

Free Point and Back-Off

- Determining the amount of free pipe above a stuck point.
- Backing off (unscrewing) connections downhole

Base on Tubing Elongation

$$\Delta L = (F L)/(E A_n)$$

where:

ΔL = tube stretch, inches

F = axial force on tubing, lbs

L = free length of tubing, inches

A_n = nom. x-sect area, in²

E = Young's modulus, 30×10^6 for steel

Determining Free Point - part 1

- 1. Pull pipe into tension with at least 500 lb of load over the hanging weight of tubing in the hole.
- Make a visible reference mark on the pipe
- Increase pull on the pipe in increments of 1000 lb over original tubing weight.
- Measure amount of pipe stretch (ΔL)

Free Point - part 2

- Subtract original weight reading from final pull weight (F_D)
- Read Correct Free Point Constant (C_{FPC}) from Table
- Use Equation:

Free Point - part 3

$$L = \Delta L C_{\text{FPC}} / F_D$$

where:

L = minimum length of free pipe

ΔL = stretch, inches

C_{FPC} = Free Point Constant (from table)

F_D = pull force, 1000 lb

Free Point Example

- Determine the minimum length of free CT when a 10,000 ft length of 1.25", 0.087" wall CT stretches 39 inches with an applied pull of 5000 lb over tubing weight.

- $C_{FPC} = 760$ (table), $F_D = 5000/1000 = 5$

$$L = \Delta L * C_{FPC} / F_D = 39 * 760 / 5$$

$$L = 5928 \text{ ft}$$

1.25" CT Stretch Tables

CT Size	x-sect area	C_{FPC}
1.25 x 0.087	0.304 in ²	760.0
1.25 x 0.095	0.328 in ²	820.0
1.25 x 0.102	0.351 in ²	877.5
1.25 x 0.109	0.374 in ²	935.0
1.25 x 0.125	0.420 in ²	1050.0
1.25 x 0.134	0.451 in ²	1127.5
1.25 x 0.156	0.512 in ²	1280.0

1.5" CT Stretch Tables

CT Size	x-sect area	C_{FPC}
1.50 x 0.095	0.399 in ²	997.5
1.50 x 0.102	0.428 in ²	1170.0
1.50 x 0.109	0.456 in ²	1140.0
1.50 x 0.125	0.512 in ²	1280.0
1.50 x 0.134	0.552 in ²	1380.0
1.50 x 0.156	0.629 in ²	1572.5

1.75" CT Stretch Tables

CT Size	x-sect area	C_{FPC}
1.75 x 0.109	0.538 in ²	1345.0
1.75 x 0.125	0.605 in ²	1512.5
1.75 x 0.134	0.652 in ²	1630.0
1.75 x 0.156	0.745 in ²	1862.5
1.75 x 0.175	0.831 in ²	2077.5

2.00" CT Stretch Tables

CT Size	x-sect area	C_{FPC}
2.00 x 0.109	0.619 in ²	1547.5
2.00 x 0.125	0.698 in ²	1745.0
2.00 x 0.134	0.753 in ²	1882.5
2.00 x 0.156	0.861 in ²	2152.5
2.00 x 0.175	0.962 in ²	2405.0

2.375" CT Stretch Tables

CT Size	x-sect area	C _{FPC}
2.375 x 0.125	0.837 in ²	2092.5
2.375 x 0.134	0.904 in ²	2260.0
2.375 x 0.156	1.035 in ²	2587.5
2.375 x 0.175	1.158 in ²	2895.0
2.375 x 0.190	1.241 in ²	3102.5

String Shot Techniques

- Aid in back-off and jump-out of coupling.
- Stringshot
 - 1 to 4 strings of 90 grain (nominal wt) detonation cord, 3 to 4 ft long, suspended with E-line, across a coupling.
 - Initiated high order
 - Tension already pulled into pipe (25k+ overpull) or torque when doing a back-off
 - May not damage coupling or pin.

Working Tensile Loads of Conveyances			
Wireline	Working Load	Weight of Wire/Tube	Running Speed
0.072	720	0.014	100-150 ft/min
0.082	930	0.018	
0.092	1160	0.023	
0.108	1827	0.031	
CT			
1.25	21900	1.332	50-100 ft/min
1.5	26600	1.623	
1.75	31440	1.915	
2.375	49520	3.011	
Tubing			
2.375	57,000	4.6	5 - 15 ft/min
2.875	79,200	6.4	
3.5	119,200	9.2	
3-1/2" DP	189,000	15.5	