

GUIDE TO STRESS CONCENTRATION DATA

Items in this section present data on stress concentration effects arising from discontinuities of shape, or from inclusions or because of local load distributions.

The following definitions are used in the Items.

STRESS CONCENTRATION. A local increase in the intensity of a stress field due to discontinuity.

STRESS CONCENTRATION FACTOR. The ratio of the highest stress to a reference stress calculate from simple theory.

GEOMETRIC STRESS CONCENTRATION FACTOR. A stress concentration factor arising solely from the shape of the part.

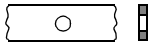
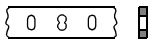
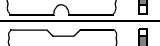
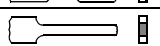
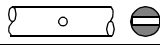
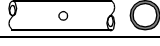
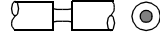
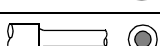
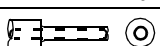
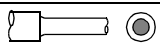
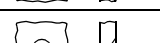
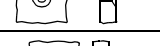
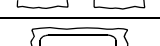
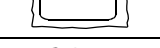
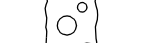
The reference stress evaluated by simple theory may be based upon either the net cross through the discontinuity or the gross section of the member ignoring the discontinuity. A reference stress based on the net cross section is preferable and this basis has been used wherever practicable. However, in a number of cases considered it is not possible to express in simple terms the nominal local stress based on the net cross section and in these cases the gross section has been used. In the Data Items on joints the stress concentration factor is not always evaluated and the maximum stresses have been given directly. Where the stress concentration factor is given it has been found convenient to use a reference stress on the basis of the joint bearing stress. Factors based on the net cross section are shown as K' and those on gross and bearing cross section as K and K_B respectively.

Care should be exercised in the use of these Items to ensure that the appropriate cross section is used in the calculation of the maximum stress from the stress concentration factor. Complete expressions defining the factors are given in the notation section of each Item.

The data apply only to isotropic materials that obey Hooke's Law. However, the majority of engineering materials are approximately isotropic and the data may be used without significant error. Poisson's ratio is assumed to be 1/3 for all Data Item calculations which require it but which do not include it in their notation. In such cases it is expected that its variation between 0.2 and 0.5 will produce less than ± 5 per cent variation in the resulting stress concentration factor.

Where it is practical to do so, limiting curves or values are presented to allow interpolation of near limit cases.

Throughout this series of Item "bars and strips" applies to bodies having solid rectangular sections and the term "rod" to bodies having solid or hollow circular sections.

FORM OF DISCONTINUITY			LOADING	ITEM NO.
BARS AND STRIPS		Central hole	Tension, bending in or out of plane	69020
		Central transverse slots	Tension	
		Side notch	Tension, bending	
		Symmetrical notches		
		Symmetrical flat-bottom notches		
		Fillets		
RODS AND TUBES		Diametral hole	Tension, bending, torsion	89048 [†]
		Diametral hole in hollow tube		
		Circumferential groove		
		Flat-bottom circumferential groove		
		Small flat-bottom circumferential groove typically for a circlip or seal	Tension, bending, torsion	79032 [*]
		Fillets	Tension, bending, torsion	89048 [†]
		Hollow rod with fillets	Tension, torsion	
		Double radius fillets	Torsion	75033 [†]
PLATES		Central hole	Tension, out-of-plane bending, pin loading	83030
		Central countersunk hole	Tension, out-of-plane bending	
		Unreinforced oblique circular holes	Unreinforced – loaded in biaxial tension	80027
		Unreinforced and reinforced circular holes	Unreinforced – all in-plane loadings. Reinforced – various set common combinations of in-plane loadings	
		Unreinforced and reinforced elliptical holes		
		Unreinforced and reinforced square holes	Various set common combinations of in-plane loadings	
		Unreinforced and reinforced equilateral triangular holes		
		Rectangular holes		
		Adjacent unequal diameter holes		
		Adjacent equal diameter holes	All in-plane loading combinations	67023
		Unreinforced and reinforced holes near an edge	Unaxial load parallel to plate edge	66004
		Rectangular notch in an edge		79008
JOINTS		Lugs	Tension	81006 [†]

* In Structures and Stress and Strength Sub-series only.

† In Structures, Stress and Strength and Fatigue Sub-series only.