

622.235.535

• • , • • (« »)

,

:

,

,

.

,

:

,

,

Rock bumps classification considering the main peculiarities of appearance and parameters for their evaluation have been developed.

Key words: rock bump, potential energy of rock bump, seismic activity.

•

-

,

,

,

,

(

,

• •).

,

,

,

.

–

,

,

.

•

•

–

[1],

;

–

,

(• •

) [1, 3];

-

[1].

• •

• •

(•)

• [2],

• (•),

•

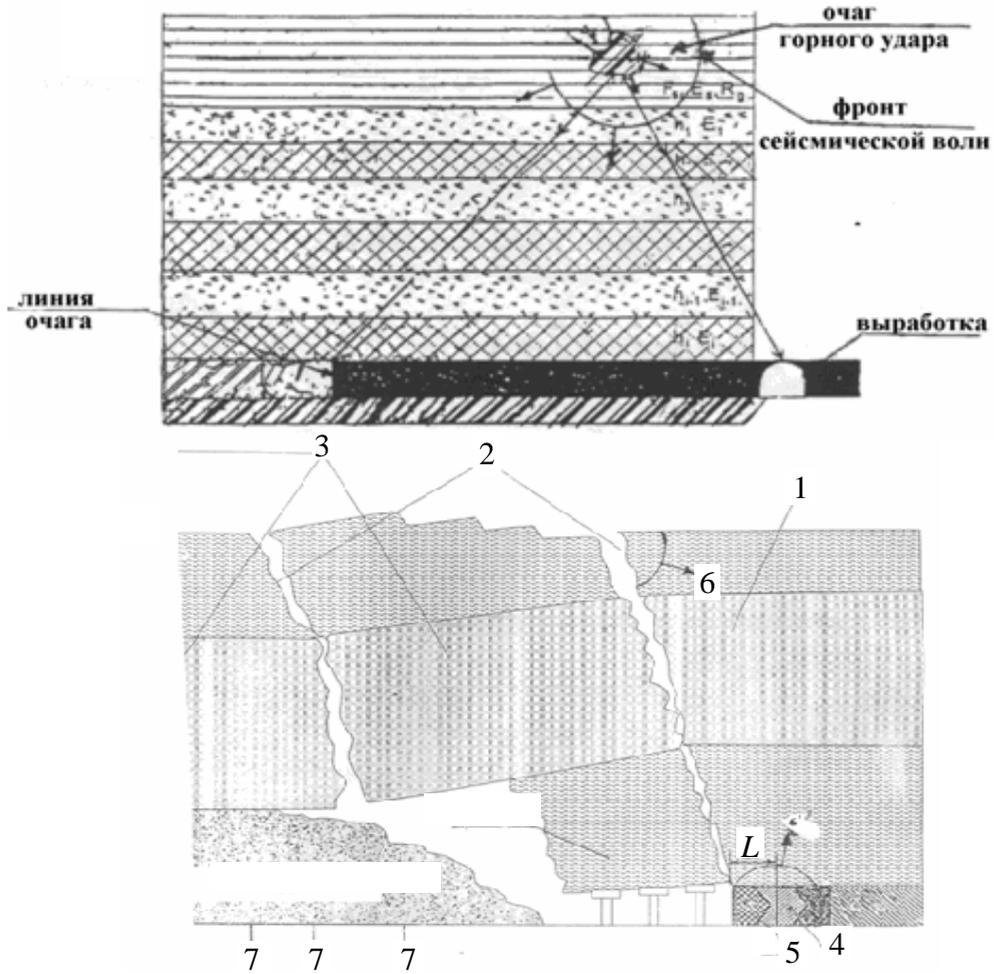
[3]

,

•

,

« » ,



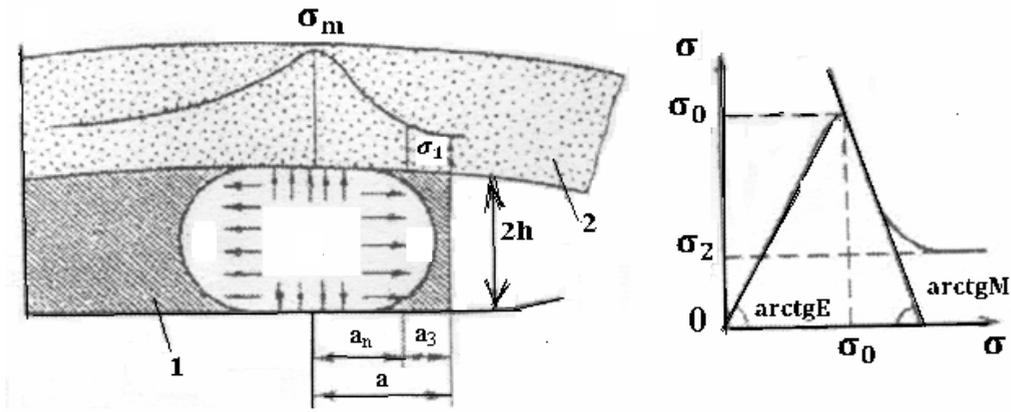
. 1.

(; 1 - ; 2 - ; 3 - ; 4 - ; 5 - ; 6 - ; 7 -) ; L - [2]

. 2

[1]

()



2. « » () ; 2 - () () : I - ()

[3] « - »
 I , $\sigma_y > \sigma_n > R_y$; (1)

II $\sigma_y < \sigma_n < R_y$; (2)

III $\sigma_y > \sigma_n < R_y$; (3)

IV , $\sigma_y < \sigma_n < R_y$, (4)

$\sigma_y -$ () ,

$$\sigma_y = \frac{R_n \cdot P_z}{0,5 \cdot P_z + 0,33 \cdot R_y}; \quad (5)$$

n - () ,

$$\sigma_n = \frac{R_n \cdot P_z}{0,5 \cdot P_z + 0,33 \cdot R_n}; \quad (6)$$

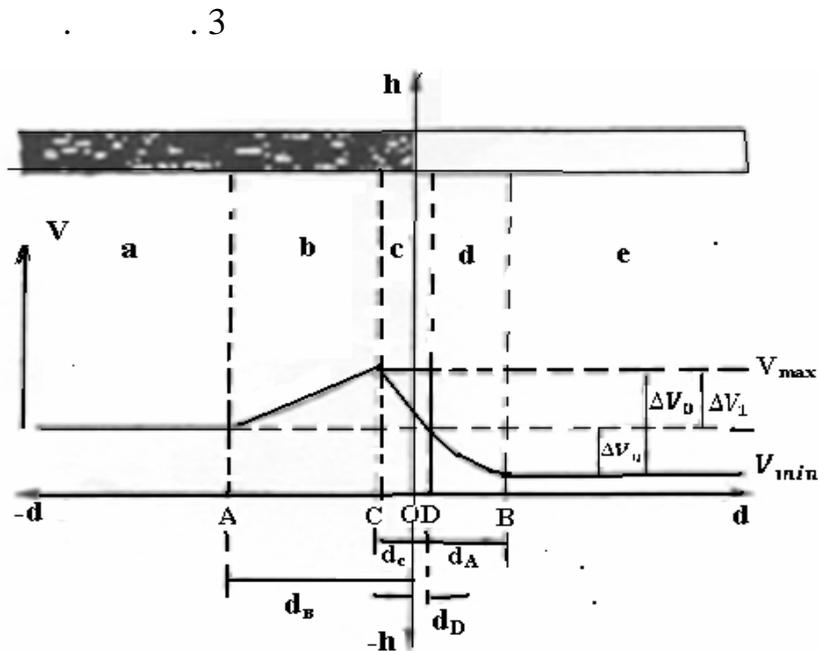
R - ; P_z - ; R_n -

$$\sigma_{n \max} = \frac{P_z \cdot R_n}{P_z + 0,12 \cdot R_n}. \quad (7)$$

[1].
 (V_p) (V_s) () (. 3).

$$A_p = \frac{V_p^{\max} - V_p^0}{V_p^0} \cdot 100\% = \frac{\Delta V^{\max}}{V_p^0} \cdot 100, \quad (8)$$

V^{\max} - ; V_p^0 -



. 3. : $a, b, c,$
 d, e - ; A, B, C, D - ;
 $\Delta V_1, \Delta V_2, \Delta V_3$ -

(ΔP)

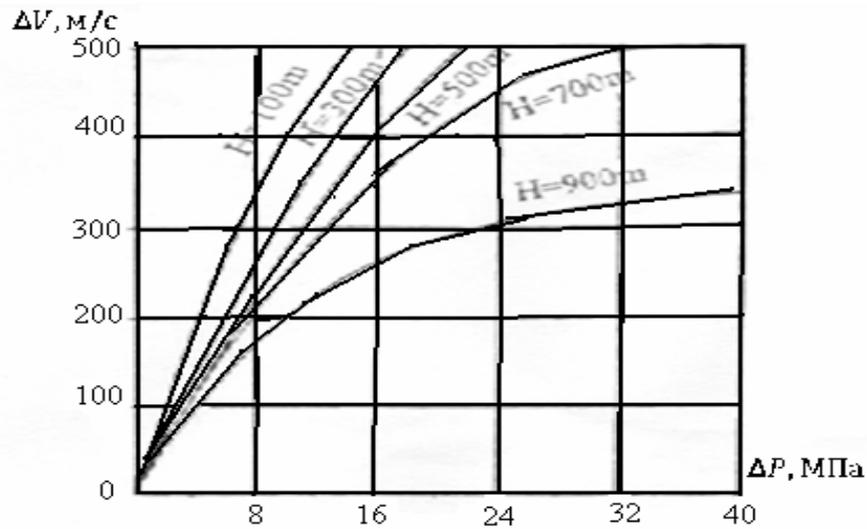
$$\Delta P = a \Delta P^b, \tag{9}$$

b – . 1,

A_0 – . 4. ΔP
:

$$\frac{V_p^{\max}}{V_p^0} = \left(\frac{\Delta P}{P_z^0} \right)^c. \tag{10}$$

c d . 1.



. 4.

H

1.

	a	b	c	d
500	36,9	0,854	0,315	0,885
700	43,36	0,725	0,738	0,692
900	46,57	0,584	1,273	0,512

(. 2).

2.

		$A_p^0, \%$	$\frac{\Delta P}{p_z^0}, \%$
0		5	-
1		5-15	20-60
2		15-25	60-140
3		25	140

3, (8) V_p^{\max} V_p^{\min} , p_z^0 , P

GR ,

$$GR = \frac{V_p^0 - V_p^{\min}}{V_p^0 \cdot \omega} \cdot 100\%, \quad (11)$$

[1]

()

3.

10-20 (50')
0,5-2,0

1000 10^{-4}

E_d

(V_p)

(V_S)

d_s

:

$$E_d = 2\rho V_S^2(1 - \nu); \nu_d = \frac{1 - 2K^2}{2(1 - K^2)} = \frac{V_p^2 - 2V_S^2}{2(V_p^2 - V_S^2)}, \quad (12)$$

$$K = \frac{V_S}{V_p};$$

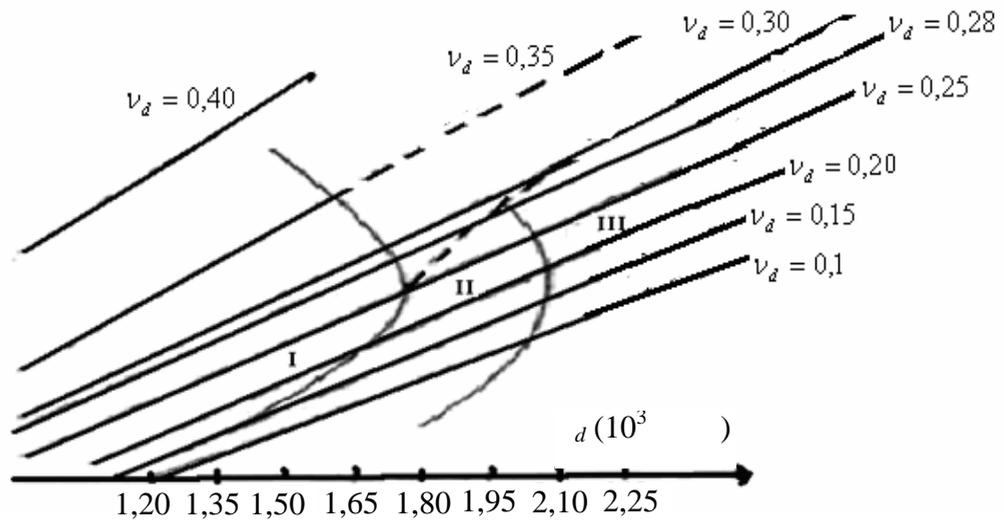
$$E_d \approx \nu_d \quad (12),$$

I
II
III

() ; (. . 5);

c ;

()



$$E_d \approx \nu_d ; \text{ I, II, III -}$$

(« »).

— .

’ , ’ , ’ -

· -

· -

— , (. 3).

3.

	, .	
(,)	< 10	< 1
	10–10 ²	1–2
	10 ² –10 ⁴	2–3,5
	10 ⁴ –10 ⁷	3,5–5
	> 10 ⁵	> 5

, , ,

, , . . . -

, (

).

· -

[1].

, , ,

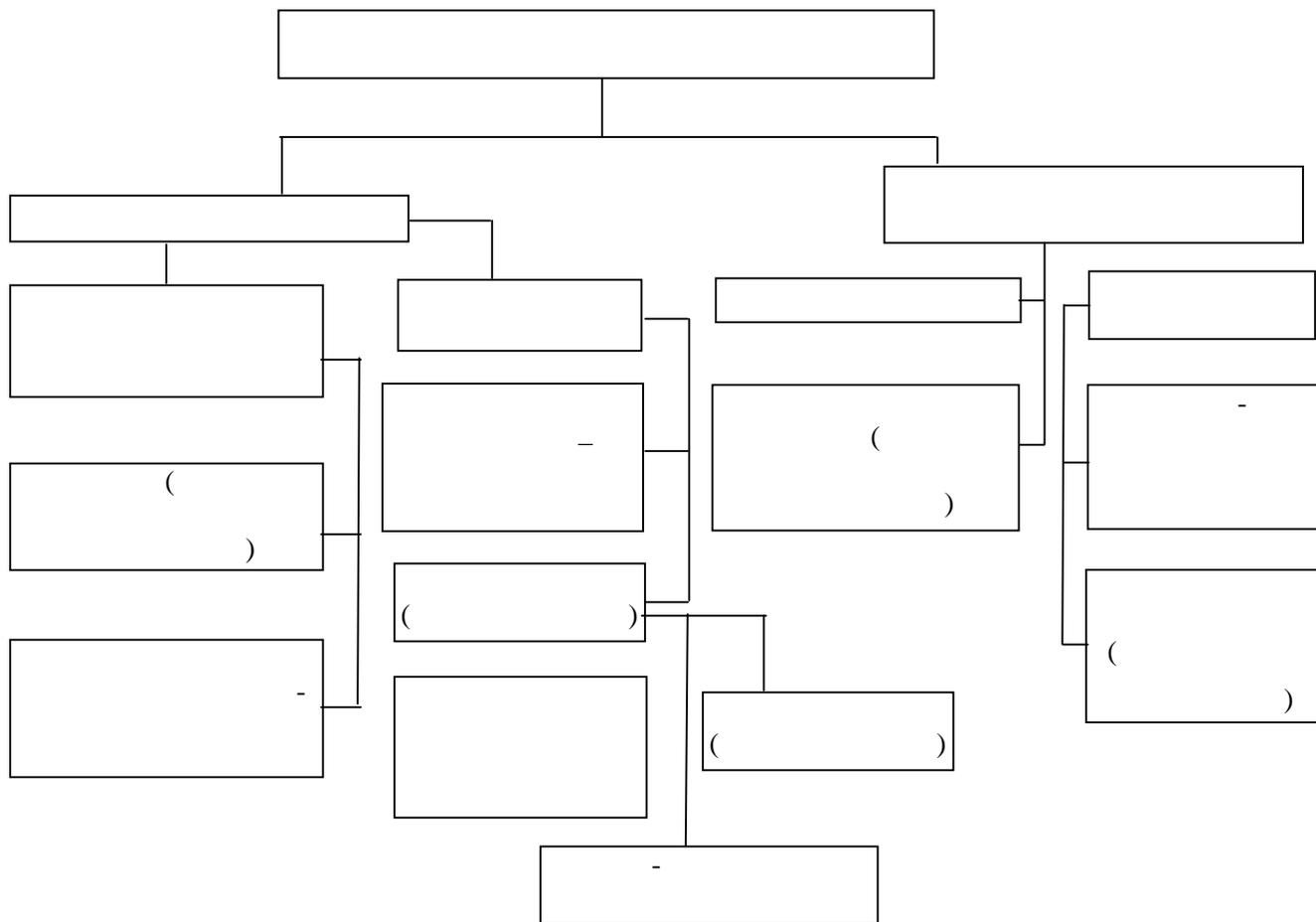
· ,

, [1],

(. 6).

, , (ΣE), -

-



. 6.

[1].

1.

2.

