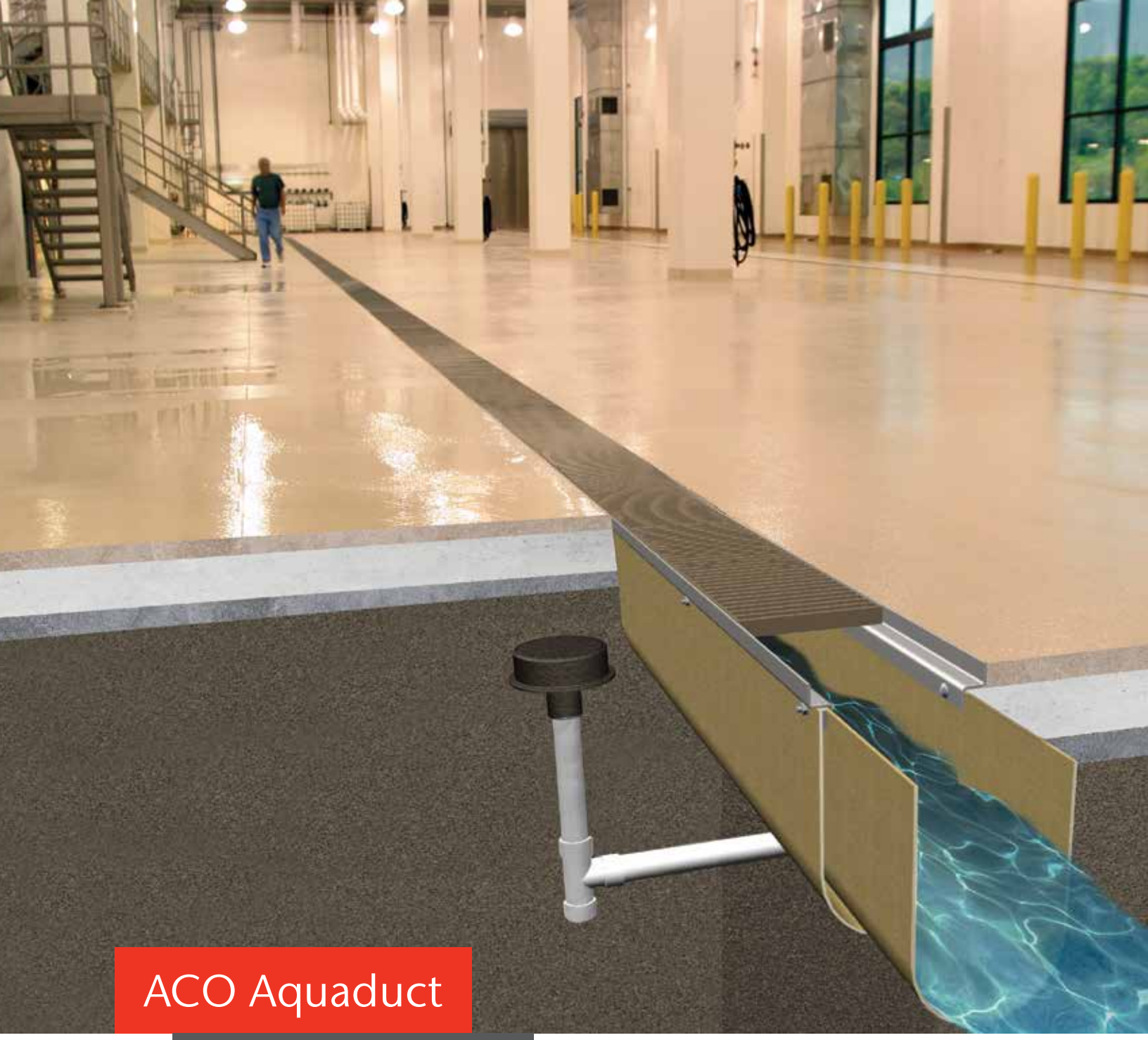


ACO Aquaduct

Custom Manufactured Drainage

Custom Trench Drains
Double Containment Drainage
FRP Trench Drain Forming System

ACO. creating the future of drainage

The ACO Group

The ACO Group is a world leader in drainage technology. Climate change sets us a challenge to react effectively with innovative solutions to new environmental conditions. With its integrated approach, ACO provides systems for professional surface water drainage, efficient cleaning, and the controlled discharge or reuse of water.

Products include:

- surface water drainage
- oil, sediment, heavy metals, and grease separators
- detention, retention, and infiltration systems
- flow control release products

Major innovative strengths of the ACO Group are its continuous research & development and technical expertise in the processing of polymer concrete, plastics, cast iron, stainless steel and cement concretes.

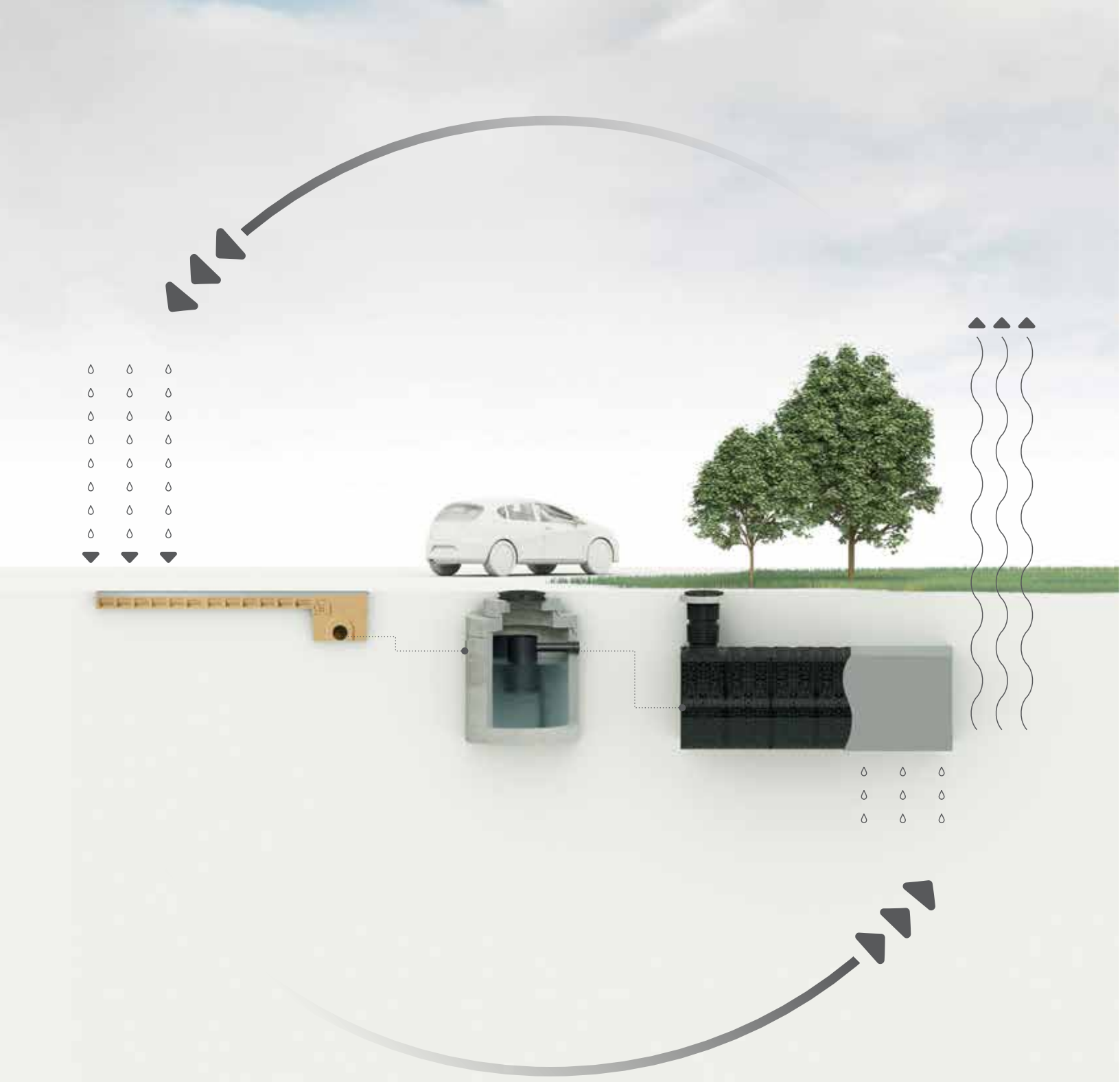
ACO in the USA

The ACO group was founded in 1946. ACO, Inc. was founded in 1978 in Ohio. Since 1978, continuous growth in the USA has seen the company expand and build manufacturing facilities in Mentor, OH, and Casa Grande, AZ. The company has further locations in Phoenix, AZ, and Fort Mill, SC. Today ACO USA has sales personnel in many states and an extensive distribution network across all 50 states, the Caribbean, and Central America.

ACO Aquaduct

Aquaduct solves drainage problems on a project-by-project basis using custom-formed assets built from FRP (fiber reinforced plastic), stainless steel and other materials. Aquaduct engineers are involved from the outset providing industry knowledge and experience, designing a solution that meets specific site requirements and budgets. Aquaduct also provides on-site technical service to advise on installation of these custom products.

Contents



collect clean hold release

The Hydrological Cycle is the natural cycle of water from rainfall to evaporation. The ACO System Chain provides products that collect water from impervious surfaces, which is transmitted to products which help clean solids and liquids from this collected surface water. Hold and Release require products that can hold and return this water back to nature in a controlled manner. These products can be used in conjunction with water reuse programs.

collect

Surface water collection from paved areas are a critical element of managing the hydrological cycle effectively. The constant increase in paved areas reduces the opportunity for natural infiltration back into the ground water to occur.

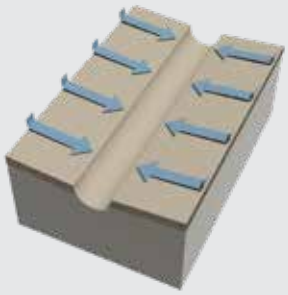
BENEFITS OF SURFACE WATER DRAINAGE

- Effectively collects water to be transferred into an underground infiltration tank that is used to recharge groundwater with a good utilization of space
- Provides an efficient way of moving water off of paved areas, preventing potential injury and/or property damage. When combined with an underground detention/retention tank outflow back into watercourses can be measured.
- When contaminated surface water is present, an efficient surface water drainage system can capture polluted liquids and transfer them to an appropriate cleaning facility before allowing clean water back into groundwater or watercourses.

METHODS TO COLLECT SURFACE WATER VIA DRAINAGE

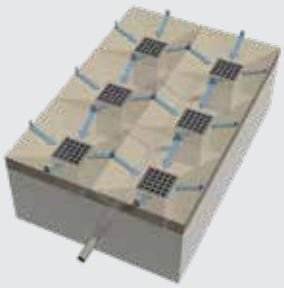
A TRENCH DRAINS

Trench drains benefit from continuous inlets along the entire length of the trench to allow for maximum water capture. For safety, trench drains allow for 100% liquid containment when required.



B SWALES

Swales can be used to direct surface water from impervious surfaces to point drains, but offer poor performance in extreme weather events and are potentially dangerous to people.



C POINT DRAINS

Point drains are pits in the pavement with grating on the top to avoid injury and/or damage to public property. Point drains are connected to an underground sewer system. Point drains evacuate water from paved surfaces, but are difficult to install correctly on graded, impervious surfaces.

D DO NOTHING

In extreme weather events, the lack of surface drainage creates flooding and property damage, as the impervious nature of pavement prevents infiltration back into groundwater.

Benefits of an ACO Aquaduct System

Custom manufacturing

Aquaduct will design and manufacture surface drainage systems to virtually any width, depth, slope or shape. The built-in slope can be varied to account for an uneven finished grade, or other site-specific requirements. Custom catch basins are also available.

Customized materials

Aquaduct will manufacture the surface drainage or trench system from different materials, depending on the fluid being handled. Aquaduct's FRP material can be made from many different resins. Various grades of stainless steel and other metals are available to meet site requirements. Aquaduct will provide gratings made with appropriate materials for your application requirements.

Forming system

The unique Aquaduct FRP forming systems can be placed to build trenches out of surround with minimal resources. The formers and accessories are removable and reusable, allowing for extensively long trenches to be formed quickly, accurately, and economically.

Double containment

Aquaduct will design and manufacture custom double-contained surface drainage systems for areas with high sensitivity to ground contamination. Environmental problems can create substantial cost implications for any industry. Double containment provides an extra measure of security to avoid these issues.

Custom Manufacturing

Custom-manufactured surface water drainage is required when an "off-the-shelf" product is not deemed capable of performing the required job. There can be a variety of reasons why this is the case; the most common are the the following constraints:

- Capacity
- Layout
- Profiles
- Materials
- Installation

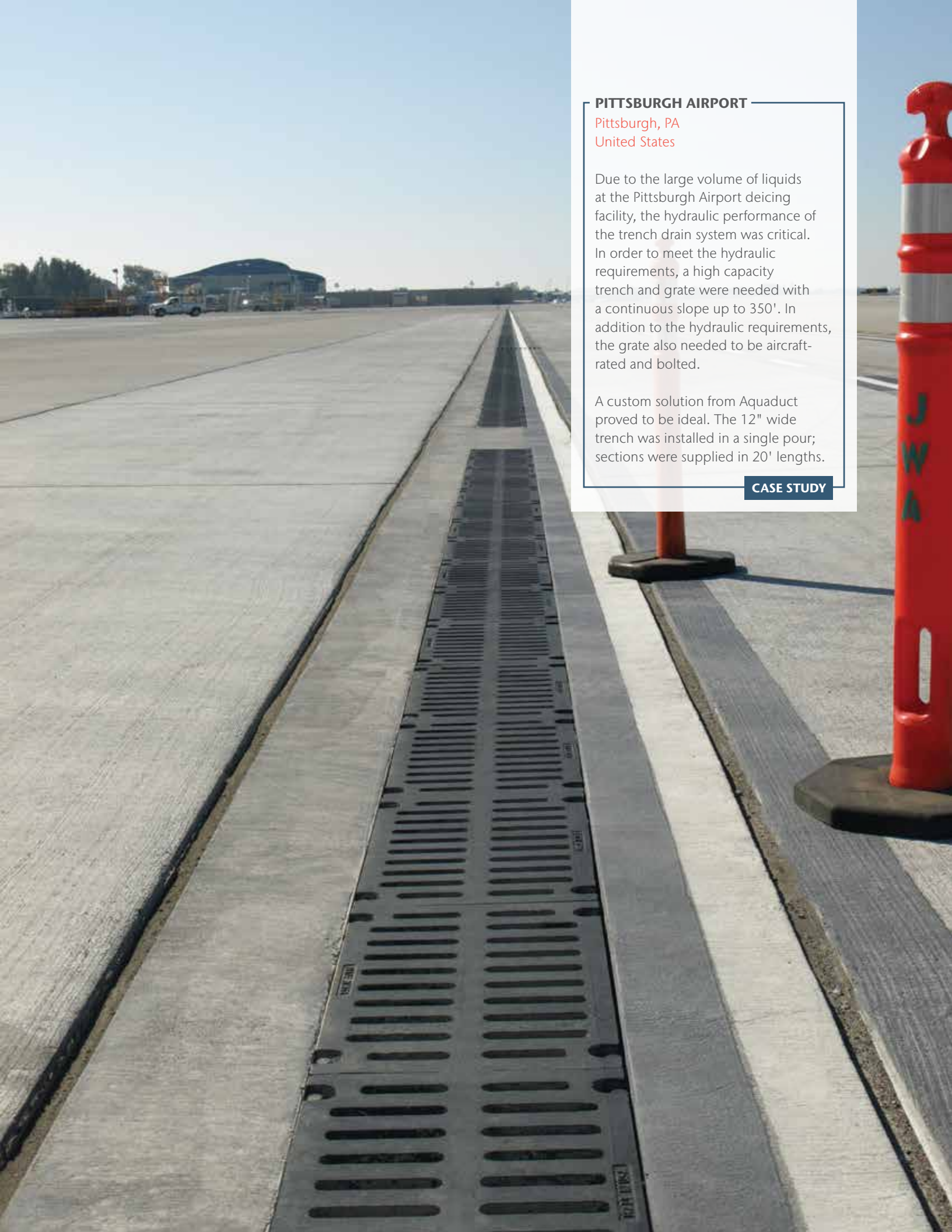
HYDRAULIC CAPACITY

Aquaduct can vary many dimensional factors to meet the required hydraulic performance of a project that exceeds the capacity of standard products.

1. Slope - the % of built-in slope to the trench unit can be altered to create a short and steep run, or a long run with a small grade. Slope can also be altered along the run, or continued as long as required.
2. Width of channel - wider channels usually offer greater hydraulic capacity, but wide grates can add significantly to project costs - particularly if heavy loads are involved.
3. Depth of channel - deeper channels allow more liquid to flow before flooding and use narrower, industry standard grates. They are a more economical solution in most instances.

DESIGN LAYOUT

Aquaduct products are usually shipped assembled with angles and junctions manufactured in the factory. This saves time assembling and producing complex fabrications on-site.



PITTSBURGH AIRPORT

Pittsburgh, PA
United States

Due to the large volume of liquids at the Pittsburgh Airport deicing facility, the hydraulic performance of the trench drain system was critical. In order to meet the hydraulic requirements, a high capacity trench and grate were needed with a continuous slope up to 350'. In addition to the hydraulic requirements, the grate also needed to be aircraft-rated and bolted.

A custom solution from Aquaduct proved to be ideal. The 12" wide trench was installed in a single pour; sections were supplied in 20' lengths.

CASE STUDY

CUSTOM PROFILES

Complex drain layouts may be necessary to fit around equipment, accept unusual inlet or outlet pipes, and deal with changes in floor elevation. In almost all circumstances, ACO can custom-design a system to meet specific needs.

INSTALLATION RESTRICTIONS

Some Aquaduct projects involve retrofitting trench drains into existing facilities, necessitating downtime.

A custom trench system reduces this downtime significantly. ACO can manufacture units up to 20' long, thereby reducing the number of pieces to be installed and joints to be sealed. This considerably reduces downtime and costs.

Aquaduct's forming system is manufactured from FRP and can be supplied to site-specific requirements.

NATURAL GAS-FIRED POWER PLANT

Carlsbad, CA
United States

Utility trenches are quite common in many commercial and industrial applications, and Aquaduct can offer solutions in numerous sizes and shapes. The photos shown here depict a utility trench furnished for an ammonia line in a California natural gas-fired power plant. Aquaduct saved the contractor countless hours of labor by integrating Unistrut into the FRP channel walls as they were being manufactured, as opposed to having to secondarily attach them.

CASE STUDY

BUSH BROTHERS & COMPANY
Dandridge, TN
United States

The Bush Brothers & Company plant required chemically resistant trench drains. Hygiene regulations imposed on food processing plants required floors to be washed down regularly, and the washing agents needed to be drained. To meet these requirements, Aquaduct custom-manufactured over 2,000' of 8" wide trench drains with a chemically resistant vinyl ester body and stainless steel frames.

With much of the project needing strong grates to support forklift traffic, custom stainless steel bar grates were supplied while medium duty grates were used for areas of pedestrian traffic.

CASE STUDY

Customized Materials

Chemical Resistant

FRP is produced from glass fibers bonded together using resins and hardeners. The most commonly varied component is resin. In special situations, carbon fibers may be used in lieu of glass for the surface and reinforcing layers. This build also dissipates static electricity, which is especially useful when dealing with potentially explosive environments.

When specifying a trench for a chemically aggressive environment, it is important to consider the following:

- Type(s) & mixture of chemical(s)
- Concentration percentages
- Contact time with system
- Temperatures of chemicals within the system
- Chemical resistances of grates, locking devices, frame
- Sealant compatibility

Test coupons are available upon request.

Fire Retardant

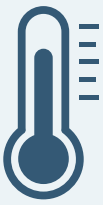
Aquaduct can include a special additive into the resin during the manufacture of the FRP trench that will give the product an 'NFPA Class 1 Flame Retardant' rating.

This is of particular importance around aircraft fueling ramps, petrochemical plants and anywhere else large volumes of flammable liquids may be present.

Abrasion Resistant

Certain industrial processes create wash down or slurry that has particles, such as glass or metal, suspended within it. Constant abrasion from such particles may, over time, wear through the trench drain body. Aquaduct can incorporate a special gelcoat onto the surface of the FRP that significantly increases abrasion resistance.

ACO Drain: FlowDrain FG200, Barcol Hardness = 30-40
Aquaduct gelcoat trench, Barcol Hardness = ~55



Temperature Resistant

Aquaduct offers a number of resins that provide much higher temperature resistances than those typically used for trench drain applications. Temperature issues include:

- Hot/cold ambient temperature of the installation
- Temperature of liquids discharged into trench drain
- Duration of discharge

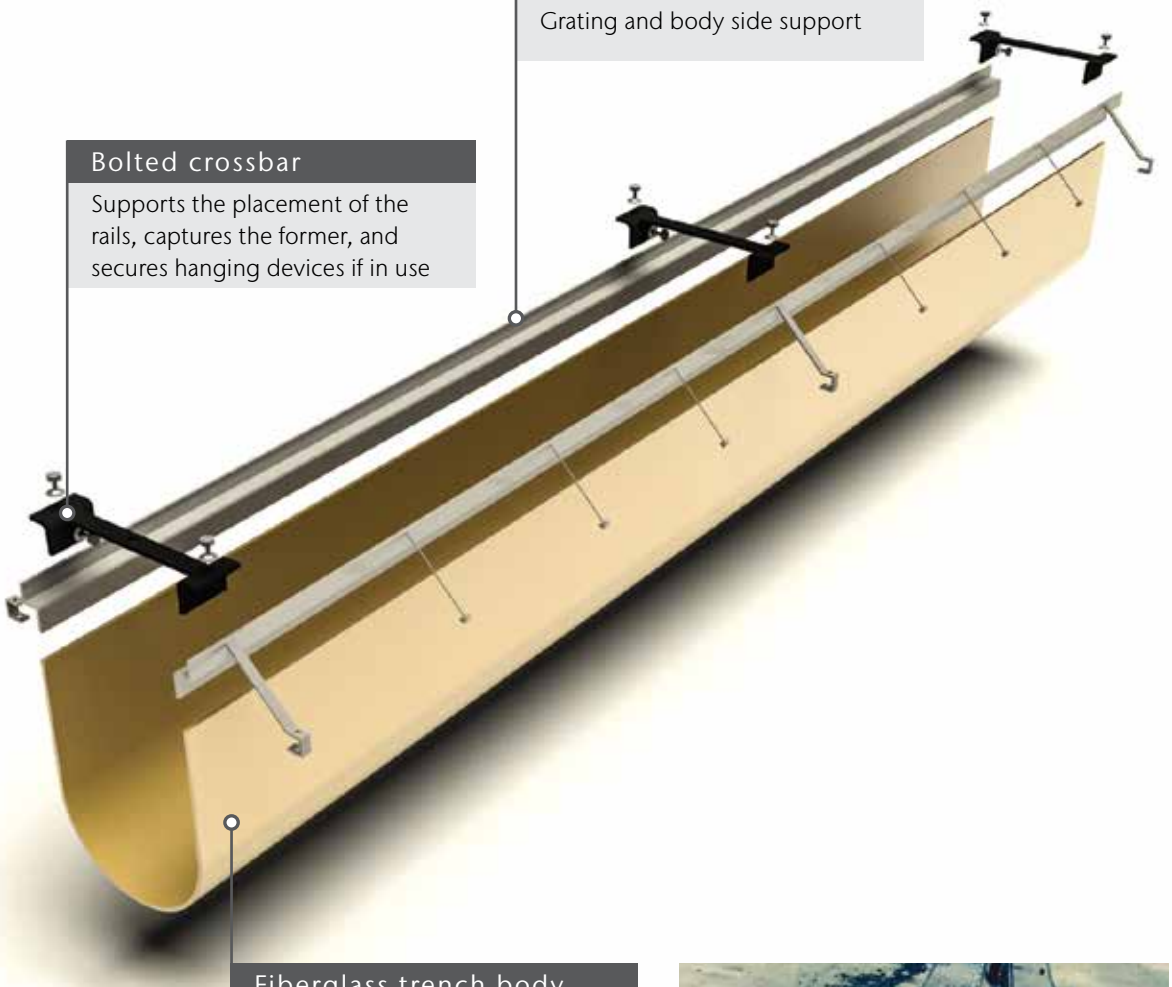
Forming System

Grate frame rail

Grating and body side support

Bolted crossbar

Supports the placement of the rails, captures the former, and secures hanging devices if in use



Fiberglass trench body

Forms the main shape of the trench

FORMING SYSTEM FEATURES

NFPA 415 Standard on Airport Terminal Buildings, Fueling Ramp Drainage and Loading Walkways states that a trench drain may be no longer than 125' before incorporating a minimum 6' fire break. This often creates a situation where a large number of identical 125' long trench drains are utilized.

Aquaduct FRP trench drain forming systems are removable and reusable fiberglass trench drain channels consisting of FRP forms (sloping or neutral), individual grate frame rails that are field assembled using removable and reusable crossbars and various accessories to accommodate things such as grate frame end plates. They allow for the creation of a completely formed trench drain made out of Portland cement concrete. Only the frame rails are left to support grating.

On-site assembly of the forming system is possible—and simple—as the system is comprised of only a small set of components:

- fiberglass trench body
- grate frame rails
- bolted crossbars

A forming system can be installed via any number of installation methods, including hanging devices, as shown here. Indivual frame rails and formers are connected by bolted crossbars, which aids in both horizontal and vertical alignment prior to a concrete pour.

Once the surround has hardened, the formers are removed and grates are set and bolted as necessary. After curing is complete, the trench drain is ready for traffic.

Depending on the grates installed, trench drains created with an ACO Aquaduct forming system can support load demands from even container terminals and airport ramps/aprons.

LAX INTERNATIONAL AIRPORT
Los Angeles, CA
United States

Los Angeles World Airports required bare concrete trench drains for several LAX projects. ACO engineers designed and prototyped a removable and reusable FRP forming system that met these site requirements.

The system consists of FRP forms (sloping or neutral), individual grate frame rails that are field assembled using removable and reusable crossbars and various accessories to accommodate things such as grate frame end plates.

CASE STUDY

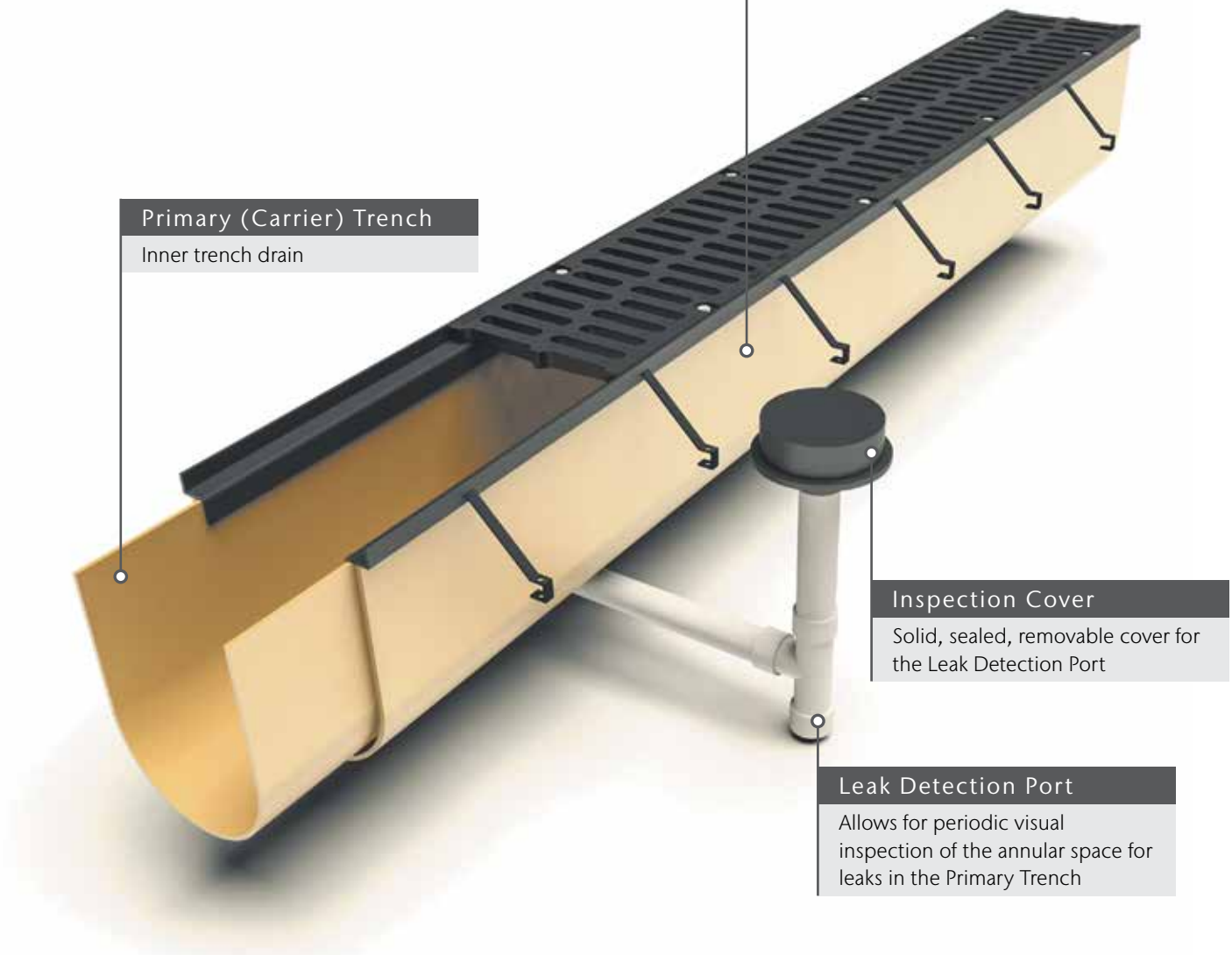
Double Containment

Secondary (Containment) Trench

Fits around the Primary Trench to contain liquids in case the Primary Trench fails

Primary (Carrier) Trench

Inner trench drain



Inspection Cover

Solid, sealed, removable cover for the Leak Detection Port

Leak Detection Port

Allows for periodic visual inspection of the annular space for leaks in the Primary Trench

SPILL PREVENTION

Government regulations, insurance providers, and industry developments (LEED) are demanding tighter pollution control for groundwater quality. When environmental concerns and/or hazardous chemicals are involved, a fail-safe, double containment drainage system may be necessary.

While there are several double-contained pipe systems and small catch basins available, these do not offer the collection and catchment performance benefits of an ACO Aquaduct double containment trench drain.

Aquaduct's double containment trench system consists of two FRP trench drains assembled with one inside the other, leaving an annular space between in which any leakage will collect.

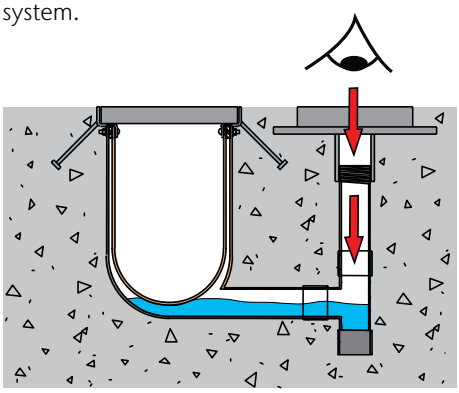
Double containment trenches are manufactured in sections up to 20', as joints are easier to seal in the factory. However, field joints are almost always required. Aquaduct's field service technician will be available on-site to seal these joints.

The entire trench system is water-tested prior to concrete being poured to ensure joints for both primary and secondary trenches are sound.

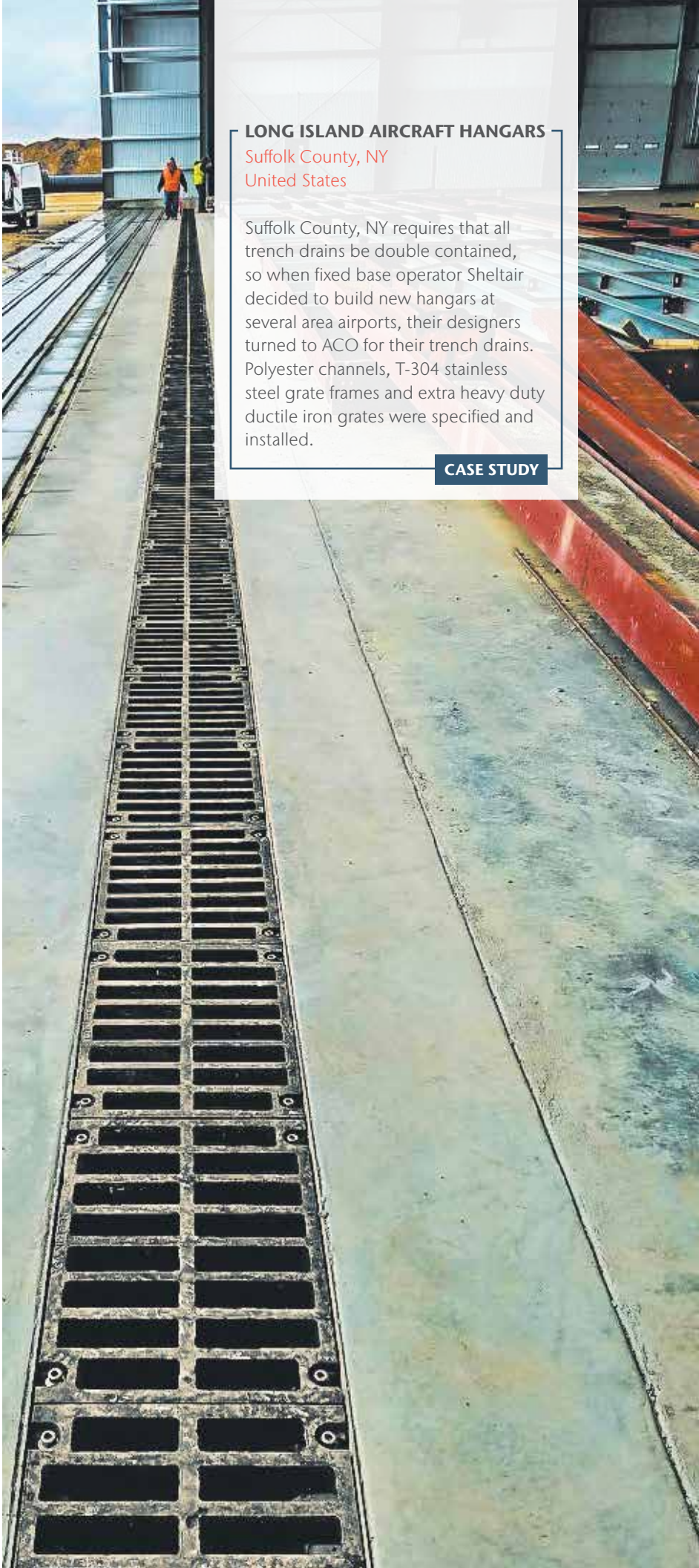
Should the primary trench of a double containment system leak, a full repair is usually possible since the entire trench is accessible from ground level.

LEAK DETECTION

Leak detection ports - allows visual detection, positioned at various low points around the system.



Removal of inspection covers provides visability into the secondary trench to check for any leaks.



LONG ISLAND AIRCRAFT HANGARS

Suffolk County, NY
United States

Suffolk County, NY requires that all trench drains be double contained, so when fixed base operator Sheltair decided to build new hangars at several area airports, their designers turned to ACO for their trench drains. Polyester channels, T-304 stainless steel grate frames and extra heavy duty ductile iron grates were specified and installed.

CASE STUDY

Technical Services and Product Support

The Aquaduct Service

The Aquaduct division has been designing and manufacturing custom trench drain systems since 1989. Aquaduct provides a total solution from design to product and from manufacturing process through installation.

With any custom-designed product, the optimum result comes from both parties understanding the needs and limitations of each other.

Aquaduct has in-house engineers who work with clients within all phases of the construction process to provide a product that meets project requirements.


DHL

The Four Phases of the Aquaduct Service

1 DESIGN PHASE

Aquaduct's engineers can work with you to design a custom trench drain system that meets your exact requirements while advising away from potential design issues. Aquaduct can also offer a number of options that may give significant cost and/or time savings.

Our in-house engineers have extensive experience in the design and manufacturing of custom trench drains. They can advise on the various materials available and commonly-faced installation issues.

2 MANUFACTURING PHASE

The production of FRP can be achieved through a number of techniques: filament winding, hand lay-up, spray-up, pultrusion or closed molding. The technology used depends upon the size and type of product to be produced along with the anticipated usage.

3 INSTALLATION PHASE

No product will meet expectations if installed incorrectly.

When practical, Aquaduct delivers products assembled to minimize the number of individual pieces on-site, reducing installation time and complexity. All projects are delivered with parts clearly identified and marked as identified on a layout print.

Pre-delivery product advice is available to ensure that the correct excavation and other details are carried out, which speeds installation once products arrive.

For projects that are complex or unusual in nature, Aquaduct employs a field service technician who is available to go to site to help ensure a good installation.

This on-site service provides hands-on guidance and training to ensure the contractor is capable of:

Correct assembly, layout, bracing and alignment of product - this ensures trench system is correctly positioned and setup prior to pouring concrete.
Concrete placement - this ensures that concrete is poured in a manner that does not disturb the setup and alignment.
On-site fabrications - should on-site fabrications or changes be required, training can be provided to ensure these are done in the correct manner.

4 FOLLOW-UP PHASE

Aquaduct's involvement doesn't end once the product is installed. Support is available to answer future questions, and advise on maintenance issues. In the unlikely event that a problem arises, a certified field technician will visit the site to address any issues.

ACO's Service to You

Every project brings its own requirements and challenges. In addition to our products, we offer you our knowledge and services to jointly develop tailor-made solutions from planning to after-sales support.

Information and further education

At ACO, we share the expertise of the global ACO Group with architects, engineers, installers, and distributors who value quality. We invite you to benefit from it.

Planning and optimization

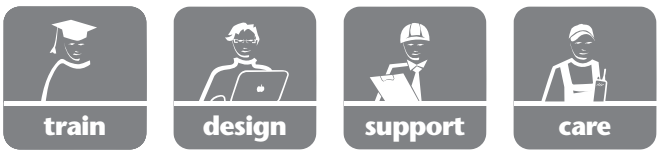
There are many drainage solutions to consider when planning a project. But which option leads to the most economically and technically safest solution? We help you to find the right answer.

Construction advice and presence

To prevent unpleasant surprises between planning and implementation stages, we advise and support you on a project-specific basis.

Inspection and maintenance

ACO products are designed and produced to last. With our after-sales support, we ensure that ACO will exceed your standards for years to come.



ACO Service Chain

With our extensive network of sales and support representation, ACO strives to ensure that the needs of your project are professionally and efficiently met.

Have a Question?

askACO

askACO

Together we will find the right drainage solution for you and your project.

www.acousa.com/askaco

ACO on the web

You will find further information for our products on the ACO USA website. This allows you to access technical data, images, specifications, and installation instructions during planning.

www.acousa.com
www.aquaduct.us

Personalized training from ACO

ACO provides a forum for excellent construction. The courses provided by ACO Academy convey in-depth practical knowledge about the construction industry. Many ACO courses qualify users for professional learning credits as required by CES.

Information regarding courses

www.acousa.com/service

ACO products supports the ACO System Chain

Surface Water Management

- ACO Drain - Commercial Trench Drains
- ACO Infrastructure - Heavy Duty Drainage
- ACO Sport - Track & Field Drainage
- ACO StormBrixx® - Geocellular Tanks
- ACO Aquaduct - Custom Drainage
- ACO Environment - Solid & Oil Separators
- ACO Wildlife - Guidance & Passage
- ACO Self - Garden & Landscape Drainage
- ACO UtilityDuct - Ducting System

Building Drainage

- ACO Stainless - Stainless Trench Drains
- ACO BoxDrain - Stainless Hygienic Drains
- ACO FloorDrain - Stainless Point Drains
- ACO Pipe - Stainless Push-fit Piping
- ACO ShowerDrain - Bathroom Drainage

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