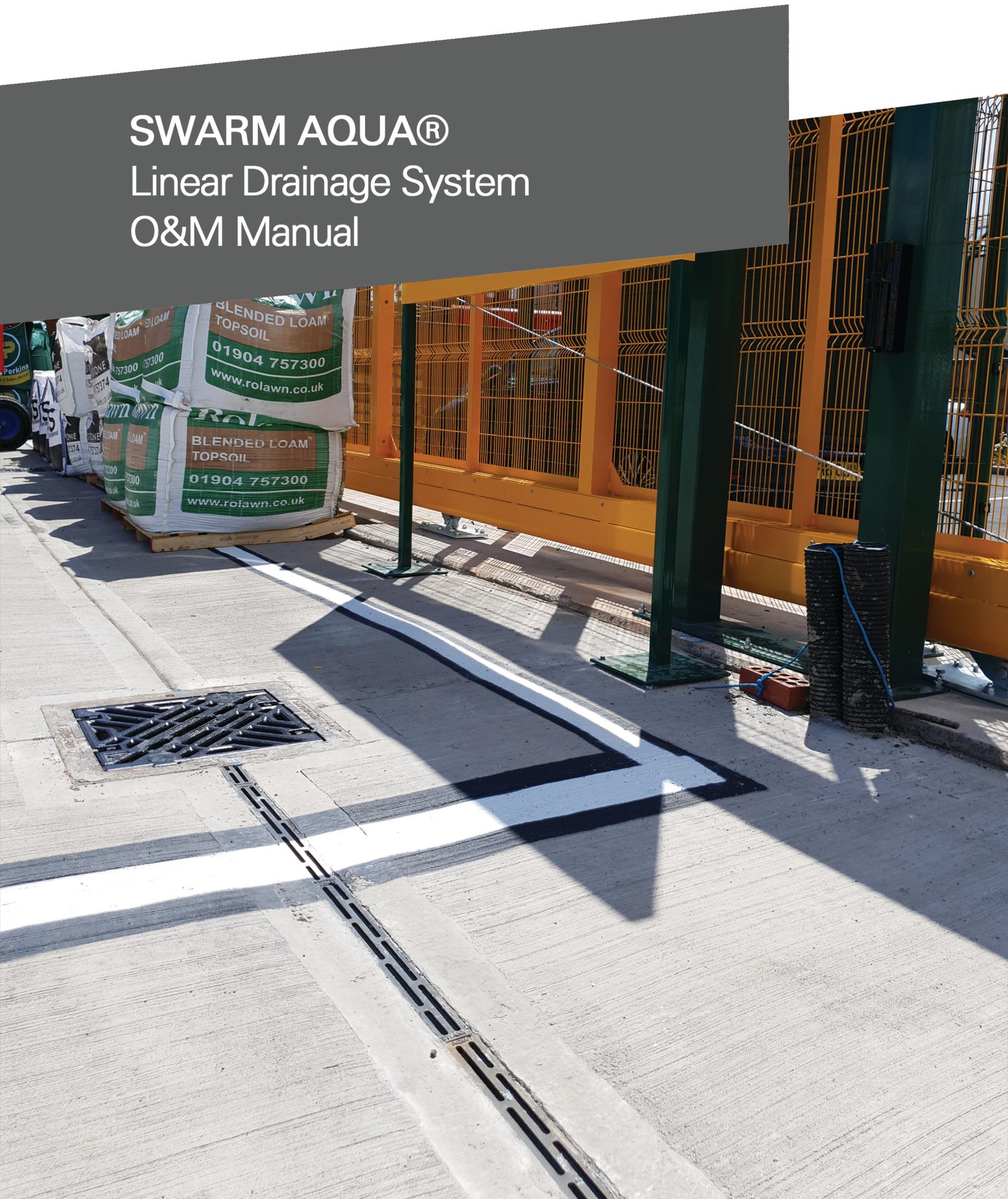




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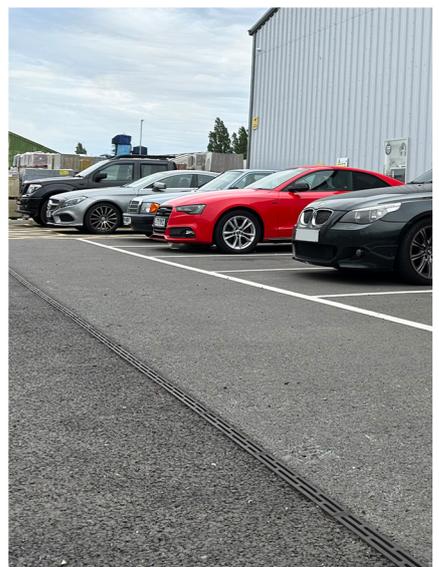
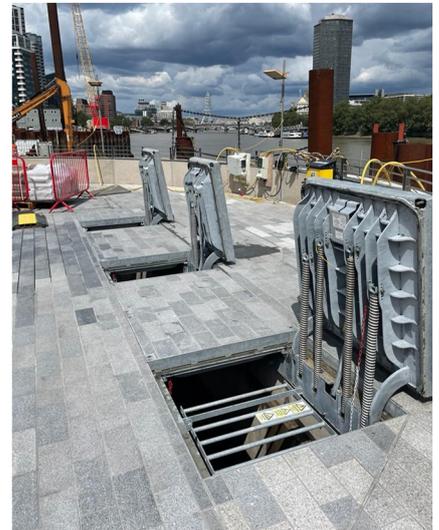
SWARM AQUA® Linear Drainage System O&M Manual



EJ, since 1883 we have been providing expertise to service your needs

By adopting a strategy of continuous investment in our production sites, we confirm our commitment to remain a world leader in infrastructure access solutions.

Access solutions to underground networks and asset security specialist, EJ is able to offer you the most appropriate solutions with the most relevant material to suit your needs.



We Create Exceptional Solutions. EJ is the world leader in the design, manufacture and distribution of access solutions for water, sewer, drainage, telecommunications and utility networks worldwide.

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Ensure the well-being and safety of your fellow citizens

EJ, are global leaders in the design, manufacture and distribution of infrastructure access solutions.

Covering water and sewerage networks, rainwater harvesting, telecommunications and other public utility networks has been **EJ** expertise for decades.

Access your underground infrastructure in cities, railway stations, industries, water & wastewater treatment plants, airports, ports, exhibition halls, tunnels with EJ **access covers and drainage solutions**.

The group's strengths: achieving the highest quality standards, guaranteed safety and respect for the environment.

Its resources: qualified and committed employees.



EJ, your partner from design to completion

We operate worldwide and distinguish ourselves by providing services to our customers to offer that leverage both our global and local strengths.



To ensure every customer benefits from our global knowledge, we work together across sectors: from engineering to manufacturing, from research to customer service - from North America to Europe, from Australia to Ireland - we share facts, data and developments across all steps.



This expertise encompasses the cultural background we have acquired through internal research, road testing and participation in standardization bodies around the world.

Our research and our spirit, in targeted collaboration, have allowed us to develop the best available solutions in the field of infrastructure. Solutions that drive industry, set benchmarks for excellence and meet customers' highest expectations.

Our distribution network, manufacturing facilities and sophisticated understanding of local cultures and quality standards put us in the ideal position to offer our customers relevant and dynamic services alongside our solutions.

Our modern local production capacities and warehouses ensure fast product availability for our customers. The result: Our customers have unrivalled local access to innovations, inventories and services.

Citizen group, eco-responsible

Our approach to social and environmental responsibility has been rewarded with a gold medal by EcoVadis. Our production site in Picardie ranks in the top 5% of the most efficient companies across all sectors.



Picardie - France, the Saint Crépin Ibouvillers foundry in Oise, 723 employees, production capacity of 100,000 tonnes, 42 hectares. Management systems certified ISO 9001, ISO 14001, ISO 45001 and ISO 50001 for the management of quality, environment, hygiene, safety and energy.

To be "Eco-Responsible" is not simply an expression but a guiding principle that features predominantly in our daily activities:

- **Quantity and nature of materials used**

Our innovative products require the use of less material, while maintaining structural integrity and load capacity. In addition, our cast iron products are made from at least **92% recycled materials**.



- **Reducing and controlling our emissions**

We ensure the use of the best available pollution control techniques to **reduce** and **control our emissions**.

- **Waste reduction, sorting and recovery**

Our sites have set up waste sorting at source. EJ favours treatment and recovery channels for waste specific to the activity as well as for other waste.

- **Third-party control and commitment to continual improvement**

Our plants use processes and management systems to minimise their impact on the environment. For example, with ISO 50001 certification, the Picardie foundry is committed to reducing its energy consumption.





Ardennes - France, our manufacturing site for galvanized or stainless steel products, 71 employees. Management systems certified ISO 9001, ISO 14001, OHSAS 18001 for the management of quality, environment, health and safety.



Birr -Ireland, with both a composite production site and a fabricated steel facility. Management system certification includes ISO 9001, ISO 14001 and ISO 45001 for quality management, environment, health and safety.



Boppard - Germany- Our production on the Rhine, Germany: a total of 70 employees - development and production of steel and stainless steel solutions. Management system certified according to ISO 9001 for quality management.



Nuneaton - UK - This is our UK distribution & manufacturing facility for galvanized and stainless steel products. Our UK facility is certified to ISO 9001 for quality management and ISO 14001 for environmental management.

Our certifications



*To check the validity of these certificates you can call:
 Bureau Veritas Certification + 33 (0) 1 41 97 00 60 -
 BSI, Kitemark Court, Davy Avenue, Knowlhill, Milton Keynes MK5 8PP.
 + 44 345 080 9000
 DNV GL Business Assurance Certification & Environmental Verifier GmbH
 +49 201 7296-555

Boppard* and Nuneaton

ISO 9001: Quality Management System
 ISO 14001 : Environmental Management System

Picardie Foundry*

ISO 9001 : Quality Management System
 ISO 14001 : Environmental Management System
 ISO 50001 : Energy Management System
 ISO 45001 : Health Management System and Safety at work

Manufacture Ardennes*

ISO 9001 : Quality Management System
 ISO 14001 : Environmental Management System
 OHSAS 18001 : Occupational Health and Safety Management System

Birr Manufacture

ISO 9001 : Quality Management System
 ISO 14001 : Environmental Management System
 ISO 45001 : Health Management System and Safety at work

Site Preparation

Swarm Aqua® channels are designed to be installed within a concrete surround and completed at surface level with a range of finishes, be it pavement quality concrete, asphalt, block paving or landscaping. Swarm recommends using a two-pour installation method within a pre-formed trench to ensure the final load rating of the channel is in line with project specifications. When installed in concrete, Swarm Aqua® channels can cater for loadings of up to F900kN. For block paving and asphalt installations, Swarm Aqua® is rated for up to D400 loading as it is not recommended to surpass this loading due to the nature of the malleable or movable surface.



Trench Preparation

Swarm Aqua® channels are designed to be installed within a preformed trench before being set within concrete using a two-pour method. It is important to follow the instructions laid out within our recommended installation drawings SA-S-001 (Full Concrete Surround), SA-S-002 (Asphalt Surface Finish) & SA-S-003 (Paved Surface Finish) to achieve the required load rating for the project. The trench is required to be 150mm deeper than the base of the channel section and 200mm wide from either side of the channel to ensure the concrete can flow underneath the Swarm Aqua® channel and provide suitable wall thickness.



Reinforcement

EJ have performed an independent design and loading check on Swarm Aqua® when it is installed in concrete, asphalt and Block Paving.

Our recommendations for reinforcement can be requested from us and are represented by an installation drawing showing a reinforcement mesh where required for the relevant loadings.

Handling & Storage

Swarm Aqua® channels can be heavy, as such it is important to observe all relevant site health and safety guidelines and regulations and use mechanical lifting methods where necessary. The channels themselves should be kept in their original packaging and stored in a location that will prevent damage on site.



Once installed in the ground if it is necessary for site equipment to traverse the trench, a protective bridge should be formed to protect the Swarm Aqua® channel from unnecessary damage. It is important that Swarm Aqua® is never trafficked prior to the final stage of it's installation, as the strength of the drainage channel is dependent on it's concrete surround and any unnecessary loading will cause deformation and may affect the quality or length of the channel's lifespan

Handling Swarm Aqua®

Swarm Aqua® channels are generally 2m long and can be heavy, as such it is important to observe all relevant site health and safety guidelines and regulations and use mechanical lifting methods where necessary. Lifting straps should not be attached through the throat spacers or around the feet, they should be wrapped around the channel, between ribs where able to do so.

Swarm Aqua® accessories can be handled manually, however as they are primarily of cut steel construction it is important to take care that any burrs and sharp edges are avoided, and PPE considerations are made.



Delivery to Site

In most cases Swarm Aqua® channels are delivered to your site packaged in bundles as shown in the image to the right. The channels will be tessellated to protect them from movement during haulage, however care should be taken when separating the bundle on site to ensure components or units are not damaged in any way during this process. Accessories will be either bundled together with the channel or delivered in their own crate and should be easily separated. Delivery to site will be made on articulated flat bed lorries without hi-ab or off-loading facilities, so it is important that site off-loading facilities are provided on site.



PPE



Swarm Aqua® has laser cut steel parts and as such some parts of the channel and accessories may have sharp edges or burrs. Although every effort is taken to minimize these areas of risk, It is important when handling channels and accessories that relevant PPE is worn and site health and safety guidelines are followed.



Transporting Swarm Aqua Channels



Swarm Aqua® channels are delivered in tessellated 2m bundles no more than 1.2m wide. When arriving on site it is recommended that the bundles are kept together and a forklift is used to move the bundle to a safe area where the channels can be stored until they are ready to be installed. Preferably this area is covered and in an area where possible damage to the channels is minimal.



Site Off-loading Facilities

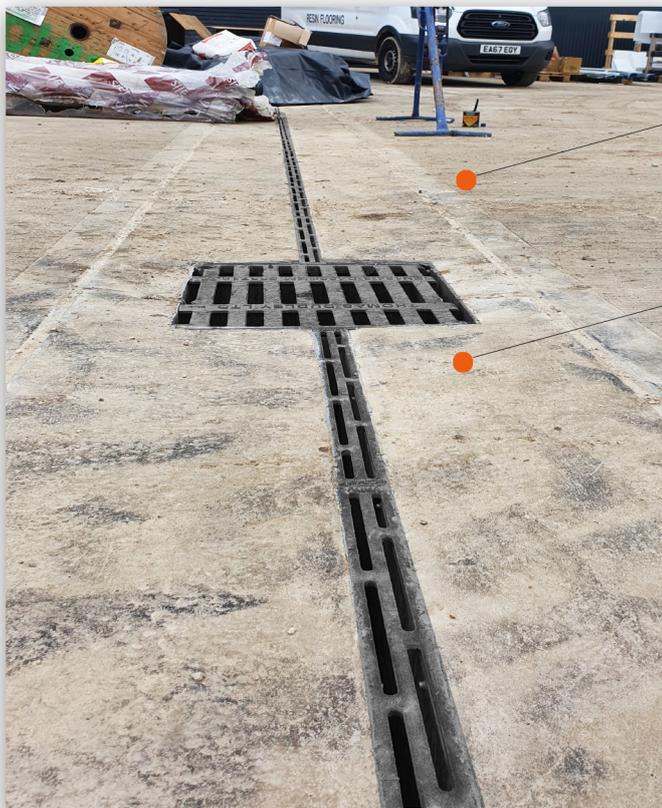
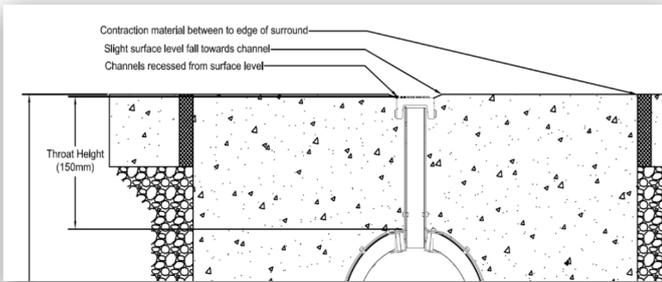
Swarm Aqua® channels are delivered on flat lorries without hi-ab or off-loading facilities. It is the responsibility of the site receiving delivery to arrange for mechanical site off-loading facilities.

Installation Details

Full and up to date installation details for the Swarm Aqua® systems are available online at www.swarmwm.co.uk or by request. It is important to follow the guidelines regarding trenching, setting, concreting, expansion and contraction joints as these details have been verified to achieve the specified load ratings by third-party structural engineers. If Swarm Aqua® is not installed in line with the given guidelines it may cause damage to the product and/or effect the final load rating or finish of the installation.

Expansion & Contraction Joints

Swarm Aqua® must reside within its own concrete surround which includes an expansion material between the surround and any other surface finishes beyond that. Failure to include an expansion joint at this point can result in product damage due to the natural thermal expansion and contraction of concrete and other materials.



Expansion Joints

Large concrete bays must always be separated from the Swarm Aqua® trench to ensure independent movement and expansion into the drainage void.

Surface Crossfall

When installing Swarm Aqua® a slight crossfall on the concrete surround of around 5mm will ensure all surface water is collected in the system and prevents surface pooling.

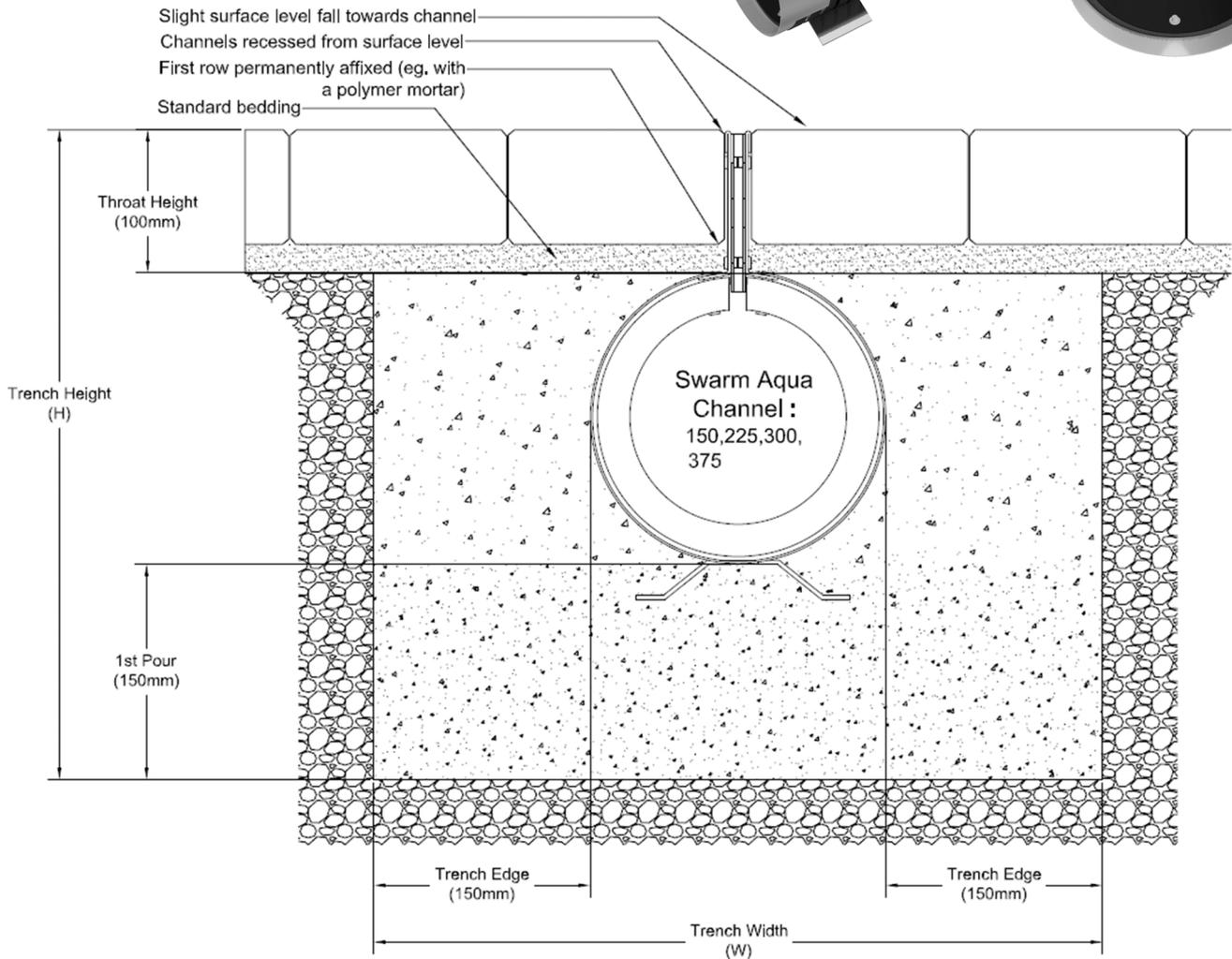
Crack Inducers

K-Form screed railing can be used as a crack inducer at each channel joint in order to ensure the integrity of the finished slab in full concrete installations. However it is also possible to use a generic crack inducer to achieve the same result.



Paving Installation

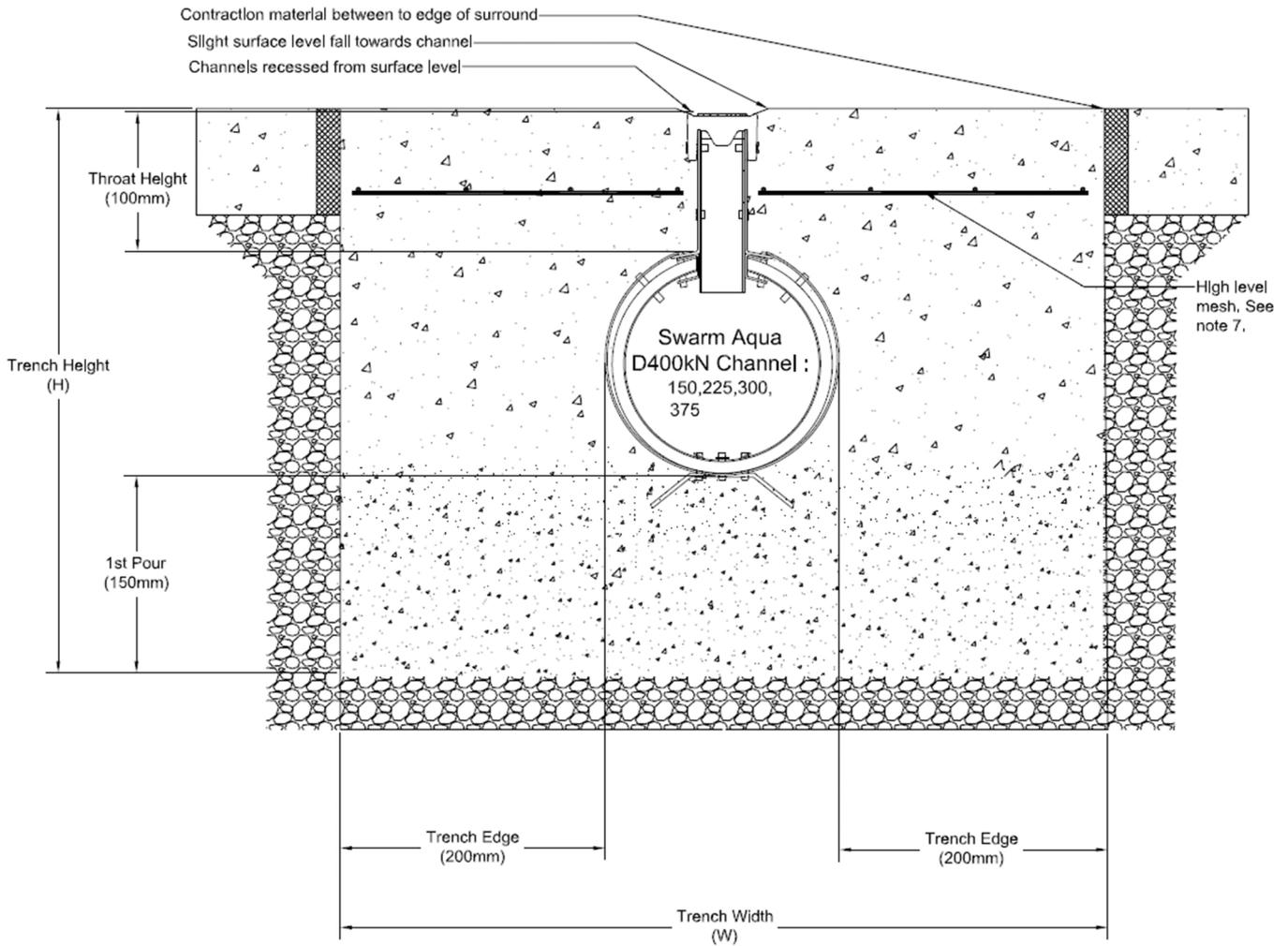
The below detail and table shows the Swarm Aqua® paving system with a discrete single slot arrangement installed in a block paved scenario. This system is rated up to D400kN along with its recessed access box covers (supplied with part PD01S) to ensure the optimum aesthetic solution for high-end or block paved areas.



Product Information								Trench Information	
Code	Description	Loading	Length	Width	Height	Invert	Opening	Width (W)	Height (H)
SA150P	150mm Aqua Paving	D400	2.0m	178mm	300mm	280mm	20000mm ²	478mm	430mm
SA225P	225mm Aqua Paving	D400	2.0m	265mm	390mm	370mm	20000mm ²	565mm	520mm
SA300P	300mm Aqua Paving	D400	2.0m	354mm	480mm	460mm	20000mm ²	654mm	610mm
SA375P	375mm Aqua Paving	D400	2.0m	426mm	550mm	530mm	20000mm ²	726mm	680mm

D400 (Concrete) Installation

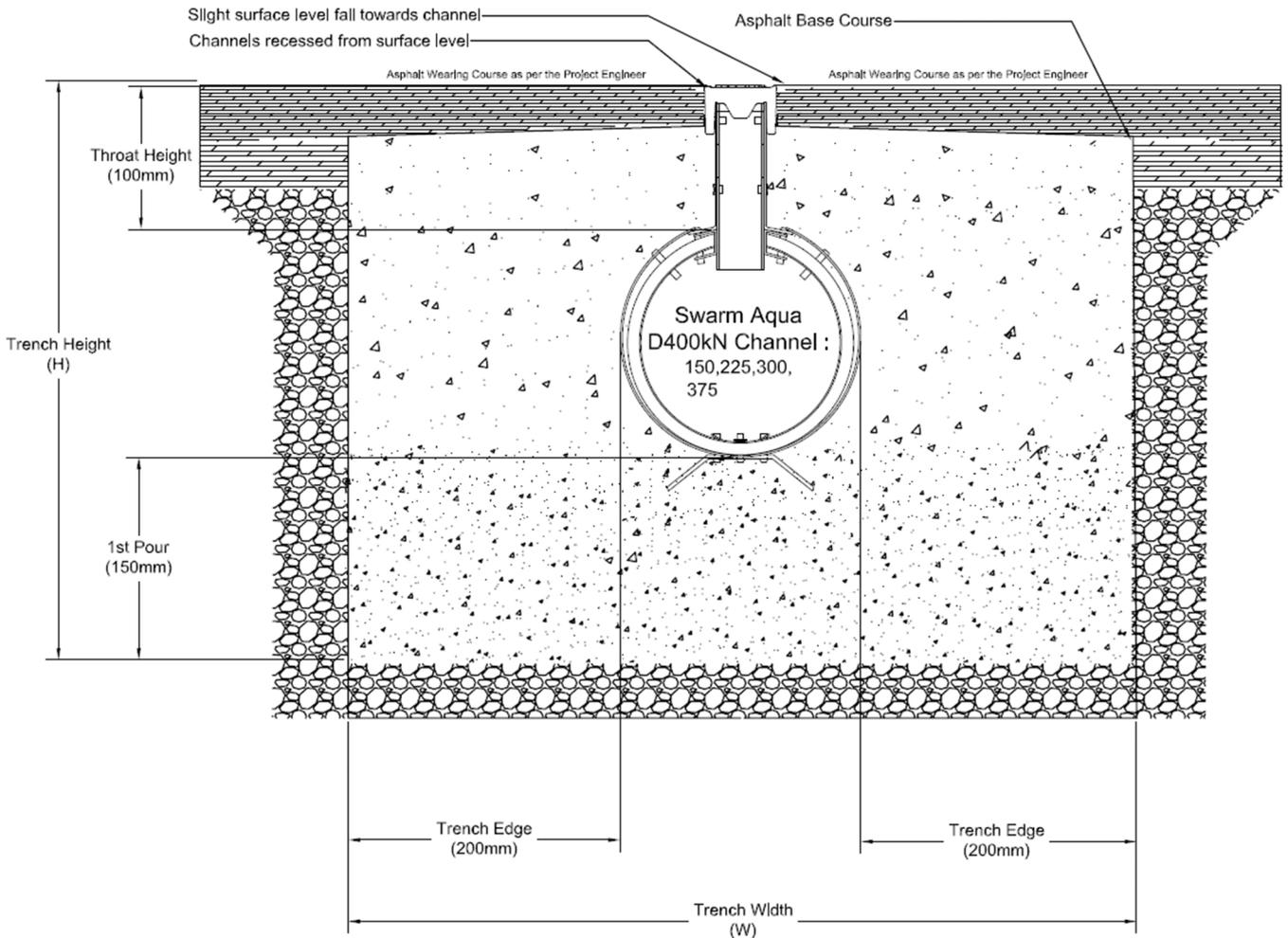
The below detail and table shows the Swarm Aqua® D400kN system installed in a concrete surface finish. This system can be installed in situations requiring a load rating of up to D400kN along with ductile iron grating and frames.



Product Information								Trench Information	
Code	Description	Loading	Length	Width	Height	Invert	Opening	Width (W)	Height (H)
SA150D	150mm Swarm Aqua	D400	2.0m	178mm	298mm	278mm	14490mm ²	578mm	428mm
SA225D	225mm Swarm Aqua	D400	2.0m	265mm	385mm	365mm	14490mm ²	665mm	515mm
SA300D	300mm Swarm Aqua	D400	2.0m	354mm	474mm	454mm	14490mm ²	754mm	604mm
SA375D	375mm Swarm Aqua	D400	2.0m	426mm	546mm	526mm	14490mm ²	826mm	676mm

D400 (Asphalt) Installation

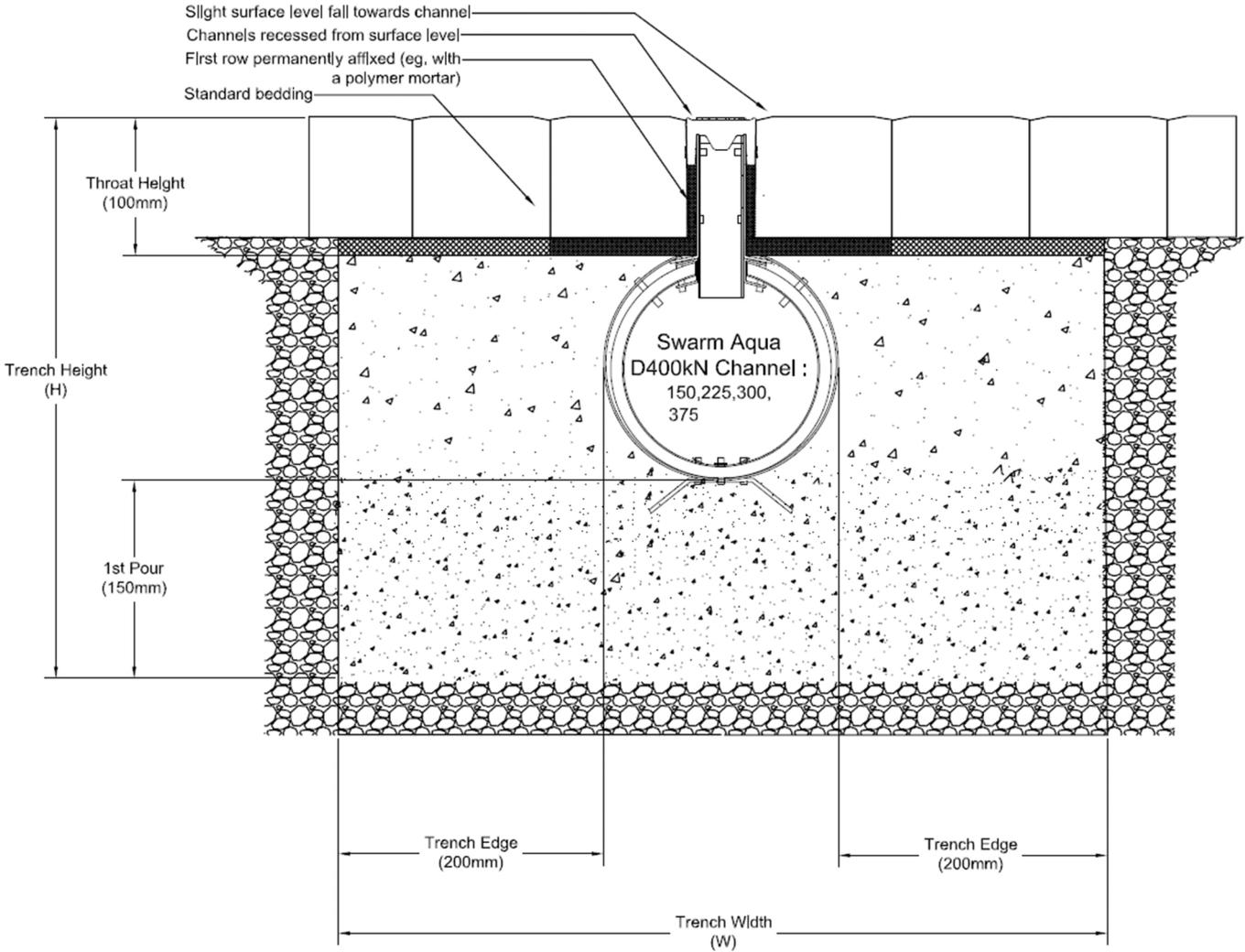
The below detail and table shows the Swarm Aqua® D400kN system installed in an asphalt surface finish. This system can be installed in situations requiring a load rating of up to D400kN along with ductile iron grating and frames.



Product Information								Trench Information	
Code	Description	Loading	Length	Width	Height	Invert	Opening	Width (W)	Height (H)
SA150D	150mm Swarm Aqua	D400	2.0m	178mm	298mm	278mm	14490mm ²	578mm	428mm
SA225D	225mm Swarm Aqua	D400	2.0m	265mm	385mm	365mm	14490mm ²	665mm	515mm
SA300D	300mm Swarm Aqua	D400	2.0m	354mm	474mm	454mm	14490mm ²	754mm	604mm
SA375D	375mm Swarm Aqua	D400	2.0m	426mm	546mm	526mm	14490mm ²	826mm	676mm

D400 (Paving) Installation

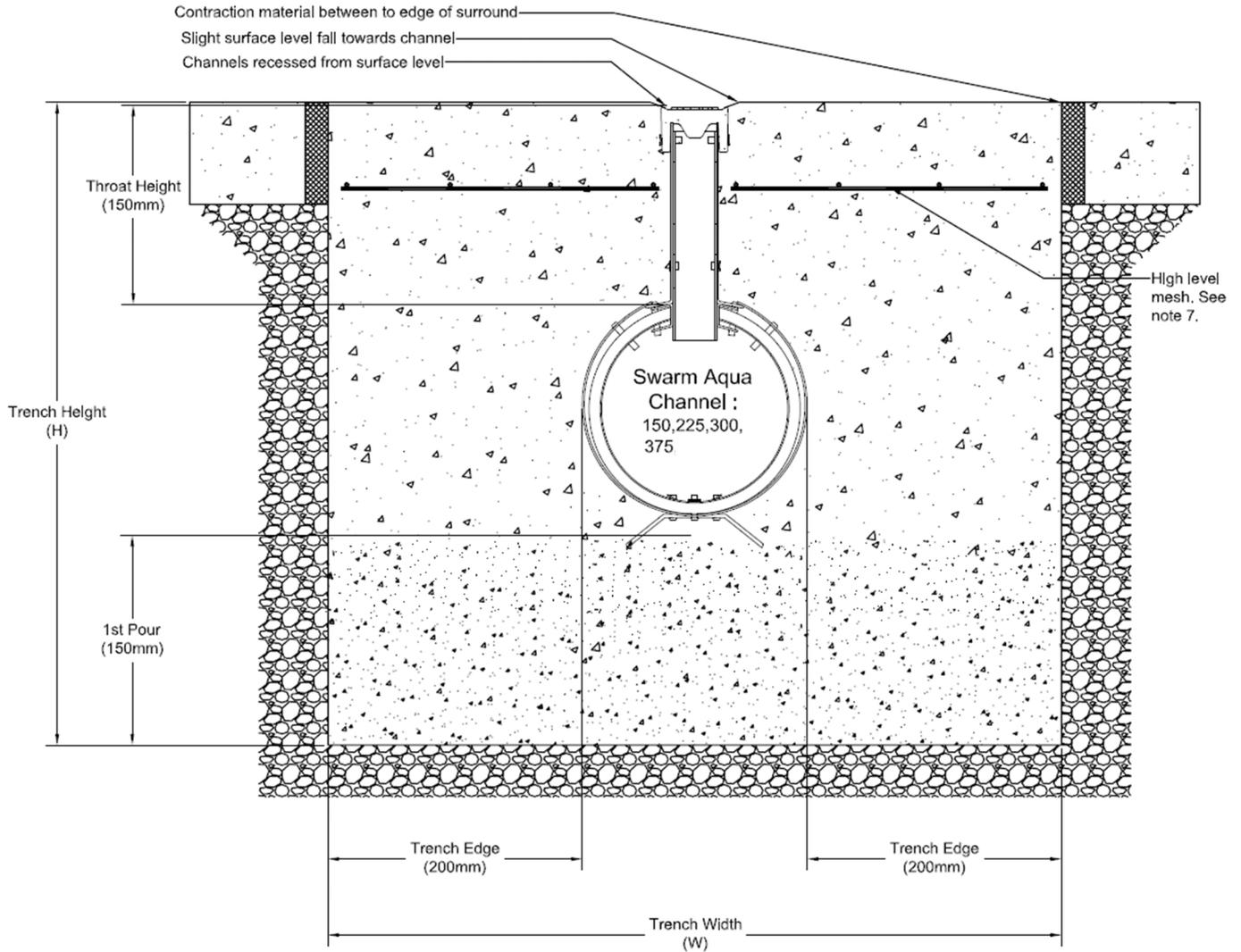
The below detail and table shows the Swarm Aqua® D400kN system installed in a paved surface finish. This system can be installed in situations requiring a load rating of up to D400kN along with ductile iron grating and frames.



Product Information								Trench Information	
Code	Description	Loading	Length	Width	Height	Invert	Opening	Width (W)	Height (H)
SA150D	150mm Swarm Aqua	D400	2.0m	178mm	298mm	278mm	14490mm ²	578mm	428mm
SA225D	225mm Swarm Aqua	D400	2.0m	265mm	385mm	365mm	14490mm ²	665mm	515mm
SA300D	300mm Swarm Aqua	D400	2.0m	354mm	474mm	454mm	14490mm ²	754mm	604mm
SA375D	375mm Swarm Aqua	D400	2.0m	426mm	546mm	526mm	14490mm ²	826mm	676mm

F900 Product(Concrete) Installation up to E600

The below detail and table shows the Swarm Aqua® F900kN system when installed with a full concrete surround. This system can be installed in situations requiring a load rating of up to F900kN along with ductile iron grating and frames.



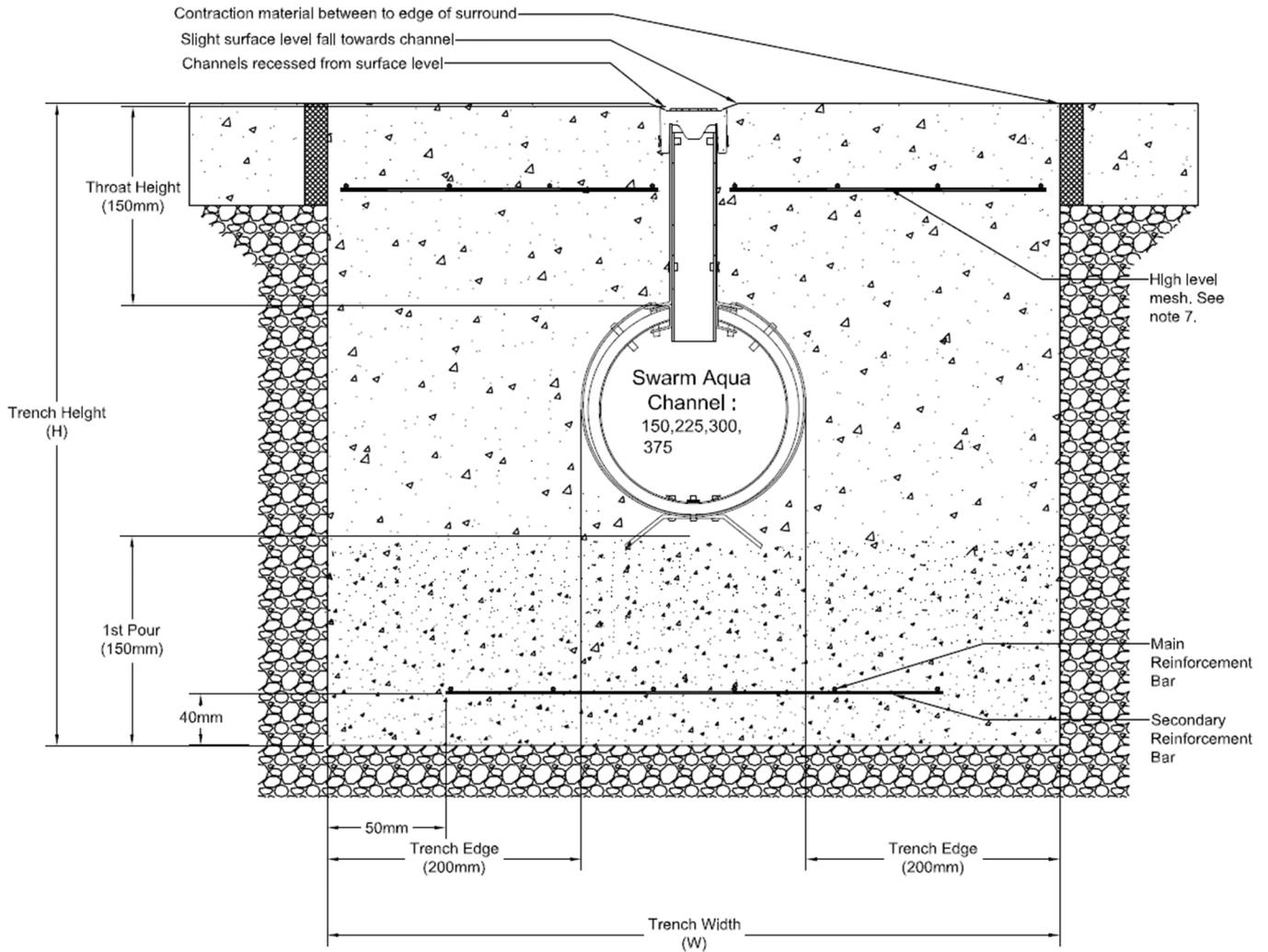
D400 Reinforcement Requirements		
Code	Description	Mesh
SA150F	150mm Swarm Aqua	N/A
SA225F	225mm Swarm Aqua	N/A
SA300F	300mm Swarm Aqua	N/A
SA375F	375mm Swarm Aqua	N/A

E600 Reinforcement Requirements		
Code	Description	Mesh
SA150F	150mm Swarm Aqua	N/A
SA225F	225mm Swarm Aqua	N/A
SA300F	300mm Swarm Aqua	N/A
SA375F	375mm Swarm Aqua	N/A

F900 Reinforcement Requirements		
Code	Description	Mesh
SA150F	150mm Swarm Aqua	B785
SA225F	225mm Swarm Aqua	B785
SA300F	300mm Swarm Aqua	B785
SA375F	375mm Swarm Aqua	B785

F900 Reinforcement Detail

The below detail and table shows the Swarm Aqua® F900kN system with its required reinforcement profile to meet specific load ratings. This system can be installed in situations requiring a load rating of F900kN along with ductile iron grating and frames.



D400 Reinforcement Requirements		
Code	Description	Mesh
SA150F	150mm Swarm Aqua	N/A
SA225F	225mm Swarm Aqua	N/A
SA300F	300mm Swarm Aqua	N/A
SA375F	375mm Swarm Aqua	N/A

E600 Reinforcement Requirements		
Code	Description	Mesh
SA150F	150mm Swarm Aqua	N/A
SA225F	225mm Swarm Aqua	N/A
SA300F	300mm Swarm Aqua	N/A
SA375F	375mm Swarm Aqua	N/A

F900 Reinforcement Requirements		
Code	Description	Mesh
SA150F	150mm Swarm Aqua	B785
SA225F	225mm Swarm Aqua	B785
SA300F	300mm Swarm Aqua	B785
SA375F	375mm Swarm Aqua	B785

Maintenance

Swarm Aqua® channels require regular maintenance at least once every twelve months, although this interval may become shorter depending upon environmental factors.

There are three areas to address when cleaning and maintaining the Swarm Aqua® channel, these are the surface, the combined box, and the channel body.

Surface Maintenance

The cast/slot portion of the system can be cleaned by a normal pressure washer. Removing any surface debris, this ensures that the openings remain clear to allow water to enter the system. If there is a larger build up of debris in the slot itself, it is possible to use a slot drain cleaning paddle, or other suitable tool to fit into the 9mm slotted openings.



The Combined Box

If using the recommended Swarm Combined Box, this is used as an access point for cleaning. For channel sizes up to 300mm a small box with a hinged D400 grating is used (as shown), this can be opened without any specialised tools. For 375mm channels, a large box with double triangular solid top cover is used.

Once the cover is open, silt and debris that may have collected in the combined box can be removed by hand, making sure to follow your site's standard health and safety, and PPE guidelines.

Cleaning the Channel & Blockages

Swarm Aqua® channels will achieve a self-cleansing velocity, however in some cases blockages can occur.

The channel can be rodded from the head of the run if a combined box was installed, pushing debris towards the outlet. If the system has a transition piece and therefore has different size pipes in the same run, the system should be rodded downstream to where the pipes change diameter and then rodded from the up-stream combined box to where the system changes size.

The channel can also be jet washed through the surface openings in order to aid the flow of debris to the outlet chamber.



Universal access & outlet boxes to allow for both rodding access and outfall into external water systems. For Cast systems, a grating or cover is supplied. For Paving systems, a recessed steel cover can be supplied.

Swarm Aqua® Combined Access/Outlet Boxes

Code	Description	Loading	Weight	Length	Height	Depth
SD01	Small Combined Box	D400*	31kg	524mm	610mm	450mm
SD02	Large Combined Box	D400*	48kg	605mm	750mm	675mm

*Swarm combined boxes are supplied with D400kN covers as standard



Swarm Aqua® Combined Access/Outlet Boxes for Paving

Code	Description	Loading	Weight	Length	Height	Depth
PD01	Small Paving Box	FACTA D	31kg	524mm	610mm	450mm



Combined Access/Outlet Units

Swarm Aqua® is a complete solution for most cases, as such Combined Access/Outlet Units are available to provide both an access solution for maintenance and an outlet for discharge into local waste water systems. Combined boxes are available for channels up to 300mm (small) and for channels up to 375mm (large).

The grating and frames supplied are load rated for up to D400kN. Chambers can also be formed on site to cater for special inverts.



Using Swarm Aqua® Access/Outlet Units

Swarm Aqua® combined boxes have been pre-perforated with the appropriate sizes for channel connections with Swarm Aqua® Chamber Connectors or standard twinwall pipe fittings. The knockouts are removable by cutting through the 1.5mm steel tabs that hold them in place, following required site safety guidelines.

Outlet knockouts are also pre-cut on all four sides of the combined access/outlet boxes for connection to local waste water systems. These all provide an invert lower than the invert of Swarm Aqua® channels to ensure water is efficiently removed from the system.



Swarm Aqua® Chamber Connectors

When using either a Swarm Aqua® combined access/outlet box or a chamber formed on site, a Swarm Aqua® Chamber Connector can be used. This is a standard Twinwall pipe fitting and it is normal to use offcuts on site in lieu of this piece. A 200mm gap is recommended between the end of the channel and the chamber itself to ensure that the cover and frame receive an adequate concrete surround to ensure the appropriate load rating is achieved.



Connecting Channels

Swarm Aqua® channels are designed with a male and female end to make installation quick and as simple as possible. The integrated throat spacer provides a spigot for the channels to connect to each other ensuring a snug and straight fit.



Connecting Accessories

All of the accessories available with Swarm Aqua® systems use a similar method of jointing. Metal tabs are used to keep the channel located in place and it is recommended that the accessory is held in place securely to prevent ingress of concrete during installation.



Closing Channel Joints

Once the Swarm Aqua® channels have been placed in their final locations and it is ensured that any gaps are closed using the integrated connection system, we recommend checking all joints and connections to make sure the channels and accessories are in place and secure. Throughout the installation process, please make sure that channels are protected as the load rating of the system is achieved once installation is complete.



Integrated Throat Spacer

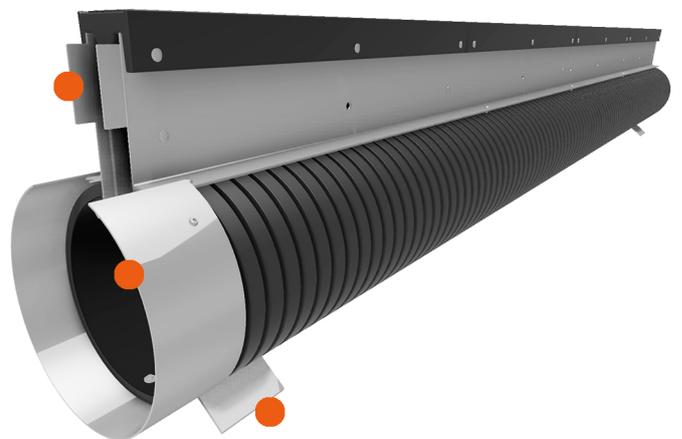
The throat spacer protrudes from the steel throat to locate one Swarm Aqua® channel to the next. As the location is inside the channel walls this avoids any interference with the concrete near the surface of the trench.

Positive Collar Connection

An integrated steel collar provides connection of the channel conduit from one unit to the next, ensuring a straight, neat finish every time.

Stabilising Channel Feet

The steel feet are provided to stabilise the Swarm Aqua® channels during installation.





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