

# What Drill Pipe Upset Type Changes: ID, OD, Flow and Weld Support

API 5DP Reference | IU, EU and IEU Pipe-End Geometry, Hydraulic Path, Weld-Zone Support and Inspection Focus

<b>Pipe-end geometry</b>	<b>Forged upset end</b>	<b>Weld support target</b>	<b>Order control item</b>
Upset changes where extra wall thickness is placed before tool-joint welding: toward ID, toward OD, or both.	Tube ends are locally heated and forged to thicken the pipe-body end before the tool joint is attached.	The added cross-sectional area supports the weld zone; common engineering references use weld tensile strength at least 110% of pipe-body yield.	API 5DP / ISO 11961 ordering review should specify upset type together with grade, OD, wall thickness, RSC, length and inspection.

## 1) Geometry Map: Where the Added Wall Thickness Goes



## 2) Quick Comparison Table

Upset Type	ID / OD Change	Flow and Tool Passage	Weld-Zone / Stress Support	Primary Inspection Focus
IU	ID decreases; OD is mainly maintained, with minor external upset possible.	Most sensitive to bore restriction, drift diameter and internal tool passage.	Adds wall thickness toward the bore side; transition profile must be smooth.	ID, drift, internal taper, surface condition and tool hang-up risk.
EU	OD increases; ID is mainly maintained and larger than comparable IU / IEU configurations.	More open bore helps reduce local flow restriction and improves tool passage.	External wall increase supports the weld area without the same bore reduction.	OD transition, elevator/handling compatibility, external upset OD tolerance and records.
IEU	ID decreases and OD increases at the upset area.	Balanced option: better weld-area support than a simple geometry while retaining managed hydraulic performance.	Wall support is added on both sides of the pipe end for a robust transition.	Bore/drift plus OD transition, weld zone, hardness / NDT records and marking consistency.

Engineering takeaway: upset type is not a naming detail. It changes pipe-end bore clearance, external transition, hydraulic path, weld-zone support and the inspection items that must be checked before acceptance.

# Performance Effect and API 5DP Acceptance Points

Use this page as a review sheet when upset type is discussed with drill pipe size, connection ID and inspection scope.

## A. Bore and drift clearance

IU and IEU reduce usable ID at the upset area. Review drift diameter, internal taper, connection ID and wireline/tool passage before treating the pipe as hydraulically equivalent to EU.

## B. Hydraulic path

EU keeps a more open bore at the pipe end. The lower restriction is helpful for drilling-fluid circulation, but full pressure-drop review still depends on ID, mud properties, length and connection geometry.

## C. Weld support

Upset increases wall thickness around the pipe-body end so the weld area has additional cross-section. This is why upset style is tied to weld-zone strength and tool-joint support.

## D. Stress transition

The transition from pipe body to upset and tool joint must be gradual. Abrupt geometry changes raise local stress concentration and can create inspection or service concerns.

## API 5DP / ISO 11961 Review Items Related to Upset Geometry

Review Item	Data / Requirement to Check	Why It Matters for ID, OD, Flow or Weld Support
Purchase specification	Specify document number, quantity, OD, wall thickness, grade, upset type, RSC, length/tolerance, inspection and documentation.	Prevents grade-only review. The same grade can have different pipe-end geometry and acceptance points.
Internal upset profile	Internal upset taper area should have a smooth profile, without sharp corners or drastic section changes that can hang up a 90-degree hook-type tool.	Directly affects internal tool passage, drift clearance and bore-side stress transition.
External-upset OD tolerance	For sizes below 6-5/8, OD tolerance behind external upset applies over approx. 127 mm / 5 in; for 6-5/8, over approx. one OD. Measure with calipers or snap gauges.	Controls outside transition where EU and IEU increase local OD and stiffness.
Weld-zone hardness	Surface hardness: E/X/G/S <=37 HRC; V <=40 HRC; SS grades <=32 HRC. Through-wall mean hardness follows the same E/X/G/S and V limits, with SS per specified tables.	Connects tool-joint weld-zone condition with mechanical acceptance and sour-service sensitivity review.
Hardness methods	ISO 6506-1 / ASTM E10; ISO 6507-1 / ASTM E92; ISO 6508-1 / ASTM E18.	Keeps inspection records auditable instead of only stating "hardness checked."

### Minimum acceptance checklist for this article section

Upset type + pipe OD/WT + grade + RSC + length range + drift / ID requirement + OD transition + weld-zone hardness / NDT + marking, MTC and inspection records.

This PDF is intended as a quick technical supplement; final acceptance depends on project ITP and purchase agreement.

# Worked Example and Selection Notes

Example values below show why upset type should be reviewed together with tool-joint ID, OD and performance data.

## Example: 5 in, 19.50#, 0.362 in, G105, IEU, R2 - NC50 (4-1/2 IF)

Item	Example Value	Review Meaning
Pipe body OD	5.000 in / 127.00 mm	Base OD used with wall thickness to define pipe-body geometry.
Pipe body ID	4.276 in / 108.61 mm	Main bore reference before considering tool-joint ID and upset transition.
Wall thickness	0.362 in / 9.19 mm	Controls pipe-body strength basis and available wall for inspection class review.
Nominal weight	19.50 lb/ft / 29.019 kg/m	Used in size identification and string planning.
Grade	G105	Grade group with minimum yield strength level of 105 ksi for pipe-body review.
Upset type	IEU	ID decreases and OD increases near the upset area; drift and OD transition must both be reviewed.
Maximum upset OD	5.125 in	Local OD increase must be checked against handling and transition requirements.
Connection / tool joint	NC50 (4-1/2 IF), TJ OD 6.625 in, TJ ID 3.250 in	Tool-joint ID can become a practical restriction even when pipe-body ID is larger.
Drift size	3.125 in	Critical acceptance value for internal passage through the connection area.
Connection torque reference	Max MUT 30,700 ft-lb; Min MUT 25,600 ft-lb at FF 1.0	Connection data must be reviewed with OEM sheet, drilling manual and safety factor.

## Selection Logic: Match Upset Type to the Main Acceptance Risk

Project Priority	Preferred Direction	Practical Check Before Release
Largest bore / better tool passage	EU generally gives the most open internal path.	Confirm tool-joint ID, drift, OD transition and handling compatibility.
Balanced drilling configuration	IEU is commonly used when weld support and hydraulic performance need a practical balance.	Confirm bore reduction, OD transition, hardness / NDT and marking records.
Near-flush OD or slim-hole style application	IU may be used where external profile must stay limited.	Confirm restricted flow, internal taper smoothness and 90-degree hook-type tool clearance.
Strongest documentation package	Do not specify grade alone.	State upset type, size, connection, length, drift requirement, inspection scope, MTC and traceability records.

### Reference basis used for this quick guide

- API 5DP / ISO 11961 public reference copy: order information, upset configuration, internal upset profile and OD tolerance review.
- API 5DP 2nd Edition Addendum 1, January 2025: weld-zone hardness limits, OD tolerance note and hardness test methods.
- Public engineering bulletin reference: upset formation by heating/forging, 110% weld tensile reference, and IU / EU / IEU geometry behavior.
- Public 5 in G105 NC50 IEU specification sheet: example dimensions and connection data; final values must be verified against project-specific OEM data sheet.