

## **Specification for selection of field joint coating for buried pipelines**

### **1. Scope**

This specification describes the material, application, testing and inspection of field joint coating of Petroleum & Energy Infrastructures Ltd and Oil Products Pipeline Ltd (TASHAN) buried pipelines, including buried station piping.

Polyethylene/butyl rubber cold apply tapes shall be used for field joints of buried pipelines which do not exceed a maximum operating temperature of 50 °C.

Any deviation to the specified material and its characteristics, properties and performance shall be submitted by the contractor in written and requires the TASHAN's approval.

### **2. Pre-requisites from technicians before application**

Anyone who implements the cold apply tapes shall be instructed by the manufacturer and will present to TASHAN a document proving that he has undergone the training.

### **3. Requirements for butyl rubber tape material**

Tapes or tape systems according to EN 12068, class C 50 shall be used exclusively.

The structure described in the following section shall be chosen as standard for the coating.

Primer and an inner and outer tape with an asymmetrically structured PE tape (PE layer coated on both sides with butyl rubber) shall be applied. The inner and outer tapes shall be spirally wrapped with 50% overlap, equivalent to two layers each. To facilitate correct application the inner butyl layer should be different in colour to the outer butyl layer. The tape must be fully self-amalgamating between the layers and at overlaps and must have release paper or film. The tape width shall be  $\leq 100$  mm.

**The total system thickness shall be 3.4 mm after application.**

## Inner and outer tape

### Inner tape Structure

Type of carrier film	PE, stabilized
Type of adhesive	butyl rubber based
Total thickness (ASTM D-1000)	≥ 1.2 mm
Thickness carrier film	approx. 0.14 mm
Thickness inner adhesive layer	approx. 1.00 mm
Thickness outer adhesive layer	approx. 0.06 mm

### Inner tape Properties

Elongation at break (EN 12068)	≥ 450 %
Tensile strength (EN 12068, 23 °C)	≥ 40 N/cm
Aging resistance	According to EN 12068

### Outer tape Structure

Type of carrier film	PE, stabilized
Type of adhesive	butyl rubber based

Total thickness (ASTM D-1000)  $\geq 0.5$  mm

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**Denso**  
LEADERS IN CORROSION PREVENTION

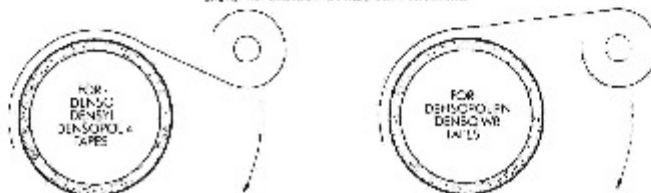
**DENSO PETROLATUM TAPES**  
DENSO TAPE, DENSO LT TAPE, DENSYL TAPES,  
DENSOPOL 4 TAPE, DENSOPOL PN TAPE,  
DENSO WB TAPE

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## INSTRUCTIONS FOR USE

- USE:** For the protection of pipes, fittings and similar structures from corrosion above ground, buried or immersed. To protect the metal structure from the environment the tapes must cover the entire surface.
- SURFACE PREPARATION:** Surfaces must be clean and dry. Remove all loose rust, scale and flaking coatings by scraping, wire brushing or blast cleaning.
- PRIMING:** For small diameter pipes and fittings (e.g. service pipes) apply DENSO PASTE by gloved hand in a thin layer over the entire surface including threads, crevices and pitted areas. For larger areas, brush DENSO PRIMING SOLUTION over the entire area.

SKETCH OF CORRECT APPLICATION PROCEDURE



### APPLICATION:

#### (a) Pipes, Rods and Cables:

Select as wide a width of tape as practical, e.g. 75mm wide for 75mm diameter pipe. For buried or immersed applications apply tapes with 55% overlap to give double thickness.

For above ground use overlap tapes by 15mm for widths up to 150mm and 25mm for wider tapes. Press the end of the tape firmly onto the pipe and unroll the tape around the pipe spirally, overlapping itself (see diagram). Apply sufficient tension to conform the tape to the surface without gaps. Do not overstretch. Start a new roll by overlapping the ends by one tape width. Press down all folds and smooth the entire area with special attention to overlaps.

#### (b) Butt Welded Joints:

As (a) but apply one circumferential turn around the pipe with half the tape width covering the existing pipe coating and half on the bare joint area. Continue to apply the tape spirally with 55% overlap across the joint area until it overlaps the existing pipe coating by half its width. Complete the wrapping with one circumferential turn.

#### (c) Elbows, Tees, Flanges etc.

Carefully bandage the fitting, pressing down folds and avoiding air gaps. Cover the whole fitting with at least two layers continuing onto the pipe coating either side. At large changes of diameter, bolts and internal angles, make the profile more suitable for wrapping by applying DENSYL MASTIC as a filler at angles and around bolts. Wrap the profiled joint as above ensuring the tape does not bridge gaps.

#### (d) Coating Repairs:

Cut away and remove loose coating from the damaged area and smooth or chamfer edges. Prime the exposed metal. For thick coatings, build up the depression with patches of tape or DENSYL MASTIC. Wrap the section of pipe as (a) continuing at least 50mm either side of the damaged area.



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Thickness carrier film approx. 0.28 mm  
Thickness inner adhesive layer approx. 0.16 mm

Thickness outer adhesive layer                      approx. 0.06 mm

**Outer** tape Properties

Elongation at break (EN 12068)                       $\geq 600 \%$

Tensile strength (EN 12068, 23°C)                       $\geq 100 \text{ N/cm}$

Aging resistance    According to EN 12068

Cathodic Disbanding of all the coating system shall be                       $\leq 6 \text{ mm}$

#### **4. Application of field coating**

The tapes width shall be limited to 100 mm, if coating machine shall be used.

Manual application of tape materials shall be only by tapes with 50 mm width.

In addition to the requirements of this specification, the manufacturer's specifications shall be observed.

##### **4.1. Surface preparation**

Pipes or fittings must be cleaned (includes mill-scale) on site by grid blasting prior to field coating according to standard surface grade Sa 2<sup>1/2</sup> in line with ISO 12944-4. Dirt and rust must be thoroughly removed from the steel surface using a wire brush (manually, pneumatically or electrically operated). It shall be ensured that the steel surface is shiny and roughened but not polished whilst brushing.

Roughness shall be  $\geq 40 \mu\text{m}$ .

Edges of the adjoining factory coating must not be loose or under-rusted. Where appropriate, such parts are to be removed until total adhesion can be provided.

In the event that the weld is heated after the adjoining factory coating has been roughened, it must then be ensured that the roughness will be kept maintained.

It shall be ensured that the whole area to be coated is dry.

##### **4.2. Prime coating**

The thickness of the prime coating to be applied shall be determined in line with the manufacturer's specifications.

Prior to the prime coating, the field coating area shall be dried. The primer shall then be applied to the complete field-coated area using either a brush or a roller. Prior to further work being undertaken, the primer shall be ventilated at least five minutes depending on the external temperature. After priming, the coating has to be applied within a period of eight hours. Moistening of primer has to be avoided.

##### **4.3. Application**

All areas which may be subject to cavity formation should be filled with butyl rubber.

The PE tape shall be tightly wrapped helically with a min. 50% overlap (inner layer). A second layer of PE tape shall be wrapped with a 50% overlap in the same direction (as with the inner layer), so that the inner layer is completely covered (by the outer layer). The first and the last wrapping of the inner and outer layer of the PE tape as well as all new outer layers shall be concealed, i.e. concentrically without any offset.

## **5. Directives for usage of protective rock shields**

When laying field-coated piping, it should be ensured that such piping is only laid in fine-grained sand.

If the pipe coating is also subject to mechanical stress, polypropylene non-woven fabric-based protective rock shields shall be used. The weight/area value shall be min. 1000 g/m<sup>2</sup>. This shield should extend beyond at least 10 cm around the circumference and the longitudinal direction in the area to be post-coated. The overlap must point towards the pipe base so that, when backfilling, no pockets develop.

## **6. Inspections**

All field coatings shall be inspected as detailed below.

Additional inspections certificates according to the manufacturer's specifications and in line with EN 12068 may be demanded by TASHAN.

### **6.1. Visual testing**

The field coating shall be visually inspected. There must be neither lumps, pleats nor loose or projecting parts of the tapes, nor tangible cavities in the weld area and the interfaces to the factory coating.

### **6.2. Holiday detection**

The completed field coating shall then be subjected to holiday detection. The test voltage shall be 5 kV +5 kV per mm of layer thickness to max. 25 kV. There must be no coating breakdown during holiday detection.

6.3. Peeling resistance

The peeling resistance shall be determined at least one per kilometer, and the resistance of the testing strip must be at least 30 N/cm with a peeling rate of 100 mm/min. Peeled coating areas shall be repaired according to the manufacturer's specification.

6.4. Layer thickness test

For the complete field coating system, the minimum layer thickness, according to the manufacturer's specifications, shall be measured on request using a non-destructive layer thickness detector.

7. **Documentation**

All the tests shall be documented. Documents shall be regularly submitted for TASHAN's approval during construction phase.

8. **Exceptional cases**

Exceptional cases may occur at underground valve stations with small diameter pipe fittings.

Here the following materials may be used for the coating of small T-pieces, bends and weldolets, upon TASHAN's approval.

EN 10289 - External liquid applied epoxy and epoxy-modified coatings

EN 10290 - External liquid applied polyurethane and polyurethane-modified coatings