



ACO DRAIN

*Commercial trench drainage
Technical handbook & product catalog*



The ACO Group

Founded in 1946, the ACO Group manufactures products for the building and construction industry. Today, ACO employs over 4,000 people world-wide and has sales and manufacturing operations in more than 40 countries.

ACO is the pioneer and world leader of modular trench drain systems. ACO drainage systems are used in a variety of applications from domestic environments to airports. ACO products have been used at many prestigious locations, including Olympic stadiums, since 1972.



Arizona facility.

ACO USA

ACO USA was founded in 1978 and is America's foremost manufacturer of trench drainage products.

As market leader, ACO USA is constantly innovating to bring new products to the market.

ACO has a fully established R&D department responsible for continuous development, quality and testing to ensure ACO products continue to lead the market.



Ohio facility.

Trench drain pioneers

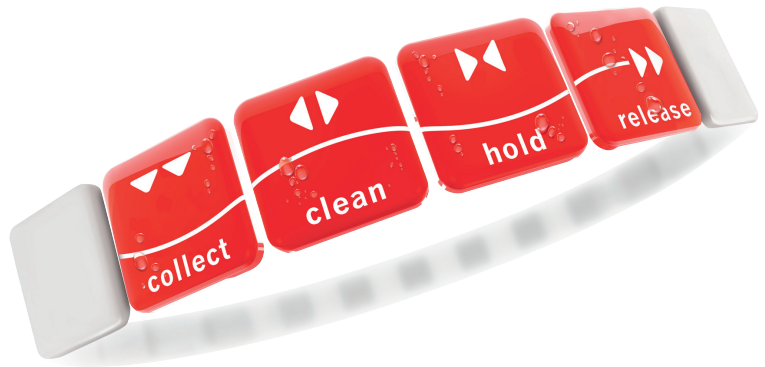
ACO Drain is the market leading modular trench drain system and is manufactured at the company's modern manufacturing facilities in Arizona and Ohio.

ACO Drain offers the most comprehensive range of trench drain solutions for every application. ACO Drain products are offered in a variety of widths, depths, and load ratings, with grates to suit. In conjunction with a comprehensive, quality product range, ACO supports its business with extensive stocking distributors, technical sales support and world class customer service.



Pioneers.

ACO. creating the future of drainage



System chain

ACO is a global leader in surface water drainage. ACO manufactures products to collect, clean, hold and release water. This addresses all phases of the water cycle and supports Sustainable Drainage (SD, SUDS, WSUDS), Low Impact Development (LID) and LEED principles.



Collect

Trench drains
Catch basins



Clean

Oil/Water separators



Hold

Detention/Retention
devices



Release

Infiltration systems
Flow control

Service chain

To support this extensive product range, ACO provides full support from design conception to product after care.



Train

ACO believes in the benefits of education and is heavily involved in product training and continuing education.



Design

A complimentary design service is offered by qualified in-house engineers to help customers ensure the right product, layout and installation details.



Support

Technical Sales Support provide complimentary on-site training, assistance and advice during installation to ensure best possible results.



Care

Our customer service goes beyond getting the order. It starts with early design concepts and continues through the service life of the product.

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Product selector

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Glossary



Introduction - selecting the right product

When selecting trench drains the following two main factors should be considered to ensure a long service life.

- 1 Application
 - Installed location factors - loading, site & user requirements

- 2 Hydraulics
 - Amount of liquid to collect and drain

Summarized information is provided on pages 8 - 9 with additional supporting information provided on pages 124 - 149.



What are trench drains?

A - Trench drain



Modular

Factory produced units offer consistent quality and can be created with advanced shape profiles and built in slope, providing additional benefits and savings.

Safety - Superior liquid capture minimizes slip hazards to pedestrians and vehicles (reduce risk of litigation).

Pavement longevity - Reduced standing water extends service life (especially in freeze-thaw environments) and pavement aesthetics.

Environmental/Health

- Standing water attracts insects and bacteria.
- Collection of rainwater for reuse (LEED).
- Collection of liquids for treatment (EPA).

Pipe savings - Minimal underground pipe, related excavation and site work required.

A trench drain is a continuous line of surface drainage that removes liquid from impermeable/semi-permeable surfaces. It has a continuous inlet along the entire length ensuring maximum liquid capture. Trench drains allow simple one-way grading of surfaces to be drained.

Narrow grates - Typically narrow grates are significantly cheaper - particularly in high load class applications.

Grading - Simple one-way slopes; easy and quick to construct.

Hydraulics - Narrower systems with built in slopes create increased velocity and system efficiency, often results in lower materials costs.

Product costs - Initial costs may seem high, but can be offset by lower pipe and installation costs.

Maintenance - Easy access to system. Increased flow velocity = less sediment build-up and maintenance.

Cast-in-place

Boxed out trench created on-site during concrete pour. Offers many of the benefits and savings of modular trench drains with the following exceptions:

Deterioration - Concrete surface deteriorates, especially in freeze-thaw environments, resulting in lower performing hydraulics and hard to clean surfaces.

Wider grates - Typically wider grates are significantly more expensive - particularly in higher load class applications.

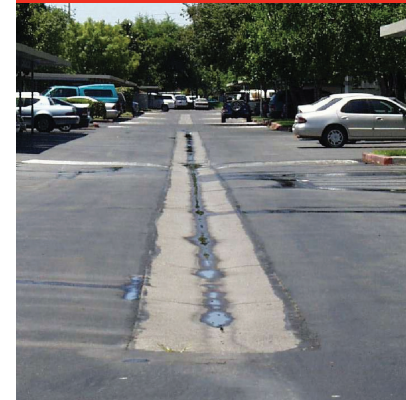
Site work - Excavation, formwork construction, creation of slope and 'U' or 'V' profile can be costly and time consuming. Tees/corners are difficult and time consuming to create.

Quality - Can vary greatly and be inconsistent depending upon the contractor. Difficult to achieve level grate and frame with good concrete support resulting in the common cause of many future problems.



Alternatives to a trench drain

B - Open swale



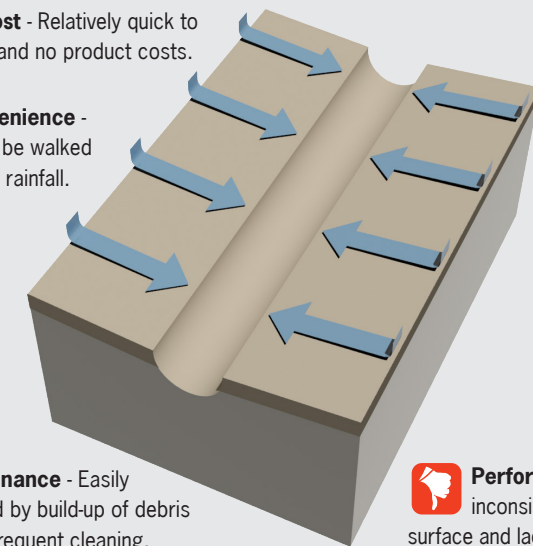
Formed ditch in pavement often leading to a catch basin.

Low cost - Relatively quick to create and no product costs.

Inconvenience - Cannot be walked on even in low rainfall.

Maintenance - Easily blocked by build-up of debris and requires frequent cleaning.

Performance - Shallow, inconsistent/irregular surface and lack of slope results in reduced hydraulics.



C - Catch basin



Series of catch basins located at strategic places in the pavement. Precise and exact grading is needed to drain effectively.

Grading - Complex four-way slopes can be difficult and time consuming to design and construct.

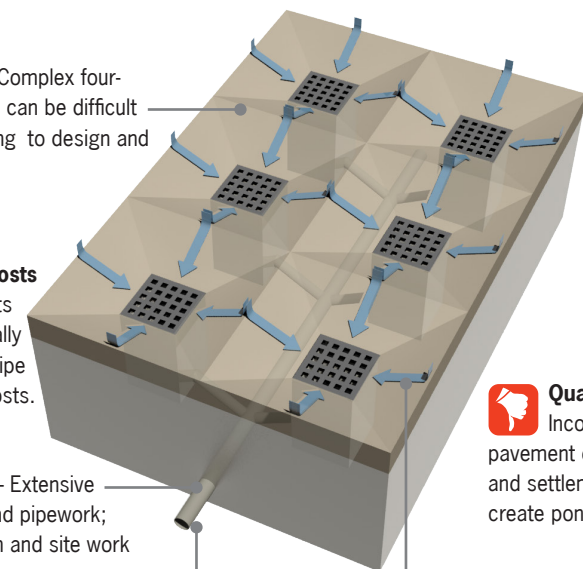
Product costs - Initial costs may be less, usually offset by higher pipe and installation costs.

Pipe cost - Extensive underground pipework; related excavation and site work required.

Maintenance - Pipes are easily blocked by build-up of debris and require frequent maintenance.

Quality - Inconsistent pavement quality and settlement can create ponding.

Pavement longevity - Ponding and undulating surface often deteriorates and results in shorter service life (especially in freeze-thaw environments).



D - Do nothing



No product costs.

Risk litigation from damage to property or injury to persons.

Risk environmental issues/penalties.

Remediation can be expensive.

Increased maintenance and reduced service life of paved areas.

Potential property damage due to water ingress.



When selecting trench drains, the following factors should be considered to ensure a long service life.

- 1 Application**
- Installed location factors; loading, site and user requirements
- 2 Hydraulics**
- Amount of liquid to collect and drain

Summarized information is provided on these pages - additional supporting information is provided on pages 124-149.



1 Application

See page 126

A number of issues relating to where the drain is used are critical to address. Incorrect product choice could lead to product failure, remediation costs, possible litigation or 'over-engineered' solutions.



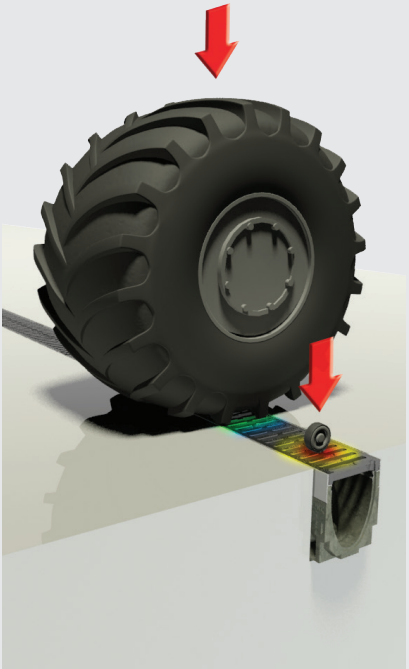
1a) Loading

See page 128

Loading refers to any kind of traffic or load being applied to the trench and grate. There are several US Load Standards relating to larger catch basin grates. ACO uses the EN 1433 standard which is specifically written for trench drains of different widths.

Loading is categorized into several load classes (light, medium and heavy). Choosing the correct solution is determined by:

- Type of traffic - Pedestrians, cars, trucks, forklift, aircraft, etc.
- Wheel loads - Include vehicle, weight of load being carried and type of tire (solid or pneumatic).
- 'Unusual' traffic – E.g. dumpsters/snow plows being dragged across trench etc.
- Frequency - Occasional versus frequent use may also affect product choice.



1b) Site requirements

See page 136

Specifics of the installed environment may drive, or limit, 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 may demand a shallow trench drain system.
- Chemicals, or other corrosive elements may influence channel and grate material choices. See page 139.
- Non-metallic trench drains may be required for factors other than chemical resistance - non-magnetic explosive environments (sparking) may be required in certain industrial applications.



- Environmental needs such as Sustainable Drainage, Low Impact Development (LID) or LEED qualification may be a determining factor in certain applications.
- Sloped trench drains may be required to eliminate standing water, which can provide a breeding ground for mosquitoes and potential health concerns - Malaria, SARS, West Nile virus, Zika, etc.

1c) User requirements

See page 140

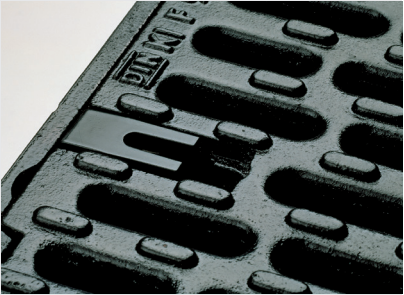
User requirements typically affect the grate, as that is the exposed part once trench drain is installed.

Requirements are project specific and once loading requirements are met, grate choice typically relates to aesthetics, legal or safety concerns.

- Aesthetics - Intake shape (slots, holes or other shapes) and material (iron, stainless, plastic) can be chosen to complement surrounding landscape.
- Legal requirements typically relate to ADA compliance, heel safety and bicycle safe needs.



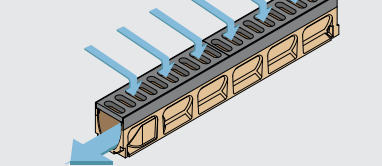
- Safety requirements typically refer to grate lockings and special surfaces (slip resistance). ACO recommends all grates are locked in place (especially in high load areas). Some applications may require multiple locks per grate or security lockings. On occasion, monolithic trench drains may be required for maximum grate security - See ACO Infrastructure product line.



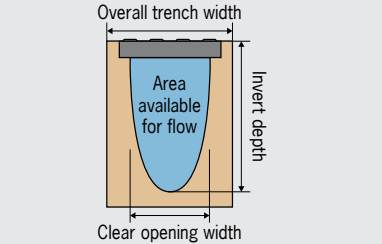
2 Hydraulics

See page 142

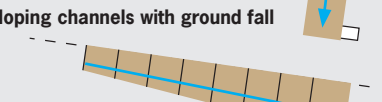
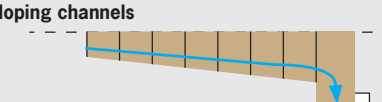
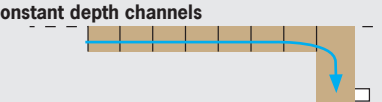
The amount of liquid a trench drain needs to collect and drain in a given time period determines size.



- Area available for flow (channel width AND depth) - Right combination avoids unnecessary costs and/or flooding.



- Slope increases velocity providing a more efficient trench. Slope is added in 3 ways:
 - Sloping invert channels
 - Constant depth channels & ground slope
 - Combination of both



- Outlet size AND position
 - Avoid restricting flow with small pipe.
 - Central outlets may enable fewer outlets.
- Grate intake - Open area (calculated by size and quantity of openings) and slot design affect how much water gets into trench, and rate of bypass (water flowing straight over grate).

When using trench drains the following factors should be considered to ensure long service life.

Open tab for key to icons

PAGE						
A	B	C	D*	E	F	LOADING EN 1433

Loading
Loading refers to any traffic or load applied to trench and grate. ACO uses EN 1433 which classifies loads into A - F.

200,000 lb	HS20
HS25	

SITE REQUIREMENTS

Channel material
Edge rail
Grates
Ductile iron
Galvanized steel
Stainless steel
Non-metallic

USER REQUIREMENTS

Lockings
Aesthetic options
Safety

HYDRAULICS

Channel width
Slope
PAGE



Selection Criteria

1a) Loading notes

The amount of loading (weight) - pounds per square inch, a trench drain needs to withstand. All ACO products are independently certified to EN 1433, and relevant US load standards - full details and a comparison to common US load standards are provided on page 128-133.

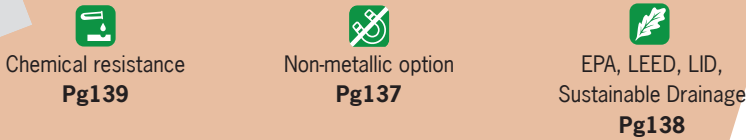


* EN 1433 suggests monolithic systems for Load class D due to dynamic loading of fast moving vehicles. See ACO Infrastructure HighwayDrain for product solutions.
** H100 is rated up to Load Class C even if grates of higher load class are used; H100K, H200K & H300K up to Load Class E (depending upon rating of grate chosen); H100SK, H200SK and H300SK up to Load Class F (depending upon rating of grate chosen).
*** MembraneDrain is recommended to a maximum of Load Class C even if grates of higher load class are used.

1b) Site requirements notes

Project environment may drive, or limit, the choice of trench drain and grate material.

For chemical and application requirements not met by standard products, ACO's Aquaduct line offers a range of different fiberglass resins and can be customized to suit. Stainless steel channels are also available. Contact (800) 543-4764 or info@acousa.com for details.



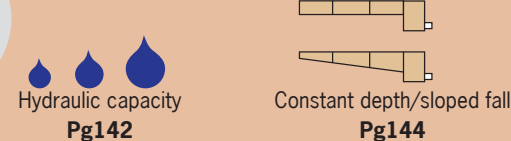
1c) User requirements notes

Typically project-led criteria based on design preference or legislation compliance.



2 Hydraulics notes

Width, depth and slope of trench drain determines amount of liquid a trench can collect and drain in a given time period - if unsure, ACO can use software to determine the right size for specific projects. See page 142-147.



	KLASSIKDRAIN							POWERDRAIN			SLAB SOLUTIONS			
	K100	K200	K300	MiniKlassik	Brickslot100	Brickslot200		S100K	S200K	S300K	SlabDrain**	Membrane***	FG200	
PAGE	22	34	44	54	58	58		66	76	86	100	108	112	PAGE
LOADING EN 1433														LOADING EN 1433
A	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	A
B	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	B
C	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	C
D*	✓	✓	✓	✗	✗	✗		✓	✓	✓	✓ HK/HSK	✗	✓	D*
E	✓	✓	✓	✗	✗	✗		✓	✓	✓	✓ HK/HSK	✗	✓	E
F	✗	✗	✗	✗	✗	✗		✓	✓	✓	✓ HSK	✗	✗	F
200,000 lb	✗	✗	✗	✗	✗	✗		✓	✓	F grate only	F grate only	✗	E grate only	200,000 lb
HS20	✗ C & E grate only	✗ C & E grate only	✗ C & E grate only	✗ C grate only	✓	✓		✓	✓	✓	✗ C, E & F grate only	✗ C grate only	✓	HS20
HS25	✗ C & E grate only	✗ E grate only	✗ E grate only	✗ C grate only	✗	✗		✓	✓	✓	✗ E & F grate only	✗ C grate only	✗ E grate only	HS25
SITE REQUIREMENTS														SITE REQUIREMENTS
Channel material	Polymer concrete	Polymer concrete	Polymer concrete	Polymer concrete	Polymer concrete	Polymer concrete		Polymer concrete	Polymer concrete	Polymer concrete	Polymer concrete	Polymer concrete	Fiberglass	Channel material
Edge rail	Galvanized or stainless steel	Galvanized or stainless steel	Galvanized or stainless steel	Galvanized or stainless steel	Galvanized or stainless steel	Galvanized or stainless steel		Ductile iron	Ductile iron	Ductile iron	Polymer concrete/ steel/iron	Galvanized or stainless steel	Galvanized, coated or stainless steel	Edge rail
Grates														Grates
Ductile iron	✓	✓	✓	✓	✗	✗		✓	✓	✓	✓	✓	✓	Ductile iron
Galvanized steel	✓	✓	✓	✓	✓	✓		✗	✗	✗	✓	✓	✓	Galvanized steel
Stainless steel	✓	✓	✓	✓	✓	✓		✗	✗	✗	✓	✓	✓	Stainless steel
Non-metallic	✓	✗	✗	✓	✗	✗		✗	✗	✗	✓ 100mm only	✓	✗	Non-metallic
USER REQUIREMENTS														USER REQUIREMENTS
Lockings	 QuickLok™/ DrainLok™	 QuickLok™/ DrainLok™	 QuickLok™/ DrainLok™	 DrainLok™	NA	NA		 PowerLok™/ Bolted	 PowerLok™/ Bolted	 PowerLok™/ Bolted	 Various	 QuickLok™/ DrainLok™	 Bolted	Lockings
Aesthetic options								✗	✗	✗			✗	Aesthetic options
Safety					Dependent on paver	Dependent on paver								Safety
HYDRAULICS														HYDRAULICS
Channel width	4" 100mm	8" 200mm	12" 300mm	2" 50mm	4" 100mm	8" 200mm		4" 100mm	8" 200mm	12" 300mm	4" / 8" / 12" 100 / 200 / 300mm	4" 100mm	8" 200mm	Channel width
Slope														Slope
PAGE	22	34	44	54	58	58		66	76	86	100	108	112	PAGE



Products - ACO Drain

ACO Drain consists of a wide selection of products to meet most project loading, design, hydraulic and budget requirements.

KlassikDrain	<i>General purpose trench drains.....</i>	<i>14</i>
	<i>K100.....</i>	<i>22</i>
	<i>K200.....</i>	<i>34</i>
	<i>K300.....</i>	<i>44</i>
	<i>MiniKlassik K50</i>	<i>54</i>
	<i>Brickslot 100/200</i>	<i>58</i>
PowerDrain	<i>Heavy duty trench drains.....</i>	<i>62</i>
	<i>S100K.....</i>	<i>66</i>
	<i>S200K.....</i>	<i>76</i>
	<i>S300K.....</i>	<i>86</i>
Slab Solutions	<i>Concrete slab trench drains.....</i>	<i>96</i>
	<i>SlabDrain 100/200/300.....</i>	<i>100</i>
	<i>MembraneDrain</i>	<i>108</i>
	<i>FlowDrain FG200</i>	<i>112</i>