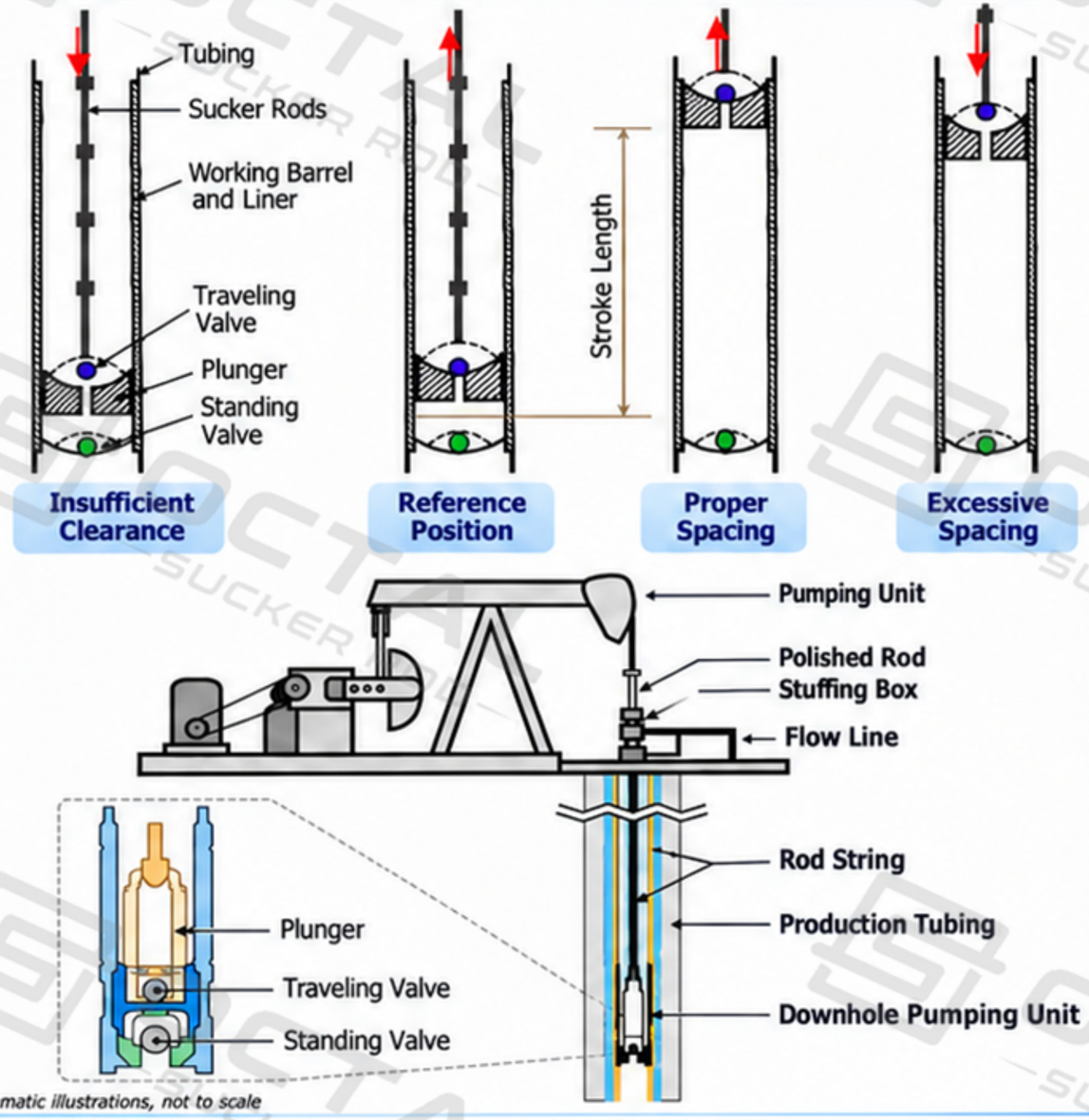
SUCKER ROD PUMP SPACING: FIELD SETUP AND VERIFICATION CHECKLIST

This page explains the operating principle of sucker rod pump spacing and the clearance window required to avoid pump tagging while limiting unnecessary dead space.

PUMP SPACING PRINCIPLE



KEY COMPONENT LABELS

English Label	Description
Sucker Rod String	Reciprocating rod string
Production Tubing	Production conduit
Pump Barrel	Working barrel
Plunger	Reciprocating plunger
Traveling Valve	Valve moving with plunger
Standing Valve	Fixed lower valve
Seating Assembly	Pump seating assembly
Lower Mechanical Reference	Lower reference position
Polished Rod	Surface polished rod
Polished Rod Clamp	Polished rod clamp

SPACING OPERATING WINDOW

Insufficient Clearance

Pump Tagging

Mechanical contact and impact loading

Proper Spacing

Operating Clearance

Adequate clearance with controlled dead space

Excessive Spacing

Reduced Compression

Increased unswept volume and possible gas interference

ENGINEERING NOTE

Pump spacing is not a fixed distance applicable to every sucker rod pump. The final setting must be established from the actual pump geometry, rod-string design and expected operating conditions. Illustrations are schematic and not to scale. Actual component arrangement and mechanical reference points vary by pump design.

SUCKER ROD PUMP SPACING: FIELD SETUP AND VERIFICATION CHECKLIST

Before establishing sucker rod pump spacing, verify the installed pump configuration, rod-string dimensions, tubing arrangement and operating data.

PUMP AND ROD STRING COMPONENTS (EXAMPLES)



REQUIRED INSTALLATION DATA

Data Category	Required Information	Engineering Purpose
Pump Configuration	Pump type, model and barrel arrangement	Establishes the mechanical reference
Pump Dimensions	Barrel length, plunger length and valve-rod or pull-tube dimensions	Defines aveilable travel and internal geometry
Seating Assembly	Anchor position and seating arrangement	Confirms the installed pump position
Rod String	Material, grade, diameter and section length	Determines elastic behavior
Rod Configuration	Taper sequence, pony rods and connection types	Establishes actual string geometry
Tubing String	Tubing size, length and anchor condition	Determines tubing movement
Operating Conditions	Pumping speed, stroke length and fluid level	Defines operating loads and dynamic conditions
Gas Conditions	Pump intake pressure and free-gas conditions, where available	Supports compression and gas-interference assessment

REQUIRED TECHNICAL DOCUMENTS

Pump Assembly Drawing

Confirms the actual pump configuration, internal dimensions and mechanical reference points.

Rod String Design and Tally

Identifies the material, grade, diameter and length of each rod section.

Installation Insturctions

Defines the approved seating, reference and spacing procedures for the selected equipment.

Previous Installation Records

Provides historical measurements and operating information for comparison.

SAFETY AND PRE-JOB INSPECTION

PRE-JOB SAFETY CHECK

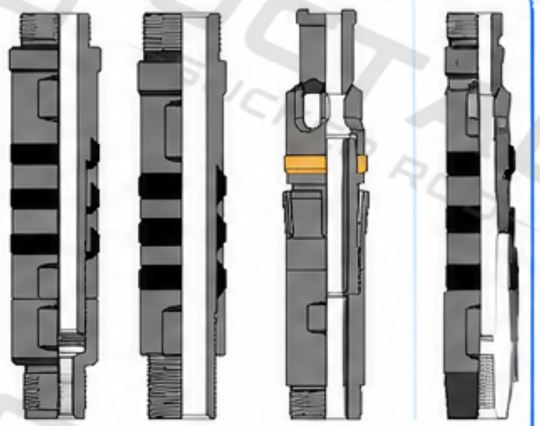
- Confirm the approved well-servicing and well-control procedure.
- Verify pumping-unit shutdown and mechanical securing.
- Confirm pressure-control arrangements before well intervention.
- Inspect rod elevators, handling tools and holding equipment.
- Keep personnel clear of suspended rods and pinch points.
- Confirm the crew understands the assigned work sequence.

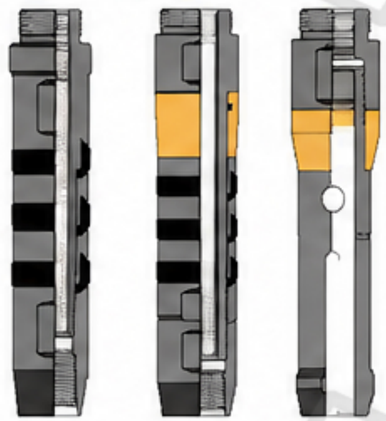
ENGINEERING NOTE **Do not proceed with the final spacing calculation until the pump configuration, rod-string tally and tubing arrangement have been verified.**

SUCKER ROD PUMP SPACING: FIELD SETUP AND VERIFICATION CHECKLIST

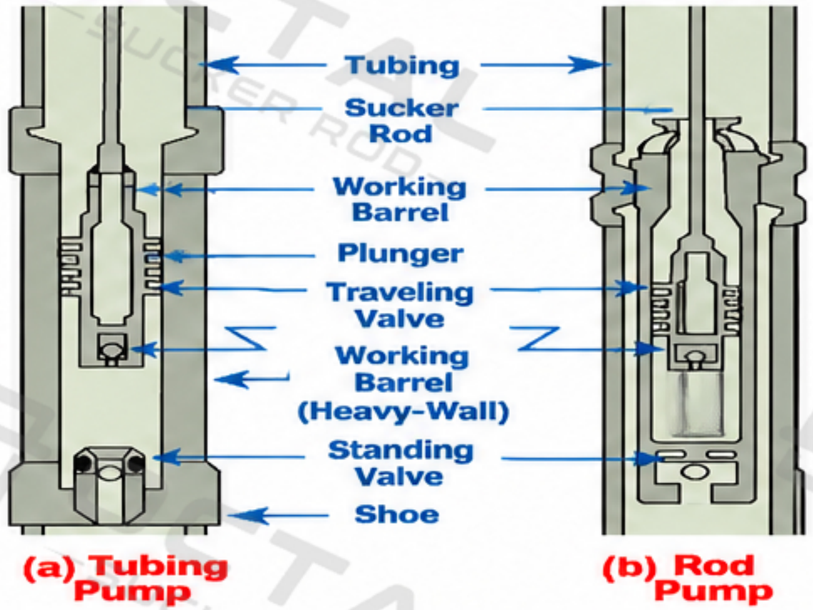
A reliable pump spacing measurement starts with confirming the pump's installed position and identifying the correct mechanical reference.

PUMP SEATING AND INSTALLATION (EXAMPLES)





MECHANICAL REFERENCE (EXAMPLE)



STEP 1 — CONFIRM PUMP SEATING

Verify the installed pump type and seating arrangement before establishing the reference position.

- For insert pumps, confirm engagement with the designated seating assembly according to the specified installation method.
- For tubing pumps, verify the installed position through the tubing installation records and applicable equipment instructions.

STEP 2 — IDENTIFY THE MECHANICAL REFERENCE

The mechanical reference must be identified from the actual pump assembly drawing and installation procedure.

- Depending on the pump design, the relevant reference may involve the lower plunger travel position, valve-rod arrangement or another manufacturer-defined mechanical stop.
- A generic pump-bottom measurement should not be applied to every pump configuration.

STEP 3 — ESTABLISH AND RECORD THE TAG REFERENCE

Establish a repeatable measurement position during the approved space-out procedure.

- Where a contact-based reference is specified, the approach must be controlled and carried out without impact loading.
- Record the measured rod position, pump seating condition and reference method.
- Repeat the measurement as required by the approved procedure to confirm consistency.

THREE-STAGE REFERENCE DIAGRAM

01 — Pump Seating Confirmed

Verify the pump's actual seating and mechanical installation position.

02 — Mechanical Reference Identified

Identify the approved lower travel reference for the selected pump configuration.

03 — Rod Position Recorded

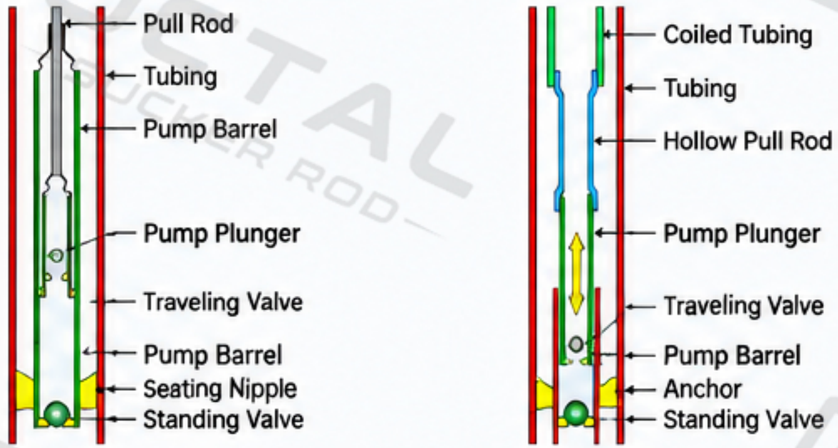
Record the reference mark, rod tally and measurement conditions.

ENGINEERING NOTE **The tag reference and final operating position are two different measurements. The calculated spacing allowance must be applied after the reference has been established.**

SUCKER ROD PUMP SPACING: FIELD SETUP AND VERIFICATION CHECKLIST

The final spacing allowance must account for the difference between surface rod movement and actual downhole plunger travel. Rod elasticity, tubing movement and dynamic overtravel all influence the plunger's position.

SUCKER ROD PUMP CONFIGURATIONS (EXAMPLES)

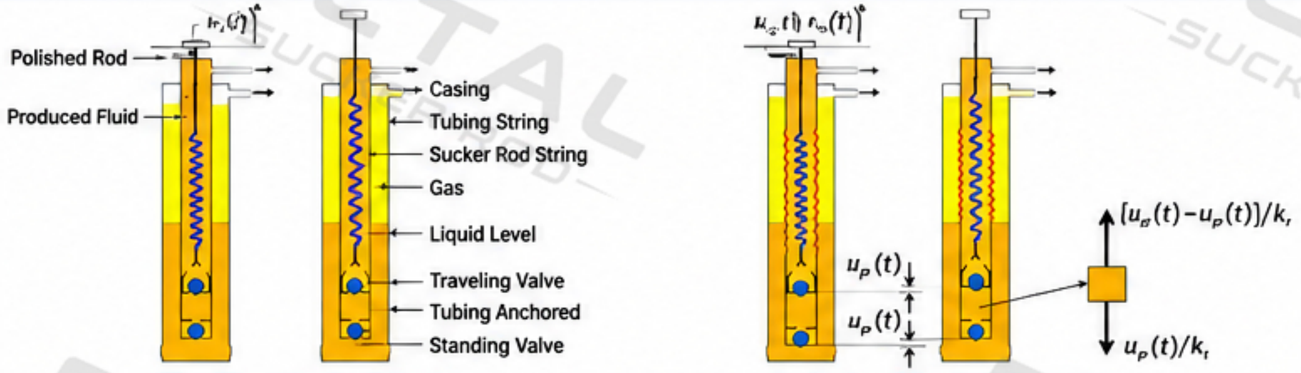


Conventional Pump | Hollow Rod Pump

ENGINEERING CALCULATION FACTORS

Calculation Factor	Required Engineering Input	Effect on Spacing
Rod Stretch	Rod material, grade, diameter, section length and axial load	Changes actual downhole plunger position
Tubing Stretch	Tubing dimensions, anchor condition and axial load	Changes relative movement between plunger and barrel
Dynamic Overtravel	Pumping speed, surface stroke and rod-string dynamics	May extend downhole plunger travel beyond static estimates
Fluid Loading	Fluid level, density and pump intake conditions	Changes effective rod-string loading
Pump Geometry	Plunger length, barrel dimensions and mechanical travel limits	Defines available travel and required clearance
Gas Conditions	Free-gas volume and pump intake pressure	Influences the compression requirement and acceptable dead space

ROD AND TUBING MOVEMENT



(a) Tubing Anchored | (b) Tubing Unanchored

ROD STRETCH CALCULATION METHOD

Rod Section	Material	Diameter	Section Length	Elastic Property	Calculated Stretch
Section 1	Steel	Actual OD	Actual Length	Material-specific	To be calculated
Section 2	Steel / FRP	Actual OD	Actual Length	Material-specific	To be calculated
Section 3	Steel / FRP	Actual OD	Actual Length	Material-specific	To be calculated
Total	—	—	Total Length	—	**Total Stretch**

For tapered or mixed-material rod strings, elastic elongation should be evaluated section by section. Each section has its own material properties, cross-sectional area and length.

SIMPLIFIED PLUNGER STROKE RELATIONSHIP

$$S_p \approx S_s - \Delta L_r - \Delta L_t + O_d$$

S_p : Estimated downhole plunger stroke

S_s : Surface polished rod stroke

ΔL_r : Rod-string elastic stretch

ΔL_t : Tubing stretch

O_a : Dynamic overtravel

CALCULATION RESULT — FINAL SPACING ALLOWANCE

Calculated Rod Stretch: _____

Tubing Movement Allowance: _____

Dynamic Overtravel Allowance: _____

Pump-Specific Clearance Requirement: _____

Approved Final Spacing Adjustment: _____

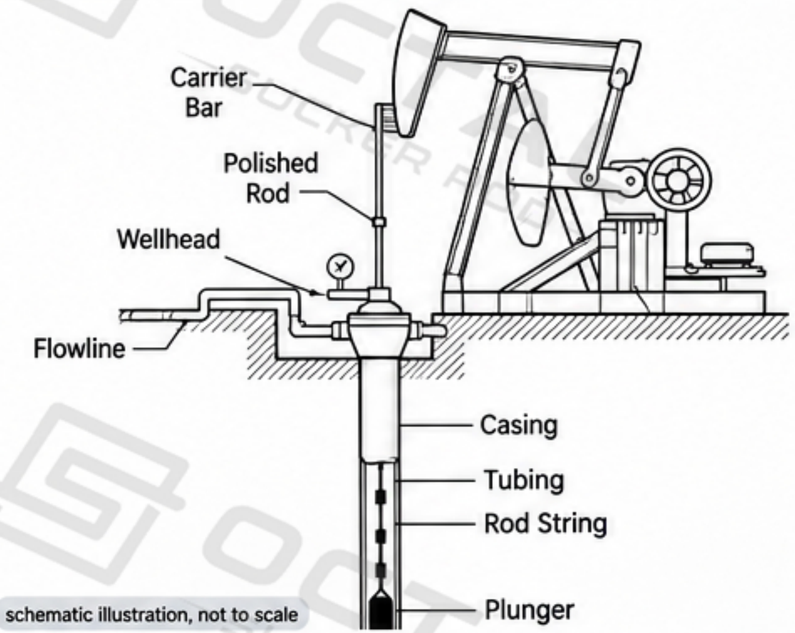
⚠ IMPORTANT

The final spacing adjustment must be checked against the pump-specific installation requirements and actual well operating conditions. No universal spacing value applies to all rod strings and pump configurations.

SUCKER ROD PUMP SPACING: FIELD SETUP AND VERIFICATION CHECKLIST

After the spacing allowance has been established, the rod string is adjusted to the approved position and the installation is verified under actual operating conditions.

ROD STRING FINAL POSITION (EXAMPLE)

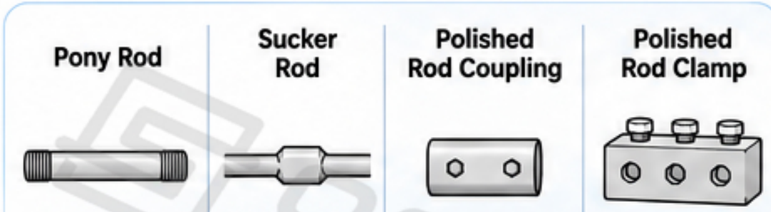


schematic illustration, not to scale

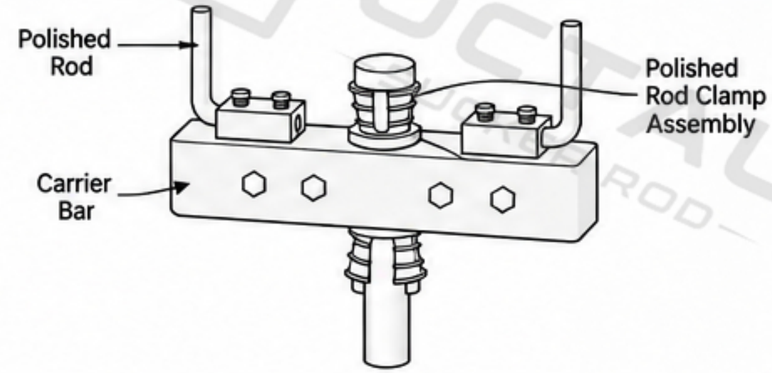
STEP 1 — ADJUST THE ROD STRING POSITION

Raise or adjust the rod string to the calculated position using the approved well-servicing procedure. The final polished rod clamp position must correspond to the calculated setting and the actual rod-string configuration.

Where a pony rod is required, its length, diameter, grade and connection type must be compatible with the adjacent rod sections. The polished rod coupling and associated connections must also match the installed equipment.



STEP 2 — SECURE THE POLISHED ROD CLAMP



- Confirm the final rod position against the approved calculation.
- Verify correct polished rod clamp installation.
- Check carrier bar alignment.
- Confirm that the clamp and associated components are properly secured according to specification.
- Record the final rod position and any pony rod adjustment.

STEP 3 — RESTART AND VERIFY OPERATING CONDITIONS

Verification Item	What to Check
Surface Movement	Polished rod stroke and abnormal movement
Dynamometer Card	Abnormal load changes and possible tagging
Downhole Pump Card	Plunger movement and pump fillage
Pumping Speed	Actual SPM and operating stroke
Fluid Level	Pump submergence and intake conditions
Production	Actual production compared with expected displacement
Mechanical Condition	Abnormal noise, vibration or evidence of contact

OPERATING CONDITION ASSESSMENT

Mechanical Tagging
Check abnormal end-of-stroke loading and possible mechanical contact.

Gas Interference
Review gas compression, intake pressure and unswept volume.

Incomplete Pump Fillage
Check well inflow, fluid level and pumping speed.

A single abnormal dynamometer card does not conclusively establish incorrect pump spacing. Operating conditions, pump configuration and other possible mechanical or fluid-related problems must also be evaluated.

REASSESS PUMP SPACING WHEN

- Pumping speed or surface stroke changes significantly.
- Rod-string material, grade or configuration changes.
- Tubing anchor condition changes.
- Fluid level or loading conditions change materially.
- Pump assembly or setting depth is changed.
- New dynamometer or pump-card evidence indicates abnormal operation.

ENGINEERING NOTE Final spacing verification should be based on the installed rod-string configuration, actual operating response and the approved installation procedure, not on polished-rod position alone.

SUCKER ROD PUMP SPACING: FIELD SETUP AND VERIFICATION CHECKLIST

This page is designed as a printable field record for installation data, spacing adjustment and operating verification.

FIELD RECORD TITLE

Sucker Rod Pump Spacing — Field Verification Record

Installation Data, Spacing Adjustment and Operating Verification

WELL AND EQUIPMENT IDENTIFICATION

Record Item	Field Information
Well Name / Well ID	_____
Field / Location	_____
Installation Date	_____
Workover / Job Number	_____
Pump Manufacturer / Model	_____
Pump Type	_____
Pump Setting Depth	_____
Seating Assembly Type	_____
Rod String Material	_____
Rod String Grade	_____
Tubing Anchor Condition	_____

SPACING CALCULATION RECORD

Calculation Item	Recorded Value	Unit / Remarks
Total Rod String Length	_____	ft / m
Rod Material and Grade	_____	—
Calculated Rod Stretch	_____	in / mm
Tubing Movement Allowance	_____	in / mm
Dynamic Overtravel Allowance	_____	in / mm
Mechanical Clearance Requirement	_____	in / mm
Calculated Spacing Adjustment	_____	in / mm
Final Polished Rod Position	_____	in / mm

Field measurements should be recorded from actual site observations and approved calculation data.

INSTALLATION AND VERIFICATION CHECKLIST

A. Pre-Job Verification

- ○ Pump model and configuration confirmed.
- ○ Rod-string tally verified.
- ○ Tubing anchor condition confirmed.
- ○ Installation drawings reviewed.
- ○ Approved work procedure confirmed.

B. Reference and Spacing

- ○ Pump seating verified.
- ○ Mechanical reference identified.
- ○ Reference position recorded.
- ○ Spacing allowance calculated.
- ○ Final rod position established.
- ○ Polished rod clamp secured.

C. Operating Verification

- ○ Pumping unit restarted under approved procedure.
- ○ Surface dynamometer card reviewed.
- ○ Downhole pump card reviewed, where available.
- ○ Fluid level checked, where available.
- ○ Production performance reviewed.
- ○ No confirmed mechanical tagging.
- ○ Abnormal operating conditions documented.

FINAL ENGINEERING ASSESSMENT

Assessment	Result
Spacing Status	Accepted / Reassessment Required
Operating Condition	Normal / Abnormal
Corrective Action	_____

Field Engineer: _____

Installation Supervisor: _____

Date: _____

REASSESSMENT RECORD

Change Condition	Reassessment Required
Pumping Speed Change	Yes / No
Rod String Replacement	Yes / No
Tubing Anchor Change	Yes / No
Fluid Level Change	Yes / No
Pump Replacement	Yes / No
Abnormal Dynamometer Card	Yes / No

ENGINEERING CONCLUSION

A reliable sucker rod pump spacing setting requires agreement between installed pump geometry, rod-string elastic behavior, tubing movement and actual operating conditions. The final setting should be supported by recorded installation measurements and verified operating data. Any significant change in the pumping system should trigger a review of the original spacing assessment.

TECHNICAL REFERENCE DOCUMENTS

- API Spec 11AX — Specification for Subsurface Sucker Rod Pump Assemblies, Components, and Fittings.
- API RP 11AR — Recommended Practice for Care and Use of Subsurface Pumps.
- API Spec 11B — Sucker Rods and Rod-Related Products.
- API TR 11L — Design Calculations for Sucker Rod Pumping Systems (Conventional Units).
- Manufacturer-Specific Sucker Rod Installation and Pump Spacing Instructions.

Use no third-party logos or branded product photos on this record page.

ENGINEERING NOTE This record should be completed during field installation and retained with the pump spacing documentation for future review and reassessment.