

ELASTIC STRESS CONCENTRATION FACTORS. RECTANGULAR NOTCH IN THE EDGE OF A WIDE FLAT PLATE IN TENSION

1. NOTATION

f	uniform direct stress in plate, remote from notch, acting parallel to plate edge	N/m ²	lbf/in ²
f_{max}	maximum direct stress in plate	N/m ²	lbf/in ²
h	depth of notch (see Figure 1)	m	in
K	stress concentration factor defined by $f_{max} = Kf$		
L	length of notch (see Figure 1)	m	in
r	radius of curvature at re-entrant corners of notch (see Figure 1)	m	in

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

2. NOTES

Figure 1 provides K plotted against L/h for various values of r/h for rectangular notches, or cut-outs, in the edge of a wide flat plate loaded in tension parallel to the plate edge. The peak stress, f_{max} , occurs at both points 1 and 2 shown in the sketch on Figure 1. When $L = 2r$ the notch root is semicircular, as indicated by the dashed line on Figure 1. In these cases points 1 and 2 coincide at the root of the notch.

The data are based upon a notch which has a $0.05r$ radius on the salient (outer) corners, as shown in the sketch on Figure 1. For the range of notch proportions covered by Figure 1 this small radius is insufficient to influence the value of f_{max} . The data apply strictly to semi-infinite flat plates but are applicable to finite width plates loaded uniformly in tension provided that they are at least $5h$ wide. The data may also be used to obtain an estimate of K for a plate subjected to in-plane bending; however, the resulting K will be an overestimate. For semicircular bottomed notches Figure 4.2 of Item No. 69020 can be used to obtain an estimate of the resulting error.

The data apply only to isotropic materials that obey Hooke's Law. However, most engineering materials conform substantially in these respects and for them the data may be used without significant error. If the stress concentration factor is such that the maximum stress is above the limit of proportionality of the material, the stresses will be redistributed and will give rise to residual stresses on unloading.

Introductory notes on stress concentration are given in Item No. 64001. Further data on stress concentration may be located by reference to the Engineering Sciences Data Index.

3. DERIVATION

This section lists the source which has assisted in the preparation of this Item.

1. RUBENCHIK, V.Ya. Stress concentration close to grooves. *Vestnik Mashinostroeniya*, Vol. 55, No. 12, pp. 26-28, 1975.