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Part 3: Design»)
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Vessels and apparatus. Norms and methods of strength calculation. Stength and teak-tightness calculation of flange joints

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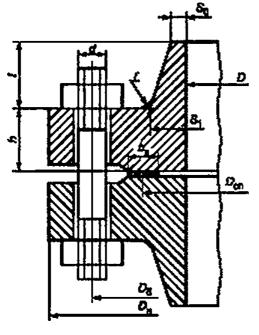
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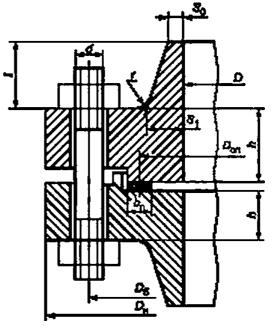
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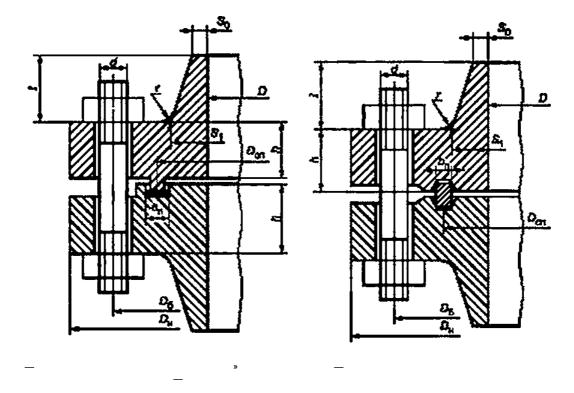
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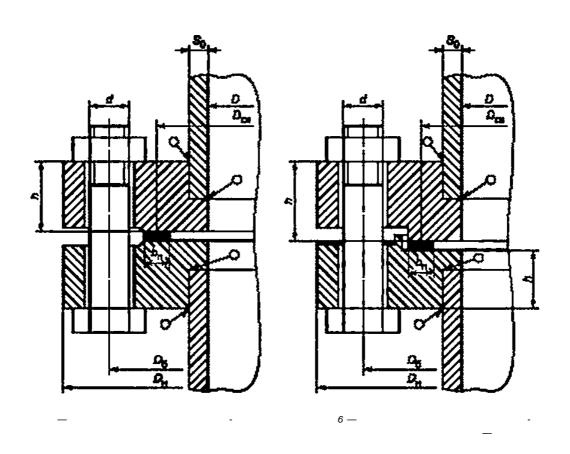




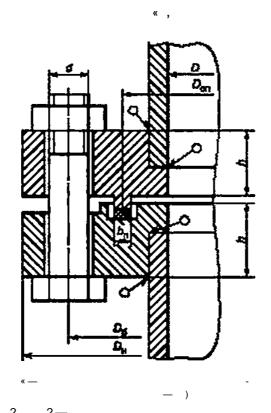
1. 1-

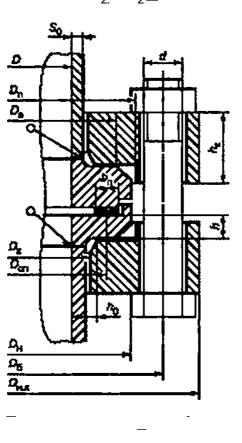


1. 2—

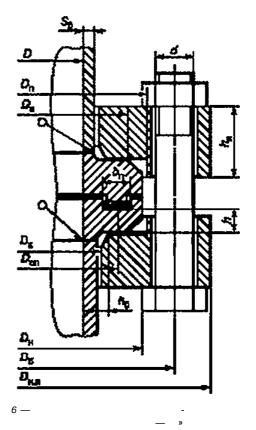


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<⁶> (7) 5.2 - = O.SsDtn £> Qoc*t-(8) 5.3 $R_n =$ (9) *R*,, -0. (6) 6.1 () $A_t = nf_6$. (10)) 6.2 -0.785 ". (11) 6.3 < "Pi ^l-1 6.4 (. 1) (. 2) $Qt = (4.1 \text{ (f*i - 20)} + (4.2 \text{ ft (ft}_2 - 20)) - (4.1 \text{ (ft + 1)}) \text{ ft } (-20)\text{J};$ (13) (. 3): $, = ?[«*, | (1*, -20) + _2 ft (ft_2 - 20) + 2 ft, ft - 20) - « (ft, + ft_2 + 2ft) ft - 20) j;$ (14)

Q, * yjift, ft, (ft, -20) + h_2 (ft₃ - 20) + h_p ft - 20) - $_0$ (ft, + ft₂ + ft_p) ft - 20)j. (16)

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(15)

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8.4.4

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<* (40)

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8.4.5

$$\sigma_{\kappa}^{D} = \frac{\beta_{Y} M_{z}^{D}}{h^{2} D_{\kappa}}.$$
 (42)

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8.5 8.5.1 S,

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$$\max \left\{ |\sigma_1^4 + or| \right\} s K_T[o)_M; \tag{43}$$

• :

$$\max Jo? - < " + " | : | ? - ? + ? | : | ? + ? | : | .$$
 (44)

8.5.2 S₀ :

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8.5.3 , So :

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$$\max\{|o|f + \$\ | \ \pounds + ?|\} \ \ [\]_{o};$$
 (47)

- :

$$\{|^{\circ} -<.., +e^{?}|: |^{a}S - {\circ}o_{B} +<|:|^{n}S +<..|\}^{**}$$
 (48)

 $[\)=[\] \ -$

*D*1400 [^ = — [^ -

8.5.1.

8.5.4 ,

S₀ 8.5.3 , :

$$S_0 £ 16$$
 : (49)

$$h*D$$
 £[a] 20. (51)

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(52) h³D 8.5.5 S : $\max \left\{ \left| \sigma_{0w,o}^{p} \right| ; \left| \sigma_{0w,w}^{p} \right| \right\} \leq \{\sigma\}.$ (53) |:| ?|} **-,**[]: (54) (55) $\max\{|o^{*}|:|n?|JfiK_{T}(o].$ 8.5.1. 8.5.7 : <SK_T|«f; (56) (57) 8.5.1. 9 9.1 (58) (] = 0.006 **D**£ 400 [0] = 0.013**D** >2000 < D £ 2000 (0] 400 [0] = 0,013.**"-1**— : -1,3 — 9.2 (59)

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(5 '1* ; **(73)**

10.1.5

 $\mathbf{S_0}$:

°01 °0+ »» » • (74)

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10.1.6

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(81)

10.2

10.2.1

a,, 4. *rfS,:*

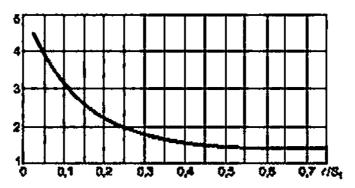


Рисунок 4 — График α_п

10.2.2

max |^oe * |-|°02 - 0 |} - 2 (831

 * , 4. Si = S₀. 10.2.3

<u>i.5max ||o q i|: [ogg - ogij- | ° ~ ° |</u> (84)

10.2.4

« ₂ (85)

10.2.5 ()

 $\frac{1}{41}$ (86)

10.3

10.3.1

 $^{\text{max}} \left\{ \underline{0} = -\frac{1}{2} - \frac{2}{2} - \frac{2}{2} - \frac{2}{2} \right\}$ (87)

q | | ®0,{-| 01 •'°0 |: |^°S| * |-'°02|: | 02 * ^eS*!*!¹⁴⁰» " 0 (881

1.5 $\| \langle , |; | \S_3 |; | \S, \qquad \frac{\Delta \sigma_{03}^p}{2} |; |\Delta \sigma_{04}^p|; |\Delta \sigma_{02}^p|; |\Delta \sigma_{02}^p|$ (89)

10.3.4

 $\stackrel{|\Delta \sigma_{\mathbf{k}}^{\mathbf{p}}|}{=} \tag{90}$

10.3.5 -

- -"2" (91)

52857.4—2007

?,, ,. §₂. ^ . . . ®. (88) — (92) $10.1.4\,-\!10.1.6.8.4.5\quad 7.1\colon \ \$,,\, {\rm og}\,, .\,\, {\rm og}_{\,2}.$ "2 52857.6. 10.4 52587.6. () 10.2. [W)_c. (®) 10.3, [/]. Ν.. (92) () 300'. 1,6 . 1.6 6.3 .

6.3

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$$- + \frac{4}{\pi D_{cn}^2} \left(F + \frac{4|M|}{D_{cn}} \right). \tag{.1}$$

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too 126.0	105,0	150,0	1 2.0	230.0	230.0	227.0	80					
200 120.0	98.0	150.0	165.0	225.0	200.0	217.0	76					
250 107.0	95.0	144.0	158.0	222.0	182.0	210.0	_					
300 97.0	90.0	139.0	150.0	222.0	174.0	199.0	_					
350 86.0	86.0	128.0	147.0	185.0	166.0	185.0	_					
375 80.0	85.0	128.0	146.0	175.0	166.0	180.0	_					
400 75.0	83.0	128.0	145.0	160.0	166.0	175.0	_					
425 68.0	82.0	125.0	143.0	156.0	161.0	168.0	_					
450 —	80.0	123.0	142.0	_	156.0	161.0	_					
475 —	79.0	120.0	140.0	_	_	152.0	_					
500 —	78.0	118.0	_	_	_	143.0	_					
510 —	_	117.0	_	_	_	_	_					
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100	232.0	234.0	234.0	230.0	314.0	196.0	226.0					
200	231.0	224.0	231.0	220.0	312.5	186.0	221.0					
250	224.0	213.0	227.0	218.0	309.8	186.0	219.0					
300	220.0	202.0	227.0	209.0	307.0	186.0	217.0					
350	213.0	185.0	220.0	207.0	307.0	166.0	215.0					
375	209.0	183.0	216.0	_	_	186.0	214.0					
400	206.0	182.0	213.0	_	_	186.0	213.0					
425	202.0	178.0	208.0	_	_	186.0	213.0					
450	199.0	175.0	203.0	_	_	166.0	213.0					
475	195.0	171.0	196.0	_	_	186.0	213.0					
500	192.0	167.0	189.0	_	_	186.0	208.0					

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530	_	_	_	_	_	183.0	199.0
540	_	_	_	=	_	181.0	196.0
550	-	-	-	-	-	180.0	195.0
560	-	-	-	-	-	165.0	183.0
570	=	=	_	-	=	150.0	171.0
580	-	-	_		_	135.0	169.0
590	_	_	_	l	_	120.0	157.0
600	_	_	_	l	_	115.0	147.0
610	_	_	_	_	_	110.0	_
620	_	_	_	_	_	105.0	_
630	_	_	_	_	_	100.0	_
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() , 2	707,0	962,0	1257.0	1521.0	1810.0	2124.0	2290.0	2463,0

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$$= 0.5 (D_e - D_{en}).$$
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$$= 0.5 (D_0 - DJ.$$
 (.2)

$$b = 0.5 (D_t - D_{co}).$$
 (.)

rfleD, = $0.5(D_H + D_K + 2h_o)$.

:

$$= 0.5 (D_{cn} - D - S J,$$
 (.4)

 S_5 — ,

$$S_{1} = S_{1} - S_{2} - S_{3} - S_{3$$

£,

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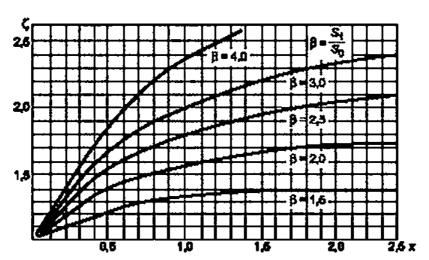


Рисунок Е.1 — Коэффициент ζ

V*o- (.7)

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$$^{+}$$
 $g+2$ 2 2 $^{+}$ 1 1 2 1 2 2 (.9)

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$$\frac{-(*1 1 + 2 2)*>}{* $*(1 + 2)*>*}$$
(.11)

- :

$$-1 \frac{-< y + *>}{* *(y + y)^2}$$
 (1.12)

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 + 2 0 ^b t
+ 0 + 2 2 + 2 0 6 ('14)

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	10*», "									
	20	100	200	300	400	450	S00	SS0	600	650
10. 20. 25. 30. 35. 40	2.13	2.10	1.98	1.90	1.85	_	1.79	_	_	_
35 . 40 , 15 . 35	, 2.18	2.15	2.08	2.01	1.92	_	1.79	_	_	_
12X1 (12), 25 1 (10). 25 2 1 (723). 20 1 1 1 (182). 20 1 1 1 (44)	2.15	2.12	2.08	2.02	1.94	_	1.83	1.77	1.70	_
20X13(2X13). 15X11 (1X11). 20 12 (428). 18 11 (291). 1 12 2 (961), 18 12 (993)	2.28	2.22	2.13	2.05	1.93	_	1.84	1.751'	1.70	_
12 18 10 (18 10). 08 18 10 (0 18 10). 08 16 1 2 (680). 31 19 9 (572). 35 (612)		2.02	1.97	1.90	1.81	1.80	1.73	1.70	1.85	1.60
10X11 22 (696)	1.9	1.81	1.69	1.58	1.48	1.42	1.37	1.33	1.31	1.30
16	0.71	0.87	0.59	_	_	_	_	_	_	_

565 " 1.73-10*⁵, .

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.2

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				10* .		
	20-100	20—200	20—300	20-400	20-500	20-000
10. 20. 25. 30. 3	5 11.1	11.9	_	13.4	_	_
40	11.3	12.0	13.3	13.3	_	_
20X13	10.4	10.9	11.4	11.8	_	_
14 17 2	10.6	10.8	11.0	11.1	11.3	_
35 .40 ,38	13.4	13.3	_	14.8	_	_
20	11.0	12.0	13.0	13.5	14.0	14.5
30	12.3	12.6	12.9	13.9	_	14.4
25X1	11.3	12.7	_	13.9	_	14.6
25 2 1	12.5	12.9	13.3	13.7	14.0	14.7
18 12	11.2	11.3	11.4	11.8	12.0	_
7 12 8 8	15.9	16.0	19.2	21.5	22.4	21.0
12 18 10 . 10 17 13 2	16.6	17.0	18.0	18.0	18.0	
45 14 14 2	_	17.0	_	18.0	_	18.0
35	14.8	15.1	15.5	15.9	16.1	16.6
08 15 24 4	14.5	15,5	16.3	16.8	17.2	17.4
07 16 16	11.2	11.9	12.1	12.5	12.9	_
1	22.7	23.4	_	_	_	_

()

-.1.

		W	[0].		£,, 10**.
- :					
7338					
65	0.5	2.0	18.0	0.4	
7338					
65	1.0	4.0	20.0	0.09	/1 0.4.10 ₊
481					
2—3	2.5	20.0 ¹ »	130.0	0.90	0.02
2650 1—3	2.5	20.0	130.0	0.90	0.02
6-05-810(1) - 1—3	2.5	10.0	40.0	1.00	0.02
(« ») - -	2.0	4.0	200.0 120 —	1.00	0.02
(« »)	2.5	4.0	$ft_n = 2$; 100 - h = 3;	1.00	0.02
:					
21631	4.0	60.0	_	_	_
63 2208	4.75	90.0	_	_	_
05 9045	5.5	125.0	_	_	_

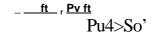
. 1

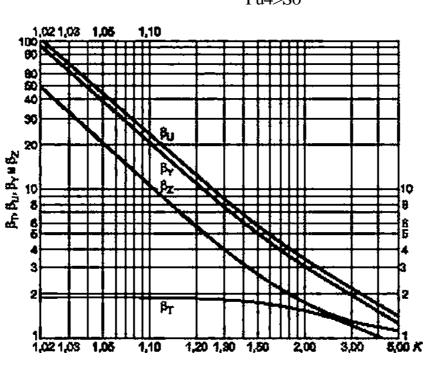
	ІТ)	W	(.		£ *.	
2850						
	3.25	38.0				
	3.5	46.0	_	_	_	
05	3.75	53.0	_	_	_	
12 18 10	3.75	63.0	_	_	_	
:						
	3.0	69.0				
	2.5	69.0	_	_	_	
: 05 9045 08X13						
9045 08X13 5632	5.5	125.0				
08 18 10	6.5	180.0	_	_	_	
) = 35.0 .						

() (), () .1 <u>* 6,</u> (.1) *"* = 0.) (.2) efV' $= {}_{0} + 0.280 -$ $L_{a} = L_{eo} + 0.560 -$.2 (.) -JosT-- 9» (.4) .1. p_z. (1 + 8.55 lgK) - 1 (.5) (1,05 + 1945)(-1)' ²(1 + 8.55lgK) * 1. (.6) ^13 (2-1)(-1)' (.7) +1 (.) /, p_F .2— .4. ft. (.9) (.)

32

 $p_F = 0.91; = 0.55. / = 1.$





.1— (, . , [5₂.

0.91(1

< .13>

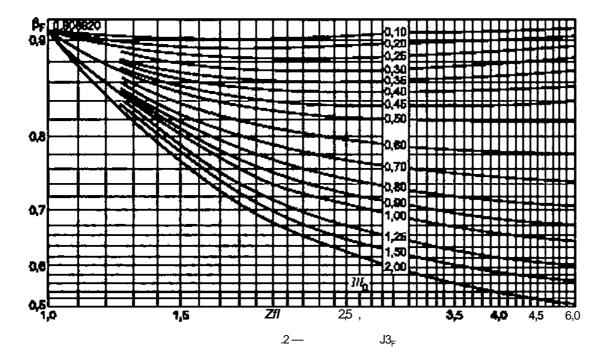
$$< =1.281 \text{ g}^{\land}.$$
 (K.14J

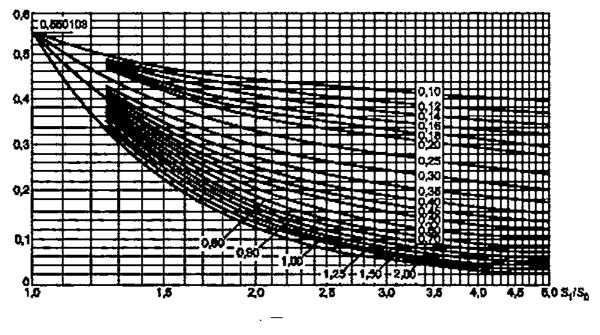
- (. 1.2):

$$= \left(\frac{\pi}{4}\right)^3 - \frac{1}{200} = \frac{1}{200}$$
 (.15)

(. 3):

$$\left(\frac{\pi}{4}\right)^3 20^{5s}$$
. (.17)



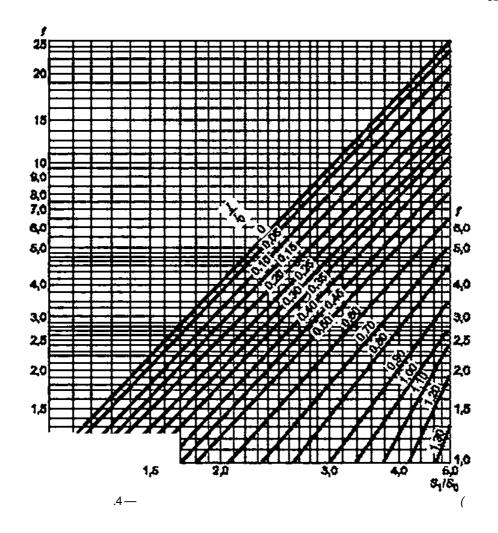


Cf • max 1;
$$--$$
 (.18)

),

0' = 0— £ 20S,: D = 0 + S₀— » 0<20S, f>1; D' = D + S,— » 0<20S, Hf>1.

: * = D.



, <u>-<- + 1285 +</u> * ••°

 $X_{i} = A_{JSo}$,

Mi - 1

1 + 1,285X, + 1.63 X,

*
*>' 20 3 • (.21)

0,67 (1 •» 8.55lgK,p) -1]

<-1 * <1*57 ** 1)^1

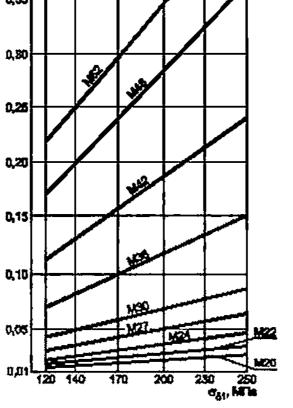
*pJ

· 0,,

()

() 8 $<_1$ () $M_{i\triangleright}$ -

() .1. ` / ... /



" -0.3%-" (.1)

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20.05.2009. 60x64%, 4.65. .- . . 4.30. 73 . *. 973.