ACO Water Management:
Civils + Infrastructure

Uniclass L2123 + JR12 + JS10 + L71121 + L731	EPIC J3413
CI/SfB (52.5)	

ACO Maintenance Guide

ACO Maintenance Guide

Channel drainage, ACO KerbDrain® and ACO Qmax®

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 channel drainage maintenance

ACO supports effective asset management in channel drainage – from site design through to life-cycle maintenance. ACO have a comprehensive range of gullies and access units for silt management, with easy access for maintenance and cleaning.

What is good channel maintenance?

Inspection routines are essential to maintain efficient performance of drainage channels and they should be carried out at frequent and regular intervals. The frequency will depend upon the location and the environment, and should be based on local knowledge, but inspections should be carried out at least once a year.

Benefits of maintenance

- Maintains the original hydraulic capacity of the drainage system
- Maintains the aesthetic appearance of a site
- Ensures safety issues for pedestrians and vehicle traffic are identified with regular inspections

Health and Safety

Contractors undertaking cleaning activities should consult the Health and Safety at Work etc Act (1974), the Construction (Health, Safety and Welfare) Regulations (1996) and EN 1829: High pressure cleaners, High pressure water jet machines-Safety requirements. The safety aspects to be addressed relating to jetting, are not limited to practices concerning high pressure water, possible infection from the drain contents, working on the highway and in some circumstances, working in confined spaces.

By giving maintenance advice, ACO accepts no liability for injury or loss caused by such activities.

Maintenance of grates

ACO grates are available in a variety of materials; ductile iron, composite, galvanised and stainless steel. Each has their own characteristic oxidisation cycle. The following information documents the expected performance of ACO grates, focusing on the four main grates, which depending on customer aesthetic standards, may require maintenance during the life of the grate types. One piece polymer channels like MonoDrain/RoadDrain/H Range do not have separate grates as the inlets are integral to the channel. This reduces the risk of stolen or incorrectly installed grate types.

	Grate Material Type			
	ACO Ductile Iron	**ATec Ductile Iron**	**Composite**	
				
Coating at delivery	Black paint	Electrochemical coating, black	No coating present, no possibility of oxidisation	
Protection achieved	Minimal protection, may require painting to retain black appearance if not frequently trafficked	High protection, may require occasional touch-ups	No possibility of oxidisation	
Possible treatments	Acrylic black paint	Acrylic black paint	N/A	
Low traffic areas	✓ Ideal*	✓ Ideal*	✓ Ideal	
High traffic areas	✓ Ideal	✓ Ideal	✓ Ideal	

*Application of paint my be prefered over time

ACO Ductile Iron

Ductile iron has long been used in outdoor drainage situations, as over time oxidation forms an insoluble graphitic layer which protects the iron from further attack. This is a natural process called patination. The structural integrity of a grating made of ductile iron will not be negatively affected by surface oxidation and the formation of a protective surface film. Areas with moderate traffic will help to buff the grates into the characteristic aged cast iron usually seen and do not require painting.

The water based paint with which ACO coat our gratings, is intended to protect the grating for a short period of time after manufacture. It is not intended to be either a long term or architectural finish. In areas of low traffic it may be preferred to apply a proprietary rust inhibitor.

Images showing stages in the process of patination. The period of oxidation depends on the environmental conditions. Photo on the right shows a stable buffed grate

	Polymer*	Galvanised Steel	Stainless Steel
			
	No coating present, no possibility of oxidisation	Zinc oxide coating	Inherent protection due to high grade SS
	No possibility of oxidisation	High protection from oxidisation. Any materials damaged or cut to fit on site will require recoating on their cut or damaged surface	High protection from oxidisation
	N/A	Galvanised metal paint	N/A
	✓ Ideal	✓ Ideal	✓ Ideal
	✓ Ideal	✓ Ideal	✓ Ideal

ACO ATec Ductile Iron

ACO ATec coating is a high performance finish offering superior resistance to corrosion and enhanced long term durability in demanding environments. ATec uses an electrophoretic process, which uses current to deposit organic coatings on electrically conductive parts, this is then cured at high temperatures forming a strong and durable coating. The benefit of ATec or KTL coatings is that any scratches or damage will not result in the oxidisation undercutting or spreading under the painted surface, and this results in overall lower levels of visible oxidisation.

ATec is particularly suited to low trafficked areas, or areas where high aesthetic appearance is required, as it provides an easily maintained system compared to water based surface coatings. ATec provides a chemically stable platform for the application of secondary paint finishes if preferred. In moderate traffic areas the coating will eventually wear away and form the polished ductile iron surface common to architectural ductile iron as discussed above.

ACO Stainless Steel

Stainless steel gives very high protection from oxidation due to the high grade steel used, and the use of pickle passivation process during production. Along with polymer and composite, stainless steel grates are a good choice for coastal applications where environmental salt levels are high. Stainless steel products in coastal applications will require regular cleaning to remove salt build up, and a proprietary protective coating may be advisable depending on the aesthetic required.

In most standard drainage situations stainless steel will not require any maintenance, and will retain a high standard of appearance over the life of the grate.

Maintenance of grates

ACO Galvanised Steel

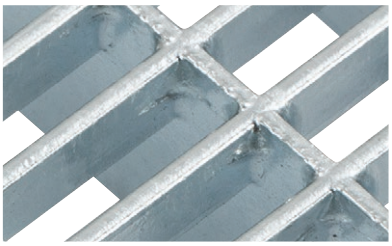
Galvanised grates are hot dipped in zinc, which gives long lasting protection from environmental effects. During the coating process the zinc reacts with the steel, giving a demarcation free transition of alloy layers.

The quality of zinc coating applied by hot dip galvanization is specified in the technical standard EN ISO 1461. For mild steel sheet material thickness >1.5mm and <3mm minimum local coating thickness is required to be 45 microns (to average coating thickness 55 microns). ACO's galvanised steel zinc coating can measure between 60 to 80 microns, giving extra protection to the underlying steel.

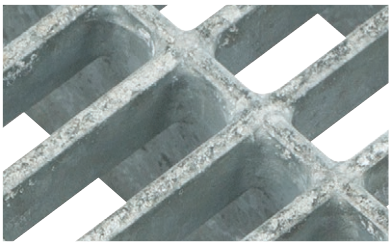
The zinc corrodes in preference to the steel in a process called sacrificial protection.

Zinc will react with the environment, creating a thin white protective layer. Damage to the coating will result in the zinc deposits resealing it from the atmosphere and therefore protecting from corrosion.

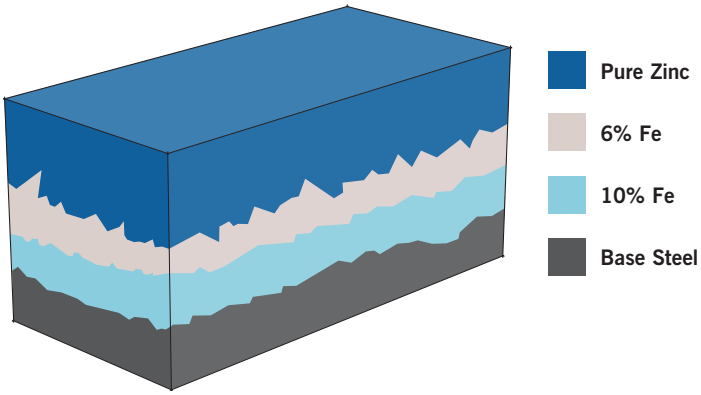
The distance of the installation from the coast will effect the level of protection achieved as the salt accelerates the oxidisation process. For more information please refer to the Galvanizers Association website: www.galvanizing.org.uk/ corrosion-map/ Divide 60 microns by the microns/ year figure to get a rough estimate on the level of protection. This figure gives a guide to the maximum time before the zinc coating is oxidised due to varying levels of wear. The base metal will still be functional and may require an application of zinc based protection to retain the aesthetic.



Newly galvanised



Protective oxidised layer



ACO Channel Edge Rails

Channel edge rails improve the strength and durability of grated channels, and their dimensions and performance must conform to EN1433:2002. There are three types of edge rail available, ductile iron, galvanised and stainless steel depending on the channel system chosen.

Users who wish to have the highest resistance to oxidisation should select stainless steel edged channels. These are made from 304 Stainless steel. The percentage of nickel and chromium that is present in 304 stainless steel equips this metal with good corrosion resistance, in particular from moderately caustic and acidic solutions.

Due to the wet nature of their environment and their exposure to chemicals, metal components will naturally oxidise at varying rates depending on wear. Metal edges have been selected for their long term performance, but for customers who demand specific aesthetics, maintenance may be required in the form of painting the edge rails as required. In most cases rails and grates are left untouched for the life of the product, with ACO drainage channels being renowned for their high performance.

Access through grates

Locking systems

BS EN 1433 recommends that all gratings and covers, at or above Load Class C 250, should be locked in position. ACO gratings can be secured by a variety of locking arrangements. These will vary according to the channel system, grating type and Load Class. With the exception of the heavy-duty S system, which is provided with eight bolts per metre length, gratings will generally be locked every 500mm. Part of your maintenance procedure should be to check that all grates are secure and that no bolts or locking mechanisms are missing/broken.

Current locking systems:

1. Drainlock™ bar-less locking; used in the MultiDrain range of grates
2. Bolt direct into integrally-cast frame; used in S Range channels
3. Powerlock® boltless locking system; used on some access covers

Older locking systems:

1. Quicklock® bayonet and bar boltless locking system
2. Bolt and locking bar

Grated and non-grated channel systems will have access to the channels through the sump or access unit. If access is through a grate, ensure that any security locks (where fitted) or bolts are removed prior to lifting the grate.

Bolted grates

Bolts can be removed using a spanner or socket set. Greasing or oiling bolts before refitting is suggested.

Security locks and Drainlock™

Round M6 security screws, mean that the grate has been installed with ACO's security locking system. Both of these screws need loosening before the grate can be removed

Drainlock™ systems are the standard locking mechanisms identified by black squares.

LIFTING GRATES

When lifting gratings, use the Drainlock™ grating lifting tool (part number 1367). Insert the tool in from the end of the grate as shown, and gently lift the grate until the Drainlock™ clips release taking care not to bend or damage the grate.

Lifting with/without the lifting tool at the end of a grate, may result in damage/ bending of the grate (particularly the composite and steel grates). Always lift closer to the Drainlock™ clips as shown.

Access to Brickslot

Drainlock™ grating lifting tool

To remove the ACO Brickslot access unit tray, insert two lifting tools as shown.

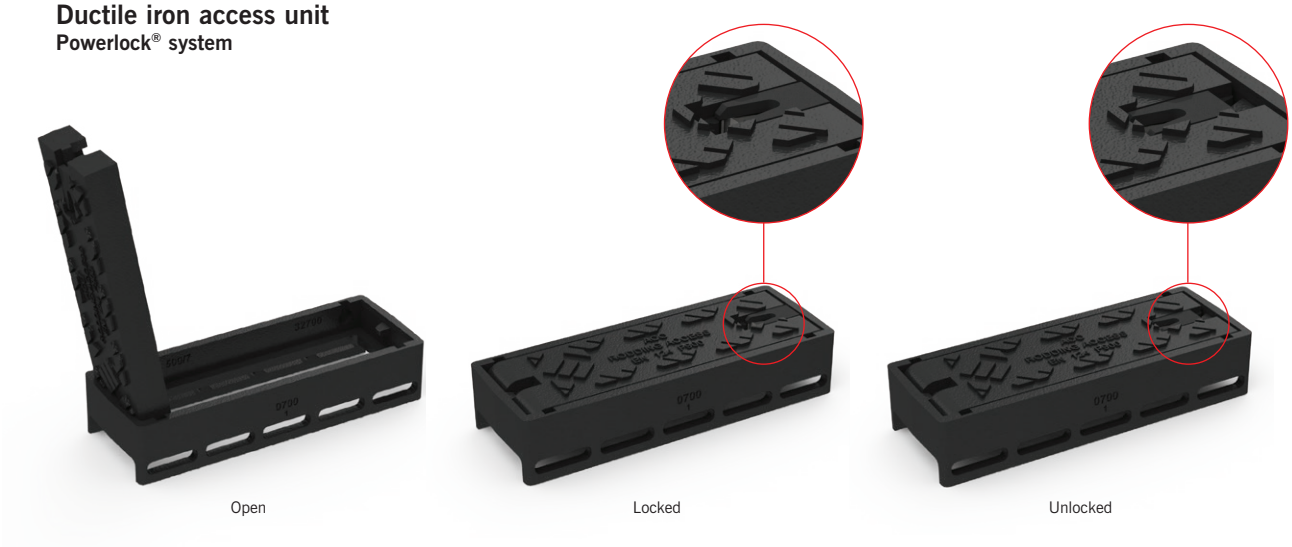
Then lift the tray vertically from the frame.

Be aware that this unit complete with surfacing material, may be very heavy and safety precautions should be taken.

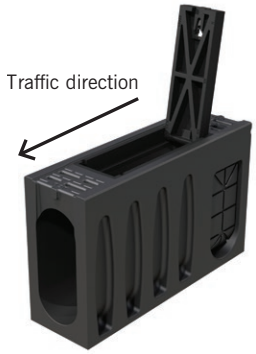
Access units

Other than grates on sumps, there are two types of solid access covers, Ductile iron and Composite. Composite access units are present in all new production of MonoDrain, KerbDrain and RoadDrain.

Ductile iron access unit
Powerlock® system



Open | Locked | Unlocked

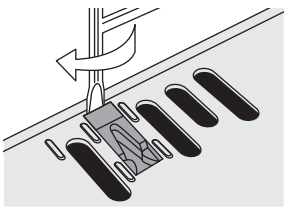


The orientation of the cover can be changed dependent on traffic direction. It is recommended the cover is orientated so that it opens against the traffic direction, please ensure that the lid is installed/replaced in the correct position and locked after use.

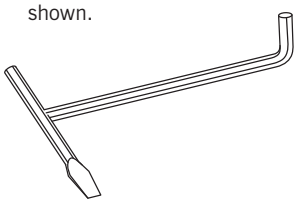
Ductile iron access unit replaced composite access units in 2018.

POWERLOCK

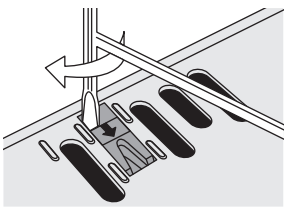
Used on the older systems, Powerlock® provides secure locking without bolts or screws and simple, rapid installation, using the ACO locking tool.



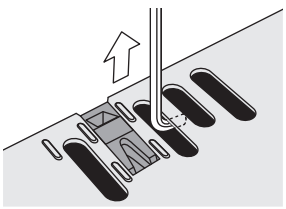
1. **To open:** slip chamfered end of locking tool into the slot behind the back of the Powerlock mechanism as shown.



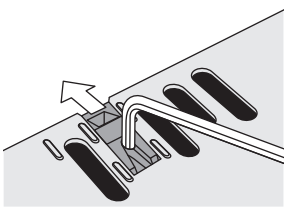
ACO Locking Tool



2. Rotate the tool through 90º until the lock mechanism slides across and clicks. Repeat for each lock.



3. Lift grating with the hook at the end of tool.



4. **To close:** fit one side of grating under lugs in channel rail and lower grating into position. Use the hook on the locking tool in the recess of the lock mechanism to push clip back towards the closed position, until a click is heard. Repeat for all locks.

Composite access units

MonoDrain access unit

KerbDrain access unit

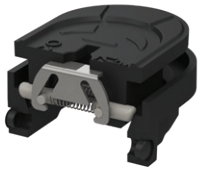
COMPOSITE ACCESS UNIT - TO OPEN

1. Using a standard, medium duty drain lifting key, insert the key head through the keyway slot and press down.

2. Rotate the drain lifting key 90° - ensuring the key remains vertical.

3. Lift the key and cover as a complete unit and remove from the frame. (If you wish to remove the key, hold the cover and twist the key 90°.)

COMPOSITE ACCESS UNIT - TO CLOSE



1. If the key is still in the cover, closing is the reverse of opening. If the key is not used see above.

2. To fit the cover in the frame, simply push the cover down onto the frame - The locking pins will retract and snap into place to lock the cover.

   The steel crossbar will rise to the top to identify the cover is secure.

Always ensure that access units are securely closed and locked after use.

Access through universal gullys and access chambers

UNIVERSAL GULLYS

- Universal gullys may be installed with MultiDrain, MonoDrain, RoadDrain and S Range channels.

- There are two types of ductile iron cover, the D400 version will be bolted (remove bolts before lifting), whilst the F 900 version is hinged (open as shown). Care should be taken when lifting the cover.

ACO QMAX® ACCESS CHAMBERS

- Access chambers are installed with ACO Qmax® channels. There are three types of access lid depending on the channel system installed. The covers may/may not be bolted in the corners, and these require removing prior to lifting. The cover may be hinged, and opened as shown above.
- Access chambers installed with ACO Qmax® Q-Slot grates will have a recessed steel cover and frame. Remove the M8 screws with an allen key, and lift out the tray using appropriate lifting method. When replacing ensure the screws are fully tightened through the tray and into the frame.
- The top of the screw should not project above the top of the tray, maximum tightening torque 18Nm.
- Removal and lifting of access covers will require on-site assessment of H&S manual handing procedures.

Maintenance of domestic channel systems

Channel systems which have silt buckets can use method 1 or 2, including channels with grates or Brickslot.

Alternatively method 2 can be used for grated systems with or without silt buckets. For instructions on lifting grates please refer to page 7.

Equipment needed: ACO recommend using a domestic pressure jetting machine with jetting hose attachment for method 1, or small trowel for method 2.

ACO RainDrain

ACO HexDrain Brickslot

ACO HexDrain

METHOD 1

1. Remove the grate located over the outlet or sump using an ACO Drainlock™ lifting tool (refer to page 7).
2. Remove the silt bucket, disposing of any contents and clean.
3. Return the silt bucket to the sump, this will catch any flushed out debris.

4. Insert the jetting hose, and push until it reaches the end of the channel system. Cover the channel system to prevent spray or debris damaging nearby vehicles/buildings.
5. Turn on the pressure jet machine and slowly pull out of the channel system. The jetting machine will flush debris into the silt bucket.

6. If cleaning brickslot, pressure jet down through the slot with a standard hand held attachment, and repeat the flushing of the channel.
7. Remove the silt bucket and clean.
8. Replace the silt bucket and grate.

METHOD 2

1. Remove the grates along the entire channel system using an ACO Drainlock™ lifting tool (refer to page 7).

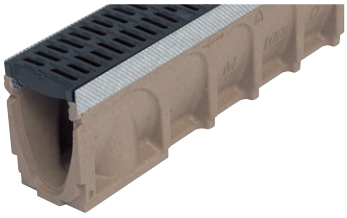
2. Using a trowel remove any debris.
3. Empty the silt bucket if applicable.
4. Replace silt bucket and all grates.

Using boiling water or cleaning agents is not recommended. If you want to use cleaning agents, please consult the cleaning product's manufacturer for information on compatibility with the material properties.

Maintenance of commercial channel systems

Independent of whether the channel system has grates, Brickslot or is monocast (ie one piece channel with built-in inlets) the maintenance method is the same. Access is gained through an access unit, sump or universal gully. For instructions on lifting and locking/unlocking grates and access units please refer to page 7.

Equipment needed: ACO recommend using a recycler combination jetting unit with hydraulic winch, capable of producing pressure from 80 bar (1160 psi) to 150 bar (2176 psi).



ACO MultiDrain®

ACO MultiDrain® Brickslot

ACO MonoDrain

METHOD

1. Remove the bolts or use a lifting tool to gain access to the sump or access unit (refer page 7-8).
2. Remove the silt bucket, disposing responsibly of any contents and clean the bucket.
3. Position the jetting unit near the access unit. Introduce a 3 inch (75mm) suction hose into the sump area. This suction hose will remove the silt/detritus that the jetting hose flushes out.
4. Attach a suitable jetting head. In this example a 1 inch (25mm) diameter tandem jetting head with forward and backward facing jets was used.
5. Introduce the jet into the sump/access unit, facing the direction of channel section which is to be cleaned.
6. Activate the suction hose and jetting hose. A suitable initial jetting pressure is 80 bar or 1160 psi.
7. As the jetting head travels up the length of the channel, place boards or other suitable material over the channel grates to prevent the escape of water (spray back) and protect any vehicles or nearby property.
8. The jetting head will be propelled to the end of the channel. When it reaches the end, increase the pressure to 150 bar (2176 psi).
9. Use a hydraulic winch to pull the jetting head backwards toward the sump. The suction hose previously inserted in the sump will remove the flushed out water and detritus.
10. If a reduction of 'spray back' is required reduce the pressure to 80 bar (1160 psi). This pressure will still be sufficient to clean the channel.
11. If cleaning brickslot, pressure jet down through the slot with a standard hand held attachment, and repeat the flushing of the channel.
12. Replace the silt bucket and grate/access lid, and secure (refer pg 7-8).

ACO MultiDrain® channels incorporate Drainlock™ gratings. This is a bar-less locking device which improves hydraulic capacity and provide easier access for maintenance. Older grated channels may have a bar system for holding the gratings in place. The occurrence of these bars may restrict access to the channel. In this case reduce the size of the jetting head to gain access.

Maintenance of ACO KerbDrain®

Combined kerb drainage, ACO KerbDrain®, is maintained in very much the same way as grated or monocast systems and can be used with the same jetting equipment.

Access is gained through an access unit or gullies. ACO KerbDrain® gullies provide the outfall connection to different systems and silt management, easily accessed by a ductile iron cover.

Equipment needed: ACO recommend using a recycler combination jetting unit with hydraulic winch, capable of producing pressure from 80 bar (1160 psi) to 150 bar (2176 psi).

ACO KerbDrain® splayed access unit

ACO KerbDrain® half battered gully

ACO KerbDrain® half battered access unit

METHOD

1. Remove access unit top.
2. Position the jetting unit near the access unit or gully.
3. Attach a suitable jetting head and insert into access unit, towards the direction of travel. In this example a 1 inch (25mm) diameter tandem jetting head with forward and backward facing jets was used.
4. Introduce a 3-6 inch (75-150mm) suction hose into the adjacent gully/ outlet.
5. This suction hose will remove the silt/ detritus that the jetting hose flushes out.
6. Activate the suction hose and jetting hose. A suitable initial jetting pressure is 80 bar or 1160 psi.
7. As the jetting head travels up the length of the channel, place boards or tarpaulin over the channel openings to prevent the escape of water (spray back) and protect any vehicles or nearby property. Alternatively reduce the pressure to prevent spray back (high pressure, pictured above).
8. The jetting head will be propelled to the end of the channel or a determined length. When it reaches the end, increase the pressure to 150 bar (2176 psi).
9. Use a hydraulic winch to pull the jetting head backwards toward the access unit. The suction hose previously inserted in the gully/outlet will remove the water and detritus.
10. If a reduction of 'spray back' is required reduce the pressure to 80 bar (1160 psi). This pressure will still be sufficient to clean the channel.
11. When cleaning is completed, remove hoses and secure all gratings and covers.

Maintenance of ACO Qmax® channels

ACO Qmax® high capacity slot drainage is accessed through the large combined access and silt chambers and jets in a similar way to standard channel systems.

Equipment needed: ACO recommend using a recycler combination jetting unit with hydraulic winch, capable of producing pressure from 80 bar to 150 bar (2176 psi).

ACO Qmax® channels

METHOD

ACO Qmax® maintenance demonstration images taken from ACO lifecycle testing event

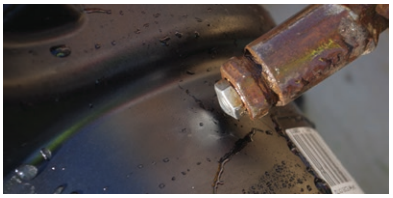
1. Access to ACO Qmax® channels is gained through the access and silt chambers (picture shows chamber without metal cover or frame). See page 10 for more information on ACO Qmax® access units.
2. Position the jetting unit near this access chamber to allow a 3-6 inch (75-150mm) suction hose to be introduced. This suction hose will remove the silt/detritus that the jetting hose flushes out.
3. Attach a suitable jetting head. In this example a round headed 'bullet' jet (15cm length 8cm diameter) was used for ACO Qmax® 225 with rear facing jets. The larger ACO Qmax® 500 was jetted with a 'bomb' jet (40cm length 12cm diameter) with rear facing jets.
4. Introduce the jet into the channel, facing the direction of travel.
5. Activate the suction hose and jetting hose. A suitable initial jetting pressure is 80 bar or 1160 psi.
6. As the jetting head travels up the length of the channel, place boards over the channel inlets to prevent the escape of water (spray back) and protect any vehicles or nearby property.
7. The jetting head will be propelled to the end of the channel. When it reaches the end, increase the pressure to 150 bar (2176 psi).
8. Use a hydraulic winch to pull the jetting head backwards toward the access chamber. The suction hose previously inserted in the access unit will remove the water and detritus.
9. If a reduction of 'spray back' is required reduce the pressure to 80 bar (1160 psi). This pressure will still be sufficient to clean the channel.
10. After cleaning is complete, replace cover and secure in place.

ACO Qmax® life cycle testing & other maintenance information

ACO Qmax® life cycle testing

Extensive testing was overseen and reported by Vine Technical Services Ltd, who documented the results of pressure jetting ACO Qmax® channels.

ACO Qmax® channels are extremely strong and robust, able to withstand maximum pressure 150 bar (2176 psi) [maximum pressure UK industrial pressure jetting machine]. This pressure was applied to the surface of the channel for two minutes at a distance of 5mm, resulting in no damage to the channel [Test method according to Water Industry Standard 4-35-01]. The only visible sign of this rigorous testing was in some cases a faint superficial scuff



mark, some tests resulted in no visible signs at all. Vine Technical Services Ltd concluded "The results showed that a maximum pressure of 150 bar or 2176 psi caused no damage (as defined in Water Industry Standard 4-35-01) to the ACO Qmax® 225 or 550 channel bodies during the maximum pressure testing".

ACO Qmax® channels have also been subjected to life cycle maintenance tests, to replicate twenty years of annual cleaning. Abrasive material was introduced along the length of ACO Qmax® channels (ACO Qmax® 225 and 550) and pressure jetted along it's length. At the end of

this 20 test cycle the internal surfaces of the channels were inspected by Vine Technical Services Ltd who reported "The introduction of sand to replicate sediment build up within channel bodies did not cause any visible signs of damage to the inside of the channel bodies' surface".

ACO Qmax® channels robust material and innovative design will provide long term solutions for surface water drainage, and regular pressure jetting will not affect the structural integrity of the product, when our maintenance guidelines are followed.

Other important information

Using boiling water or cleaning agents is not recommended. If you want to use cleaning agents, please consult the cleaning product's manufacturer for information on compatibility with the material properties.

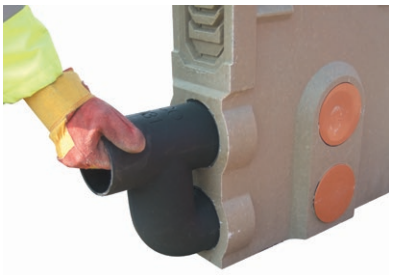
When conducting maintenance, channels and grates should be inspected for damage. Grating slots and exposed edges of channels should be examined, and ensure that locking mechanisms and bolts are tight.

Sumps and sump bucket

Each site has different levels of debris and leaf matter which will be collected by the sump bucket during rain events. The frequency for inspecting your sumps or gullies will depend on these factors. Inspection of sumps/gullys should be carried out in conjunction with an inspection of the underground drainage connection out of the channel system. Occasionally, water should be poured into the sump (or gully) to check that it disperses freely.

Maintenance of connecting drains

ACO's sumps may be connected to a roddable foul air trap or directly to a straight connector pipe, either option will provide an access point to the connecting drains.



View of foul air trap before installation

The use of an ACO roddable foul air trap with an ACO sump allows the pipe system to be accessed and maintained. Simply remove the top bung to gain access. When you have completed your maintenance, replace the bung.

Maintenance of sealed joints

Channel sealing joints should be inspected routinely, to check they are functional and that the sealing material has not become dislodged.

Where necessary the joint sealant should be removed and replaced in accordance with the relevant manufacturer's instructions.

ACO Technologies plc

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

ACO Water Management:
Civils + Infrastructure

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