Table 5. Theoretical and experimental values of ultimate pressure for Vibrac (EN25).

Diameter ratio K	Temp. (°C)	Experimental ultimate pressure (tonf in^{-2})	Calculated ultimate pressure (tonf in^{-2})		
			mean diameter	based on shear stress-strain	
				maximum	minimum
1·4	20	18·8	18·1 (−3·7%) 18·5 (−1·6%)	18·6 (−1%)	17·6 (−6·4%)
1·2	300	9·2	9·55 (+3·8%)	9·2 (0%)	8·84 (−3·9%)
1·4	300	17·4	17·5 (+0·6%)	17·0 (−2·3%)	16·3 (−6·3%)
1·6	300	24·5	(−1·2%)	(−3·3%)	(−7·3%)
		24·1	24·2 (+0·4%)	23·7 (−1·7%)	22·7 (−5·8%)
1·8	300	28·9	30·0 (+3·8%)	29·6 (+2·4%)	28·4 (−0·17%)
2·0	300	34·8	35·0 (+0·6%)	34·9 (+0·3%)	33·4 (−4%)
2·5	300	45·7	45·0 (−1·5%)	45·8 (+0·2%)	43·9 (−3·9%)
1·4	370	16·04	15·8 (−1·5%)	15·5 (−3·3%)	14·6 (−9%)
2·0	370	32·0	31·7 (−0·9%)	31·9 (−0·3%)	30·1 (−6%)

The pressure-expansion curves at large strains have been calculated by Crossland (1964) from the maximum and minimum shear stress-strain curves and compared with experimental curves, as for example in Figure 17. It will be seen that the agreement is reasonable. The ultimate pressures have been taken from these theoretical pressure-expansion curves and also calculated on the basis of the mean diameter formula (Appendix). Figure 22 shows the theoretical ultimate pressure based on the mean shear stress-strain data plotted against the diameter ratio K for 20, 160, 300 and 370°C with the experimental points included. Table 5 gives the experimental and calculated values of ultimate pressure; the numbers in brackets are the percentage differences compared with experimental values. It will be seen that both the mean diameter values of ultimate pressure and those computed from shear stress-strain data are in good agreement with the experimental data.

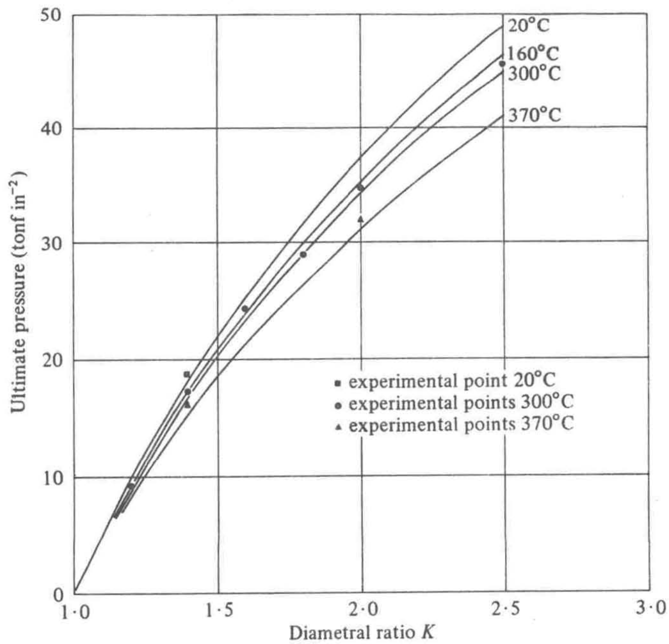

Figure 22. Ultimate pressure of Vibrac cylinders calculated from torsion data.

Table 6. Theoretical and experimental values of initial yield pressure and of collapse pressure for mild steel EN3.

Diameter ratio *K*	Temp. (°C)	Experimental initial yield pressure (tonf in^{-2})	Calculated initial yield pressure (tonf in^{-2}) maximum	minimum	Experimental collapse pressure (tonf in^{-2})	Calculated collapse pressure (tonf in^{-2})
1·4	20	4·75	4·7	4·45	4·7	4·5
1·6	20	5·45	5·85	5·55	6·07	6·3
1·8	20	6·5	6·64	6·3	7·8	7·85
2·0	20	6·8	7·2	6·8	9·05	9·3
1·4	160	4·0	4·6	4·35	4·2	4·5
1·8	160	6·2	6·5	6·15	7·45	7·85
1·4	300	2·6	2·81		-	–
1·6	300	3·3	3·6		-	-
1·8	300	4·0	4·09		-	-

Mild Steel (EN3)

The initial yield pressures based on the upper shear yield stresses given in Table 2 are shown for various temperatures in Figure 23, together with the experimental values, and these values are also listed in Table 6. The agreement is excellent though some influence of stress gradient on the upper yield stress might be expected according to Crossland (1964). Figure 24 shows the collapse pressures calculated on the plastic or lower shear yield stress for 20 to 160°C together with the experimental values. At higher temperatures it will be seen from Figure 11 there is no yielding at a constant

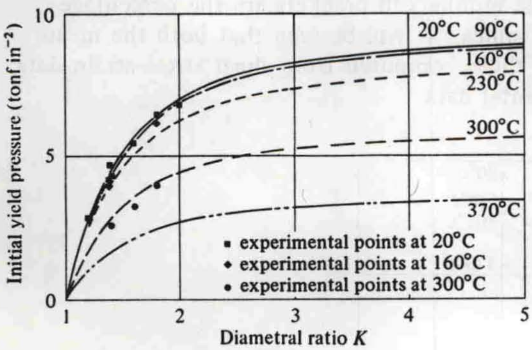

Figure 23. Initial yield pressure of EN3A cylinders at various temperatures.

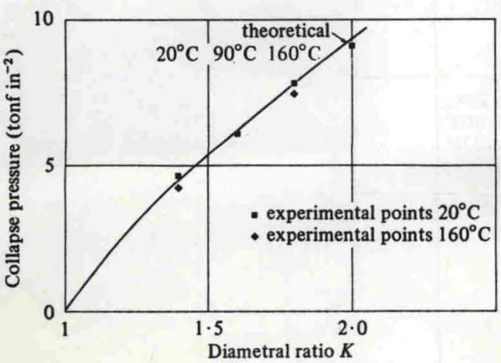

Figure 24. Collapse pressure of EN3A cylinders at 20 and 160°C.