
TRELLEBORG
ELASTOPIPE™
The flexible
Piping System

This handbook is for internal use in Trelleborg Offshore only!

Owner of book:

……..

Date received:…….

This edition of Personal Handbook on the **ELASTOPIPE™** System was completed from the publisher June 2011.

A publication from www.indok.no, Kongsberg, Norway.

ELASTOPIPE™

Contents

1 INTRODUCTION

1.1 Purpose Of Manual

The purpose of this handbook is to provide installation guidance for the ELASTOPIPE™ System, as supplied by Trelleborg Offshore.

The handbook is intended to give the user sufficient technical information and data to be able to understand the functions and features of the ELASTOPIPE™ System, together with the necessary transport, handling, commissioning, maintenance and installation information.

2 GENERAL INFORMATION

2.1 Symbols and Conventions

The following words and symbols found throughout this manual mark special messages to alert the operator of specific information concerning of the PERSONNEL, the EQUIPMENT or the PROCESS.

The WARNING symbol draws attention to potential danger for personnel(including possible loss of life) and considerable damage to equipment

The CAUTION symbol draws attention to potential danger of damage to equipment

The NOTE symbol draws attention to additional clarifying infor mation or special instructions which are also crucial for equipment or to the instal lation performed.

The QUALITY symbol draws attention to operations where quality inspections must be performed

2.2 Safety Notes

The WARNING symbol as a Safety Note draws attention to installer's responsibility to identify any possible danger and take necessary precautions to avoid serious personal injury or equipment damage.

2.3 Abbreviations

Abbreviation	Explanation
mm	millimetres
"	inches
kg	kilogram
TM	Trade Mark

3 TECHNICAL DESCRIPTION

3.1 ELASTOPIPE™

ELASTOPIPE™ is made of synthetic rubber and replaces rigid steel, titanium and glass-fibre reinforced plastic piping.
All sleeves and tees for extensions are supplied in titanium.
ELASTOPIPE™ is a flexible piping system, which is easy and safe to fit, and has the following unique properties:

- No corrosion
- Jet fire resistant
- Impact resistant
- Minimizes water hammer effects
- Explosion resistant
- Frost resistant
- Maintenance free
- No welding or hot work necessary

These properties make **ELASTOPIPE™** ideal for the piping of deluge and sprinkler systems for offshore oil and gas installations, ships, industrial plants, buildings, mines, etc.

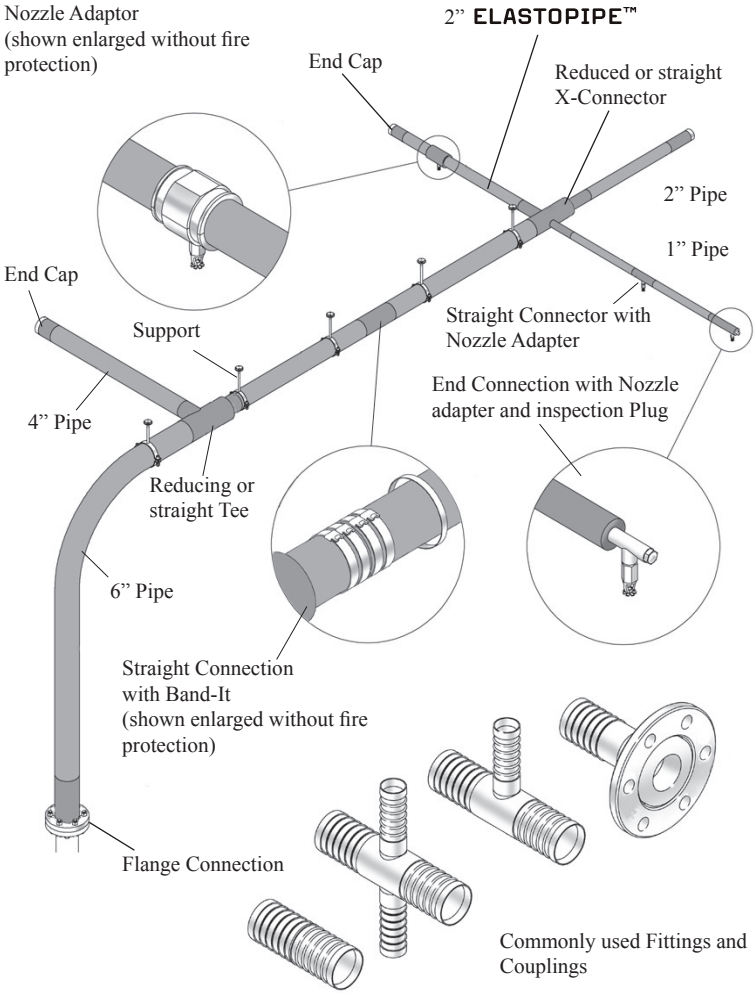
There are different ways to support **ELASTOPIPE™**

- UNO Channels
- Cable trays
- Duo Clamps (when using existing pipes for support)

ELASTOPIPE™ is a unique piping system and can therefore be put into use in a variety of unconventional surroundings where flexibility is necessary.

The **ELASTOPIPE™** system has many unique joint and connection solutions. Examples of an **ELASTOPIPE™** system with joints and connections are shown on the following page.

For detailed technical data, see the System Manual


Nozzle Adaptor
(shown enlarged without fire
protection)
2" ELASTOPIPE™
End Cap
Reduced or straight
X-Connector
2" Pipe
1" Pipe
End Cap
Straight Connector with
Nozzle Adapter
Support
End Connection with Nozzle
adapter and inspection Plug
4" Pipe
Reducing or
straight Tee
6" Pipe
Straight Connection
with Band-It
(shown enlarged without fire
protection)
Flange Connection
Commonly used Fittings and
Couplings

4 TRANSPORT AND HANDLING

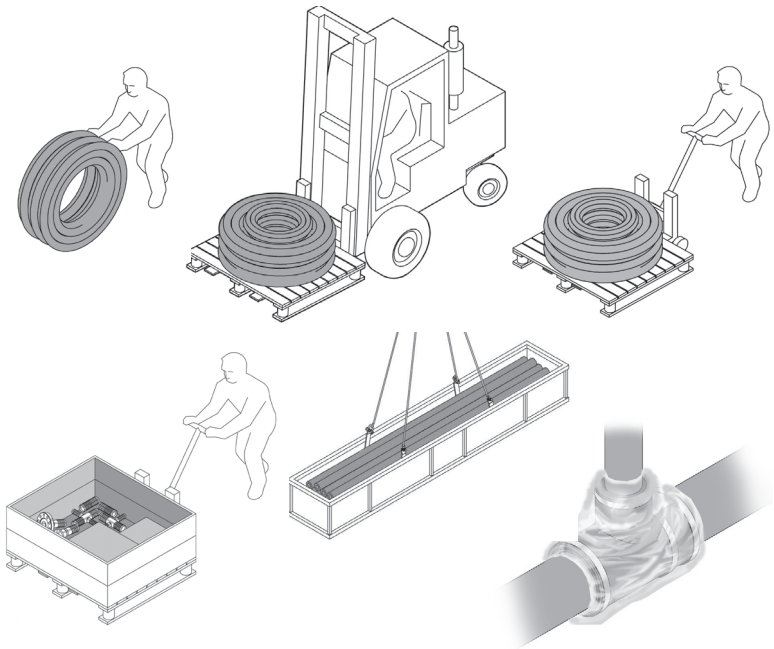
4.1 Transport

CAUTION

All titanium parts must be stored dry and NOT together with other materials

CAUTION

ELASTOPIPE™ can be bent to 5D, but avoid breaking and buckling



Fittings and mounting materials are transported and stored on pallets.

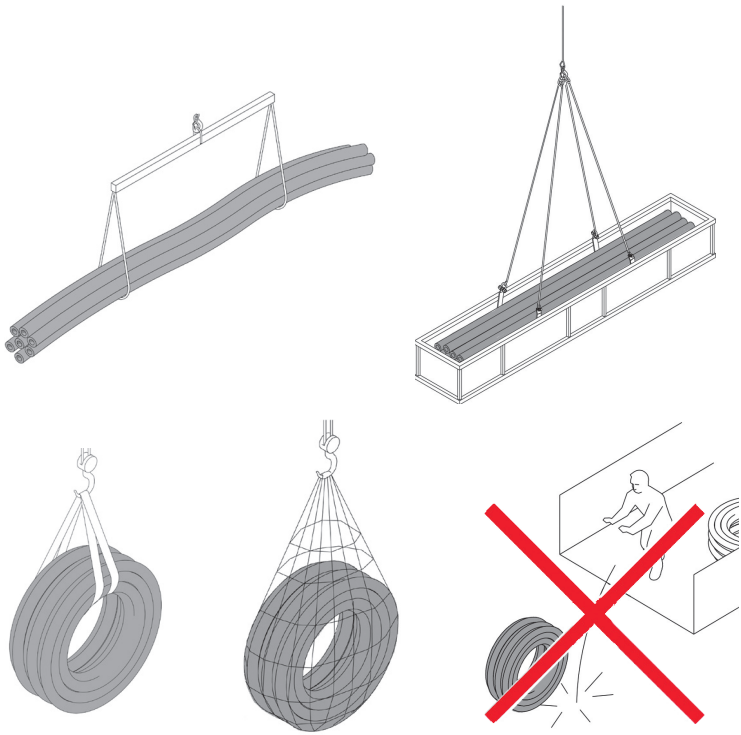
Preassembled **ELASTOPIPE™** *are transported and stored in baskets.*

The protection on preassembled fittings should be kept on during all transport and handling.

4.2 Handling

CAUTION

All lifting operations shall be done according to local lifting procedures, surveyed by certified operators

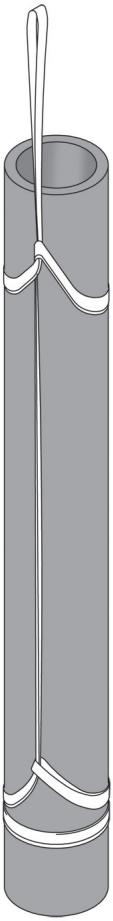


Both single pipes and bundles of pipes can be lifted positioned horizontally using soft slings.

CAUTION

Maximum distance between soft slings are 3 metres.

4.2.1 Lifting vertically positioned Pipes



Straps in the end of pipes can lift both single and bundles of pre-assembled pipes positioned vertically.

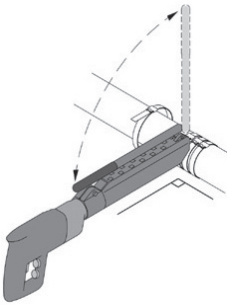
During lifting of vertically positioned pipes, the strap must be secured by lashing the strap around the pipes twice, and with double strapping.

5 PREPARATION AND INSTALLATION OF ELASTOPIPE™

5.1 Work Process

1. Briefing installation crew in actual project

2. Supporting methods,
Chapter 5.2

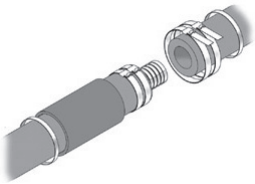


3. Cutting **ELASTOPIPE™**,
Chapter 5.3.1

4. Applying sealant,
Chapter 5.3.2

5. Preparation of passive fire protection,
Chapter 5.3.3.1

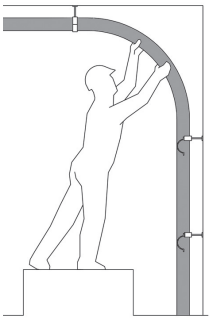
6. Installation of pipe fittings,
Chapter 5.3.3.2



7. Installing Band-It bands,
Chapter 5.3.3.5

8. Control
Chapter 5.3.3.5

9. Mounting ConNect Clamps
Chapter 5.3.3.6



10. Installation of nozzle clamps,
Chapter 5.3.3.3

11. Fitting ends to **ELASTOPIPE™**,
Chapter 5.3.3.4

12. Mounting **ELASTOPIPE™**,
Chapter 5.3.4

5.1.1 Unpacking and preparation

This section provides guidelines for unpacking and preparation of ELASTOPIPE™ once it has arrived at the installation site.

The following instructions apply when ELASTOPIPE™ is removed from its storage and transportation protection:

If possible, keep ELASTOPIPE™ in its packed condition prior to installation.

Packaging material is the customer's property and should be disposed of in an environmentally safe manner.

1. Remove the packing that covers ELASTOPIPE™.

The pipes are stable so there is no danger of uncontrolled movement during removal of packing materials.

2. Remove packing material from installation parts and tools.

Make sure that the content of the package tally with the packing list, which is included.

Conduct a thorough visual inspection of every component and tool. Be particularly aware of loose or broken components. Make sure that mechanical/electrical tools function as expected. Report any damage or discrepancies, enclosing a copy of the packing list.

ELASTOPIPE™ is made of flexible composite materials and can be installed in a different manner than other conventional piping systems. The pipes are not subject to thermal expansion so expansion loops are not necessary.

5.2 Support

NOTE

NO HOT WORK: Since all installation of ELASTOPIPE™ can be done without hot work, welding of supports should be avoided. Only installation requiring cold work are recommended.

NOTE

Support systems for both replacement of existing pipes and installation on new builds are included. For replacement work the reuse of existing support is favourable, and should be the preferred choice.

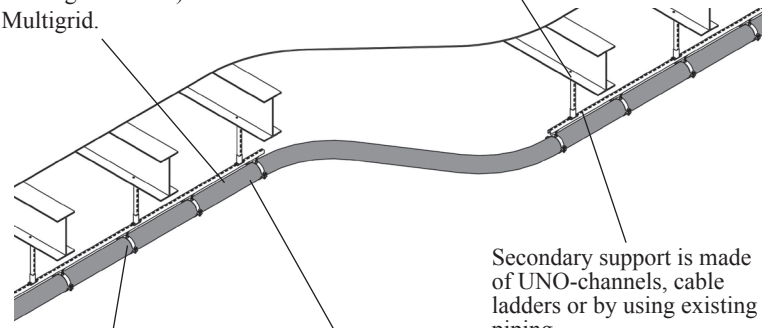
NOTE

To reduce the consumption of support materials, and to make installation in narrow areas easier, the use of support should be reduced to a minimum by fastening ELASTOPIPE™ directly to the structure or primary support

5.2.1 Definitions

Primary Support is defined as existing pipe supports, angle iron, UNO-channels (mainly for diagonal struts) or Multigrid.

Fastening to structural steel with beam clamps, bolts in drilled holes or direct fastening with nails or studs.



Secondary support is made of UNO-channels, cable ladders or by using existing piping.

ELASTOPIPE™

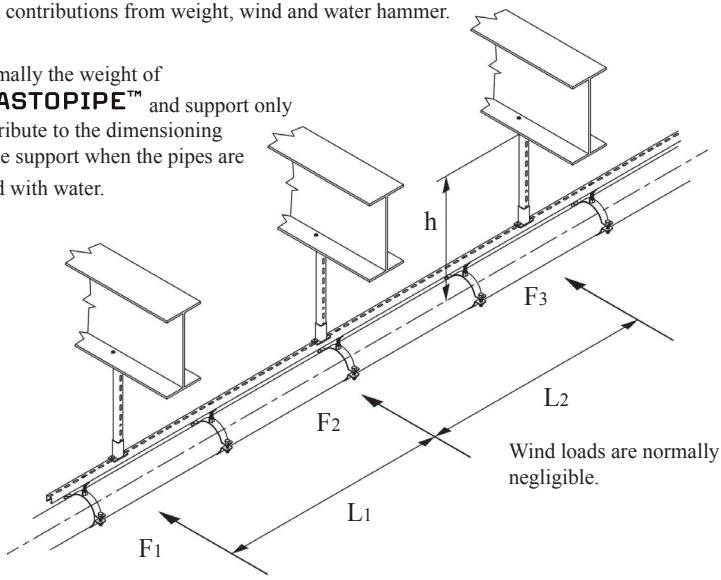
ELASTOPIPE™ is fastened to the secondary support with pipe rings, bow clamps, straps or Duo-clamps.

NOTE

ELASTOPIPE™ is flexible and the elastic material dampens the effect of explosion, impacts and water hammer.
The support should be designed to allow the dampening, but also to allow draining and avoid sagging.

In most cases explosion (transient) is the dimensioning load in support calculation. A typical Design Accidental Load (DAL) of 0,25 bar is normally dominating compared to the load contributions from weight, wind and water hammer.

Normally the weight of ELASTOPIPE™ and support only contribute to the dimensioning of the support when the pipes are filled with water.

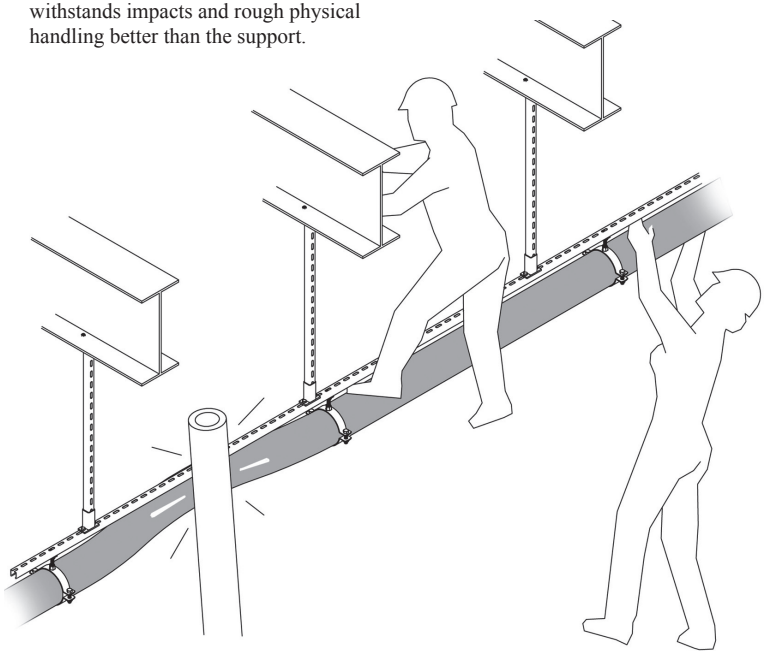


Wind loads are normally negligible.

An ELASTOPIPE™ installation shall have a nice, robust appearance without sagging and water pockets. The principle of free hanging pipe with minimum support to allow dampening often contradicts this.

Water hammer effects (transient) can be damaging to pipes and support, but are dampened considerably by ELASTOPIPE™.
The loads from water hammer effects are only considered in specific project and design cases.

Normally **ELASTOPIPE™** withstands impacts and rough physical handling better than the support.

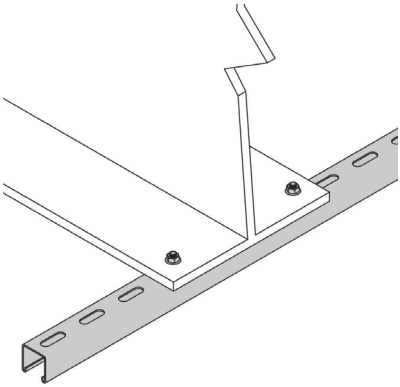


If climbing is performed in the area with **ELASTOPIPE™** installed, and any risk that the pipes may be stepped on or hanged in, the supports can be designed and installed to allow this without sagging.

5.2.3 Fastening to Structure

NOTE

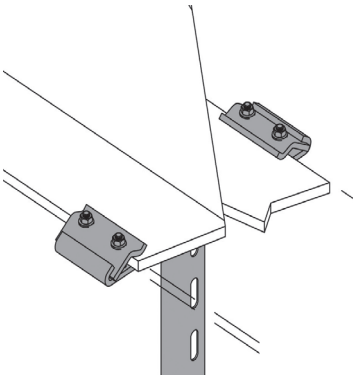
All installation of ELASTOPIPE™ can be made without hot work. Fastening methods which do not include welding or other hot work are recommended.



Using bolts are the common way to fasten ELASTOPIPE™ supports.
Bolts should always be secured.

Supports can also be fastened directly to structure with nails or studs.

Fastening should always
be made according to local requirements.



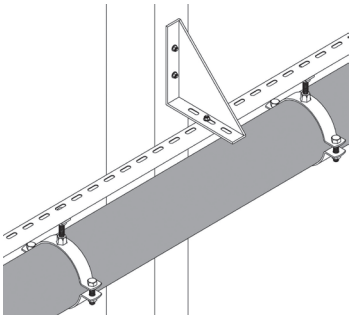
Fastening with beam clamps.

Beam clamps must always be secured against sliding and twisting by use of double bolts and clamps on both sides.

5.2.4 Primary Support

NOTE

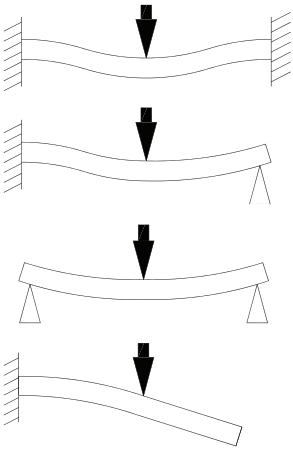
Traditional pipe supports made of angle iron are suitable as primary support for ELASTOPIPE™, but stainless systems (e.g. UNO channels) with standard prefabricated components are available and recommended.



In replacement projects it is recommended to use the existing support and bolt holes.

5.2.3.1 Design Models for UNO-profiles

- Fixed - Fixed
- Fixed - Hinged
- Hinged - Hinged
- Fixed - Free (Cantilever)



The distance between primary supports is depending on explosion loads. Ref. Chapter 7.

5.2.4 Primary Support, continued

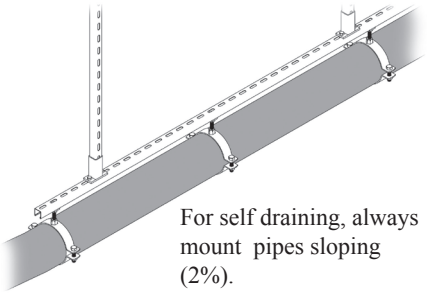
In order to compile the primary support the designer has to select the load from the secondary support onto the primary support, called Fx. The force (e.g. F1, F2, and F3 in 5.2.2) is either 2145 kg (single UNO profile) or 3831 kg (double UNO profile).
Then measure the height (h) from existing structural steel down to centre of **ELASTOPIPE™**.

The brackets can be used in the following configurations:

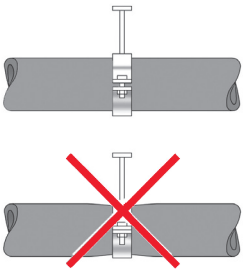
Table 5.1 Support Bracket Designs

Height (h) of primary support: (cantilever)	Load (Fx) on primary support (kg)						
	500	600	750	1000	1200	1500	3200
0-0.4 m 	K10-400-P SS						
0-0.4 m 	K10-400-P SS						
0-0.67 m 	K20-600-P SS						
0-0.67 m 	2 x K20-600-P SS						
0-0.93 m 	MG CH 100-3SS						
0-0.93 m 	2 x MG CH 100-3SS						
0-3.0 m	Compiled frame of UNO Channels To be designed and verified from case to case						

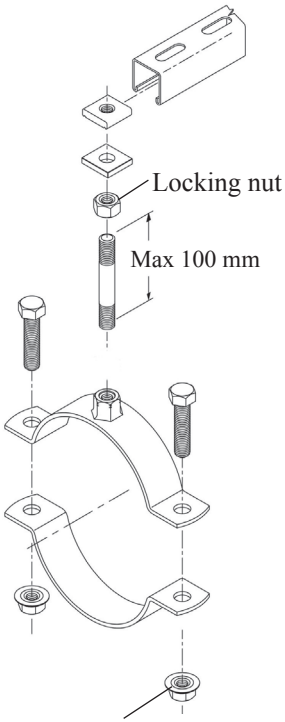
5.2.6 Secondary Support



For self draining, always mount pipes sloping (2%).



Do not tighten the clamp bolts more than necessary to obtain a firm grip around the pipe without deforming, and leaving a gap between the two clamp halves.

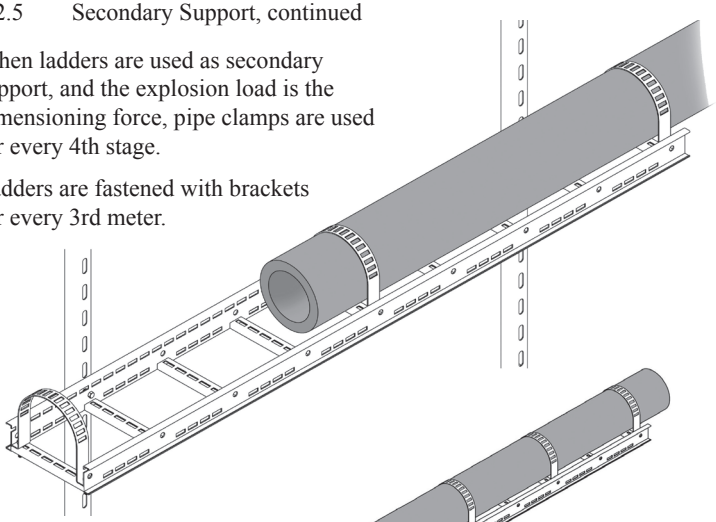


The clamp bolts must be secured with lock nuts.

5.2.5 Secondary Support, continued

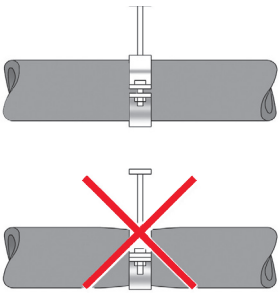
When ladders are used as secondary support, and the explosion load is the dimensioning force, pipe clamps are used for every 4th stage.

Ladders are fastened with brackets for every 3rd meter.

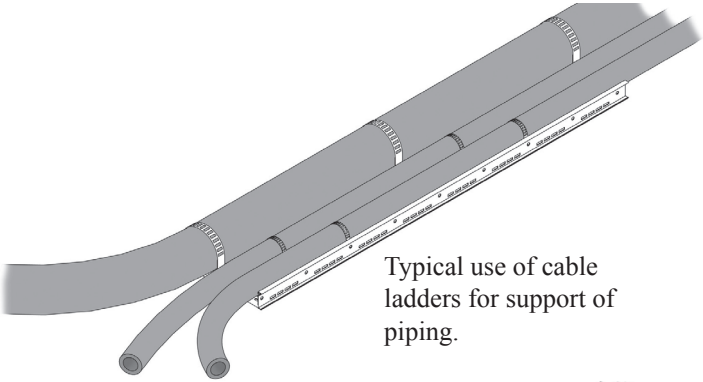


When the dimensioning force is stronger than the explosion load, i.e. loads from water hammer, clamps on every second stage of the ladder is recommended.

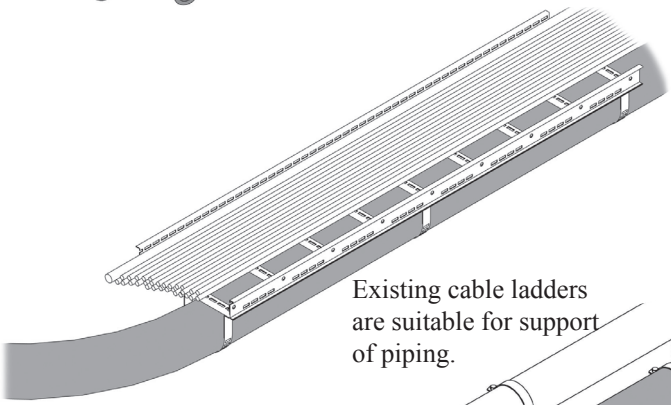
Around corners max distance between clamps should not exceed 1300 mm.



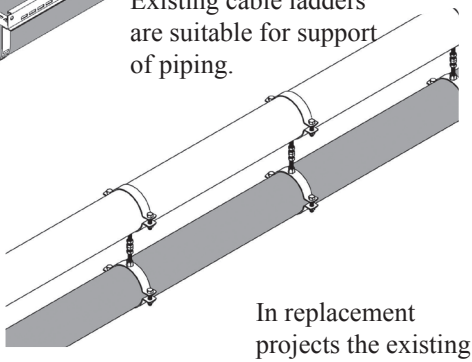
Do not tighten the clamp bolts more than necessary to obtain a firm grip around the pipe without deforming, and leaving a gap between the two clamp halves.



Typical use of cable ladders for support of piping.



Existing cable ladders are suitable for support of piping.



In replacement projects the existing pipe can be used as secondary support, and fastened with Duo-clamps.

5.3 Installing ELASTOPIPE™

5.3.1 Cutting ELASTOPIPE™

WARNING

Protective wear must be worn and safety precautions observed, as defined by the manufacturer of the cutting tool. Some of the methods shown below may require "Hot Work" permits.

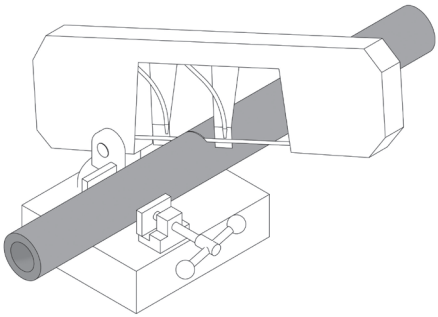
NOTE

A fine-toothed blade is always recommended for a clean cut.

5.3.1.1 Cutting using an air driven, slow moving band saw with water flushing

NOTE

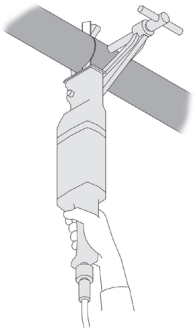
This method entails no risk of sparks.



5.3.1.2 Cutting using Tiger saw/Bayonet saw

CAUTION

This cutting method may cause sparks and must therefore only be performed in suitable areas. Will require a work permit for "Hot-Work".



Fasten the saw to the pipe with equipment suitable for the saw.

Let the saw work through the pipe without using excessive force.

The cut should be perpendicular to the pipe.

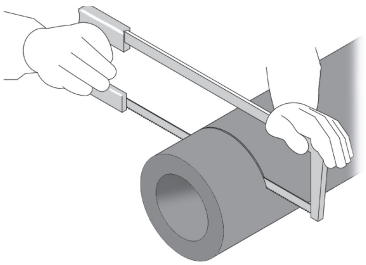
NOTE

This method is also suitable for cutting ELASTOPIPE™ in installed systems.

5.3.1.3 Cutting using a hacksaw

CAUTION

This cutting method may cause sparks and must therefore only be performed in suitable areas. Will require a work permit for "Hot-Work".



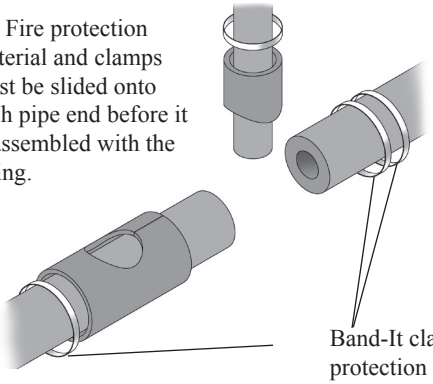
The cut should be perpendicular to the pipe

5.3.2 Jointing **ELASTOPIPE™**

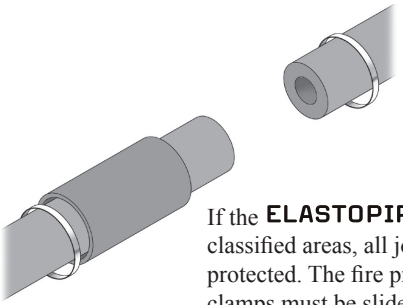
Equipment required:
- Pipe fitting
- Band-It band (quantity in accordance with the Band-It chart)
- Sealant (Superfix and fire sealant)
- Band-It machine
- Chain block
- Rubber mallet / fibre mallet

5.3.2.1 Preparation of passive Fire Protection for joints

All Fire protection material and clamps must be slided onto each pipe end before it is assembled with the fitting.



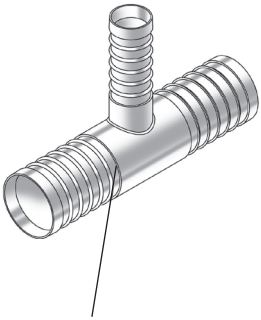
Band-It clamps for the fire protection material



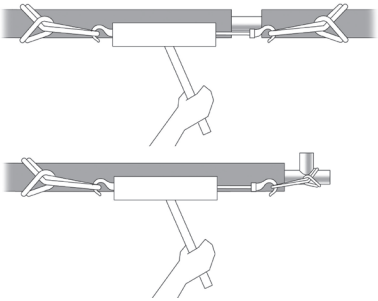
If the **ELASTOPIPE™** is used in classified areas, all joints must be fire protected. The fire protection material and clamps must be slided over one end of the pipe before the other end is assembled onto the joint connection.

NOTE

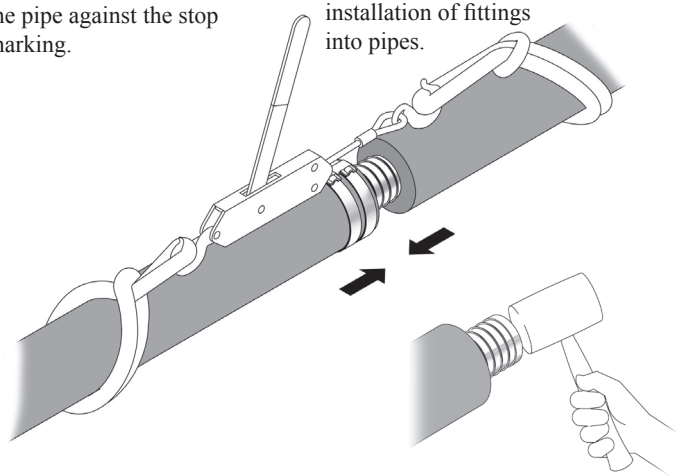
For cutting ELASTOPIPE™, see chapter 5.4.1.



Position the fitting into the pipe against the stop marking.



Use a chain block and slings to ease the installation of fittings into pipes.



NOTE

If it is difficult to insert the fitting use a rubber mallet or similar which will not damage the fitting.

CAUTION

Do not use metal tools.

Slide Band-It bands in correct number and suitable dimension according to the chart below onto the pipes.

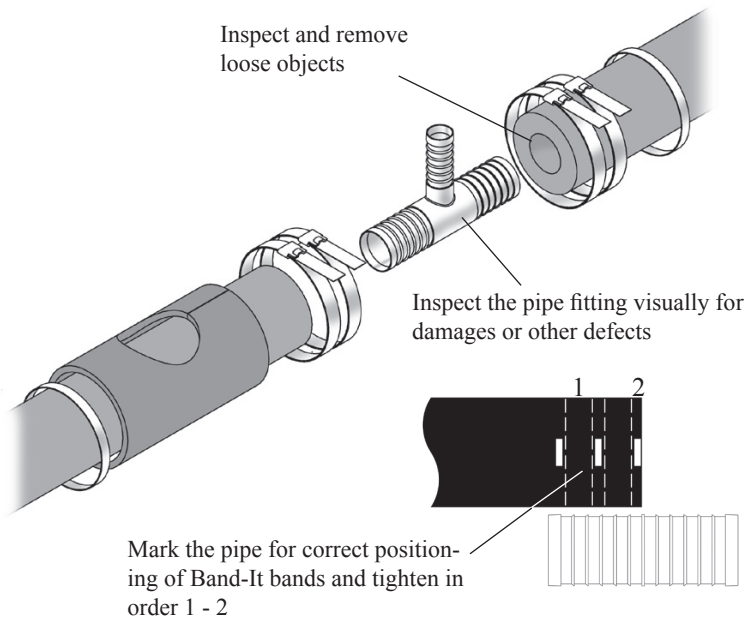


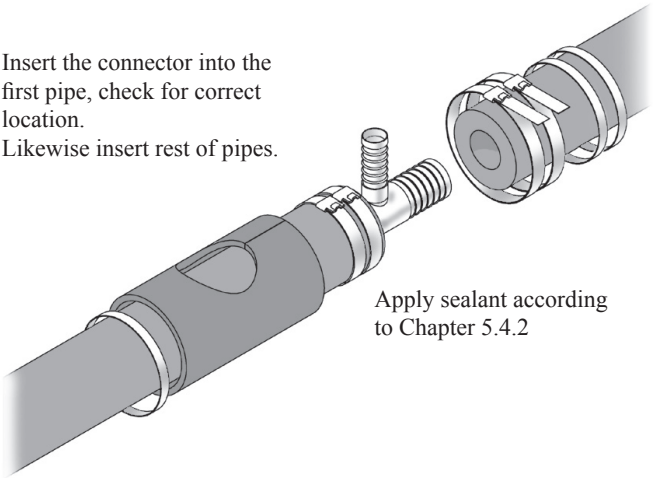
Table 5.2 Band-It Specifications

ELASTOPIPE™ dimension		Outside diameter	No. of Band-It bands per end	Type Band-It band
ID 25	1”	53 mm	2	ULC, 0,030”X3”
ID 40	1 ½”	68 mm	2	ULC, 0,030”X3”
ID 50	2”	78 mm	2	ULC, 0,030”X31/2”
*ID 75**	*3”*	*103.5 mm*	*3*	*ULC, 0,030”X41/2”*
*ID 100**	*4”*	*128.5 mm*		
*ID 150**	*6”*	*184 mm*		
*ID 200**	*8”*	*234 mm*		

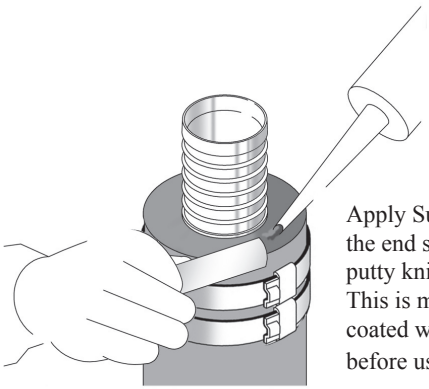
All dimensions use Band-It lock type INCONEL 625

* Dimensions marked in *“italic”* normally are secured with ConNect clamps not Band-It, refer to 5.3.2.5

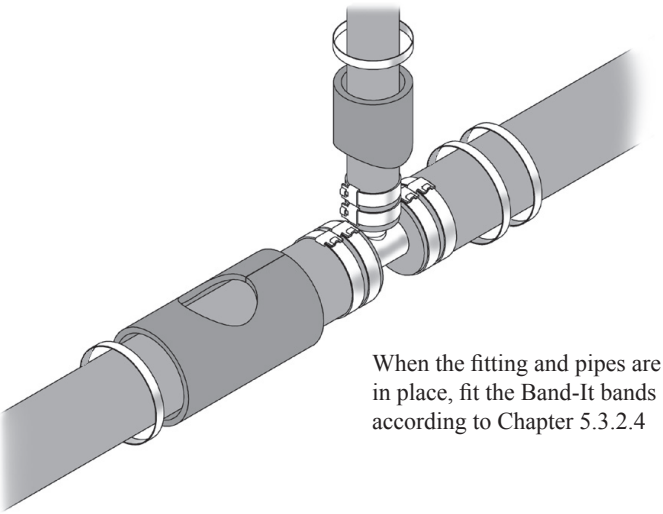
Insert the connector into the first pipe, check for correct location.
Likewise insert rest of pipes.



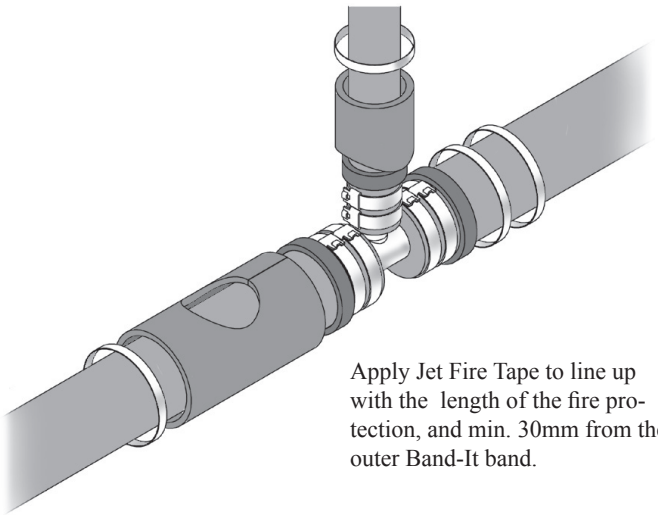
Apply sealant according to Chapter 5.4.2



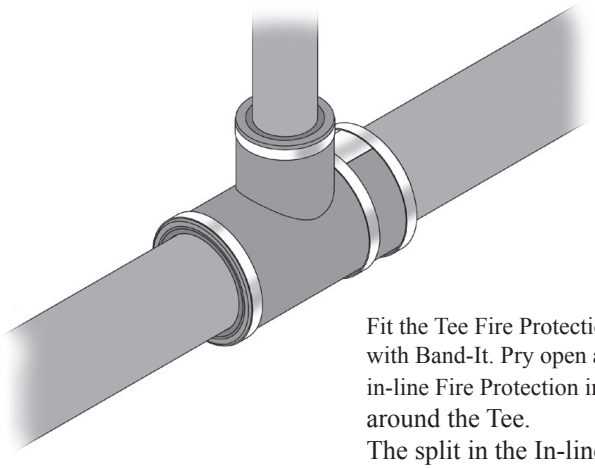
Apply Superfix sealant evenly to the end surfaces with the aid of a putty knife or similar.
This is made easier if the tool is coated with dishwashing soap before use.



When the fitting and pipes are in place, fit the Band-It bands according to Chapter 5.3.2.4



Apply Jet Fire Tape to line up with the length of the fire protection, and min. 30mm from the outer Band-It band.



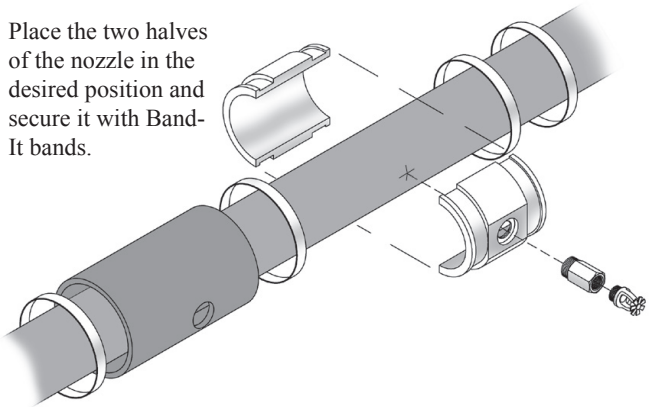
Fit the Tee Fire Protection and secure with Band-It. Pry open and slide the in-line Fire Protection in position around the Tee.
The split in the In-line Protection must be covered with a piece of Band-It band, secured with clamps.

Apply fire sealant to all joints

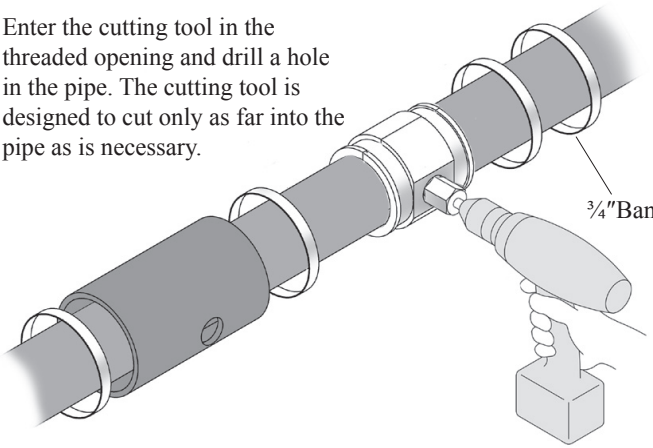
5.3.2.3 *Fitting a nozzle clamp on* ELASTOPIPE™

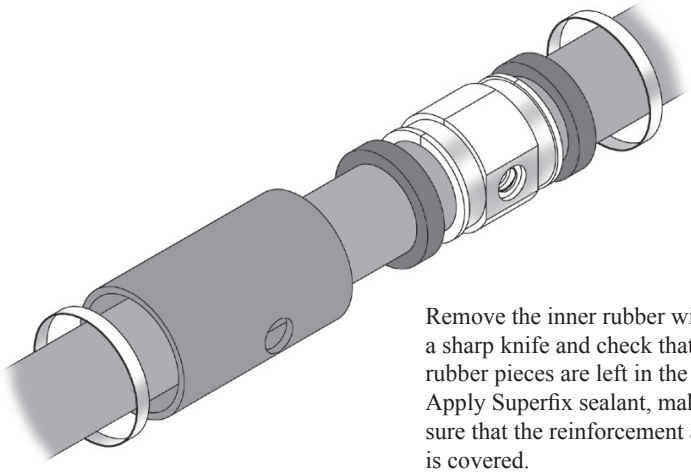
Equipment required:
- Cutting tool
- Nozzle clamp
- Loctite thread lock
- Band-It bands
  (quantity according to the Band-It chart)
- "Superfix" sealant (in the hole)
- Band-It machine UL 9000

Place the two halves of the nozzle in the desired position and secure it with Band-It bands.

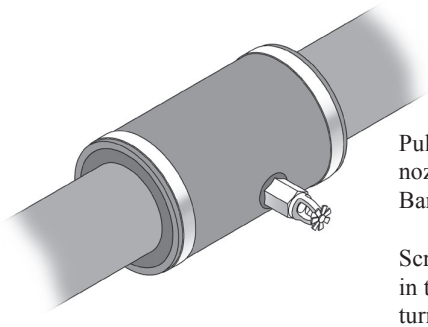


Enter the cutting tool in the threaded opening and drill a hole in the pipe. The cutting tool is designed to cut only as far into the pipe as is necessary.





Remove the inner rubber with a sharp knife and check that no rubber pieces are left in the pipe.
Apply Superfix sealant, making sure that the reinforcement area is covered.
Apply fire tape on each side of the nozzle mount.



Pull the fire protection over the nozzle clamp and fasten it with Band-It bands

Screw the nozzle into the hole in the clamp (hand¬tight + 1 ½ turn) and mount the nozzle.

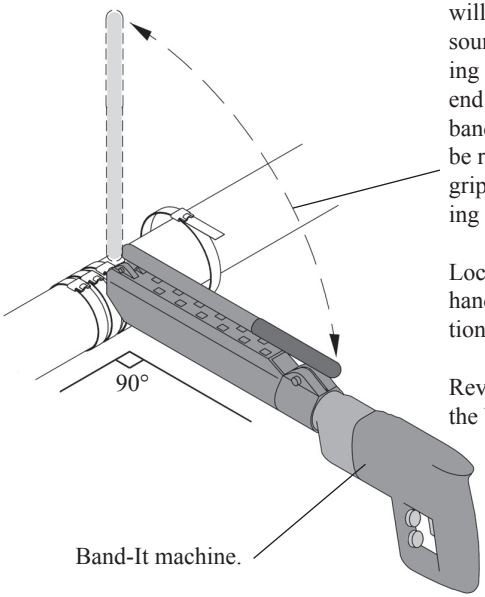
CAUTION

After installation, check the system according to chapter 5.5

WARNING

The following details are important and must be observed when fitting Band-It bands:

- **Location of bands according to the markings.**
- **The machine's angle in relation to the band.**
- **Sufficient space to operate the Band-It machine and the locking handle.**



Start the machine and the band will gradually tighten. A rattling sound indicates that the tightening mechanism has reached the end position, but not that the band is firm. The machine must be reversed to engage a new grip before any further tightening can be made.

Lock the band by pushing the handle up to the locking position.

Reverse the machine to release the band.

Keep settings to match the calibration certificate. Electrically and pneumatically operated machines have different and individual settings.

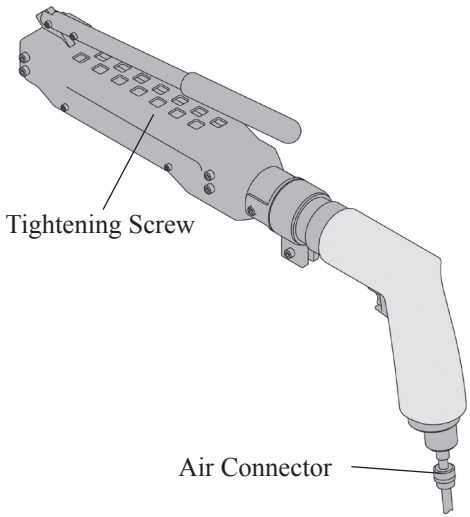
NOTE

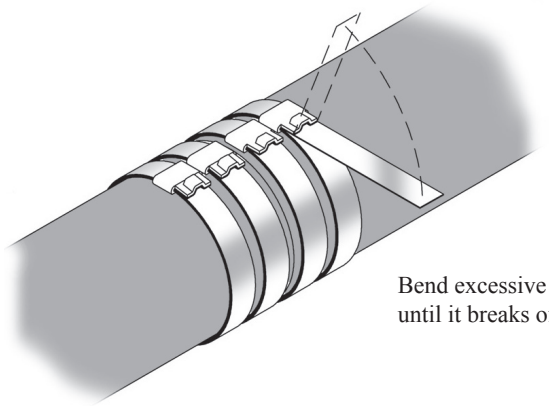
Please note the following when using pneumatically operated Band-It machine:

- Daily lubrication of the tool is necessary. Lubricate the thightening screw with molybdenum grease.
- Run the machine until it stops completely. Then release the clamp and repeat the process, making sure the clamp is tight.
- Trelleborg Viking must carry out all repair and calibration onshore.

Use of the pneumatic Band-It machine:

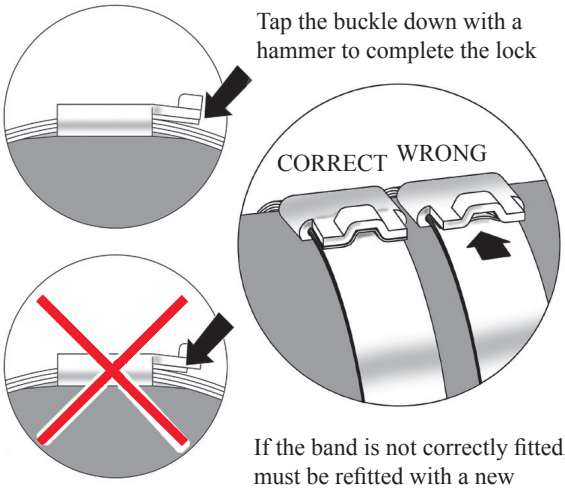
- Apply a few drops of oil in the pneumatic tool (via the air connector).
- The machine must only be used with an approved air regulator.
- The pressure setting must be set according to the machine's calibration certificate.Check the airpressure each time the machine is connected to compressed air.





Bend excessive end up and down until it breaks off

A correctly fitted Band-It should look as illustrated below. The band must follow the contour the lock, and must not slide back more than 1mm

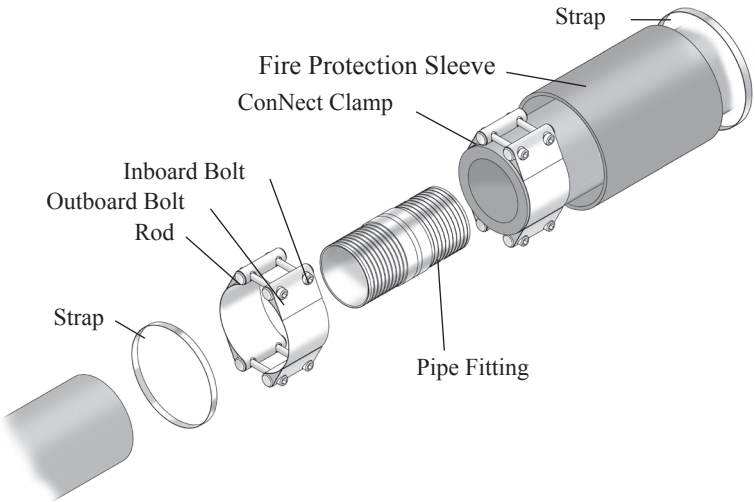


Tap the buckle down with a hammer to complete the lock

If the band is not correctly fitted, it must be refitted with a new

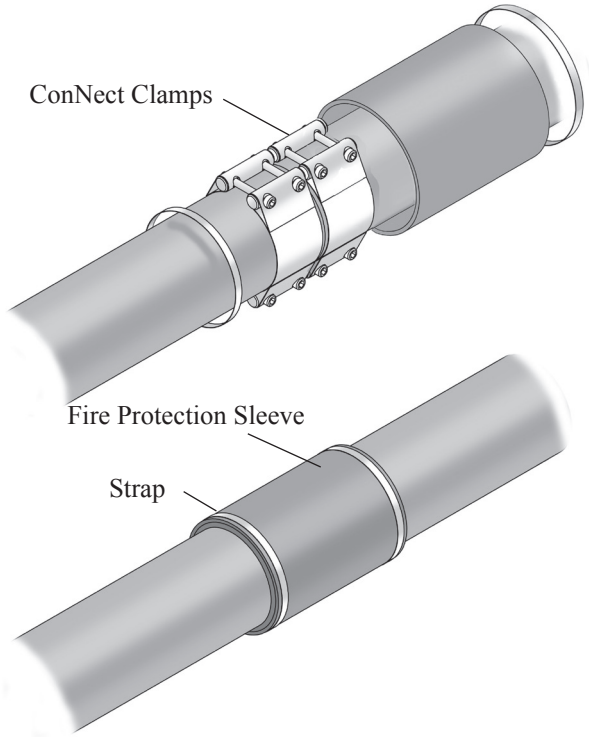
5.3.2.5 Mounting ConNect Clamps

Equipment required:
- Pipe Fitting
- ConNect Clamps
- Sealant (Superfix and fire sealant)
- Molycoat
- Torque Wrench



Installation sequence:

1. Slide the fire protection sleeve and the ConNect clamp onto the **ELASTOPIPE™** before the fitting is inserted.
2. Insert the fitting into the **ELASTOPIPE™** by hand, and push until the pipe contacts the stop ring on the fitting.
3. Lubricate the bolts and tighten sequencially to obtain a snug fit. The rods should be parallel, and the gaps should be equal on both sides, check by measuring.
4. Position the clamp.



5. Tighten the bolts sequencially to 50 % of the labeled torque. Each bolt maximum 2 turns at a time,using a torque wrench.

6. Tighten the inboard bolts to full labeled torque. Tighten the outboard bolts likewise.

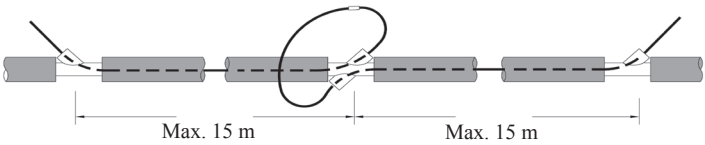
7. Slide the second ConNect clamp onto the other **ELASTOPIPE™** before it is mounted onto the fitting.

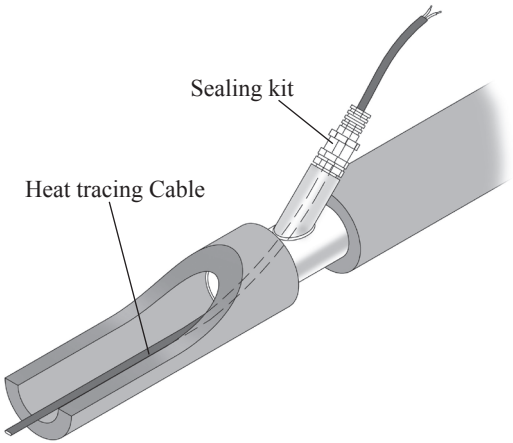
8. Position the second clamp in line with the first one, and repeat the steps 3 - 6.

9. Slide the fire protection sleeve over the clamps, fasten with straps and seal the exposed gaps with fire sealant compound.

5.3.2.6 Heat Tracing

1. In ELASTOPIPE™ the heat tracing cable is drawn inside the pipe, exposed to the medium.

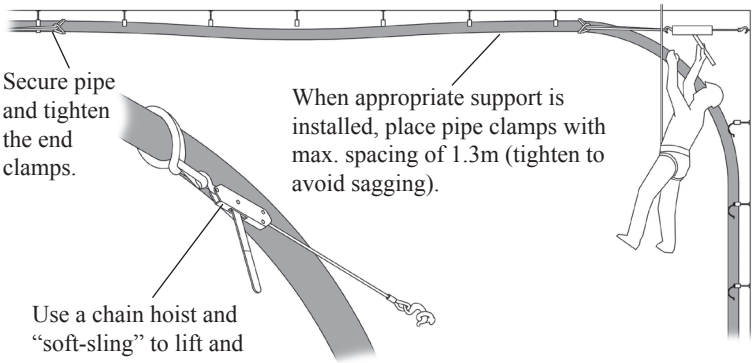


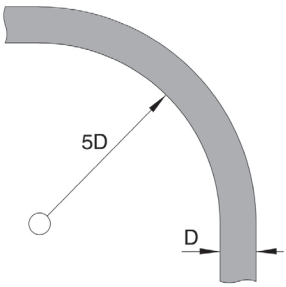


2. A flag line should be pulled through the pipe before connecting pipe and fittings to help installing the heat tracing cable.
Lubricate cable with soap before installation.
The cable must be pulled carefully from reel by two persons.
Termination seals are supplied in plastic bags together with a mounting instruction that should be followed thoroughly. The seal must be tightened firmly, without squeezing the teflon.

3. Install fire protection according to chapter 5.3.2.1

5.3.4 Mounting ELASTOPIPE™





Minimum bend radius for **ELASTOPIPE™** is 5D
See Table next page

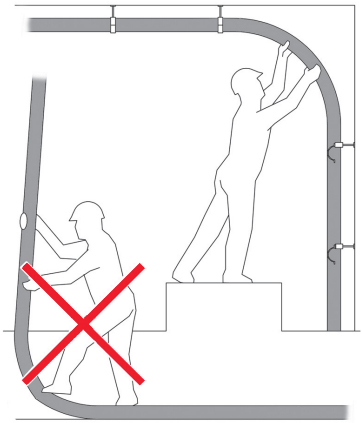


Table 5.3 ELASTOPIPE™ Dimensions

Tubing Dimension	D	Bending Radius	Weight
1” (ND25)	53 mm	265 mm	2,8 kg/m
1 1/2” (ND40)	68 mm	340 mm	3,5 kg/m
2” (ND50)	78 mm	390 mm	4,4 kg/m
3” (ND75)	103,5 mm	518 mm	6,6 kg/m
4” (ND100)	128,5 mm	643 mm	8,4 kg/m
6” (ND150)	184 mm	920 mm	15,0 kg/m
8” (ND200)	234 mm	1170 mm	20,0 kg/m

5.4 Checking

When the installation of the ELASTOPIPE™ system is completed, and before any mounting of fire protection, all supports, clamps and Band-It bands (locks, position and quantity) must be inspected by a Trelleborg Offshore supervisor.

Use a check list for the inspection.

Flushing, pressure testing and full scale testing may be required and faults must be rectified after the installation and testing procedure is completed.

Each ELASTOPIPE™ system/project will require a unique set of tests.

5.4.1 Pressure Testing

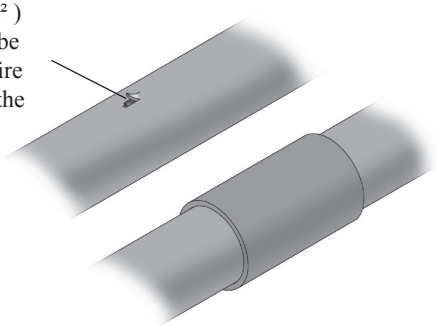
5.4.2 Full scale function testing

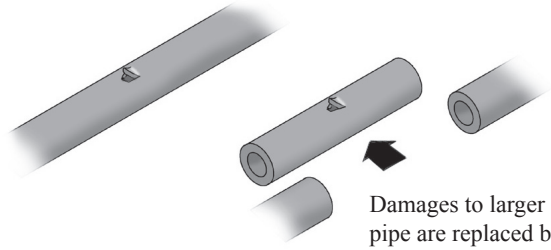
6 MAINTENANCE, REPAIRS AND MODIFICATION

ELASTOPIPE™ has an expected life time of more than 30 years without maintenance, but inspection of joints, nozzles, and end caps, etc. should be performed at regular intervals according to TV inspection procedure TV 89104-005.

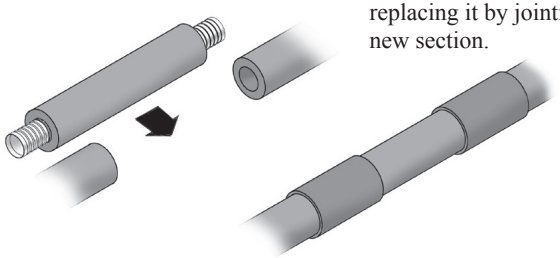
ELASTOPIPE™ is well suited for modification as it is an easy system to expand.

Minor damages (< 4 cm²) on the pipe surface can be repaired by applying a fire protection section over the damaged area.





Damages to larger areas of pipe are replaced by cutting out the damaged section and replacing it by jointing in a new section.



7 SUPPORT DEFINITIONS

7.1 Tables for 0,5 Barg Dynamic Explosion Load

7.1.1 Table of Max Span

Pipe dimension		1" ND25	1,5" ND40	2" ND50	3" ND75	4" ND100	6" ND150	8" ND200
Single UNO (Span mm)	Fixed - Fixed	4600	4000	3700	3000	2600		
	Hinged - Fixed	2700	2300	2100	1800	1500		
	Hinged - Hinged	1500	1300	1200	1000	800		
	Fixed - Free (cantilever)	300	300	300	200	200		
Double UNO (Span mm)	Fixed - Fixed	5700	5100	4800	4100	3600	3000	2600
	Hinged - Fixed	3300	3000	2400	2400	2100	1800	1500
	Hinged - Hinged	1900	1700	1300	1200	1200	1000	800
	Fixed - Free (cantilever)	400	400	300	300	300	200	200

7.1.2 Explosion Load on **ELASTOPIPE™**

Pipe dimension	1" (ND25)	1,5" (ND40)	2" (ND50)	3" (ND75)	4" (ND100)	6" (ND150)	8" (ND200)
Max span, secondary support, Single UNO (mm)	4600	4000	3700	3000	2600	- -	- -
Explosion load/ meter Single UNO (kg)	267	310	339	411	482	- -	- -
Max load on one span Single UNO (kg)	1230	1240	1253	1233	1254	- -	- -
Max span, secondary support, Double UNO (mm)	5700	5100	4800	4100	3600	3000	2600
Explosion load/ meter Double UNO (kg)	384	427	455	528	599	757	899
Max load on one span Double UNO (kg)	2189	2176	2185	2164	2156	2270	2337

Conclusion:

When using single UNO as secondary support the load onto the primary support is less than 1300 kg.

When using double UNO as secondary support the load onto the primary support is less than 2350 kg.

Trelleborg Offshore
P. O.Box A
N-3051 Mjøndalen
Norway

Tel.: +47 32 23 20 00
Fax: +47 32 23 22 00
Email: offshore.norway@trelleborg.com

www.trelleborg.com/offshore/no

www.elastopipe.com

Production: Industriell Dokumentasjon a.s - www.indok.no