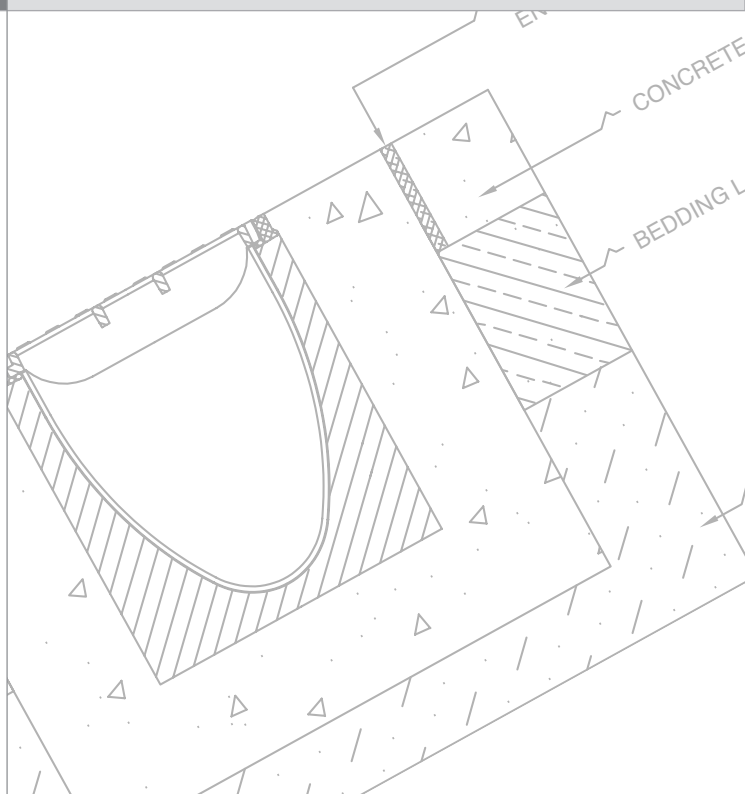


SMITH/ACO DRAINAGE SYSTEMS



ACO DRAIN

Site Installation Manual

Polymer Concrete Drain Systems



Getting Started

Smith/ACO Drainage Systems consists of a full range of modular channels with captive gratings; Systems include catch basins, end caps, and other accessories.

When installed correctly, Smith/ACO Drainage Systems products are designed to withstand a variety of loadings as classified by EN 1433/DIN 19580 (The only standards specifically for trench drain systems).

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Polymer concrete products should be handled with care as they can be damaged by impact from other products, or machinery.

Typical equipment necessary for installation may include:

- *Excavating equipment*
- *String-line and laser level*
- *Measuring tools*
- *Masonry drill, grinder and/or saw*
- *Rubber mallet*
- *Concrete - 4,000 psi minimum compressive strength*
- *Gloves, respirator and eye protection*

Commercial Trench Drains

Health and Safety

Polymer concrete products are manufactured using synthetic resin, mineral aggregates and curing agents.

Main hazards include:

- Abrasive damage to hands.
- Inhalation of dust from grinding, cutting, or drilling.
- Grinding, cutting, etc. may project small fragments.

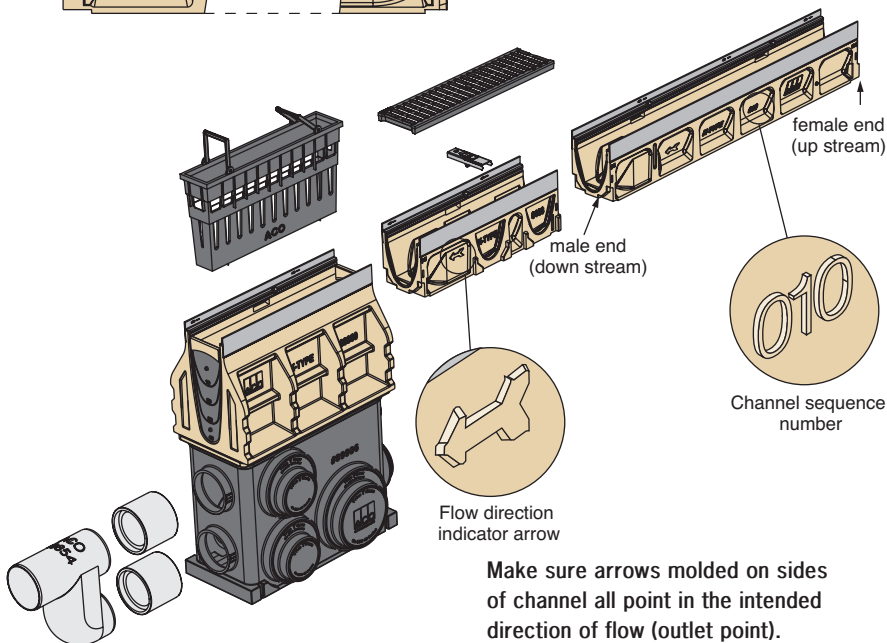
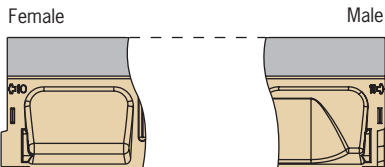
Grates made from metals are either cast or fabricated.

Main hazards include:

- Abrasive damage/cuts to hands.
- Inhalation of dust from grinding or cutting.
- Grinding, cutting, etc. may generate sparks; flammable items should be removed from area.

Gloves, eye protection and a respirator should be worn to avoid these hazards.

Gloves, eye protection, and respirator should be worn to avoid these hazards. Operations should be conducted away from areas of fire or explosion hazard.



Make sure arrows molded on sides of channel all point in the intended direction of flow (outlet point).

Installation Sections

These illustrations are a guide for typical ground conditions only. Engineering advice should be taken.

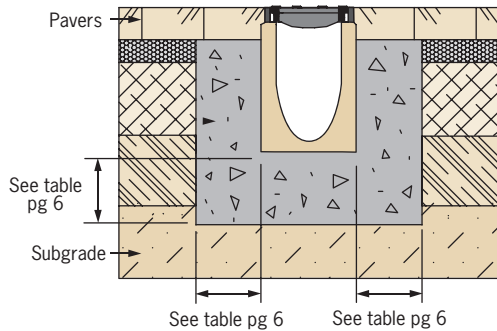
An installed Smith/ACO Drainage Systems System should incorporate the following:

- Correct grate type.
- Correct channel type and size.
- Minimum grade 4,000 psi compressive strength cement concrete surround.
- Concrete surround dimensions are **minimum** dimensions and engineering advice should be taken to confirm appropriate for the specific project.
- Concrete surround should typically be the same thickness as the concrete slab.

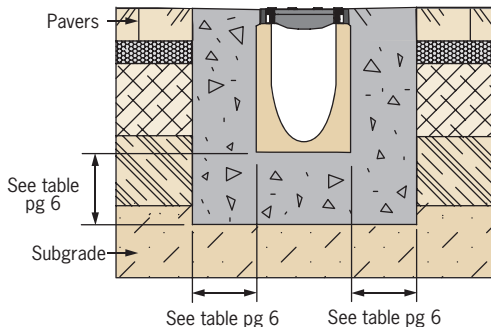
Poor site conditions and low load bearing pavement will require an increase in these dimensions to meet both vertical and lateral loads.

Reinforcing steel may be required within the slab and around the trench drain - engineering advice should be sought to determine bar size and configuration.

Pavers - EN 1433 Class A - C only



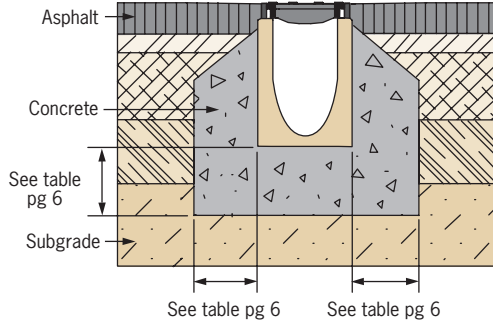
Pavers - EN 1433 Class A - F



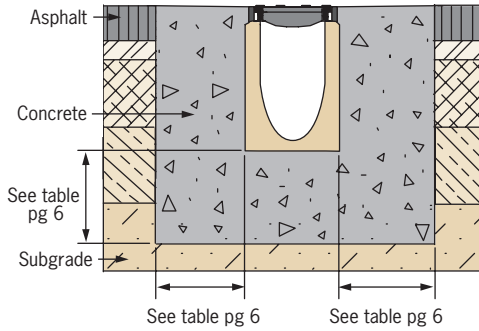
Commercial Trench Drains

POLYMER CONCRETE

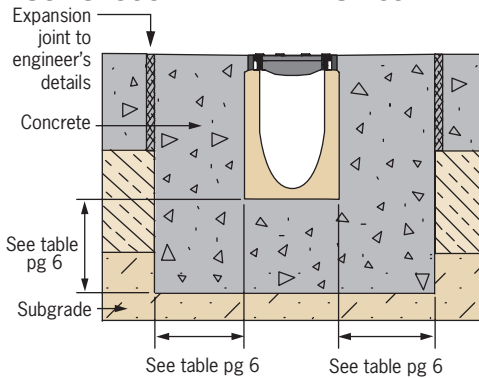
Asphalt - EN 1433 Class A - C only



Asphalt - EN 1433 Class A - F



Concrete - EN 1433 Class A - F



5

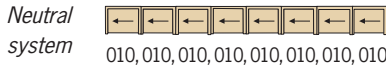
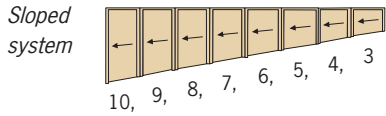
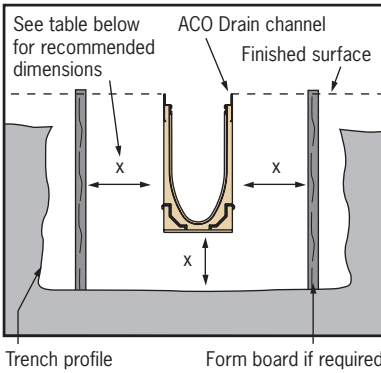
1 Excavation

Excavate trench to accommodate drain system. Excavations must be made about the center line of proposed drainage run and catch basin.

Trench must be big enough to accommodate each of the following:

- A. Channel/catch basin width and depth dimensions.
- B. Concrete surround dimensions*.

- C. For sloped systems, excavate base of trench to roughly follow fall of trench run.



NOTE: Check product literature for overall product depth. Add additional measurement for concrete surround from table at left.

Ensure loose material is removed from trench and base is well compacted.

Run string line, or laser, at finished surface level along full length of proposed trench run to ensure trench is installed to grade.

In concrete pavements ensure an allowance is made for expansion/isolation joints, if necessary, to allow movement due to thermal expansion/contraction.

Concrete Surround Dimensions* (x)

Load Cl	A	B	C	D	E	F
4" channel	4"	4"	6"	6"	8"	8"
8" channel	6"	6"	8"	8"	10"	10"
12" channel	8"	10"	10"	12"	12"	12"

* These dimensions are recommended minimums only, based on 4,000 psi concrete. Ground conditions will affect actual dimension required; engineering advice should be sought. Concrete surround should be same thickness as surrounding slab depth.

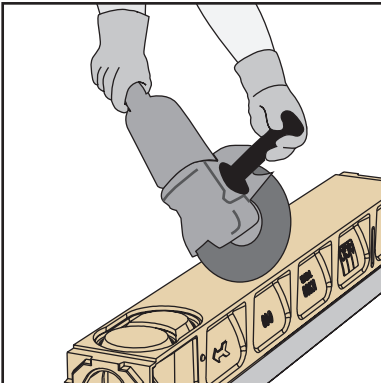
Commercial Trench Drains

2 On-Site Fabrications

When cutting channels and/or grates, gloves, protective eye wear and respirator or mask are recommended.

Cutting channels is required to form miters, tee junctions and non-standard lengths. Most fabrications can be completed on site. ACO offers a custom fabrication service for more complex fabrications. Contact ACO Technical Department for further information.

Channels should be cut with a masonry or diamond disc saw. Gratings should be cut with band saw, or similar, with suitable blade.



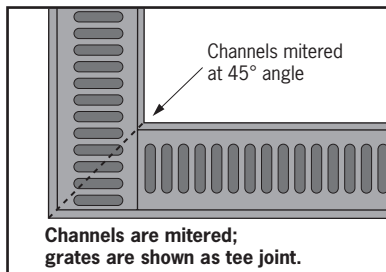
A 2 - part rigid resin glue (ACO Bond) can be used to bond cut surfaces together, if required.

If corrosive liquids are transported in trench, joints should be properly sealed. Ensure the sealant/adhesive used is chemically resistant.

Miters

Mitered joints are formed by cutting channels to required angle and butting together.

For heavy duty applications, mitered grates are not recommended. A tee joint is suggested to give grate maximum support.

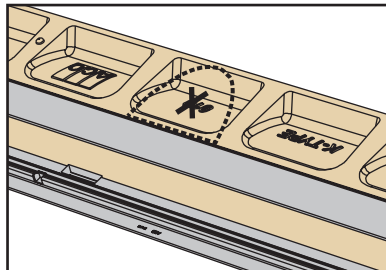


Tee Junctions

Tee junctions are when an opening is cut into the side of one channel and another channel is butted up to this opening.

All half meter channels provide molded guide for side removal. Other channels; mark area in channel wall to be removed by butting channels together and marking profile of interior of channel.

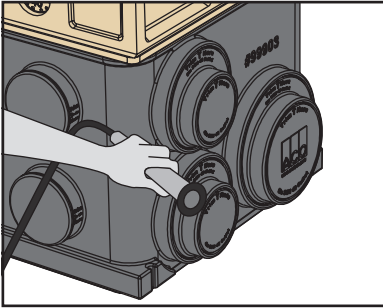
Edge rail should be left intact to provide additional strength and seating for grate.



3 Pipe Connections

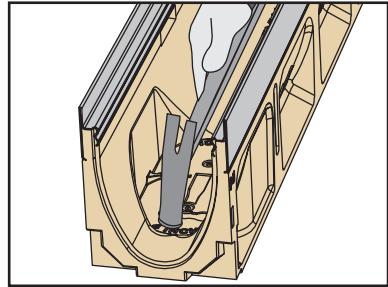
Removal of knockout, or cut hole:

1. Identify and mark area to be removed.
(Bracing may be necessary).
2. Material removal:
 - Catch Basin - cut-out**
 - Use cut-off tool, reciprocating saw or band saw to cut opening for required pipe size and location.

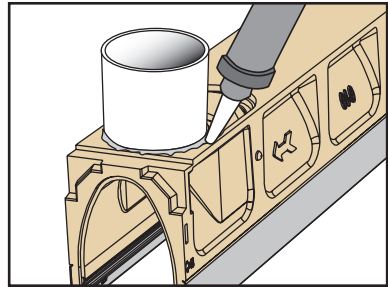


Channel - knockout

- Stand channel upright holding outlet end in hand to absorb impact and prevent cracking. Using hammer, from inside of channel, carefully tap out required area at 12, 3 and 9 O'clock positions.



3. Insert pipe into hole and seal using appropriate sealant/adhesive.
If corrosive liquids are transported in trench, ensure sealant or adhesive is chemically resistant.



3. Use a grinder to dress or enlarge hole for proper pipe insertion.
4. A pipe may be fitted into hole using appropriate sealant/adhesive.
If corrosive liquids are transported in trench, ensure sealant or adhesive is chemically resistant.

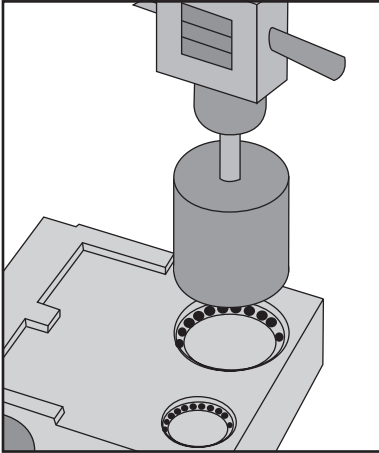
3 Pipe Connections

Removal of knockout, or cut hole:

1. Identify and mark area to be removed. (Bracing may be necessary).
2. Remove drill-out.

Core Drill

- Using correct size diamond core drill, remove channel/catch basin wall/base to fit pipe.

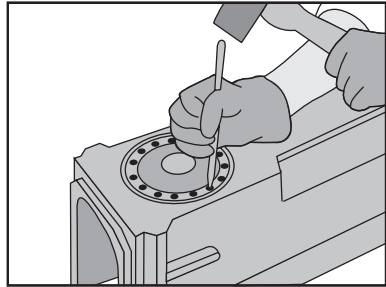


3. A grinder may be used to dress or enlarge hole for proper pipe or channel insertion.
4. A pipe may be fitted into hole using appropriate sealant/adhesive. If corrosive liquids are transported in trench, ensure sealant or adhesive is chemically resistant.

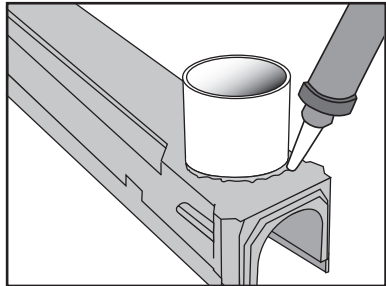
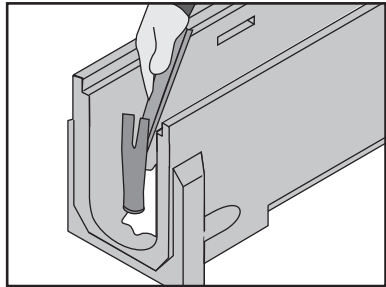
CAUTION: Do not hammer directly on material to make penetration or remove knockout. This may cause severe cracking of material surrounding hole.

Stitch Drill

- Using hammer and nail punch, or 1/4" concrete drill bit, pierce every dimple around drill-out.



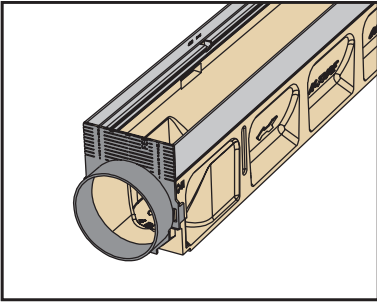
- From inside of channel, carefully tap out inside of perforated area.



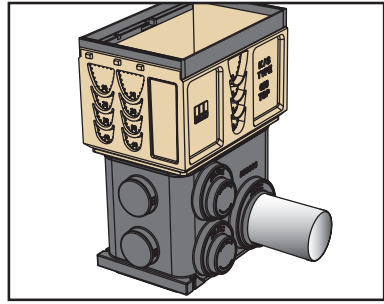
4 Connection with Underground Piping

Channels may be connected directly to underground piping via:

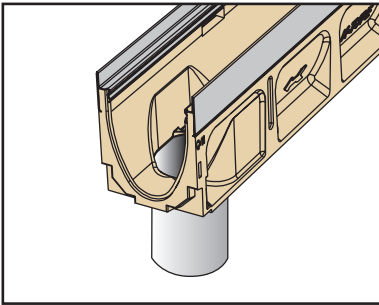
- 1. End cap outlets (horizontal outlet).



- 4. Catch basin.



- 2. Vertical knockouts (penetrations on underside of channel).



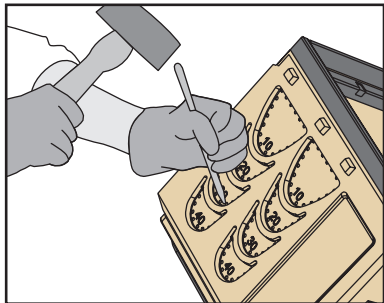
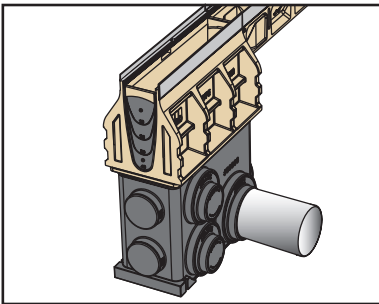
Connecting channels to catch basins

Catch basins have guides for channel connection at depths corresponding to invert level of designated channel units (10, 20, 30, 40).

In-line catch basins - cut out black end material at required channel height. Seal joint with flexible sealant.

600 Series catch basins - stitch drill out polymer concrete panel at required height following instructions on page 9.

- 3. In-line catch basin.



5 Positioning of Channels

Start with outlet point. Ensure string-line, or laser is set at top edge of required channel height.

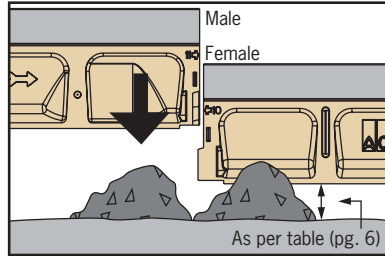
Common methods of positioning channels include:

1. Patty Method
2. Hanging Method

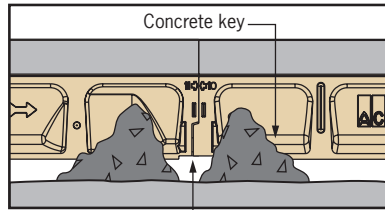
1. Patty Method

- a) Set catch basin (or outlet channel) on bed of concrete to required height (see page 6 for concrete dimensions). Connect and seal outlet pipe.
- b) Using low slump concrete, create 'patties' at intervals to support channels. Allow two patties per channel, spaced such that no concrete material is trapped in the joint, creating gaps.

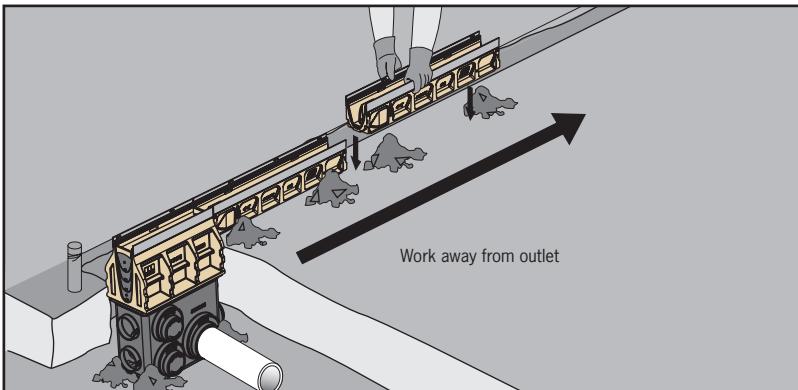
Note: Patties should be sized to provide required concrete surround (see page 6).
- c) If channels are to be sealed, roughen ends and use a flexible sealant - check chemical compatibility, if required.



- d) Lower channel vertically onto 'patties' and position to correct height and alignment ensuring 'tight' connection to previous channel.



- e) Add concrete on top of 'patty' to cover concrete 'keys' on side of channel - this prevents movement, or floating, during concrete pour.



- f) Continue to lay channels until end of run or next catch basin is reached.

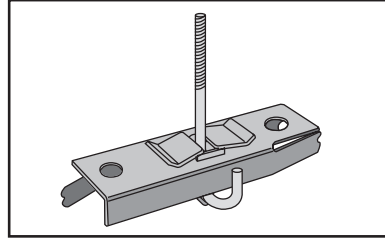
5 Positioning of Channels - Hanging Methods

Retrofit installations - use existing slab to anchor supports. Alternatively, form boards can also be used.

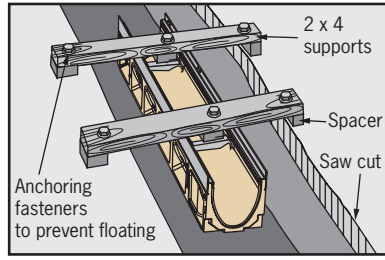
2.i Bolting Method - QuickLok

9895, 9896, 9897, 9832, 9836, 9898, 9899 will require a 'J' bolt through the QuickLok bar.

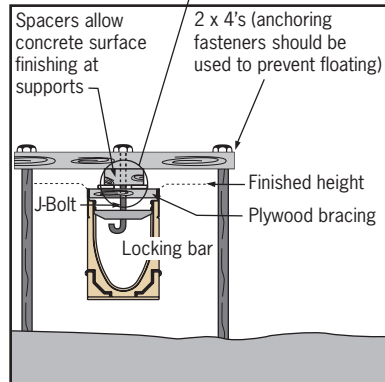
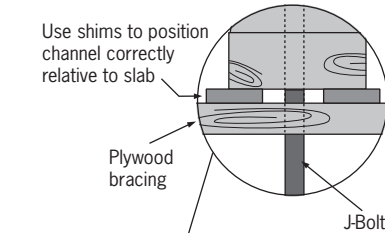
- Cut 2 x 4's to length to span excavated trench or form boards (minimum 2 per channel - K200 & K300 will require 3 - 4). Cut 'spacers' to 'lift' supports above finished level. Cut bracing to fit into grate rebate.
- Drill 5/8" diameter holes in the center of each 2 x 4 and spacer. Drill holes in center of bracing at 19.69" (500mm) centers to match locking positions.
- Slide J-bolt through center of clip on each QuickLok locking bar. Fit locking bars into channel (see page 18).
- Slide bracing, spacers and 2 x 4's over J-bolts. Use washer and nut to hold assembly together. (Do not overtighten as this will damage QuickLok bar).
- Lower channels into excavated trench, adjust to required position and height. Shims may be required beneath 2 x 4's to achieve required height and ensure channels are level.
- If channels are to be sealed, roughen ends and use a flexible sealant - check chemical compatibility, if required.
- Nail or anchor 2 x 4 supports securely to slab/form boards. This ensures channels are held securely during concrete pour.



Locking bar with J-Bolt



Retrofit installation



New installation

Commercial Trench Drains

5 Positioning of Channels - Hanging Methods

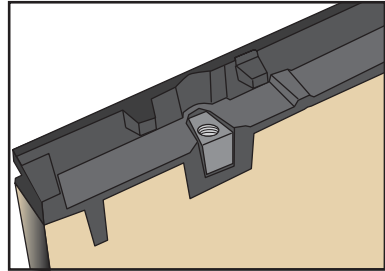
Retrofit installations - use existing slab to anchor supports. Alternatively, form boards can also be used.

2.ii Bolting Method - PowerLok

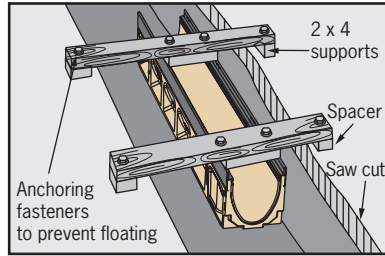
9877, 9878, 9879, 9805, 9806, 9807 will require M10 - 1.5 x 120mm bolts to screw into widgets in edge rail of channel. This allows the bolt to pass through the spacers, 2 x 4's and into widget nut.

- a) Cut 2 x 4's to length to span excavated trench or form boards (minimum 2 per channel - 9878 & 9879 will require 3 - 4 per channel). Cut 'spacers' to 'lift' supports above finished level.
- b) Drill two 5/8" diameter holes in the 2 x 4's and spacers - width to match widgets in channel rail.
- c) Using M10 - 1.5 x 120mm bolts with washers, bolt 2 x 4 and spacer to channel - do not overtighten. If using torque wrench do not set higher than 15ft. lbs.

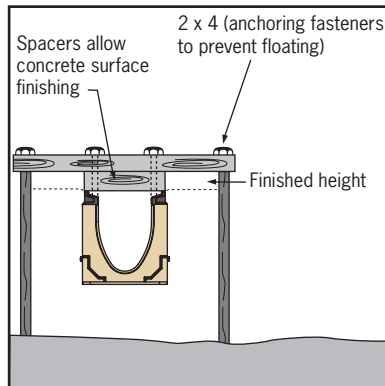
- d) Lower channels into excavated trench, adjust to required position and height. Packing material may be required beneath 2 x 4's to achieve required height and to ensure channels are level.
- e) If channels are to be sealed, roughen ends and use a flexible sealant - check chemical compatibility, if required.
- f) Nail or bolt 2 x 4 supports securely to slab/form boards. This ensures channels are held securely during concrete pour.



Widgets in edge rail



Retrofit installation



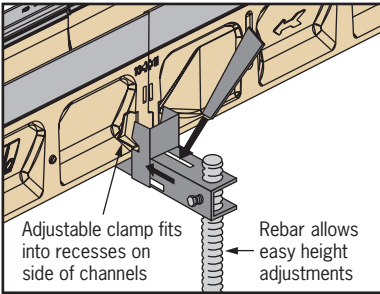
New installation

5 Positioning of Channels - Installation Devices

A number of installation devices are available to assist with installation.

For Channel Support Installation Devices

A clamping system that fits around the profiled end details. Rebar is used to achieve correct height. One device per joint is required. 100, 200 & 300 wide versions available.



Designed for use with KlassikDrain and PowerDrain channels.

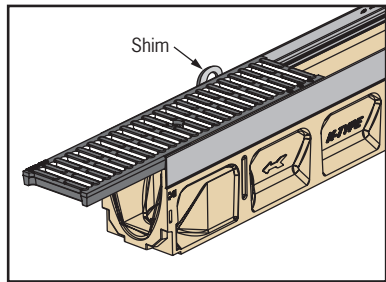
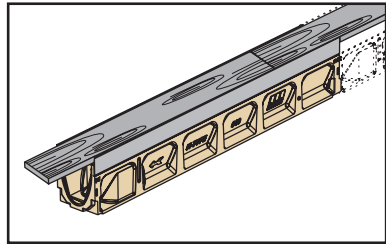
1. Drive #4 or #5 rebar into ground to hold three installation devices spaced using ACO template*. Screw installation device to rebar at required height.
2. Set channels in position so that fixed clamp fits into recess in channel end.
3. Push adjustable clamp tight onto other side of channel.
4. Tap metal wedge into slot to lock adjustable clamp in place, locking channel joint closed.
5. Repeat for additional channels.
6. Check channels are at required level - adjust using screws on rebar.

6 Pouring Concrete

Channel Bracing

To prevent channel wall and joints from distortion by weight of concrete, gratings or 3/4" plywood sections (cut to create a snug fit) should be placed in the grate rebate of channel.

If gratings are used, they should be suitably protected from concrete contamination during concreting (wrapped in plastic or masking tape) and should be laid to bridge channel joints to aid alignment. Shims (or washers) should be placed along one side to maintain a clearance gap.



Concrete Pour

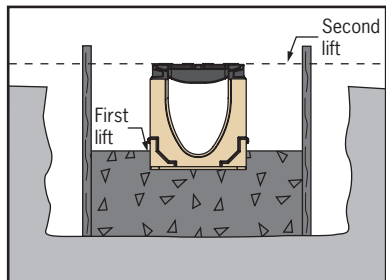
If using closing/outlet end caps with channels 1-10 remove unused spigot to ensure sufficient concrete coverage.

To prevent concrete from filling channel body, cover open areas with plywood or similar. (Bracing should suffice).

Concrete should have compressive strength of minimum 4,000 psi.

If using hanging method, once channels are securely in position, first concrete lift should come approx. 2 inches (50mm) up sides of channels.

Once concrete 'patties' or first lift has been placed, remaining concrete surround can be poured.



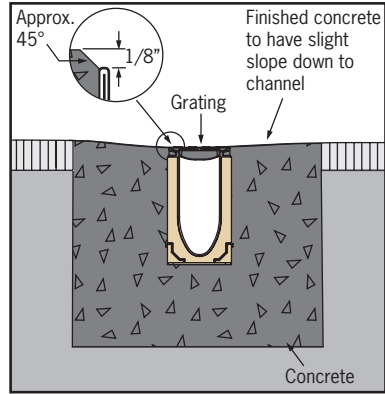
Concrete should be poured evenly (both sides of channel) and carefully to avoid dislodging channels. A wand type concrete vibrator should be used to ensure plastic concrete distributes evenly underneath and around channels.

If 'cold joints' are a concern, **engineering advice should be sought** to determine alternative details.

7 Pavement Finishing - Concrete

To finish installation, trowel concrete flat and taper down to channel edge. The top of adjacent pavement must be above the grating level (approximately 1/8"), this ensures all liquids drain into the channel.

Once concrete has cured 24 hours, remove bracing and/or grate protection. Fit grates - see page 18.

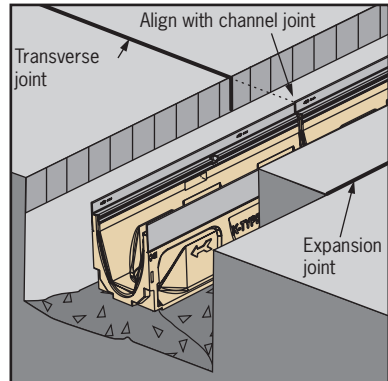


Expansion joints

Transverse joints (perpendicular to the channel) are required to prevent surface cracking in the slab. Such joints should be positioned at channel joints to prevent channels from cracking. If such spacing is not possible, a cut must be made at the appropriate location through the channel and sealed with flexible sealant.

Longitudinal expansion/isolation joints should be continuous and flexible. They must be provided between the concrete surround and surrounding slab and may be varied to suit concrete surround width by up to a meter (3 feet) from the channel.

If the joint is dowelled, debonding should be provided. **ACO recommends seeking engineering advice.**



Commercial Trench Drains

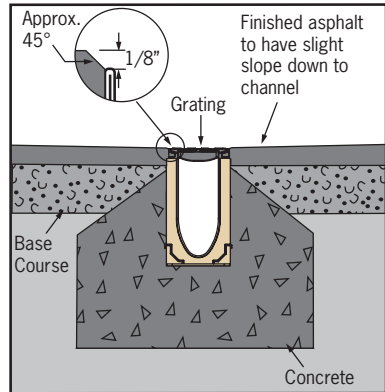
7 Pavement Finishing - Asphalt

For applications up to Load Class C, asphalt can be applied directly up to channel edge. For applications over Class C a full concrete surround should be used. See page 6 for concrete haunch details.

CAUTION: To prevent damage to channels and grates, protect channel between concrete pour and application of asphalt and when rolling asphalt.

Asphalt must be above grating level by approximately 1/8", this ensures all liquids drain into channel.

Once pavement is finished, remove bracing and/or grate protection. Fit grates - see pages 18.



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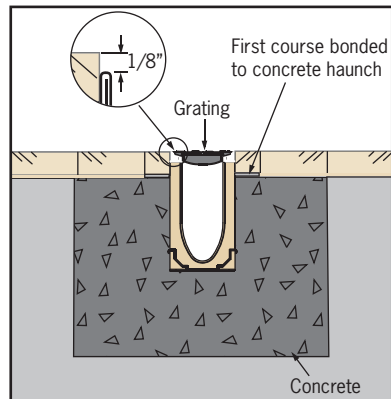
Pavement Finishing - Brick Pavers

For applications up to Load Class C, brick pavers can be installed up to channel edge. For applications over Class C a full concrete surround should be used. See page 6 for concrete haunch details.

Brick pavers adjacent to channel **MUST** be fully bonded to concrete haunch. This prevents movement of bricks and possible damage to channel. Subsequent pavers can be bedded on compacted sand.

Bricks must be above grating level by approximately 1/8", this ensures all liquids drain into channel.

Once pavement is finished, remove bracing and/or grate protection. Fit grates - see pages 18.



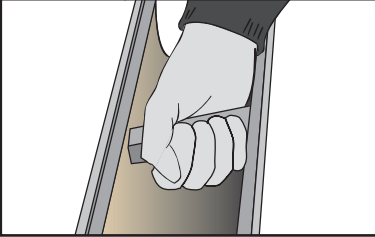
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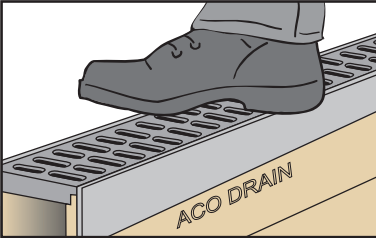
Fit Grates

QuickLok Gratings

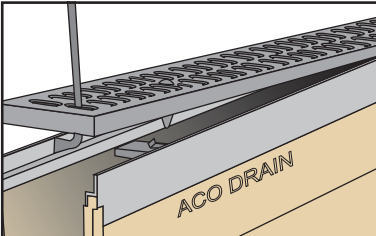
1. Fit QuickLok bar in channel wall recesses by rotating clockwise.
K100- Use hammer to tap into place, so that serrated ends grip in recess.
K200/K300- Use plastic safety clip to hold bar in place.



2. To install grating, align stud directly over locking bar. Push down/stand on grating until clicks into position.



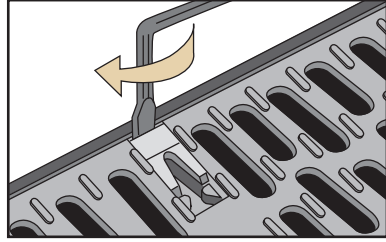
3. To remove first grate, insert removal tool under grating bar, pull up sharply. Subsequent grates can be removed by hand - Grip end of grate and lift sharply.



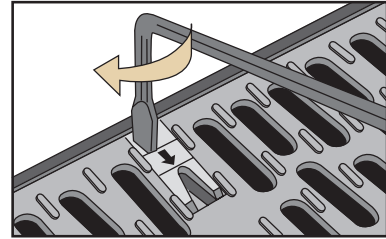
4. To remove 9895 bar, insert screwdriver into hole at end of bar - lever back serrated section to loosen. 9896/9897 - remove plastic clip to remove bar.

PowerLok Gratings

1. **To unlock:** slip flat end of grate removal tool into the slot between PowerLok mechanism and edge rail as shown.

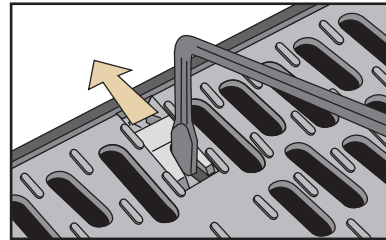


2. Rotate through 90° until lock mechanism slides across and clicks open.



3. To remove grates, insert removal tool under grating bar and lift first grate out, once unlocked other grates can be removed by hand (use gloves).

4. **To lock:** Fit one side of grating under lugs in rail and lower into position. Use hook on removal tool to push clip back to closed position, and click is heard.



9 Final Inspections & Maintenance

Final Inspections

1. Remove any debris in system and grate rebate. Ensure outlet pipes are clear.
2. Install trash buckets in catch basins, if required.
3. Flush trench run to check for pipe work blockages, unblock if necessary.
4. Empty trash buckets and clean out pipe connections, if necessary. Replace trash buckets.
5. Install gratings in proper position ensuring they are securely locked down (page 18).

Drainage system is now ready for use.

Maintenance

Regular inspections of trench drain system are recommended. Frequency will depend on local conditions and environment, but should be at least annually.

Inspections should cover:

- Grates and locking devices
- Catch basins and trash buckets
- Concrete surround and adjacent paving

All items should be inspected for damage, blockage or movement. Compare with site drawings if necessary.

1. Remove grates - see page 18.
2. Remove debris from channel.
3. Flush channels with water or high pressure washer.
4. Repair damaged surfaces, if necessary, with an appropriate repair kit.
5. Renew joint seals as required.
6. Empty trash buckets and clean out pipe connections.
7. Re-install trash buckets.
8. Re-install grates, ensuring they are locked in place.

Systems with grates that have wide slots may be cleaned with the use of pressured water applied through the grate — debris will be washed to catch basin for removal. (Empty and replace trash bucket).