

ACO Water Management: Civils + Infrastructure

Uniclass L7315 + L2123	EPIC J3413
Cl/SfB (52.5)	

ACO RoadDrain®



ACO RoadDrain®

Heavy-duty channel drainage system



Introduction to the ACO Group

Throughout the world ACO branded drainage and surface water management systems are recognised for their innovative design, high quality manufacture, environmental excellence and industry leading performance.

Today the ACO Group has a research and production base that reaches across four continents. This unmatched resource pioneers the development of solutions that are tailored to individual applications, meeting the need for high performance, sustainable products that deliver optimum value throughout their operational life.

ACO Technologies plc

ACO operates as ACO Technologies plc in the United Kingdom. Founded over 30 years ago, the company has grown quickly on a reputation for design innovation and customer service.

There are now 2 divisions within ACO Technologies that serve every sector of the construction industry, providing solutions for applications as diverse as rail, highways, airports, landscaping, retail, distribution centres and environmentally sensitive projects.



To help architects, designers and contractors meet the legal requirements that now tightly control the way surface water is managed, ACO has created its unique system chain that combines a 'Surface Water Management Cycle' – Collect, Clean, Hold, Release, with the service support of Train, Design, Support and Care.

These processes enable ACO to offer a combination of product and service expertise necessary for the complete and sustainable management of surface water drainage.



Contents

Introduction to ACO RoadDrain®	4
Channel range layout	6
Features overview	8
Project case studies	10
Problem solving with ACO RoadDrain®	11
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ACO RoadDrain® System	
ACO RoadDrain® 100	12
ACO RoadDrain® 200	15
ACO Universal Gully	17
<hr/>	
Problem Solving Drainage Solutions	
Design Software	18
Design Support Services	19
Installation details	20
Chemical Resistance Chart	22
Material benefits	23
Specification Clause / CE Conformity	24



Introduction to ACO RoadDrain®

ACO RoadDrain® is a high strength monolithic channel system which delivers high performance drainage in applications subject to extreme wheel loads, including motorways, ports, docks and aircraft aprons.

What is ACO RoadDrain®?

ACO RoadDrain® is a surface water drainage system, specifically designed for heavy duty and industrial applications. The channel ranges 100 and 200 are fully certified to BS EN 1433:2002 for applications D 400 to F 900. ACO RoadDrain® complies with specification for Highways Works Clause 517.

Manufactured from Vienite®, ACO's sustainable high strength material the RoadDrain® channels are available in two widths, 100mm and 200mm in a variety of depths.

The 0.5m channel units that make up the ACO RoadDrain® system are available in constant depths. This enables either flat or stepped installations to be achieved making it ideal for many highways, local authority, commercial or industrial applications requiring positive interception and drainage of surface water.

Where a higher capacity drainage system is required, RoadDrain® 200 constant depth units are ideal for dealing with larger volumes of water.

This keeps the water closer to the surface and reduces the need for costly underground pipe networks.



Typical applications

All channels and accessories are certificated to BS EN 1433:2002 load class D 400 to F 900 so are suitable for a wide range of applications. The monocast construction means they are suited to applications where strength and reliability are key:

- ▶ Roads and road junctions
- ▶ Distribution and warehouses
- ▶ Commercial areas
- ▶ Light and heavy industrial
- ▶ Motorways
- ▶ Ports/Docks
- ▶ Aircraft aprons
- ▶ HGV parking areas



If you need help with specification, design or installation, or just wish to learn more about this and other Surface Water Management products from ACO, contact our free, no obligation ACO Water Management Design Services Team who can provide advice and dedicated design support for your project – 01462 816666 or visit www.aco.co.uk.

Why Choose RoadDrain®?

Heavy-duty

ACO RoadDrain® is specifically designed for heavy-duty and industrial applications fully certified to BS EN 1433:2002 for applications D 400 to F 900.

The polymer concrete's high strength characteristics means the material is four times stronger than traditional concrete.

ACO RoadDrain® is a robust one-piece drainage channel, which has proven history of withstanding high dynamic forces encountered in highways and heavy industrial applications.

Durability & water tightness*

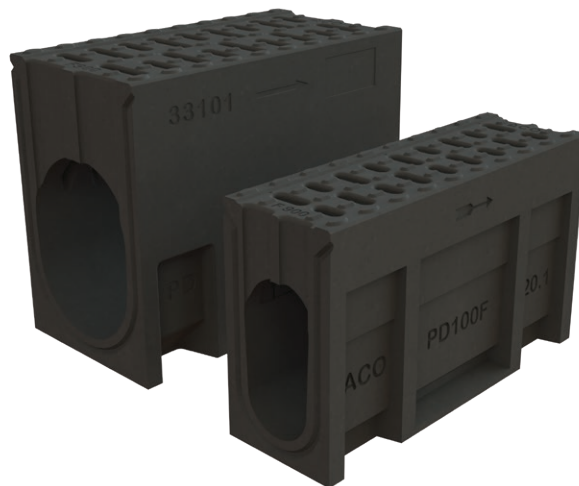
Manufactured from Vienite® RoadDrain® channels have many benefits including excellent resistance to dilute acids and alkalis, is unaffected by road salts, fuels and oils typically encountered during service.

Having a water absorption level of only 0.01% by weight, Vienite® ensures water tight* installations can be achieved to prevent unwanted contamination of surrounding soil or ground water.

Flexible installation

ACO RoadDrain® has a full range of easy to use accessories including endcaps, outlets and universal gullys, allowing flexibility for installations.

ACO RoadDrain® is also compatible with ACO KerbDrain® installations, allowing cross junction areas to connect to kerb side drainage.



System benefits:

- ▶ One piece design means no separate grating specifications
- ▶ Caters for extreme wheel loads such as airport aprons, ports and docks
- ▶ Strong and robust design
- ▶ CE Marked and BS EN 1433:2002 certified Load Class D 400 to F 900
- ▶ Caters for a range of catchment depths
- ▶ Integral inlets in polymer concrete cannot be lost or stolen
- ▶ Polymer concrete construction maintains colour and offers excellent chemical resistance
- ▶ Sump and gully outlets available for connection to underground drainage



NEW ACO Hydraulic Design Software

Register online for our free, secure online design software:

- ▶ All designs are securely stored and easily accessed online
- ▶ Data always up-to-date
- ▶ Proven calculation methodology - more accurate and efficient designs
- ▶ Flexible catchment design
- ▶ Integrated rainfall data
- ▶ Automated product optimisation
- ▶ PDF summary documents



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www.aco.co.uk/quad-hydraulic-design-2.0

*ACO RoadDrain channels are tested to confirm compliance with the water tightness requirements of BS EN 1433. See water tightness note on page 21.

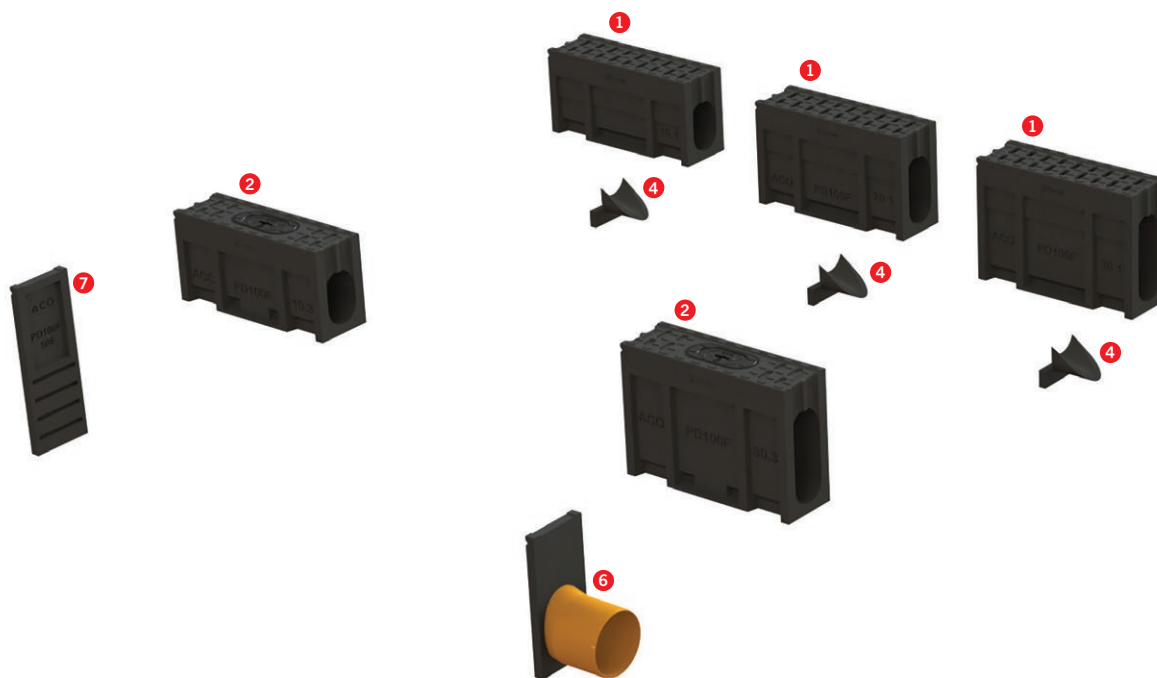


ACO RoadDrain® Layout

To support a wide variety of catchment depths, hydraulic capacities and applications, the system is available in two channel widths, 100mm and 200mm and has a range of constant depth channels to suit the drainage design.

The layout below illustrates the channels and accessories available within the ACO RoadDrain® range and to aid product selection, a summary of the function and features of each component is provided.

All ACO RoadDrain® channels are monolithic making them perfect for public roads and carriageways.



1 Constant depth channels – 0.5m



- ▶ **100mm wide bore:** Five constant depth channel units are available in 0.5m lengths with overall depths ranging from 250mm to 450mm.
- ▶ **200mm wide bore:** Three constant depth channel units are available in 0.5m lengths with overall depth ranging from 400mm to 500mm.

2 Access Units – 0.5m



- ▶ **100mm wide bore:** Three 0.5m constant depth access units are available with overall depths ranging from 250mm to 450mm
- ▶ **200mm wide bore:** Three 0.5m constant depth access units are available with overall depths ranging from 400mm to 500mm.

These channels include vertical knockout for connection to Ø110mm (100mm wide bore) or Ø160mm (200mm wide bore) pipework.

3 Sump



- ▶ **100mm wide bore:** one 0.5m sump for connection to constant depth 10.1, 20.2 and 30.1 channels only. For 100mm 40.1 and 50.1 depths the Universal Gully can be used.
- ▶ **200mm wide bore:** the Universal Gully is used with this range.

The sump has connections for three depths of channel. Outlet options for Ø110mm and Ø160mm pipes and foul air traps. Plastic silt bucket provided with each unit.

4 Step Connector

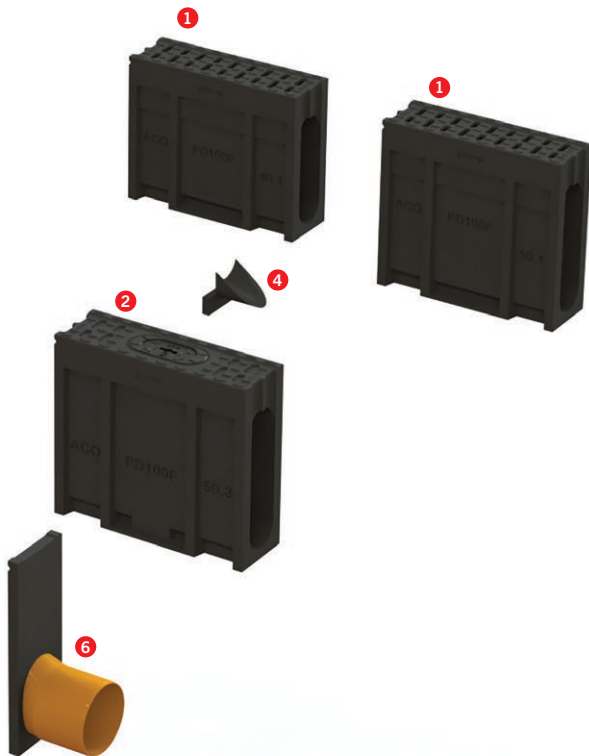


A polymer concrete unit which helps provide smooth water transition between constant depth channels when used in a stepped system design. The step connector is suitable for the 50mm step between each of the constant channel depths.

5 Universal Gully



One universal gully for all applications compatible with RoadDrain® 100 and RoadDrain® 200 ranges and certified to Load Class D 400 to F 900. Standard features include ductile cast iron cover, silt bucket and roddable foul air trap for connection to Ø160mm PVC-U pipe.



6 Inlet/outlet Endcap



Polymer concrete inlet/outlet endcaps to be used with specific heights in the channel run. Two depths available for 100mm wide bore and three depths available for 200mm bore.

7 Closing Endcap



Two widths of polymer concrete closing endcaps are available for closing the channel run.



ACO ROADRAIN® FEATURES OVERVIEW

A range of high intake heavy duty inlets designed to resist debris blockage

Fully certified to BS EN 1433: 2002 Load Class D 400 to F 900

Sealant groove for simple watertight installations

Smooth polymer concrete channel bore for efficient hydraulic performance



LOAD CLASSES



D 400

Parking areas for all vehicle types, distribution yards.



E 600

Industrial areas, heavy wheel loads, slow-moving HGV's and forklifts, service stations.



F 900

Airport runways, very heavy industrial and military installations, service yards and lorry parks.



Traditional channel and grating drainage system

Highways England Compliant, complies with Clause 517 SWH and is Kitemarked to BS EN 1433:2002 for highway use



*BS EN 1433
KM 53858
D 400

Manufactured from Vienite®, a polymeric based recycled material that improves stability and anchors product into concrete surround



External surfaces anchor channel securely into concrete surround to prevent displacement



NEW ACO Hydraulic Design Software

Register online for our free, secure online design software:

- ▶ All designs are securely stored and easily accessed online
- ▶ Data always up-to-date
- ▶ Proven calculation methodology - more accurate and efficient designs
- ▶ Flexible catchment design
- ▶ Integrated rainfall data
- ▶ Automated product optimisation
- ▶ PDF summary documents



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ACO RoadDrain® project case studies

The many benefits of ACO RoadDrain® have, since its launch, helped architects, engineers and contractors install the most robust and reliable channels in high profile projects.

In differing applications with widely varying objectives, the ACO Water Management Design Services Team has played a key partnering role, ensuring each finished system not only met those objectives but added wider value.

The next two pages demonstrate how ACO RoadDrain® has provided efficient and cost effective drainage to a diverse range of applications.



For more ACO Water Management case studies visit www.aco.co.uk.

Project requirement: Protecting the environment

Project name: Dublin port

Client:

Dublin Port Company

The creation of a new loading yard and terminal to meet the demands of increasing port traffic required a drainage solution that could separate out clean from contaminated water, and meet the point loading demands from the cranes and other heavy traffic. ACO RoadDrain® monocast construction could cope with the turning wheels of the port cranes and an on-site wet test was arranged to show the system could be sufficiently sealed to meet the Environmental Protection Agency regulations to avoid any contaminated liquid being discharged into the sea.



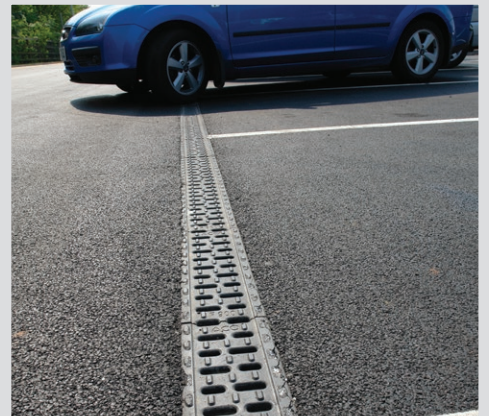
Project requirement: Integrated design

Project name: M5 Michaelwood services integrated design

Contractor:

Buckingham Group Contracting Ltd

The refurbishment of Michaelwood services involved an update to the car and lorry parking areas to accommodate more vehicles and ease traffic movement. ACO RoadDrain® was chosen to sit across the larger car parking areas to provide optimum removal of surface water. Its easy integration with ACO KerbDrain®, combined kerb and drainage, and the existing sewer connections, allowed an installation with minimal ground infrastructure disruption. This simplified the construction of the hardstanding and improved the integrity of the finished pavement.



Project requirement: Tailored traffic scheme

Project name: Layton Blackpool

Client:

Blackpool Council

The regeneration project at Layton District Centre, two miles east of Blackpool, involved the use of 'shared space' to create a safe and attractive mixed-use zone of traffic and pedestrians. ACO RoadDrain® was used along the central reservation of these 20mph zones, which were turned into a pedestrian islands, lowered to carriageway level and finished to match the footways. ACO RoadDrain® was used to demark boundaries between this pedestrian island and the vehicle carriageway. A formulated colour additive was put in to the resin concrete base mix to achieve a colour that could clearly demark the two areas.



Problem solving with ACO RoadDrain®

In addition to providing efficient drainage of carriageways, and public roads and motorways, ACO RoadDrain® can be used to solve many drainage problems created within the modern built environment.

Some examples of how ACO RoadDrain® is successfully used by engineers and designers are shown below.

For more ACO Water Management case studies visit www.aco.co.uk.



If you need help with specification, design or installation, or just wish to learn more about any Surface Water Management products from ACO, contact our ACO Water Management Design Services Team who can provide free, no obligation advice and dedicated design support for your project – 01462 816666 or visit www.aco.co.uk.

T-Junctions

• **PROBLEM:**

Where side roads adjoin the main carriageway, flow of surface water along the gutter can be impeded or prevented leading to standing water and drainage issues. Surface water runoff from side roads entering the main carriageway can also be a hazard to road users.



• **SOLUTION:**

- The ACO RoadDrain® range can combine with ACO KerbDrain® to effectively drain the road junction, providing continuous and effective interception and drainage of surface water flows across the junction.
- The photograph shows ACO KerbDrain® HB480 external mitre units and HB480 junction channel units being used with ACO RoadDrain® PD200F to provide drainage at a T junction.

Across roads

• **PROBLEM:**

Channels which cross public carriageways are subjected to continual traffic. RoadDrain is a non-grated system and therefore is not restricted under DMRB HD33/06 Clause 6.17, which restricts the use of grated systems in these types of installations.



• **SOLUTION:**

- ACO RoadDrain® units are monocast, they are a one-piece drainage channel providing long term security and robustness. Effective drainage of the carriageway is maintained and the risk of ponding is eliminated.
- The photograph shows ACO RoadDrain® PD100F installed across a public road, adjacent to a pedestrian crossing.

Multi-use car parks

• **PROBLEM:**

Parking areas near industrial sites may be required to take the loading of HGVs as well as lighter commercial vehicles.



• **SOLUTION:**

- ACO RoadDrain® offers a robust and effective drainage solution capable of withstanding the heaviest F 900 loads. The channel can be combined with sumps or gullies for full access to the system
- The photograph shows ACO RoadDrain® PD100F being used to provide drainage at an industrial carpark, at the edge of parking bays.



ACO RoadDrain® 100

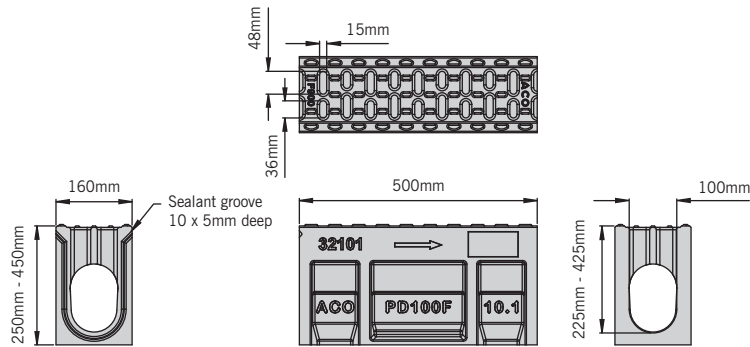
ACO RoadDrain® 100 constant depth channels listed below are constant channels which can be used in a stepped system.

Suitable for applications up to and including BS EN 1433:2002 Load Class D 400 to F 900.

The ACO universal gully can be used with all ACO RoadDrain® channels see page 17 for further details.

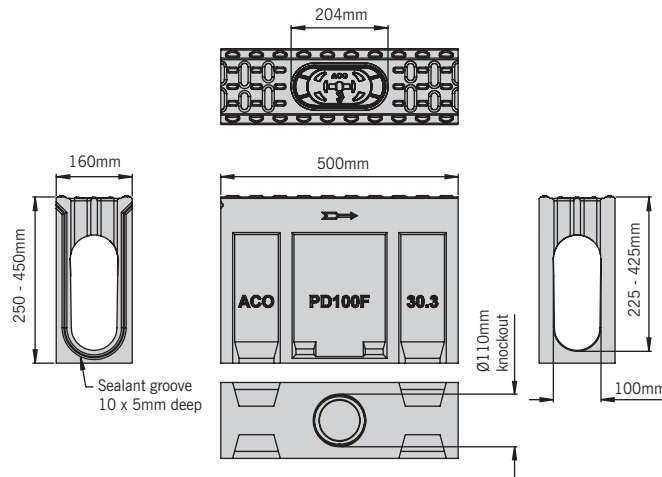
Constant depth channels

Product code	Description	Length (mm)	Depth overall (mm)	Invert depth (mm)	Weight (kg)	Sump	Gully unit	Closing endcap	Inlet/outlet/end cap	Step connector
32101	PD100 F 10.1	500	250	225	21.0	PD900 F	601/602/607	PD100 F 506	-	-
32201	PD100 F 20.1	500	300	275	23.5	PD900 F	601/602/607	PD100 F 506	-	PD100 F 123
32301	PD100 F 30.1	500	350	325	25.4	PD900 F	601/602/607	PD100 F 506	PD100 F 308	PD100 F 123
32401	PD100 F 40.1	500	400	375	27.5	-	601/602/607	PD100 F 506	-	PD100 F 123
32501	PD100 F 50.1	500	450	425	29.8	-	601/602/607	PD100 F 506	PD100 F 508	PD100 F 123



Access units

Product code	Description	Length (mm)	Depth overall (mm)	Invert depth (mm)	Weight (kg)	Sump	Gully unit	Closing endcap	Inlet/outlet/end cap	Step connector
32103	PD100 F 10.3*	500	250	225	26.4	PD900 F	601/602/607	PD100 F 506	-	-
32303	PD100 F 30.3*	500	350	325	31.0	PD900 F	601/602/607	PD100 F 506	PD100 F 308	PD100 F 123
32503	PD100 F 50.3*	500	450	425	34.6	-	601/602/607	PD100 F 506	PD100 F 308	PD100 F 123



*These Level Invert Channels have a vertical Ø110mm knockout

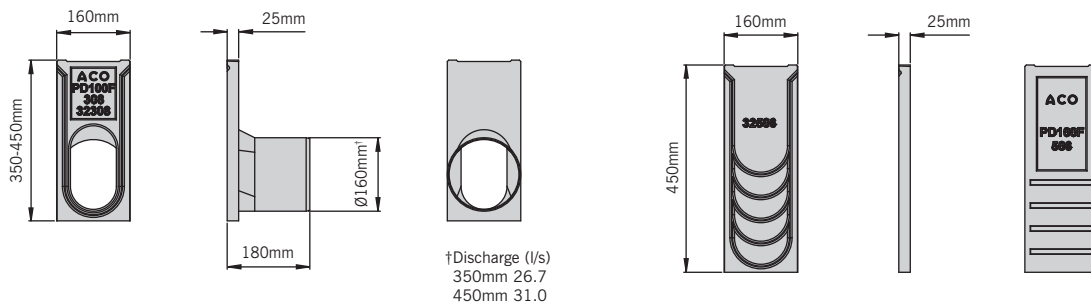
These products are subject to weight and dimensional tolerances. The dimensions shown on this page are for guidance purposes only.



ACO RoadDrain® 100

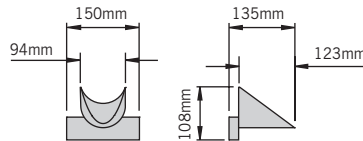
Endcaps

Product code	Description	Length (mm)	Width bore (mm)	Width overall (mm)	Depth overall (mm)	Invert depth (mm)	Weight (kg)
32506	PD100 F 506 Closing endcap	25	-	160	450	-	2.8
32308	PD100 F 308 Inlet/outlet endcap	25	150	160	350	325	2.2
32508	PD100 F 508 Inlet/outlet endcap	25	150	160	450	425	3.0



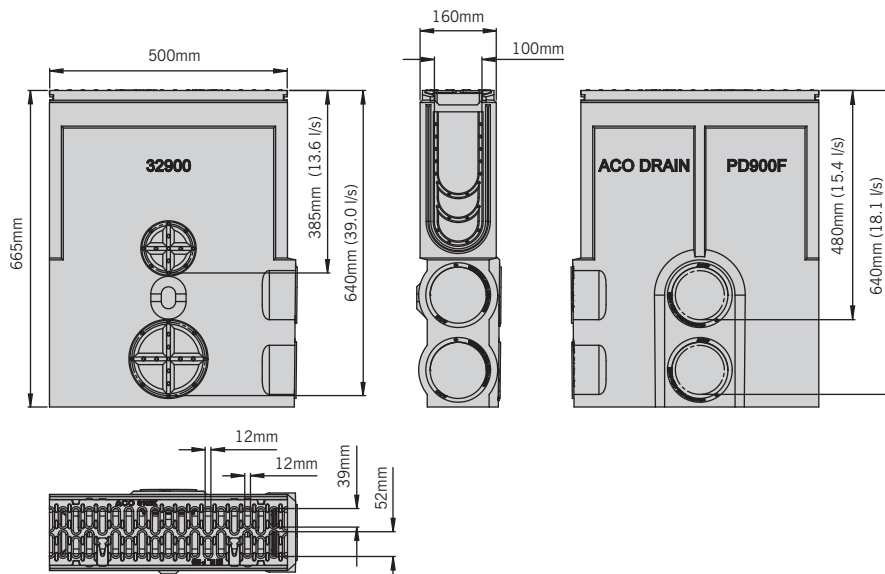
Step connector

Product code	Description	Length (mm)	Width bore (mm)	Width overall (mm)	Depth overall (mm)	Invert depth (mm)	Weight (kg)
30123	PD100 F 123 Step connector	123	94	150	-	-	0.9



Sump unit with cast iron edge rails

Product code	Description	Length (mm)	Width bore (mm)	Width overall (mm)	Depth overall (mm)	Invert depth (mm)	Weight (kg)
32900	PD900 F Sump includes sediment bucket	500	100	160	665	640	43.6



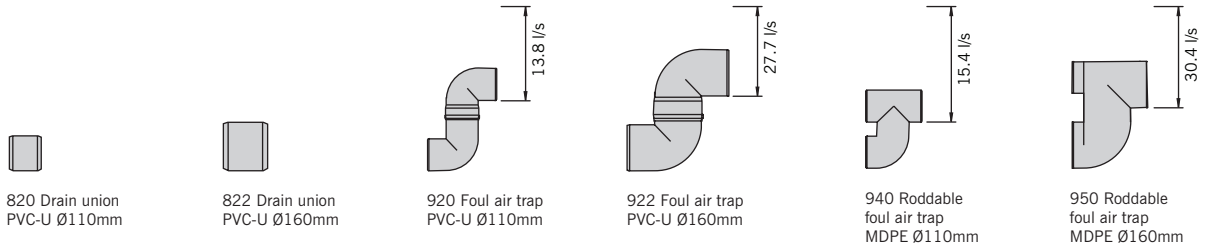
These products are subject to weight and dimensional tolerances. The dimensions shown on this page are for guidance purposes only.



ACO RoadDrain® 100

Drain unions and foul air traps

Product code	Description	Length (mm)	Width bore (mm)	Width overall (mm)	Depth overall (mm)	Invert depth (mm)	Weight (kg)
0056	820 Drain union PVC-U Ø110mm	100	100	110	-	-	0.1
0058	822 Drain union PVC-U Ø160mm	150	150	160	-	-	0.5
2640	920 Foul air trap PVC-U Ø110mm	-	100	110	-	390	0.5
2638	922 Foul air trap PVC-U Ø160mm	-	150	160	-	375	1.9
7931	940 Roddable foul air trap MDPE Ø110mm	-	100	110	-	480	0.6
7932	950 Roddable foul air trap MDPE Ø160mm	-	150	160	-	435	0.8



Polymer repair kit

Product code	Description	Weight (kg)
32599	Polymer concrete repair kit	1kg†



Polymer repair kit

Note: For gully details please refer to page 17.

†Repair kit includes 0.5kg tin of natural colour polyester concrete repair resin, grey and black pigment, hardener paste, mixing instructions and material safety data sheets.

These products are subject to weight and dimensional tolerances. The dimensions shown on this page are for guidance purposes only.



ACO RoadDrain® 200

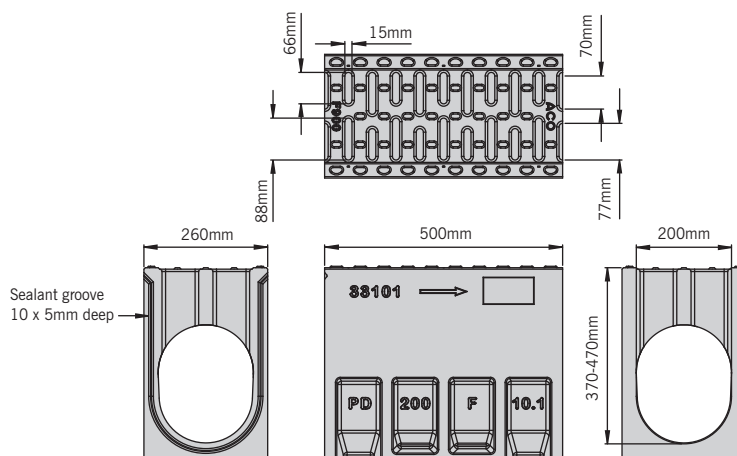
ACO RoadDrain® 200 constant depth channels listed below are constant channels which can be used in a stepped system.

Suitable for applications up to and including BS EN 1433:2002 Load Class D 400 to F 900.

The ACO universal gully can be used with all RoadDrain® channels see page 17 for further details.

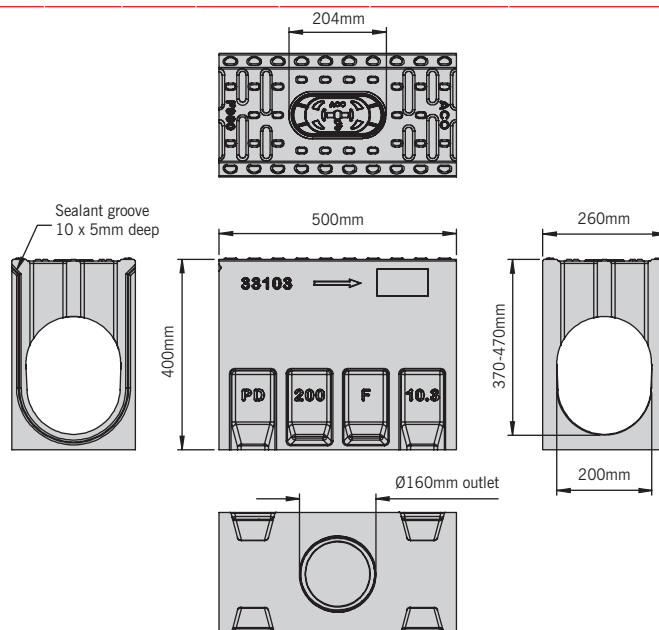
Constant depth channels

Product code	Description	Length (mm)	Depth overall (mm)	Invert depth (mm)	Weight (kg)	Sump	Gully unit	Closing endcap	Inlet/outlet/end cap	Step connector
33101	PD200 F 10.1	500	400	370	52.0	-	601/602/607	PD200 F 306	PD200 F 108	PD200 F 123
33201	PD200 F 20.1	500	450	420	54.5	-	601/602/607	PD200 F 306	PD200 F 208	PD200 F 123
33301	PD200 F 30.1	500	500	470	58.3	-	601/602/607	PD200 F 306	PD200 F 308	PD200 F 123



Access units

Product code	Description	Length (mm)	Depth overall (mm)	Invert depth (mm)	Weight (kg)	Sump	Gully unit	Closing endcap	Inlet/outlet/end cap	Step connector
33103	PD200 F 10.3*	500	400	370	58.9	-	601/602/607	PD200 F 306	PD200 F 108	PD200 F 123
33203	PD200 F 20.3*	500	450	420	61.0	-	601/602/607	PD200 F 306	PD200 F 208	PD200 F 123
33303	PD200 F 30.3*	500	500	470	63.1	-	601/602/607	PD200 F 306	PD200 F 308	PD200 F 123



*These Level Invert Channels have a vertical Ø160mm knockout

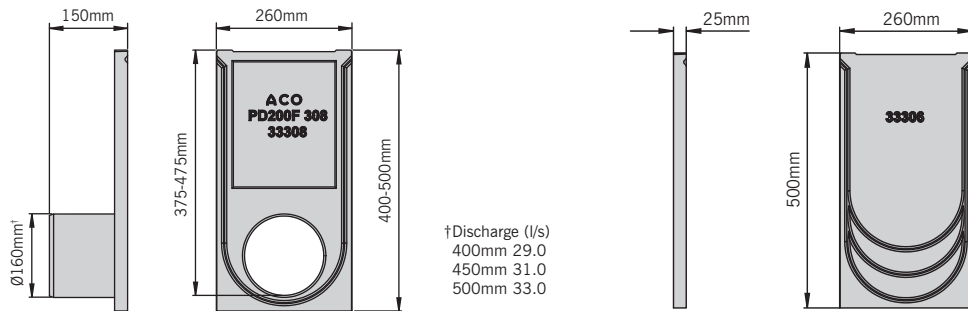
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ACO RoadDrain® 200

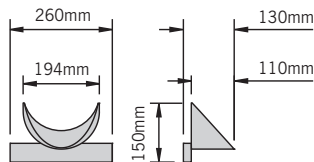
Endcaps

Product code	Description	Length (mm)	Width bore (mm)	Width overall (mm)	Depth overall (mm)	Invert depth (mm)	Weight (kg)
33306	PD200 F 306 Closing endcap	25	-	260	500	-	4.6
33108	PD200 F 108 Inlet/outlet endcap	25	150	260	400	375	4.3
33208	PD200 F 208 Inlet/outlet endcap	25	150	260	450	425	4.7
33308	PD200 F 308 Inlet/outlet endcap	25	150	260	500	475	5.2



Step connector

Product code	Description	Length (mm)	Width bore (mm)	Width overall (mm)	Depth overall (mm)	Invert depth (mm)	Weight (kg)
33123	PD200 F 123 Step connector	110	194	260	-	-	1.4



16



Drain unions and foul air traps

Product code	Description	Length (mm)	Width (mm)	Width overall (mm)	Depth overall (mm)	Invert depth (mm)	Weight (kg)
0058	822 Drain union PVC-U Ø160mm	150	150	160	-	-	0.5

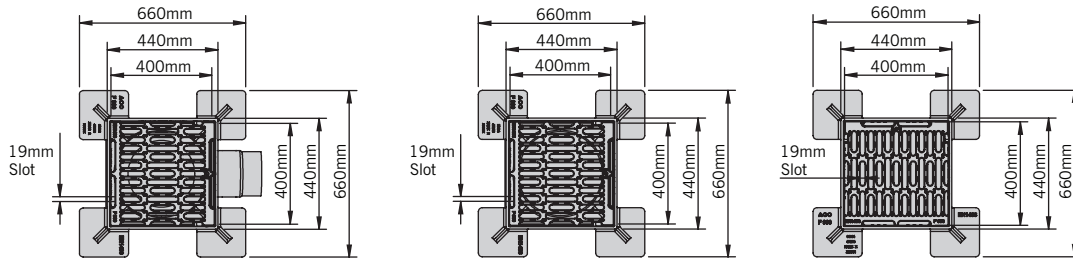


822 Drain union PVC-U Ø160mm

ACO Universal Gully

ACO Universal Gully for RoadDrain® 100 and 200

Product code	Description	Length (mm)	Width overall (mm)	Depth overall (mm)	Invert depth (mm)	Slot width (mm)	Invert type	Weight (kg)
33601	Gully assembly and bucket 601F	440	440	1315	870	19	1	78.8
33602	Gully assembly no bucket 602F	440	440	1315	870	19	1	77.4
33607	Gully top assembly only 607F	440	440	655	-	19	1	73.1
33604	Grating and frame 604F	400*	660††	100	-	19	1	69.5



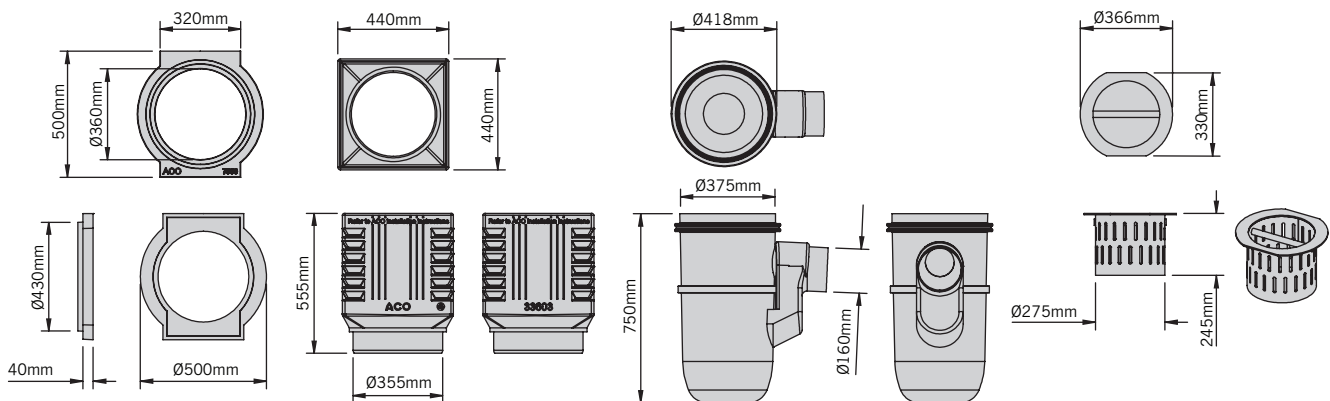
Gully assembly No 601F and No 602F

Gully top assembly No 607F
(Gully pot supplied by others)

Gully grating and frame only No 604F

ACO Universal Gully components

Product code	Description	Length (mm)	Width overall (mm)	Depth overall (mm)	Invert (mm)	Invert type	Weight (kg)
7060	Gully connector 615	500	Ø500	40	-	1	7.0
33603	Gully intermediate unit 603	440	440	555	-	1	5.1
33605	Gully base unit 605	-	Ø375	750	310	1	4.3
33606	Bucket polyethylene 606	-	Ø275	245	-	1	1.4



Gully connector No 615

Gully intermediate unit No 603

Gully base unit No 605

Gully bucket No 606

* Clear opening size †† Over frame size

These products are subject to weight and dimensional tolerances. The dimensions shown on this page are for guidance purposes only.



Design Software

ACO QuAD Hydraulic Design Software

TRY OUR FREE DESIGN TOOL

The new free-to-use ACO QuAD Hydraulic Design software has unprecedented levels of choice and flexibility built-in, to enable the efficient and accurate hydraulic design of any surface water management scheme.

The hydraulic engine has been robustly tested and is the tool used by ACOs own internal Design Services team in modelling surface water solutions for customers.

ACO QuAD Hydraulic Design software uses differential equations for spatially varied flow that online alternative solutions cannot accurately match. For example the Manning's equation for steady uniform flow does not work with level channels and is grossly inaccurate on shallow gradients.



Here are some of the features it includes:

- Powerful project-based software
- Create catchment models that are fully editable
- PDF summary document output
- Cloud based – All designs are stored securely on our server against your login
- Integrated rainfall data for the whole of the UK

To use the QuAD Hydraulic Design software visit: www.aco.co.uk/quad-hydraulic-design-2.0

QUAD FEATURES OVERVIEW

Cloud based

The software means increased efficiency providing design resources you need when you need it, allowing you to deploy the same design capability consistently, with the same consistency in results every time.



Flexible download format

Output can be generated for all or parts of the project and can be generated in pdf or CSV formats.



Secure scheme filing

All designs created by registered users are stored on a secure server and are password protected. Past projects are easily retrieved from the personalised menu.



Flexible catchment design

QuAD is designed to support designers in the creation of catchment areas. Supplementary catchment areas can easily be added upstream and downstream of any previously designed channel run.



Application

Application selection ensure designers are able to get quick and accurate guidance in selection of the most suitable products based on the type of application the catchment is to cater for.



Knowledge database

There is support available either through a query submission or through self-help made possible by the comprehensive Knowledge database.



Product optimiser

Optimising the specific channel runs can be done with the optimiser feature selecting the smallest product suitable. Excavation and concrete requirements are also provided.



Rainfall assist

Rainfall intensity by location matters in design. QuAD provides a site locator map enabling the most accurate intensity to be input.



Resilience assessment

By inputting anticipated sedimentation rates and sedimentation density the QuAD software enables the designer to test their suggested maintenance schedules.



Attenuation assessments

Calculate the attenuation required for the project and compare it with the storage available in the channel design. Attenuation volume is presented along with suitable options for storage.



Register Now - It's Free
www.aco.co.uk/quad-hydraulic-design-2.0



Design Support Services

Surface water management system design can often be a complex task. Success in combining products and processes requires a thorough understanding of how these different elements work together.

The ACO Design Services Team is able to work closely with you through the entire design process to ensure accurate and cost-effective product selection is made.

Services we offer include (free and without obligation):

- Whole system design, from collection to the attenuation of surface water
- Hydraulic calculations and AutoCAD detailing
- Parts schedules

ACO has embraced the concept of value engineering as an approach to on-site construction that saves both time and money.

ACO will review any design to minimise the total scheme and life cost of a proposal. The team can suggest the most appropriate range depending on your requirements.

Some ranges like MultiDrain or MonoDrain allow water to be contained and conveyed close to the surface, which accords with the principles advocated for Sustainable Drainage (SuDS Manual, 2015), by removing the need for pumping. Other ranges like Qmax allow attenuation – the storage of large volumes of water during storm events, reducing overall site costs.

For detailed designs using the ACO Hydraulic Design Software, please contact the ACO Water Management Design Services Team.

If manual calculations are preferred to using our QUAD software, hydraulic tables and instructions for manual calculations can be provided.

ACO Water Management Design Services Team

Tel: 01462 816666

Email: technical@aco.co.uk

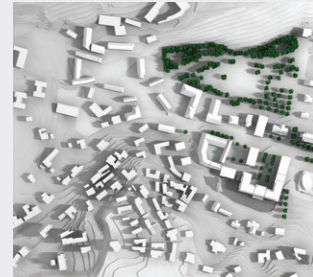
ACO BIM MODELS

BIM is the process of generating and managing data, and developing collaborative behaviours that will unlock new and more efficient ways of working at all stages of the project life-cycle. These files will help contractors specify and optimise drainage systems in line with the overall benefits of BIM-enabled

working, including faster project delivery, reduced costs, reduced waste and greater project predictability.

Depending on the product range Civils3D, IFC or Revit files are available for download.

www.aco.co.uk/aco-bim-models



Professional Development

Helping create knowledge champions

In today's ever-changing construction industry, it has never been more important to ensure you are up to date with current industry trends and new innovations. Surface water management is one of the most dynamic sectors of the construction industry with new legislation, innovative products and ground-breaking materials constantly emerging.

Depending on your professional body or employer, you may be required to undertake between 20 and 30 hours CPD per year. ACO understands this can be a daunting task and has developed a series of professional

development courses that can be accessed in a number of ways including online, in-office or at our state-of-the-art training facility at ACO UK office headquarters in Bedfordshire.

The courses have been carefully developed to provide essential learning and knowledge and are delivered by ACO's UK wide experienced Business Development Team ensuring that only the highest quality content is delivered.



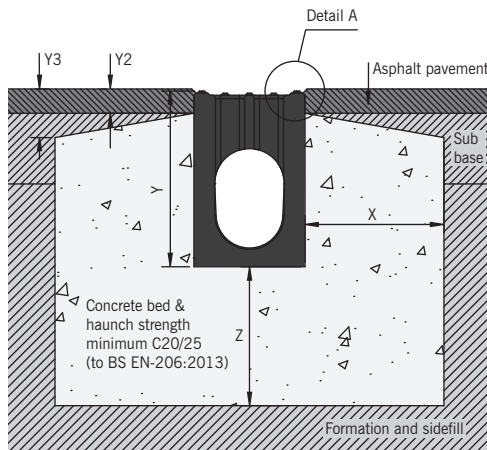
To find out more and book a professional development course, visit: www.aco.co.uk/professional_development



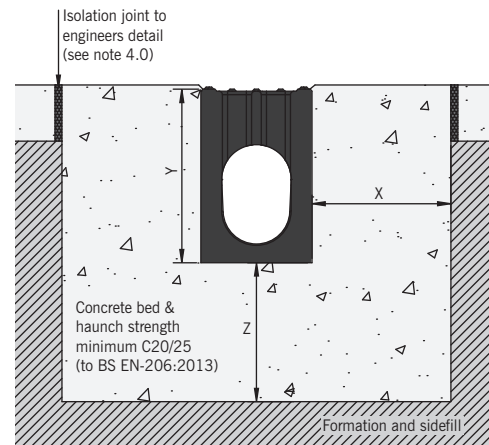
Installation detail

ACO ROADRAIN®

Asphalt pavement



Concrete pavement



1.0 Load Class

Installation recommendations shown are ACO minimum recommendations for BS EN 1433:2002 load class requirements.

2.0 Ground Conditions

The long term performance of a channel installation to sustain vertical and lateral loads depends upon A) ground conditions B) stability of the adjacent pavement and C) a durable concrete bed and surround. The recommended installation detail may require the minimum dimensions to be revised to achieve site specific load class requirements (referred to in 1.0 above).

3.0 Cutting and Jointing

Mitre joints are formed by cutting the channels to the required angle and butting them together with appropriate sealant (e.g. Sikaflex 11FC or similar) or ACO Repair Kit. Where possible 90° joints and T's should be formed so that gratings do not have to be cut. Angles can be formed by connecting them using proprietary PVCu pipework attached to ACO inlet/outlet endcaps. For further details please contact ACO Design Services Team.

Note: For Load Classes higher than C 250, mitred joints are not recommended in vehicular areas. Where requested ACO can custom manufacture angled junctions to order.

4.0 Isolation Joints

The channel must be isolated from the surrounding environment. An isolation joint must be positioned up to 1500mm from the channel wall. Any dowel bars must be located no nearer than 150mm from the channel wall. Other isolation joints in surrounding slab must be continued through the channel.

Additional crack control may be required to comply with specifier requirements.

5.0 Installation into in-situ slab

Where a channel is to be installed into an existing concrete slab it is necessary to cut a suitably sized pocket in the slab. The channel will then need to be bedded in polymer modified mortar of 25mm minimum thickness (this may vary depending on the type of mortar used). Engineering advice may be necessary.

6.0 Temporary Installation

A channel installation is not complete until the final surfacing is laid. In any temporary condition, i.e. with the channel walls projecting above adjacent ground, site traffic should not cross channels. Loose boards, stone fill or cover plates will not protect the channel walls or grating. A temporary channel crossing should be formed by raising the ground level locally, to 3 - 6mm above top of channel, either side of a channel for a distance of 750 to 1000mm, to form ramps. Note that the channel load class should be adequate to carry the site traffic.

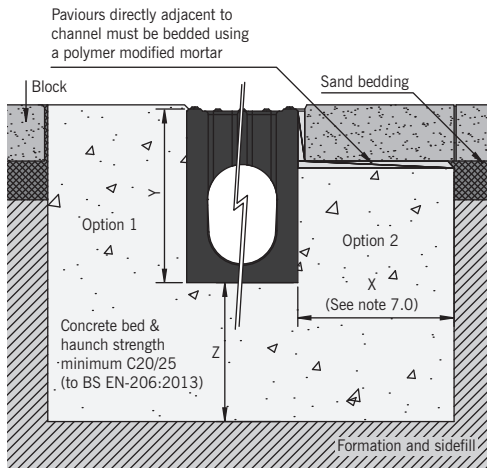
7.0 Block Pavements

The channel must be supported laterally. Blocks laid directly against a channel must be laid as a soldier course and restrained from movement by bedding securely on the concrete haunch e.g. by using a polymer modified mortar for bed and perpendicular joints (e.g. RONAFIX mortar mix C or similar). Blocks or slabs bedded on sand remote from the channel should be set at a higher level to compensate for possible settlement of the paving in service.

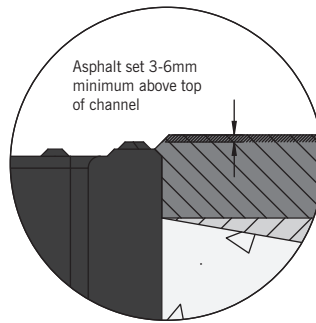
8.0 Grate Locking System

Gratings should be securely fixed to the channel, where required, using an appropriate grate lock system (where available).

Block pavement options 1 and 2



Detail A



For Guidance a typical method of application follows:

- ▶ The end faces of the channels are to be sound and free from dust, oil, and grease, with any loose material or dirt removed, e.g. by mechanical wire brush. No water drops should be evident.
- ▶ Using a standard cartridge gun, apply the sealant evenly and with no flaws. The detail on the ends of a channel varies from one product to another:
- ▶ Products with a basically flat face - apply the sealant in a layer approximately 5mm thick to one face of the joint.
- ▶ Products with a sealing groove within the end face - apply the sealant in a bead of approximately 10mm diameter into the sealing groove.
- ▶ Products with a sealing groove following the inside shape of the channel - apply the sealant to the end face of the channel and to the sealant groove, such that when the joint is completed, the sealant will both cover the end face and fill the groove.
- ▶ The channel unit should be placed on the prepared concrete bedding and pressed against the previously placed channel unit. A sealed joint of approximately 1-2mm width should be formed between adjacent channel units.
- ▶ Excess sealant should be wiped from the inside face of the channel to leave a smooth finish.
- ▶ The sealant is to be left to cure for 24 hours, during which time the sealant should be kept as dry as possible.

9.0 Channel Protection

Avoid contact between compaction equipment and top of ACO channel. The installer must ensure that the finished surface level lies above the top of the channel (by at least 3-6mm). Covering or protecting the channel, before concreting the haunch or laying blocks, removes the time and cost associated with cleaning the channel of cement material and embedded stones.

10.0 Watertight installation to BS EN 1433:2002

Where ACO channel joints/fittings and channel/pavement interfaces are to be sealed, an appropriate sealant should be used (e.g. Sikaflex 11FC or similar). Guidance on the necessary surface preparation and/or priming should be sought from the sealant manufacturer.

11.0 Minimum dimensions of concrete surround

Load Class		D 400	E 600	F 900
Minimum dimensions (mm)	x	200	200	200
	y	Full depth of channel (Less Y2 if necessary)		
	z	200	200	200
Maximum dimensions (mm)	Y2	35	35	35
Asphalt pavement only	Y3	70	70	70



These details are available to download in DWG or PDF format from the ACO website. Please go to www.aco.co.uk and sign in or register to access this information.



Chemical resistance chart

Vienite®, ACO's sustainable high strength material, has a high resistance to dilute acids and alkalis, and are unaffected by road salt, fuel and oil, and other commonly encountered chemicals. Further details of the chemical resistance can be obtained from the ACO Water Management Design Services team or, for particular chemicals, samples of the polymer concrete can be supplied to customers for their own testing. The chemical resistance will also depend on the temperature of the effluent. Clean water should not exceed 80°C.

This chemical resistance chart refers to chemicals at ambient temperatures (20°C) and the results are for general guidance only.

Chemical medium	% conc	Resistance: Polyester concrete	Chemical medium	% conc	Resistance: Polyester concrete
Acetic acid, glacial	100	No	Hydrobromic acid	48	Yes
Acetic acid	10	Yes	Hydrochloric acid	10	Yes
Acetic anhydride	100	No	Hydrofluoric acid	10	No
Acetone	10	No	Hydrogen peroxide	30	Yes
Acetone	100	No	Lactic acid	100	Yes
Alum	100	Yes	Lead acetate	100	Yes
Aluminium sulphate	100	Yes	Magnesium chloride	100	Yes
Ammonium chloride	100	Yes	Magnesium sulphate	100	Yes
Ammonium nitrate	100	Yes	Maleic acid	100	Yes
Ammonium phosphate	65	Yes	Methyl ethyl ketone (MEK)	100	No
Ammonium sulphate	100	Yes	Motor oil	100	Yes
Aniline (aminobenzene)	100	No	Nickel chloride	100	Yes
Barium chloride	100	Yes	Nickel sulphate	100	Yes
Benzaldehyde	100	No	Nitric acid	5	No
Benzene	100	No	Nitrobenzene	100	No
Benzyl alcohol	100	Yes	Oleic acid	100	Yes
Benzyl chloride	100	No	Oxalic acid	100	Yes
Borax	100	Yes	Perchloric acid	10	Yes
Boric acid	100	Yes	Perchlorthylene	100	Yes
Bromine	100	No	Phosphoric acid	20	Yes
Bromine water	Saturated	No	Phosphorus trichloride	100	No
Butyl acetate	100	No	Potassium carbonate	50	Yes
Butyric acid	100	Yes	Potassium chloride	100	Yes
Calcium carbonate	100	Yes	Potassium dichromate	100	Yes
Calcium chloride	100	Yes	Potassium hydroxide	10	Yes
Calcium chlorate	8	Yes	Potassium nitrate	100	Yes
Calcium hydroxide	100	Yes	Potassium permanganate	10	No
Calcium nitrate	100	Yes	Potassium sulphate	100	Yes
Carbon disulphide	100	No	Pyridine	100	No
Carbon tetrachloride	100	Yes	Sodium acetate	100	Yes
Castor oil	100	Yes	Sodium bromide	100	Yes
Chlorine gas, wet	100	No	Sodium carbonate	35	Yes
Chlorine water	Saturated	No	Sodium chlorate	100	Yes
Chlorobenzene	100	Yes	Sodium chloride	100	Yes
Chloroform (trichloro-methane)	100	No	Sodium hydroxide (caustic soda)	50	No
Chromic acid	12	Yes	Sodium hypochlorite	18	No
Citric acid	100	Yes	Sodium nitrate	100	Yes
Copper chloride	100	Yes	Sodium nitrite	100	Yes
Copper nitrate	100	Yes	Sodium phosphate	10	Yes
Cyclohexane	100	Yes	Sodium sulphate	100	Yes
Diesel fuel (DERV)	100	Yes	Sodium sulphide	100	Yes
Dimethyl formamide	100	No	Sodium sulphite	100	Yes
Dimethyl phthalate	100	Yes	Sodium thiosulphate	100	Yes
Diethyl phthalate	100	Yes	Stearic acid	100	Yes
Ethanol	95	No	Styrene	100	No
Ethanolamine	100	Yes	Sulphuric acid	75	No
Ethyl acetate	100	No	Sulphuric acid	50	Yes
Ethylene glycol	100	Yes	Sulphuric acid at up to 40°C	10	Yes
Ferrous chloride	100	Yes	Tetachloroethylene	100	Yes
Ferrous chloride	100	Yes	Thioglycolic acid	80	Yes
Ferrous sulphate	100	Yes	Thionyl chloride	100	No
Formaldehyde	30	Yes	Toluene	100	Yes
Formic acid	10	Yes	Toluene sulphonic acid (aqueous solution)	Saturated	Yes
Formic acid	100	No	Trichloroacetic acid	50	Yes
Fuel oil	100	Yes	Turpentine	100	Yes
Gasoline	100	Yes	Water	100	Yes
Glycerine	100	Yes	Xylene	100	Yes
Hydrazine	50	No	Zinc sulphate	100	Yes



Material benefits

The correct material selection for products installed in permanent works is extremely important to assure optimum performance throughout its design life.

ACO RoadDrain® is manufactured from Vienite®, ACO's sustainable high strength material. This material offers distinct advantages over other products and materials, addressing key specification and performance requirements for engineers and designers.



Sustainable use of materials

Efficient use of material resources is a key contributor to sustainability in construction. ACO RoadDrain® has been carefully designed to maximise strength while minimising material use.

- Vienite® combines the mechanical and performance benefits of synthetic resin concrete with high levels of recycled fillers.
- Vienite® is a sustainable material that contains in excess of 20% by weight post consumer waste previously destined for landfill in the UK.

- Vienite® fully conforms to and exceeds all performance requirements as specified by BS EN 1433:2002 for linear drainage units.
- ACO RoadDrain® manufactured from Vienite® holds BSI Kitemark certification as a result of continuing independent verification of material performance by BSI.
- Vienite is recyclable, i.e. it can be collected, processed and returned for re-use as a raw material.

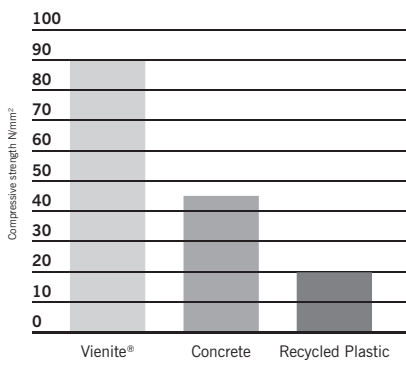
The ACO RoadDrain® range also includes components manufactured from ductile iron and steel which contain between 25% and 90% recycled material.

MECHANICAL PROPERTIES OF VIENITE®

The following data compares the advantages of Vienite® used to manufacture ACO RoadDrain® with Ordinary Portland Cement (OPC) concrete and recycled plastic composite materials.

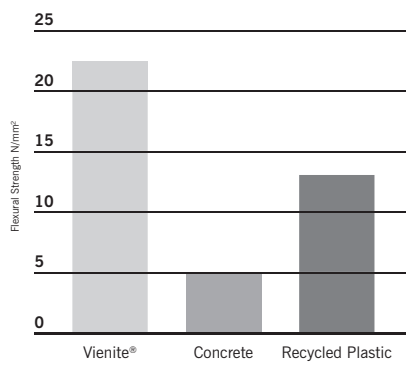
Compressive strength

Vienite® has high compressive strength and is therefore extremely resistant to service loads.



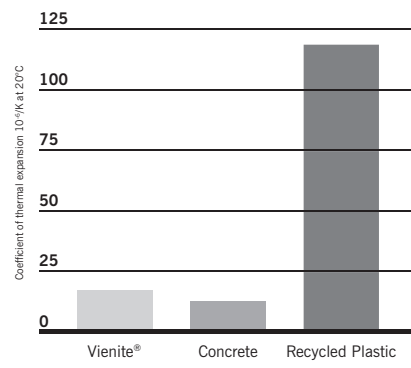
Flexural Strength

Vienite® has excellent flexural strength making the product resistant to side loads typically encountered during surfacing and installation.



Coefficient of Thermal Expansion

Vienite® has a low coefficient of thermal expansion making it extremely stable, and unlike some materials it will not buckle or distort if subjected to high or low temperatures during service.



Impact Resistance

ACO RoadDrain®'s optimised design combined with the nature of Vienite®, makes it highly resistance to damage typically caused during installation or from traffic impacts.

Water absorption

Vienite® has low water absorption of only 0.01% by weight which means surface water or liquids are contained within the product until discharge without contaminating surrounding soil or groundwater.

Chemical Resistance

Vienite® has high resistance to dilute acids and alkalis and is unaffected by road salts, fuels and oils which are typically encountered during service. For a copy of our full chemical resistance chart for Vienite® please contact our ACO Water Management Design Services Team.

Coefficient of Friction (Mannings)

Vienite® is extremely smooth having a Mannings coefficient of 0.011 giving enhanced hydraulic performance and resisting the build up of silt and debris.

*Tested by Birmingham City Laboratories (BCL)



Specification clause

The surface drainage system shall be ACO RoadDrain® PD100F/PD200F† channel system as supplied by ACO Technologies plc; all materials and components within the scope of this channel system shall be obtained from this manufacturer. The system shall be certificated Load Class D400 to F 900 as defined in BS EN 1433:2002 with Initial Type Test certification issued by a notified body independent of the manufacturer and shall comply with the Manual of Contract Documents for Highway Works: Specification for Highway Works, Clause 517. The linear drainage channel shall be certified by a third party product certification system compliant with BS EN 45011:1998 carried out by an accredited body (UKAS or equivalent), e.g. Kitemark.

Declarations of Performance (DoP) shall be supplied to the Supervising Officer upon request. The system shall be of units 500mm long and 100mm/200mm† nominal internal width. Manufactured as one piece in polymer concrete, with integral resin concrete grating featuring 15mm downward flared inlet slots to ACO registered pattern providing to minimum inlet area of 23260mm² per metre for ACO RoadDrain® 100 and 44260mm² per meter for ACO RoadDrain® 200. All units shall be manufactured from Vienite resin concrete with minimum recycled content of 20% by weight.

The system shall be installed in accordance with the manufacturer's printed instructions, and the work carried out as specified in drawing no. (*) and in accordance with recognised good practice. Standards of workmanship shall generally be as specified in BS EN 752:2008 and BS 8000:Part 14:1989.

* insert appropriate information
 † delete non-appropriate information

Highways Specification – Appendix 5/6

The Appendix 5/6 will need to be completed for each project. A model Appendix 5/6 for ACO RoadDrain® is available from the ACO Water Management Design Services Team.

NBS Specifications

ACO RoadDrain® should be specified in section Q10:180. Assistance in completing this clause can be found in the ACO Water Management entry in NBS Plus, or please contact the ACO Water Management Design Services Team.

Note: A specification in NBS format is available to download from www.thenbs.com or www.aco.co.uk

Conformity

The ACO RoadDrain® system is fully certified to BS EN 1433:2002 and CE marked in accordance with the Construction Products Regulation.

Declarations of Performance are available via the CPR Zone on our website (www.aco.co.uk), or on request. Please contact ACO Water Management Design Services Team on 01462 816666 for further information.

BS EN 1433:2002



General information

ACO products are subject to weight and dimensional tolerances. The weights and dimensions shown in this document are for guidance purposes only. ACO products are made from naturally occurring materials and may be subject to variations in colour, texture and marking. These aesthetic variations do not affect the performance or functionality of our Goods. The appearance of products shown in our company documentation are for illustration purposes only.

ACO Technologies plc

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Civils + Infrastructure
Building + Landscape
- ACO Building Drainage
- ACO Sport
- ACO Wildlife

Member of:



ISO 9001
FM 13502



ISO 14001
EMS 538781



OHSAS 18001
OHS 524145

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ACO. creating the future of drainage

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