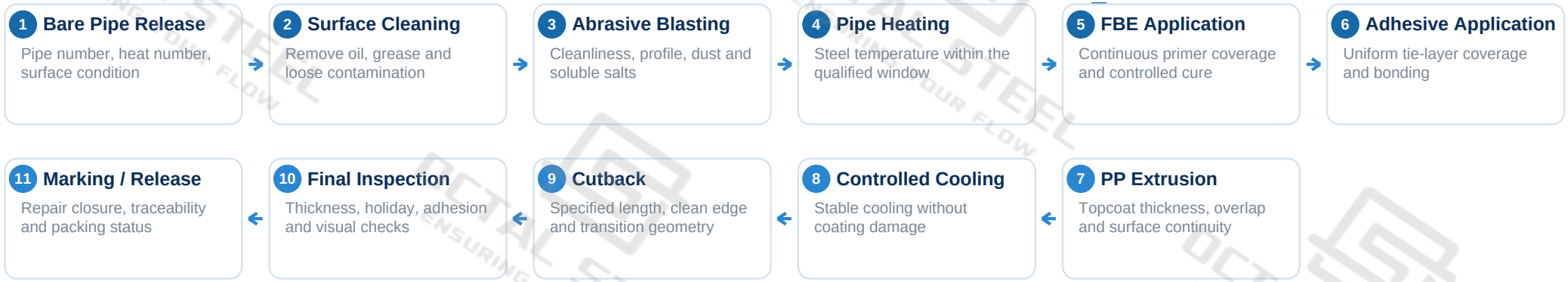
3LPP Coated Pipe Manufacturing, Inspection and Traceability Control

Plant-applied three-layer polypropylene coating: controlled process from bare-pipe release to final acceptance

Reference basis: ISO 21809-1:2018, DIN 30678-1:2024-01, qualified coating procedure and approved project ITP.



Bare pipe

Pipe number, heat number and released surface condition.

Surface preparation

Cleanliness, angular profile, dust level and soluble contamination.

Pipe heating

Qualified steel temperature before primer application.

FBE

Continuous coverage, gel/cure control and no visible contamination.

Adhesive

Continuous interlayer bonding between FBE and polypropylene.

PP extrusion

Specified thickness, overlap control and surface continuity.

Cooling

Controlled temperature reduction without cracking, wrinkling or distortion.

Cutback

Specified length, edge geometry and clean transition for field joint work.

Final release

Holiday test, repair closure, marking and traceability confirmation.

Production and Inspection Control Matrix

Each coating stage requires a defined control point, a repeatable inspection method and a retained record. Acceptance criteria and test frequency are taken from the specified coating class, project specification, approved procedure and ITP.

Process Stage	Critical Control	Inspection Method	Required Record
Bare-Pipe Release	Pipe identity, heat traceability, dry and acceptable surface	Visual check and identity verification	Bare-pipe release sheet
Surface Preparation	Cleanliness, profile, dust and soluble contamination	Visual examination, profile measurement and specified contamination checks	Surface-preparation report
Pipe Heating	Qualified steel-temperature window and uniformity	Continuous or defined-interval temperature monitoring	Coating-line temperature log
FBE / Adhesive / PP	Coverage, cure, interlayer bonding and thickness	Process monitoring, visual check and thickness measurement	Production batch record
Cooling / Cutback	Controlled cooling, cutback length and edge geometry	Cooling check and dimensional inspection	Line log and cutback report
Finished Coating	Continuity and absence of holidays	Holiday detection at the specified voltage basis	Holiday test report
Adhesion	Interlayer bonding and resistance to peeling	Peel test at specified conditioning and test conditions	Peel test report
Mechanical Performance	Impact resistance and indentation resistance	Laboratory testing on qualified samples	Mechanical test report
Cathodic Disbondment	Resistance to coating disbondment under cathodic polarization	Specified laboratory test and measurement	Cathodic-disbondment report
Cutback / Repair	Geometry, repair boundaries and complete defect closure	Dimensional check, visual examination and relevant retest	Repair and retest record

Release logic

3LPP Inspection and Acceptance Logic

The inspection plan should confirm surface release, application control, coating integrity, mechanical performance and repair closure. Test conditions and acceptance values must be taken from one coordinated standard basis, coating class and approved project ITP.

1 Surface preparation acceptance

METHOD

Visual cleanliness, profile, dust and specified soluble-contamination checks

DECISION

Release only after all surface-preparation criteria are recorded.

2 Application-temperature control

METHOD

Monitor steel temperature at defined locations and intervals

DECISION

Hold coating if the qualified application window is not maintained.

3 Thickness measurement

METHOD

Measure total coating and any specified layer-control points

DECISION

Compare with the contractual minimum and permitted local variation.

4 Holiday detection

METHOD

Scan the complete coated surface using the specified voltage basis

DECISION

Repair every detected discontinuity and retest the repaired area.

5 Peel strength

METHOD

Condition and test samples using the specified orientation and method

DECISION

Confirm cohesive or interlayer bonding meets the defined requirement.

6 Impact resistance

METHOD

Apply defined impact energy and inspect the test point

DECISION

Reject or investigate coating fracture or loss of continuity.

7 Indentation resistance

METHOD

Apply specified load, temperature and duration

DECISION

Confirm residual indentation remains within the acceptance limit.

8 Cathodic disbondment

METHOD

Test under the specified electrolyte, voltage, temperature and duration

DECISION

Measure disbondment and compare with project acceptance criteria.

9 Cutback inspection

METHOD

Check length, tolerance, edge condition and coating transition

DECISION

Release only when field-joint geometry is suitable and traceable.

10 Repair retesting

METHOD

Repeat the relevant visual, thickness and holiday checks

DECISION

Close the repair only after documented successful retest.

Disposition rule

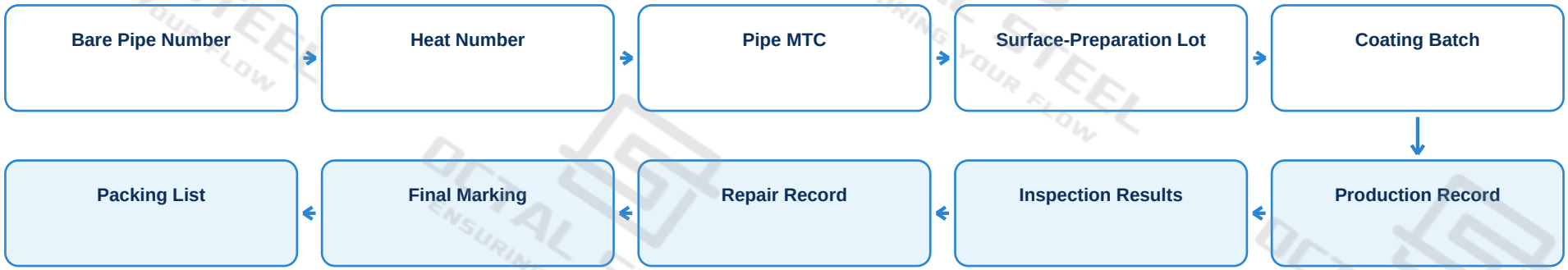
Accept -> Hold -> Repair -> Retest -> Release

Do not apply generic fixed values for temperature, thickness, holiday-test voltage, peel strength, impact, indentation or cathodic disbondment unless the coating system, coating class, pipe configuration, standard edition and project ITP are aligned.

Traceability Chain and Final Document Package

Traceability chain

Every coated pipe should remain linked to the bare-pipe identity, coating materials, production batch, inspection results, repair history, final marking and packing list.



How it is manufactured -> How it is inspected -> How it is traced -> How it is released

A closed technical record loop is required for each released coated-pipe lot.

Final document package

1 Base-pipe records

Pipe MTC, release record, pipe number and heat-number list.

2 Coating material certificates

FBE, adhesive and polypropylene batch certificates and approved storage status.

3 Approved application procedure

Qualified process window, line setup, repair method and inspection plan.

4 Production logs

Surface preparation, temperature, application, cooling, cutback and batch records.

5 Inspection and test reports

Thickness, holiday, peel, impact, indentation and cathodic-disbondment results.

6 Cutback and repair records

Location, defect type, repair material, operator, retest and closure status.

7 Final marking and packing records

Pipe identity, coating batch, release status, packing list and shipment map.

Specification Basis and Purchase-Order Definition

A 3LPP coating cannot be released from the product name alone. The order should define the applicable standard, coating class, service conditions, qualified materials, process controls, inspection frequencies, acceptance criteria and final document package.

Three-layer coating system

FBE provides the corrosion-protection primer; the adhesive forms the tie layer; the polypropylene topcoat provides mechanical and thermal protection. Layer compatibility and qualified application conditions are essential.

Reference standards

ISO 21809-1:2018	Plant-applied external three-layer PE and PP coatings for welded and seamless steel pipeline pipe.
DIN 30678-1:2024-01	Requirements and testing for factory-applied extruded polypropylene coatings on steel pipes and fittings.
Project specification / ITP	Defines coating class, thickness, service conditions, test frequency, hold points, acceptance and records.

Purchase-order and ITP definition fields

1. **Base pipe**
   Standard, grade, PSL or delivery condition, dimensions, pipe number and heat identity.
2. **Coating designation**
   3LPP standard, coating class, intended service and design-temperature basis.
3. **Materials**
   Approved FBE, adhesive and polypropylene grades; batch certificates and storage controls.
4. **Process qualification**
   Surface preparation, preheat, application, cooling, cutback and repair procedure.
5. **Inspection scope**
   Test methods, frequencies, sampling, hold or witness points and acceptance criteria.
6. **Coating dimensions**
   Specified total thickness, any layer controls, cutback length and tolerance.
7. **Repair limits**
   Permitted defect size, approved repair system, marking and mandatory retest.
8. **Handling and packing**
   Padding, lifting, stacking, end protection and shipment identification.

Critical rule

Do not mix acceptance values from different standards or coating classes. Holiday voltage, layer thickness, temperature windows, peel, impact, indentation and cathodic-disbondment criteria must come from the same contractual basis and approved ITP.