G105 vs S135 Drill Pipe

Inspection, Test Records and Document Release Review

A data-focused checklist for high-strength API 5DP drill pipe covering physical inspection, mechanical testing, NDT, thread control, drift clearance and shipment traceability.

G105 GRADE
105 ksi
minimum yield strength for controlled medium-to-deep drilling

S135 GRADE
135 ksi
minimum yield strength for deeper, longer and higher-torque drilling

PIPE JOINT
Body + TJ
seamless pipe body, upset, friction weld zone and tool joint

RELEASE BASIS
Records
MTC, NDT, dimensional, thread gauge, drift and packing list

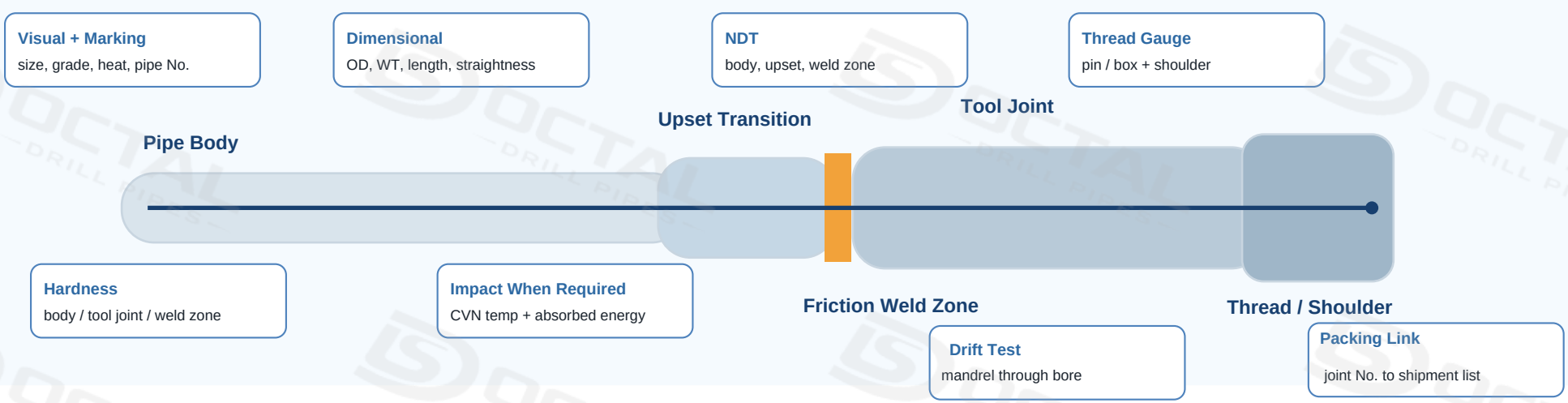
Document Traceability Chain

Pipe marking → Heat number → MTC → Mechanical test → Dimensional inspection → NDT report → Hardness / impact → Thread gauge → Drift test → Packing list

Review Area	What Must Be Connected	Field Acceptance Meaning
Material identity	grade, heat number, pipe number, tool joint reference	proves that the pipe received matches the order and certificate
Pipe body performance	yield strength, tensile strength, elongation, hardness and impact when required	supports API 5DP grade acceptance and project toughness review
Connection control	thread gauge, shoulder face, make-up torque reference, tool joint OD/ID	reduces mismatch risk during rig-site make-up and string assembly
Shipment release	packing list, bundle photos, pipe numbers and TPI release when required	keeps receiving inspection and document review traceable

Inspection Coverage Map

A complete G105 or S135 drill pipe joint is more than a pipe body. Inspection should cover the body, upset transition, friction weld zone, tool joint, pin / box thread, shoulder, drift path and final marking.



Pipe Zone	Typical Check	Why It Matters
Pipe body	OD, wall thickness, straightness, NDT, marking	controls strength verification, dimensional fit and material traceability
Upset transition	visual check, geometry review, NDT when required	fatigue-sensitive area under bending and cyclic load
Friction weld zone	visual / NDT / hardness review according to ITP	critical transition between pipe body and tool joint
Tool joint	OD/ID, shoulder, hardbanding, bore, surface damage	controls torque transfer, wear and compatibility with drill string design
Thread connection	thread gauge, shoulder face, pin / box condition, protector	supports correct make-up and rig-site acceptance
Drift path	specified drift mandrel through pipe and tool joint ID	confirms internal clearance for fluid flow and downhole tools

Shipment Inspection Matrix - Physical Checks

The inspection matrix below shows what is actually reviewed before release. The ITP may adjust the scope, witness points and acceptance basis according to grade, well profile, sour-service exposure and project specification.

Inspection Item	Type of Check	Actual Operation	Release Evidence
Visual and marking	100% visual review is commonly applied before packing	Check pipe number, heat number, size, grade, connection, range, color band, thread protectors and visible handling damage.	Marking photos, visual report, pipe list
Dimensional inspection	Measured check with calibrated gauges and measuring tools	Measure OD, wall thickness, length, straightness, upset geometry, tool joint OD/ID and shoulder dimensions.	Dimensional report with joint or batch reference
Pipe body NDT	UT, EMI or project-specified NDT	Scan pipe body for cracks, laminations, wall-loss areas or discontinuities not visible from outside.	NDT report, method, inspected area, covered pipe numbers
Friction weld zone	Visual, NDT and hardness review when required	Review the pipe-to-tool-joint weld transition, weld profile, surface condition and test coverage per ITP.	Weld-zone NDT / hardness record, inspection release
Tool joint check	Dimensional and condition inspection	Review tool joint OD/ID, shoulder face, hardbanding area, bore condition and visible wear or damage.	Tool joint inspection record
Thread gauge	Connection-specific gauge inspection	Check pin and box thread form, taper, shoulder condition, galling, damaged crests and gauge result.	Thread gauge record by connection type

Control Point	G105 Focus	S135 Focus
Grade acceptance	105 ksi minimum yield strength; fatigue and connection review	135 ksi minimum yield strength; closer hardness and toughness review
Service risk	controlled medium-to-deep and directional loads	deeper, longer, high-torque or high-overpull drilling
Documentation	traceability across mixed-string replacement or project supply	additional attention to weld zone, hardness and sour-service documents

Mechanical, Impact and Hardness Testing

Mechanical and metallurgical records explain why the pipe can be accepted beyond the stencil marking. For high-strength drill pipe, the report should show actual test values, specimen reference and heat number, not only a general pass statement.

Tensile Test

YS

- Specimen is pulled until yielding and fracture under a tensile testing machine.
- Report records yield strength, tensile strength and elongation.
- G105 supports 105 ksi minimum yield; S135 supports 135 ksi minimum yield.

Charpy Impact

CVN

- Notched specimen is cooled to the specified test temperature.
- Pendulum hammer breaks the specimen and absorbed energy is recorded in J.
- Used when toughness, low-temperature or offshore review is required.

Hardness Test

HB

- Hardness readings may use HB, HRC or HV according to project requirement.
- Common review areas include pipe body, tool joint and weld zone.
- Important for S135 and H2S-related cracking sensitivity review.

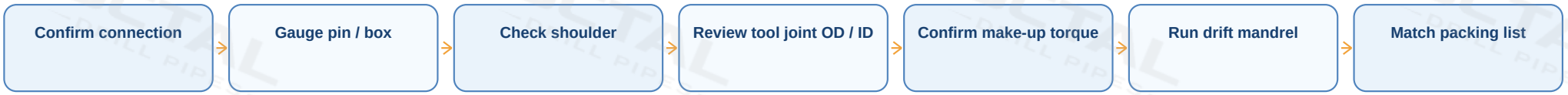
Test / Record	How It Is Performed	Data to Review
Mechanical test report	Tensile specimen is loaded in a calibrated machine to obtain yield strength, tensile strength and elongation.	heat number, specimen ID, YS, TS, elongation, test standard and actual values
Impact test report	Charpy V-notch specimen is cooled to the required temperature and broken by a pendulum impact tester.	test temperature, specimen size, absorbed energy, location, average / individual values when specified
Hardness record	Portable or bench hardness testing is performed on specified areas according to ITP.	HB / HRC / HV method, test locations, readings, acceptance limit when specified
Heat treatment record	Full-length quench-and-temper or specified heat-treatment route is reviewed from production documents.	heat treatment condition, batch reference, furnace or lot record when available

NDT, Thread Gauge and Drift Test Review

These checks focus on hidden defects, connection usability and internal clearance. They are practical release controls because many field problems appear at the weld zone, thread shoulder, tool joint bore or drift path, not only in the pipe body strength value.

Review Area	Typical Method	Practical Operation Detail	What the Report Should State
Pipe body discontinuities	UT / EMI / project NDT	Scan pipe wall for longitudinal / transverse defects, laminations or wall-loss signals according to the inspection plan.	method, coverage, calibration reference, inspected pipe numbers, result
Weld zone and upset area	UT / MPI / visual plus hardness when required	Pay attention to the pipe-to-tool-joint transition where bending, torque and tensile load concentrate.	tested zone, acceptance basis, inspector, joint identification
Thread and shoulder	Gauge inspection plus visual review	Check pin / box thread profile, taper, shoulder contact face, galling, corrosion, crest damage and protector condition.	connection type, gauge result, pin / box status, repair or rejection note
Drift clearance	Specified drift mandrel	Pass the drift mandrel through the bore including tool joint ID; any obstruction should be recorded and resolved.	drift size, pass/fail result, pipe numbers covered
Hardbanding / coating	Visual and dimensional review	Confirm hardbanding type, coverage area, edge condition and internal coating condition if ordered.	hardbanding / coating record, photos when required

Field Matching Control Logic



Risk Signal	Why It Should Not Be Ignored
Correct grade but wrong connection	The pipe may pass mechanical requirements but fail rig-site matching.
Thread damage or shoulder wear	Torque transfer and connection acceptance can be affected even when pipe body strength is correct.
Missing drift record	Internal clearance for fluid flow and downhole tools is not proven.

Document Release Package

Final release should connect the physical pipe, test values and shipping records. Each certificate should be traceable back to the same pipe marking, heat number or pipe list used for packing.

Document / Record	What It Should Contain	Practical Review Point
MTC	grade, heat number, chemical composition, yield strength, tensile strength, elongation and heat-treatment condition	must match pipe marking and order grade
Heat number record	material heat, production batch and pipe identification	links pipe body to the correct material source
Mechanical test report	actual tensile values and specimen reference	confirms G105 / S135 grade acceptance
Impact test report	test temperature, specimen size, absorbed energy and location	required when toughness or low-temperature review is specified
Hardness record	method, locations and readings	important for S135, weld-zone control and sour-service review
Dimensional report	OD, WT, length, straightness, upset dimensions and tool joint OD/ID	proves physical compatibility with the ordered string design
NDT report	method, inspected area, acceptance basis and covered pipe numbers	shows hidden-defect screening scope
Thread gauge record	connection type, pin / box gauge result and shoulder condition	supports make-up and field matching
Drift test record	specified drift mandrel and pass/fail result	confirms internal clearance
Packing list	quantity, size, grade, connection, pipe number, heat number and bundle	connects documents to shipment release

Recommended Release Chain

Final Acceptance Logic

The shipment should not be released only because the stencil shows G105 or S135. The complete acceptance logic is whether grade, dimensions, connection, test records and packing documents point to the same physical drill pipe joints.

Acceptance Layer	G105 Review Emphasis	S135 Review Emphasis	Release Result
Grade and mechanical data	verify 105 ksi minimum yield strength and tensile record	verify 135 ksi minimum yield strength and actual values	grade claim becomes measurable
Fatigue-sensitive areas	review slip marks, upset transition, corrosion pits and connection condition	add closer review of weld zone, tool joint and high-stress areas	service risk is not judged by strength alone
Connection and tool joint	match existing string by connection, OD/ID, range and drift	also confirm make-up torque, shoulder and hardbanding condition	rig-site matching risk is reduced
Sour-service / H2S condition	do not select by grade only; review environment and hardness when applicable	higher strength needs stricter cracking-sensitivity review when H2S is present	material route is aligned with project requirement
Documents	MTC, NDT, dimensions, thread gauge, drift and packing list should connect	same chain plus hardness / impact / TPI when required	receiving inspection has traceable evidence

Do Not Release If	Reason
MTC heat number does not match pipe marking	material identity cannot be traced
Grade is confirmed but connection data is missing	field make-up and string matching remain uncertain
Thread gauge or drift record is absent for a connection-sensitive order	rig-site acceptance risk increases
S135 is selected for H2S exposure without hardness / environment review	sour-service cracking risk is not controlled
Packing list cannot link pipe numbers to bundle or shipment	receiving inspection and document control become difficult

Practical conclusion: G105 is often reviewed as a balanced high-strength grade for controlled medium-to-deep drilling, while S135 is reviewed where higher tensile and torque margins are required. In both cases, document traceability and connection control decide whether the pipe can be accepted, not the grade name alone.