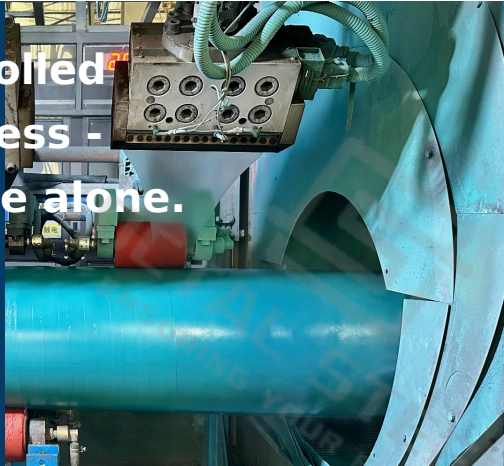


3LPE Coating Integrity Risks and Control Points

Six failure zones | evidence-based release

Integrity is controlled through the process - not the PE surface alone.

Surface preparation, application temperature, material compatibility, thickness, repair and traceability must remain linked to the pipe number.



RELEASE PRINCIPLE

A visually intact PE topcoat does not confirm adhesion at the FBE-steel interface or bonding between FBE, adhesive and PE.

PROCESS DATA

temperature, line speed, material batches

INSPECTION DATA

surface, thickness, holiday, peel/bond

REPAIR DATA

location, method, cure and retest

IDENTITY DATA

pipe number, heat, marking and packing map

1 FBE adhesion

MAIN RISK

Underfilm disbondment below an apparently intact PE layer.

RELEASE EVIDENCE

Cleanliness/profile, steel temperature, cure, peel and CD records.

2 Interlayer bonding

MAIN RISK

PE separation during handling, cutting or cutback preparation.

RELEASE EVIDENCE

Approved material combination, batch traceability, extrusion log and PQT.

3 Thickness and weld coverage

MAIN RISK

Local thin zones, bridging or trapped air reduce mechanical protection.

RELEASE EVIDENCE

Body, weld, end and repair readings plus visual and holiday reports.

4 Pipe-end cutback

MAIN RISK

Incorrect geometry can delay welding or force field-joint rework.

RELEASE EVIDENCE

Left/right length, tolerance, edge condition, exposed steel and compatibility.

5 Damage and repair release

MAIN RISK

A local repair may be closed without enough release evidence.

RELEASE EVIDENCE

Defect map, repair batch, method, cure, thickness and holiday retest.

6 Traceability

MAIN RISK

Pipe, coating-material and inspection identities can become disconnected.

RELEASE EVIDENCE

Pipe no., heat/MTC, shift, inspection, final marking and packing-list map.

ACCEPTANCE = PROCESS CONTROL + TEST RESULTS + RECORDS + TRACEABILITY

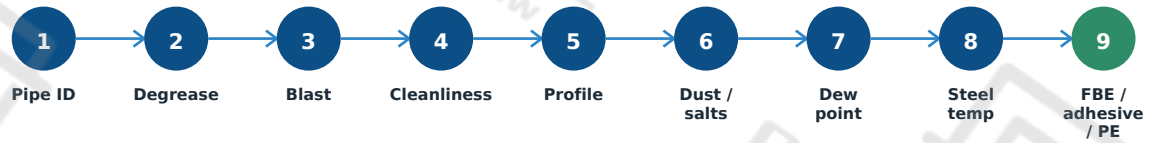
FBE Adhesion and Interlayer Bonding Control

Surface data | application data | qualification evidence

i Surface preparation and application data must be traceable to the same pipe, production time and coating material batches. No universal numeric limits are imposed in this guide.



DATA CAPTURED BEFORE AND DURING COATING



Minimum data set: pipe number, date/time, production shift, instrument ID, actual result, acceptance basis and inspector status.

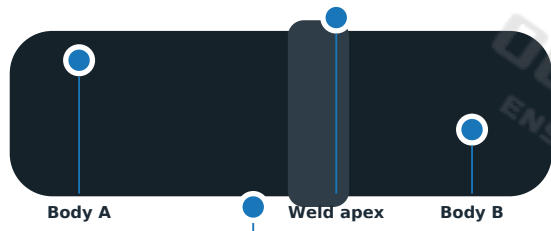
Control point	Data / method	Record and risk controlled	Control point	Data / record	Release basis
Pipe identity	Pipe no., heat no., dimensions, receipt status	Traveler continuity; prevents grade/heat mix-up	Steel application temperature	Actual deg C, time and calibrated pyrometer ID	Within approved APS/PQT/material TDS range
Visual cleanliness	ISO 8501-1 preparation grade recorded	Cleanliness log; controls residual rust, scale and contamination	FBE powder	Product code, batch, shelf-life/storage status	Approved and traceable material only
Dust	ISO 8502-3 quantity and particle-size class	Tape record; controls dust trapped beneath FBE	FBE cure	Approved cure check and production period	Qualified cure result documented
Soluble salts	ISO 8502-6 extraction + ISO 8502-9 conductometric result	Location, conductivity/result; controls osmotic and adhesion risk	Adhesive + PE	Approved material pairing, batch certificates	Compatibility and identity confirmed
Surface profile	ISO 8503-5 replica-tape reading in project units	Reading + gauge ID; controls weak key or excessive peaks	Extrusion parameters	Set/actual temperature, line speed, pressure/timing	Within qualified process window
Condensation risk	Steel/air temperature, RH, dew point, time	Environmental log per ISO 8502-4 guidance	Peel / bond performance	Production test result, sample location and frequency	Applicable standard and project ITP

Thickness, Weld-Seam, Cutback and Repair Release

Measurement map | disposition | retest

i No fixed coating thickness, holiday-test voltage, cutback dimension or repair-size limit is shown. Values come from the contract standard, qualified system and project ITP.

THICKNESS AND WELD COVERAGE



Record location + result + gauge ID + pipe number

PIPE-END CUTBACK



VALUE Capture left/right length, tolerance, coating-edge geometry, exposed-steel condition and field-joint compatibility.

REPAIR DISPOSITION



LOCAL REPAIR

Within approved size and method



TECHNICAL REVIEW

Engineering disposition required



RECOAT / REJECT

Outside approved repair limits

Disposition must reference the approved repair limit, defect location and final retest evidence.

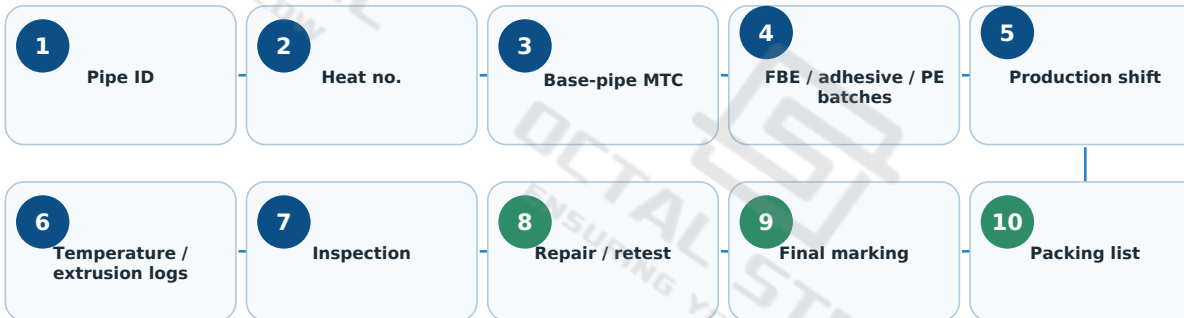
Control point	Data captured / method	Required record	Release condition
Coating thickness	Body, weld, end transition and repair readings; gauge ID	Location-based thickness report	Specified class/system requirement achieved
Weld-seam coverage	Focused visual and thickness checks over HFW/LSAW/SSAW geometry	Weld-area inspection record	No bridging, trapped air or local thin zone
Holiday detection	Approved voltage based on coating system/thickness; full coverage	Holiday report linked to pipe no.	Discontinuities repaired and retested
Cutback geometry	Left/right length, tolerance, edge, exposed-steel condition	Cutback inspection report	Compatible with welding and field-joint procedure
Repair preparation	Defect size/location, sound-edge prep and repair material batch	Repair map and material traceability	Within approved repair limits and method
Repair reinspection	Visual, cure status, thickness and holiday retest	Closed repair record linked to pipe	No open defect or unresolved NCR

Pipe, Coating-Lot and Inspection Traceability

Evidence chain | final dossier | packing-list map

i Loss of pipe identity during blasting or coating breaks the release chain. Final marking and the packing list must map back to the base-pipe MTC, coating batches and inspection records.

TRACEABILITY CHAIN



Storage and shipment release

Pipe identity, repair status and packing records must remain matched.

Document / record	Linked identifier	What it confirms	Risk controlled
Base-pipe MTC	Heat no. + pipe no.	Steel grade and base-pipe identity	Wrong heat or grade
Coating material certificates	FBE / adhesive / PE batch	Approved material system and batch status	Incompatible or expired material
APS and PQT	Procedure revision + qualified system	Approved process window and qualification basis	Uncontrolled process variation
Calibration certificates	Instrument ID	Validity of temperature, thickness and holiday data	Unreliable inspection result
Surface and application logs	Pipe / shift / date-time	Cleanliness, environment, temperature and extrusion stability	Hidden adhesion/bonding loss
Inspection / test reports	Pipe / lot / sample	Thickness, holiday, peel/bond and project-required tests	Unverified coating performance
Repair register	Pipe no. + location	Repair material, method, cure and retest closure	Untraceable local defect
Final marking and packing map	Pipe / bundle / shipment	Released identity preserved through shipment	Document-package mismatch

FINAL RELEASE GATE: all records complete | all repairs closed | identity restored | no open NCR | packing-list map matched