TECHNICAL PROCUREMENT GUIDE

API 5CT T95 Sour Service Selection and Inspection Guide

Material limits, sulfide stress cracking qualification, inspection release and purchase order controls for casing and tubing.

API 5CT T95 is a controlled-yield, quenched-and-tempered steel grade for seamless casing and tubing. It combines a 95-110 ksi yield range with a specified maximum hardness, making it a common candidate for higher-load wells where sour-service cracking control is required. The grade designation alone does not approve a string for every H2S environment.

95-110 ksi **655-758 MPa** Specified yield strength	**>=105 ksi** **724 MPa** Minimum tensile strength
<=25.4 HRC **or 255 HBW** Maximum hardness	**>=649 C** **1200 F** Minimum tempering temperature

Current-edition alert

API Specification 5CT, 11th Edition no longer references Product Specification Levels (PSLs). A current purchase order should identify the applicable edition, addenda and errata, then state the required supplemental requirements, inspection controls and purchaser-manufacturer agreements directly. Do not use legacy PSL2/PSL3 wording as a substitute for a defined technical scope.

USE THIS GUIDE TO

- Screen T95 against the actual sour environment.
- Define SSC testing and inspection evidence.
- Avoid ambiguous RFQ and purchase-order language.
- Release pipe by traceable heat, lot and test records.

Technical basis checked 18 September 2026. Confirm standard status again at purchase-order issue.

1 T95 Grade Position and Material Boundary

Casing supports the wellbore and isolates formations; tubing is the production or injection conduit installed inside the casing. Both may be ordered in T95, but their dimensions, drift, connections, load cases and service exposure are not interchangeable. T95 describes the steel grade and its mechanical/metallurgical controls - not the completed string design.

Mechanical-property context

Grade	Yield range	Min. tensile	Max. hardness	Typical engineering position
L80 Type 1	80-95 ksi 552-655 MPa	95 ksi 655 MPa	23 HRC	Lower strength; sour use still requires environment and material review.
C90	90-105 ksi 621-724 MPa	100 ksi 689 MPa	25.4 HRC	Controlled-yield sour-service option below T95 strength.
T95	95-110 ksi 655-758 MPa	105 ksi 724 MPa	25.4 HRC / 255 HBW	Higher load capacity with controlled strength and hardness.
P110	110-140 ksi 758-965 MPa	125 ksi 862 MPa	No comparable fixed maximum in the grade summary	Higher strength; do not treat as a direct sour-service substitute.

What the grade does - and does not - tell you

The grade sets material-strength and processing requirements. Burst, collapse and axial capacity depend on OD, nominal mass or wall thickness, geometry, tolerances and connection performance. Sour-service suitability additionally depends on H2S partial pressure, pH, temperature, chlorides, water chemistry, applied and residual stress, and the project's qualification basis.

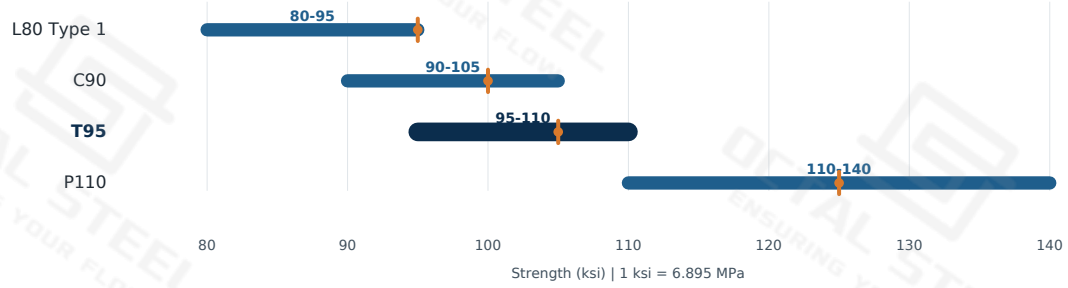
Product boundary

Item	T95 purchasing implication	Do not assume
Pipe body	Seamless, quenched and tempered; verify ordered size and mass combination with the mill.	Every API casing/tubing size is available in T95.
API connection	Specify casing or tubing connection, thread form, coupling grade and applicable API 5B controls.	Pipe-body grade proves connection gas tightness.
Premium connection	Name the licensed connection, qualification level, gaging, torque and running procedure.	A trade name alone defines acceptance criteria.
Coupling stock	Require traceability and mechanical/hardness evidence appropriate to the ordered connection.	The pipe-body MTC automatically covers couplings.

Common API connection families include STC/LTC/BTC for casing and NUE/EUE for tubing. Availability and suitability must be confirmed for the exact OD, nominal mass, range and service design.

Figure 1 - API grade strength windows

Blue = yield range | orange = minimum tensile

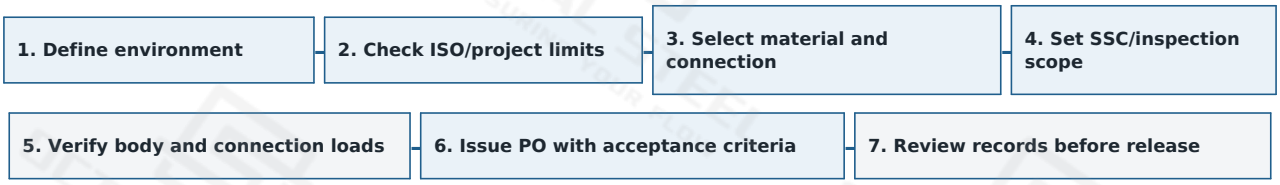


2 Sour-Service Selection Inputs

Start with the well environment, not the grade name. ISO 15156-2 provides the framework for selecting and qualifying carbon and low-alloy steels in H2S-containing oil and gas production environments. The following inputs should be frozen before the pipe requirement is released for quotation.

Input	Why it matters	Minimum procurement record
H2S partial pressure	Key sour-severity input; total H2S concentration alone may be misleading.	Maximum operating and credible transient value, with basis.
In-situ pH	Affects hydrogen charging and SSC severity.	Expected range and calculation/measurement method.
Temperature	Material limits and cracking behavior vary with temperature.	Operating, shut-in, startup and upset envelope.
Chloride and water phase	Influence localized corrosion and the aqueous environment at the steel surface.	Chloride range, water cut and water chemistry.
CO2 and contaminants	Drive mass-loss/localized corrosion and can change the surface condition.	Partial pressure or composition; solids and organic acids if relevant.
Applied and residual stress	SSC is stress-assisted; straightening, threading and make-up add local effects.	Design stress, connection stress and qualification basis.
Connection sealing	A qualified pipe body does not establish gas-tight connection performance.	Connection qualification, make-up torque and sealability basis.
Corrosion management	Inhibitors and operating controls may be part of the integrity strategy.	Treatment assumptions, monitoring and contingency limits.

Selection sequence



Cracking control is not the whole corrosion assessment

ISO 15156-2 addresses cracking mechanisms including SSC and related hydrogen-assisted damage. It does not, by itself, solve general or localized mass-loss corrosion. CO2 corrosion, erosion, deposits, oxygen ingress, inhibitor performance and corrosion allowance require a separate design review.

3 Metallurgy and SSC Qualification

T95 performance depends on a controlled microstructure, not only on meeting a final tensile number. Heat treatment, alloy balance, straightening practice and local hardness all influence sulfide stress cracking resistance.

Manufacturing and release route

Seamless shell → **Quench** → **Temper >=649 C** → **Controlled straighten** → **NDE, thread, release**

Element	T95 Type 1 chemistry reference	Engineering relevance
C	<=0.350%	Strength/hardenability; excess can increase hardness and welding sensitivity.
Mn	<=1.200%	Strength and hardenability; segregation control remains important.
Cr	0.400-1.500%	Hardenability and temper response.
Mo	0.250-0.850%	Hardenability and resistance to temper softening.
Ni	<=0.990%	Toughness/hardenability; constrained in the grade chemistry.
P / S	P <=0.020%; S <=0.010%	Residual control supports cleanliness and cracking resistance.

This table summarizes the T95 Type 1 chemistry route. API also distinguishes T95 Type 2; do not infer service severity from the type number alone. For Type 1, the Mo minimum may be reduced to 0.15% where the applicable API wall-thickness note permits it. The ordered edition, type, product form, wall-thickness notes, heat analysis and product analysis requirements govern.

Why hardness mapping matters

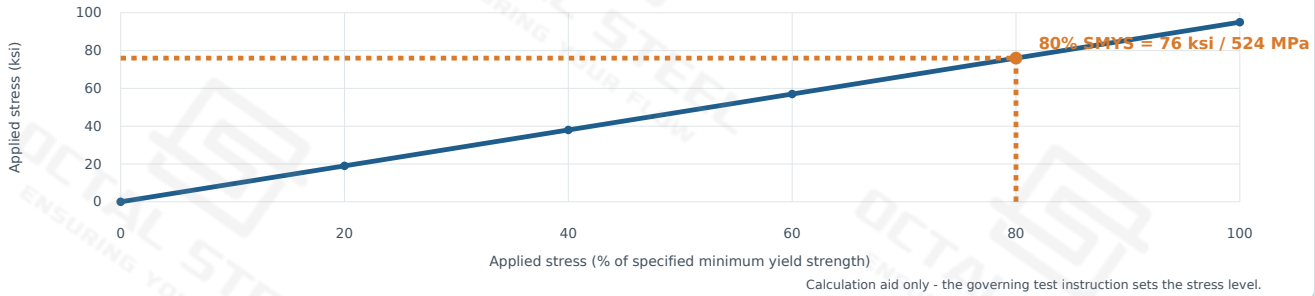
A compliant average can hide a local hard spot. The inspection plan should identify hardness method, sampling frequency, specimen or indentation location, acceptance basis and any required full-length hard-spot screening. End zones, straightened areas and threaded regions deserve deliberate coverage because local cold work and processing history may differ from the mid-body.

SSC test instruction - write the test, not just 'NACE compliant'

Required field	What the PO / test instruction should state
Standard and method	ANSI/NACE TM0177-2024, including applicable errata; identify Method A if that tensile test is required.
Applied stress	State the percentage of actual or specified yield basis required by the governing API/project document. Use 80% SMYS only where it is explicitly invoked; do not assume it silently.
Specimen definition	Orientation, pipe-body or coupling source, wall location, surface condition and lot/heat representation.
Environment and acceptance	Test solution, temperature, loading basis, duration and acceptance criteria per the invoked document.
Record	Raw result, specimen identity, calibration, deviations, retests and link to heat/heat-treatment lot.

Figure 2 - T95 SMYS stress conversion

Based on 95 ksi / 655 MPa SMYS



Calculation aid only - the governing test instruction sets the stress level.

4 Inspection and Release Plan

The inspection and test plan (ITP) converts a grade callout into auditable evidence. For each activity, name the governing document, method, coverage, frequency, acceptance level, reporting format and witness point. The exact API 5CT 11th Edition addenda and errata stated in the PO control the final scope.

Control point	Minimum evidence	Purchaser decisions to state	Release concern
Heat chemistry	Heat analysis; product analysis where required	Residual limits or additional elements	Heat identity lost across processing
Heat treatment	Quench/temper route; furnace records; lot identity	Lot definition and record detail	Mixed or undocumented heat-treatment lots
Tensile	Yield, tensile, elongation; specimen identity	Frequency and retest rules	Yield above 110 ksi or inadequate lot link
Hardness	Method, values, locations and sample identity	Mapping/screening beyond standard minimum	Local hard spots or end-zone variation
SSC qualification	Method, stress basis, specimen and result	Lot frequency; pipe body vs coupling	Generic certificate without test basis
Wall thickness	Full-body measurement record and calibration	Coverage and reporting resolution	Unmeasured end zones or unclear minimum
Body NDE	Method, reference standard, calibration and results	Acceptance level; coverage; operator qualification	'100% NDT' with no method or threshold
Ends / threads	End-zone examination; visual and dimensional records	Unscanned length and supplementary method	Dead zones near upset/threaded ends
Hydrostatic	Pressure, hold record and result per ordered requirements	Special pressure or witness if applicable	Summary result without pipe identity
Dimensions / drift	OD, wall, length, mass and drift results	Standard or special drift	Nominal description used as measured data
Connection	Thread gaging, visual, coupling and make-up controls	API vs premium criteria; torque data	Pipe body accepted while connection evidence is missing
Traceability	Marking, tally, MTC and packing-list cross-reference	Heat map and digital record format	Relabeling or bundle identity gaps

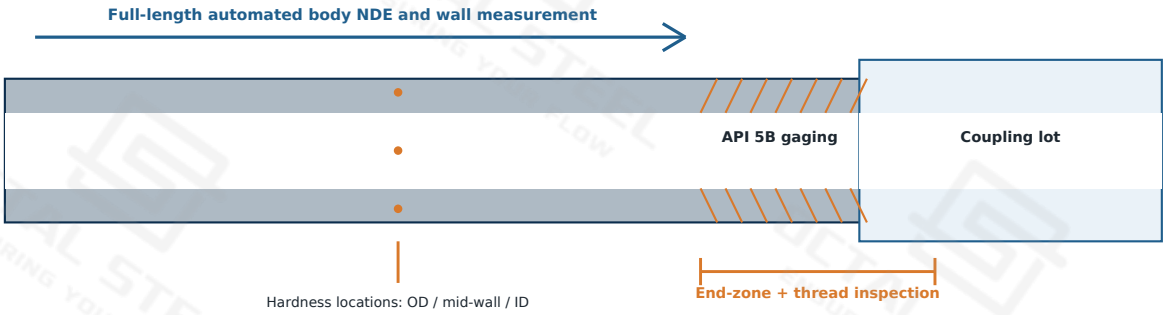
Evidence chain

Pipe marking / tally — **Heat + HT lot** — **Mechanical + SSC** — **NDE + hydro + threads** — **MTC + packing release**

Practical release rule

Do not release on a certificate title alone. A usable dossier lets the inspector move in both directions: from any pipe or bundle marking to the heat, heat-treatment lot and test results - and from every reported test result back to the represented material.

Figure 3 - Pipe-body, end-zone and connection release coverage



Schematic, not to scale. Coverage and sampling frequency remain controlled by the ordered API edition, PO and ITP.

5 Purchase Order Checklist and Red Flags

A precise PO reduces commercial rework and prevents a technically incomplete mill offer. The checklist below is intentionally short enough to insert into an RFQ datasheet.

#	PO field	Required entry
1	Standard basis	API Specification 5CT, 11th Edition; identify applicable addenda and errata at PO issue.
2	Product / grade	Casing or tubing; grade T95 and type where applicable; quantity and delivery unit.
3	Dimensions	OD, nominal mass or wall thickness, length range, and any special tolerances.
4	Manufacture / heat treatment	Seamless; quenched and tempered; required production-route records.
5	Connection	API connection and API 5B controls, or licensed premium connection and qualification basis.
6	Drift	Standard drift or clearly dimensioned special drift.
7	Service envelope	H2S partial pressure, pH, temperature, chlorides, CO2, water chemistry and design stress.
8	SSC testing	Standard/method, stress basis, specimen source, lot frequency and acceptance criteria.
9	Hardness	Method, maximum, sampling/mapping, end-zone coverage and retest rules.
10	NDE / wall	Method, coverage, reference standard, calibration, acceptance level and end-zone treatment.
11	Hydro / dimensions	Applicable standard requirements plus any purchaser-specific pressure, witness or dimensional controls.
12	Documents	MTC content, raw reports, English language, electronic format and retention period.
13	Inspection points	Review, witness and hold points; third-party inspection scope if required.
14	Marking / packing	Traceable pipe marking, protectors, tally, bundle heat map, storage and shipping protection.

Do not default to legacy PSL wording

The 11th Edition removed PSL references. Translate the technical intent into explicit supplemental requirements, purchaser agreements, ITP controls and acceptance criteria. If a legacy project document still says PSL2 or PSL3, reconcile it formally before order placement.

Five red flags in a supplier offer

Red flag	Why it is incomplete
'7 in T95'	No nominal mass/wall, range, connection, drift or service basis.
'100% NDT'	No method, coverage, acceptance level, calibration or end-zone treatment.
'NACE compliant'	No standard edition, test method, stress level, lot or environment basis.
One MTC for pipe and coupling	No proof that both components share the stated heat/lot and test evidence.
Premium connection by name only	No licensor procedure, qualification level, gaging, torque or running criteria.

6 Reference Basis and Engineering Handoff

Use the licensed standards and the signed purchase order as the controlling documents. This guide is a working aid for specification review, bid clarification and inspection planning; it does not reproduce proprietary acceptance tables or replace well-specific materials engineering.

Primary and technical references

1. American Petroleum Institute, API Specification 5CT - Casing and Tubing, 11th Edition. Official standards announcement and current Webstore record. API announcement | API Webstore.
2. American Petroleum Institute, Removal of Product Specification Level Requirements from API Specification 5CT, 11th Edition. Confirms that the 11th Edition no longer references PSLs. API technical notice.
3. ISO 15156-2:2020, Petroleum and natural gas industries - Materials for use in H2S-containing environments in oil and gas production - Part 2: Cracking-resistant carbon and low-alloy steels, and the use of cast irons. ISO official record. ISO lists a revision under development; verify status at PO issue.
4. ANSI/NACE TM0177-2024, Laboratory Testing of Metals for Resistance to Sulfide Stress Cracking and Stress Corrosion Cracking in H2S Environments, including applicable errata. AMPP official record.
5. IOGP JIP33 S-735 v1.0 (April 2022), Supplementary Specification to API Specification 5CT Casing and Tubing. Apply only when invoked by the project; reconcile it with the ordered API edition. IOGP official record.
6. Octal Steel, API 5CT Casing and Tubing Specification, technical cross-reference for grade properties, sizes, manufacturing, testing and ordering context. Octal Steel technical reference.

ENGINEERING HANDOFF BEFORE QUOTATION		
OWNER / OPERATOR	**MATERIALS / WELL ENGINEERING**	**PROCUREMENT / QA-QC**
Provide the credible operating and upset environment, design life and integrity strategy.	Approve the grade, size/weight, connection, load envelope, cracking qualification and corrosion controls.	Convert requirements into the PO/ITP, resolve deviations and preserve the traceable release dossier.

Request-for-quotation minimum

Send the supplier: product type, grade, dimensions, connection, quantity, API edition/addenda/errata, sour-environment envelope, SSC requirement, NDE/inspection scope, document list and required delivery date. Ask the mill to return a line-by-line deviation schedule rather than a general statement of compliance.

TECHNICAL ENQUIRIES	Web: www.octalsteel.com
DOCUMENT STATUS	Procurement guide | Revision 1 - illustrated edition | 18 September 2026