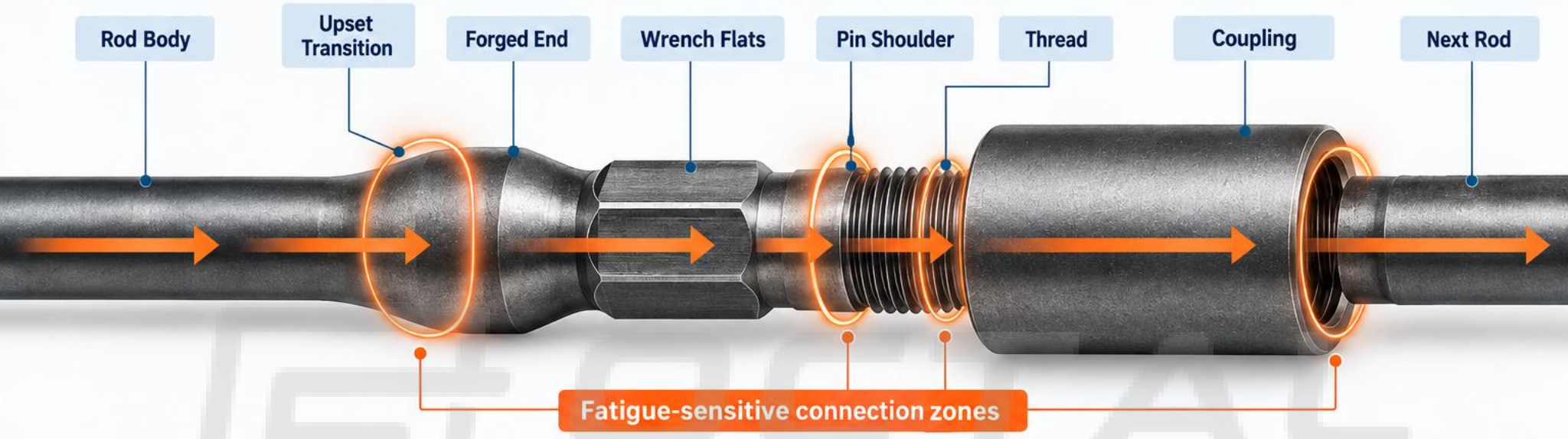
# Grade D Sucker Rod Connection Load Path

API 11B Grade D Sucker Rod




## Load Path Through the Connection

Cyclic tensile load is transmitted from the rod body, through the upset transition and forged end, across the pin shoulder and threads, through the coupling, and into the next rod.

The connection elements must work together to maintain load capacity under repeated cycling.

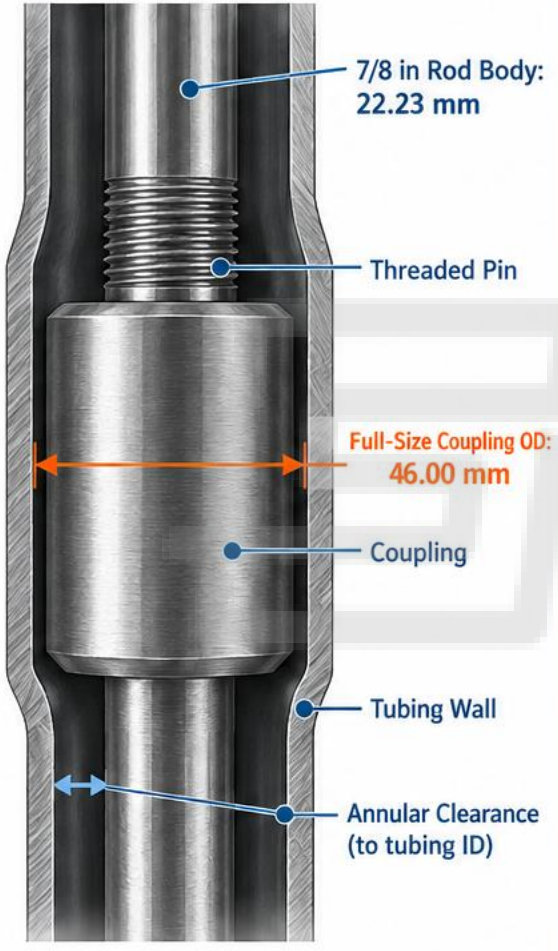
## Key Takeaways

**Connection integrity must be evaluated together with rod-body mechanical strength.**

# Full-Size and Slim-Hole Coupling Dimensions

API 11B Grade D Sucker Rod

## Full-Size Connection (7/8 in Rod)




## Slim-Hole Connection (7/8 in Rod)


**4.70 mm OD reduction**

## Coupling Dimensional Reference

| Rod Size | Full-Size OD | Slim-Hole OD | Length |
|---|---|---|---|
| 5/8 in | 38.10 mm | 31.80 mm | 101.6 mm |
| 3/4 in | 41.28 mm | 38.10 mm | 101.6 mm |
| 7/8 in | 46.00 mm | 41.30 mm | 101.6 mm |
| 1 in | 55.60 mm | 50.80 mm | 101.6 mm |
| 1-1/8 in | 60.33 mm | 57.15 mm | 114.3 mm |

## 1 in Rod Example

**1 in Rod**

Full-Size: **55.60 mm**

Slim-Hole: **50.80 mm**

**Difference: 4.80 mm**

## Reducing Coupling Note

For reducing and slim-hole reducing couplings, outside diameter and length follow the larger thread size.

## Engineering Takeaway

Reduced coupling OD can provide additional tubing clearance, but thread compatibility and connection requirements must still be confirmed.

# Grade D Material and Heat-Treatment Control

API 11B Grade D Sucker Rod

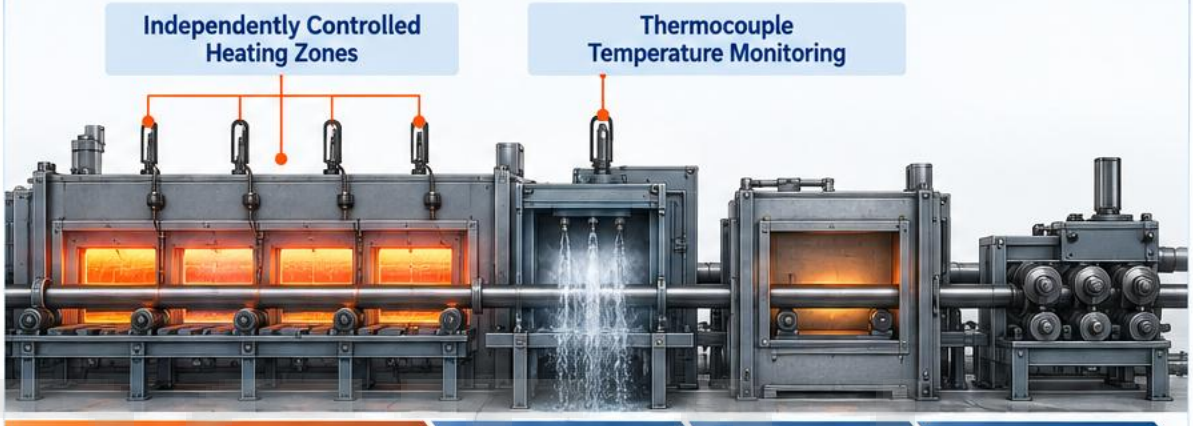
## Material Route

### Qualified Carbon or Alloy Steel Route

4130 | 4138M | 4320

Examples of material routes — not a universal Grade D material requirement.

## Heat-Treatment Process




## Resulting Performance

Material + Heat Treatment → Controlled Finished Properties (Grade D Acceptance)

- Yield Strength
- Tensile Strength
- Ductility
- Hardness Consistency
- Straightness

## Engineering Meaning

Grade D does not correspond to one fixed steel chemistry. It defines the required finished mechanical performance of the sucker rod. Different qualified carbon or alloy steel routes may be used, provided that the finished product meets all applicable Grade D requirements.

## Key Takeaway

**Finished mechanical properties determine Grade D acceptance.**

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

# Manufacturing Control for Grade D Sucker Rod

API 11B Grade D Sucker Rod

### 800-ton Horizontal Forging Machine


### 800-ton Hydraulic Upsetting Unit

### 1,000-ton Hydraulic Straightening Machine

| Raw Steel Bar | Forging / Upsetting | Heat Treatment | Straightening | Machining | Thread Processing | Final Inspection |
|---|---|---|---|---|---|---|
|  |  |  |  |  |  |  |
| Incoming material quality | Forged-end geometry | Mechanical-property consistency | Rod straightness | Dimensional control | Pin / thread accuracy | Dimensional and thread verification |

## Process Control Focus

| Forging | Heat Treatment | Straightening | Machining | Threading |
|---|---|---|---|---|
|  |  |  |  |  |
| Forged-end geometry | Mechanical-property consistency | Rod straightness | Dimensional control | Pin / thread accuracy |

**Grade D performance depends on controlled forging, heat treatment, straightening, machining, thread processing and final inspection.**

# Inspection, Traceability and Final Order Verification

API 11B Grade D Sucker Rod

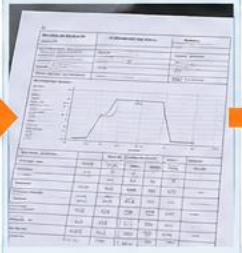
### Material Heat Number


Raw material identified by heat number.

### Production Lot

Rods traced to production lot.

### Heat-Treatment Record



Heat-treatment records linked to lot and heat number.

### Mechanical Test

Tensile and impact testing per API 11B Grade D.

### Dimensional Inspection

Key dimensions inspected and recorded.

### Thread Inspection


Thread form and gauging inspection.

### Final Marking


Final marking for traceability.

### Packing Documentation


Packing list and documentation prepared.

## Test and Verification

### Tensile Testing

Verifies Grade D mechanical-property compliance.

### Impact Testing

Confirms impact toughness requirement for Grade D.

### Hardness Testing

Verifies hardness is within Grade D requirement.

### Metallographic Testing

Examines microstructure for compliance.

## Final Order Verification Before Shipment

- ☑ Grade D
- ☑ Rod Diameter
- ☑ Length
- ☑ Pin / Thread
- ☑ Coupling Type
- ☑ Service Condition
- ☑ Inspection Requirement
- ☑ Documentation Requirement

**Traceability should connect the finished sucker rod to its material heat, production lot and inspection records.**