



Hall Longmore

3-Layer (Trilaminar) Coatings

Originally developed for the oil and gas industry, 3-layer coatings have applications across the entire steel pipe corrosion protection spectrum. 3-layer coatings provide a “belt and braces” solution to steel pipe treatment by offering the enhanced corrosion protection of the Fusion Bonded Epoxy (FBE) layer along with the robust, impact and mechanical resistance of the polyethylene top coat.

The long term benefits include:

High impact resistance

High corrosion resistance with cathodic protection

Excellent resistance to soil stresses

Highly impermeable to water penetration

Superior adhesion to steel

Good flexibility

Excellent insulation properties with long term resistance to stray current

Can be customised to specific operating conditions by varying the thickness of the coating in line with specifications



3-Layer Coating is the generic term for a pipe outer coating comprised of FBE base or primer coat, an extruded co-polymer adhesive intermediate layer and an extruded polyethylene top coat, as described by System B1 of the Canadian Specification Z245.21-02.

Application of 3-layer coatings follow the same typical process. Pipes are shot blast to Sa2½ to remove rust, debris and to provide a suitable profile for adhesion of the FBE layer.

Pipes are then fed through induction heaters to bring the pipes up to a temperature required for the FBE to bond. The FBE is applied through a number of electrostatic spray nozzles.

The co-polymer adhesive - which provides a chemical bond between the FBE and top coat - and the polyethylene top coat are then applied through extruders on to the rotating pipe. Cure is affected within 90 seconds of application which allows the pipes to be cooled quickly by means of water quenching.

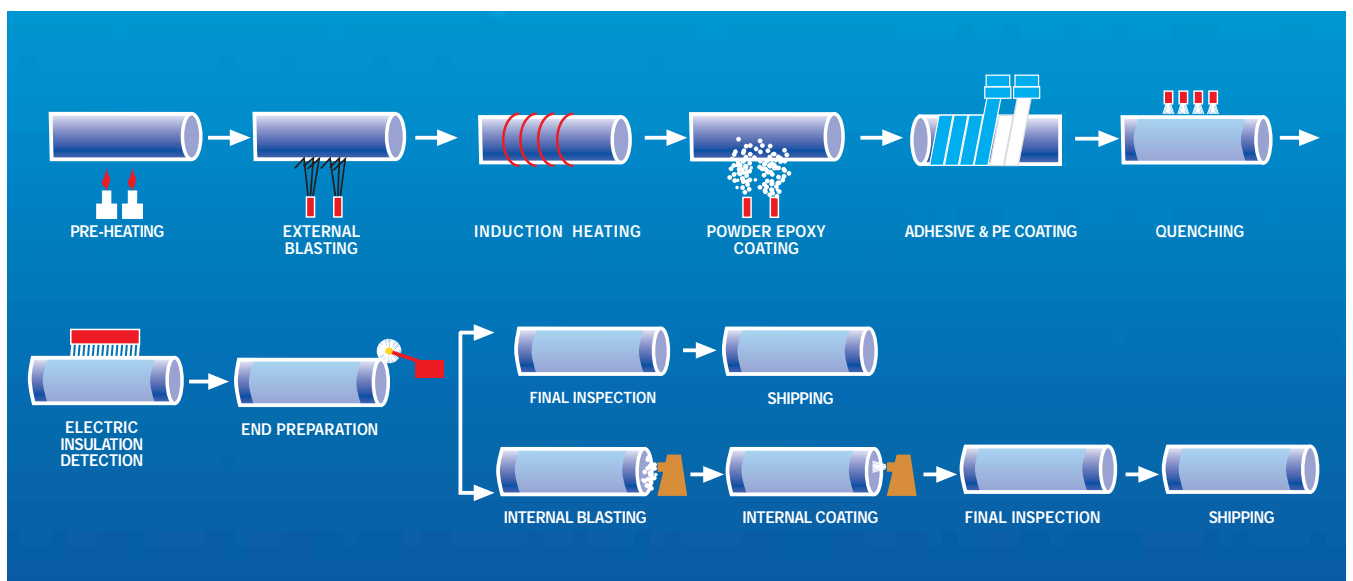
Once fully cooled, pipes are subjected to Electric Insulation Detection (EID) to check for pinholes before having the ends dressed and prepared.



Shot Blasted Pipe



Extruded Material



The 3-Layer Manufacturing Process

3-Layer Coating

Hall Longmore offers the following tests on all 3-layer coatings:

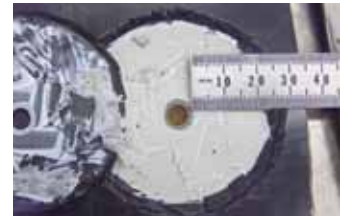
1. Cathodic Disbondment (CD)
2. Peel Adhesion
3. Elongation
4. Impact
5. Dust and Debris
6. EID (Holiday testing)

The above tests are generally performed in accordance with CSA Z245.20/21-02. Additional or enhanced testing as required by Institutional / Client based Particular Specifications must be verified by Hall Longmore's Quality-Assurance/Control department.

Pipe inspections are performed at each stage to ensure compliance and minimize the risk of defects.

3-Layer Polyethylene Coatings (3LPE) can be used in operating conditions of up to 80°C, making them suitable in most steel pipe applications from water to gas transfer. However, for pipelines with operating temperatures in excess of 80°C, polypropylene and the associated high temperature FBE and co-polymer adhesives are required – 3LPP.

Please contact Hall Longmore for further information in this regard.



Cathodic disbondment



Peel Adhesion



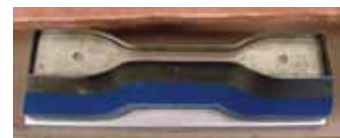
Elongation Test



Impact Test



Dust and Debris Inspection



Sample Cut



Electric Insulation Detection (EID)

3-Layer Coatings: Technical Details

TYPICAL TECHNICAL SPECIFICATION FOR 3-LAYER COATINGS

System B1 : A coating that consists of a powdered epoxy primer (FBE) an extruded co-polymer adhesive (cohesive) and an extruded polyethylene outer layer (HDPE)

| Characteristic | Test Criteria | | | Component Layers | | |
|--|------------------------------|------------------------------|--------------------------------|--|-----------------------------|---|
| | Standard | Clause | Table | FBE Layer | Cohesive Layer | HDPE Layer |
| Compound Description | CSAZ245.20-02 | 3 | N/A | A thermosetting coating material based on epoxy resin. | | |
| | CSAZ245.21-02 | 3 | N/A | | Polyethylene based adhesive | A black high density natural resin polyethylene with ultraviolet stabiliser and colourant |
| Cure time | CSAZ245.20-02 | 12.1 | 1 | Meets manufacturers specification | | |
| Thickness | CSAZ245.21-20 | N/A | Table 6 | 0.12mm minimum | 0.1mm minimum | 0.45mm minimum |
| Operating Temp range | Manufacturers specifications | | | 100°C general 140°C spikes | | |
| Water Absorption | CSAZ245.20-02 | 12.3 | 1 | < 0.50% max | | |
| Density | CSAZ245.20-02 | 12.5 | 1 | 1400g/l | .915g/cm ³ ± 1% | |
| | ASTM D 792 | | CSAZ245.21-20 Table 3 | | | .950g/cm ³ ± 1% |
| Impact Resistance | CSAZ245.20-02 | 12.12 | 1 | 1.5J | | 3J / mm of actual thickness |
| Bond strength / Adhesion | CSAZ245.20-02 | 12.14 | 1 | Rating 1-3 | | Peel: 150N min. |
| Dialectric strength | ASTM D 149.95 | | CSAZ245.21-20 Section 7.4.2 | > 550v/mil | | 10V / micron of thickness up to 15000V max. |
| Shore Hardness D | ASTM D 2240 | | | 90 | | > /=60 |
| Flow Rate | ASTM D 1238 | | CSAZ245.21-20 Table 2 | | 1.5g/10min ±20% | 0.4g/10min ± 20% |
| Softening Point | ASTM D 1505 | | CSAZ245.21-20 Table 2 | | > 85°C | |
| Tensile strength at yield | ASTM D 638 | Manufacturers specifications | 1 | | > /= 18MPa | 17MPa min. |
| Elongation / Ductility | ASTM D 638 | Manufacturers specifications | 1 | | 300% min. | 300% min. |
| Environmental stress cracking resistance | ASTM D 1693 | | CSAZ245.21-20 Table 3 | | | ±1000hr |
| Cathodic Disbondment | CSAZ245.20-02 | 12.8 | 1 | 7mm max. (24 hrs @ 3.5V; 65°C accelerate) | | |
| Flexibility | CSAZ245.21-20 Table 1 | | 1 | | | Bend of 2.5° - 3.0° (R=22.42t) |

Hall Longmore reserves the right to change or amend the contents of this document at anytime without any notice with this document intended for general information only. Any specific information required about product specifications, applications, technical information, sales, conditions, warranties and guarantees as required for any design or installation should be obtained from Hall Longmore.



Osborn Road, Wadeville,
Johannesburg, South Africa
Tel: + 27 11 874 7300
Fax: + 27 11 824 4962
E-mail: info@hall-longmore.co.za
Web: www.hall-longmore.co.za



A Murray & Roberts company