TABLE - 1

SUMMARY OF INSPECTION AND TESTS TO BE CARRIED-OUT FOR PROCEDURE QUALIFICATION OF LINEPIPE COATING FOR EACH PIPE DIAMETER

Property	Acceptable Values	Number of Tests
Before Cleaning		
♦ Pipe condition	Condition A&B of ISO 5801 (part 1)	10
♦ Chlorides	2 µ g cm²	30 (3x10 pipe)
♦ Oil Contamination	No indication of oil contamination	10
After cleaning		
♦ Cleanliness	Sa 2 ½	10
♦ Profile	50 – 100 µm	10
♦ Chloride	2µ grams/cm²	30(3x10 pipe)
♦ Dust and Oil	No indications of dust or oil contamination.	
Coating Thickness		
♦ FBE coated	300µm - 400µm	24(12x2 pipes)
♦ FBE+Adhesive+PE	3000 µm	120(12x10 pipe)

Property	Acceptable Values	Number of Tests
Holidays		
♦ FBE	Smooth with no surface defects	2
♦ FBE+Adhesive+PE	Smooth with no surface defects	10
Adhesion/Peel Strength		
♦ FBE	Resistance to peel or a cohesive failure	2
♦ FBE+Adhesive+PE	35N/cm at 20± 50°C, 50N/cm at 50+2°C	10 (2x5 pipes)
Impact resistance		
♦ FBE	18J (minimum)	2
♦ FBE+Adhesive+PE	Zone A of Fig. 1 DIN 30670	5 (Random)
Penetration (indentation) testing		
♦ FBE	0.20mm at 25°C, 0.30 mm at 50°C	10(2x5 pipes)
♦ FBE+Adhesive+PE	Original Value	2
Degree of Cure		
♦ FBE	-2°C$\leq$ $\triangle$Tg $\leq$ +3°C	2

♦ FBE+Adhesive+PE		3 (Random)

Flexibility Bend Test

♦ FBE	No cracking/disbondment pinholes	2

Hot water resistance

♦ FBE	No disbanding or blistering after adhesion tests.	1 (Random)

Cathodic disbondment

FBE	Average radius of disbondment 5 mm	2
FBE+Adhesive+PE	Average radius of disbondment 5 mm	3 (Random)

Transverse electric resistivity test

$10^8 m^2$ after 100 days of immersion.

Resistance of Ultraviolet.

800h at 60°C in 65% relative humidity 50%

TABLE 2

SUMMARY OF INSPECTIONS AND TESTS TO BE CARRIED-OUT FOR PRODUCTION OF COATING OF LINEPIPE SYSTEM FOR EACH PIPE DIAMETER

Property	Acceptable Values	Minimum frequency
Before Cleaning		
♦ Pipe condition	Conditions A&B of ISO 8501 (part 1)	
♦ Chlorides	2 µ g cm²	
♦ Oil	No indication of oil contamination	
After cleaning		
♦ Cleanliness	ISO-Sa 2 ½	
♦ Profile	50 – 100 µm	
♦ Chloride	<2µg /cm²	
♦ Dust	No indications of dust contamination.	
♦ Oil	No indications of oil contamination.	
FBE Application		
♦ Pipe temperature	MANUFACTURER'S required range	Continuous
Coating Thickness	300-400 microns	Each pipe
Holidays	No holidays.	Each pipe
Visual Examination.		Each pipe
♦ Thickness of coating	No surface defects	
♦ Longitudinal welds.	No air contrapment.	
♦ Cut backs	150+0/-20 mm width, bevel 30-45°	
Peel Strength		
♦ At 20°C	35 Newtons per cm width of strip peeled	1 per 100 pipe
♦ At 50°C	15 Newtons per cm width of strip peeled	1 per 100 pipe
	Zone A of Fig. 1 DIN 30670	1 per 100 pipe
Impact Resistance		
Penetration (indentation) Testing	MANUFACTURER'S required range	1 per 100 pipe
Cathodic Disbondment	< 5 mm	First pipe, last pipe and at intervals of every 350 pipes.
Hot Water Resistance	No disbonding or blistering after adhesion tests.	First pipe, last pipe and at intervals of every 350 pipes.

4.0 COATING REPAIRS

10.1 General

10.1.1 The Coating mill shall submit a repair procedure for the approval of the Company prior to the start of production.

10.1.2 The Supplier shall demonstrate that the repair is as strong as the parent material.

10.2 Repair of Bare Pipe

10.2.1 Scratches, grooves, gouges, and slivers may be removed by filing or grinding, in accordance with procedures approved by the Company.

10.2.2 The Supplier shall grind or otherwise repair damaged bevels and pipe found to have been damaged, in accordance with the pipe repair section of the Line Pipe Spec. 4985-PA-2006.

10.2.3 All ends of pipes which are damaged to such an extent that they cannot be repaired by grinding or filing shall be rebevelled by the Supplier.

10.2.4 The Supplier shall furnish a bevelling machine for repair of the pipe ends.

10.3 Repair of Polyethylene Coating

Damaged line coating shall be repaired as per the following criteria:

a. Small Damages Extending up to 1.0 cm^2

Small damages to 3LPE should be repaired using PE melt sticks; with epoxy primer if bare metal is visible.

b. Damages Extending up to 300 mm or 100 cm^2

Polyethylene repair patches precoated with hotmelt adhesive, should be used in conjunction with a hotmelt filler adhesive and epoxy primer (if bare steel visible) as per manufacturer's recommendations. Repair patches when installed should overlap the damaged area by minimum 50 mm all round. Surface shall be mechanically cleaned before the application of FBE primer.

c. Damages Extending Over 300mm or 100cm^2

Full encirclement heatshrink sleeves with epoxy primer in accordance with specification. Surface shall be mechanically cleaned before the application of FBE primer.

The Supplier shall warrant that if the coating is found defective or not meeting the required performance the Supplier shall repair or replace the defective coating. The warranty shall be valid for 12 months from the acceptance date of pipeline facility.

5.0 IDENTIFICATION & MARKING

11.1 The pipe will be delivered to the Supplier marked in accordance with the Spec. 4880-PA-2006. The Supplier shall maintain the pipe identification throughout the process of cleaning and coating of the pipe.

11.2 Additional markings shall be applied 50 mm from the end of the coating and outside the pipe at each end. Letters and numerals shall be 25 mm in height.

11.3 Pipe which has undergone repair in accordance with section 10.0 shall be marked with a band painted around the entire circumference of the coated pipe and not more than 75mm from the cutback at each end. These pipe sections will be retained as spares by the Company.

11.4 All markings shall be stenciled and spray applied with paint compatible with the coating material and of a contrasting color.

11.5 Pipes of different wall thickness shall be color coded with different color bands.

6.0 STORAGE HANDLING & SHIPPING

12.1 The coated pipe shall at all times be handled in a manner to avoid damage to the coating.

12.2 The coated pipe shall be supported only by the uncoated ends until the coating has cooled to ambient temperature.

12.3 The coated pipe shall be stored in an area, which will not result in accumulation of dust or dirt either from the environment or surrounding.

12.4 The coated pipe shall be protected to avoid degradation from ultraviolet light radiation.

12.5 Any coated pipe section that shows contamination in any form whatsoever from the environment or surrounding shall be adequate grounds for stripping the entire coating and completely re-coating the pipe with 3-layer polyethylene and/or FBE as considered appropriate by Company's/Engineering consultant representative.

12.6 All pipes which have undergone repair shall be stockpiled separately from non-repaired joints or shall be color coded for ease of identification.

12.7 A padding approved by the Company shall be provided between the pipe stacked after coating during storage, transportation and shipment.

12.8 The number of rows of pipes to be stacked up shall not exceed six.

7.0 DOCUMENT SUBMITTALS

13.1 The Supplier shall submit copies of each of the following documents to the Company/Engineering Consultant as set forth below:

Document	Submittal	No of Copies
Quality Control and Application Procedures	Before PQT	2
Coating Repair Procedures	Before PQT	2
Storage, Handling and Transportation Procedures	Prior to Coating	2
Qualification Test Report	Prior to Coating	2
Certified Material Test Certificates	Prior t o Coating	2
Certified Inspection Report	Weekly	1
Tally Record of Pipe Received	Weekly	1
Tally Record of Pipe Coated/Loaded Out	Prior to Shipping	6
Coating Repairs Undertaken	Reported Daily	1

13.1 All certificates shall be in English language and with SI units of measure. Certificates shall be visibly signed by the Supplier.

13.2 The Supplier shall maintain a complete record of the pipe from the time it first enters the coating yard until the completion of load out of coated pipe. Pipe joint length and date of the coating application shall be recorded for each joint of pipe. The Supplier shall provide this information to the Company according to the schedule specified above.

8.0 TRANSPORTATION

The Supplier shall be responsible for the good condition of the coated pipes. In all cases, the Supplier shall be responsible for the repair of coated pipes until the pipeline is taken over by the Company/Engineering Consultant. On receipt of coated pipes, at Site, the Company/Engineering Consultant shall be invited for the inspection of coating. The Supplier shall arrange for the re-coating or replacement of pipes found to be excessively damaged.

9.0 WARRANTY

The Supplier shall warrant that if the coating is found defective or not meeting the required performance the Supplier shall repair or replace the defective coating. The warrantee shall be valid for 24 months from the acceptance date of the pipeline facility.