

53-101-98

"

( 17 1999 . 37)

Production and quality control of steel structures

1 1999 .

1

( - )

2

II-23-81\*

2.03.11-85

23118-78

9.032-74

9.105-80

9.303-84

9.402-80

164-90

166-89

427-75

1759.0-87

1759.1-82

2651-80)

1759.4-87

1759.5-87

2246-70

3749-77

5264-80

5378-66

6996-66

7502-89

7505-89

7512-82

8050-85

8420-74

8479-70

8713-79

9087-81

9150-81

9467-75

10157-79

10549-80

11533-75

11534-75

14771-76

14782-86

15140-78

16093-81

18123-82

19282-73

19903-74

22261-94

22353-77

22354-77

22355-77

22356-77

23518-79

24705-81

26047-83

27772-88

3

3.1

II-23-81\*

3.2

II-23-81\*

3.3

4

4.1

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-

-

-

-

-

4.2

4.3

4.3.1

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-

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4.3.2

4.3.3

4.3.4

4.4

4.4.1

4.4.2

4.4.3

4.4.4

4.4.5

4.5

4.6

4.7

4.8

5

5.1

5.2

1. 5.3

5.4

5.4.1

800 °  
- 700 °

5.4.2

5.4.3

0,001/ 10

- 1

1,0


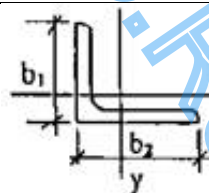
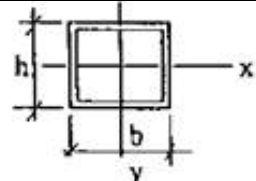
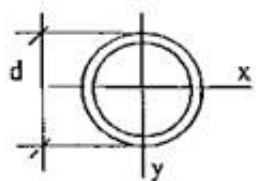
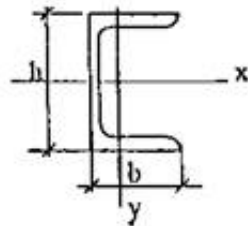
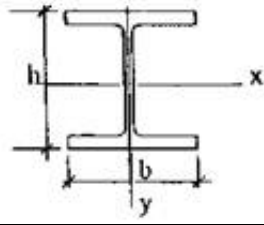
5.4.4

19903.

5.5

5.5.1

1

|  |   |            |                              |
|--|---|------------|------------------------------|
|  |   | -<br>y - y | $i^2/400h$<br>$i^2/800b$     |
|  |  | -<br>y - y | $i^2/720b_1$<br>$i^2/720b_2$ |
|  |  | -<br>y - y | $i^2/400h$<br>$i^2/400b$     |
|  |  | -<br>y - y | $i^2/400d$<br>$i^2/800d$     |
|  |  | -<br>y - y | $i^2/400h$<br>$i^2/720b$     |
|  |  | -<br>y - y | $i^2/400h$<br>$i^2/400b$     |

Примечание - 1 -

5.5.2

5.5.3

5.6

5.7

5.8

5.9

5.10

6.1

6.2

+15 °

B3-246.

6

2.

8420

200 (

7502

427,

166,

164,

3749,

5378.

2

|  |          |     |
|--|----------|-----|
|  |          |     |
|  | 5 - 25   | 4,0 |
|  | 28 - 50  | 5,0 |
|  | 50 - 100 | 6,0 |
|  | 5 - 25   | 3,0 |
|  | 28 - 50  | 4,0 |
|  | 50 - 100 | 5,0 |
|  |          | 4,0 |
|  |          | 5,0 |

|         |   |           |
|---------|---|-----------|
|         | : | 5,0       |
|         |   | 3,0       |
| ( ):    |   |           |
| 16      | , | 1,0       |
| 40      | : | 2,0       |
| 40      |   | 3,0 - 4,0 |
| :       |   |           |
| , , , : |   | 1,0       |
| 400     |   | 1,5       |
| 400     |   | 1,0       |
| , 1     |   |           |

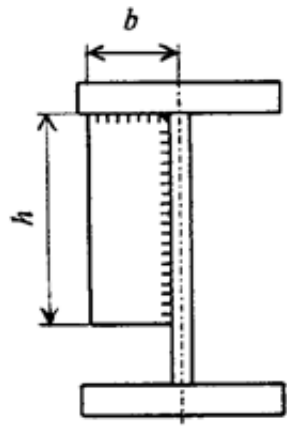
3

|  |       |
|--|-------|
|  |       |
|  | +0,15 |
|  | ±0,25 |
|  |       |
|  | ±0,35 |
|  |       |
|  | ±1,0  |

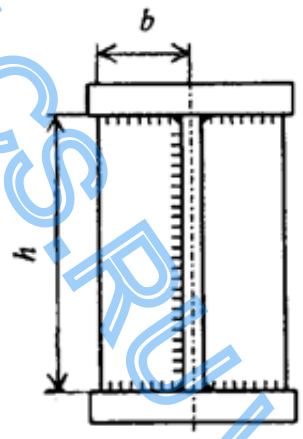
4

|      |  |       |
|------|--|-------|
|      |  |       |
|      |  | ±5    |
|      |  | 0,3   |
| 1    |  |       |
| ,    |  | ±5    |
|      |  | ±3    |
|      |  | 0,001 |
| :    |  | ±5    |
| ( 1) |  | 0,002 |
|      |  | ±5    |
| ( 2) |  | -2 -4 |
|      |  | 0,001 |
| :    |  |       |
| ( 3) |  | -2 -4 |
|      |  | ±5    |
|      |  | 0,001 |
| ( 4) |  | -2 -4 |
|      |  | 0,001 |
| ,    |  | ±10   |
|      |  | 0,004 |
| :    |  |       |
|      |  | ±5    |
|      |  | ±2    |
|      |  | ±3    |
|      |  | ±3    |
| ( )  |  | 0,001 |
|      |  | ±10   |
|      |  | 0,004 |

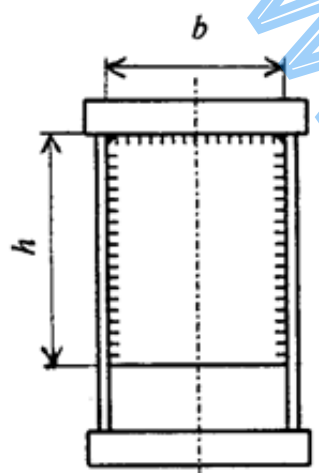
|  |  |                   |
|--|--|-------------------|
|  |  | $\pm 3$<br>0,0007 |
|  |  | $\pm 3$<br>0,0007 |



1

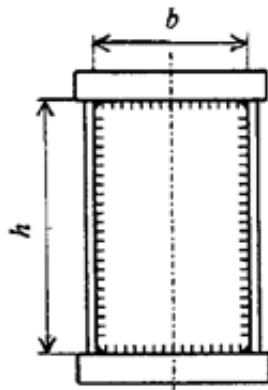


2



3





4

6.3

2

6.4

3.

6.5

.)

6.6

4.

7

7.1

7.2

7.3

7.4

-

- 25

- 16

7.5

- I II

II-23-81\*

350 ;

275 ;  
285 - 350 .

I

II-23-81\*.

7.6

7.7

0,2

7.8

7.9

7.10

7.11

7.12

II-23-81\*),

-  
-

0,3 ;

7.13

7.9 - 7.12,

1,0

- 1,5

7.14

7.11

7.12.

7.15

7.16

7.17

7.18

1,0

7.19

4.

6.1,

2-034-225-87.

8

8.1

8.2

8.3

8.4

350

8.5

-

4.6, 4.8, 5.6, 5.8, 8.8 -  $0,7t/d_b$ ,  $t \geq 20$  ;

-

10.9 -  $0,5t/d_b$ ,  $t \geq 12$  .

8.6

I

II-23-81\*

$0,5t/d_b$ .

8.7

8.4 - 8.6,

8.8

8.9

8.10

2 -

3

8.11

5.

5

|  |        |      |
|--|--------|------|
|  | 15     | +0,6 |
|  | .15 23 | +0,9 |
|  | .23    | +1,2 |
|  | .27    | +0,6 |
|  | .27    | +0,9 |

8.12

8.13

-

-  $\pm 1,5$  ,

-

( L)

6 -  $\pm 3$  ,

6 -  $\pm 0,0005L$ .

9.1  
9.2  
9.3  
9.4  
9.5  
9.6  
9.7  
9.8  
9.9

900 - 950 ° ;  
900 - 1000 ° ;  
700 °

275  
275  
275  
275  
350  
350  
350  
350  
350

6.  
II-23-81\*  
7.5.

1,3  
2  
1,2  
16  
2,5  
I II III  
IV

$\sqrt{\sigma_H/275}$ ,  $\sigma$  -  
I  
I

900 - 950 ° ;  
900 - 1000 ° ;  
700 °

275  
275  
275  
350  
350  
350  
350  
350

6.  
II-23-81\*  
7.5.

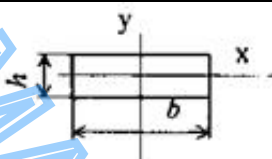
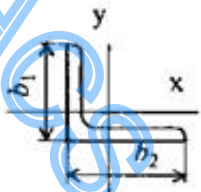
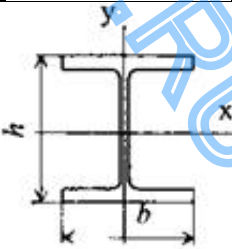
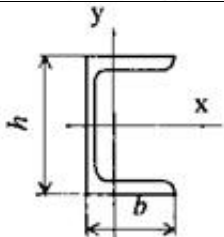
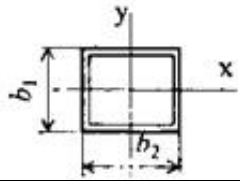
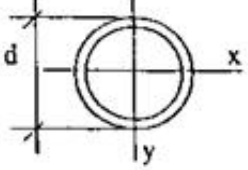
1,3  
2  
1,2  
16  
2,5  
I II III  
IV

9.10  
2  
9.11  
-  
-  
9.12

2 ;  
0,01.

6.1

6

|   |   |            |                                      |
|---|---|------------|--------------------------------------|
|   |    | -<br>y - y | 25h                                  |
|   |   | -<br>y - y | 45b <sub>1</sub><br>45b <sub>2</sub> |
|   |  | -<br>y - y | 25h<br>25b                           |
|   |  | -<br>y - y | 25h*<br>45b                          |
|   |  | -<br>y - y | 30b <sub>1</sub><br>30b <sub>2</sub> |
|   |  | -<br>y - y | 30d                                  |
| * |   |            |                                      |

10

10.1

10.2

11

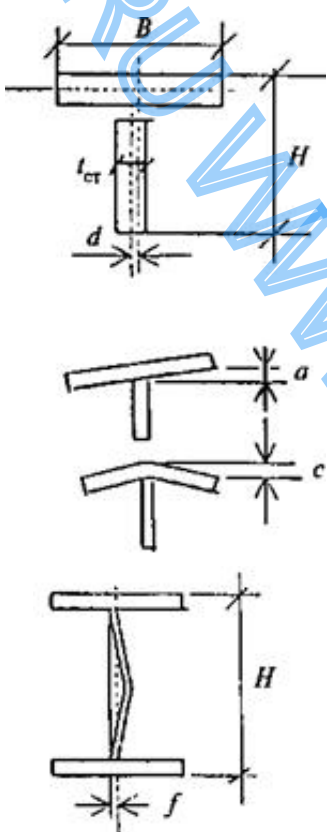
11.1

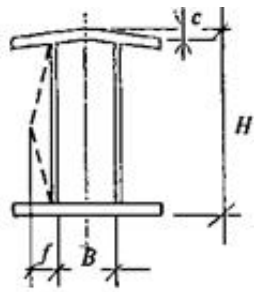
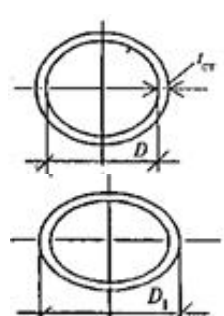


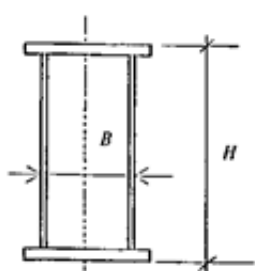
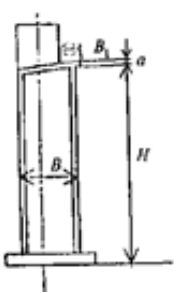
3 - 8

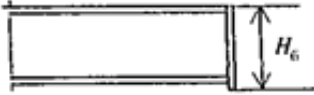
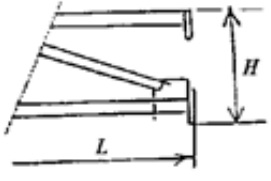
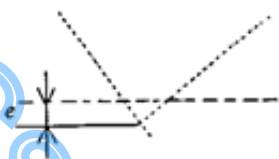
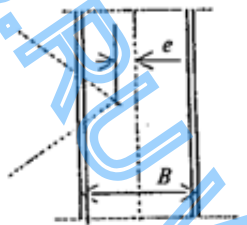
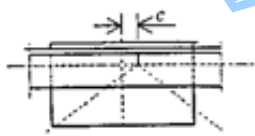
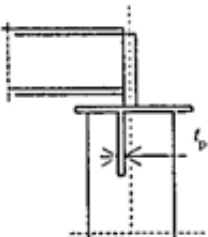
11.2

11.3

7

|   |   |   |
|---|---|---|
| 1.  |   |   |
| <p><math>H</math></p> <p><math>a</math></p> <p><math>c</math></p> <p><math>f</math></p> <p><math>H</math></p> <p><math>B</math></p> <p><math>c</math></p> |  | <p><math>\pm 3,0</math></p> <p><math>0,5t</math></p> <p><math>0,01B</math></p> <p><math>0,01H \ t</math></p> <p><math>0,05H \ t</math></p> <p><math>\pm 3,0</math></p> <p><math>\pm 3,0</math></p> <p><math>\pm 0,015B \ t</math></p> |

|   |  |   |
|---|--|---|
| <p>2.</p> <p><math>f</math></p>   |    | <p><math>\pm 0,015H \ t</math></p>  |
| <p><math>P = D</math></p> <p><math>D_1</math></p>   |   | <p><math>\pm 0,75t</math></p> <p><math>\pm 0,01D</math></p> <p><math>\pm 0,02D</math></p>                                     |
| <p>3.</p> <p><math>L \ 6000</math></p> <p><math>L \ 6000</math></p> <p><math>a</math></p> |   | <p><math>\pm 3,0</math></p> <p><math>\pm 5,0</math></p> <p>0 - 5,0</p> <p><math>0,0007B</math></p> <p>0,3</p>                 |
| <p>4.</p> <p><math>L</math></p>   |   | <p>0 - 5,0</p> <p>0 - 10,0</p> <p><math>\pm 5,0</math></p> <p><math>\pm 3,0</math></p> <p><math>0,0007B</math></p> <p>0,3</p> |
| <p>5.</p> <p><math>H</math></p> <p><math>a</math></p> <p><math>B_1</math></p>             |   | <p><math>\pm 3,0</math></p> <p><math>0,001B_1</math></p>  |

|           |   |               |
|-----------|---|---------------|
|           |    | <p>±2,0</p>   |
| <p>6.</p> |    | <p>±5,0</p>   |
|           |   | <p>±5,0</p>   |
|           |   | <p>±10,0</p>  |
|           |   | <p>±5,0</p>   |
|           |   | <p>±3,0</p>   |
|           |   | <p>±10,0</p>  |
|           |    | <p>±5,0</p>   |
|           |  | <p>0,03B</p>  |
| <p>7.</p> |   | <p>0,001H</p> |
| <p>8.</p> |   | <p>0,001L</p> |
| <p>9.</p> |  | <p>±5,0</p>   |
|           |  | <p>0,25tp</p> |
|           |   | <p>±10,0</p>  |

11.4

5264, 8713, 14771, 22261.

11.5

11.6



11.7

11.8

- ;

- ;

- II-23-81\*;

- 30 ;

- 500 ;

- ;

- ;

- ;

11.9

11.10

11.11

11.12

7.

12

12.1

12.2

- 6996:

- ;

- : 350HV (340 , 53HR<sub>b</sub>) - I

- II-23-81\* 400HV (380 , 100HR<sub>b</sub>) ;

- VI ;

- 29 / <sup>2</sup> ;

- ;

- 16 %.

1  
 2  
 5 / 2  
 3  
 12.3  
 12.4  
 12.5  
 12.6  
 12.7  
 12.8

WWW.NORMACS.RU

12.9

12.10

12.11

12.12

12.13

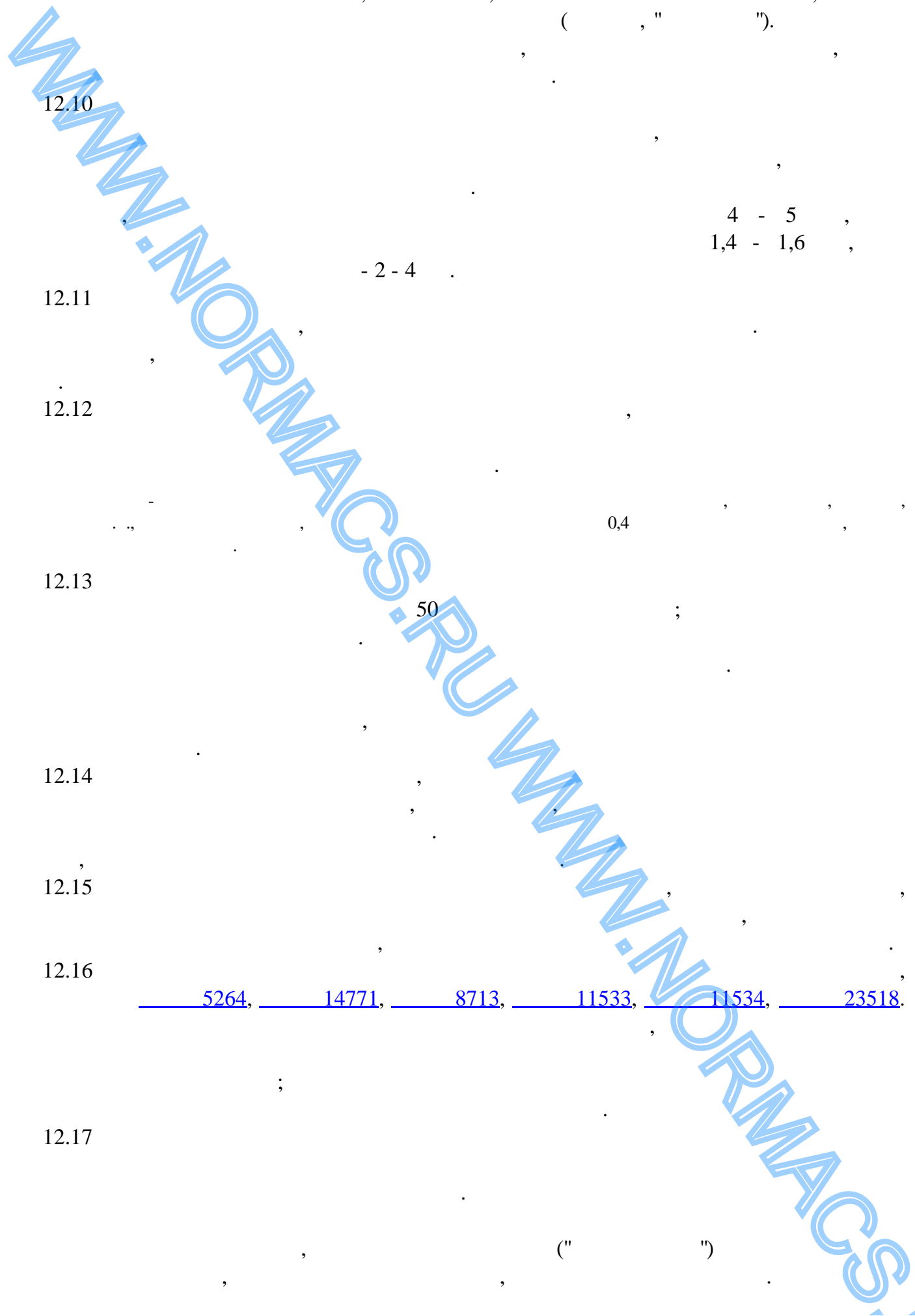
12.14

12.15

12.16

12.17

5264, 14771, 8713, 11533, 11534, 23518.



12.18 800

800

12.19 120 - 160

390 30 440 -

25 20

12.20

12.21 4

12.22

12.23 ( 4).

12.24

12.25

12.26

I, II III

8.

9.

2-

8

|     |   |
|-----|---|
| I   | 1. 0,85R ( )<br>2. 0,85R ,<br>3. $0,85R_{wf}$ I<br><a href="#">II-23-81*</a> II<br>40° ( 7 - 12)                              |
| II  | 4. 0,4R <<br>0,85R , < 0,85R ,<br>5. $< 0,85R_{wf}$ ( 3).<br>0,75R <sub>wf</sub><br>6. 0,4R<br>7. ( ) II III<br>8. ( ) II III |
| III | 9. ( )<br>10. ( )<br>11. ( )<br>12. ( ) IV  |

9

|  |   |       |       |
|--|---|-------|-------|
|  | 8 | 100 % | 1 - 5 |
|  | 8 |       |       |

|                  |     |       |             |
|------------------|-----|-------|-------------|
| ( <u>14782</u> ) | 1 2 | 100 % |             |
| ( <u>7512</u> )  |     |       |             |
|                  | 3   | 10 %  | 1 2 ,       |
|                  | 4   | 5 %   |             |
|                  | 5 8 | 1 %   | - « -       |
| ( <u>6996</u> )  |     |       | <u>12.2</u> |

1

2

12.27

12.28

12.17

12.29

10.

10

|  |              |   |
|--|--------------|---|
|  | ( <u>8</u> ) |   |
|  | I            | 1 |
|  | II III       |   |

|  |         |      |     |         |
|--|---------|------|-----|---------|
|  |         | 1    | 2   |         |
|  | I       | 25   | 4 % | 25      |
|  |         | 50   | 4 % |         |
|  | II      |      | 5 % | 400     |
|  |         |      | 50  | 2       |
|  |         |      | 400 |         |
|  | III     | 20 % |     | 400     |
|  |         | 3    |     |         |
|  | I       |      |     |         |
|  | II ( 4) | 400  | 50  | 5 %     |
|  |         |      |     |         |
|  | I       |      | 0,5 |         |
|  | II ( 4) |      | 1   |         |
|  | II ( 5) |      | 1,5 | 10      |
|  |         | - 12 | 2   | 14 - 20 |

12.30

12.31

12.32

8 )

15  
V-

(

60 - 70°)

5 -  
5, 7 - 12

8

12.33

3 - 4  
400 V,

0,5 20 ( 20 1 20 % )

12.34

12.35

1

12.36

12.37

700 ° (

900 °

( 650 - 700 °

600 °

13

13.1

13.2

13.3

1,5  
75 %

75 %



13.4

13.5

13.6

13.7

14.1

14.2

14.3

14.3.1

14.3.2

100 %

0,5

13.3.

14

2.03.11-85

2.03.11-85,

9.402

9.105

+15 °

80 %.

+5 ° .

14.3.3

24 .

6 .

14.4

14.4.1

:  
 - , ;  
 - :  
 - ;  
 - ( );  
 - .

14.4.2

9.402

2.03.11-85

14.4.3

11.

11

|       |              |       |
|-------|--------------|-------|
|       | <u>9.402</u> |       |
|       | 3            | * ( ) |
| -     | 2            | ( ),  |
| * 4 . |              |       |

14.4.4

-0199 ( 6-102084-86)

14.4.5

14.4.6

9.402.

" " 150/180

14.4.7

14.5

14.5.1

14.5.2

14.5.3

14.5.4

01.07.1988

11)

9.402

2,

(

80

14.6

14.7

14.7.1

14.7.2

14.7.3

9.402.

14.7.4

9.105

14.7.5  
14.7.6  
%

14.7.7  
14.7.8  
( 25-06.2500-82) 0 - 12 5 %.

14.7.9  
2  
15  
15.1  
16  
16.1  
-  
-  
-  
-  
-  
16.2  
16.3  
-  
2651-80) 5.8, 8.8, 10.9  
1759.4 ( 898/1-78); 1759.5  
5, 8 10; 18123.  
- 20, 24, 27 22353, 22354, 22355,  
22356.

9.032.  
15140.  
23118.  
1759.1 ( 4203-83),  
1759.0 ( 5.8, 8.8, 10.9  
15140  
-1 . -41  
100

16.4 , 3 , 1 .  
 235  
 5  
 16.5 - : 20 - 20 , 24 - 30 , 27 -  
 40 .  
 16.6 , : 20 - 60 , 24 - 100 , 27 - 140 .  
 140 ,  
 16.7 20 27  
 16.8 ( , , 12.  
 . . ) ,  
 12

|  |     |     |         |   |    |
|--|-----|-----|---------|---|----|
|  | , 2 |     |         |   |    |
|  | 0,5 | 1,0 | 10 (-2) | 4 | 10 |
|  | 0,5 | 1,0 | 3 (-1)  | 4 | 10 |

1 ,  
 2 -  
 16.9 ( ) 20,  
 24 27 40 " "  
 110 (1100 / 2),  
22353 - 22356.  
22353, 22356 ; - 22354 - 22356.  
 ( 24); 20 27 , 24  
 24  
 16.10 , ,

:

|    |    |
|----|----|
| 20 | 20 |
| 24 | 25 |
| 27 | 30 |

16.11

16.12

1,2

200

16.13

0,002;

0,0007

16.14

10 %

0,0007

0; -5 ;

0,1

40

16.15

17

17.1

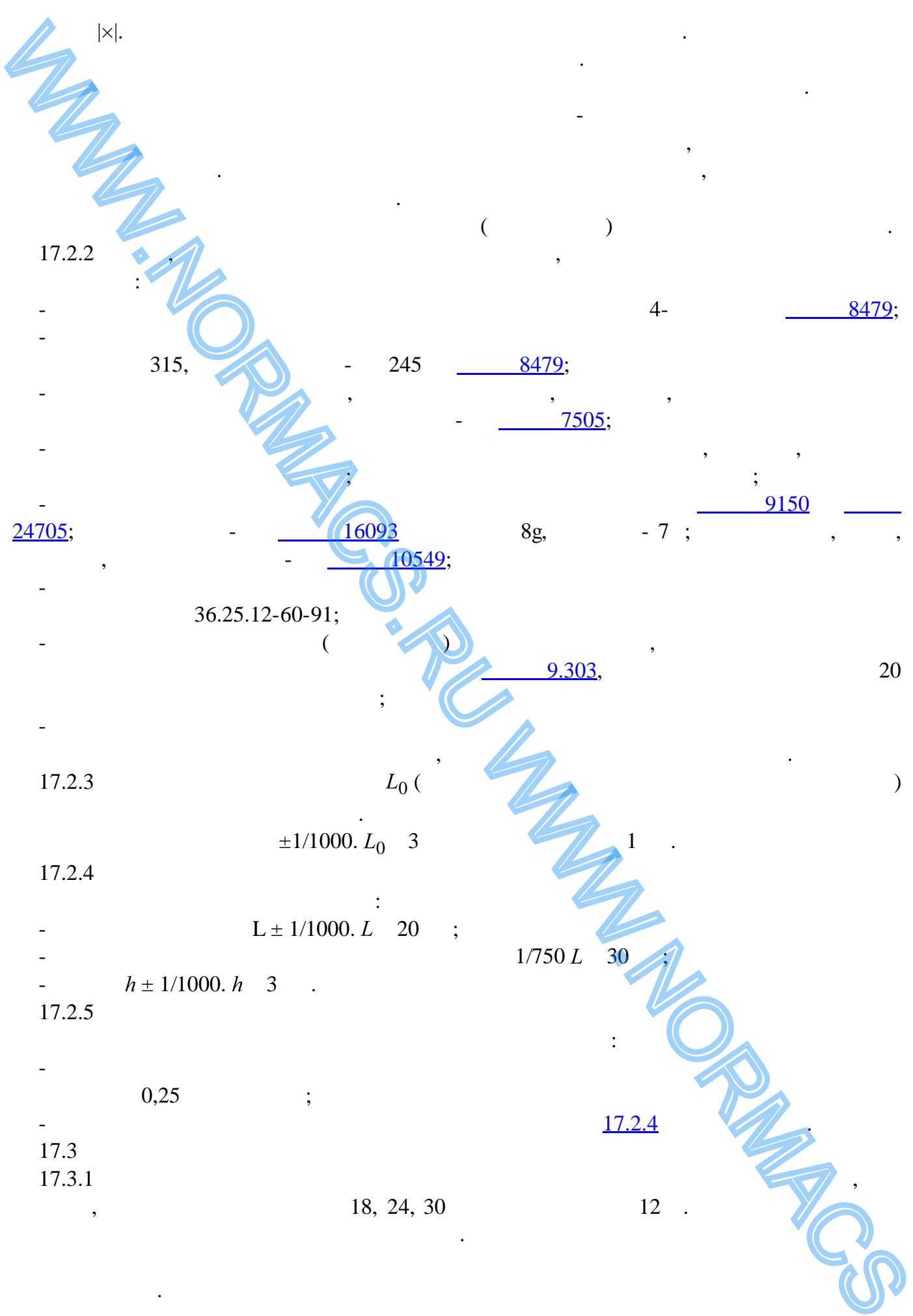
[1](#) - [15](#)

[17.2](#) - [17.4](#).

17.2

17.2.1

|x|.



17.2.2

315, - 245 8479;  
 - 7505;  
 - 24705; - 16093 8g, - 7; 9150 10549;

36.25.12-60-91;

( )

9.303,

20

17.2.3

$L_0$  ( )

$\pm 1/1000 \cdot L_0$  3

1

17.2.4

$L \pm 1/1000 \cdot L$  20 ;

$1/750 L$  30 ;

$h \pm 1/1000 \cdot h$  3

17.2.5

0,25 ;

17.2.4

17.3

17.3.1

18, 24, 30

12

17.3.2

17.3.3

16

17.3.4

17.3.5

13.

17.3.6

17.3.7

13.

17.4

17.4.1

36

17.4.2

16

17.4.3

-

-

17.4.4

-  $H - \pm 1/1000H$  10 ;

-  $L - \pm 1/1000L$  25 ;

- +30 - 5 ;

-  $- 1/1000L$  30

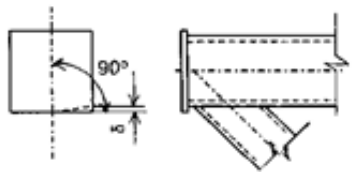
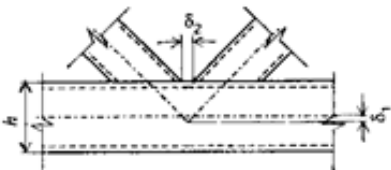
17.5

16.25

13

|                    |                                   |  |
|--------------------|-----------------------------------|--|
|                    |                                   |  |
|                    | 1/1000L<br>25                     |  |
| ): (               | 2,0<br>1,0                        |  |
| 6000<br>6000 12000 | 1/1000,<br>$\pm 5,0$<br>$\pm 6,0$ |  |



|   |   |                 |  |
|---|---|-----------------|--|
|   |   | $\pm 0,5$       |  |
| 1 | 2 | $0,25h$<br>$50$ |  |

18

18.1

( )

( )

1000 .

18.2

1

: 0; +0,6 .

0,1

1,5 .

1,5

18.3

-

40 °

, -

275

20

16

375

;

-

,

40

°

, -

275

12

10

375

18.4

:

-

$\pm 0,3$  ;

-

,

-

;

;

18.5

$\pm 1,5$  .

18.6

:

- ±0,7

- ±1,0

- ±1,0

18.7

18.8

18.9

18.10

2 %

19  
14

19

19.1

19.2

19.3

19.4

19.5

250

250

19.6

6

480 °

14 (

19.7

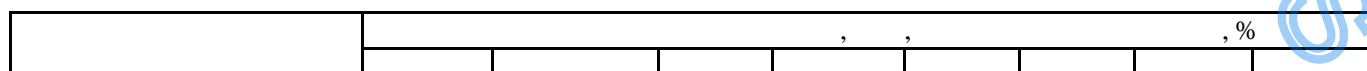
0,07 %

0,12

0,4 %

15.

14



|   |  |      |       |     |      |     |     |     |     |
|---|--|------|-------|-----|------|-----|-----|-----|-----|
|   |  | 0,05 | 0,075 | 0,1 | 0,12 | 0,2 | 0,3 | 0,4 | 0,5 |
| 3 |  | 80   | 140   | 90  | 85   | 90  | 125 | 160 | 200 |
| 6 |  | 110  | 240   | 140 | 100  | 120 | 160 | 210 | 280 |
| 9 |  | 140  | 360   | 200 | 120  | 200 | 260 | 330 | 400 |

15

|                |             |              |
|----------------|-------------|--------------|
| $t > 6$        | $95 \pm 10$ | $215 \pm 25$ |
| $3 < t \leq 6$ | $85 \pm 15$ | $140 \pm 25$ |
| $1 < t \leq 3$ | $60 \pm 10$ | $80 \pm 10$  |
|                | $85 \pm 15$ |              |
|                | $55 \pm 5$  |              |

19.8

0,07 %

0,12 0,2 %.

0,05 0,12 %

0,2 %.

[16.](#)

16

|   |     |     |     |     |     |     |     |     |     |      |      |      |
|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|
| 2 | 360 | 395 | 430 | 470 | 500 | 610 | 685 | 720 | 830 | 1010 | 1370 | 1550 |
|   | 50  | 55  | 60  | 65  | 70  | 85  | 95  | 100 | 115 | 140  | 190  | 215  |

19.9

( 2 ),

( 19.10 )

19.10

19.11

19.12

19.13

19.14

19.15

19.16

19.17

| <u>27772</u>   |        |     |     | , %  | E,                 |
|----------------|--------|-----|-----|------|--------------------|
| 235            | 3      | 295 | 470 |      | 4500*              |
| 255            | 3      | 305 | 500 | 29,3 | 4500*              |
| 345            | 09 2   | 440 | 595 | 27,6 | 4500*              |
| 375            | 10 2 1 | 420 | 605 | 28,5 | 4500*              |
| 390            | 10     | 525 | 655 | 29,9 | 4500**,<br>2500*** |
| 390            | 14 2   | 600 | 715 | 24,1 | 4500**,<br>2500*** |
| 440            | 16 2   | 580 | 720 | 23,7 | 2500***            |
| 590            | 12 2   | 885 | 950 | 15,5 | 2500***            |
| 590            |        | 805 | 920 | 17,1 | 2500***            |
| *<br>**<br>*** |        |     |     |      |                    |

- 1 \_\_\_\_\_
- 2 \_\_\_\_\_
- 3 \_\_\_\_\_
- 4 \_\_\_\_\_
- 5 \_\_\_\_\_
- 6 \_\_\_\_\_
- 7 \_\_\_\_\_
- 8 \_\_\_\_\_
- 9 \_\_\_\_\_
- 10 \_\_\_\_\_
- 11 \_\_\_\_\_
- 12 \_\_\_\_\_
- 13 \_\_\_\_\_

14 \_\_\_\_\_

15 \_\_\_\_\_

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16 \_\_\_\_\_

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17 \_\_\_\_\_

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18 \_\_\_\_\_

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19 \_\_\_\_\_

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