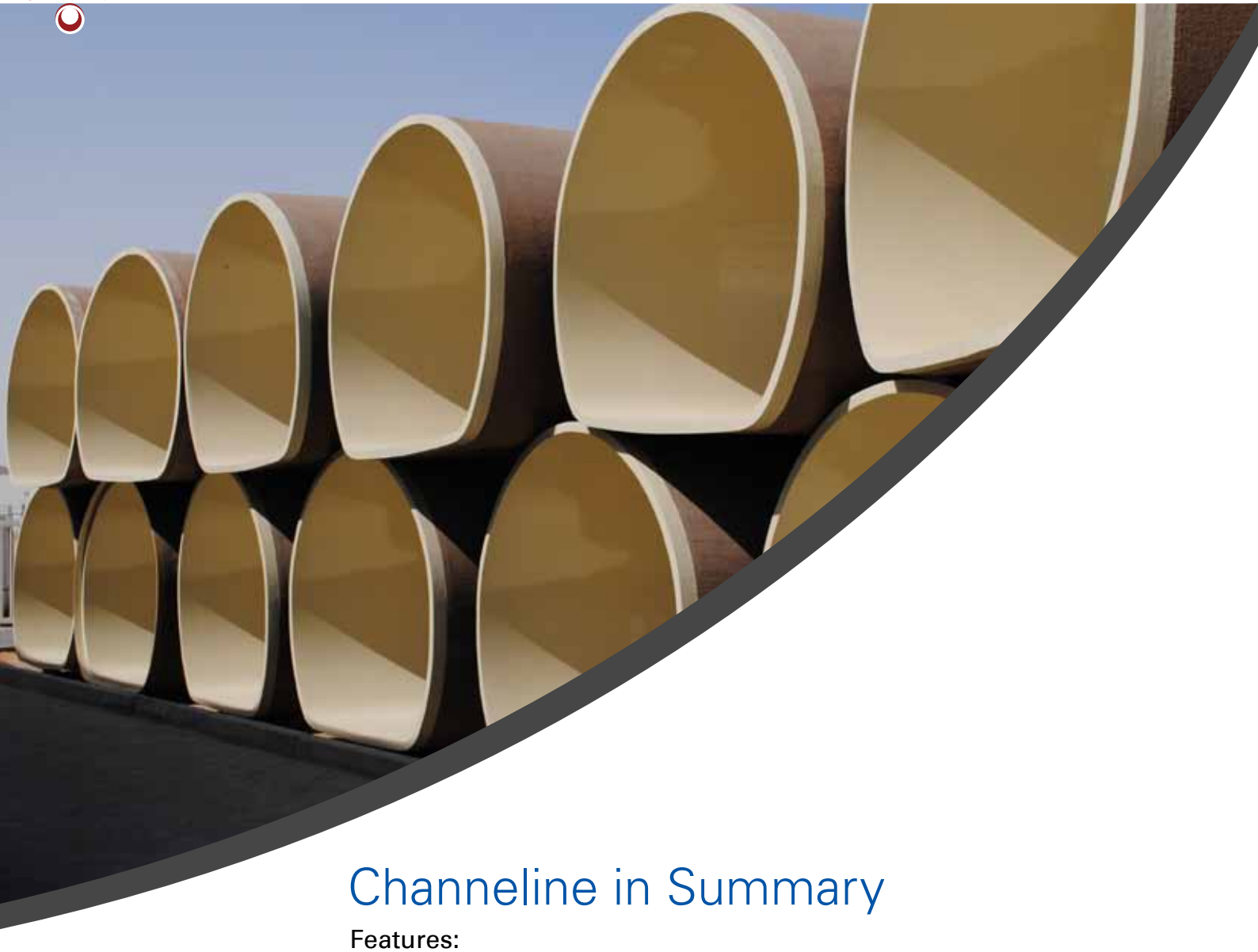
CHANNELINE
GRP Structural Lining Systems

Over 3 decades of accumulated experience

CHANNELINE
Beyond the Ordinary



Channeline in Summary

Features:

- Custom-Made Production in any Shape or Size Required
- Fully Structural Rehabilitation Solution
- Maximizing Hydraulic Capacity
- Excellent Corrosion Resistance
- Excellent Impact and Abrasion Resistance
- Expected Service Life of Over 50 Years

Applications:

- Sewer Main Pipelines
- Sewer Overflow Pipelines
- Sewer Interceptor Pipelines
- Sewer Inverts
- Storm Water Drains
- Seawater Cooling Pipelines
- Large Diameter Culverts and Tunnels
- Railway & Road Culverts

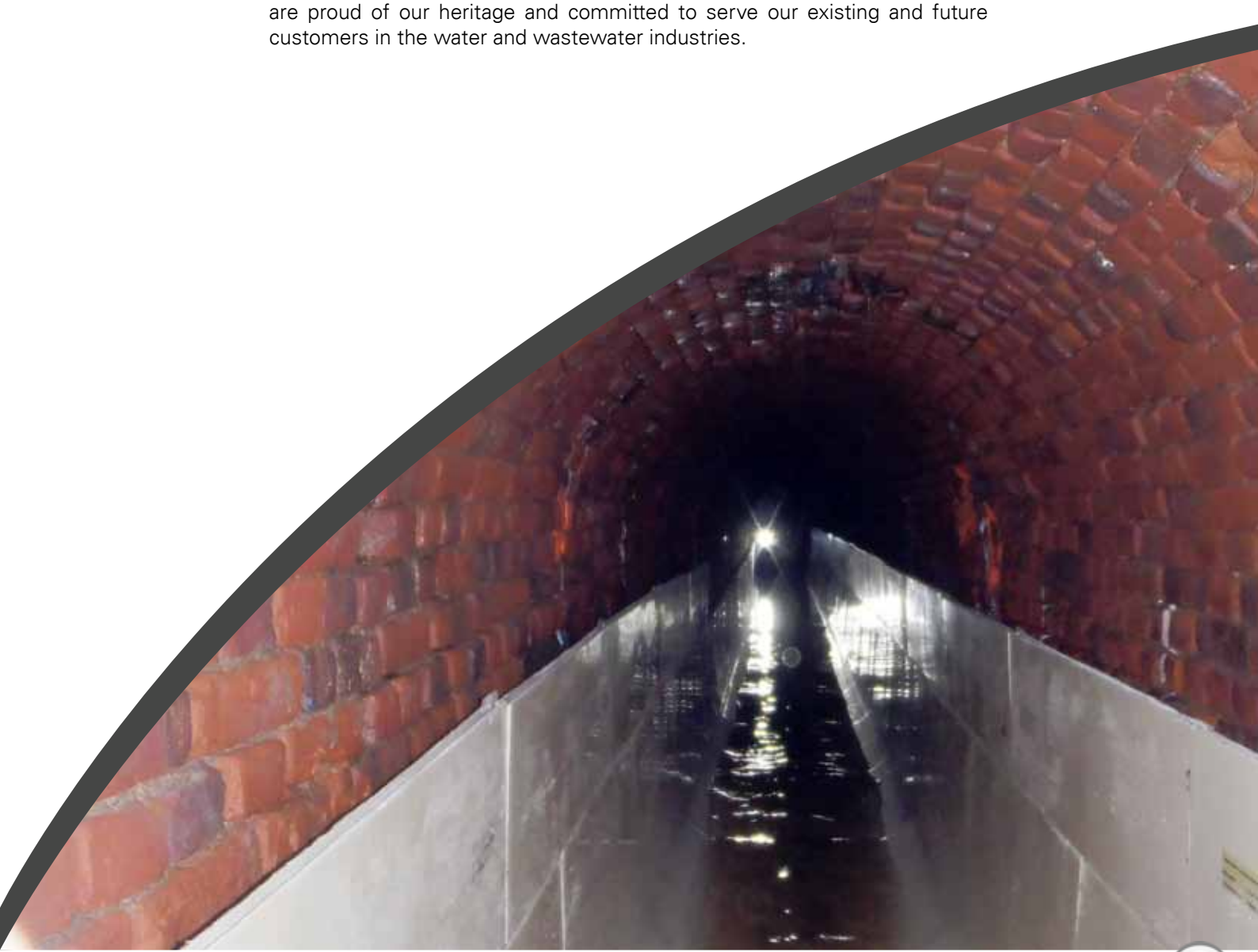
Over 3 decades of accumulated experience

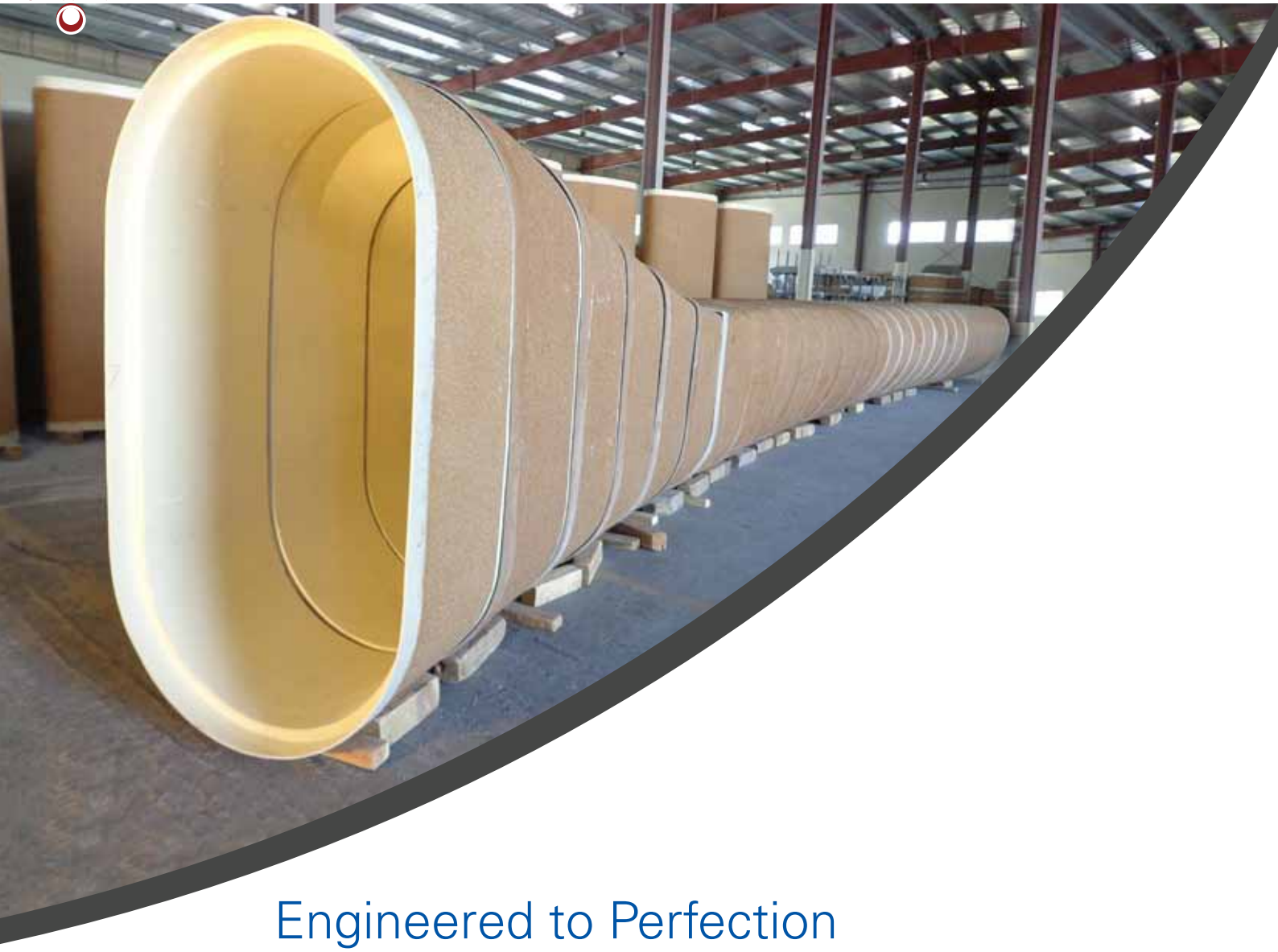
Large diameter pipelines and culverts represent the backbone of any city's utility network for the collection and disposal of sewerage and effective drainage of stormwater.

In many cases the fabric of these pipelines, which may consist of brick, stone, concrete or clayware will have been constructed decades ago and although proven resilient, has eventually succumbed to the ravages of time, suffering the effects of H2S attack or erosion and may even be exhibiting signs of imminent failure due to structural loading beyond that of it's remaining capability.

At this point the need arises to consider the means by which the structural rehabilitation of these pipelines and ducts can be achieved whereby a new, 50-year plus life expectancy can be provided with a high degree of confidence.

Channeline has been involved in the provision of specialist GRP structural lining elements for over 3 decades, during which time we have accumulated an unrivalled degree of experience relative to the rehabilitation of both circular and non-circular large diameter buried pipeline structures worldwide. We are proud of our heritage and committed to serve our existing and future customers in the water and wastewater industries.





Engineered to Perfection

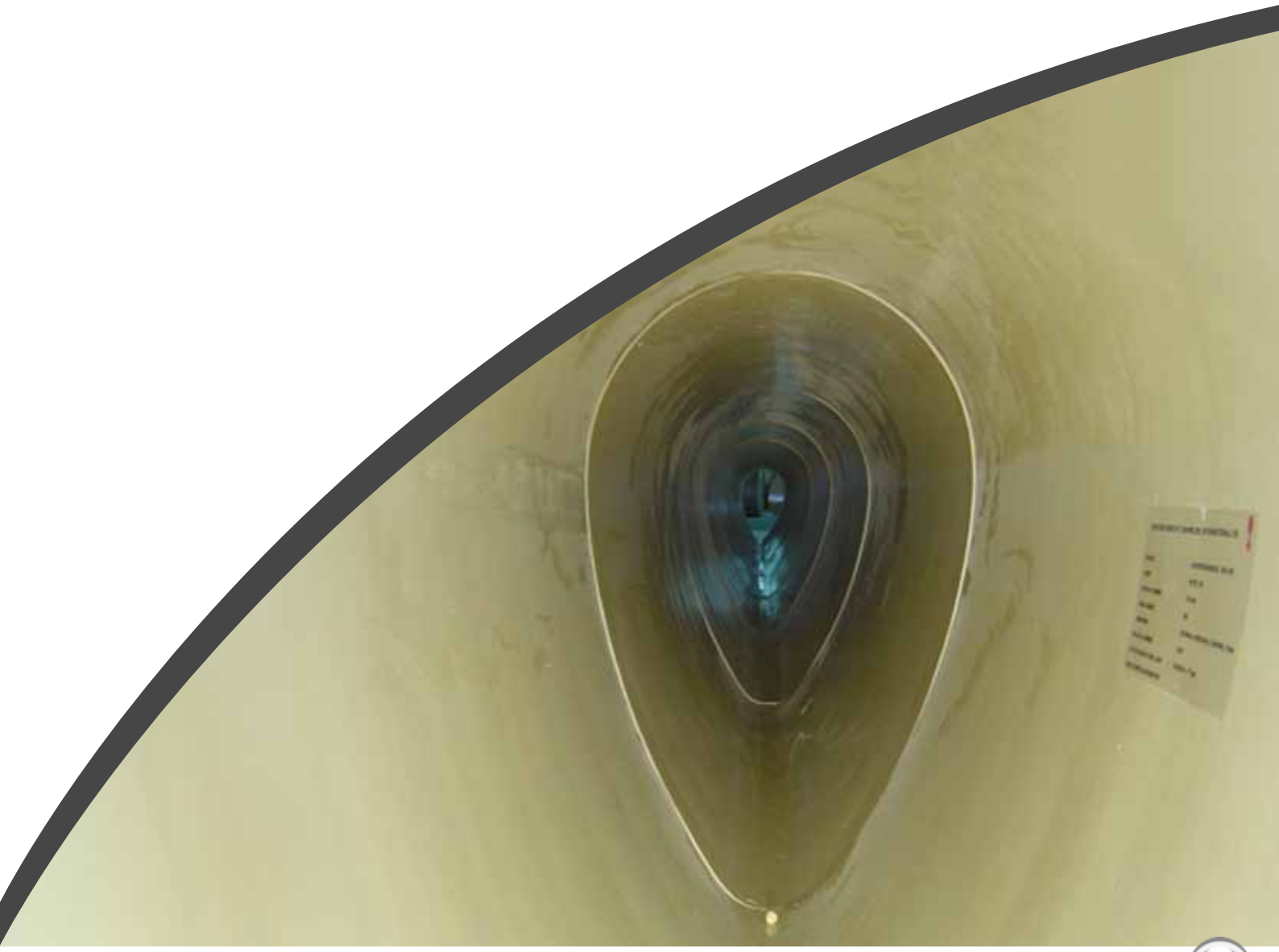
The general concept of the Channeline product is that a remarkably stiff and strong panel section is constructed, but with a relatively thin wall. The product differs from that of standard GRP hand or filament wound pipework in several fundamental and important ways. Normal GRP pipework consists of windings of layers of resin-saturated glass, which is impregnated with sand, achieving its stiffness by building up ever increasing wall thickness. Channeline however, derives its strength and stiffness through a different method, employing the mechanics of sandwich panel design, incorporating a unique polymer and aggregate core.

The first stage of Channeline manufacture is an inner sandwich structure incorporating a 1.5 mm (0.06 inch) corrosion barrier on the inside surface which is manufactured from high grade surface veil, precisely impregnated with Isophthalic or Vinyl Ester resin, followed by several layers of thoroughly impregnated multi-axial engineered fabric and CSM, forming the inner sandwich skin.

The central core comprising of carefully metered amounts of silica and resin which is prebatched, mixed and evenly applied to the exact thickness required.

The outer sandwich skin is then formed using several further layers of multi-axial fabric, CSM and resin, with the outer surface being treated with a bonded graded aggregate to enhance adhesion to the annular grout, which is used during the installation phase.

The sandwich construction process is continuous, and carefully monitored and controlled ensuring exceptional bonding of all layers throughout the process.



Made To Measure

The sheer ingenuity of the designers and constructors of large buried structures of by-gone days never ceases to amaze us and requires a high degree of flexibility for our manufacturing unit.

The Channeline segments for each rehabilitation project are custom made to provide a precise fit to the size and shape required. There really is no theoretical limit to the shape and size of Channeline panel that can be effectively manufactured. Because Channeline technology includes the evolution of multi-piece segmental construction, where necessary for transportation, even very large, peculiar shaped rehabilitation projects can be accommodated using Channeline product.

Channeline can be produced in any size and shape, and specializes in egg, box and elliptical shapes, maximizing the rehabilitated cross-sectional area, thereby optimizing the flow capacity.

The following shapes and forms can be produced by our factory in Dubai in any size required:

- Circular
- Ovoid
- Egg Shaped
- Elliptical
- Flattened Elliptical
- Arch Barrel
- Box Shaped
- Flattened Box Shaped

Product Characteristics

Channeline Structural GRP Lining Panels are manufactured to fully comply with the WRc materials standards for GRP (Guidance note WIS 4-34- 02) and are also manufactured in accordance with BS 5480 and ASTM D3262.

Mechanical Properties

At the outset of each project a detailed design analysis is undertaken, taking into account all necessary criteria such as depth of pipe, condition of existing pipe, ground loading, the likely effect of external water etc. to determine the exact requirements for the liner design. Design work is generally undertaken in compliance with the requirements of the latest edition of the WRc manual (other standards may be used) which then establishes the liner thickness.

Channeline Mechanical Properties

Material	Flexural Modulus in MPa		Bending Stress in MPa		Tensile Strength inMPa	
	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term
Channeline	10000	4000	110	60	98	45

Corrosion Resistance

The deterioration of a sewer or culvert is often accelerated by corrosive gasses and the oxidization of Hydrogen Sulfide into Sulfuric Acid.

Soft mortar is not always easily identified by CCTV surveys. For Man Entry sewers manual inspection is recommended. Most structural failures in sewers are caused by insufficient tensile capacity. Corrosion will contribute to this reduction in strength.

The resins used by Channeline are highly resistant to sewer gases and most trade effluent. A detailed corrosion resistance guide is available from your Channeline Representative or can be downloaded from our website.

Barcol Hardness and Abrasion Resistance

The high quality gel coat resins and surface veils used in the manufacture of Channeline panels provide an exceptional degree of resistance to impact and abrasion.

Wet abrasion testing comparisons with other liner methods show impressive and superior results. The Barcol hardness of cured Channeline material is Shore D 30.

Hydraulic Capacity

The hydraulic capacity of a sewer or culvert is dependent on the cross sectional area of the unit and the surface roughness of the sewer or culvert wall. Collapsed and protruding sections of the host pipe wall can greatly reduce the cross sectional area and increase the friction coefficient of the unit, thus dramatically reducing its hydraulic capacity.

A feature common to nearly all sewer and culvert renovation processes is that the internal surface roughness of the existing sewer or culvert is reduced, i.e. improved from a hydraulic point of view. Thus, although there is frequently a loss of cross sectional area associated with the renovation work, this is generally counteracted by the improved flow-carrying characteristics of the upgraded sewer.

Channeline will always provide an improvement to the flow capacity of a lined large diameter pipeline or culvert. Generally, this is in the range of 12% to 25% even though the cross sectional area of the structure has been reduced slightly.

Experience has shown the extremely smooth nature of the Channeline GRP material mitigates the flow/pipe wall friction so that under normal flow conditions pipelines and culverts once lined, are effectively self-cleaning.

Channeline Product Range

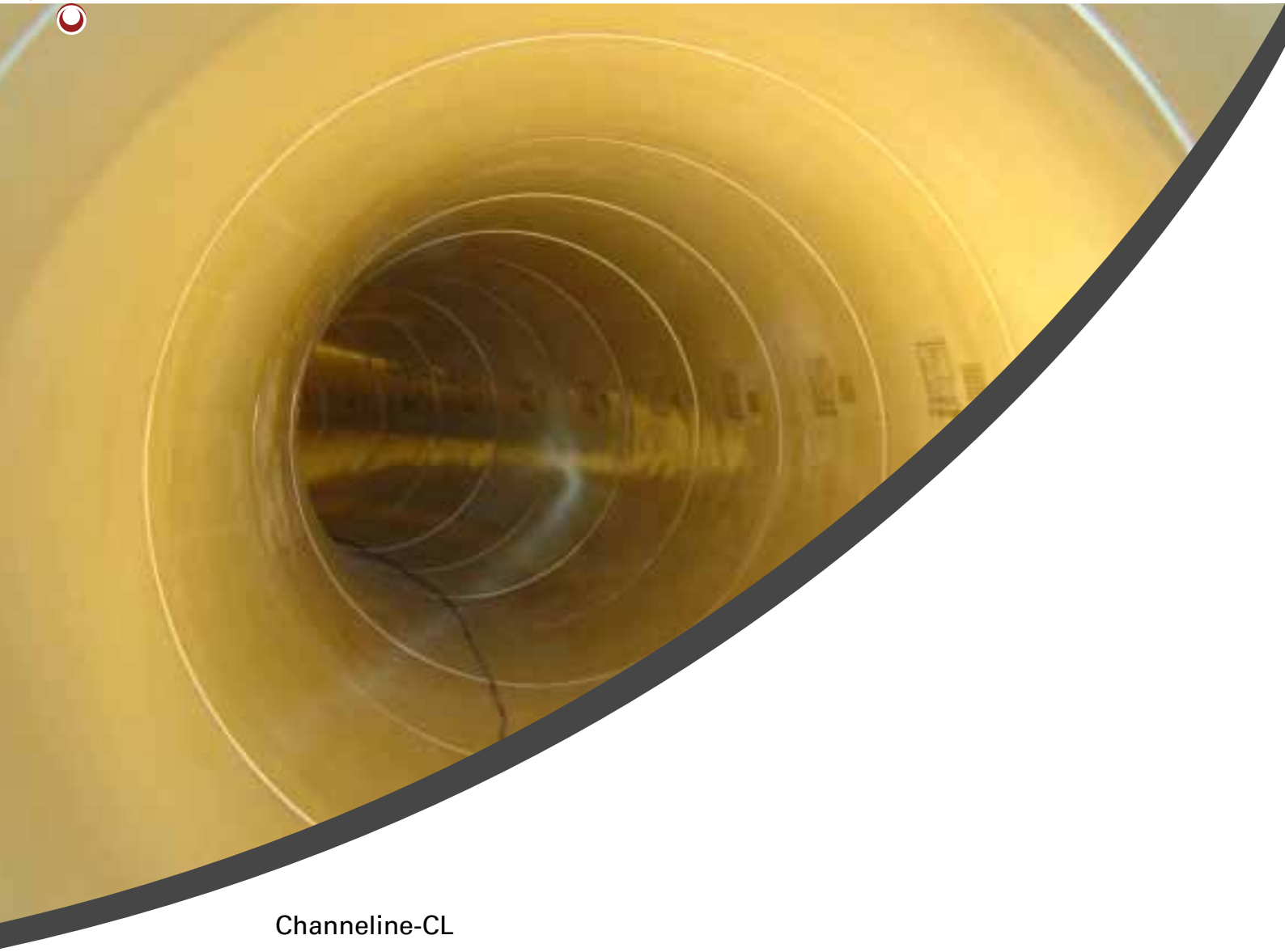
Channeline-Standard

Standard Channeline panels are manufactured with a socket and spigot joint, with adequate clearance and tolerance such that one panel connects easily into the next when positioned into the pipeline or sewer. For many projects, Channeline panels are manufactured in 2.4 meters (8.0 ft.) long solid sections.

Optional in-line jointing can be facilitated where it is necessary to provide a liner of maximum external diameter and minimum annular gap, thus eliminating the 10mm (0.4 inch) allowance required for the socket overlap.

Channeline Multi Segmental

Often due to either transportation problems or difficulties associated with access to the pipeline (e.g. entry only permitted through manholes), or in the case of a particularly large structure, it is desirable for the panels to be manufactured in two or more longitudinal sections which are site bonded above or below ground using our patented structural tongue and groove jointing system, positioned at the points of intersecture, i.e. at the points of zero bending.



Channeline-CL

This unique made to measure moulded Curved Liner is complementing the Channeline range, which offers a unique solution for lining bends for any size or shape with an integrated gasket seal.

Most older sewers and pipelines exhibit unintended deviations or deliberate direction changes, often being of a short radius nature. The Channeline socket and spigot jointing method allows for the alignment of each sequential panel installation to accommodate small direction changes and offsets quickly and easily.

Where more severe direction changes and short radius bends are encountered in the pipeline Channeline can provide computer modelling and the fabrication of custom built short sectional or lobster type bend sections.

Channeline-SL

This Slip Liner version allows for slip-line installation (non-man-entry) in live sewer flow conditions, reducing installation costs both in time and elimination of over-pumping.

Our in line high strength joints are combined with a lubricated silicon filled rollover gasket, providing ease of connection and a high integrity pressure tight seal.

Easy to position, with our mounted centralizing skids, and easy to jack straight line lengths of 350 meters (1200 feet) and more can be accommodated in a single insertion process.

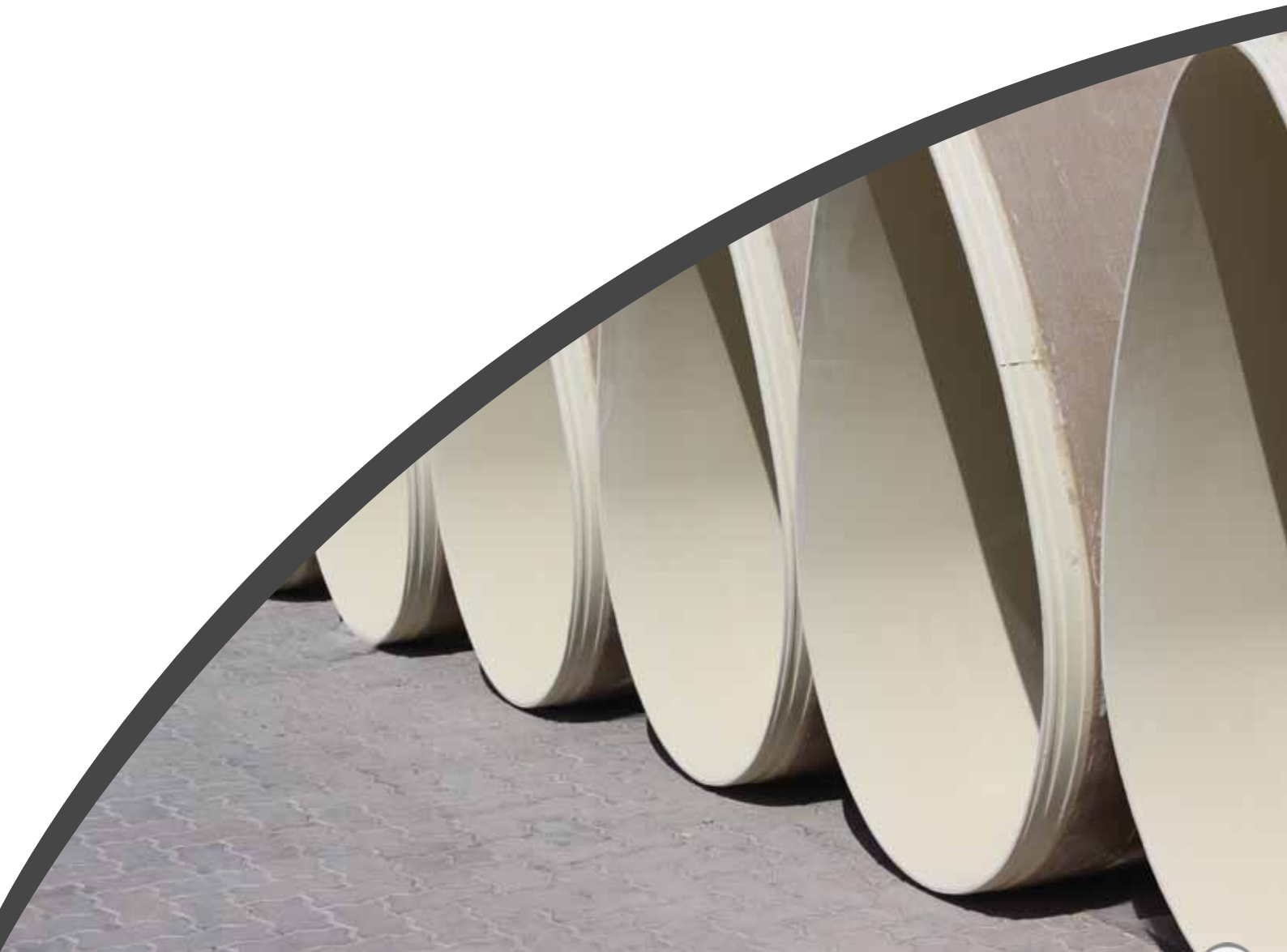
Channeline-SL-3

The Channeline SL-3 system combines the advantages of Channeline SL, allowing for non-man-entry and live flow installation, with the benefits of multi segmental delivery, allowing for reduction in transportation costs and accommodating for construction constraints.

Channeline Lateral Connections and Fittings

Many sewers and pipelines are constructed with incoming lateral connections throughout the length of the structure.

The rehabilitation of these lateral connections is easy and straightforward with the Channeline liner product. Laterals can be connected with mesh and mortar or where necessary, for severely degraded lateral connections repair mortars and GRP inserts can be prefabricated, installed and subsequently bonded to the main sewer liner to provide a smooth, durable solution.



Quality Control and Testing

Channeline International is certified and operates in compliance with ISO 9001:2008/BS EN, ISO 14001:2004 and OHSAS 18001:2007.

Rigid in house quality control during manufacture is ingrained in our philosophy, which, together with strict inspection and testing regimes and the ability to coordinate with third party inspectors and external test houses, ensures we deliver on our quality pledge.

Daily and batch testing of each material production run is carried out by our QC department to verify conformity with the following project requirements:

- Dimensional checks of wall thickness/ID/OD/Height/Width
- Bending and flexural modulus
- Tensile tests
- Socket and Spigot fit
- Barcol hardness
- Visual appearance

Certificates of Conformity are issued to each customer together with the test result handbook for each delivery shipped.

Installation Made Easy

The pipeline or duct to be rehabilitated will first have been de-silted, cleaned and surveyed and the information gathered from which the design dimensions of the liners will have been determined.

Once manufactured, the liner material elements will be trucked to the job site, offloaded and stored in a convenient location close to the job site.

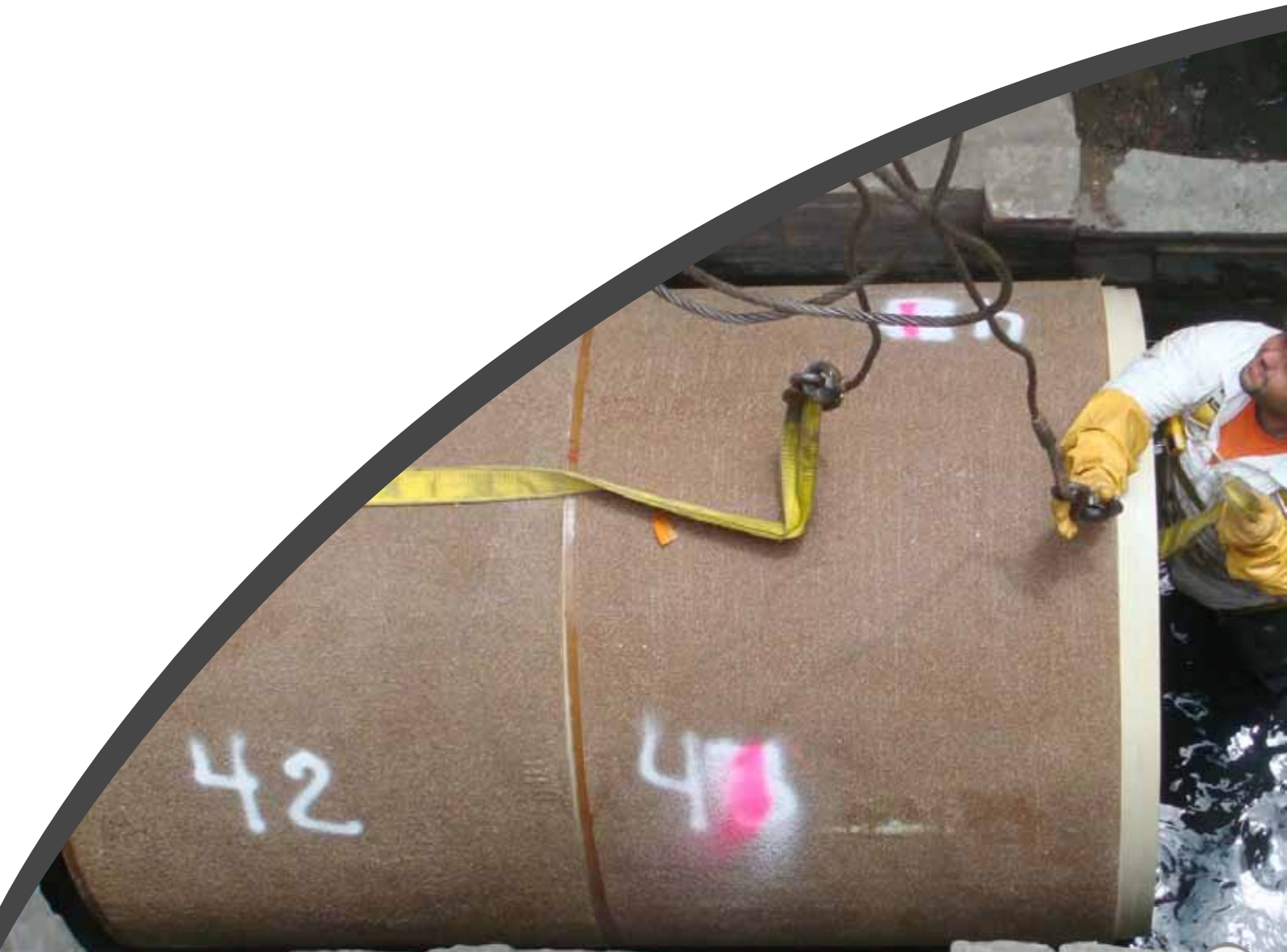
Access pits are prepared at suitable locations along the length of the pipeline to allow insertion of the Channeline sections. The Channeline segments are lowered into the pipeline and a special hydraulic trolley unit is then used to transport each liner segment along the length of the host pipe to the required location.

Each liner segments connects easily to the previously installed one by means of the socket and spigot joint. Once butted together, the joints are injected with a flexible mastic epoxy adhesive/filler.

After installation of the liner segments the annular gap between the host pipe and the Channeline segments is subsequently filled with a low viscosity, free flowing, rapid setting, and high-strength grout.

The same installation procedure applies to the Channeline SL with the exception that the Channeline SL sections are either jacked or winched in from the entry pit. The segments are connected through a gasket sealed bell and spigot joint. The Channeline CL can either be installed using the same procedure as the Channeline SL, or be manually installed.

Channeline pipeline rehabilitation liners are installed world-wide by a network of trained and approved specialist contractors, experienced and trained in confined entry.



Proven Track-Record

The Channeline GRP Structural Lining Systems have a proven track record for large diameter pipeline rehabilitation around the globe. Channeline products have been installed in projects in more than 30 countries worldwide.

For a detailed project experience list, please contact our Channeline Representative Office, or visit our website: www.channeline-international.com

Worldwide Distribution Network

Channeline International is using licensed distributors to make our Channeline systems available throughout the world.

Channeline International brings unrivalled levels of innovation, experience and expertise in GRP Lining Systems technology. We have in-depth knowledge of the industry, our customers' day-to-day challenges and the environmental, health and safety standards in the marketplace. By working in close partnership with our customers, our company is able to provide timely, efficient, cost-effective and above all quality products and services.

Channeline International
P.O. Box 8091 Dubai
United Arab Emirates
Tel: +971 48848383
Fax: +971 48848384
E-mail: timwebb@apsdubai.com

Website: www.channeline-international.com

Channeline International North America
Tel: +1 514 2424495
E-mail: andysherwin@channeline-international.com

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