



$$\text{Total pressure on end of billet} = \frac{p(A + A_m)}{A} = p + \frac{p A_m}{A}$$

where  $p$  = fluid pressure  
 $A_m$  = area of mandrel  
 $A$  = area of billet

A - 54663

FIGURE 27. FLOATING MANDREL ARRANGEMENT FOR HYDROSTATIC EXTRUSION OF TUBING

Analysis Is Given Showing Difference Between Fluid Pressure and Billet End Pressure

TABLE XXIX. EXPERIMENTAL DATA FOR 80 F HYDROSTATIC EXTRUSION OF TUBING FROM 7075-O A1, AISI 4340, AND Ti-6Al-4V

Die Angle - 45 degrees (included)      Fluid - Castor oil      Billet surface finish - 60 to 120 microinches

Nominal Extrusion Ratio	Outside Diameter, inches		Mandrel Dimensions		Stem Speed, ipm	Billet Lubricant (Listed in Table 3)	Extrusion Pressure, 1000 psi				Billet-End Pressure <sup>(b)</sup> , 1000 psi	Type of Curve (Fig. 26)	Length of Extrusion, inches	Comments	
	Billet	Extrusion	Diameter, inch (max)	Taper, inch/inch on diameter <sup>(a)</sup>			Breakthrough		Runout						
<u>7075-O Aluminum</u>															
3	1.86	1.107	0.959	0.749	0.0011	20	L17	20	19	20	19	35	A1	4.5	
5(c)	3.2	1.104	0.782	0.749	0.0011	20	L17	33	30	32	29	53	D1	7.0	
1	3.8	1.750	1.107	0.749	0.0003	20	L17	50	49	48	47	58	A4	9.0	
3	3.8	1.750	1.107	0.749	0.0003	20	L17	48	49	48	48	59	A1	14.0	
1	3.8	1.750	1.107	0.749	0.0011	20	L17	49	51	48	50	61	A1	13.0	
8	3.8	1.750	1.107	0.749	0.0011	20	L48	49	48	50	48	59	A1	13.0	
5	3.8	1.750	1.107	0.749	0.0011	20	L52	51	49	48	47	58	A1	11.0	
9	7.0	1.750	0.959	0.749	0.0011	20	L17	78	75	73	71	86	D1	18.0	
5	12.2	1.750	0.875	0.749	0.0003	1	L17	135	127	99	93	114	D1	48.0	
2	12.2	1.750	0.875	0.749	0.0003	6	L17	121	115	98	87	106	D4	42.0	
4	12.2	1.750	0.875	0.749	0.0003	20	L17	118	109	100	89	109	D1	36.0	
0	12.2	1.750	0.875	0.749	0.0011	80	L17	112	107	96	97	119	D2	28.0	
4(c)	12.9	1.107	0.782	0.749	0.0011	20	L17	178	161	--	--	297	--	4.0	Billet upsetting occurred at breakthrough
<u>AISI 4340</u>															
2	2.6	1.750	1.240	0.749	0.0011	6	L17	112	109	105	105	128	B1	8.0	
6	3.8	1.750	1.107	0.749	0.0003	6	L17	174	158	179	155	190	B4	9.5	
3	3.8	1.750	1.107	0.749	0.0011	6	L17	166	159	162	154	189	B3	7.0	
4	3.8	1.750	1.107	0.749	0.0011	6	L48	170	160	164	154	189	B1	10.0	
5	3.8	1.750	1.107	0.749	0.0011	20	L48	169	160	165	154	189	B1	11.0	
9	3.8	1.750	1.107	0.749	0.0011	20	L48	162	150	160	147	180	B1	13.0	
1	5.7	1.750	1.001	0.749	0.0011	6	L48	240	209	232	202	247	D3	6.0	
7	7.0	1.750	0.959	0.749	0.0011	6	L48	280	249	--	--	--	--	--	P <sub>b</sub> not achieved