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; e-mail: hart@ua.fm

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This paper considers the stress and strain field in an elastic square plate with an elongated rectangular opening whose sides are reinforced with rectangular inserts. The aim of this work is to study the effect of the insert parameters and the opening orientation (the orientation of the major and the minor sides of the opening relative to the load direction) on the reduction of the stress and strain intensity in the plate at stress concentration sites. The material of the reinforcing inserts differs from that of the plate. Using the variational grid finite-element method, computer simulation and calculations were conducted to determine the most suitable geometric and mechanical characteristics of the reinforcing inserts and their locations. It was shown that the proper choice of the reinforcing insert parameters reduces the stress concentration in the plate. The results obtained may be used in increasing the strength of structures that include thin-walled plates with rectangular openings at low material consumption for reinforcing inserts.

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[1, 4 – 6, 11].

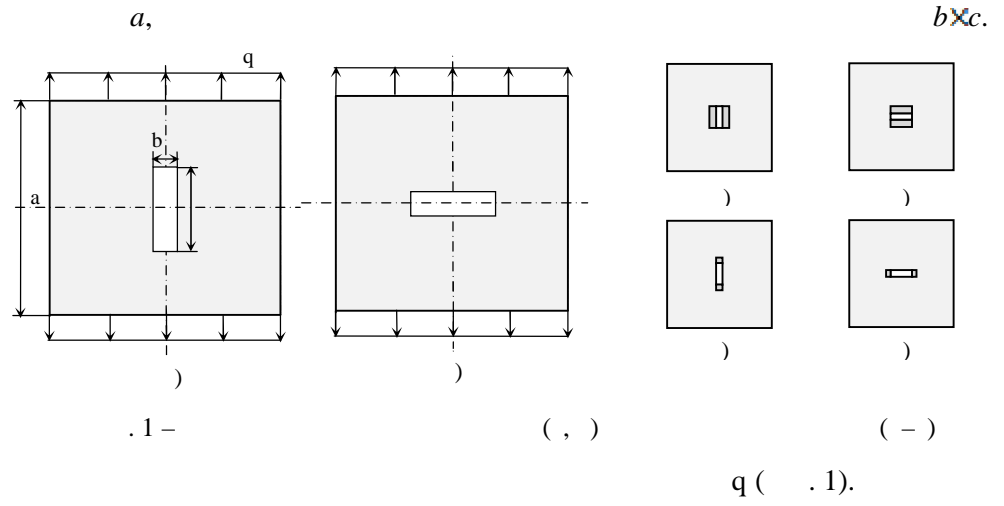
[12],

© . . . , . . . , . . . , 2018

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[6].
[3]

[8].



(.1,))
(.1,))

(.1,))

(.1,) - (.1,))

(.1,))
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[7, 10]

Intel core i3, 4 core – 2.3 GHz, 4 GB RAM.

15

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.2,)

σ_i

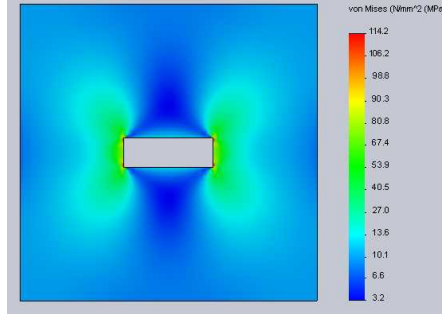
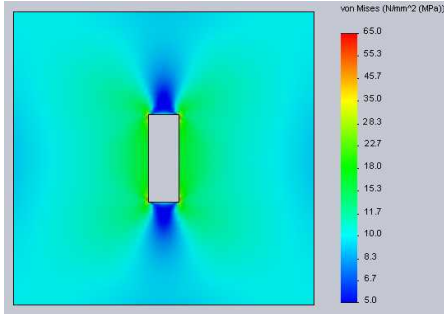
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6,5.

(.2,)).

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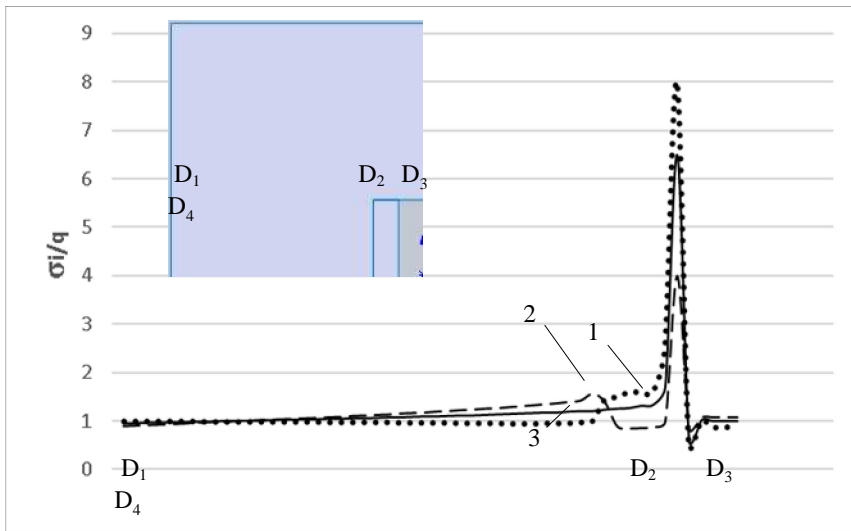
.2 –

σ_i []

[3].

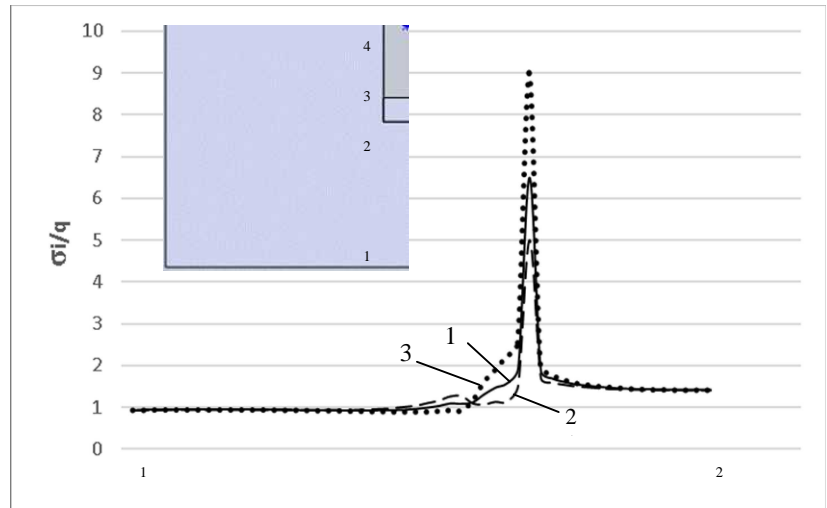
σ_i/q .3
D₁–D₄

.1,).



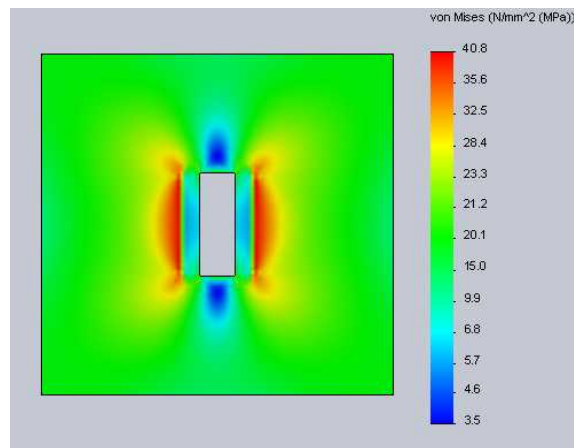
.3 – σ_i/q D₁ – D₄: 1 –

1:3; 3 – 3:1



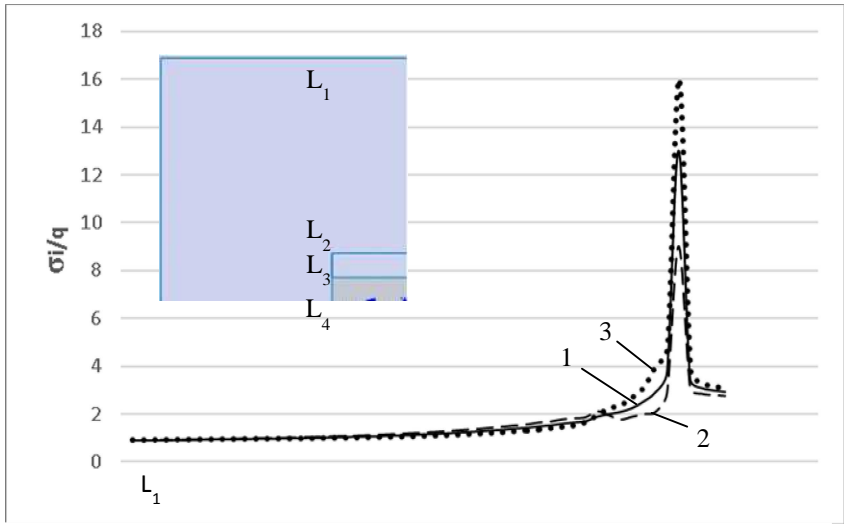
σ_i/q $E_1 - E_4$: 1 - ;
 2 - 1:3; 3 - 3:1

σ_i/q $E_1 - E_4$ (.1,) ,
 (.1,) , (.1,))
 ~35 %
 3:1. $\sim 23\%$ (.5, 2).
 $b/2$ b

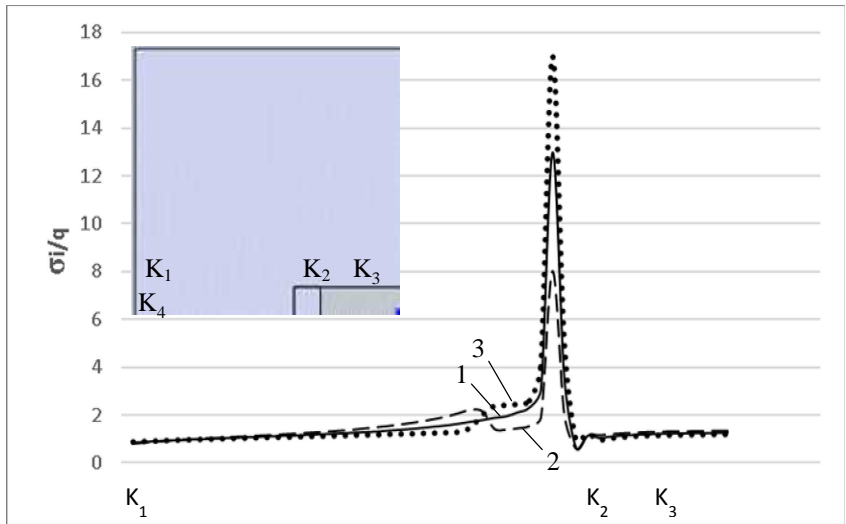


σ_i [] 1:3

σ_i/q $L_1 - L_4$;
 .1,). ~21% (.6,
 2)
 σ_i/q $L_1 - L_4$;
 .7 ~24% (.1,).
 2).

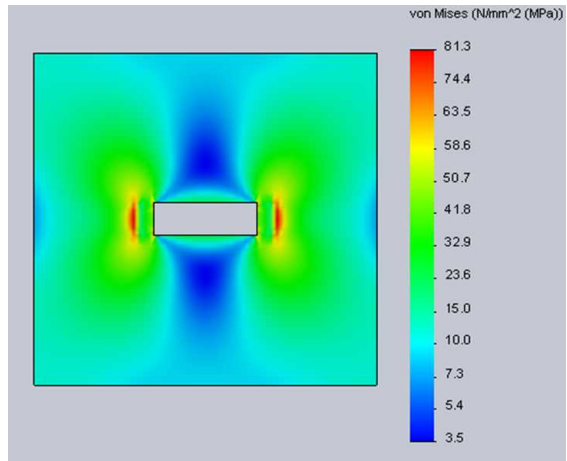


σ_i/q $L_1 - L_4$; 1- ;
 2- 1:3;
 3- 3:1



σ_i/q $K_1 - K_4$; 1- ;
 2- 1:3;
 3- 3:1

.6 .7 ,
 ,
 .8
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.8 – σ_i [] 3:1

- 1) ;
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 - 3) $b/2$ b ~35 %;
- $b/2$.

1. : i , 1969. 220 .
 2. – 2015: (,14-17

- 2015).
3. ,2015. .81.
 4. ,2015. .24. .35-47.
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23.01.2018,
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