AISI 4142M Sucker Rod
Chemical Composition and Alloy Function

A data-focused reference for 4142 / 4142M Cr-Mo alloy steel sucker rod material, API 11B Grade D Alloy strength control, and finished rod verification.

Material Identity	AISI 4142M is a modified chromium-molybdenum alloy steel route used in Grade D Alloy sucker rod discussions. The material name defines chemistry; it does not replace the finished API 11B grade.
Strength Context	Grade D sucker rods are commonly controlled in the 115,000-140,000 psi tensile strength range. AISI 4142M reference data often shows a 120-140 ksi tensile range and 95 ksi minimum yield strength direction, subject to actual MTC and specification.
Verification Logic	Finished rod acceptance should connect heat number, MTC, mechanical test, heat treatment record, thread inspection, coupling match, rod marking and packing list.

Core Chemical Composition

Element	Reference Range	Function in 4142 Sucker Rod
Carbon, C	0.38-0.45%	Provides the strength foundation and supports hardness response after heat treatment.
Chromium, Cr	0.80-1.10%	Improves hardenability and helps maintain strength consistency through the rod section.
Molybdenum, Mo	0.15-0.25%	Supports hardenability, temper resistance and strength stability during Grade D Alloy service.
Manganese, Mn	0.80-1.00%	Contributes to strength and steelmaking control in the Cr-Mo alloy route.
Silicon, Si	0.15-0.35%	Acts mainly as a deoxidizer and provides secondary strength contribution.
Phosphorus, P	<= 0.035%	Residual element controlled to protect toughness and reduce embrittlement risk.
Sulfur, S	<= 0.035%	Residual element controlled to support cleaner steel behavior and fatigue performance.
Vanadium, V	0.02-0.07%	Microalloying support for grain refinement and strength control where specified.

Note: ranges are reference values for A-4142-M / Grade D Alloy sucker rod material from public technical datasheets. Final acceptance must follow the actual MTC, API 11B requirements and project specification.

Alloy Function and Strength Control

How AISI 4142M chemistry supports finished sucker rod verification

Element Function Map

Alloy Group	Main Effect	Finished Rod Meaning
C + Cr + Mo	Higher-carbon Cr-Mo alloy route	Creates the basis for Grade D Alloy strength after controlled heat treatment.
Cr + Mo	Hardenability and temper resistance	Helps maintain more stable mechanical response through rod body and upset regions.
Mn + Si	Steelmaking control and deoxidation	Supports consistent melting, refining and secondary strength contribution.
P + S control	Residual cleanliness control	Reduces toughness and fatigue concerns caused by excessive harmful residuals.
Heat treatment	Normalized and tempered route where applicable	Links chemistry to final tensile strength, yield strength, hardness and fatigue behavior.

Mechanical Reference and Review Points

Item	Reference / Control Point	Technical Meaning
API Grade	Grade D Alloy	Finished sucker rod strength category; material route alone is not enough.
Tensile strength	115-140 ksi Grade D range; 120-140 ksi common 4142M reference direction	Confirms the finished rod strength envelope, subject to actual test record.
Yield strength	95 ksi minimum reference direction for 4142M Grade D Alloy data	Shows the load-bearing strength level after heat treatment.
Elongation	10% minimum reference direction	Provides ductility indication; final acceptance follows specification.
Hardness	HRC 23-31 reference direction	Useful for heat treatment consistency review and abnormal condition screening.

Verification Chain

Heat number -> MTC -> mechanical test -> heat treatment record -> thread inspection -> coupling match -> rod marking -> packing list

Technical takeaway: AISI 4142M defines the Cr-Mo alloy steel route. API 11B Grade D Alloy defines the finished sucker rod strength identity. MTC, mechanical testing, heat treatment, thread inspection, coupling match and packing records confirm whether the finished rod matches the intended rod pumping service.