CANUSA-CPS

A SHAWCOR COMPANY

Field Joint Protection for Pipelines used in Horizontal Directional Drilling (HDD)

For More Information, Contact:

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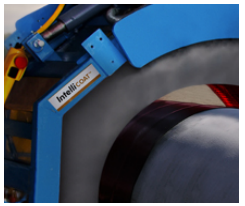
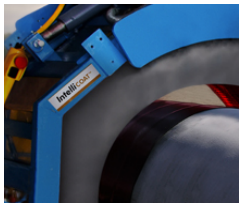
Overview



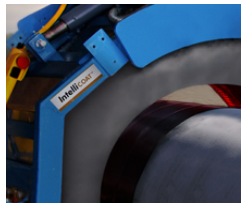
- Canusa-CPS, A Global Leader
- Corrosion Protection for Field Joints
- Effects of HDD on Field Joints
- DDX System to Mitigate Effects
- Benefits of DDX
- Important tests
- Recommendations

Canusa-CPS – The Global Leader



Global ranking in field-applied coatings and services	#1
Headquarters in	Canada
Countries actively selling in	> 60
Manufacturing and service facilities worldwide	18
Employees worldwide	350

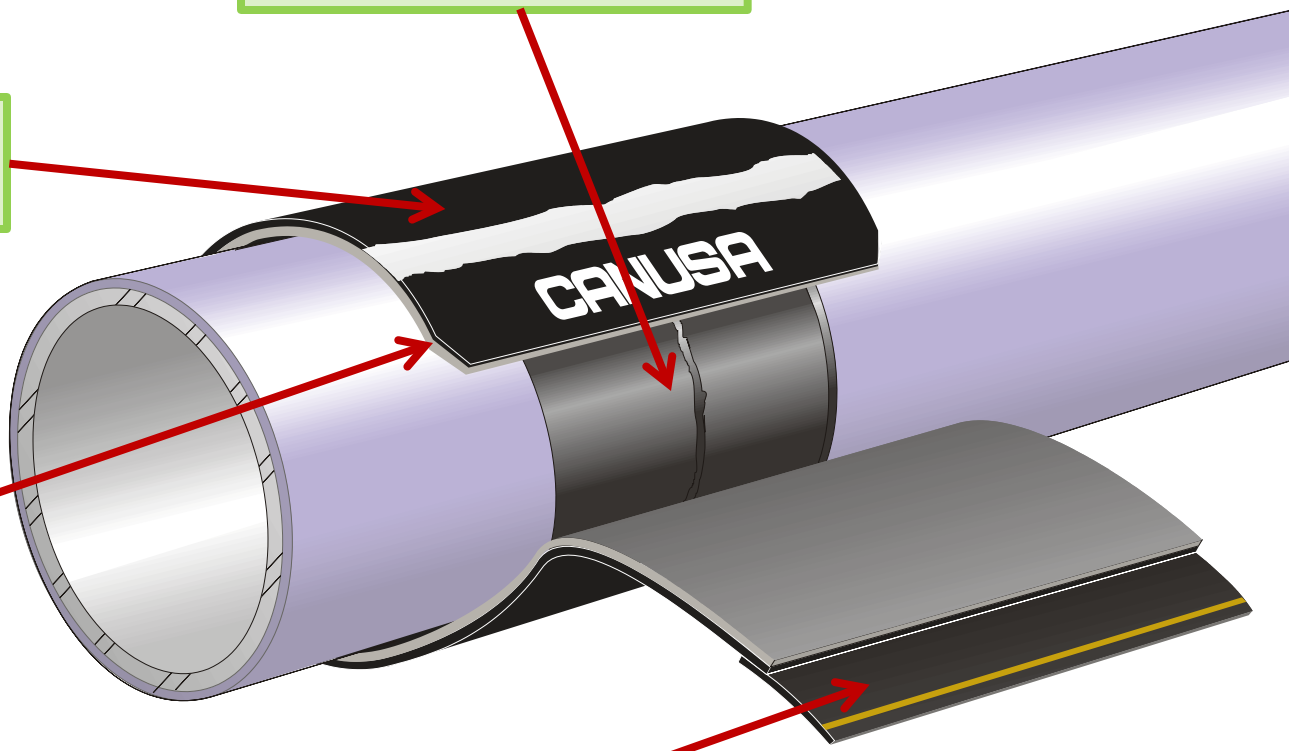
Field Joint Corrosion Protection



3LPE System

Force Cured ***Epoxy*** System to Bare Steel

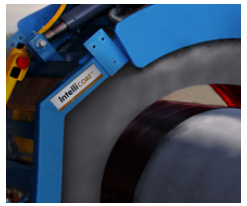
Cross-linked PE ***Backing***



High Shear Strength ***Adhesive***

Pre-Attached Closure System

Effects of HDD on Pipeline Coatings

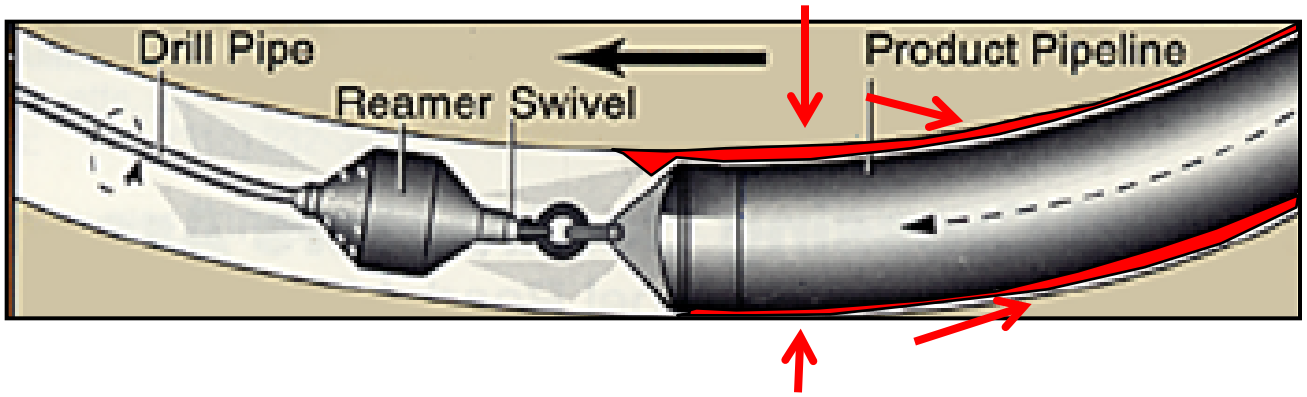


- **Protective coatings can be damaged during pull-through**
  - Damaged when in contact with gravel, cobbles, boulders, etc.

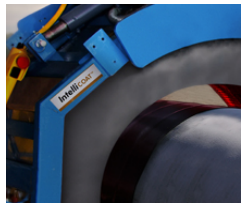
- **Coating can wear out over time due to soil stress and pipe movements**
  - HDD pipelines are not accessible for future coating repairs
  - Effective long term soil stress resistance is therefore critical

HDD Forces
- **Gouging**
- **Abrasion**
- **Extreme Shear**
- **Impact**
- **Penetration**

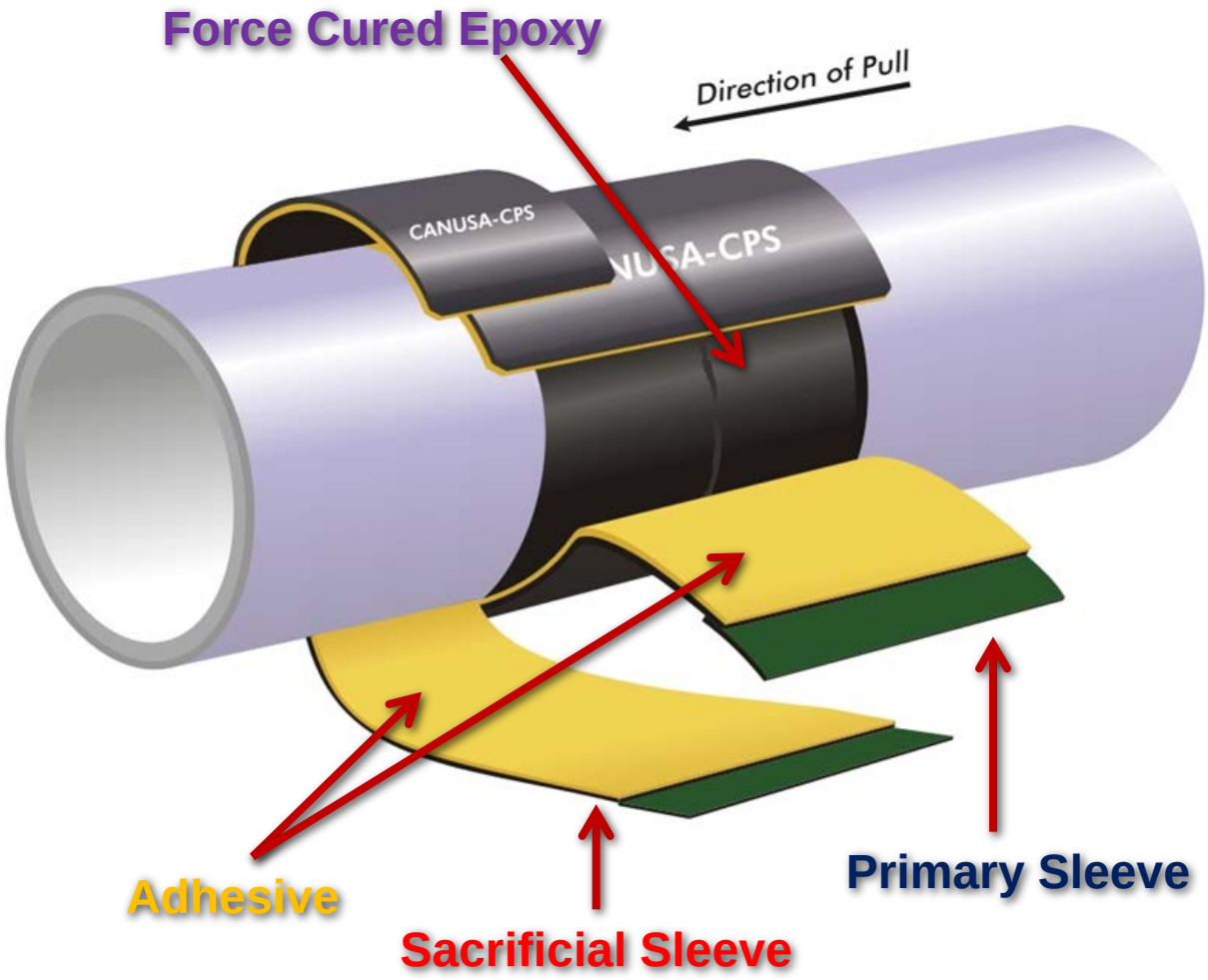
Long Term
- **Soil Stresses**
- **Thermal Cycling**
- **Moisture Ingress**
- **Penetration**



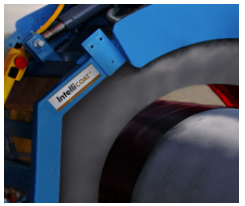
DDX for HDD Pipeline Joints



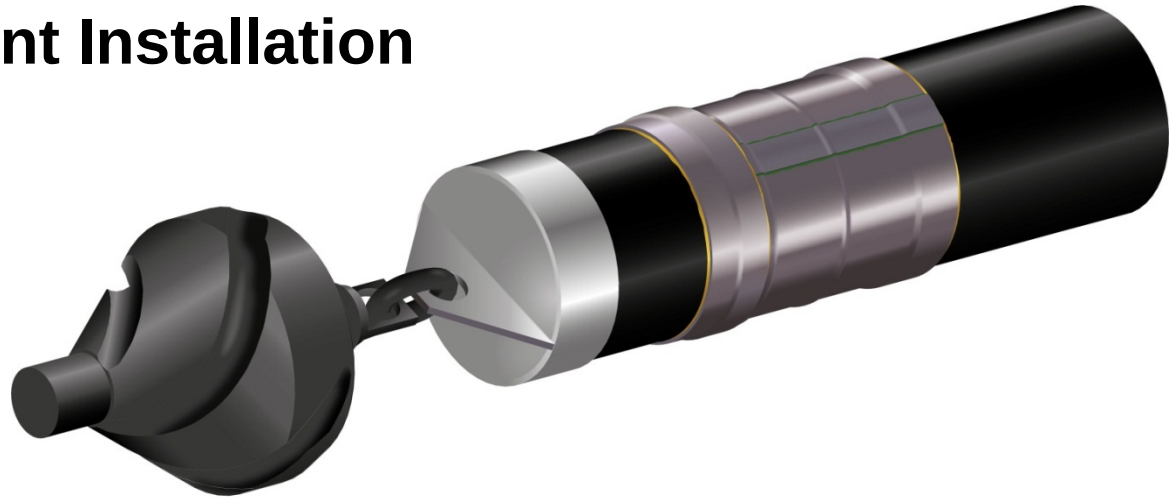
- **Provides maximum corrosion protection**
- **Reengineered heavy duty HDPE backing for directional drilling**
- **High performance PE copolymer adhesive requiring low preheat**
- **Protects leading edge of primary sleeve during pull-through**



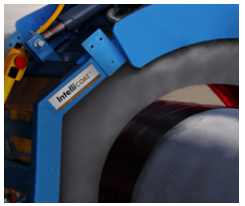
Why DDX?



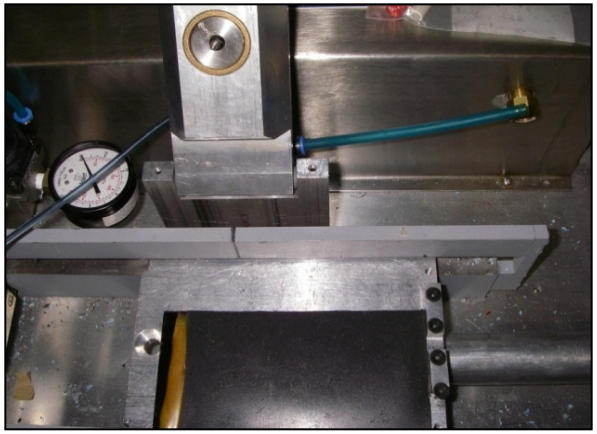
- ✓ **Superior HDD Performance**
- ✓ **Excellent Long Term Corrosion Protection**
- ✓ **Extremely Efficient Installation**



Superior HDD Performance Without Sacrificing Corrosion Protection



Gouge Resistance



- Simulates coated pipe being dragged across a sharp gouging force (ex. a rock protruding into the drill bore hole)
- **Parameters**: smooth carbide tip, 30 psi, 17 kg force

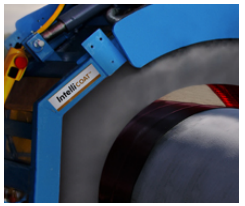
21 mil avg. gouge
(Excellent)

Superior Adhesion Strength

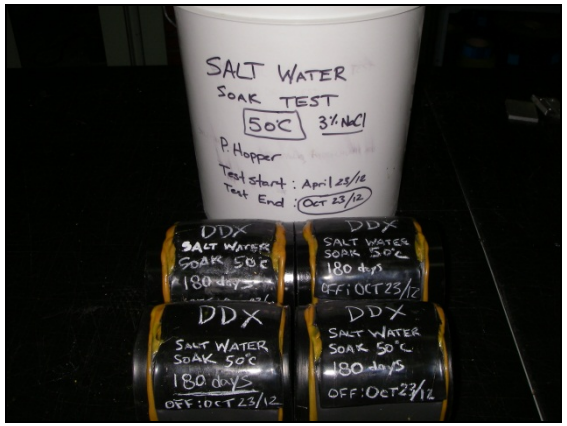
- Ensure that the sleeve will adhere to the pipe providing long-term protection
- **Parameters**: 10 mm/min peel speed, 2 cm wide cut

> 125 N/cm at 23° C
(Excellent)

Superior HDD Performance Without Sacrificing Corrosion Protection



Resistance to Moisture Ingress



- Simulates elevated temperature pipeline submerged in water containing salt contaminants typical of many soil conditions
- **Parameters**: Soak in 50° C, 3% NaCl (Salt) solution for 180 Day Duration

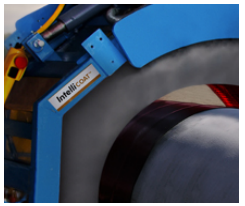
No Change

Resistance to Cathodic Disbondment

- Resistance to delamination caused by electrical currents from the cathodic protection system
- **Parameters**: 23° C for 28 days and 65° C for 48hr, 0.25" holiday (EN 12068)

< 3 mm

Superior HDD Performance Without Sacrificing Corrosion Protection

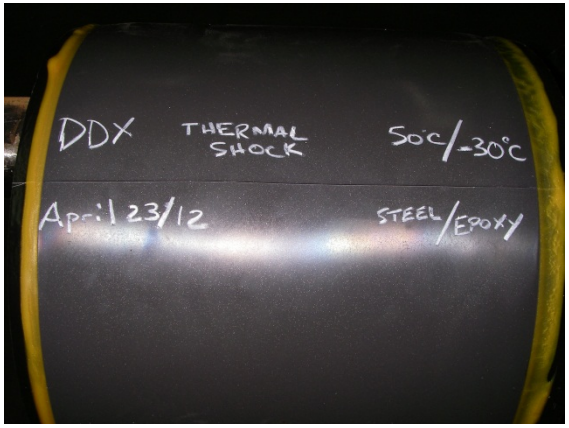


Resistance to Soil Stress

- **EN 489:2009 Soil Stress Test**
- Simulates the back and forth movements of pipe
- **Parameters**: 0.3 m sand + rigid compression, 75 mm; forward / backward 10/50 mm/min, 100 cycles followed by water pressure test.

Pass
System fully intact/no water ingress

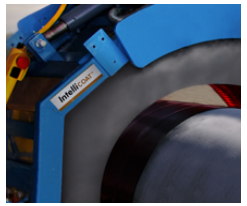
Resistance to Thermal Cycling



- Simulates thermal contraction and expansion cycles of the pipeline due to temperature fluctuations
- **Parameters**: Longitudinal cut across coating, cycle between hot (50° C for 16hrs) and cold (-30° C for 8hrs) temp. for 10 cycles

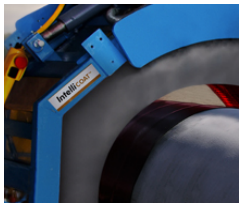
No Movement

DDX Performance Summary

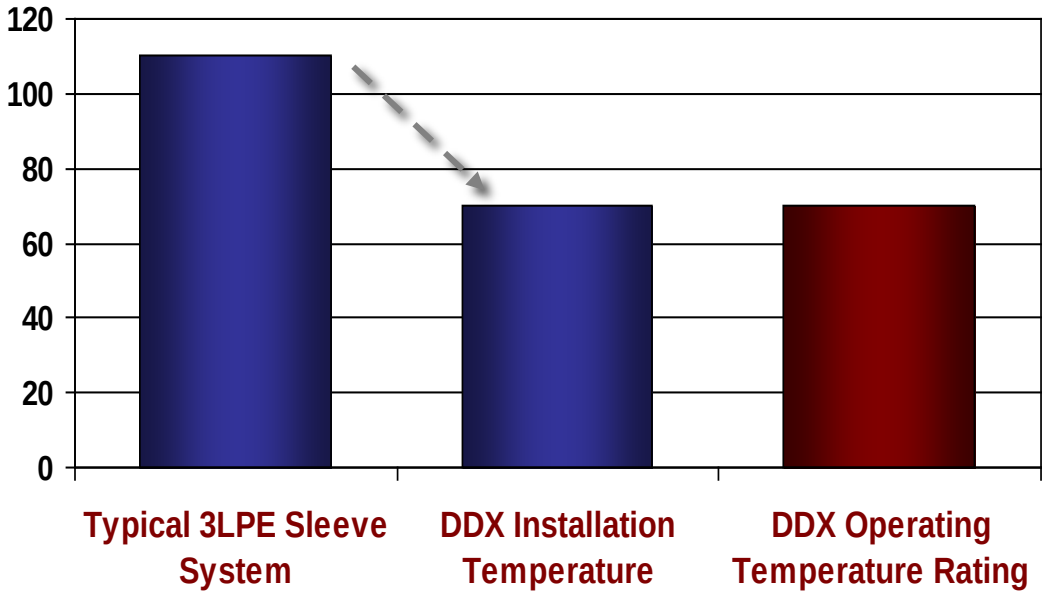


PROPERTIES	STANDARD	REQUIREMENT	DDX	STD. MET?
Resistance to Gouge Forces	-	Comparative	21 mils avg. (Excellent)	✓
Soil Stress Resistance	EN 489	PASS	PASS	✓
Abrasion Resistance	ASTM D1044	Comparative	< 6 mg loss (Excellent)	✓
Resistance to Cathodic Disbondment	EN 12068 (28 days/23° C)	< 15 mm	< 3 mm	✓
Adhesion Strength	EN 12068	> 7.5 N/cm	> 125 N/cm	✓
Impact Resistance	EN 12068, Class C	No Holidays 15 J @ 15kV	No Holidays 32 J @ 20kV	✓
Indentation Strength	EN 12068, Class C	> 0.6 mm remaining	> 1.0 mm remaining	✓
Resistance to Hot Water Immersion	50C, 3% NaCl for 180 Days	No Signs of Moisture Ingress	No Change	✓

Extremely Efficient Installation

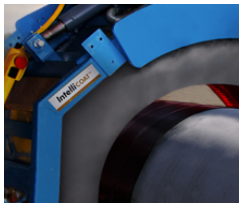


- **Extremely quick, simple and forgiving installation procedure:**
  - 100% solids, force curable liquid epoxy available in safe, easy-to-use, environmentally friendly bubble packs
  - New re-engineered, fast shrinking crosslinked HDPE backing layer
  - State-of-the-art adhesive technology with very low preheat temperature



Significantly reduced installation temperature still with elevated operating temperature rating!

Case Study – 24” Water Pipeline



Obstacle:
Roadway crossing

24” OD Water Pipeline
Drill distance = 120 m

Leading edge

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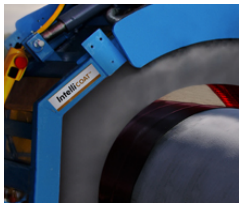

- **Primary sleeve DID NOT sustain any damage**
- **Sacrificial sleeve performed as intended protecting the leading edge of primary sleeve**

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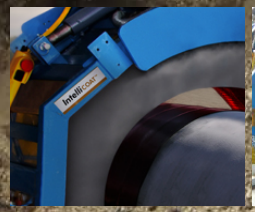

The DDX System

Advanced Corrosion Prevention for Joints on Directionally Drilled Pipelines

For additional information, please contact:

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