

E75 Drill Pipe Manufacturing, Inspection and Traceability Control

A process-based technical reference connecting E75 pipe-body manufacture, upset control, tool-joint production, friction welding, thread machining, inspection records and final release.

Standard basis API Spec 5DP drill pipe body, tool joints and complete drill pipe assembly	Grade focus E75 pipe body: 75-105 ksi yield window; 100 ksi minimum tensile strength	Control objective Keep pipe-body heat, tool-joint heat, weld lot, thread report and final marking traceable to one released joint
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1. Complete Manufacturing Route

The route below is a typical API 5DP manufacturing sequence. The exact furnace and machining order can vary by qualified manufacturer procedure, but the released drill pipe must connect each operation to verified material, dimensional and inspection records.

1. Pipe-body material Heat identity chemistry review	2. End upsetting IU / EU / IEU geometry control	3. Pipe-body heat treatment E75 mechanical window	4. Tool-joint production Forging, heat treatment OD / ID	5. Friction welding Alignment, flash weld identity	6. Post-weld treatment Weld-zone property control	7. Thread machining API 7-2 profile gauging	8. Final release Marking, records packing
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2. E75 Mechanical and Material Baseline

Control Item	E75 Requirement / Reference	Manufacturing Significance
Minimum yield strength	75 ksi / 517 MPa	Lower boundary for pipe-body permanent-deformation resistance.
Maximum yield strength	105 ksi / 724 MPa	Keeps the E75 body inside the specified strength window.
Minimum tensile strength	100 ksi / 689 MPa	Minimum resistance before fracture in the tensile test.
Pipe-body phosphorus	0.030% maximum	Grade E chemical limit in the current API 5DP addendum.
Pipe-body sulfur	0.020% maximum	Grade E chemical limit in the current API 5DP addendum.
Heat-treatment route	Manufacturer-qualified route	E75 is accepted by verified properties; API 5DP does not define one universal furnace cycle for all manufacturers.

Critical distinction: E75 is not established by grade marking alone. The heat number, chemistry, tensile results, dimensions and final marking must refer to the same production route.

3. Pipe-Body Manufacturing and End-Upset Control

Production Stage	Required Process Control	Inspection / Data	Traceability Record
Incoming pipe-body material	Confirm heat identity, OD, nominal wall, length range and source documentation.	Heat analysis review; visual and dimensional receiving inspection.	Heat map / receiving record
End heating	Control heating zone, temperature uniformity and transfer time before upsetting.	Furnace or induction log; end-temperature monitoring.	Upset heat / batch record
End upsetting	Form IU, EU or IEU end geometry without laps, folds or unacceptable transition shape.	Upset OD / ID, length, transition profile and visual inspection.	Upset operation record
Pipe-body heat treatment	Use a qualified cycle that produces the E75 strength window through the pipe body and upset area.	Furnace chart, lot identity, tensile test and straightness check.	Heat-treatment lot record
Straightening	Correct heat-treatment distortion without damaging the upset transition.	Straightness and end-alignment inspection.	Dimensional report
Wall-thickness verification	Verify wall along a helical or longitudinal path; manually prove-up areas not covered by automation, especially the upset transition.	Automated UT or documented equivalent plus manual prove-up.	Wall-thickness inspection report
Body NDT / dimensional release	Release the pipe body only after required defect and dimensional checks are complete.	NDT status, OD, wall, length, straightness and upset dimensions.	Pipe-body release record

4. Pipe-Body Test Frequency - Grade E PSL-1

Product Size	Chemical Analysis	Tensile Test	Charpy Impact - Pipe Body	Key Note
Below label 1: 6 5/8	2 product analyses per heat	1 per 400 bodies or per lot, whichever is smaller	Not a base PSL-1 Grade E body requirement	SR 19 can add body impact testing.
Label 1: 6 5/8 and above	2 product analyses per heat	1 per 200 bodies or per lot, whichever is smaller	Not a base PSL-1 Grade E body requirement	Project / PSL / supplementary requirements can increase scope.

The frequency table is useful only when the manufacturing lot definition is controlled. Each test report should identify the heat, heat-treatment lot, size and quantity represented.

5. Tool-Joint Production, Friction Welding and Weld-Zone Control

Stage	Process Control	Numerical / Technical Check	Record
Tool-joint raw material	Maintain separate pin and box heat identity through forging and heat treatment.	Heat chemistry; forging lot; material identification.	Tool-joint heat record
Tool-joint heat treatment	Achieve specified mechanical properties and hardness before final machining.	Non-SS box hardness: 285-341 HBW.	Heat-treatment and hardness report
Rough machining	Establish weld-end geometry, OD / ID stock and concentricity.	OD, ID, end face and alignment checks.	Dimensional report
Friction welding	Control rotational energy, axial force, burn-off, alignment and flash formation.	Weld parameter log; axial mismatch / alignment; visual flash review.	Weld-lot record
Flash removal	Remove internal and external flash without undercut or excessive metal removal.	Bore condition, OD transition and surface visual check.	Post-weld machining record
Post-weld heat treatment	Restore the weld-zone property gradient and control hardness after welding.	Weld-zone hardness not above 37 HRC for Grades E, X, G and S.	PWHT chart / weld-lot record
Weld-zone machining	Blend pipe body to tool joint while preserving transition geometry and inspection access.	OD, ID, transition profile and surface condition.	Weld-zone dimensional report

6. Weld and Tool-Joint NDT

Inspection Area	Required Method / Scope	Verified Control Point
Weld-zone outside surface	Wet fluorescent magnetic-particle inspection for transverse imperfections over the entire outside weld-zone surface.	Minimum black-light intensity 1000 uW/cm ² at 365-370 nm; particle concentration checked every 8 h or each shift change.
Tool joint after heat treatment and threading	Wet magnetic-particle inspection on inside and outside surfaces for longitudinal and transverse imperfections.	Written procedure, calibrated equipment and recorded acceptance status for each tool joint.
Weld-line hardness	Hardness checks tied to each weld and weld-lot control.	For Grades E, X, G and S, weld-zone surface / through-wall mean limits are controlled at 37 HRC maximum.

NDT identity should follow the weld, not only the finished drill-pipe serial number. A weld-lot record should connect pipe-body heat, tool-joint heat, weld date / line and post-weld treatment.

7. Thread Machining and API 7-2 Gauging Control

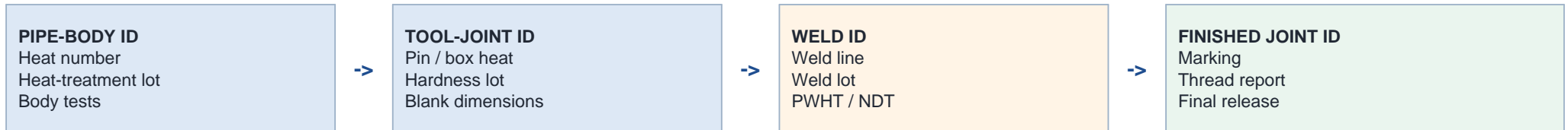
Control Area	Inspection Requirement	Acceptance / Record
Connection identification	Confirm specified NC, FH, IF, REG or project connection before machining.	Traveler and machining program match the order specification.
Thread profile and taper	Machine pin and box geometry with controlled pitch, taper, lead and root / crest form.	Working-gauge and dimensional inspection record.
Shoulder face	Contact face plane and square to thread axis.	Within 0.05 mm / 0.002 in.
Shoulder surface finish	Surface finish before treatment supports compound retention and sealing.	0.8-3.2 um Ra / 32-125 uin Ra.
Gauge identity	Use uniquely identified plug / ring gauges with current calibration or certification status.	Gauge ID, calibration status, inspector and result on thread report.
Final thread condition	Inspect thread damage, shoulder contact, burrs, phosphate / surface treatment and cleanliness.	Thread acceptance and protector-installation record.

8. Manufacturing and Inspection Control Matrix

Production Stage	E75-Specific Control	Inspection Method	Primary Record
Pipe body	75-105 ksi yield window; 100 ksi minimum tensile; Grade E chemistry limits.	Chemical analysis, tensile and dimensional inspection.	MTC / test report
Upset	IU / EU / IEU end geometry and smooth transition.	OD / ID / length / profile inspection.	Upset record
Tool joint	Heat identity, OD / ID, hardness and connection blank geometry.	Hardness, dimensional and material checks.	Tool-joint report
Friction weld	Alignment, weld integrity, hardness and post-weld treatment.	Parameter log, MPI, hardness and dimensional inspection.	Weld-lot report
Thread	Profile, shoulder, surface finish and gauge result.	API 7-2 gauging and visual inspection.	Thread report
Final release	Marking and records match the physical joint.	Document review, marking check and packing verification.	Release certificate

9. Joint-Level Traceability Architecture

The finished E75 drill pipe combines two separately produced materials and one joining operation. Traceability must preserve the pipe-body heat, tool-joint heat and weld-lot identity through final marking and packing.



10. Traceability Chain and Reconciliation Checks

Traceability Link	Required Match	Risk Controlled
Pipe marking -> body heat	Grade, size and heat identity agree with the body MTC and tensile report.	Wrong grade or heat assigned to the finished joint.
Body heat -> heat-treatment lot	The tested tensile sample represents the released body lot.	Test results applied to an unrelated production lot.
Tool-joint marking -> tool-joint heat	Pin and box material and hardness records are individually traceable.	Mixed tool-joint heats or hardness records.
Weld ID -> weld lot	Friction-weld parameters, PWHT, hardness and NDT results refer to the same weld.	Unverified joining or post-weld treatment.
Thread report -> finished joint	Connection type, gauge ID, gauging result and shoulder inspection match the marked joint.	Incorrect connection or unverified thread geometry.
Packing list -> physical bundle	Joint count, serial / marking identity, protectors and package labels are reconciled.	Document-to-product mismatch at shipment.

Recommended release key: one finished-joint number should retrieve body heat, tool-joint heat, weld lot, heat-treatment lot, NDT, thread gauging, final dimensions and packing position.

11. Final Release Document Package

Document	Minimum Technical Content	Release Check
Material Test Certificate	Pipe-body heat, chemistry, E75 mechanical properties and product identity.	Grade and heat match marking.
Mechanical Test Report	Yield strength, tensile strength, elongation, sample / lot identity and test date.	Results within the E75 acceptance window.
Heat-Treatment Record	Pipe-body and tool-joint lot identity; furnace / cycle record; operator release.	Test pieces represent the treated lot.
Weld-Zone NDT Report	Weld ID, method, procedure, equipment status, inspector and acceptance result.	Every released weld has NDT status.
Tool-Joint Inspection	OD / ID, hardness, pin / box identity and surface inspection.	Dimensions and hardness support the specified connection.
Thread Gauging Report	Connection, plug / ring gauge ID, gauge status, gauging result and shoulder inspection.	Thread report matches finished joint marking.
Dimensional Inspection	Overall length, pipe-body OD / wall, upset geometry, straightness and tool-joint dimensions.	Released dimensions agree with specification.
Final Marking Record	API 5DP identification, grade, size, manufacturer and joint identity.	Marking is legible and traceable.
Packing List and Photos	Joint count, bundle identity, protectors, package labels and loading condition.	Physical shipment matches release records.

12. Final Release Gate

Release Gate	Pass Condition
Material identity	Pipe body, tool joints and finished-joint marking are fully reconciled.
Mechanical properties	E75 tensile results and applicable tool-joint / weld-zone properties meet the specified basis.
Dimensions	Body, upset, weld transition, tool joint, thread and overall length are accepted.
NDT and gauging	Required body / weld / tool-joint examinations and API 7-2 thread checks are complete.
Document completeness	Every report identifies the represented heat, lot, weld or finished joint.
Shipment reconciliation	Packing list, bundle marking, protectors and photographs match the released quantity.

Final technical note: E75 compliance is created by the controlled chain from material heat to finished-joint release. A complete file should prove not only that tests passed, but also that every result belongs to the physical drill pipe being shipped.

Reference basis: API Spec 5DP, 2nd Edition (May 2020), Errata 1 (July 2020), Addendum 1 (published January 2025; effective July 2, 2025), and API Spec 7-2 thread / gauging controls. Project specifications can add stricter requirements.