

The LL HS rod is extremely dependable and is designed for high-strength service.

These rods are manufactured from an AISI 4138MX chrome-moly alloy SBQ steel, providing them with the capability of handling the toughest stresses. This alloy provides a greater resistance to sulfide stress cracking

than other nickel-chrome-moly based steels used in the manufacture of other high strength sucker rods. Although the LL HS high tensile rods are not recognized by API, they are manufactured to meet API dimensional specifications. They are also subjected to the same API quality control practices to insure manufacturing consistency.

### PROCESS

Rods are straightened and subjected to eddy current testing prior to any further operations. Any rods that do not meet Liberty Lift's specifications are removed from further processing. The rods are forged to size. The rods are brought to a normalizing temperature to relieve previously induced stress and air cooled. All rods will be brought to a temper temperature which will produce the desired mechanical properties and air cooled.

The rods are shot-peened for enhanced fatigue resistance. Random rod samples are subjected to Yield and Tensile testing. In addition, stringent hardness and Charpy Impact tests are conducted for further verification of the desired mechanical properties. The pin ends are precision machined and threads are cold rolled, adding additional strength to the sucker rod pin connection.

### CHEMISTRY

CARBON	MANGANESE	PHOSPHORUS	SULPHUR	SILICON	COPPER	NICKEL	CHROMIUM	MOLYBDENUM
0.38-0.42	1.00-1.30	< 0.025	< 0.025	0.20-0.40	<0.25	< 0.30	0.55-0.90	0.25-0.35

### MECHANICAL PROPERTIES

MINIMUM YIELD	TENSILE STRENGTH	ELONGATION (% IN 8IN)	REDUCTION OF AREA %	ROCKWELL HARDNESS C
115,000 PSI	140,000-150,000 PSI	10Mn	40Mn	30 to 34

### APPLICATIONS

Deep, highly loaded wells with mildly corrosive environments when satisfactory corrosion inhibition practices are followed.

### MAXIMUM OPERATING STRESS

$$S_a = (T/2.8 + 0.375 S_{min}) SF$$