API 5CT Q125 vs P110, L80 and C110 Comparison

Data-focused comparison of common OCTG casing and tubing grades for yield strength, tensile strength, hardness control, sour-service review and selection limits.

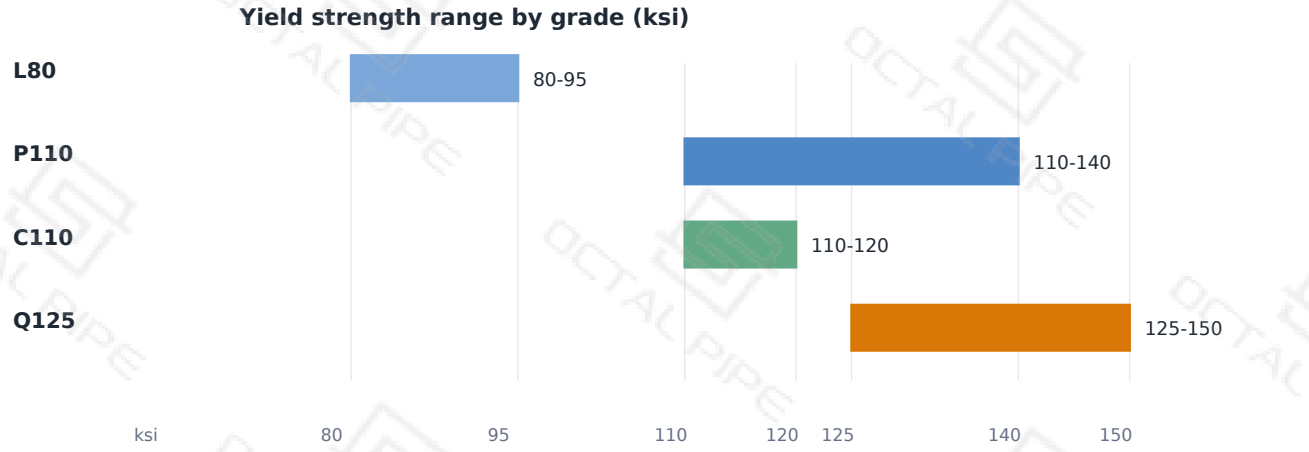
API 5CT Q125 is often compared with P110, L80 and C110 because these grades sit at different strength levels and are used under different well-design conditions. This reference focuses on mechanical data and selection boundaries rather than general product claims. It is designed to support the API 5CT Q125 technical blog and should be used together with the latest applicable API 5CT/API 5B requirements, the well program and the material test certificate.

Grade	Minimum Yield	Yield Range	Minimum Tensile	Primary technical position
L80	80 ksi / 552 MPa	80-95 ksi / 552-655 MPa	95 ksi / 655 MPa	Medium-strength controlled grade; includes L80 Type 1, 9Cr and 13Cr variants.
P110	110 ksi / 758 MPa	110-140 ksi / 758-965 MPa	125 ksi / 862 MPa	Common high-strength grade for deeper or higher-pressure sweet-service sections.
C110	110 ksi / 758 MPa	110-120 ksi / 758-828 MPa	115 ksi / 793 MPa	Controlled-yield grade often reviewed where strength and sour-service resistance both matter.
Q125	125 ksi / 862 MPa	125-150 ksi / 862-1,034 MPa	135 ksi / 931 MPa	Higher-strength grade for deep, high-load or high-pressure casing strings; not a simple substitute for other grades.

Key reading: C110 has the same minimum yield class as P110 but a much narrower yield window, which is why C110 is treated differently from P110 in sour-service discussions. Q125 has the highest yield window in this comparison, but its use still depends on connection capacity, collapse design, toughness and service environment.

1. Mechanical Property Comparison

The table below converts the grade names into the strength ranges that most directly influence pipe-body design. Values are commonly referenced for API 5CT casing and tubing grade comparison; final acceptance should be verified by the applicable standard edition and MTC.



Grade	Yield strength	Minimum tensile strength	Hardness / controlled property note	Data meaning
L80	80-95 ksi 552-655 MPa	95 ksi min 655 MPa min	Commonly listed as 23 HRC max / 241 HBW max for L80-1 type data.	Moderate strength with property control; variants include Type 1, 9Cr and 13Cr.
P110	110-140 ksi 758-965 MPa	125 ksi min 862 MPa min	No general sour-service hardness cap should be assumed; usually not selected for H2S service without review.	Higher strength than L80/N80; broad yield window allows higher strength but increases material sensitivity.
C110	110-120 ksi 758-828 MPa	115 ksi min 793 MPa min	30 HRC max / 286 HBW max commonly referenced; extensive hardness and SSC review may apply.	Controlled-yield grade: same 110 ksi minimum as P110 but lower maximum yield to support sour-service control.
Q125	125-150 ksi 862-1,034 MPa	135 ksi min 931 MPa min	Hardness acceptance is project/specification dependent; high-strength grade needs toughness, NDE and connection review.	Highest yield range in this comparison; used when pipe-body margin is needed but not automatically suitable for every severe well.

2. Grade Position and Selection Factors

The comparison below keeps the original article logic but adds the main engineering factors that should be checked before using one grade as a substitute for another. This is especially important for Q125, because higher yield strength can shift the limiting factor to connection, collapse, impact or sour-service qualification.

Grade	General strength position	Typical use logic	Key technical caution / selection factors
L80	Medium-strength controlled grade	Used where moderate strength and controlled properties are required.	Not the same strength level as Q125. Selection should still consider well depth, burst/collapse design, corrosion system, L80 type, heat treatment and service environment.
P110	Common high-strength OCTG grade	Used where higher strength than N80/L80 is required, normally in sweet-service high-load or deep well sections.	Lower minimum yield strength than Q125. Connection type, string tension, collapse rating, temperature, impact requirement and inspection records should be checked before substitution.
C110	High-strength controlled-yield grade	Used where strength and SSC resistance may both matter; often discussed in sour condensate well design.	Requires strict sour-service, hardness, SSC and impact toughness review, especially where H2S exposure is present. Not all sour environments are automatically covered.
Q125	125 ksi minimum yield high-strength grade	Used in deep, high-load or high-pressure casing strings where higher pipe-body strength is required.	Not automatically suitable for sour service or every severe well. Review required yield strength, burst/collapse design, connection capacity, heat treatment, full-body NDE, impact toughness and inspection records.

Q125 has a higher minimum yield strength than P110, but grade selection should not be treated as a simple strength upgrade. In sour-service conditions, high-strength steel may be more sensitive to sulfide stress cracking if hardness, stress and environment are not properly controlled. In other cases, the final design limit may come from the connection, collapse rating, impact toughness requirement or inspection acceptance rather than the pipe body alone.

3. Sour-Service and Design-Limit Review

A data comparison becomes useful only when it is tied to the actual well environment. Yield strength alone does not confirm sour-service suitability or full-string capacity. The table below separates pipe-body strength from the other design limits that often control grade selection.

Review item	L80	P110	C110	Q125
Strength position	80 ksi minimum yield	110 ksi minimum yield	110 ksi minimum yield with tighter upper yield window	125 ksi minimum yield
Sour-service thinking	Depends on L80 type and environment; hardness and corrosion condition must be reviewed.	Generally not treated as a sour-service choice in H2S service without strict qualification.	Often reviewed for sour-service control; requires hardness/SSC and environment review.	Should not be assumed suitable for sour service only because it is high strength; qualification and project review are required.
Connection risk	Standard connections may be adequate when loads are moderate.	Connection tensile efficiency and sealability must match higher body strength.	Connection and SSC-resistant design should be reviewed together.	Connection capacity may become the limiting factor even when pipe body strength is high.
Collapse / burst review	Moderate-strength grade; check wall and design load.	Higher strength supports load capacity but collapse is still affected by OD/wall and ovality.	Strength and environmental control both matter.	Do not treat grade as high-collapse guarantee; collapse depends on wall, OD/wall ratio, ovality, residual stress and design basis.
Inspection focus	Hardness, tensile, dimensional and traceability records.	Tensile, hydrotest, NDE, drift and thread inspection.	Hardness distribution, SSC test basis, impact toughness, NDE and traceability.	Tensile range, impact response, heat treatment stability, full-body NDE, drift, thread/coupling inspection and MTC traceability.

Practical conclusion: P110 and Q125 are strength-driven choices, while C110 is a controlled-yield grade often brought into sour-service discussions. L80 is not a replacement for Q125, and Q125 is not a replacement for C110. The correct grade depends on load case, service environment, connection design and inspection evidence.

4. Selection Notes for API 5CT Q125 Comparison

When the article compares Q125 with P110, L80 and C110, the comparison should point the reader toward the actual engineering decision. The following checklist is intentionally short and data-centered so it can be used near the end of the blog as a downloadable reference.

Question	Technical point to check	Why it matters
Is Q125 needed over P110?	Compare required yield strength with 110-140 ksi P110 and 125-150 ksi Q125 ranges.	If P110 already provides the required safety factor, Q125 may not add practical value; if load margins are short, Q125 may be reviewed.
Is C110 more suitable than Q125?	Check H2S, SSC exposure, hardness requirements and NACE MR0175 / ISO 15156 review.	C110 is a controlled-yield sour-service grade; Q125 is a higher-strength grade but not an automatic sour-service choice.
Does connection match pipe body?	Review STC/LTC/BTC/premium connection tensile efficiency, pressure sealing and make-up requirement.	A strong pipe body can still be limited by thread/coupling capacity or sealability.
Is collapse the controlling load?	Check OD, wall thickness, ovality, residual stress, manufacturing route and collapse calculation/test basis.	Collapse rating is not controlled by grade name alone.
Is inspection scope sufficient?	Confirm tensile, hardness, impact, hydrotest, drift, full-body NDE, thread inspection, coupling inspection and MTC traceability.	High-strength grades require stronger acceptance evidence, especially when used in deep or high-load strings.

Reference basis and cautions

• API notice: API Spec 5CT 11th edition was published in December 2023 and no longer refers to Product Specification Levels used in the 10th edition.

• Mechanical property values in this reference align with public API 5CT grade data: L80 80-95 ksi yield and 95 ksi tensile minimum; P110 110-140 ksi yield and 125 ksi tensile minimum; C110 110-120 ksi yield and 115 ksi tensile minimum; Q125 125-150 ksi yield and 135 ksi tensile minimum.

• ISO 11960 preview material highlights grade-specific testing and full-body/full-length NDE topics for high-strength grades including L80 13Cr, C90, T95, C110 and Q125.

• For sour-service applications, final material qualification should be checked against NACE MR0175 / ISO 15156, project environmental data and the applicable API 5CT/API 5B requirements.

Source references used for this summary: API official 5CT 11th edition notice; ISO 11960:2020 public preview; API 5CT Addendum 1 public PDF; Continental Alloys API 5CT grade data; Sovonex API casing grades overview; Octal L80 reference page. Values should be verified against the ordered standard edition, purchase specification and MTC before release.