

COLLAPSE COEFFICIENTS FOR UNSTIFFENED CIRCULAR CYLINDERS UNDER UNIFORM EXTERNAL PRESSURE

1. NOTATION

E	modulus of elasticity of cylinder material	N/m^2	lbf/in^2
E_t	tangent modulus of cylinder material at stress induced by collapse pressure	N/m^2	lbf/in^2
K	collapse coefficient defined by $p = KE (t/R)^3$		
l	length of cylinder	m	in
n	number of lobes into which cylinder collapses		
p	critical external pressure	N/m^2	lbf/in^2
R	radius of cylinder	m	in
t	thickness of cylinder wall	m	in
ν	Poisson's ratio of cylinder material		

Both SI and British units are quoted but any coherent system of units may be used.

2. NOTES

Curves of collapse coefficient K are given plotted against l/R for various values of R/t for unstiffened circular cylinders under uniform external pressure. The following cases are covered.

Case 1. Pressure on ends and sides, ends simply-supported.

Case 2. Pressure on ends and sides, ends clamped.

If the pressure is applied to the sides of the cylinder only, the critical pressure will be negligibly higher than that given by this Item.

The curves in both the Cases apply to the elastic range of the material and have been drawn for $\nu = 0.3$. They may be used beyond the elastic limit provided that the tangent modulus E_t is used in place of E .

Ovality and local irregularities normally found in practical cases have an insignificant effect on the strength of circular cylinders.

The curves may also be used to determine the critical pressure for ring-stiffened cylinders where the rings are assumed not to buckle with the skin and the ring spacing is taken as l .

3. DERIVATION

1. STURM, A. A study of the collapsing pressure of thin-walled cylinders. University of Illinois Engineering Experimental Station, Bulletin 329, 1941.
2. CLEAVER, P.C. The strength of tubes under uniform external pressure. ARC CP 253, November 1955.