TRENCHLESS ASIA 2026
THAILAND

THE BENEFITS OF COMBINING PE100 PIPE SYSTEMS AND TRENCHLESS TECHNOLOGY

Pontawit Klungsuwan

PE100+ Association

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The benefits of combining PE100 pipe systems and trenchless technology

Pontawit Klungsuwan- PE100+ Association

Contents

- Introduction to the PE100+ Association
- Installing PE100 pipes using trenchless techniques
- Rehabilitation techniques that can use PE100 pipes and liners
- EN and ISO standards concerning trenchless technology
- Introduction to the PE100+ Association No-Dig Guide
- Conclusions

Introduction to the PE100+ Association

PE100+ Association: The production, testing and listing of consistently high quality PE100 materials

- PE100+ Association is an industry organisation of 15 polyethylene manufacturers and is celebrating its 27th anniversary. Its objective is to promote consistent high quality in the production and use of polyethylene for PE100 pipe systems.
- The association funds the independent KIWA managed 3rd party laboratory testing of PE100 pipes samples produced by member companies on a regular basis.
- Supported by an advisory committee and working closely with other plastic pipe, standards and utility bodies, the association encourages the proper specification, design and use of high quality PE100 pipe systems

Benefits & Advantages of HDPE pipe black compound

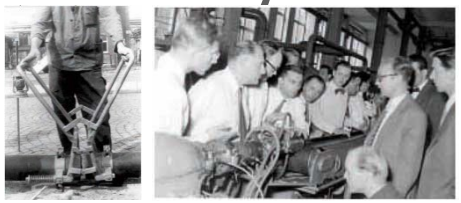
Corrosion & Chemical Resistance

Hydraulically Efficient

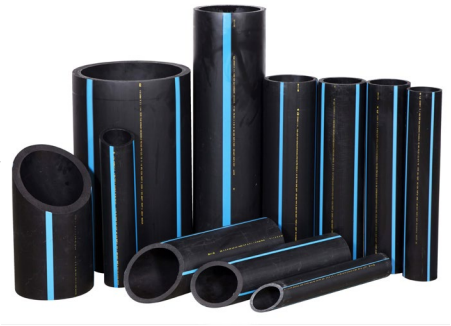
Organoleptic

Lightweight

Durability more than 50 years

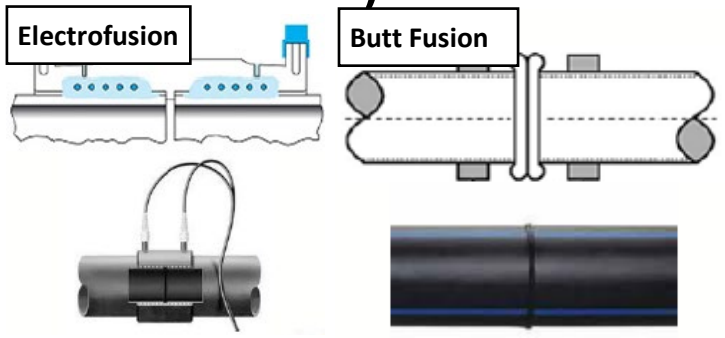


Flexible and Toughness



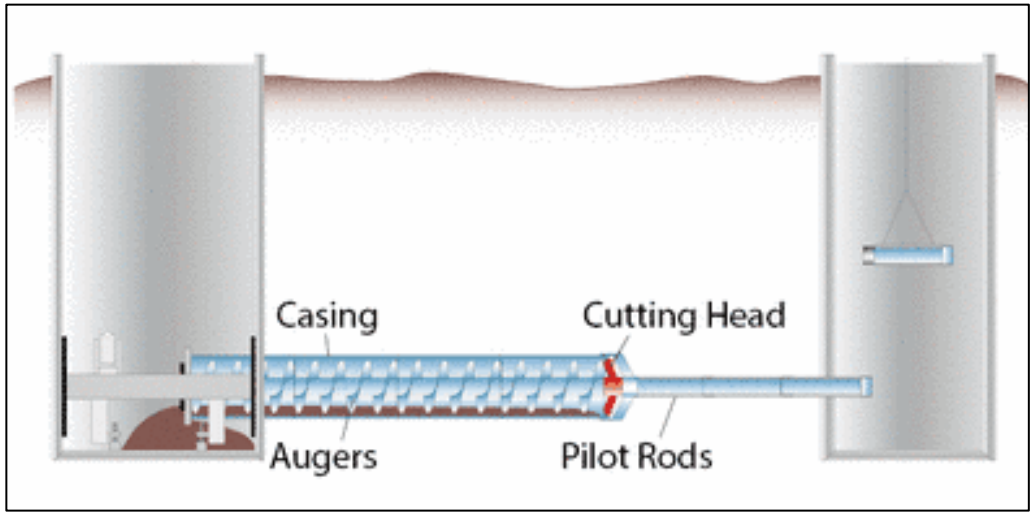
Leak free , Fully restrained joint

(Thermal heat Fusion)



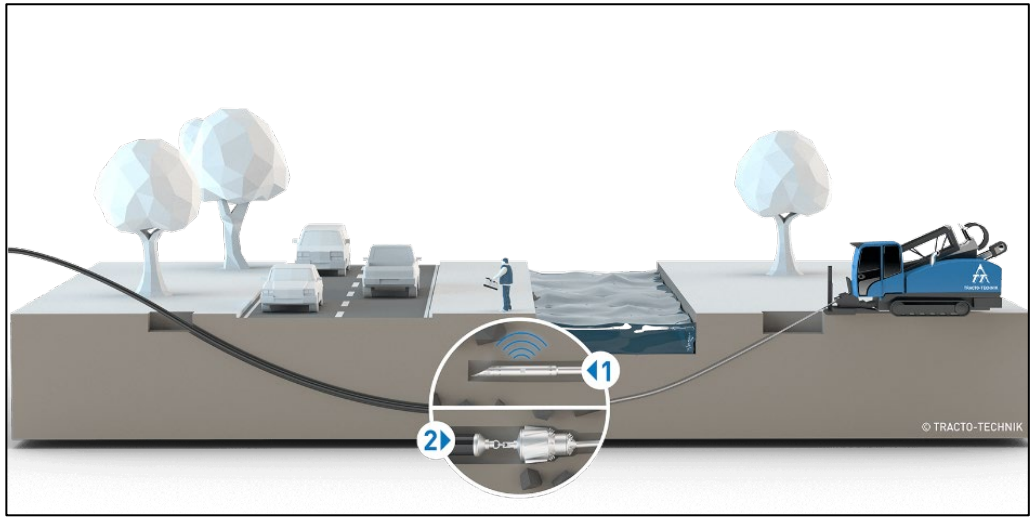
Installing PE100 pipes using trenchless techniques

Installing PE100 pipes using trenchless techniques



Pilot tube micro-tunneling

Impact Moling

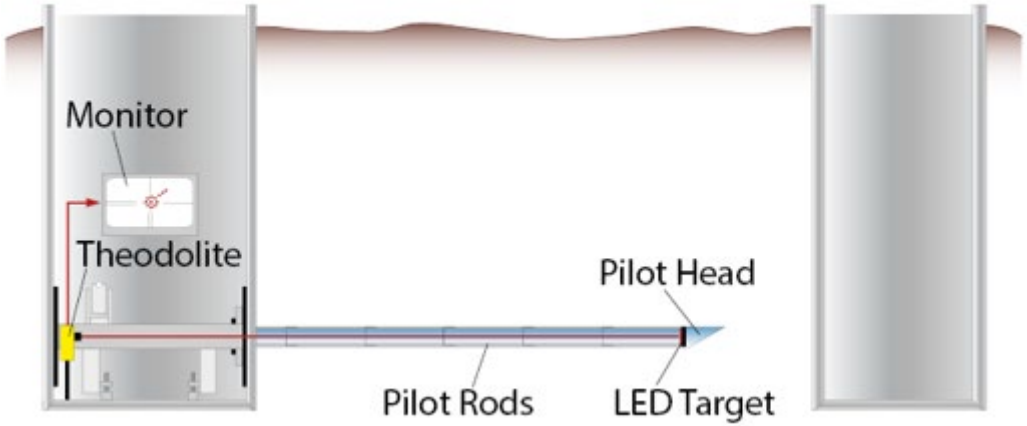


Horizontal Directional Drilling

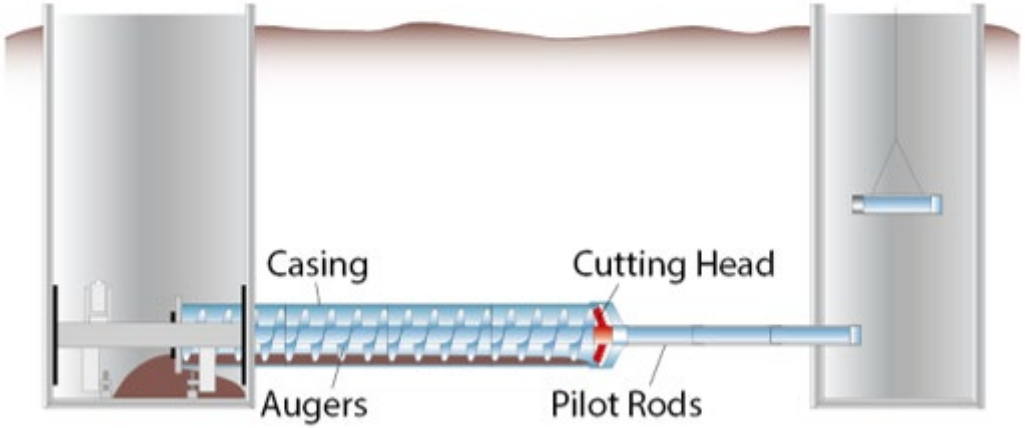
Pipe Ploughing

Pilot Tube Microtunnelling: Good for large diameters in confined spaces – shafts are needed

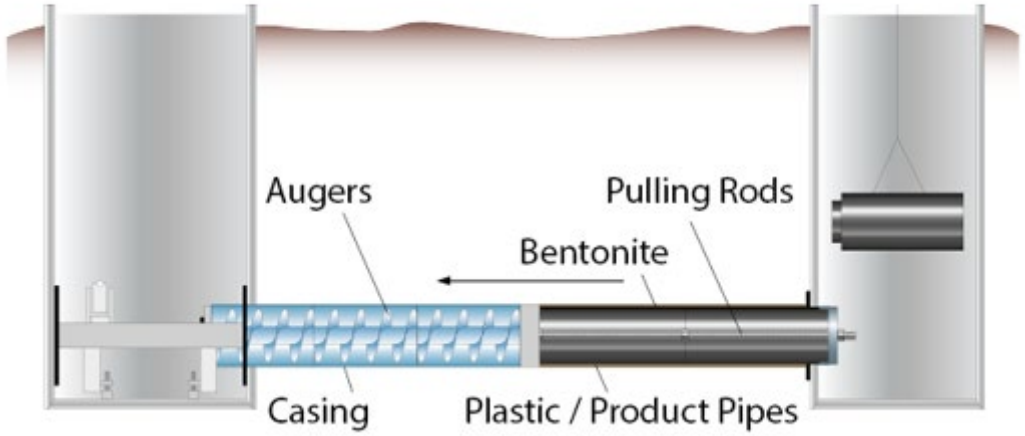
Step 1 – Pilot Bore



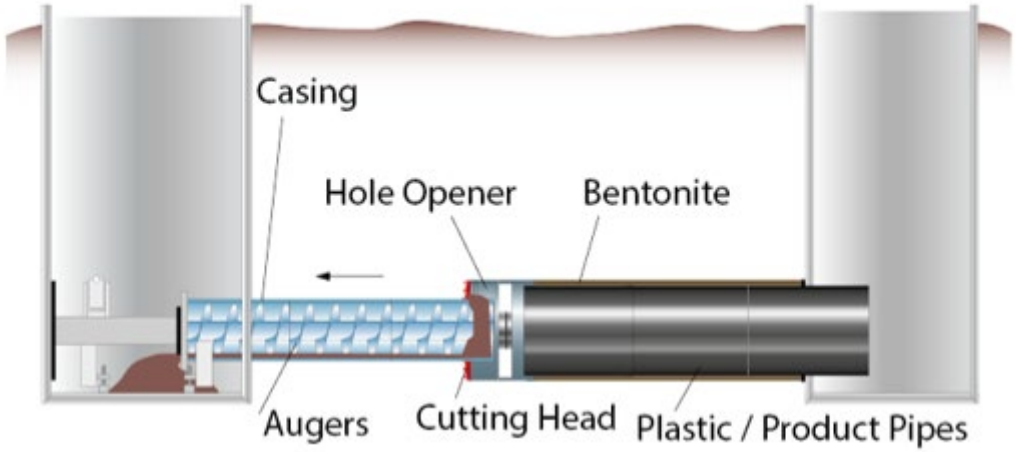
Step 2 – Augur Bore



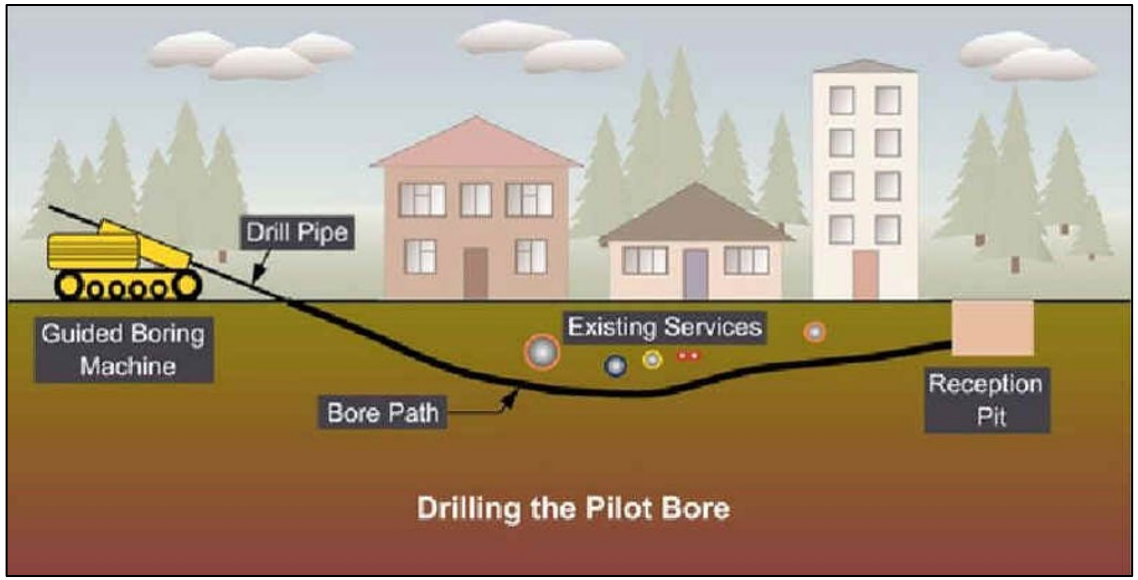
Step 3 – Pull Through



Step 3 – Large Dia. Pull Through

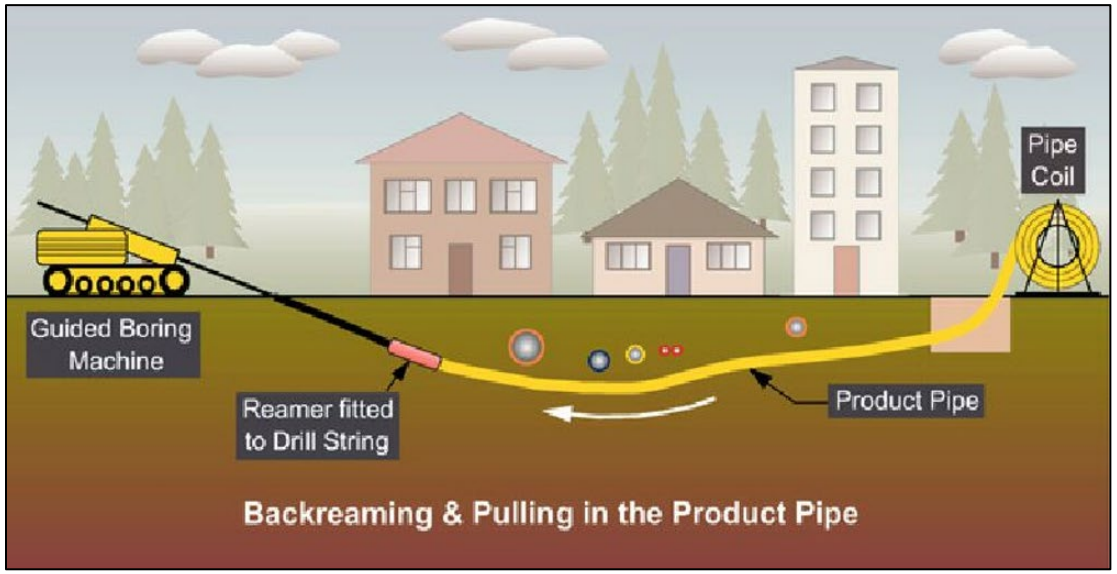


Horizontal directional drilling: For longer distance installations and larger diameters



Directional drilling is used to insert PE pipes under obstacles and in areas where excavation should be avoided.
The technique is simple in principal but requires specialised equipment

After an initial drill hole is complete a series of reamers is used to increase the bore size and to eventually pull back the product pipe. Due to risk of installation damage PE100-RC is recommended



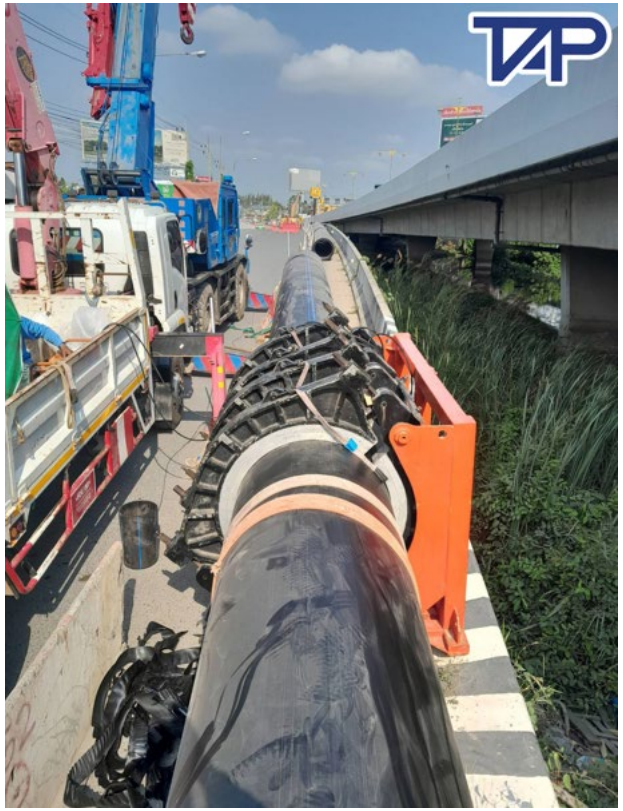
HDD Installation Technique in Phuket, Thailand

Water Pipeline Installation – Phuket, Thailand

- Project Name: Municipal Water Pipeline Project
- Location: Phuket Province, Thailand
- Pipe Specification: HDPE Pipe, OD 1,000 mm, PN 12.5
- Installation Method: Horizontal Directional Drilling (HDD)
- Maximum Pullback Distance: 425 meters

HDD Installation Technique in Bangkok, Thailand



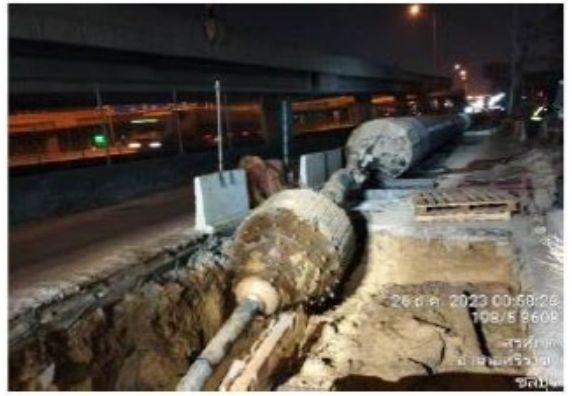
Water Pipeline Installation – Bangkok, Thailand

- Project Name: Municipal Water Pipeline Project
- Location: Bangkok Province, Thailand
- Pipe Specification: HDPE Pipe, OD 1,000 mm, PN16
- Installation Method: Horizontal Directional Drilling (HDD)

HDD Installation Technique in Chonburi, Thailand

Nong Pla Lai–Nong Kho–Laem Chabang Water Pipeline Phase 2 Installation
Method: Horizontal Directional Drilling (HDD)

- Pipe Specification: HDPE Pipe, OD 1,200 mm, PN 10
- Total HDD Installation Distance: 1,160 meters
- Key Feature: Large-diameter pipe trenchless installation for water transmission system.



Pipe ploughing: A great technique for rapid installation of pipes and cables where there are few obstructions

- In rural areas it is possible to plough PE pipes into the ground at rates of up to 5 km/day in the right conditions, due to the lack of obstacles
- Typically used to install smaller diameter PE pipes of up to 160 mm OD and cables
- Due to tough installation conditions use of PE100-RC is recommended

- In Australia, the need to lay long lengths of water injection and gas collection pipelines in open country led to the development of pipe ploughs that can install a single 630 mm OD pipe or twin pipes of up to 315 mm OD

Pipeline rehabilitation techniques using PE pipes and liners

Rehabilitation techniques using PE100 pipes and liners

Slip lining

Close fit - reduced diameter

Pipe bursting

Close fit - folded liner

Slip lining an old pipeline in Bangkok, Thailand

Project: Pipeline Rehabilitation – Bangkok, Thailand Year of Completion: 2013

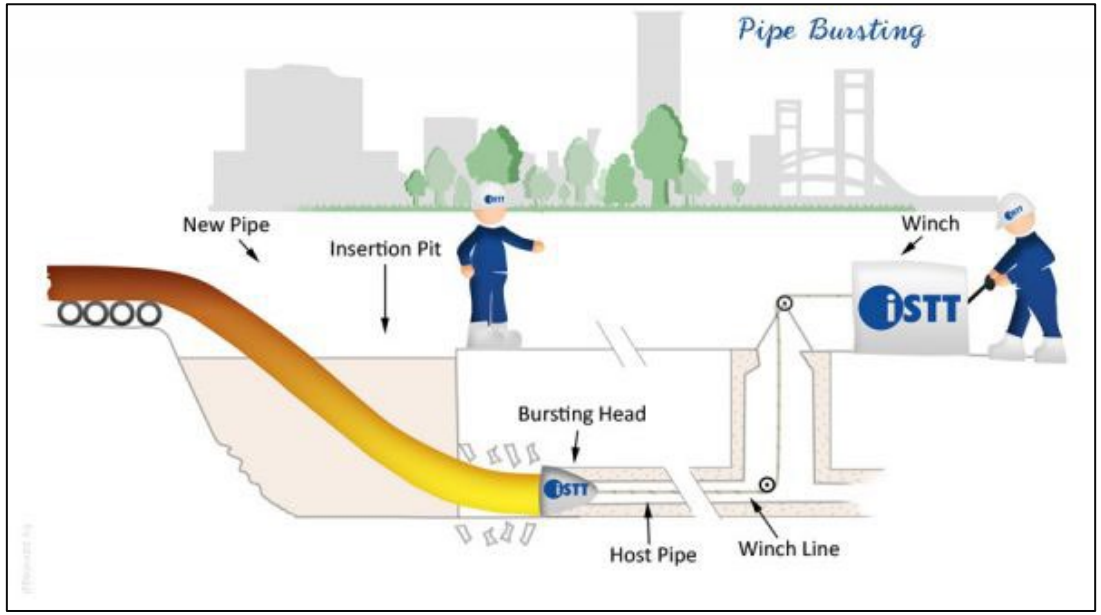
- Technology: Trenchless Rehabilitation (No-Dig Method)
- Methodology: Inserting HDPE pipe into an existing leaking steel host pipe
- Pipe Specification: HDPE Pipe, OD 800 mm, PN 10
- Total Distance: 2,800 meters
- Project Highlights:
    - Achieved fast installation with minimal disruption.
    - Eliminated traffic issues in high-density urban areas.
    - Cost-effective alternative that avoided open-cut excavation.

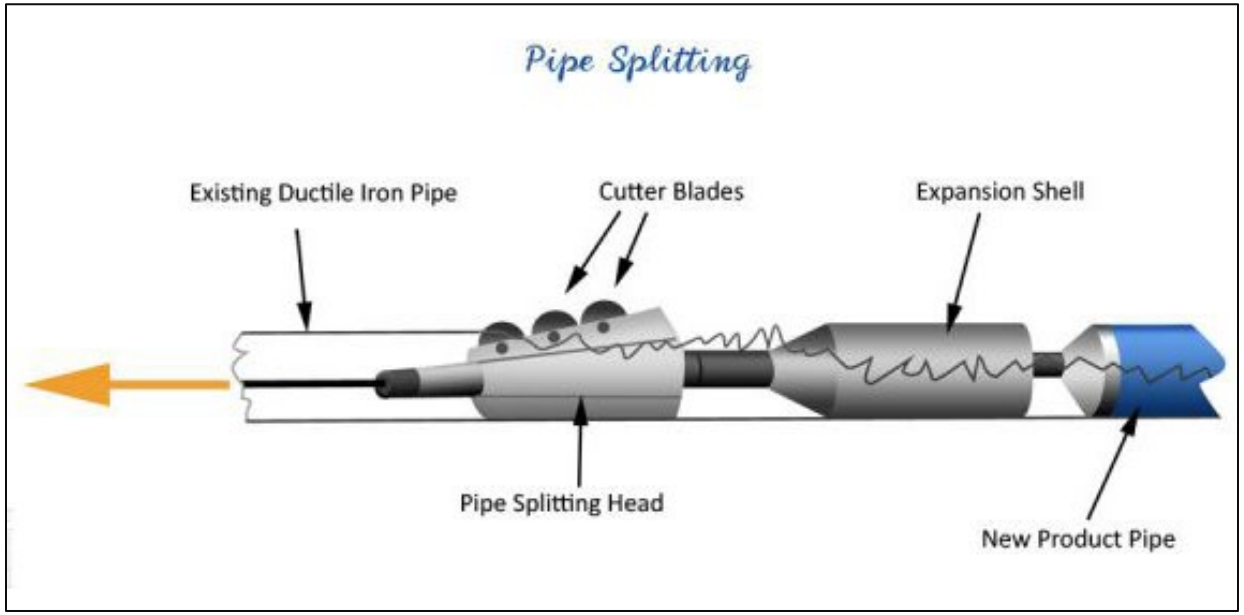
‘Close fit’ relining using concentric pipe diameter reduction using a die or hydraulically powered rollers

- Liner pipe is drawn through a die or hydraulic rollers to reduce the outside diameter by up to 10% and then drawn though the existing pipeline by a winch.
- Once the tension is released, the visco-elastic memory effect causes the pipe slowly shorten and try to return to its original diameter, forming a close fit liner.
- Hence the liner outer dia. should be slightly higher than the pipe internal dia.
- To minimise the risk of failure due to installation damage, use of PE100-RC material is recommended.

Drawing the pipe through a set of hydraulically powered reduction rollers gradually reduces the diameter.

Renovation by pipe bursting and splitting





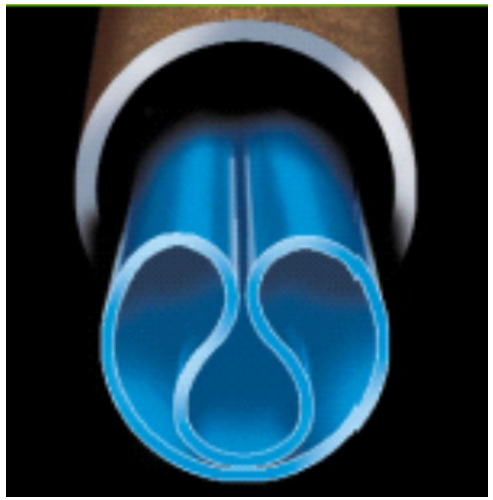
Pipe Bursting

Pipe Splitting

Both methods can be used to install the same or one size larger pipes

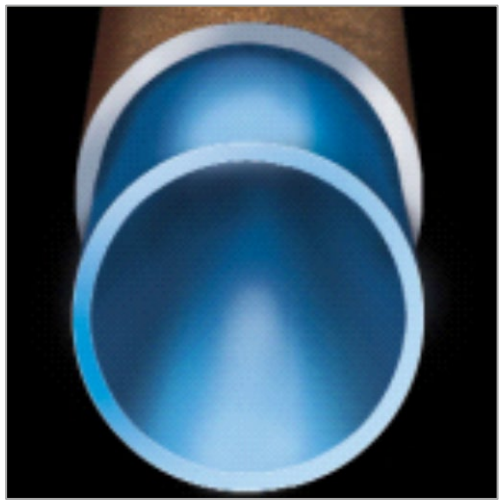
‘Close fit’ relining using folded PE100 liners

- To reduce the overall dimensions of the liner pipe it is folded into a U or C shape. The pipe liner can then be easily threaded through the old main as there is more clearance between the liner and pipe and minimal tension on the winch
- Once in place the pipe can be expanded using water or air pressure, some systems first use steam to heat up the pipe and ‘assist’ the PE visco-elastic memory effect
- Inner surface of the host pipe is often rough and can scratch the liner, which can lead to slow crack growth failures, therefore PE100-RC pipes is recommended



Shape of folded pipe during installation

Shape of expanded pipe after being pressurized



EN and ISO standards concerning trenchless technology

EN ISO 11295 provides an introduction and framework in which a family of system specific product standards fit

- Many of the systems use methods that were developed by specialist companies in different countries
- Historically companies frequently used different descriptions and buzz words to describe their systems and differentiate themselves from competitors
- Using the classifications given in EN ISO 11295 helps end users to specify systems
- The PE100+ on-line guide draws on the contents of the standard

The 2022 revision includes more on the planning and operational use of the systems

EN ISO 21225 parts 1 and 2 cover pipe bursting, horizontal directional drilling and impact moling

BS EN ISO 21225-1:2018

BSI Standards Publication

Plastics piping systems for the trenchless replacement of underground pipeline networks

Part 1: Replacement on the line by pipe bursting and pipe extraction (ISO 21225-1:2018)

BS EN ISO 21225-2:2018

BSI Standards Publication

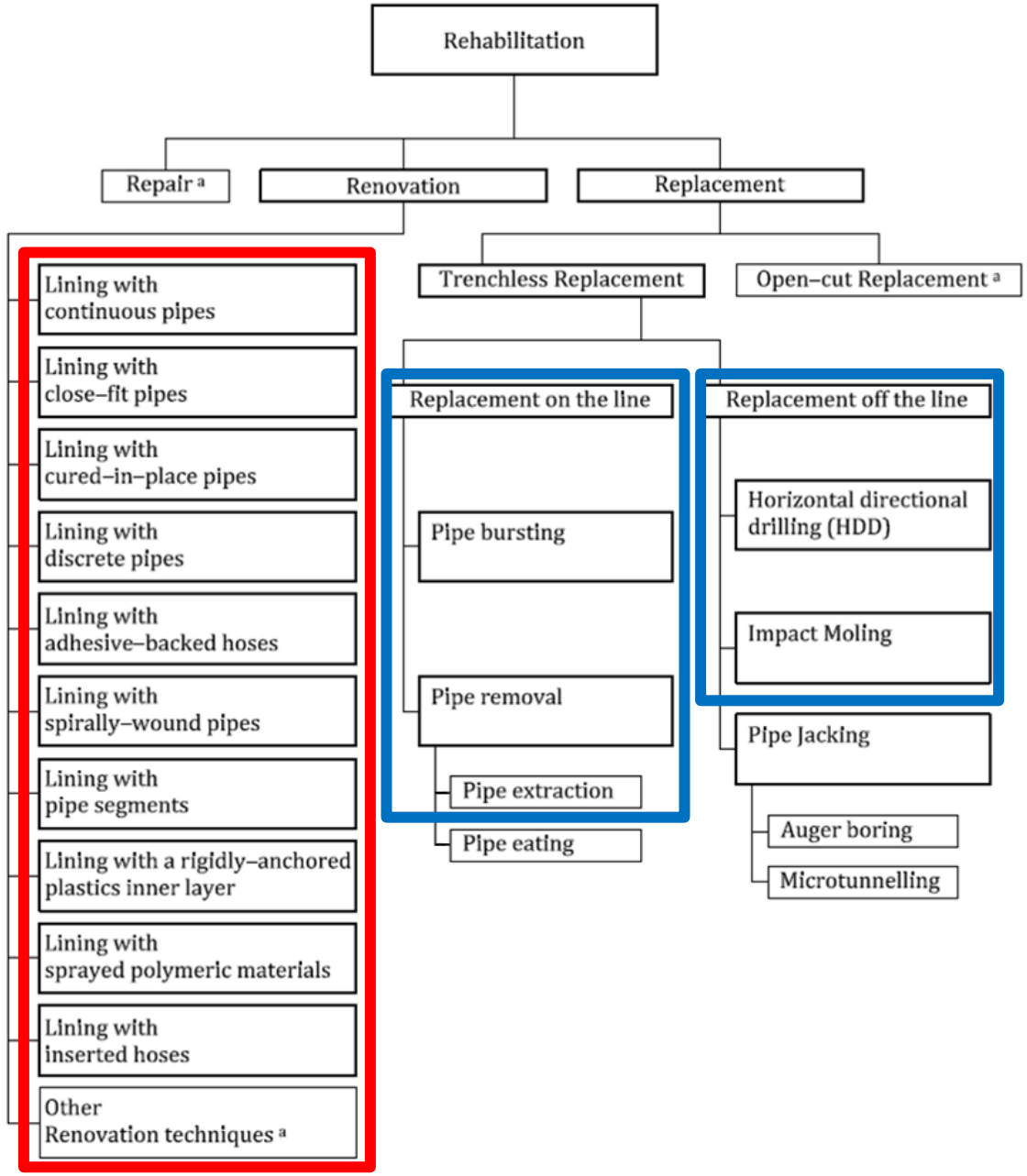
Plastics piping systems for the trenchless replacement of underground pipeline networks

Part 2: Replacement off the line by horizontal directional drilling and impact moling

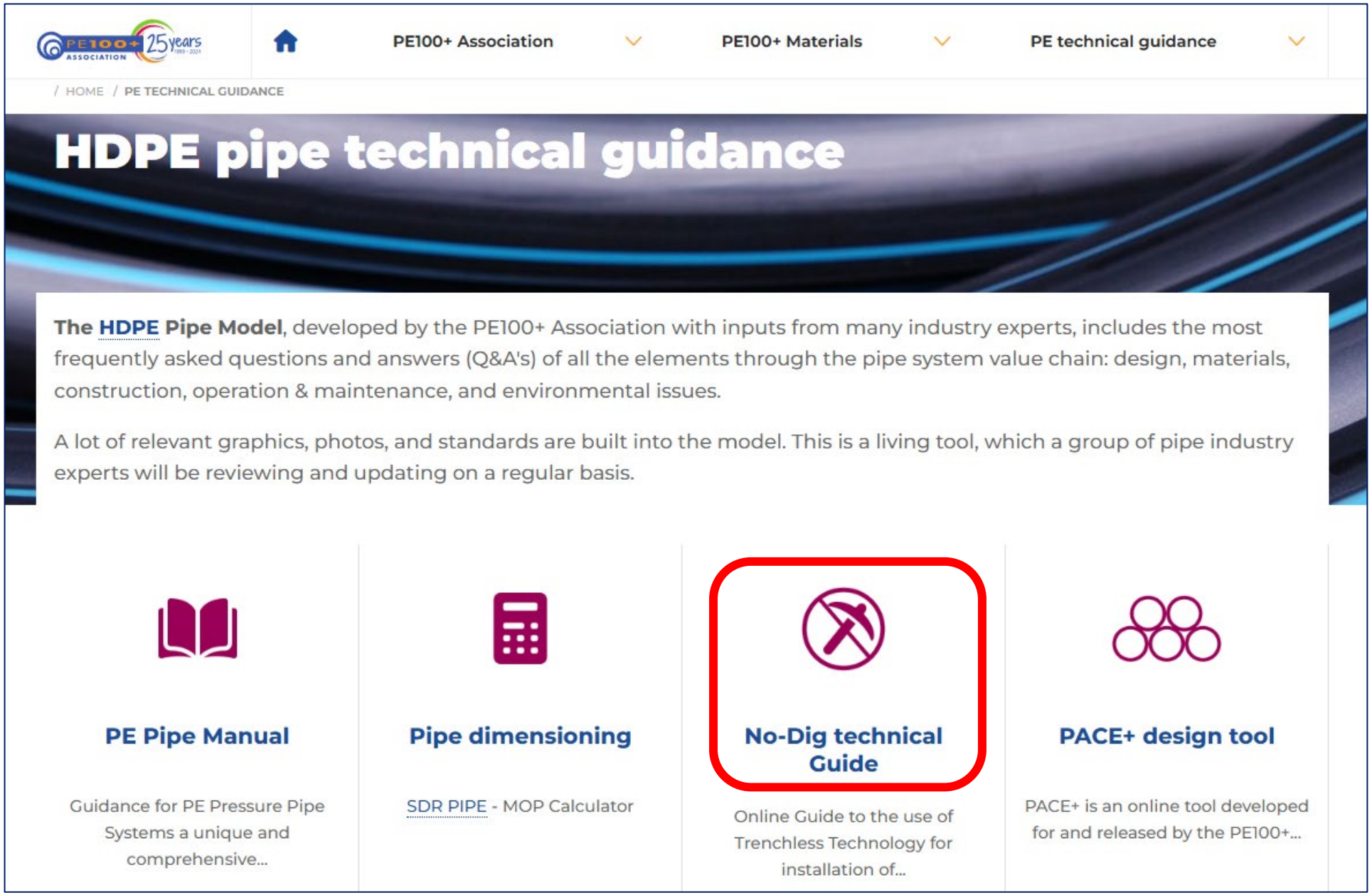
The pipeline rehabilitation techniques covered by the standards

EN ISO 11295 concerns techniques for the renovation of existing pipe systems

EN ISO 21225 concerns techniques for the trenchless replacement of existing and installation of new pipe systems



Introduction to the PE100+ Association No-Dig Guide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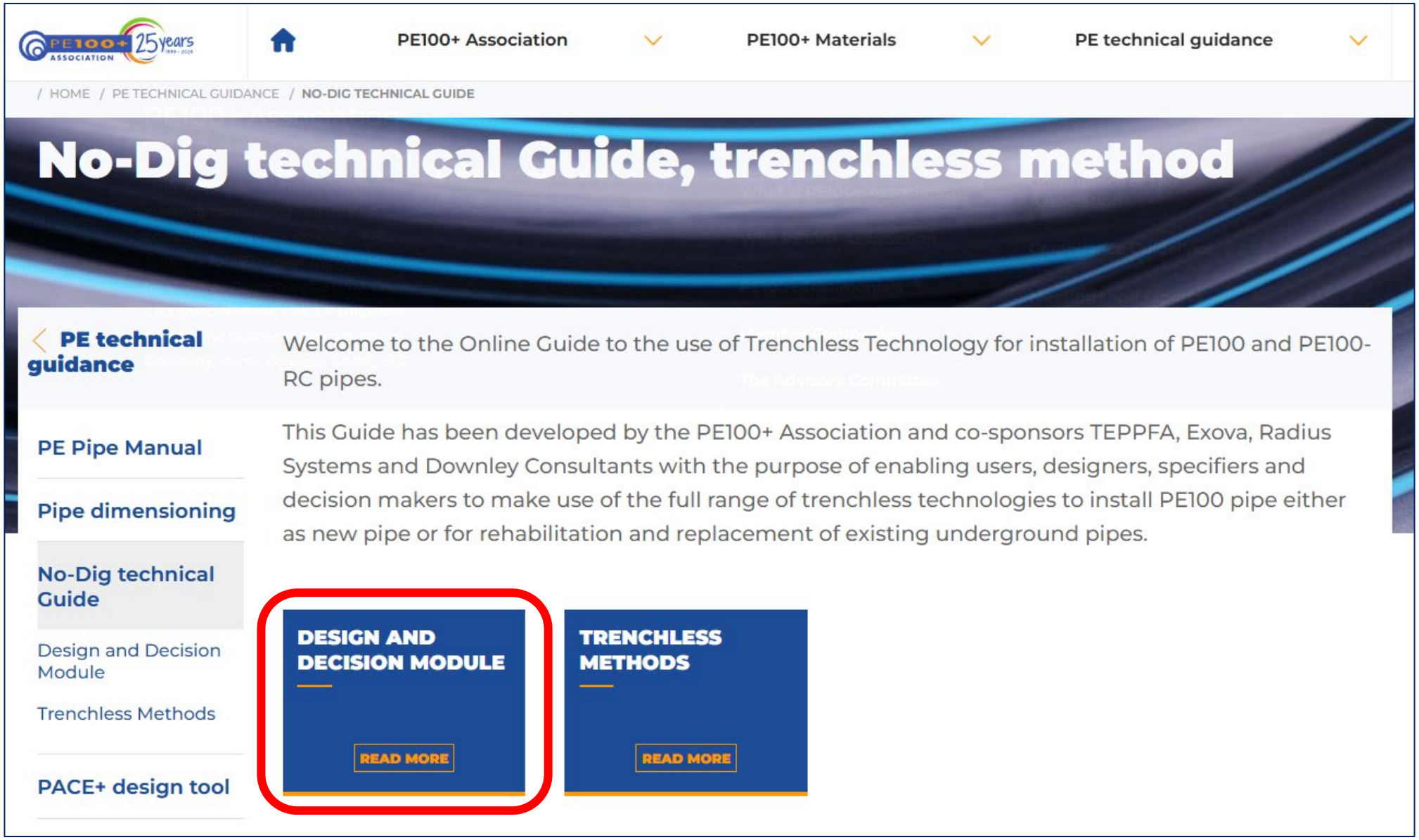
HDPE pipe technical guidance
The HDPE Pipe Model, developed by the PE100+ Association with inputs from many industry experts, includes the most frequently asked questions and answers (Q&A's) of all the elements through the pipe system value chain: design, materials, construction, operation & maintenance, and environmental issues.
A lot of relevant graphics, photos, and standards are built into the model. This is a living tool, which a group of pipe industry experts will be reviewing and updating on a regular basis.
PE Pipe Manual
Guidance for PE Pressure Pipe Systems a unique and comprehensive...
Pipe dimensioning
SDR PIPE - MOP Calculator
No-Dig technical Guide
Online Guide to the use of Trenchless Technology for installation of...
PACE+ design tool
PACE+ is an online tool developed for and released by the PE100+...

The 11 installation and rehabilitation methods covered by the PE100+ No-Dig Guide

11 Installation Methods	Water Mains	Gas Mains	Sewage		Cable Ducts
			Gravity	Pressure (Rising Mains)	
New installation with PE pipe	HDD Impact moling Mole ploughing	HDD Impact moling Mole ploughing	Pilot tube microtunnelling	HDD Impact moling Mole ploughing	HDD Impact moling Mole ploughing
Rehabilitation with PE pipe	Slip lining Close-fit lining Pipe bursting Pipe splitting Pipe extraction	Slip lining Close-fit lining Pipe bursting Pipe splitting Pipe extraction	Pipe bursting Pipe splitting Pipe reaming	Slip lining Close-fit lining Pipe bursting Pipe splitting Pipe extraction	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PE technical guidance
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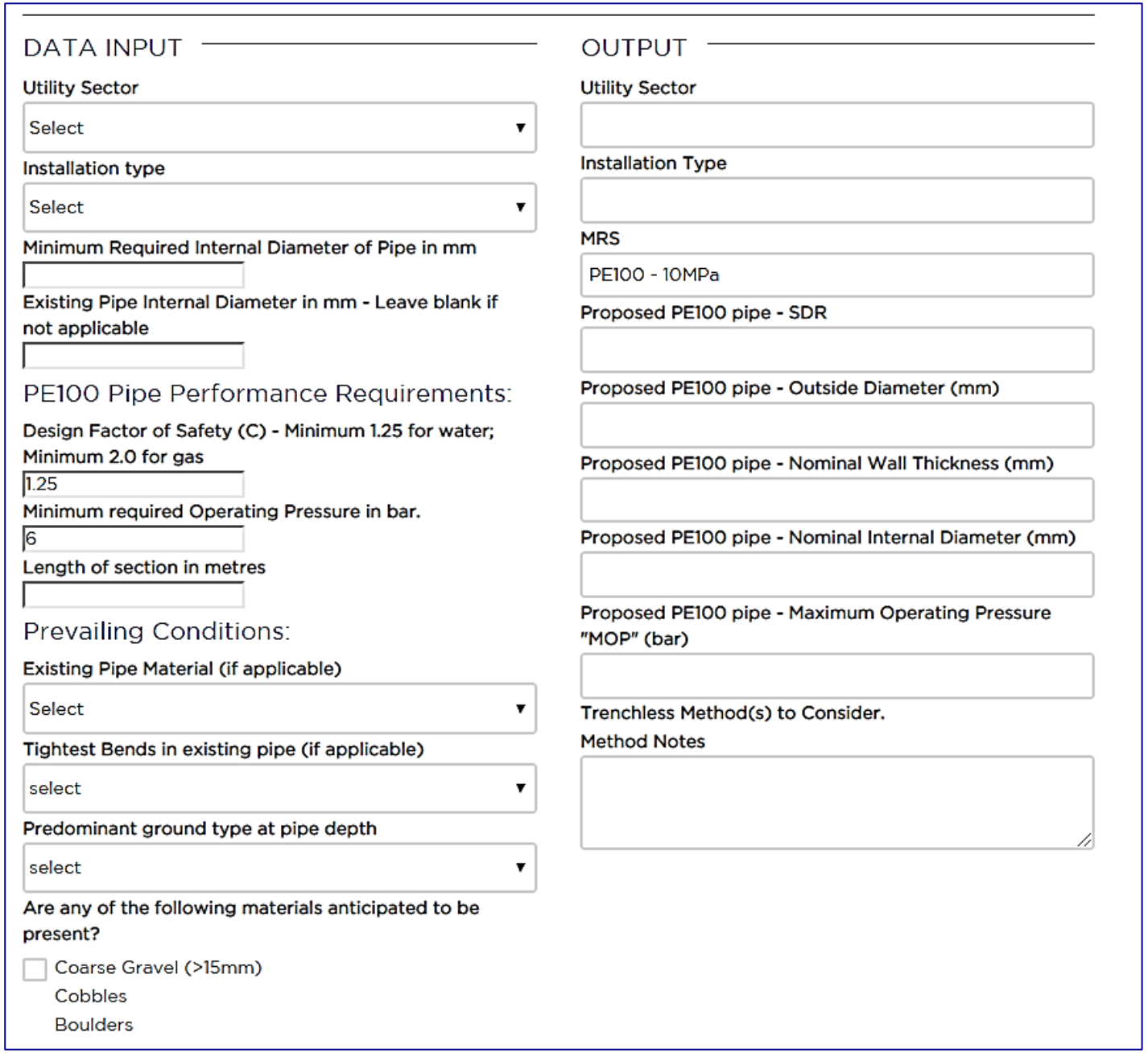
No-Dig technical Guide, trenchless method
PE technical guidance
Welcome to the Online Guide to the use of Trenchless Technology for installation of PE100 and PE100-RC pipes.
This Guide has been developed by the PE100+ Association and co-sponsors TEPPFA, Exova, Radius Systems and Downley Consultants with the purpose of enabling users, designers, specifiers and decision makers to make use of the full range of trenchless technologies to install PE100 pipe either as new pipe or for rehabilitation and replacement of existing underground pipes.
PE Pipe Manual
Pipe dimensioning
No-Dig technical Guide
Design and Decision Module
Trenchless Methods
PACE+ design tool
DESIGN AND DECISION MODULE
READ MORE
TRENCHLESS METHODS
READ MORE

Screen Shot from the Decision Module Page



DATA INPUT

Utility Sector

Select

Installation type

Select

Minimum Required Internal Diameter of Pipe in mm

Existing Pipe Internal Diameter in mm - Leave blank if not applicable

PE100 Pipe Performance Requirements:

Design Factor of Safety (C) - Minimum 1.25 for water; Minimum 2.0 for gas

1.25

Minimum required Operating Pressure in bar.

6

Length of section in metres

Prevailing Conditions:

Existing Pipe Material (if applicable)

Select

Tightest Bends in existing pipe (if applicable)

select

Predominant ground type at pipe depth

select

Are any of the following materials anticipated to be present?

Coarse Gravel (>15mm)

Cobbles

Boulders

OUTPUT

Utility Sector

Installation Type

MRS

PE100 - 10MPa

Proposed PE100 pipe - SDR

Proposed PE100 pipe - Outside Diameter (mm)

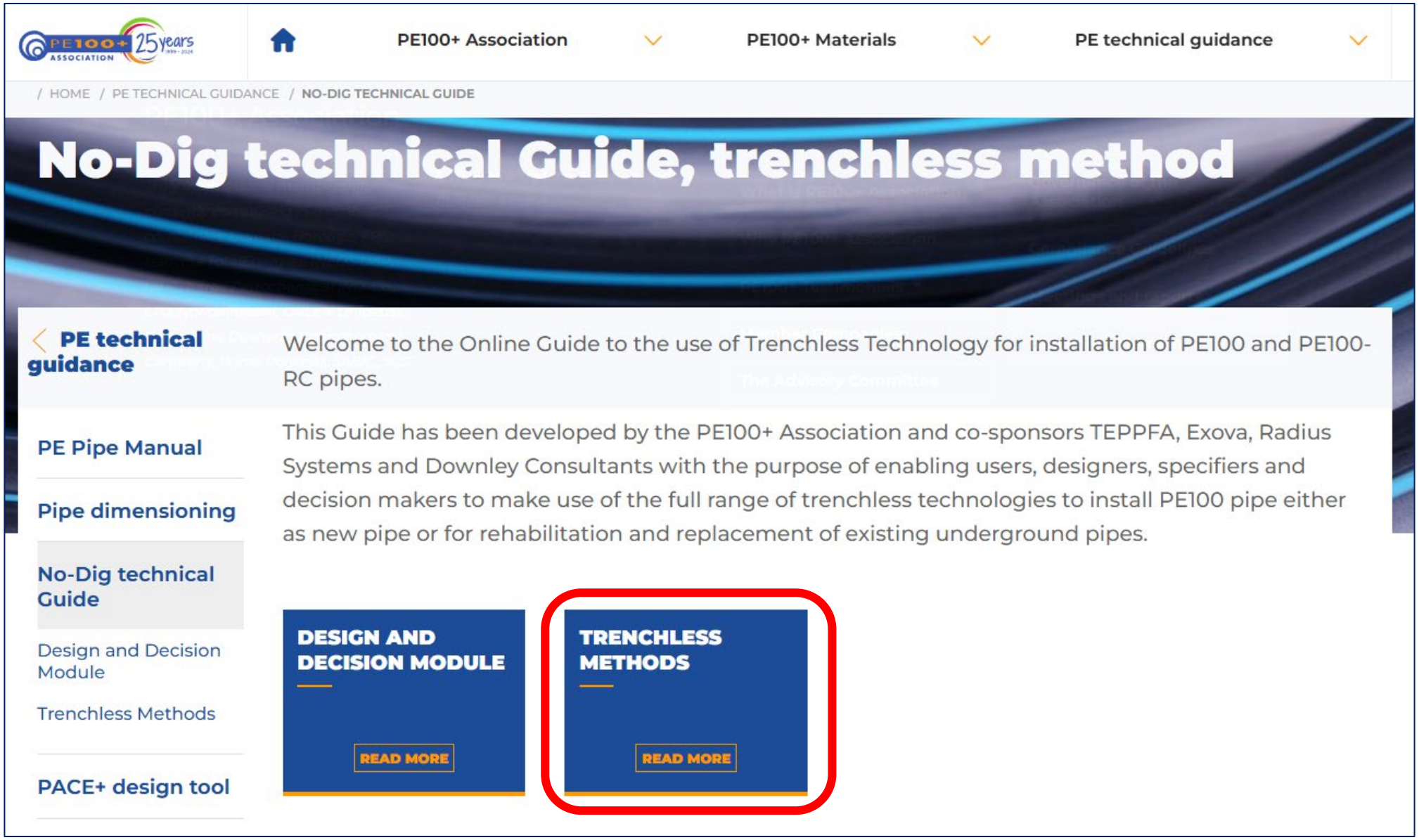
Proposed PE100 pipe - Nominal Wall Thickness (mm)

Proposed PE100 pipe - Nominal Internal Diameter (mm)

Proposed PE100 pipe - Maximum Operating Pressure "MOP" (bar)

Trenchless Method(s) to Consider.

Method Notes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DESIGN AND DECISION MODULE
READ MORE
TRENCHLESS METHODS
READ MORE

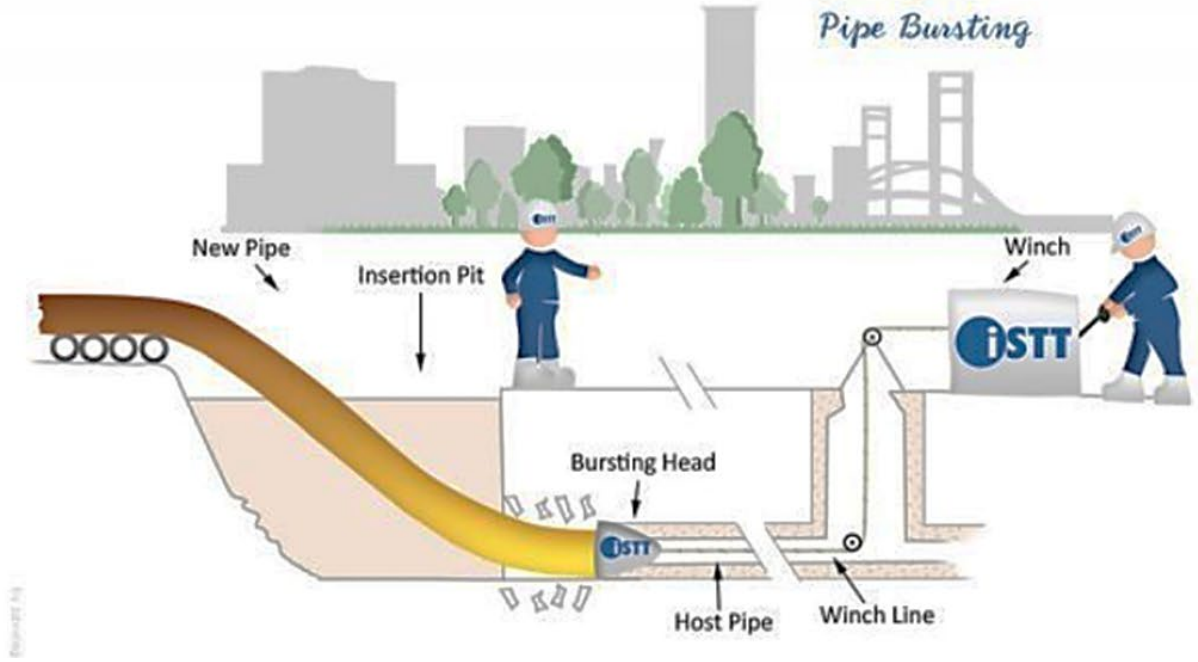
Typical information provided by the guide on each trenchless method

- General description of the method
- PE100 applications (gas/water mains, services, pumping mains)
- Installation procedures
- Equipment
- Practicalities – soil types, diameter, pressure and length ranges
- Excavations, space and access requirements
- Design, specification and planning
- Health, safety and environmental considerations
- Standards and Codes of Practice

Screen shot from the pipe bursting page of the No-Dig Guide

There are **three methods of pipe bursting**: pneumatic, hydraulic, and static pull. The difference between them is in the source of energy and the method of breaking the old pipe. Pneumatic and hydraulic methods use dynamic force to break the old pipe whereas static pull uses a constant pull force. The selection of a specific method depends on soil conditions, groundwater conditions, degree of upsizing required, type of new pipe, construction of the existing pipeline, depth of the pipeline and availability of experienced contractors with suitable equipment. Static pipe bursting has replaced pneumatic bursting as the most commonly used variant primarily because of the absence of shock waves generated by a dynamic burster, which can cause damage to adjacent buried utilities.

Pipe splitting is necessarily a static pull method.



Conclusions

Conclusions

- Using trenchless technology can provide project management benefits such as reducing construction costs and project implementation time when compared to open cut trenching.
- The right trenchless method can also reduce the carbon footprint of the installation and significantly reduce the impact on the surrounding environment, traffic and residents.
- System owners and designers undertaking a rehabilitation project should refer to EN ISO 11295 in their specification, so that all the parties refer to a common standard.
- Similarly, systems owners and designers undertaking a replacement or new installation project should refer to EN ISO 21225, if applicable.
- PE pipes and liners can be damaged during or after installation and this can initiate a Slow Crack Growth failure. It is recommended to use PE100-RC materials that are resistant to this failure mode and which are now covered in the EN PE pipe standards.
- A variety of techniques may be used in each situation, so refer to the PE100+ No-Dig Technical Guide. It's free to use, contains information aimed at system owners and designers and has been updated with the help of trenchless industry members.

THANK YOU

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