



Frac String Performance Characteristics Sheet

Patent 11,505,999

Pipe Size and Weight: 2 7/8 7.90 IEU
Pipe Grade: S135
Range: 2
Connection: 3.250 X 2.0 FSS-265®

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Frac String Pipe Body

	New-API	Premium
OD (in)	2.875	2.765
Wall Thickness (in)	0.276	0.221
ID (in)	2.323	2.323
Calculated Plain End weights (lbs/ft)	7.657	5.996
Note: Premium properties are calculated based on uniform OD and wall thickness.		
Cross sectional area pipe body (in ²)	2.254	1.765
Cross sectional area OD (in ²)	6.492	6.003
Cross sectional area ID (in ²)	4.238	4.238
Section Modulus (in ³)	1.339	1.040
Polar Section Modulus (in ³)	2.677	2.081
	New-API	Premium
Torsional Strength (ft-lbs)	17,400	13,500
Tensile Strength (lbs)	304,200	238,200
Pressure Capacity (psi)	22,680	20,736
Collapse Capacity (psi)	23,432	18,971

Connection

FRAC STRING SOLUTIONS LLC



FSS-265®

	OD (in)	3.250
	ID (in)	2.000
	Drift (in)	1.938
Frac String with a Material Yield Strength of 135000 psi		
	Pin Tong length (in)	6
	Box Tong length (in)	9
	Thread Compound	NCS30
	Friction Factor	1.0 1.15
	Torsional Strength (ft-lbs)	8,990 10,300
Severe Service Level Recommended Make-up Torque (ft-lbs)(75%)	6,740	7,800
Standard Service Level Recommended Make-up Torque (ft-lbs)(60%)	5,400	6,200
Min Recommended Make-up Torque (ft-lbs)	4,500	5,200
Operational Torque Must Not Exceed Make-up Torque		
	Balance OD (in)	3.237
	Tensile Strength (lbs)	246,500
	Connection Compressive Strength (lbs)	266,400
	Min OD for Tension and Compression (in)	3.031
	Stretch K value	0.16856

Frac String Properties

API Adjusted weight (kg/m)(lbs/ft)	12.36	8.31
Make up loss (mm)(in)	70	2.75
Approximate S/S length (M)(ft)	9.61	31.5
Working Pressure (kPa)(psi)	103421	15,000
Fluid Displacement CuM/M)(gal/ft)	0.00158	0.127
Fluid Capacity (CuM/M)(gal/ft)	0.00266	0.214
Drift Size (mm)(in)	49.23	1.938

Frac String Bend Radius

* These calculations are based on new pipe with nominal wall	
Based on Bending Stress (psi) at Pipe OD	15,000
Radius of Curvature (R) (ft.) (@ OD of pipe)	239.6
BUR (dogleg) deg/100 ft.	23.9

Combined Loading Chart

For FSS-265® 3.250 X 2.000 Tool Joint with a Material Strength of 135000 psi, using a Coefficient of Friction of 0.08, NCS30 Thread Compound and a Safety Factor of 1.0.

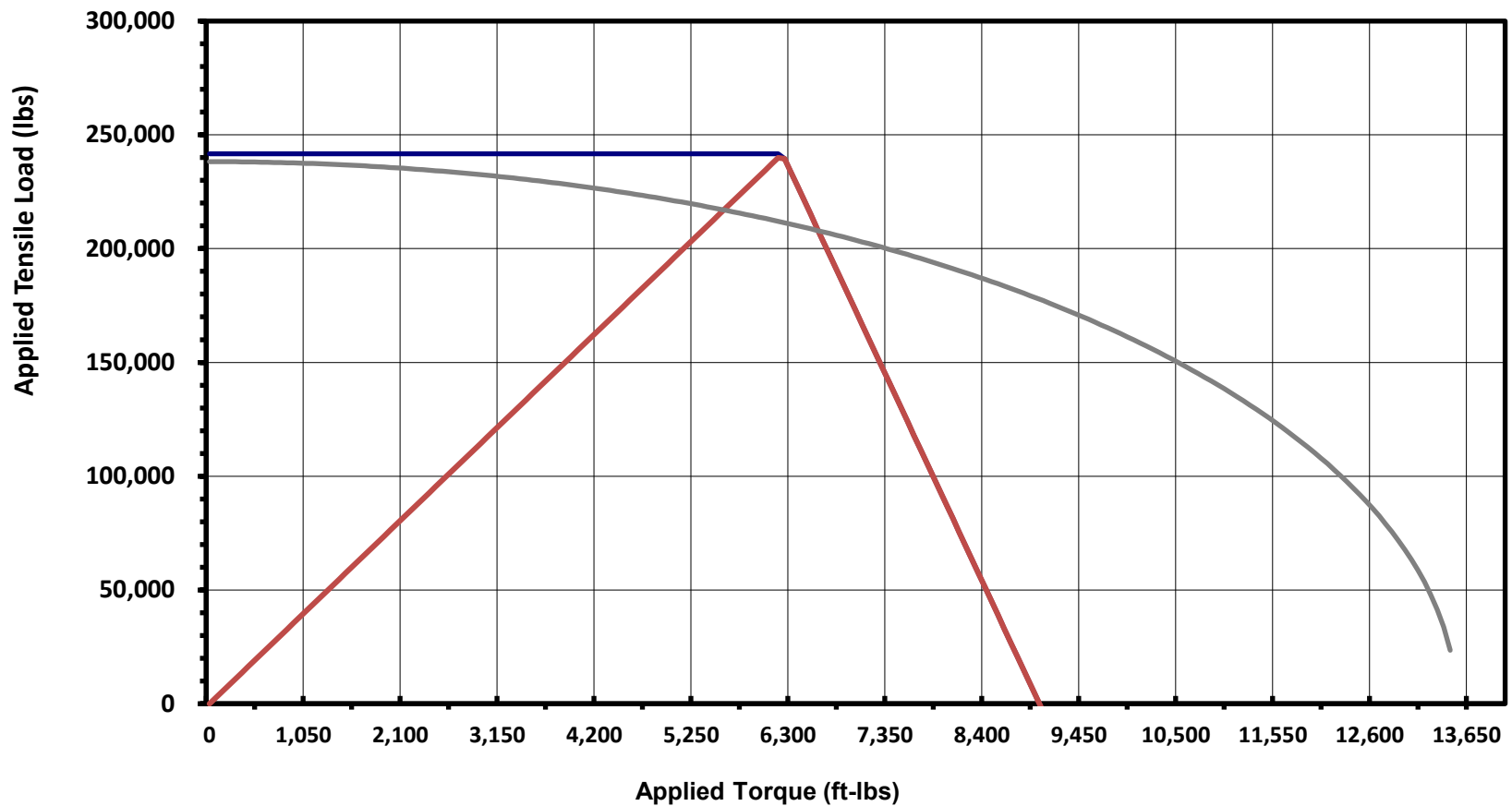
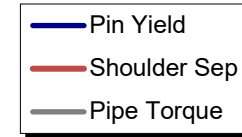
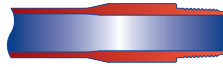
On Pipe: 2.875, 7.90#, S135 Premium Class.

Torque		Tension			MAKEUP TORQUE
Applied to String	Make Up Torque using NCS30 with FF of 1.15	Limits of Combined Loading on the FSS-265 Connection		Limit with Torque Applied to String	
	1.15	Pin Yield	Shoulder Separation		
Ft-Lbs		Pounds			
300	350	241,686	11,684	238,154	
600	700	241,686	23,368	237,978	
900	1,000	241,686	35,053	237,684	
1,200	1,400	241,686	46,737	237,271	
1,500	1,700	241,686	58,421	236,739	
1,800	2,100	241,686	70,105	236,088	
2,100	2,400	241,686	81,790	235,316	
2,400	2,800	241,686	93,474	234,422	
2,700	3,100	241,686	105,158	233,405	
3,000	3,500	241,686	116,842	232,262	
3,300	3,800	241,686	128,527	230,993	
3,600	4,100	241,686	140,211	229,595	
3,900	4,500	241,686	151,895	228,065	
4,200	4,800	241,686	163,579	226,402	
4,500	5,200	241,686	175,264	224,602	
4,800	5,500	241,686	186,948	222,661	
5,100	5,900	241,686	198,632	220,577	
5,400	6,200	241,686	210,316	218,344	
5,700	6,600	241,686	222,001	215,959	
6,000	6,900	241,686	233,685	213,416	
6,300	7,200	233,478	233,478	210,709	
6,750	7,800	207,439	207,439	207,833	
6,900	7,900	181,401	181,401	204,780	
7,200	8,300	155,363	155,363	201,541	
7,500	8,600	129,324	129,324	198,108	
7,800	9,000	103,286	103,286	194,471	
8,100	9,300	77,247	77,247	190,618	
8,400	9,700	51,209	51,209	186,535	
8,700	10,000	25,170	25,170	182,207	

TORQUE TENSION COMBINED LOAD CURVE

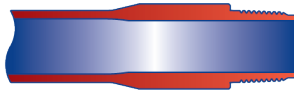
For FSS-265 3.250 X 2.000 Drill Pipe with a Material Strength of 135000 psi, using a Coefficient of Friction of 0.08, NCS30 Thread Compound (FF 1.15) and a Safety Factor of 1.0. On Pipe: 2.875, 7.90# S135 Premium Class.

FRAC STRING
SOLUTIONS LLC



FSS-265 3.250 X 2.000 CONNECTION OD WEAR CURVE

FRAC STRING
SOLUTIONS LLC



— FSS-265® with 2.0 ID
— 80% 2.875 7.90 S135 Prem
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