

# Special Material Drill Pipe Types and Selection Guide

Matching special material drill pipe to the actual drilling risk: H2S exposure, cyclic bending, low-temperature toughness, magnetic interference, string weight and connection loading.

## 1. Start from the failure mode

Special material selection should begin with the well condition: SSC risk, brittle fracture, survey interference, tool joint wear or excessive string weight.

## 2. Separate the technical areas

Pipe body, tool joint and friction weld zone can have different stress states, heat histories and acceptance limits.

## 3. Link control to evidence

Hardness, CVN, SSC basis, magnetic response and NDT are useful only when matched to heat number, lot and pipe marking.

## Selection map: operating condition -> material route

Operating condition	Main risk to control	Recommended drill pipe route	Key technical evidence
<b>H2S-bearing sour gas well</b>	SSC cracking under tensile / torsional load	Sour service drill pipe / SS grade route	Hardness control, SSC test basis, heat / lot traceability
<b>Long horizontal or ERD section</b>	Torque, drag, cyclic bending, tool joint fatigue	Controlled yield, high toughness or special connection drill pipe	Yield window, tool joint response, thread / shoulder inspection
<b>Cold region or high shock drilling</b>	Brittle fracture, impact shock, vibration	High toughness drill pipe	CVN test temperature, absorbed energy, heat treatment lot
<b>Directional drilling near MWD / LWD</b>	Magnetic interference and survey distortion	Non-magnetic drill pipe section	Magnetic permeability, material identity, connection match
<b>Weight-sensitive offshore / ERD</b>	High hook load, drag, corrosion exposure	Titanium / lightweight alloy or special alloy drill pipe	Strength-to-weight ratio, corrosion behavior, inspection feasibility
<b>Abrasive casing-contact interval</b>	Tool joint wear and casing wear	Hardbanded drill pipe	Hardbanding type, deposit area, casing compatibility

Technical basis: API 5DP grade logic, sour-service terminology such as NACE TM0177, and industry data sheets for sour-service, controlled-yield, high-toughness and non-magnetic drill pipe.

# Special Material Drill Pipe Types

A special material route is selected only when the operating condition creates a functional need that standard API grade selection cannot fully control.

## Primary material routes

Special Material Type	Used when the well section has...	What it solves	Main control focus
<b>Sour Service Drill Pipe</b>	H2S exposure with tensile load, torsion and water phase	Reduces SSC sensitivity and sour-service rejection risk	Hardness limit, SSC / NACE TM0177 basis, pipe body + tool joint + weld zone traceability
<b>Controlled Yield Drill Pipe</b>	Cyclic bending, sour-service review, high dogleg or connection fatigue	Avoids uncontrolled over-strength and excessive hardness	Defined yield-strength window, hardness control, stable heat treatment lot
<b>High Toughness Drill Pipe</b>	Low temperature, hard formation shock or vibration-sensitive drilling	Improves resistance to brittle fracture and impact shock	CVN temperature, absorbed energy, specimen size, tested product element
<b>Non-Magnetic Drill Pipe</b>	MWD / LWD tools close to magnetic steel components	Reduces survey interference and magnetic noise	Magnetic permeability, alloy identity, dimensional and connection compatibility

### Engineering notes

- The highest strength grade is not always the safest material route in sour or fatigue-sensitive wells.
- Pipe body, tool joint and friction weld zone should be evaluated as separate technical areas in special material service.
- A reliable selection links operating condition to acceptance evidence: hardness, CVN, SSC basis, NDT, thread inspection and heat / lot traceability.
- Final specification should follow the actual service condition, drill string design and project ITP.

# Extended Special Material Options

These options are used when string weight, corrosion behavior, fluid-side protection or casing-contact wear becomes the dominant design issue.

Special Material Type	Used when the well section has...	What it solves	Main control focus
<b>Titanium / Lightweight Alloy Drill Pipe</b>	Extended-reach, offshore or weight-limited string design	Reduces string weight and supports special corrosion review	Alloy grade, strength-to-weight ratio, corrosion behavior, inspection feasibility
<b>Special Alloy Steel Drill Pipe</b>	Higher toughness, corrosion behavior or custom mechanical response is required	Provides material-property control beyond standard API grade selection	Chemistry, microstructure, heat treatment, hardness, CVN and NDT scope
<b>Internally Coated Drill Pipe</b>	Fluid-side corrosion, flow efficiency or drilling fluid compatibility matters	Adds inner-wall protection and fluid-side performance control	Coating type, thickness, holiday test, adhesion and fluid compatibility
<b>Hardbanded Drill Pipe</b>	Tool joint contact, casing wear or abrasive formations are expected	Reduces tool joint wear while controlling casing-wear risk	Hardbanding type, deposit area, surface condition and casing compatibility

## How to read this guide

The safest route is not always the highest grade. In special material service, the correct drill pipe type is the one that connects the well condition to a measurable control item: hardness, CVN impact value, SSC test basis, magnetic permeability, coating verification, hardbanding compatibility, NDT and heat / lot traceability.