

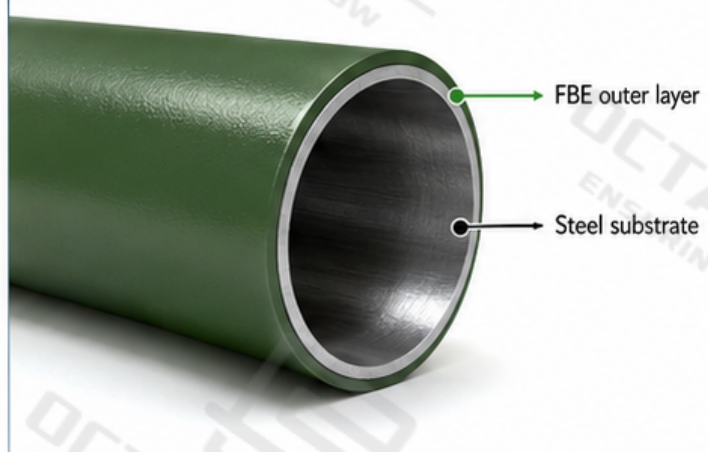
3LPE vs FBE vs 3LPP Coating Selection Guide

External Pipeline Coating Systems — Structures and Typical Characteristics

1 COATING STRUCTURES (TYPICAL)

FBE COATING SYSTEM

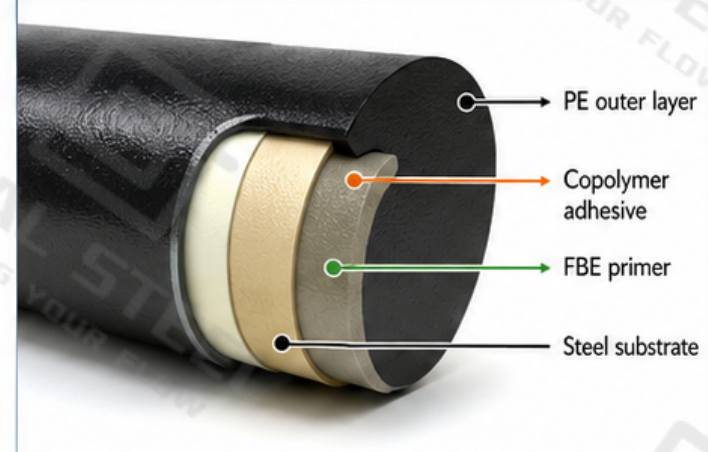
Fusion Bonded Epoxy



	Structure: Single external epoxy layer on steel
	Thickness format: System-specific dry-film thickness; approved product data controls
	Temperature note: Qualified system data and project specification control
	Selection signal: Thin external barrier where handling damage is controlled or where added protection is qualified

3LPE COATING SYSTEM

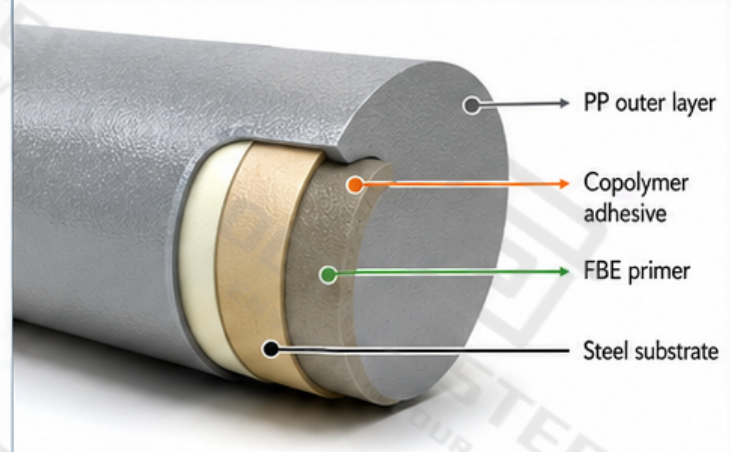
Three-Layer Polyethylene



	Structure: FBE + copolymer adhesive + polyethylene
	Representative range: Approx. -40°C to +85°C
	Selection signal: Buried pipeline coating with strong handling, backfill and transport protection
	Use note: Representative system ranges only. Approved coating-system data and project specifications remain controlling.

3LPP COATING SYSTEM

Three-Layer Polypropylene



	Structure: FBE + copolymer adhesive + polypropylene
	Representative range: Approx. -20°C to +110°C
	Selection signal: Higher-temperature pipeline service and demanding mechanical installation loads
	Use note: Representative system ranges only. Approved coating-system data and project specifications remain controlling.

! NO UNIVERSAL WINNER — FINAL COATING SELECTION DEPENDS ON QUALIFIED SYSTEM DATA AND PROJECT CONDITIONS

NOTES

- External coating structures shown schematically and not to scale.
- Only representative manufacturer-qualified temperature ranges are shown for 3LPE and 3LPP.
- Approved coating-system data, project specifications, PQT and ITP remain controlling.

Balanced Technical Comparison Matrix

3LPE vs FBE | 3LPE vs 3LPP | data and release logic

i Representative system ranges only. Approved coating-system data and project specifications remain controlling.

Selection criterion	FBE	3LPE	3LPP
Structure	Single thermoset epoxy layer bonded directly to prepared steel. Dual-layer variants exist but are a separate qualified system.	FBE primer + copolymer adhesive + extruded PE topcoat.	FBE primer + copolymer adhesive + extruded PP topcoat.
Coating-thickness format	Dry-film thickness in micrometres. Representative manufacturer data: 400-600 µm; project system controls.	Individual layer and total system thickness; normally specified in millimetres and by coating class.	Individual layer and total system thickness; normally specified in millimetres and by coating class.
Mechanical damage resistance	Direct-bonded and hard, but more vulnerable to transport gouging and backfill damage; ARO may be added for trenchless work.	High handling, indentation and abrasion protection from the PE topcoat.	High impact, indentation and abrasion resistance; PP topcoat is generally stiffer than PE.
Low-temperature flexibility	Formulation, thickness and bend strain dependent; verify flexibility testing and minimum application or service temperature.	Generally the strongest low-temperature flexibility of the two three-layer polyolefin systems.	Lower low-temperature flexibility than PE; confirm installation temperature and bend strain.
Representative qualified temperature range	System-specific. Use the coating supplier TDS, qualification test and project temperature class.	Approx. -40°C to +85°C for a representative manufacturer-qualified system.	Approx. -20°C to +110°C for a representative manufacturer-qualified system.
Field-joint compatibility	Qualified FBE, liquid epoxy, heat-shrink or other approved field-joint system; steel preparation and cure remain critical.	Field joint must bond to cutback steel and interface with PE; restore corrosion barrier and mechanical transition.	Field joint must tolerate PP service temperature and interface stiffness; heating and installation procedure require qualification.
Repair requirements	Compatible epoxy repair for permitted local damage; holiday retest. Recoat or reject when damage exceeds the approved limit.	Layer-specific repair: expose sound coating, restore FBE barrier and topcoat as required; thickness and holiday retest.	Qualified high-temperature repair system; restore bond and topcoat continuity; thickness, holiday and adhesion review.
Cathodic protection and disbondment review	Cathodic-disbondment resistance is a primary qualification item. FBE is commonly treated as non-shielding in US regulatory practice.	ISO systems are intended for use with CP, but disbanded polyolefin can raise shielding concerns; review adhesion, CD data and monitoring.	Same CP/CD review as 3LPE, with added attention to thermal ageing and interface stresses at elevated temperature.
Typical selection driver	Thin direct-bonded barrier, controlled handling, easy localized repair, or use beneath qualified ARO/CWC systems.	Buried pipeline coating for wet soil, long transport, repeated handling and ordinary backfill abrasion.	Higher-temperature pipeline, offshore installation or severe mechanical loading within a qualified PP system.
Main limitation	Mechanical damage during haul, lowering-in and rocky/HDD installation; extra protection may be required.	Upper-temperature limit, field-joint compatibility and CP-shielding review if adhesion is lost.	Lower cold-weather flexibility, higher stiffness, more demanding field repair and typically higher system cost.

Installation-Condition Selection Matrix

Buried pipeline coating | HDD | CWC | hauling and storage

i Final coating selection requires review of design temperature, installation damage, soil and backfill, field-joint coating, cathodic protection and project qualification.

Installation condition	Dominant loading / risk	Common screening outcome	Required confirmation before release
Buried pipeline in wet soil	Moisture exposure, soil chemistry, backfill contact, coating holidays.	3LPE is commonly screened first where handling and backfill protection are important. FBE remains viable with controlled installation and repairs.	Design temperature; holiday test; peel/CD qualification; field-joint compatibility; CP design.
Rocky backfill	Point impact, indentation, gouging and concentrated support loads.	Use reinforced 3LPE/3LPP, padding or a qualified ARO. Standard coating alone should not be assumed adequate.	Impact/indentation test; backfill specification; padding; allowable repair size; lowering-in inspection.
HDD pullback	Continuous abrasion, shear, soil or rock gouging and pull-force concentration.	FBE + qualified ARO is a common baseline. A three-layer system requires project-qualified abrasion protection and pullback evidence.	Bore geology; pull length and force; ARO bond; bend strain; pre/post-pull holiday survey.
River or coastal crossing	Handling, buoyancy control, wet environment, tie-in and field-joint exposure.	3LPE or 3LPP are common candidates; FBE may be selected where handling and added protection are controlled.	Temperature; installation method; field joint; anode/CP arrangement; repair plan; coating transition.
Submerged pipeline with concrete weight coating	CWC shear transfer, impact, anode details, cutback and offshore handling.	FBE non-slip or 3LPE/3LPP may be used only with a qualified CWC interface. No generic preference applies.	Shear bond; CWC application method; interface test; cutback; field joint; anode attachment.
Higher-temperature pipeline	Thermal ageing, adhesive stability, topcoat creep and field-joint performance.	3LPP is commonly favored within its qualified range. FBE is formulation-specific; 3LPE is limited by its approved temperature class.	Maximum continuous and excursion temperature; ageing; CD; peel; field-joint system; repair cure.
Long-distance hauling and storage	Repeated lifting, rail or truck vibration, stacking pressure, UV and yard damage.	3LPE/3LPP topcoats provide a mechanical handling advantage. FBE requires stricter supports, handling and repair control or added protection.	Handling procedure; separator design; storage duration; UV limits; loading inspection; repair map.

