

# Strain Rate Concentration and Dynamic Stress Concentration for Double-Edge-Notched Specimens Subjected to High-Speed Tensile Loads

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Table 1 Static stress concentration factor by FEM

Notch (mm)	$K_{ts}$ in Fig. 3(a)	$K_{ts}$ in Fig. 3(b)	Reference <sup>13-17</sup> in Fig.3(b)
$\rho=0.03, t=5$	14.46	14.48	14.49
$\rho=0.2, t=5$	6.14	6.15	6.12

Table 2 Displacement  $u$  given at the grip end

	Case in Fig.4		Case 1	Case 2	Case 3	Case 4	Case 5
Condition	Maximum displacement	$u_{\max}$	0.1 mm t=0.00100s	0.1 mm t=0.00029s	1.5 mm t=0.00429s	1.5 mm t=0.00150s	1.5 mm t=0.00030s
	Tensile speed	$u/t$	100 mm/s t<0.00100s	350 mm/s t<0.00029s	350 mm/s t<0.00429s	1000 mm/s t<0.00150s	5000 mm/s t<0.00030s

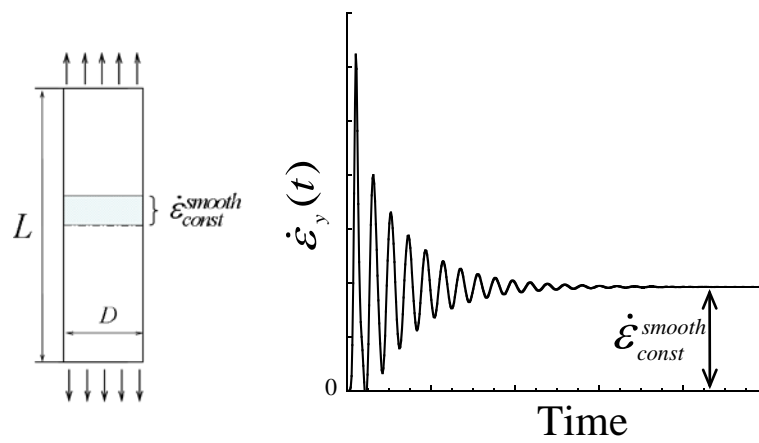
Table 3 Dynamic stress concentration factor  $K_{td}$  and the ratio  $K_{td}/K_{t0}$  ( $K_{t0}$ =the results for semi-infinite plate by Noda et al. (1995, 2002, 2010))

		$K_t$		$K_t/K_{t0}$	
t(mm)	$\rho$ (mm) 2t/D	0.2	0.03	0.2	0.03
→ 0	→ 0	13.42	31.71	1	1
1	0.1	11.72	27.62	0.873	0.871
2.5	0.25	9.48	22.16	0.706	0.699
5	0.5	6.14	14.46	0.458	0.456
7.5	0.75	3.84	9.01	0.271	0.284
9	0.9	1.87	5.94	0.139	0.187

Table 4 Strain rate concentration factor  $K_{t\dot{\epsilon}}$  and the ratio  $K_{t\dot{\epsilon}}/K_{t\dot{\epsilon}0}$  (The limiting values  $K_{t\dot{\epsilon}0}$  for  $2t/D \rightarrow 0$  are obtained by the extrapolation from the results for  $2t/D=0.1$  and  $0.25$ .)

		$K_{t\dot{\epsilon}}$		$K_{t\dot{\epsilon}}/K_{t\dot{\epsilon}0}$	
t(mm)	$\rho$ (mm) 2t/D	0.2	0.03	0.2	0.03
$\rightarrow 0$	$\rightarrow 0$	15.55	30.65	1	1
1	0.1	14.05	27.89	0.904	0.910
2.5	0.25	11.82	23.75	0.760	0.755
5	0.5	8.72	18.05	0.561	0.589
7.5	0.75	4.97	11.53	0.320	0.376
9	0.9	3.10	6.88	0.199	0.224

Table 5 Converged strain rate  $\dot{\epsilon}_{const}^{smooth}$  for smooth specimen



	$\dot{\epsilon}_{const}^{smooth}$			
	$L=25\text{mm}$	$L=50\text{mm}$	$L=100\text{mm}$	$L=200\text{mm}$
$D=20\text{mm}$	14	7	3.5	1.75
$D=10\text{mm}$	14	7	3.5	1.75

Table 6 Converged average Strain rate  $\dot{\epsilon}_{const,nom}$  for the notched specimen

	$2t/D$	$L=25\text{mm}$	$L=50\text{mm}$	$L=100\text{mm}$	$L=200\text{mm}$
$\dot{\epsilon}_{ynom,const}$ $\rho=0.03\text{mm}$	$\rightarrow 0$ ( $\dot{\epsilon}_{const}^{smooth} =$ )	14	7	3.5	1.75
	0.25	14.148	7.375	3.739	1.977
	0.5	15.933	9.294	4.882	2.668
	0.75	25.154	15.938	9.210	4.985
	0.9	50.683	34.813	19.922	12.055
$\dot{\epsilon}_{ynom,const} / \dot{\epsilon}_{const}^{smooth}$ $\rho=0.03\text{mm}$	$\rightarrow 0$ ( $\dot{\epsilon}_{const}^{smooth} =$ )	1	1	1	1
	0.25	1.0105	1.1380	1.7967	3.6202
	0.5	1.0535	1.3277	2.2768	4.9732
	0.75	1.0682	1.3948	2.6314	5.6925
	0.9	1.1297	1.5245	2.8485	6.8885