JOHN BEECH - BUSINESS DEVELOPMENT MANAGER

iLine Technologies

Sewer and culvert rehabilitation specialists

- New Name but most experienced UV installation team in the UK
- Over 20 years installation experience with hundreds of successful installations
- In-house skills & Knowledge to identify the right solution for the client.
- Proven GRP UV cured CIPP lining system
- Full turnkey package or Install only options
- Comprehensive range of solution & services to cover all industries with an unbias approach
- New approach-iLine offers real “can do” attitude
- Delivery of projects on time,on budget,safely with minimal environmental impact.
- Open to New innovation to give an affordable, reliable & proven cost effective solution

The Group-Solutions we offer our clients

iLine Technologies

- GRP UV lining from 450mm up to 1800mm diameter 22mm thick, lengths up to 500m-UV resin only
- >22mm-combined UV/Thermal resin cure liners up to 30mm thick
- Patch lining up to 1200mm diameter
- GRP segmental lining- Any shape or Size up to 7m
- Concrete spray lining
- Pressure liners & Sliplining
- CCTV Survey & cleaning
- Fully Portable UV equipment

Llewylins Farm culvert

Wash Farm Bridge,Essex

Identified radial cracking & Brick loss

Collapsing Culverts

Picture 6

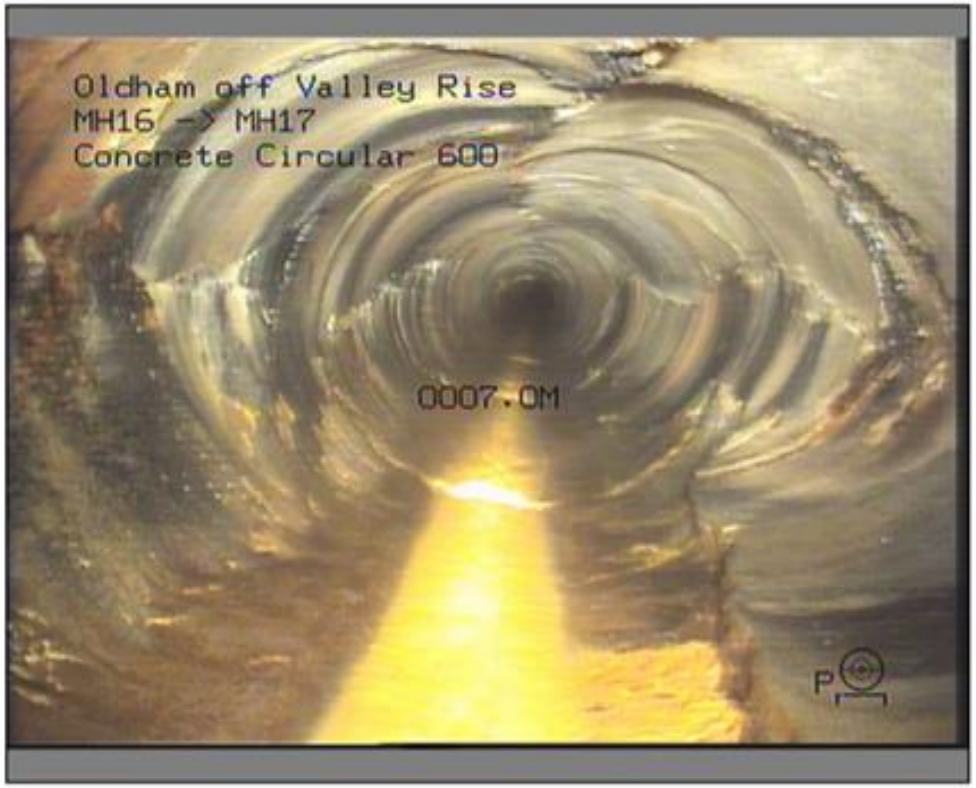


Photo: 165.JPG
7m, General photograph taken at this point

iLine Technologies

Additional services available

1. Full Design Service
2. Full site visits
3. Topographical surveys
4. Ecological surveys
5. Flow calculations
6. Land Drainage applications

iLine Technologies Client Base

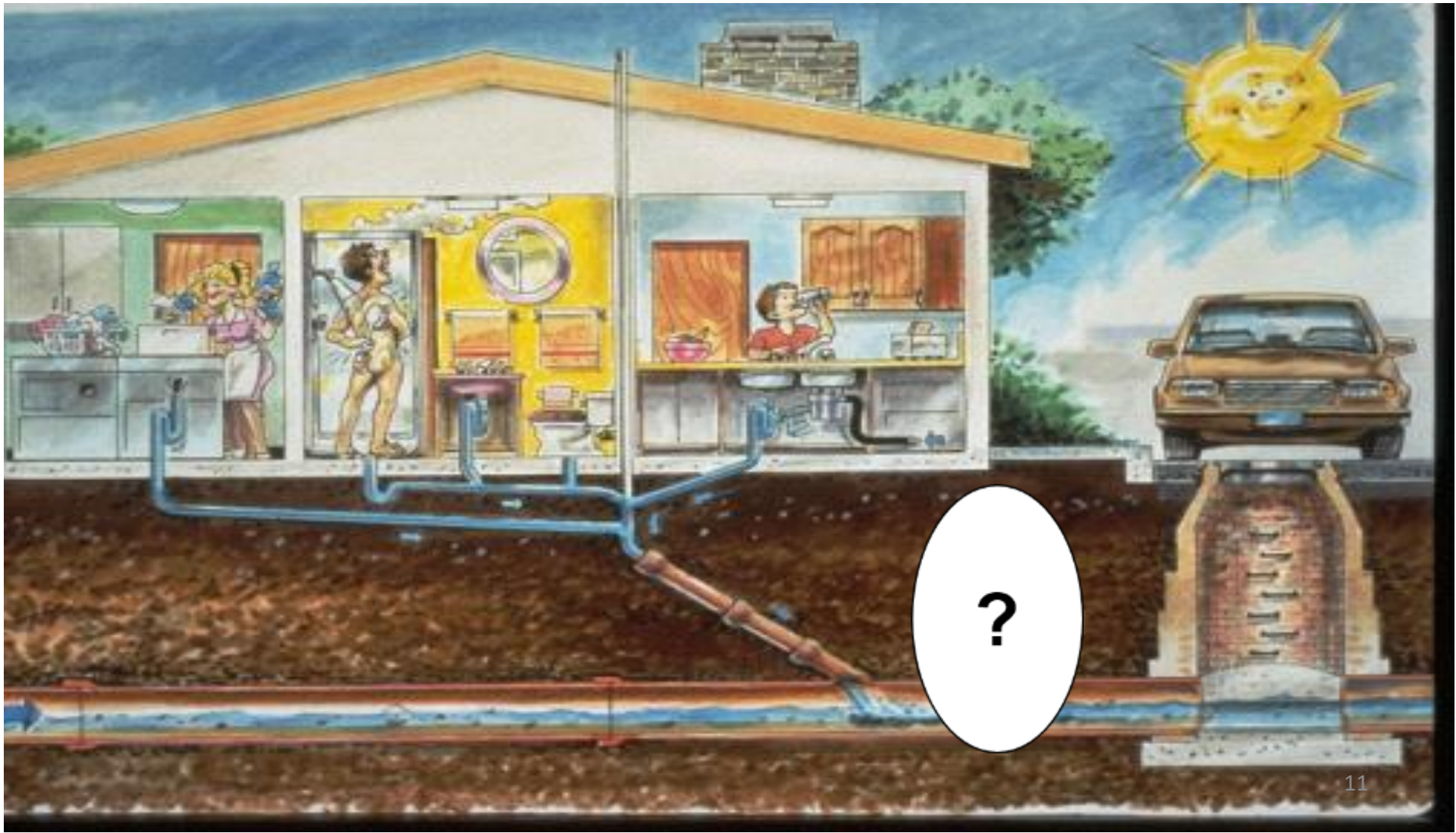
- Water companies
- Network Rail
- Environment Agency
- Highways
- Public bodies-councils etc
- Canals & Trust
- Petrochemical industries
- Private sector

Why Trenchless ?

- Cost savings of 10-15%
- Construction completed in days compared to weeks or months
- Minimal risk to other utilities
- Minimal road or rail closures
- Improved safety conditions-smaller site area than for open cut
- Less equipment on site reduced air and noise pollution
- Less disruption to public and the environment
- Carbon Emissions -80%+ less than open cut

Your Sewers & Culverts are “out of sight ,out of mind”

Before deciding what process to use, understand the problem



Gravity pipes

- Foul & Surface water Sewers
- Combined sewers
- Culverts-highway, Rail, rivers , canals etc
- Typical pipe & Culvert materials-

  Vitrified clay,Brick,Concrete,Thermoplastics

  Ultra –rib Galvanised steel,GRP section
- Typical shapes-
  Circular,Egg,Oval,Arch,Rectangular etc

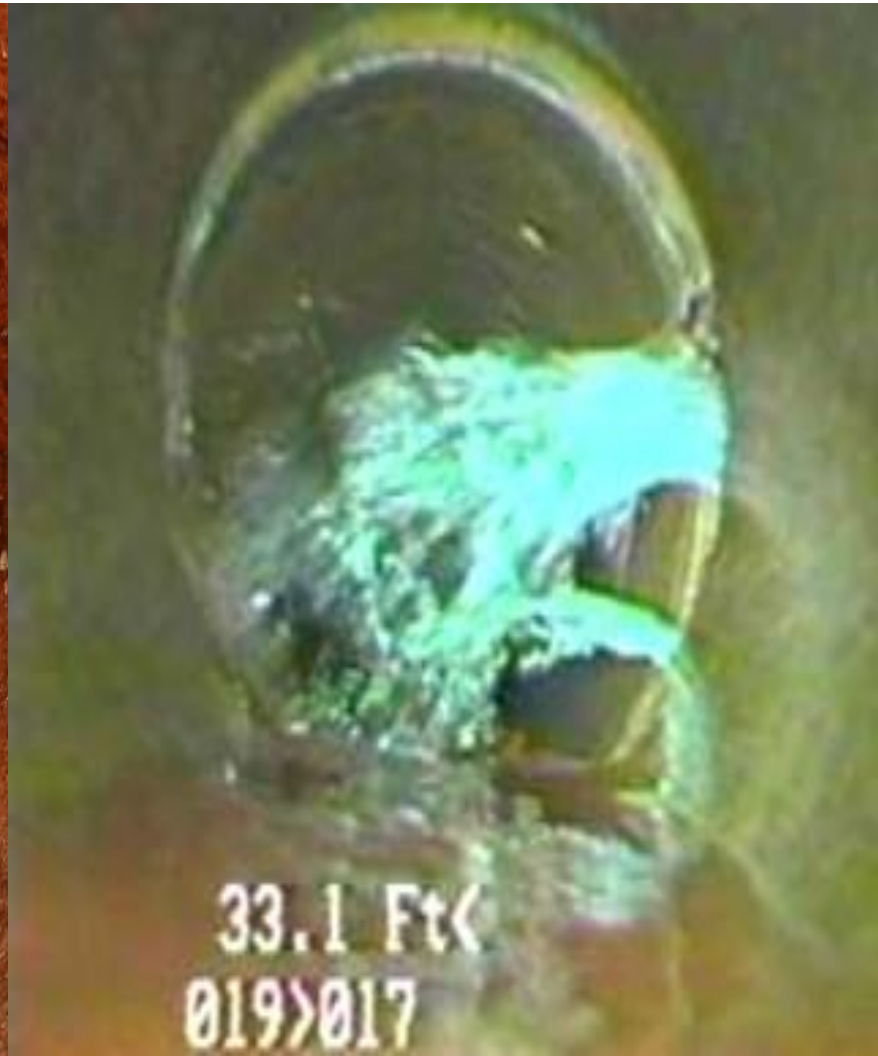
Culvert/Pipeline problems?

- Structural Failure-Fractures,Cracks,Deformation,H2S attack
- Ageing asset

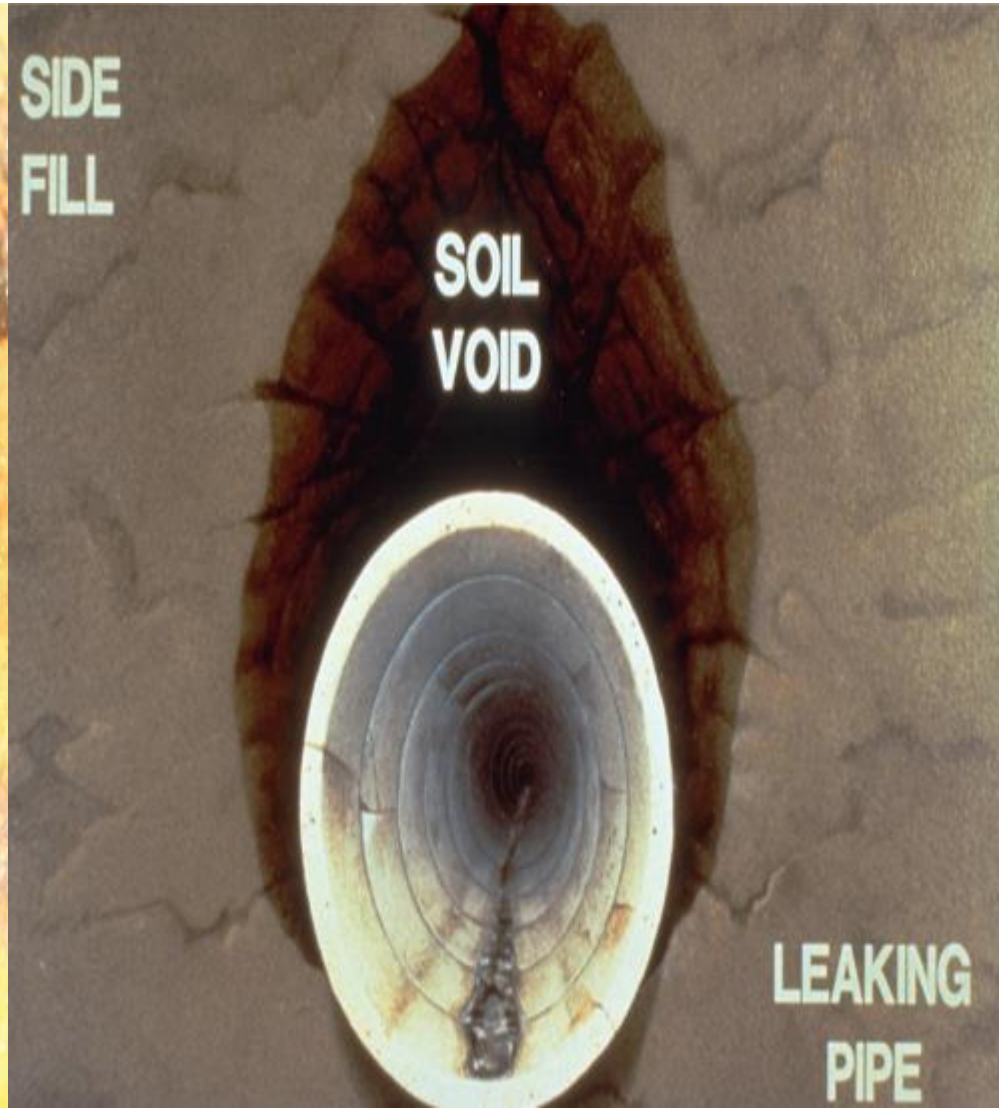
  And/or
- Faulty joints-Infiltration,Exfiltration & Roots

  Leading to
- Voids/Surface holes & collapses
- Blockages-Overflows & Flooding

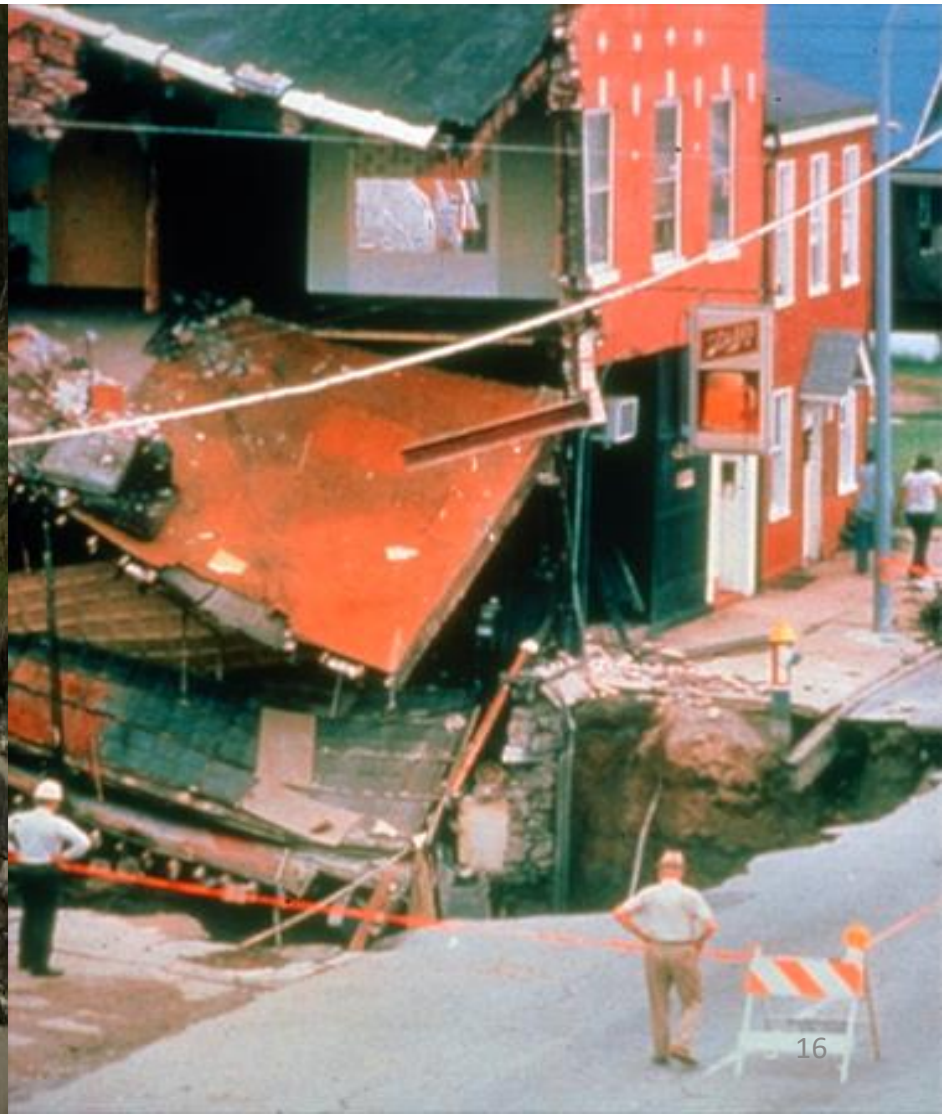
Structural & Infiltration



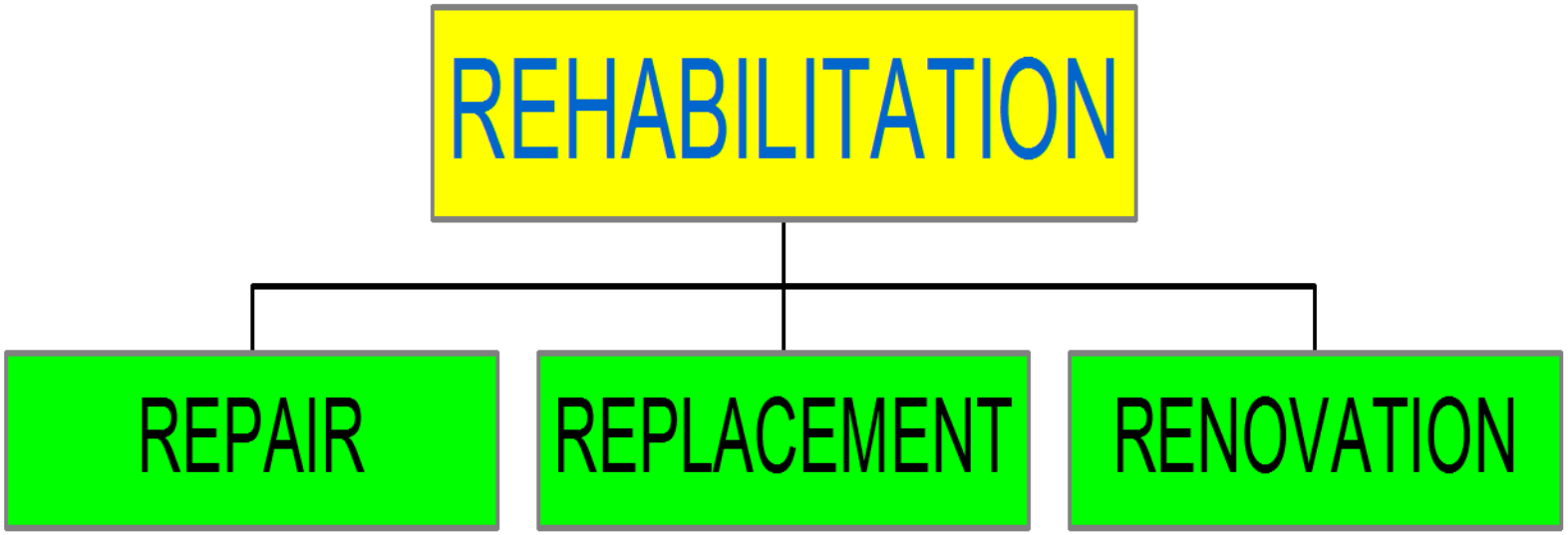
Roots & Soil Voids



Need to act before it’s too late



Rehabilitation Options?

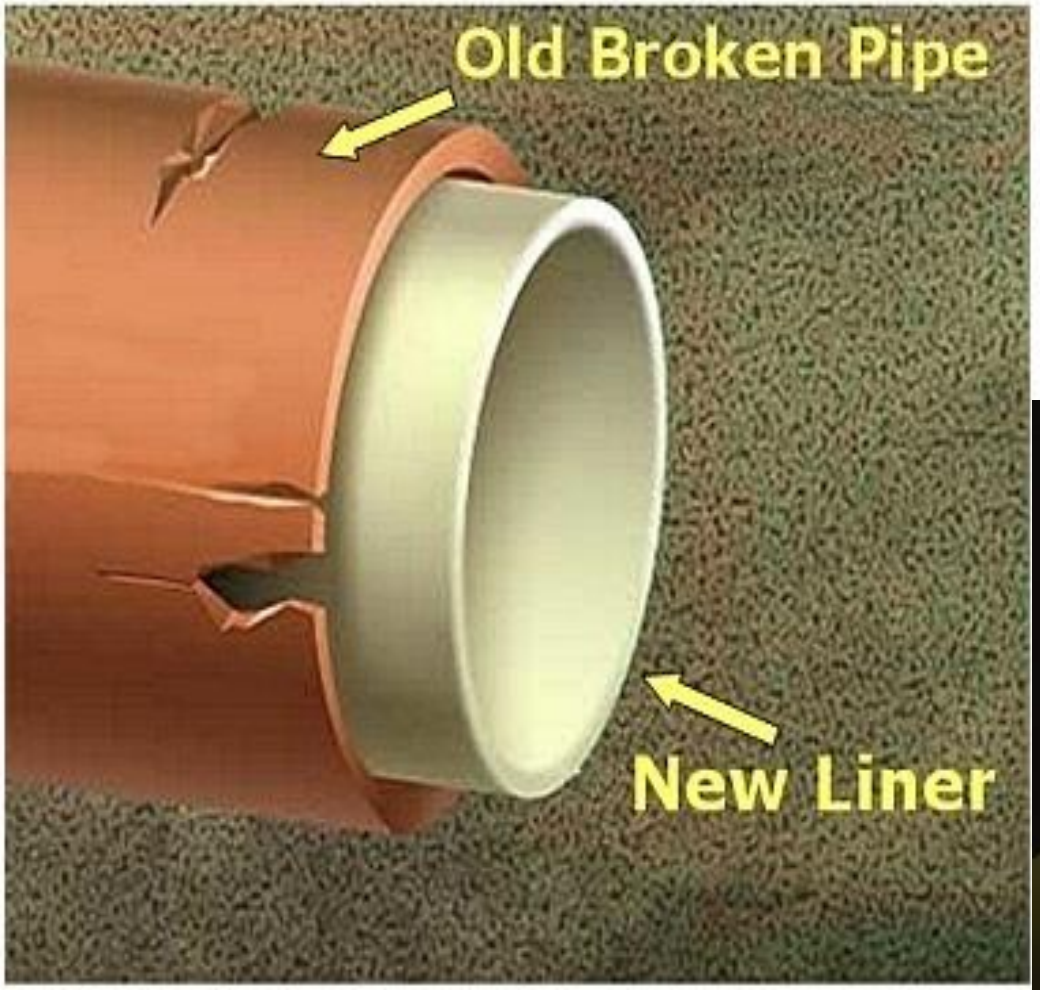


Options

- Local repairs/replacement
  -Conventional open trench
  -Trenchless-Directional Drilling or Pipe Bursting

- Trenchless Renovation by Structural lining using the existing pipe/culvert

- THE iLINE WAY !



iLine

Cured in Place Pipe

What is CIPP lining?

- CIPP is the insertion of a factory manufactured resin-impregnated tube through a manhole/headwall into the pipe to be renovated. The tube is inflated to the size of the host pipe and then cured using either UV lights, hot water or steam
- Used to renovated a structurally unsound pipe/culvert (grade 4 or 5) suffering from fractures or deformation of the pipe without digging
- Resulting in a jointless, seamless FULLY STRUCTURAL STAND ALONE pipe-within a pipe
- Design life to suit the application i.e 50 or 100 years design life (120yrs possible with new Alpha 1800 reline Europe liner)

Technical Envelop

UV GRP liners

- Diameters-150mm up to 1800mm
- Lengths up to 500m possible
- Thickness -UV resin liners only-up to 22mm thick

-Combined Resin liners-22mm up to 30mm (World record 30mm liner successfully installed by iLine for Essex Highways in September 2016)

- Design Life 120yrs-Elastic modulus strength-12250Mpa

These figures are for guidance only & vary depending on manufacturer

History of UV liners

- First CIPP liner installed in Hackney in 1971
- 1981-UV liner in prototype stage-not pursued
- 1987-1990 Reintroduction of UV hardened fibreglass liners
- 1981-1997-Market-100% felt liners
- Today-German market 90-95% GRP UV liners
- UK-15% and Growing especially in the renovation of culverts for Rail, HA & EA

Shapes & Sizes

Shapes & Sizes

Design factors considered

- Liner details to determine thickness
- -External hydrostatic head (ground water table)
- -Live & dead loads (traffic & fill)(using Euro codes for loadings)
- -Ovality
- -Diameter, Lengths, bends
- -Laterals
- Resin details-application dictates the resin selection
- -Nature of effluent
- -Temperature of effluent discharge

- Designed to produce a FULLY STRUCTURAL STAND ALONE bespoke liner with 100 years design life
- Coeff of Friction-Manning n=0.010;Colebrook-white k=0.028

Design & Testing

- Lining designed to the fully deteriorated configurations of ASTM F1216 & the WRc Sewer Rehabilitation Manual
- BS EN-1991-2.2003 Eurocode1-traffic loads on bridges (factor in ground & hydrostatic loadings)
- Linings manufactured , installed & tested to BS EN ISO 11296:Parts 1 & 4:2011 (incorporating some of the benefits of the pervious BS EN 13566 Parts 1 & 4(2002) & the WIS 4-34-04:1995 or WIS 4-34-06:2010 for “Cured in place pipe repairs-”Patching”
- Both short term and long term Flexural Modulus Test are carried out ,in accordance with the above specifications, as well as short term flexural strain & stress at the first break (ISO 178)
- Onsite random sample testing by independent laboratories

The UV lining process

- Cleaning & surveying
- Manufacturing of the liner
- Transportation to site
- Installation
- Curing

Prior to Installation

- The pipe is CCTV surveyed to verify any cleaning requirements, identify any obstructions to be removed, measure position of all connections and to confirm size and length of pipe
- Pipe is cleaned using either manual cleaning or remote high pressure jetters

Prior to Installation

- Setting up of Over pumping
- -Flows are stoppered off for the duration of the lining operations
- -Pumps or tankers are used to control flows

- Carry out any enabling works i.e vegetation clearance, civils works etc

GLASS FIBRE- GRP UV CURED LINERS

Glass Fibre Liners (Reline Europe)

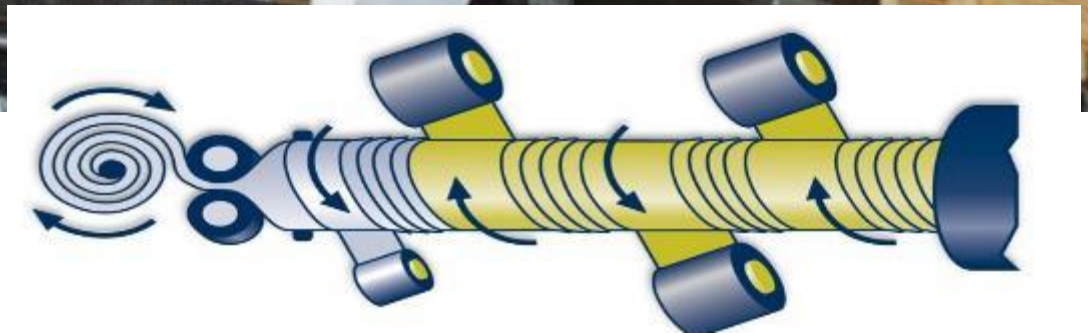
- Manufactured Using 0.7mm thickness
- Impregnated in 0.7m strips
- Seamless construction
- Simple site storage

Manufacturer of UV liner (Reline Europe)

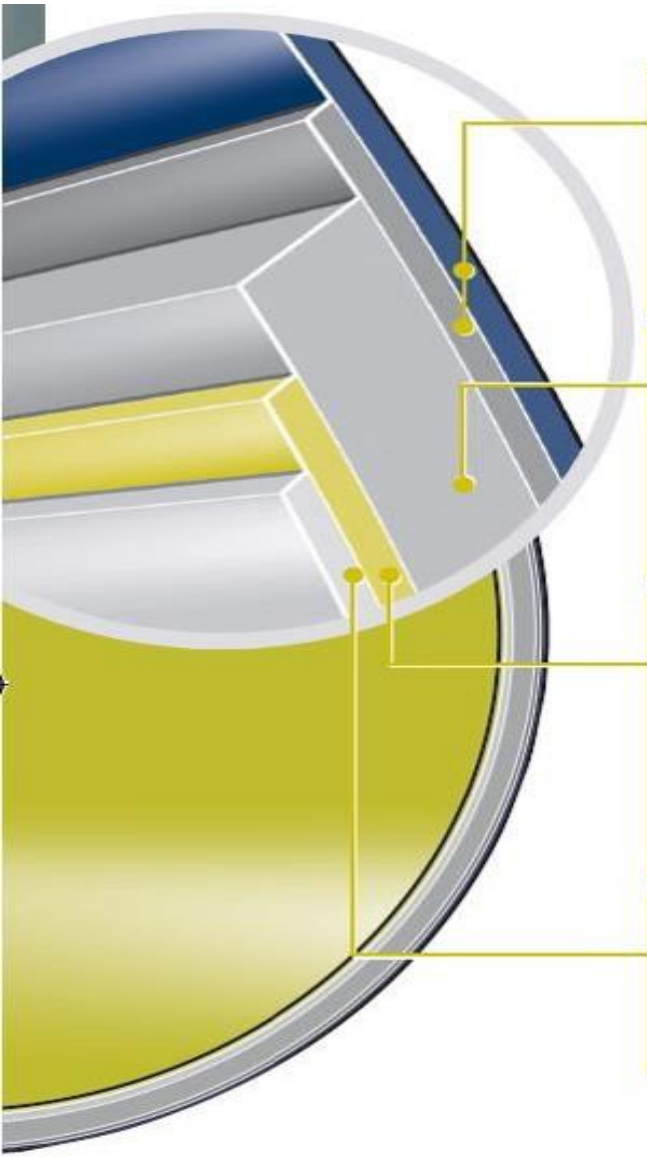
- Each glass fibre sheet impregnated separately
- No risk of part of liner not being impregnated
- Total quality management of whole process

Manufacturer of UV liner (Reline Europe)

- Impregnated liner wrapped around mandrel to form diameter required
- Seamless structure & thickness set by rate of wrapping
- Liner sealed inside robust tube and stored in box for delivery to site



UV unique wall structure (Reline Europe)



External foils with styrene and UV protection
Particularly stable multiple-layer composite foil, that prevents damage to the glass fibre reinforced material, contact with water and premature curing on site due to sunlight. The bandage effect supports the even expansion of the liner.

Glass fibre reinforcement (GFRP) for maximum durability
ECR glass fibre layers with polyester resin for municipal waste water or vinyl ester resin for industrial waste water. The filament wound layers are immersed very evenly for maximum durability to form an optimised system for rapid curing with UV light.

Wear-resistant layer/chemical-protective layer
(approx. 0.5 mm) based on DWA-A 143-3 and DIN EN ISO 11296-4 RELINEEUROPE's Alphaliner is the first CIPP liner system to be fitted with a specifically thick wear-resistant and chemical protective layer. This gives the system maximum wear and chemical resistance and the ability to withstand flushing.

Inner foil with styrene barrier
3-layer composite foil as an installation aid. This is removed after curing and its excellent transparency facilitates UV light curing.

Installation

- GRP UV cured CIPP Liners
  - Installation
  - Curing
  - Reinstatement

Transportation

- iLine-UV GRP Liners

Fully Portable System

Typical site set up

Site set

Liner delivered to site in a box

Typical site set up

Installing the UV liner

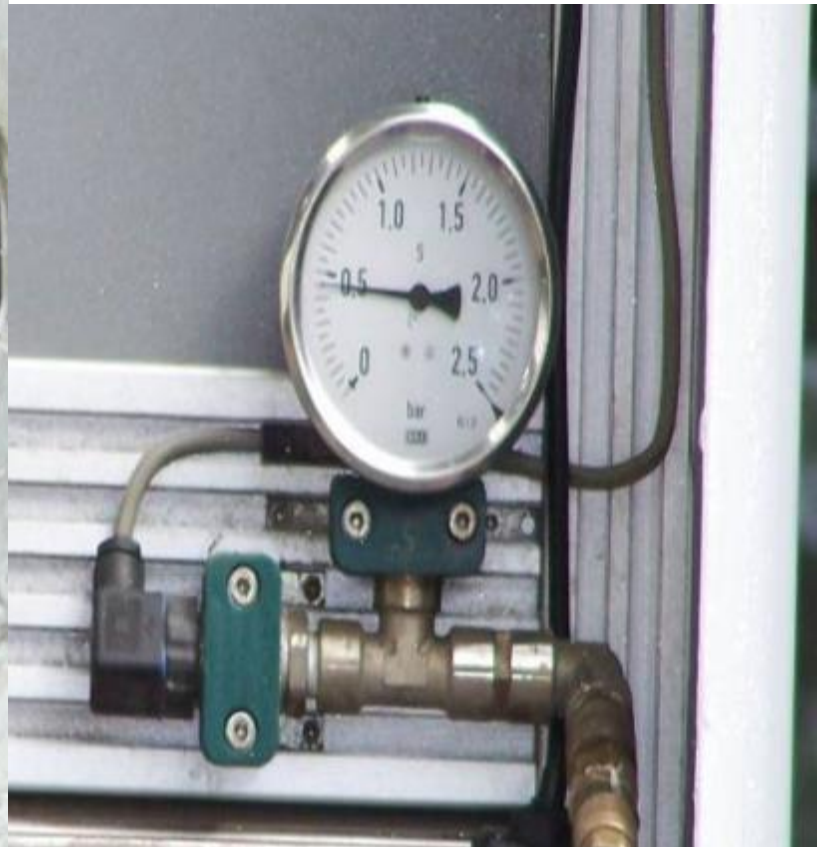
Sliding film & liner winched/pulled into the pipe

Installation

Protective sleeve, end packer & Connection pipes and temperature sensors fitted

Inflate the liner with air

Connection pipes & temperature sensors between packer & UV installation unit



Lights & Control unit (Reline Europe)

Installation

UV lights & camera inserted into pre-cured liner,End Packers fitted & liner fully inflated against walls of existing pipe using compressed air. Liner is cured under pressure

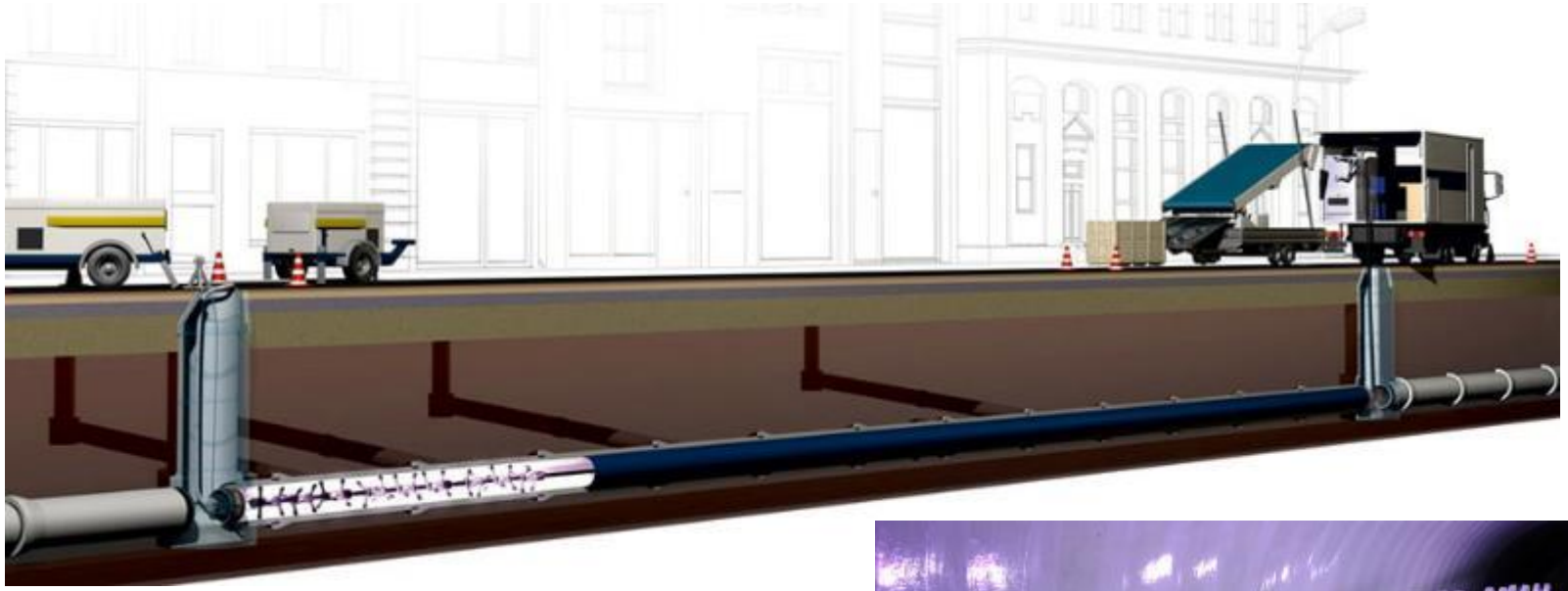
Prior to curing-pull through light train

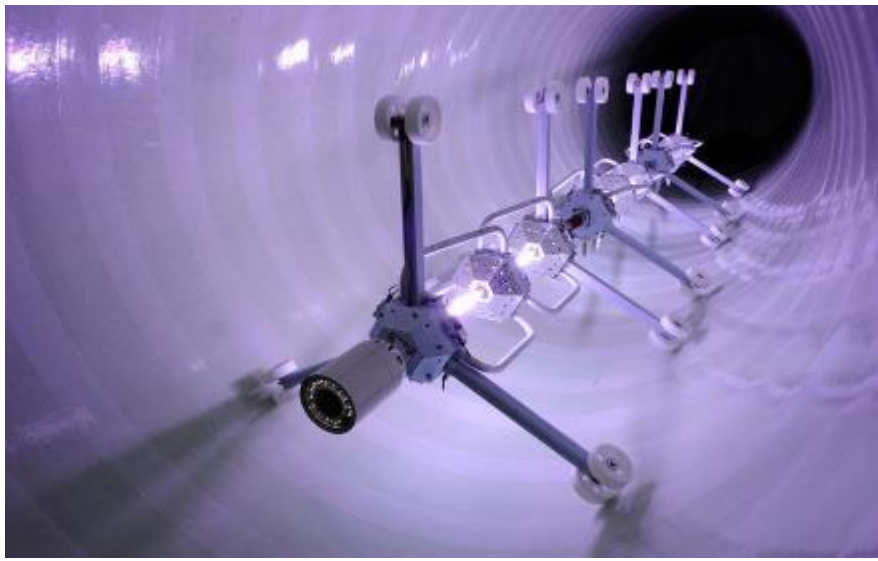
CCTV camera & UV light train

Liner checked before curing

Starting to cure the liner

UV Curing (Reline Europe)



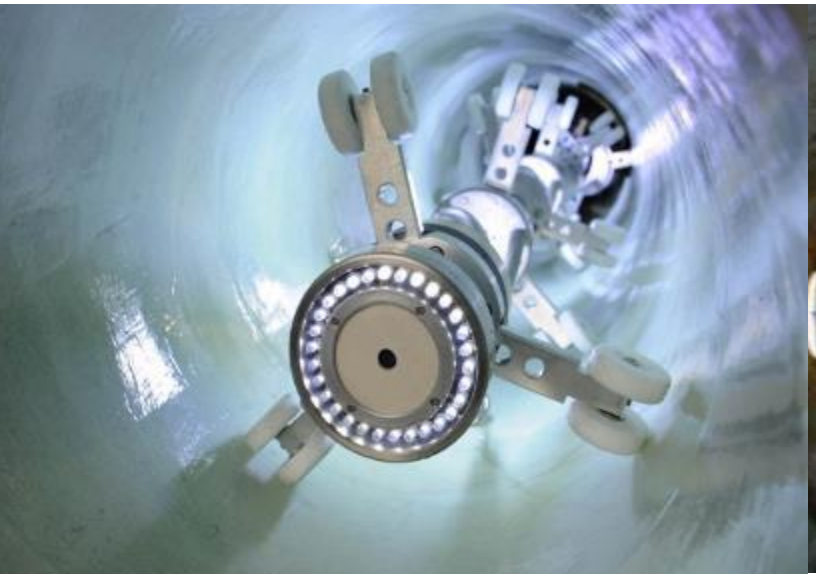


- Continual measurement of temperature.
- Precise location of cold areas
- Automatic slowing of speeds to ensure correct curing
- NO risk of Contamination

UV Curing (Reline Europe)

- Computer controlled curing process-stop & start facility
- All outputs record
- Speed based on diameter & liner thickness

  6 x 2000KW (2017-6 x 4000KW with automated curing)
- UV lights can be adjusted without changing the bulbs
- Typical Curing rate of 0.6m per minute-Now 1m per minute



Removal of UV lights after curing completed

Curing Completed

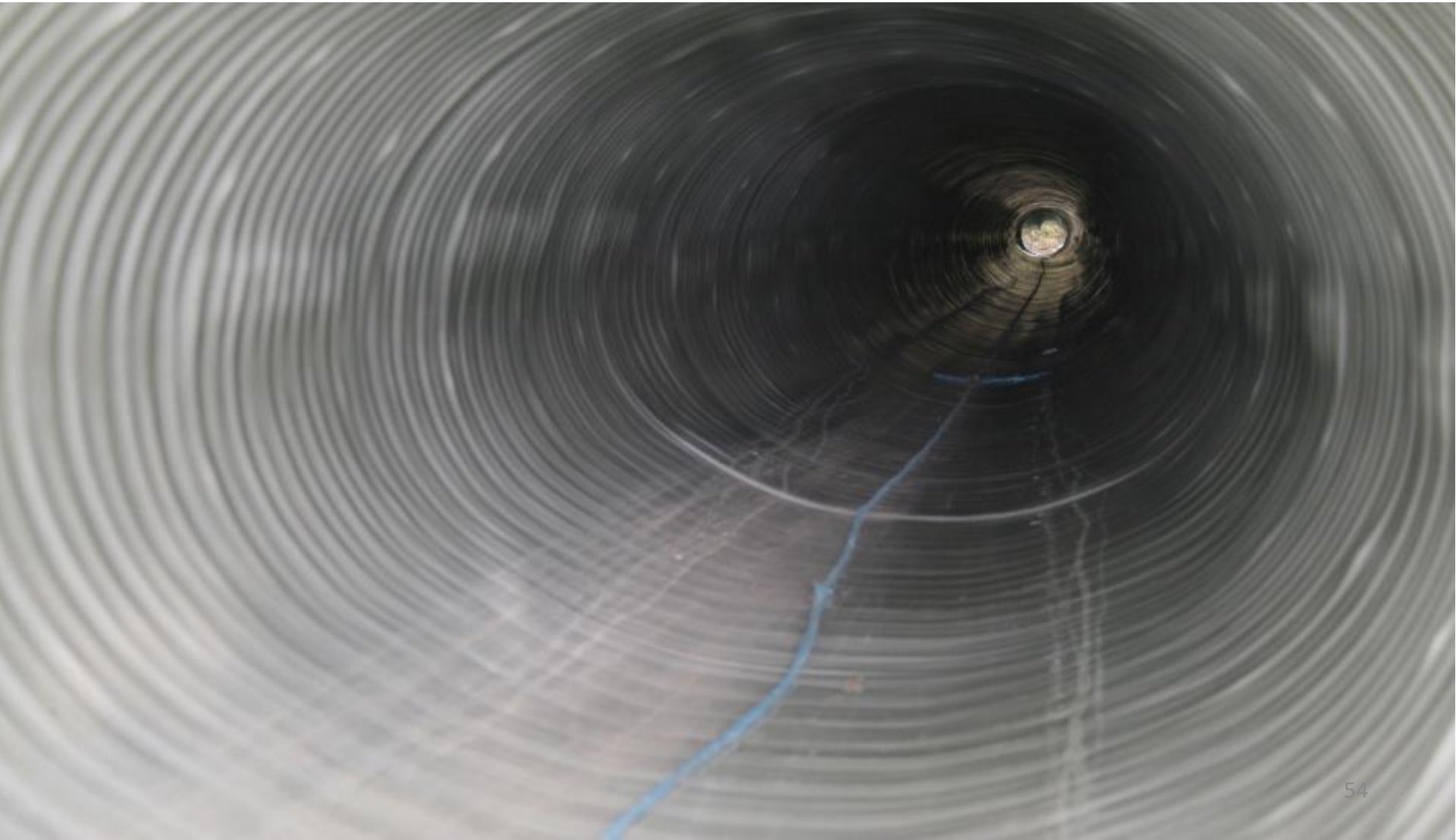
Ends of liner cut off and inner foil removed

Reinstatement

Note:- No Hot water to dispose of and No risk of contamination , pollution or styrene gases

Happy client

CCTV of Final cured liner



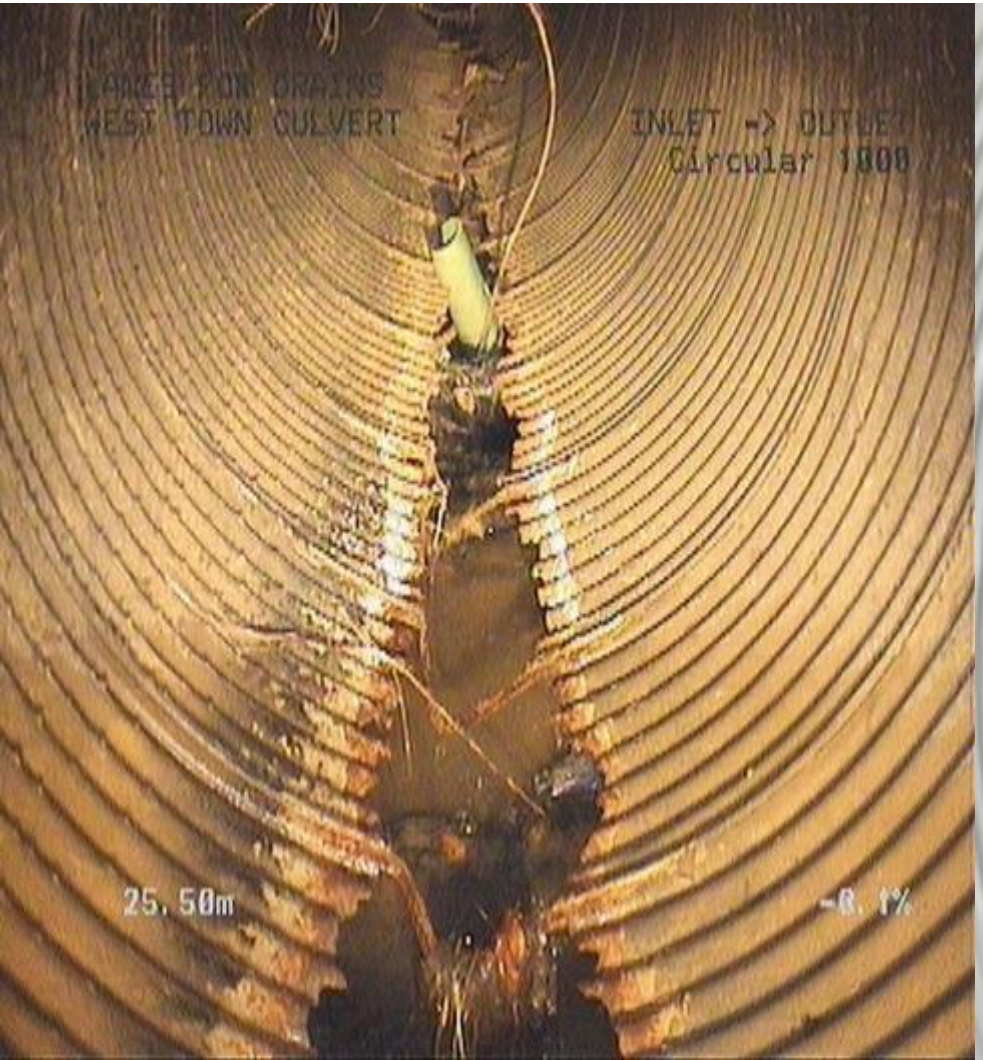
Completion

Client receives print out with

cure start/end time,liner’s air pressure,temperature,

lamps speed ,number & wattage used etc

Before & After lining of Culvert



Before & After lining of Culvert

iLine Glass fibre liners (Reline Europe)

CIPP GRP UV Cured liner

- Diameter range 150-1800mm -22mm thick UV resin liner only
- >22mm possible using combination of UV light curing & thermal curing resins up to 30mm thick
- Curing Lengths of 500m possible
- Various Cross section shape
- Inline Change of Dimension & thickness possible
- Bends of 15 degrees (up to 30 degrees may be possible)

iLine Glass fibre liners

- UV Liners 40% thinner than conventional CIPP liner & high mechanical properties-approx'ly 3+ times stronger
- Extremely fast curing time compared to traditional hot cure lining-saves monies on over pumping
- Also Fast & economic to handle on site- liner stored in a box-saves monies on enabling works
- Liner not affected by temperature
- Ready for use up to 6 months from impregnation

Typical installation timetable for lining of twin 900mm x 60m UV liner v Hot cure

0800am-Rehabilitation work starts after all enabling works completed i.e cleaning,CCTV survey etc

0900am-Sliding film pulled in

0930am-Liner winched into existing pipe and DS end packer fitted

1000am-liner inflated using compressed air & Camera & UV lights installed in pipe , US end packer fitted

1030am-Liner fully inflated to walls of existing pipe & pre cure CCTV survey undertaken

1100am-UV lights switched on and Supervised Computer controlled curing process started-Typically 0.6m per minute but can be quicker

1230pm-Curing complete,Packer removed and ends cut off and inner foil removed

1300pm-Final CCTV of finished liner.Site clearance starts.Pipe put back into operation

ALL COMPLETED IN ONE DAY

FELT LINER MAY STILL NOT YET STARTED TO CURE

Cost Comparison-UV v Hot Cure (Water/Steam)

These are actual scheme costs

1. HA Armco culvert Devon-1.2m dia x 39m
   - -Hot Cure-£72k-56% more expensive than UV
   - -UV £46k
2. Rail culvert-1.0m dia x 62m
   - -Hot Cure-£93k-69% more expensive than UV
   - -UV-£55k
3. EA/HA culvert-1.0m dia x 51m
   - -Hot Cure-£74k-51% more expensive than UV
   - -UV-£49k

PLUS

Big savings on TM for UV-only one lane closure for a part day as opposed to whole carriageway for 2-3 day for Hot Cure

Wash Farm Essex Highways Oct 2016
WORLD RECORD 30MM GRP UV LINER

TWIN 900MM (H) X 1400MM (W) X 11M

Wash Farm Essex Highways Oct 2016
WORLD RECORD 30MM GRP UV LINER

Milton,Cambridge-1100mm x 12.5m Brick arch rail culvert-lined with 23mm liner Oct 2014
Client-AMCO/Network Rail

Milton,Cambridge-Cure Rate 500mm/min
4 hrs to install,all cured by 1500hrs

Case study-Highway culverts 2008-2013

Client

HA & EnterpriseMouchel Devon & Cornwall MAC 1

Problem

50 year old ARMCO highway culverts varying sizes 600mm up to 1200mm diameter, in state of collapse

Solution

Lined over 20 culverts using GRP UV liner all completed in one day

Minimal enable works and No environmental impact

Small site footprint and no disruption to public or traffic

Client satisfied currently looking at another 6 culverts

Typical Applications

- Strengthening existing pipe/culvert & bridging discontinuities-restoring structural integrity
- Eliminating ground water infiltration
- Halting settlement by preventing exfiltration of pipe content & infiltration of soil-hence preventing collapses & surface settlement
- Protection from corrosion (H2S attack)
- Eliminating exfiltration of pollutants

Typical Applications

- Increasing hydraulic capacity
- Reducing maintenance
- Eliminating pressure leaks
- Providing pipeline/culvert construction technology for both circular & non-circular shapes and for changes in alignment,size and geometry along the pipe length

CIPP UV GRP liner benefits Summary

- Fully structural stand alone solution without digging
- Fast to install-minimal disruption to public/client
- Same day return to service
- Can accommodate all shapes & sizes (30mm thick)
- Fully portable system-all locations possible
- Minimal enabling works required
- Saves monies on over pumping & enabling works
- Environmentally safe
- GRP liner-thinner & stronger than Conventional liners.Very tight fit-no shrinkage
- Minimal capacity losses-better flow characteristics..
- Minimal HSQ risk-no working at height

SIMPLY

- Adds strength
- Stops leaks
- Increase flow
- 100 year design life (120yrs possible)

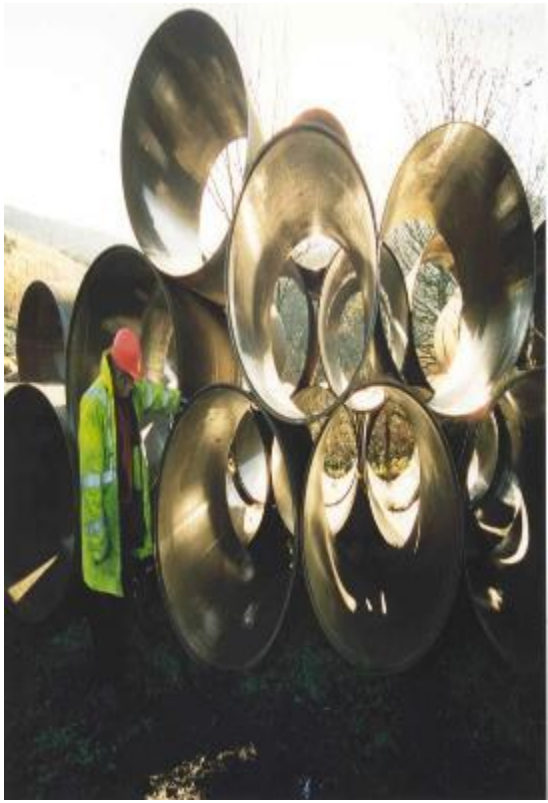
Giving
FULLY STRUCTURAL
STAND ALONE
Replacement Pipe within a Pipe
Without
Digging or Disruption

GRP section Lining

GRP lining

GRP sections

- Glass Reinforced Plastic segmental lining developed in 1979
- Made of 3 basic constituents-glass fibre,resin (Polyester/vinyl ester) & sand
- Manufactured as complete units with no horizontal joints
- Both man entry and non man entry possible
- Spigot & Socket joint within the wall thickness
- Larger diameter can be made in 2 or more segments-separate invert & soffit elements
- Short lengths to negotiate gradual bends
- Wall thickness 10mm+ Bespoke product



GRP sections

- Tailor Made for Hydraulic efficiency
- Lightweight,adaptable & easy to install
- Any shape or size possible without the need for man entry
- Design life of 100yrs
- Length of each liner 2.4m but can be manufactured to suit site conditions
- Suitable for diameters from 450mm upwards to 7m.
- Coeff of Friction-Colebrook-white k=0.028

GRP sections

- Impermeable high strength structure- sandwich structure
- Enhanced flow characteristics
- Constructed using a hi-tech gel coating resistant to most
- -Chemicals
- -Abrasion
- -Effluents
- -Sewage
- -Ground conditions

GRP-How it works

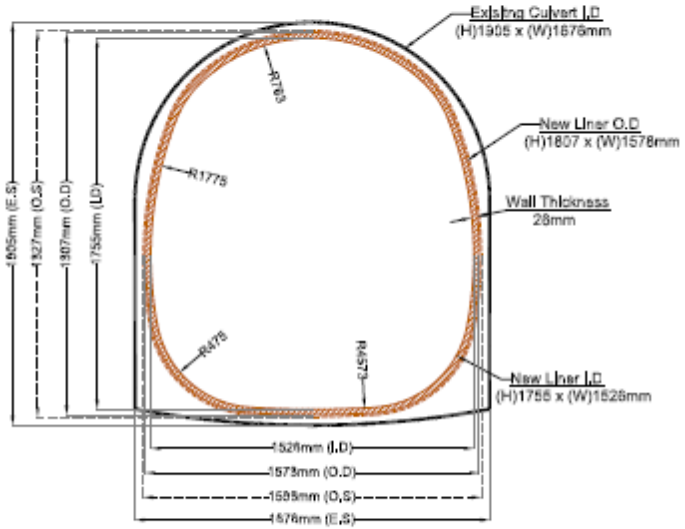
- GRP liners are designed according to one of the following criteria:-
  - A-form a composite structure with host pipe
  - B-behave as an independent element
  - C-act as permanent formwork for grout

- Grout-low viscosity, free flowing, rapid setting,no shrinkage & high strength ,
  - -In A & C-structural and in A must bond
  - -In B-acts as filler providing restraint to liner

Design of GRP liner

CHANNELINE INTERNATIONAL

GRP Structural Lining Systems . P.O. BOX: 8091, Dubai
Tel: 00971 4 8848383, Fax: 00971 4 8848384 Email: sales@apsdubai.com



Proposed New Liner

Existing Culvert I.D
P = 5.259m
A = 2,848sq.m

New Liner I.D
P = 5.412m
A = 2,268sq.m

CUSTOMER APPROVAL
Name of Company _____
Address _____
Date _____
Signature _____

ISSUED BY: TIM WEBB C.I. Dubai, U.A.E	PROJ. TITLE: Rehabilitation of Existing Arch Culvert, IL/204/16, UK		
DRAWN BY: BB	CLIENT / CONTRACTOR :	DRAWING NO.	REV.
DATE: 15 NOV. 16	All dimension are in millimeter,u.n.o and with a tolerance of ±2mm.	CH769/UK/IL/204-16/1PA/D01	2

CHANNELINE INTERNATIONAL

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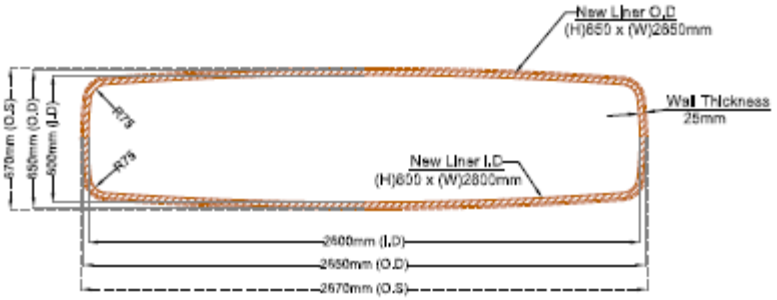


Proposed New Liner
Type# 1

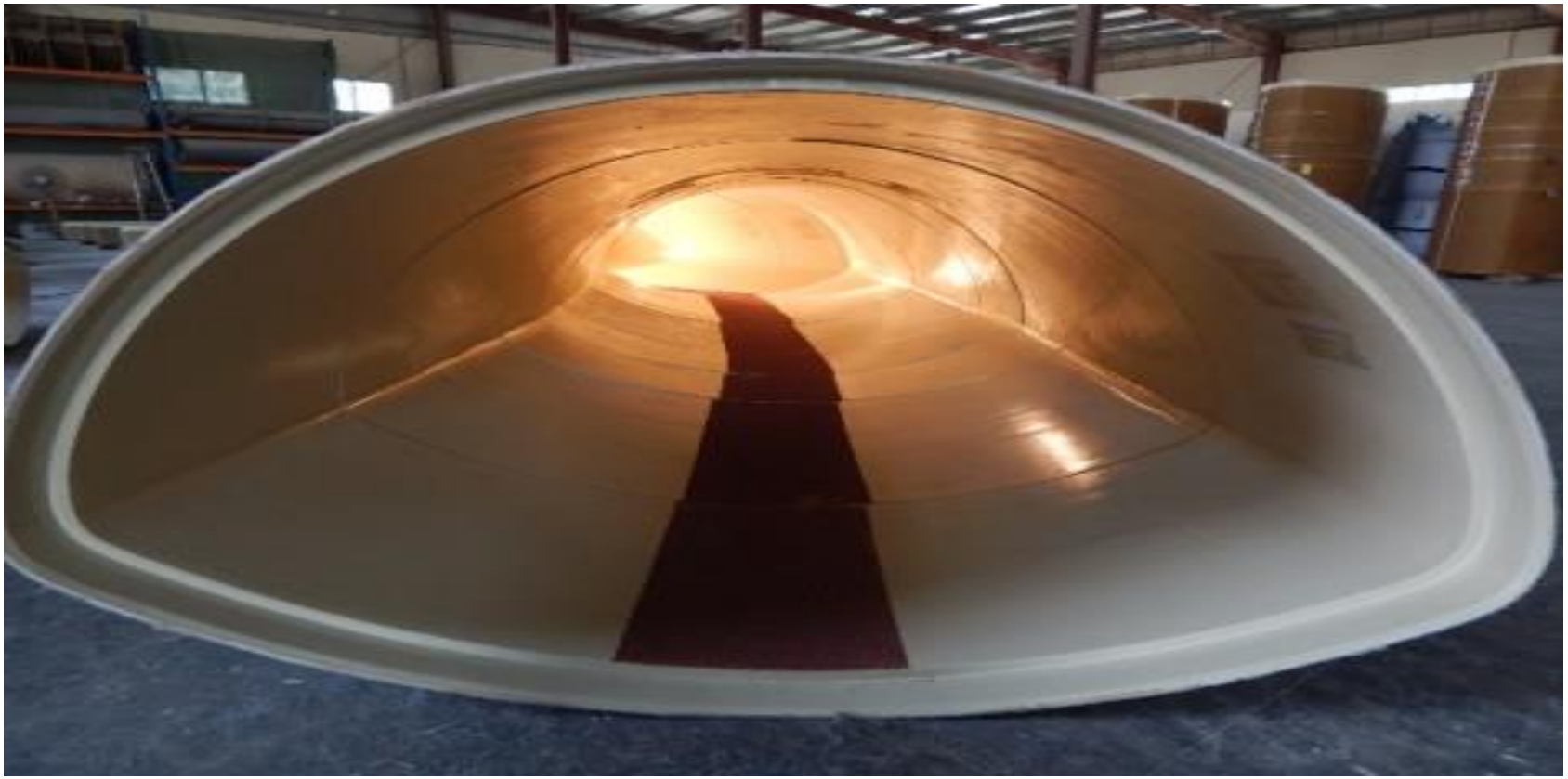
New Liner I.D
P = 6.056m
A = 1,463sq.m

CUSTOMER APPROVAL
Name of Company _____
Address _____
Date _____
Signature _____

ISSUED BY: TIM WEBB C.I. Dubai, U.A.E	PROJ. TITLE: Box Sewer, Ullveston, UK		
DRAWN BY: BB	CLIENT / CONTRACTOR :	DRAWING NO.	REV.
DATE: 12 JUL. 16	All dimension are in millimeter,u.n.o and with a tolerance of ±2mm.	CH672/UK/UL/1PB/D03	1

Establishing the profile

ALL shapes & sizes



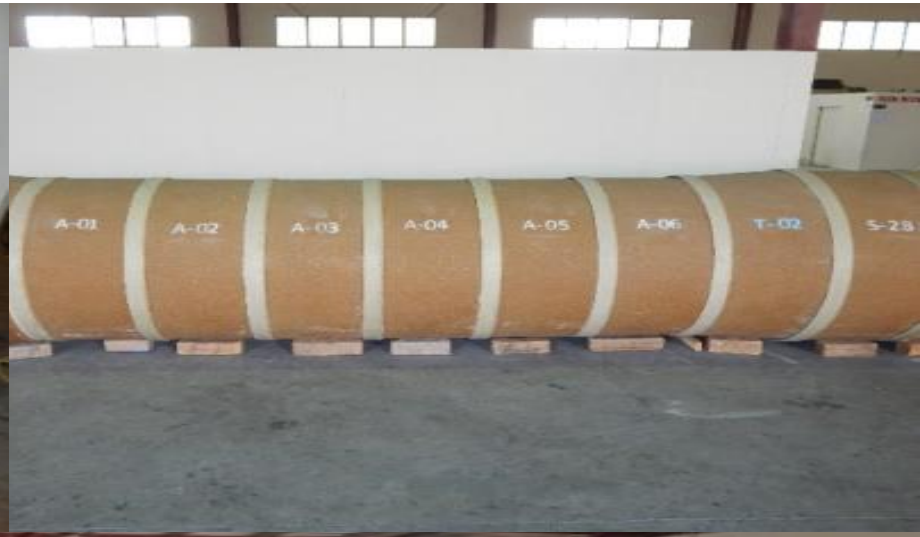
ALL shapes & sizes

All shapes & sizes

GRP lining

Site delivery set up.

Beccles EA GRP liner



Beccles EA GRP liner

GRP lining

GRP lining

GRP

GRP

GRP

GRP

GRP

GRP

GRP

Godalming Rail Culvert Surrey GRP renovation-Sept 13

- Client-Network rail/Suttles civil eng
- 1920 x 1950 brick arch culvert-18m long under rail track
- Structurally unsound
- GRP solution recommended due to high flows through culvert
- All work completed without any disruption to rail traffic

Godalming Rail Culvert Surrey GRP renovation-Sept 13

Godalming Rail Culvert Surrey GRP renovation-Sept 13

Ulverston-2017

Ulverston-2017

Ulverston-2017

Green Park Weir Port Talbot

Green Park Weir Port Talbot

Green Park Weir Port Talbot

Green Park Weir Port Talbot

Benefits of using GRP

- Smooth bore gives excellent flow characteristics
- Resistant to abrasion i.e road grit
- Comprehensive range of shapes, sizes up to 7m & lengths
- Easy to cut , drill , tap & joint
- Lightweight & adaptable to suit the project
- Liners can be quickly installed resulting in lower costs
- Can be used on pipes of Any shape or Size
- Fully structural Type II or Semi structural Type I lining solutions
- Design life of 100 years

iLine Highway History

- HA/EnterpriseMouchel MAC 1-2008-2013-Lined 20 Armco culverts under A30 & A38-ranging from 600mm up to 1600mm using UV GRP liners

- Essex Highways/Ringway jacobs
- Wash Farm Twin 900mm x 1400mm x 11m WORLD RECORD 30mm thick liner all completed in 4 days

- Bear Scotland
- A835 Inverness-3no x 900mm x 16.5m-23mm thick-one day installation per liner

- Caerphilly County BC
- Capital valley Ind estate culvert 3 x 1200m x 72m (each) x 13.5mm thick liner
- Llewylins Farm culvert 68m x 900mm x 10.2mm thick liner

- Morgan Sindall
- Llangfarch road drains-100m x 225mm x 3mm UV liners
- Wyvern road,Cardiff-2 x 900mm brick egg road culverts-7.1mm thick-special shape liners

- Energetics/SG consultants-Raunds,Northampton- 2x 125mm HDPE SDR11 Under A45 road crossing using DD

Benefits of using the iGroup

- New name but most experienced UV installation team in the UK
- New ideas & fresh approach-open to new innovations
- Unrivalled experience in installing UV liners-over 20 years experience with same Team
- Utilize Reline Europe rig & Materials-No curing conflict
- In-house skills & knowledge to identify the right solution
- iLine provide a Proven GRP UV cured CIPP lining system providing a Fully structural solution
- Unbeatable service and real “ can do” attitude
- Offer either turnkey or install only option

Benefits of using the iGroup

- iLine offer a comprehensive range of solutions & services to cover all industries with an unbias approach
- Our expertise gives clients & main contractors peace of mind
- We use only latest state of the art products and equipment-new 4000kw rig with automatic curing
- Deliver projects “on time , on budget with minimal disruption & environmental impact
- Deliver reliable and cost effective solutions to the highest HSQE standards

Benefits of using the iGroup

Questions we ask our clients

-How can we make your project easier to deliver?

-How can we reduce cost,improve lead times and increase productivity?

-How can we reduce risk,minimise environmental impact & improve safety?

Our aim is total satisfaction for you & offer the “Best engineering solution & Peace of mind”

We’d Love the chance to discuss your next sewer or culvert rehabilitation project !

Summary-What Solutions Do iLine offer ?

- CCTV Survey, cleaning and identification of culverts
- Recommendation of best renovation solution
- Design and Engineering verification of required renovation solution
- CIPP GRP UV cured CIPP lining services
- Pressure liners & Sliplining
- Segmental GRP lining services
- Concrete spray lining
- Directional Drilling services
- Pipe bursting & Guided Auger boring
- Timber Headings & Pipe jacking

iGROUP

QUESTIONS


iGroup