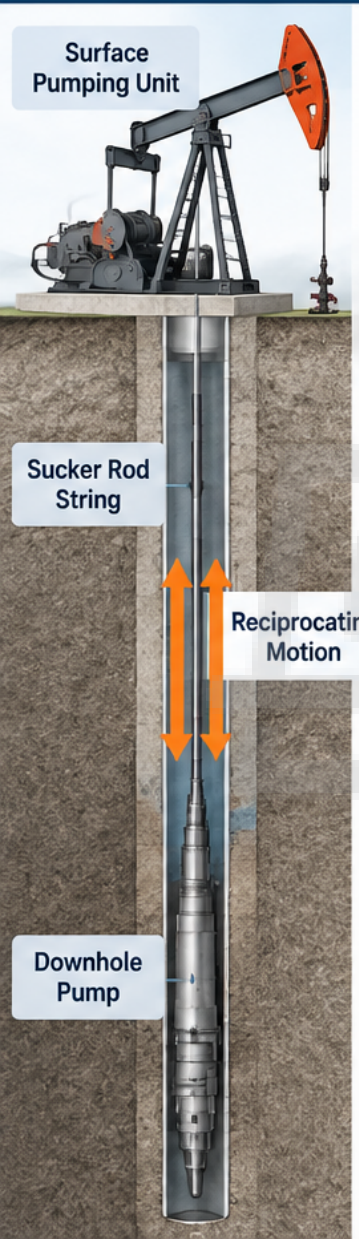
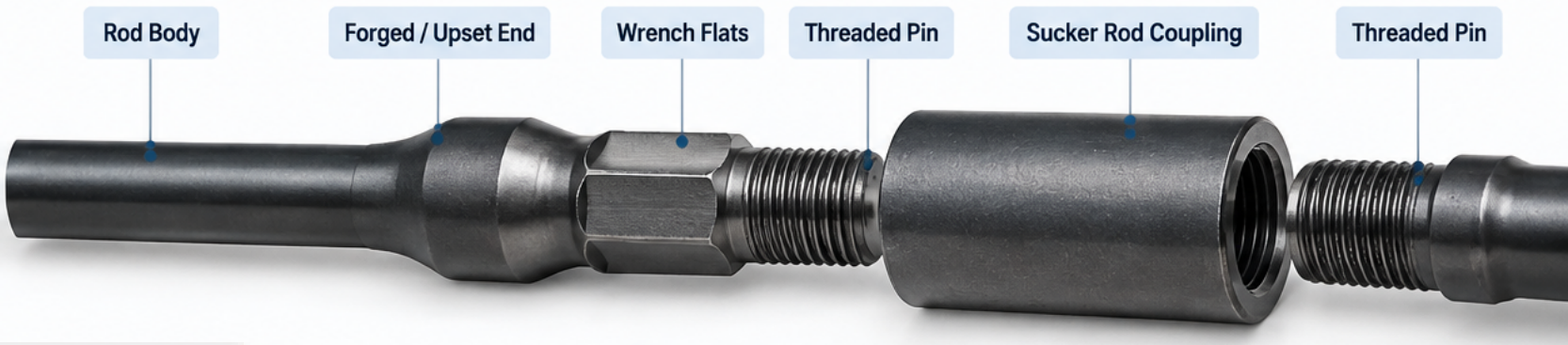
Grade D Sucker Rod Engineering Overview

Cyclic Load | Reliable Connection | Stable Operation





Cyclic Tensile Load

Key Mechanical Properties (Octal Manufacturing Reference)

85,000 psi 586 MPa	115,000 – 140,000 psi 793 – 965 MPa	≥13%	≥50%
Minimum Yield Strength	Tensile Strength	Elongation over 200 mm	Reduction of Area Octal manufacturing reference

Grade D is selected primarily for higher calculated rod-string mechanical loading.

Proper grade selection should also consider service conditions such as corrosion, well deviation, tubing contact and connection compatibility.

Grade D Mechanical Properties and Engineering Meaning

API 11B Grade D Sucker Rod

Yield and Tensile Strength

Define the load-carrying capacity and resistance to deformation of the sucker rod during cyclic service.

Yield Strength
85,000 psi (586 MPa)
Threshold for permanent deformation

Tensile Strength
115,000 – 140,000 psi (793 – 965 MPa)
Material resistance before tensile failure

Elastic Deformation
Returns to original shape

Plastic Deformation
Permanent deformation may occur

Tensile Failure
Fracture

Ductility – Elongation

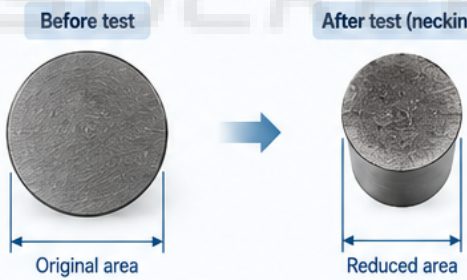
Indicates the ability of the material to deform plastically before fracture.

Elongation over 200 mm ≥13%

Ductility – Reduction of Area

Indicates the material's ability to withstand necking before fracture.

Reduction of Area ≥50%
Octal manufacturing reference



Hardness

Used to verify heat-treatment and material consistency.

Hardness: material / heat-treatment specific

Material
Qualified carbon or alloy steel

Heat Treatment
Quenching and tempering

Hardness Verification
Confirm consistency with specification

No single universal hardness value is assigned to Grade D sucker rods. Hardness should follow the approved material and heat-treatment specification and remain traceable to the production heat and lot.

Grade D performance should be verified by finished mechanical-test results, not inferred from steel designation alone.

Mechanical Properties
Material Consistency
Reliable Operation

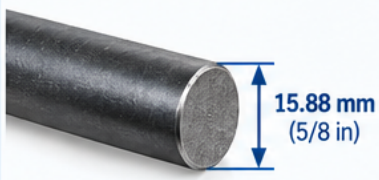
Grade D Common Sizes and Dimensional Control

API 11B Grade D Sucker Rod

Common Grade D Sucker Rod Sizes

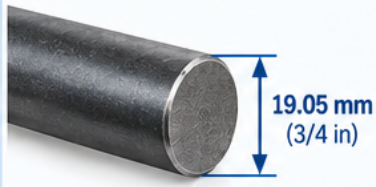
Nominal rod body outside diameter (OD) and manufacturing tolerance.

5/8 in
15.88 mm



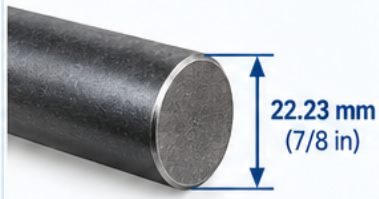
Rod Body OD Tolerance
+0.18 / −0.36 mm

3/4 in
19.05 mm



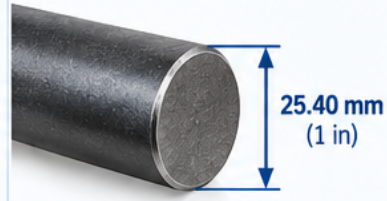
Rod Body OD Tolerance
+0.20 / −0.41 mm

7/8 in
22.23 mm



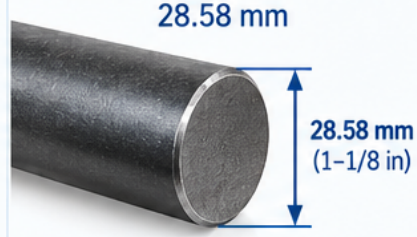
Rod Body OD Tolerance
+0.20 / −0.41 mm

1 in
25.40 mm



Rod Body OD Tolerance
+0.23 / −0.46 mm

1-1/8 in
28.58 mm



Rod Body OD Tolerance
+0.25 / −0.51 mm

Common Nominal Lengths

Standard lengths for Grade D sucker rods.

25 ft
7.62 m

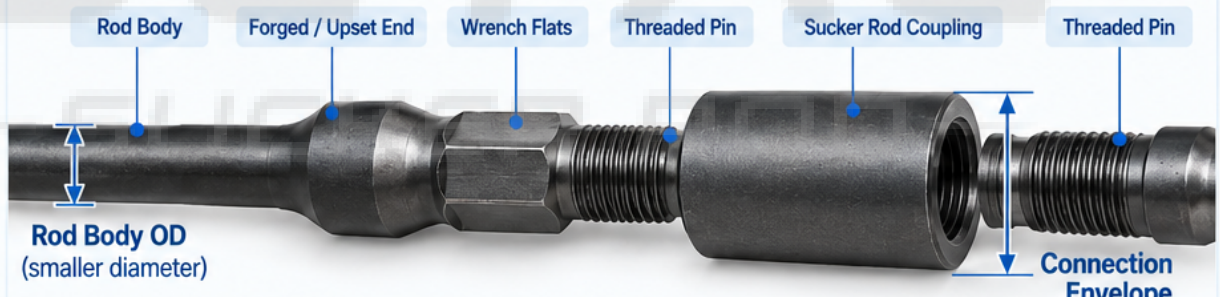
Nominal Length
25 ft (7.62 m)

30 ft
9.14 m

Nominal Length
30 ft (9.14 m)

Rod Body vs. Connection Envelope

The connection envelope is larger than the rod body OD.



Rod Body OD ≠ Connection Envelope

Rod diameter changes cross-sectional area and rod-string weight; grade defines the required mechanical-property level.

Grade C, D and K Selection Comparison

API 11B Sucker Rod Grades

Mechanical Properties Comparison

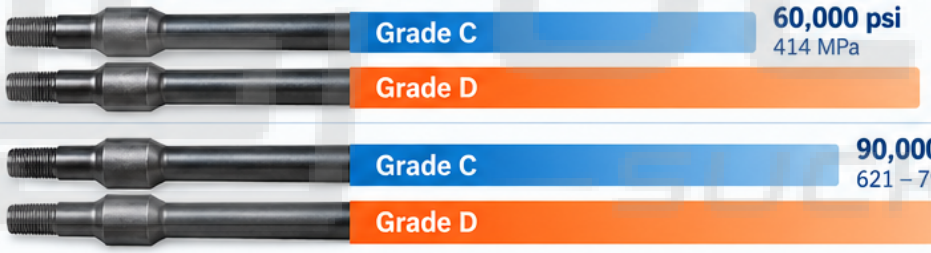
Key mechanical properties and engineering focus for Grade C, D and K sucker rods.

Property / Characteristic	Grade C	Grade D	Grade K
Minimum Yield Strength	60,000 psi / 414 MPa	**85,000 psi / 586 MPa**	60,000 psi / 414 MPa
Tensile Strength	90,000 – 115,000 psi 621 – 793 MPa	**115,000 – 140,000 psi** 793 – 965 MPa	90,000 – 115,000 psi 621 – 793 MPa
Elongation	≥13%	≥13%	≥13%
Reduction of Area	≥50%	≥50%	≥50%
Engineering Focus	Moderate rod loading	Higher calculated mechanical loading	Greater emphasis on corrosion-related service selection

Values shown according to the current Octal manufacturing reference used in this article. Final material route and service requirements should be confirmed for the project.

Grade C vs. Grade D – Mechanical Property Comparison

Grade D provides a higher mechanical-strength option for different service conditions.



+25,000 psi
Increase in yield strength
≈ +42%

Tensile strength range shifts from
90,000 – 115,000 psi
to
115,000 – 140,000 psi

Engineering Selection Guidance

Select the appropriate grade based on the dominant service risk and calculated mechanical loading conditions.

Grade C

Moderate mechanical loading

Suitable for applications with moderate calculated rod loading and standard service conditions.

Grade D

Higher calculated mechanical loading

Used when higher calculated mechanical loading is expected due to increased well loading conditions.

Grade K

Corrosion-related service selection

Used when there is greater emphasis on corrosion-related service considerations, while maintaining the same mechanical property levels as Grade C.

Same nominal rod-body size can be used across grades. | **Example: 7/8 in. (22.23 mm)** rod body can be manufactured as Grade C, Grade D or Grade K, while the mechanical-property range differs by grade.

Select by dominant service risk, not by grade ranking.

Consider calculated mechanical loading, corrosion risk, service environment and overall well design.

Grade D Selection and Ordering Verification

API 11B Sucker Rod | Engineering Selection | Reliable Operation

Rod String Requirement
Production target, well conditions and design criteria

Calculated Mechanical Load
Rod weight, fluid load, pump load and dynamic stress

Higher mechanical strength required?

- No → **Grade C** may be suitable (depending on service conditions)
- Yes → **Evaluate Grade D**
  For higher calculated rod-string mechanical loading

Check Key Selection Factors
- Rod size (nominal diameter)
- Rod length (25 ft or 30 ft)
- Pin / thread type
- Coupling type (full-size or slim-hole)
- Tubing clearance
- Fluid / corrosion condition
- Well deviation and rod-to-tubing contact

Inspection and Documentation Requirement
Confirm testing, dimensional inspection, thread inspection and required documentation.

Example Purchase Specification (PO)

For reference – adjust according to project requirements

Product	Sucker Rod
Grade	D
Nominal Size	Project specified (e.g. 5/8", 3/4", 7/8", 1", 1-1/8")
Length	25 ft or 30 ft as ordered
Connection	Specified pin / thread (e.g. API thread type as required)
Coupling Type	Full-size / Slim-hole / project specified
Inspection	Project specified (e.g. mechanical test, dimensional inspection, thread inspection, NDT if required)
Additional Requirements	Marking, packaging, documentation (MTC, inspection report, etc.)

Grade D Sucker Rod
Ready for Service

Selection Considerations

Evaluate all relevant factors, not grade name alone.

Mechanical Load
Use Grade D where calculated rod-string load is higher.

Rod Size and Length
Select nominal size and length based on design and operation.

Connection Compatibility
Confirm pin, thread and coupling type.

Tubing Clearance
Check coupling OD and tubing ID.

Fluid / Corrosion Condition
Evaluate coating or corrosion-resistant rod options if needed.

Well Deviation
Consider rod-to-tubing contact and wear.

Typical Application Scenarios for Grade D

Higher rod-string mechanical loading
Where additional strength margin is required.

High production load
Deeper wells or higher fluid and pump load conditions.

Demanding pumping operations
Where dynamic load and stress variation are significant.

Rod diameter alone is not sufficient for replacement selection.
The correct grade should be based on calculated mechanical load, service conditions, connection compatibility and inspection requirements.

Right Specification
for Reliable Operation