

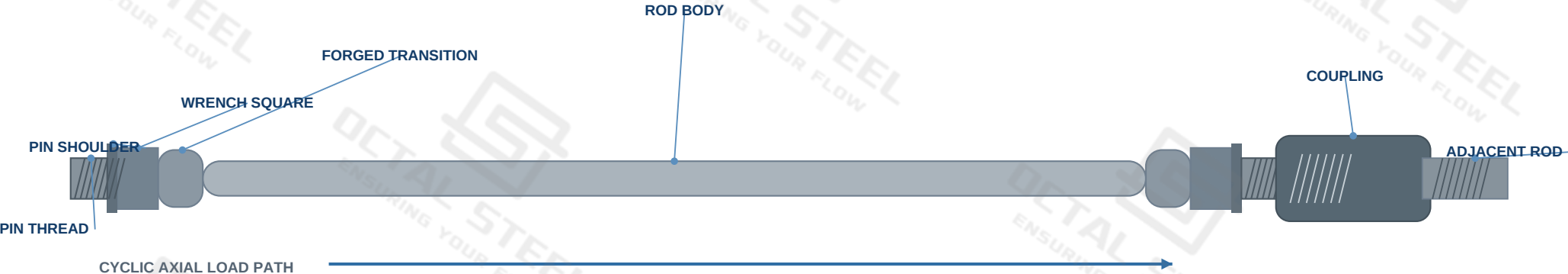
API 11B Sucker Rod Selection Guide

Rod sizes, grade selection, connection compatibility and inspection reference

CURRENT BASIS: API SPEC 11B 28th ED. + ADD. 1

1. Sucker Rod Structure and Connection

API 11B steel sucker rods transfer reciprocating motion and axial load from the surface pumping system to the downhole pump. The finished connection is more than the rod body: the forged end, wrench square, shoulder, pin thread and coupling all influence field fit and fatigue performance.



STANDARD BODY SIZES

5/8, 3/4, 7/8, 1, 1-1/8 in.
15.88 to 28.58 mm

NOMINAL ROD LENGTHS

296 in. (about 25 ft)
356 in. (about 30 ft)

API STEEL GRADES

Grade C / Grade K / Grade D
Special grades: project-specific

CONNECTION BASIS

Shouldered sucker-rod pin
10 threads per inch reference

KEY POINT

Rod size alone does not define the complete sucker-rod connection. For purchase and replacement work, confirm the rod size, material class, pin dimensions, coupling type and applicable API edition together.

Grades and Mechanical Properties

Use strength data as one input to rod-string selection - not as a stand-alone depth rule

2. API Steel Sucker Rod Grades

The standard steel grades **C**, **K** and **D** have different material routes and strength levels. Grade selection should follow the calculated cyclic stress and actual well environment rather than a simple "shallow well / deep well" rule.

Grade	Minimum Yield (0.2% offset)	Minimum Tensile	Maximum Tensile	Material Route - API 11B 27th Reference
K	60,000 psi / 414 MPa	90,000 psi / 621 MPa	115,000 psi / 793 MPa	AISI 46XX series or equivalent
C	60,000 psi / 414 MPa	90,000 psi / 621 MPa	115,000 psi / 793 MPa	AISI 10XX or 15XX series or equivalent
D	85,000 psi / 586 MPa	115,000 psi / 793 MPa	140,000 psi / 965 MPa	Carbon, alloy or special-alloy routes

What actually changes the grade decision

ROD-STRING STRESS

Peak and minimum stress across each pumping cycle

PUMP LOAD

Pump diameter and fluid load change axial demand

STROKE PROGRAM

Stroke length and strokes/min affect dynamic loading

WELL DEVIATION

Side loading adds friction and rod-to-tubing contact

FLUID ENVIRONMENT

Water, CO2, H2S and chlorides change corrosion risk

FATIGUE EXPOSURE

Repeated cycles make stress range and surface condition important

DO NOT OVER-SIMPLIFY

Grade C/K/D tells you the specified rod material class and strength range. It does **not** by itself define allowable cyclic operating load, corrosion resistance or fatigue life.

PURCHASE CHECK

For delivered rods, mechanical-property acceptance should be linked to the actual heat/lot through the **MTR and mechanical-test report**. Grade naming should stay consistent across marking, test records and packing lists.

Sucker Rod String Size and Taper Selection

A tapered rod string distributes suspended load and moving mass across the well

3. Tapered String Design Logic

A producing rod string does not have to use one diameter from the polished rod to the pump. Larger rods are often placed in the upper section, where they carry more of the suspended rod-string and fluid load, while smaller rods lower in the well can reduce moving mass. The example below illustrates the logic only; actual taper lengths require rod-string calculations.

SURFACE / POLISHED ROD



1 in. upper section

7/8 in. middle section

3/4 in. lower section

DOWNHOLE PUMP

Design inputs that change the taper

Input	Engineering effect
Pump setting depth	Changes total suspended rod length
Pump diameter	Changes pump and fluid load
Fluid level / density	Changes effective axial load
Stroke length	Changes displacement and dynamic load
Strokes per minute	Changes acceleration and fatigue cycles
Rod grade	Changes allowable stress range
Well deviation	Adds friction and tubing contact
Corrosion conditions	Reduces fatigue margin and service life

PRACTICAL DESIGN SEQUENCE

1) Define the pumping program. 2) Calculate peak/minimum loads and stress range in each section. 3) Select rod size and grade by section. 4) Check tubing clearance, coupling OD and deviation-driven contact. 5) Re-check after a major change in pump size, fluid level or stroke program.

Illustrative example - not an API prescribed taper -> 1 in. upper -> 7/8 in. middle -> 3/4 in. lower

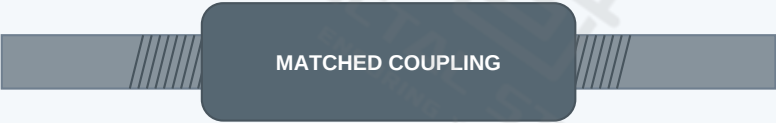
Pin and Coupling Compatibility

Replacement work must account for connection geometry, API edition and existing wear

4. New String vs. Replacement String

NEW UNIFORM STRING

New rod + matching new coupling + one approved connection basis



SAME API BASIS

GAUGE CHECKED

TRACEABLE LOT

REPLACEMENT IN AN EXISTING STRING

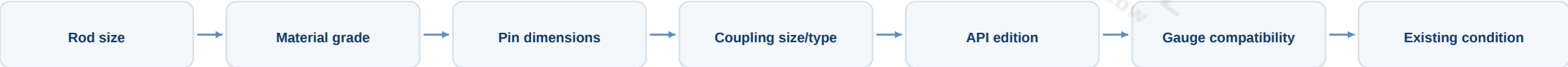
A new rod may have the same nominal size and grade as the old string but still require a connection review. The existing pin/coupling dimensions, API edition, thread condition, shoulder condition and gauge compatibility should be checked before mixed assembly.

- ☒ Nominal rod size
- ☒ Pin dimensions
- ☒ Coupling dimensions/type
- ☒ API edition
- ☒ Thread and shoulder condition
- ☒ Gauge compatibility
- ☒ Existing component wear

SAME NOMINAL ROD SIZE DOES NOT GUARANTEE CROSS-EDITION CONNECTION COMPATIBILITY

API 11B 28th Edition legacy-component note

API Spec 11B 28th Edition addressed a dimensional interference condition between sucker-rod pins and couplings. The standard also warns that potential interference can remain when **28th Edition components are mixed with components manufactured to prior editions**. For an older producing string, cross-edition fit should therefore be verified rather than assumed.



LEGACY REFERENCE

Use the superseded API Spec 11B 27th Edition only as a legacy dimensional reference. The current 28th Edition and applicable addenda should govern new purchase requirements.

Coupling Selection and Tubing Clearance

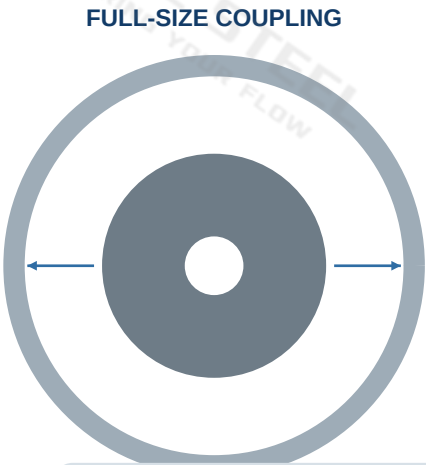
Full-size and slim-hole couplings change the connection envelope, but clearance is only one design input

5. Coupling Size Reference

Sucker rod couplings are part of the load-carrying connection between adjacent rods. API 11B legacy dimensional tables define both **full-size** and **slim-hole** coupling envelopes. Class T couplings are through-hardened; Class SM couplings use a sprayed-metal surface configuration. Current purchase drawings should follow the latest applicable API edition.

Rod Size	Full-Size Coupling OD	Slim-Hole Coupling OD	Full-Size Length Reference
5/8 in.	1.500 in. / 38.10 mm	1.250 in. / 31.8 mm	4.000 in. / 101.6 mm
3/4 in.	1.625 in. / 41.28 mm	1.500 in. / 38.10 mm	4.000 in. / 101.6 mm
7/8 in.	1.812 in. / 46.0 mm	1.625 in. / 41.3 mm	4.000 in. / 101.6 mm
1 in.	2.187 in. / 55.6 mm	2.000 in. / 50.80 mm	4.000 in. / 101.6 mm
1-1/8 in.	2.375 in. / 60.33 mm	Not listed as slim-hole in Table C.1	4.500 in. / 114.3 mm

How coupling OD changes tubing clearance



SELECTION BOUNDARY

A smaller coupling OD increases geometric clearance, but it does not by itself solve rod-to-tubing wear. Review **tubing ID, well deviation, dogleg severity, side load, rod guides, pumping dynamics and surface condition** together with coupling strength and class.

CLASS T

Through-hardened coupling construction. Confirm coupling grade, hardness and dimensional inspection against the purchase specification.

CLASS SM

Sprayed-metal coupling configuration used where the specified wear/service program calls for it. Surface condition and coating integrity become part of inspection.

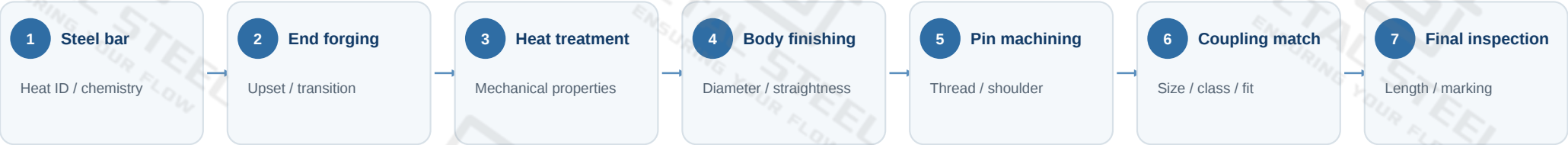
IMPORTANT

Coupling OD is a geometric input, not a stand-alone wear solution. The operating string must still be checked for load, contact and connection compatibility.

Manufacturing, Inspection and Purchase Verification

Link each finished rod to its material heat, processing route, connection inspection and shipment identity

6. Manufacturing Flow and Release Records



Inspection and evidence

Control Point	What Is Checked	Release Evidence
Steel bar	Heat identity, chemistry, bar diameter, initial surface	Material certificate / heat record
Forged end	Upset geometry, alignment, transition profile	Forging / dimensional record
Heat treatment	Lot identity and required mechanical properties	Heat-treatment / test report
Rod body	Diameter, straightness, surface condition	Dimensional inspection
Pin / shoulder	Thread form, dimensions, shoulder, gauge result	Thread-gauging record
Coupling	Size, class, thread condition and fit	Coupling inspection
Finished rod	Length, marking, protector condition, lot identity	Final inspection / packing record

PURCHASE / REPLACEMENT CHECK

- ☒ Rod size confirmed
- ☒ Exact grade / material class
- ☒ 25 ft / 30 ft length
- ☒ Pin dimensions / thread
- ☒ Coupling size and type
- ☒ API edition identified
- ☒ Existing string compatibility
- ☒ Taper position identified
- ☒ Material / mechanical records
- ☒ Inspection scope and marking

TECHNICAL BASIS

API Spec 11B, 28th Edition (current) + Addendum 1, Sep 2025; API RP 11BR:2008 (R2025).
Legacy dimensional reference: API Spec 11B, 27th Edition (superseded). Current purchase drawings and licensed standards govern contractual acceptance.

TRACEABILITY CHAIN

Heat -> Treatment -> Test -> Gauge -> Marking