Hall Longmore

3-Layer (Trilaminate) 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.

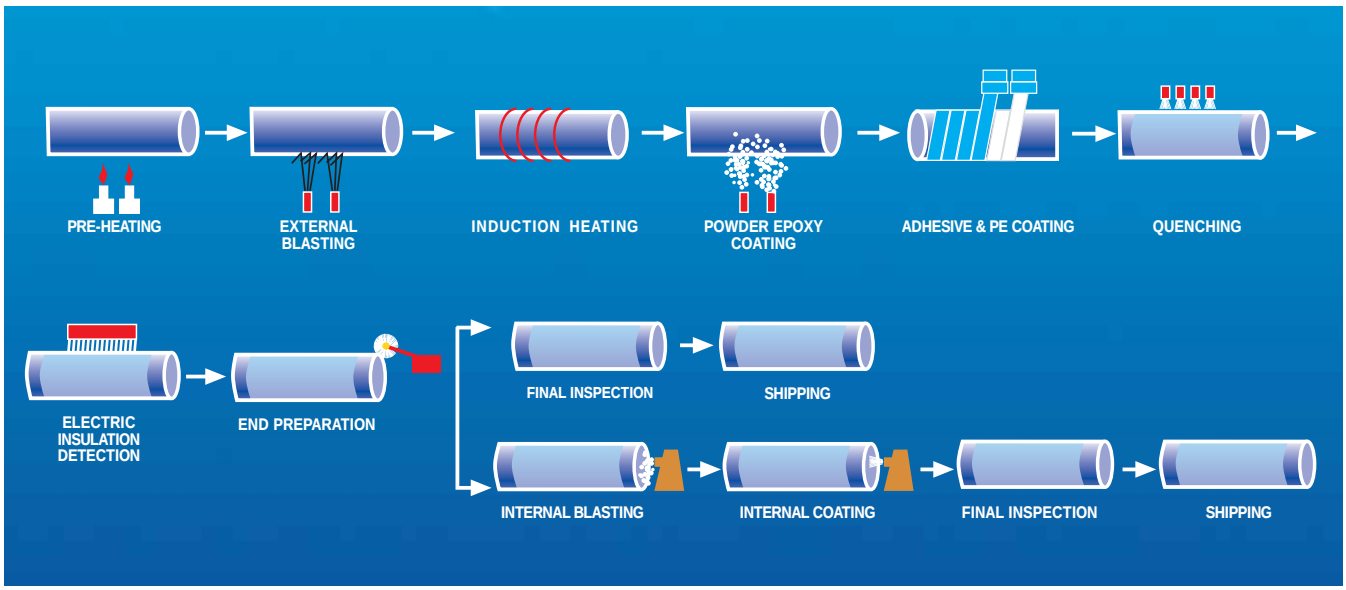
Pipes are then fed through induction heaters to bring the pipes up to a temperature required for the FBE to bond. The FBE is applied through a number of electrostatic spray nozzles.

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

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

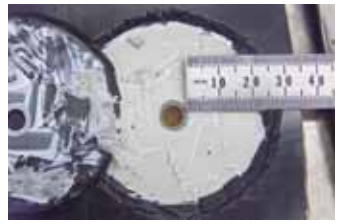
1. **Cathodic Disbondment (CD)**
2. **Peel Adhesion**
3. **Elongation**
4. **Impact**
5. **Dust and Debris**
6. **EID (Holiday testing)**

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 80ºC, making them suitable in most steel pipe applications from water to gas transfer. However, for pipelines with operating temperatures in excess of 80ºC, 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			100ºC general 140ºC 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		> 85ºC	
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; 65ºC accelerate)		
Flexibility	CSAZ245.21-20 Table 1		1			Bend of 2.5º - 3.0º (R=22.42t)

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

Murray & Roberts

A Murray & Roberts company

JULY 2008