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INTERSTATE COUNCIL FOR STANDARDIZATION. METROLOGY AND CERTIFICATION
(ISC)



31444
2012

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1.2—2009

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15 2012 . No 49)

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	AZ BY KZ KG RU UZ	

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5 31444—2012
140- 1 2014 .

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© . 2013

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7.1	4
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8.1	6
8.2	8
8.3	8
8.4	9
8.5	SAW.....	9
8.6	9
8.7	HFW.....	9
8.8	9
8.9	10
8.10	10
8.11	10
8.12	10
9	10
9.1	10
9.2	10
9.3	12
9.4	14
9.5	HFW.....	14
9.6	14
9.7	V-.....	14
9.8	15
9.9	17
9.10	20
9.11	21
9.12	23
9.13	23
9.14	23
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10.1	23
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10.3	26
10.4	33
11	40
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12	42
12.1	42
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Федеральное агентство
по техническому регулированию
и метрологии

Федеральное агентство
по техническому регулированию
и метрологии

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по техническому регулированию
и метрологии

3	9.11.1.	3183—2012 (4) 9.19.3.4	ISO 3183—2012 (46) 9.9.3.4
10.2.1.	14. « » .7.1.2	9.19.3.4 « * .7.1.3, * (32016 .)	9.9.3.4 .7.1.3. * .

Pipes from tow-alloy steels for submarine sea pipelines.
General specifications

— 2014—01—01

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3133 — 2012

31458—2012
10006—80 (6892—84)
010124 — 2002
010543 — 2002
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10124—99 «
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10543—99 «
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CSR— ;
 CLR — ;
 CTR — ;
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 DWT — ;
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 HAZ — ;
 HFW— ;
 — ;
 HV — ;
 1 — ;
 — ;
 MPS— ;
 NOT— ;
 N — ,
 — ;
 SAW— ;
 SAWH— ;
 SAWL— ;
 SMLS— ;
 SSC— ;
 WPS— ;
 WPQR— .

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N. . { 1).

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	11	
	24-5N	245N
N ,	290N	290N
	320N	320N
	360 N	360N
	2450	2450
	2900	2900
	3200	3200
	3600	3600
	3900	3900
	4150	4150
	4500	4500
	4650	4850
	5550	5550

	«	»
	245	245
	290	290
	20	320
	360	360
	390	390
	415	415
	450	450
	485	465
	555	S55M
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7.2

7.2.1

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290

(1. 1),

2.

1)];

2) SAWL $D\ell 914.00$ [2. 3];

 3) (8.3.11): ,

 4) (8.3.9);

 5) SAWH (8.9.2);

 6) (9.2.1);

 7) 5550

 5550 (4): ,

 8) N , 0.06% [9.2.1. 4. 5)]; 25 N Q

 9) 35 (9.2.2);

 10) (9.3.3);

 11) (VN) 40 (9.7.2.

 8);

 12) (9.9.1. 9. 3);

 13) (9.9.1.3);

 14) , (9.10.2.1);

 15) $t > 25.0$ [9.9.3.1, 10. 3)];

 16) (9.9.3.1);

 17) $Dlt > 75$ (9.9.3.1. 10);

 18)

 1422 (9.9.3.1. 10);

 19) [9.9.3.2. 11. 1)];

 20) , 12.10 (9.9.3.3);

 21) SAWL (13);

 22) (9.14);

 23) 3.1 . 3.1

 (10.1.3);

 24)

 (10.2.1):

 25) [15.)];

 26)

 SAW (10.4.7.4);

 27) , (10.4.8.5);

 28) (10.4.11);

 29) (10.4.11.7);

 30) (.2.2);

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 [.3.1. .1. 4)];

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 (.4.1.6);

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 (.4.3.1. .4.3.2);

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 (.4.4.2.1.

 50

 HFW

 (.4.5.2.5);

 SAW

 [.4.5.3.4.

),);

) *
) SAW [.4.5.3.4.)];
) 80 %
) SAW [.4.5.3.4.)4)];
 31) (11.2);
 32) (11.2):
 33) (11.2.3);
 34) ,
 (11.2.4);
 35) (11.2.6):
 36) (11.2.7);
 37) /
 7.2.2 ,
 (12.1).
 /
 1) 7 |, (CVN) ;
 2) ;
) (.4.1.1 .4.1.2);
) N t > 25.0 (.4.1.1)
) f>35.0 (.4.1.2);
) 275HV10 (1)—6 .1 .2);
) (HAZ) 9
) ();
) (.4.2, .7.1.3);
) ,
) HIC (.7.1.4);
) (SSC)
) (SSC)
 (.4.4, .6.2, .7.2.2);
 3) —
 (. .2).

8

8.1

2 3.

2—

	"				
	245 555	24S	5SS	S550. 5S5M	5550. S5SM
SMLS		X			—
HFW		X			—
SAWH ² »		X			X
SAWL ³ »		X			X

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290.

290

2

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DZ914

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		<		
SMLS			—	N
				N
				Q
		-		N
				Q
HFW	, -			
			11	
			11	
				N
				Q
		,	—	N
		-	—	
SAW	, , -		Uiy-tdX, MJIMd ipoOy-	N
			,	
			-	Q
				Q
			—	N
"				

8.2

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8.3

8.3.1

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8.3.2

8.3.3

0.8 3.0

8.3.4

SAWL

SAWH.

8.3.5

D G [2].

8.3.6

D G [2]

8.3.7

8.3.8

8.3.9

SAW HFW.

8.3.10

8.3.11

D G [2].

8.3.12

5 %. (. 250)

8.3.13

8.3.14

5 100-

SAWL.

0.03 %.

8.3.15

31458.

3.1. SAW—

2.2.

8.3.16

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8.4

8.4.1

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8.4.2

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8.4.3

2(SAW

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8.4.4

SAW
SAW

8.6

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8.7

HFW

8.7.1

(2)

8.7.2

HFW

8.8

8.8.1

0.015.

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8.8.2

0.003

0,015.

8.8.3

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0₄ —
0₆ —|- D_b | —

8.8.4 0,015.

8.9

8.9.1

8.9.2 SAYVH 300 *

8.9.3 , 150

8.9.4

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8.10

8.11

8.11.1 () .

8.11.2 ,

8.11.3 ,

8.12 (MPS).

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9.1

9.1.1

[3].

9.1.2 415Q, 415 4150. 415

360Q. 360 , 3600. 360

9.2

9.2.1 N Q f £25.0 4.

4—

t£ 25.0

N Q

		V								UC ^W	41
		"	Si	"		S	V		I		
245N	245N	0.14	0.40	1.35	0.020	0.010	5)	5)	0.04	•). 7)	0.36
290N	290N	0.14	0.40	1.35	0.020	0.010	0,05	0.05	0.04	7)	0.36
320N	320N	0.14	0.40	1.40	0.020	0.010	0.07	0.05	0.04	). 7»	0.38
360N	360N	0.16	0.45	1.65	0.020	0.010		0.05	0.04	«)	0.4
245Q	2450	0.14	0.40	1.35	0.020	0.010	0.04	0.04	0.04	7)	0.34
290Q	2900	0.14	0.40	1.35	0.020	0.010	0.04	0.04	0.04	7)	0.34
3200	3200	0.15	0.45	1.40	0.020	0.010	0.05	0.05	0.04	7)	0.36
3600	3600	0.16	0.45	1.65	0.020	0.010	0,07	0.05	0.04	•). »	0.39
3900	3900	0.16	0.45	1.65	0.020	0.010	0,07	0.05	0.04	). 9)	0.40
4150	4150	0.16	0.45	1.65	0.020	0.010	0.08	0.05	0.04	). 9)	0.41
4500	4500	0.16	0.45	1.65	0.020	0.010	0.09	0.05	0.06	). 9)	0.42
465Q	4850	0.17	0.45	1.75	0.020	0.010	0.10	0.05	0.06	). 9)	0.42
5S5Q	5550	0.17	0.45	1.65	0.020	0.010	0,10	0.06	0.06	). 9)	-

">

0,01 %

0,05 %

0,20 %.

21

) £ 0.060 %. N £ 0.012 %, AVN 2:1 {

Jl -C+MrV6+(Cr+Mo+Vy5+(Ni+Cu)/15.

47 C+Si/30+Mn/20+Cu/20+Ni/60+Cr/20+Mo/15+V/10+5B.

61

" £ 0.35 %. Ni £ 0.30 %. £ 0.30 %. £ 0.10 %. £ 0.0005 %.

81

0,15 %.

0,06 %.

0,25%.

*> £ 0.50 %. Ni £ 0.50 %. £ 0.50 %. £ 0.50 %. £ 0.0005 %.

£ 35.0

5,

5.

5—

(£ 35

		%								£ _u : V
		1»	Si	Mn'>		S	V	Nb	Ti	
245	245	0.12	0.40	1.25	0.020	0.010	0.04	0,04	0.04	3)
290	290	0.12	0.40	1.35	0.020	0.010	0.04	0.04	0.04	3)
320	320	0.12	0.45	1.35	0.020	0.010	0.05	0.05	0.04	3)

	"	. %.								. %.
		Si	'>		S	V	Nb	Ti	* >	
360	360	0.12	0.45	1.65	0.020	0,010	0.05	0,05	0.04	41 S) 0.20
390	390	0.12	0.45	1.65	0.020	0,010	0.06	0.08	0.04	41 S) 0.21
415	415	0.12	0.45	1.65	0.020	0,010	0.08	0.08	0.06	415) 0.21
4S0M	450	0.12	0.45	1.65	0.020	0,010	0.10	0.08	0.06	41 S) 0.22
465	485	0.12	0.45	1.75	0.020	0,010	0.10	0.08	0.06	45) 0.22®>
5S5M	555	0.12	0.45	1.85	0.020	0,010	0.10	0.08	0.06	41 S) 0.24 >

1>

0,01 %

0,05 %

0,20 %.

2>

! £ 0,060%, N £ 0,012 %, Al/N 2:1 (),

3>

> £ 0,35 %. Ni £ 0,30 %. Cr £ 0,30 %. £ 0,10 %. £ 0,0005 %.

4>

5> £ 0,50 %. Ni £ 0,50 %. Cr £ 0,50 %. Mo £ 0,50 %. £ 0,0005 %.

6>

(> 25

0,01 %.

0,15 %.

9.2.2

9.2.3

0,12 %.

< .%,

$$! = + \#^+ \frac{20 * 20 + 60 + 20 + 15 + 10 +}{* \text{Ci} \text{ V} 5} \quad (2)$$

(4 5).

0,0005 %,

9.2.4

CE_W %.

0,12 %.

$$* \text{f-6-} + \frac{\text{Cr+Mo+V Ni+Cu}}{5 + 15} \quad (3)$$

(4 5).

9.3

9.3.1

6.

	1) 1 &		1^		4»	HV 10
			"1			
245N. 245Q. 245					0.93	270
245N. 245Q. 245	245	450 3>	415	760		270
290N. 290Q. 290						270
290N. 2900. 290	290	495	415	760		270
320N. 320Q. 320						270
320N. 3200. 320	320	520	435	760		270
360N. 3600. 360						270
360N. 3600. 360	360	525	460	760		270
390Q. 390						270
3900. 390	390	540	490	760		270
415Q. 415M						270
4150. 415	415	565	520	760		270
4500. 450						270
4500. 450	450	570	535	760		300
4850. 485						300
485Q. 485	485	605	570	760		300
5550. 555						
5550. 555	555	675	625	0255'		

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2>

555

760

555

3>

5 %.

< 219.1

495

8=1940

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— 6.4 : 130 2 — 12.5 8.9 2: 65 2 —
— : :) 485 2)
10 2: : :) 485 2) 10 2:
— 4: — 555 555

9.3.2

9.3.3

9.4

9.5

HFW

HFW

08 415

(12.7

66 %

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50 %

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> 10

33 %

Z60.3

6.4

<60.3

13

9.6

9.6.1

9.6.2.

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3.2

12.5 %

9.6.2

6.4

9.7

V-

(CVN)

9.7.1

9.7.1.1

(CVN)

V-

(CVN)

10x10

(

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9.7.1.2

75 %

9.7.1.3

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9.7.2

9.7.2.1

V-

10 10

7.

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V-

	V-		(CVN)
245N. 2450. 245 245N. 2450. 245	27		22
290N, 2900. 290 290N, 290Q. 290	30		24
320N. 320Q. 20 320N. 320Q. 320	32		27
360N, 360Q, 360 360N. 3600.	36		30
3900. 390 3900. 390	39		33
415Q. 415- 4150. 415	42		35
4500.450 4500, 450	45		38
4850.485- 485Q. 485	50		40
5550. 555- 555Q. 555	56		45

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20 < f £ 40	7^10'
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9.7.2.2

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KV

$$KV \quad \frac{KV_p}{F} \quad (5)$$

KV_p —

F —

9.72.3

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V-

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7.

9.8

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9.8.1

9.8.1.1

9.8.1.2

9.8.2

SAW.

9.8.3

9.8.3.1

9.8.3.2 .2 . () ,
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9.8.4 10% - 5% -

9.8.4

6.4

9.8.5

9.8.5.1

(
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0.00SD 2.5 ().
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9852

200 0.250

9853

50. *Leucosia* (Leucosia) *leucostoma* (Fabricius)

9.8.5.4

38

) 3.2 — ,
) 6.4 — ;
) 1.0 — 100

50

100

300 HV10

250 HV10 —

[]),

9.8.7

) 0,7 $f \leq 25$ 0.05 0.5 / > 25 . , ,

) .1(0,051.);

) .2() . (): . ().

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9.9

9.9.1

9.9.1.1

9.9.1.2

9.

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	1			
	"			
10.3 13,7			1.7 2.4	.
13.7 17,1			2.2 3.0	.
17.1 21,3			2,3 3.2	.
21.3 26,7			2.1 7.5	.
26.7 33,4			2.1 7.8	.
33.4 48,3			2.1	.
48.3 60,3			2.1 12,5	.
60.3 73,0	2.1	.	.3.6 14,2	.
73.0 88,9	2.1	.	.3.6 20,0	.
88,9 101,6	2.1	4.0	.4.0 22,0	.
101,6 168,3	2.1	4.0	.4.0 25,0	.
168,3 219,1	2.1	4,0	.4.0 40,0	.
219,1 273,1	3.2	4.0	.4.0 40,0	.
273,1 323,9	3.6	5.2	.5.2 45,0	.
323,9 355,6	4.0	5.6	.5.6 45,0	.
355,6 457,0	4.5	7.1	.7.1 45,0	.
457,0 559,0	4.8	7.1	.7.1 45,0	.
559,0 711,0	5.6	7.1	.7.1 45,0	.
711,0 864,0	5.6	7.1	.7.1 52,0	.

S

	f		
	"		
864.0 965.0		.5.6	52,
965.0 1422.0		.6.4	52.0
1422.0 1629.0		.9.5	52.0
1629.0 2134.0		.10.3	52.0

1
|31 [41.
2

3

9.9.1.3
9.9.2

11.70 12.70

, = 0.02406 (-0.

(6)

t—
D—1
2 (6)() : 1.010 —
: 1,015 —9.9.3
9.9.3.1

10.

10 —

D					» ¹ SI	, « "	21
	"		» ¹ SI				
60.3	± 0.5 1 0.0075	1 0.5 ± 0,0075 D.	± 0.5	± 0.005 ± 1.6		> 1.	
60.3 610		, ± 3.2			0.015 D	0,01	

10

		11	11 31 41			
					11	21

.610 1422	1 0.01	$\pm 0.005 D$, ± 4.0	± 2.0	1 1.6	£ 75 0.01 10; 04 > 75	£ 75 0.0075 D. 8: > 75
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.1422

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31

100

(£ 25,0

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219.1

(9.9.3.1).

10.

9.9.3.2

11.

11—

		11
(SMLS)		
4.0		+ 0.600 - 0.500
4.0 10.0		0,1501 - 0,125
10,0 25,0		1 0.125t
25.0	+ 3.7 - 3.0	+ 0.1f; - 0.1f;
		2) 21
HFW		
6.0		± 0.400
.6.0 15.0		± 0.700
.15.0		± 1.000
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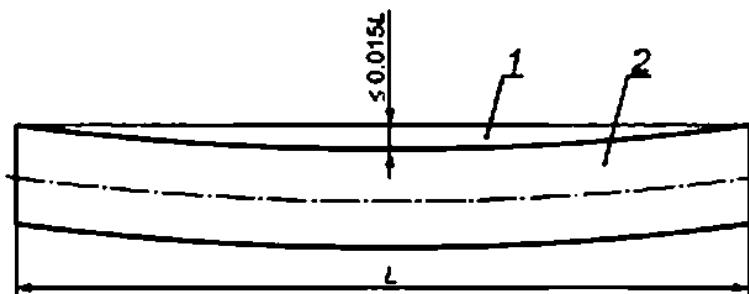
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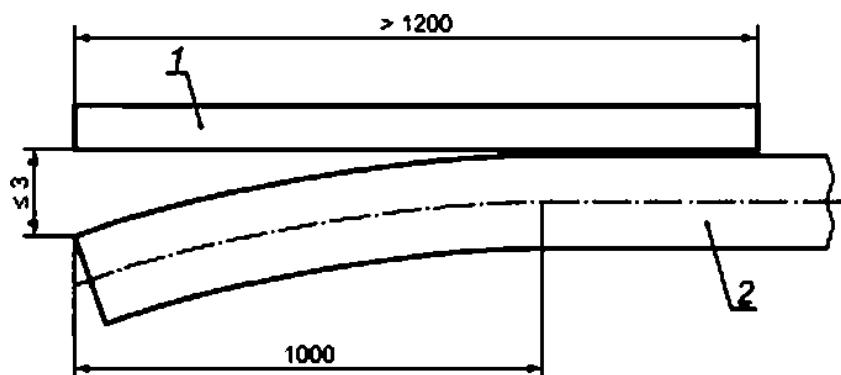
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Рисунок 2 — Измерение концевой прямолинейности

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|  | SAWL | (£ 15<br>15 < / £ 25<br>25) | 1.3 ;<br>0.1/ ;<br>2.0 |
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|  |      | (£ 20<br>/ > 20)            | 3.0 ;<br>4.0           |
|  | (    | )                           | 0.2/ 4.0               |
|  |      |                             | 300                    |
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|                |         | 100 50"      |                  | 9.3.1.<br>6    |
|                |         | 100 50"      |                  | 9.7.2.<br>7    |
| (CVN)<br>114.3 | ,       | "<br>1       |                  |                |
| 17             |         |              |                  |                |
|                | lumumie | nepiMv<br>-1 | Guj nm 100<br>-1 | 9.3.1.<br>6    |
|                |         |              |                  | 9.4            |
|                |         | 10 %<br>S-   | ,                | 4<br>9.5.5     |
|                |         |              |                  | 9.9.3.1.<br>10 |
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|                |         |              |                  | 9.9.3.3        |
|                |         | 5 %<br>8-    | .                | 4<br>9.19.3.4  |
|                |         | 5 %<br>6-    | .                | 4<br>9.10.1.3  |
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| - D2219,1                       | HFW. SAWL<br>SAWH     | 100 50"<br>11 •> ® | 9.3.1.<br>6 |
| (CVN)<br>(HAZ)<br>2 114.3<br>18 | HFW. SAWL<br>SAWH     | 100 50*<br>" "     | 9.7.2.<br>7 |
| -                               | HFW. SAWL<br>SAWH     | 50                 | 9.4.6       |
| - (HAZ)                         | HFW.<br>SAWL.<br>SAWH | 100 50*            | 9.3.1.      |
| -                               | SAWL.<br>SAWH         | 100 50*<br>" "     | 9.6         |
| -                               | SAWL.<br>SAWH         | —                  | 9.12        |
| 2 219.1                         | SAWH                  | 50<br>* •>         | 9.3.2.<br>6 |
| (CVN)<br>D 2 114.3<br>17        | SAWH                  | 50<br>" "          | 9.7.2.<br>7 |
| -                               | SAWH                  | 50<br>* *"         | 9.6         |
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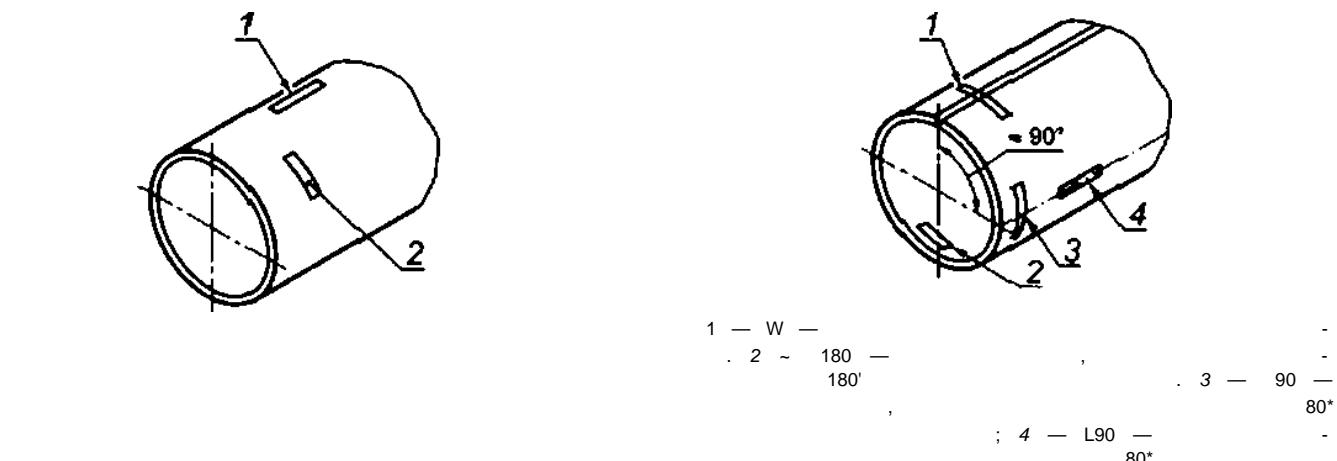
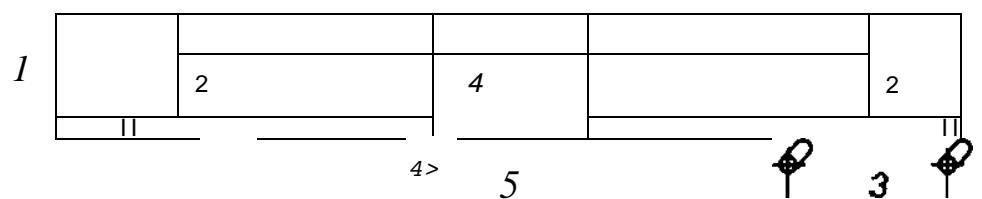
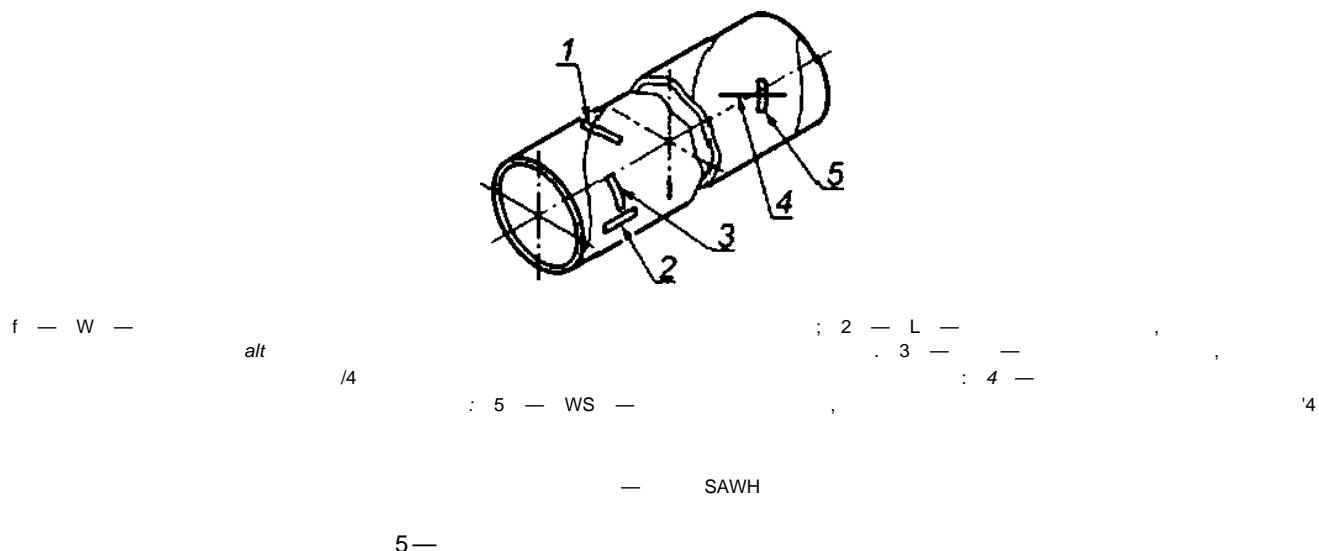
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| SMLS |  |       | 11 2>                  | 1L               | 1L                |
|      |  | (CVN) |                        |                  |                   |
|      |  |       | 1                      | 1                | 1                 |
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|      |  |       | 1                      | 1                | 1                 |
| HFW  |  |       | 1L90 2>                | 1 1 03» 4>       | 1L90              |
|      |  | (CVN) | 90                     | 90               | 90                |
|      |  |       | —                      | 1W               | —                 |
|      |  | {CVN} | 3Wh 3HAZ <sup>51</sup> |                  | ^ 51              |
|      |  |       | 1W                     | 1W               | 1W                |
|      |  | -     | 1W                     | 1W               | 1W                |
|      |  |       | 6                      |                  |                   |
| SAWL |  |       | 1LQO >                 | 1 1 03»- 4>      | 1L00 <sup>2</sup> |
|      |  | (CVN) | 90                     | 90               | 90                |
|      |  |       | —                      | 1W               | —                 |
|      |  |       | 3W 6 HAZ <sup>61</sup> |                  | 6W 12 ^ 71        |
|      |  | -     | 2W*>                   | 2W*>             | 2W®>              |
|      |  |       | 1W                     | 1W               | 1W <sup>7</sup> » |
| SAWH |  |       | 1L <sup>4</sup>        | IT <sup>31</sup> | 11»               |
|      |  | (CVN) |                        |                  |                   |
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|      |  |       | 26                           |       | 25                                               |
|      |  |       |                              |       |                                                  |
|      |  |       | 219.1                        | 219.1 | 219.1                                            |
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| SAWH |  | {CVN) | HAZ <sup>①</sup>             |       | 6W <sup>h</sup> 12 HAZ <sup>⑥</sup> <sup>1</sup> |
|      |  |       | 2W <sup>8</sup> <sup>1</sup> | 2W*>  | 2W <sup>⑥</sup> > 2W*>                           |
|      |  | -     | 1W                           | 1W    | 1W                                               |
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| 355.6 406.4   | 32.3 | 23.2 | 32.3- | 23.2  |
| 406.4 457.0   | 30.9 | 22.2 | 30.»  | 22.2  |
| 457.0 508.0   | 29.7 | 21.5 | 29.7  | 21.5  |
| 508.0 559.0   | 28.8 | 21.0 | 28.8  | 21.0  |
| 559.0 610.0   | 28.1 | 20.5 | 28.1  | 20.5  |
| 610.0 660.0   | 27.5 | 20.1 | 27.5  | 20.1  |
| 660.0 711.0   | 27.0 | 19.6 | 27.»  | 19.8  |
| 711.0 762.0   | 26.5 | 19.5 | 26.5  | 19.5  |
| 762.0 813.0   | 26.2 | 19.3 | 26.2  | 19.3  |
| 813.0 864.0   | 25.8 | 19.1 | 25.8  | 19.1  |
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| 114.3 | 141.3 | 12.6 | 11.7 | 12.6  | 10.9 | 11.7 | 10.1 | 10.9 |
| 141.3 | 168.3 | 11.9 | 10.2 | 11.9  | 9.4  | 10.2 | 8.6  | 9.4  |
| 168.3 | 219.1 | 11.7 | 9.3  | 11.7  | 8.6  | 9.3  | 7.6  | 8.6  |
| 219.1 | 273.1 | 11.4 | 8.9  | 11.4  | 8.1  | 8.9  | 6.5  | 8.1  |
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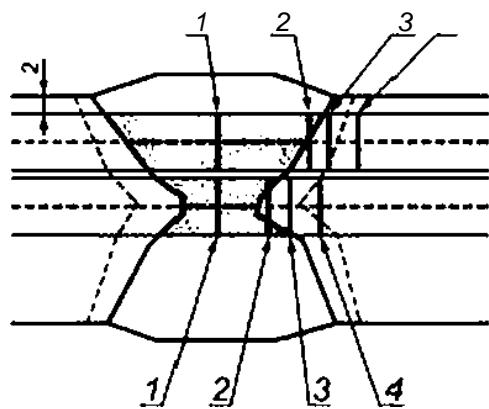
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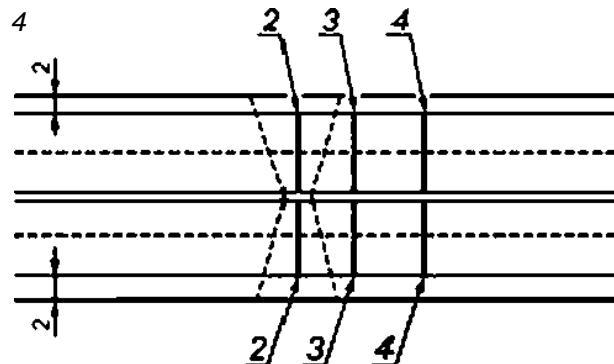
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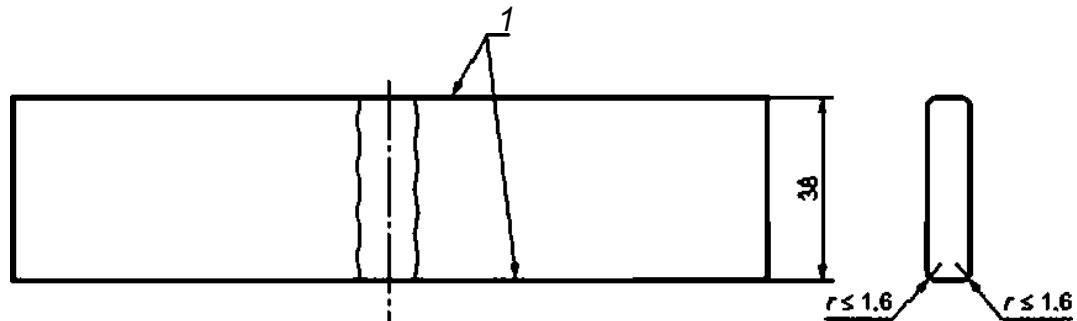
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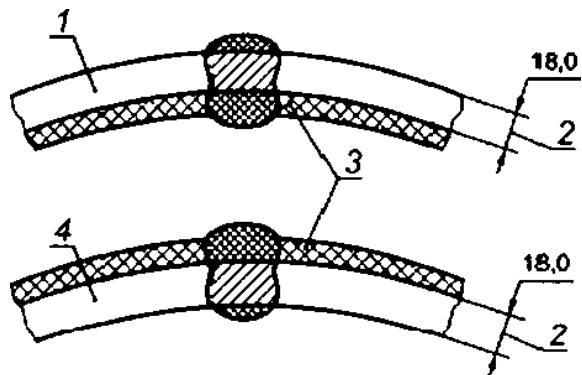
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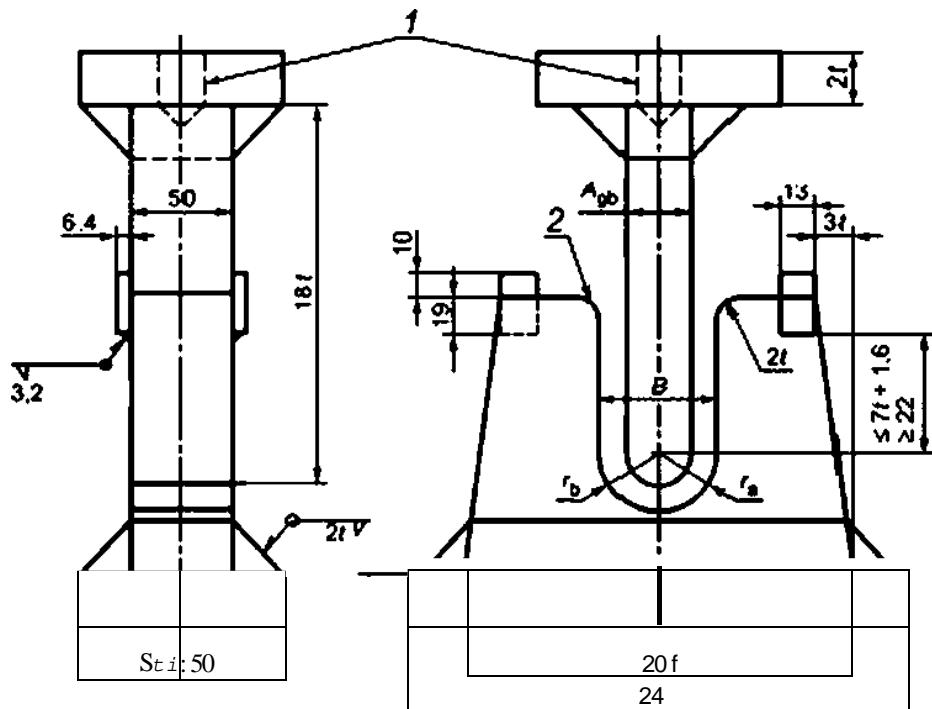
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| 290N. 2900. 290<br>29014. 2900. 290  |  |  | 0,1375  |
| 320N. 3200. 320<br>20 . 3200. 320    |  |  | 0.1325  |
| 360N. 3600, 3COM<br>36014, 3600. 360 |  |  | 0,1250  |
| 3900. 390<br>390Q. 390               |  |  | 0.1175  |
| 4150. 415<br>415Q. 415               |  |  | 0.1125  |
| 4500. 450<br>450 . 450               |  |  | 0.1 too |
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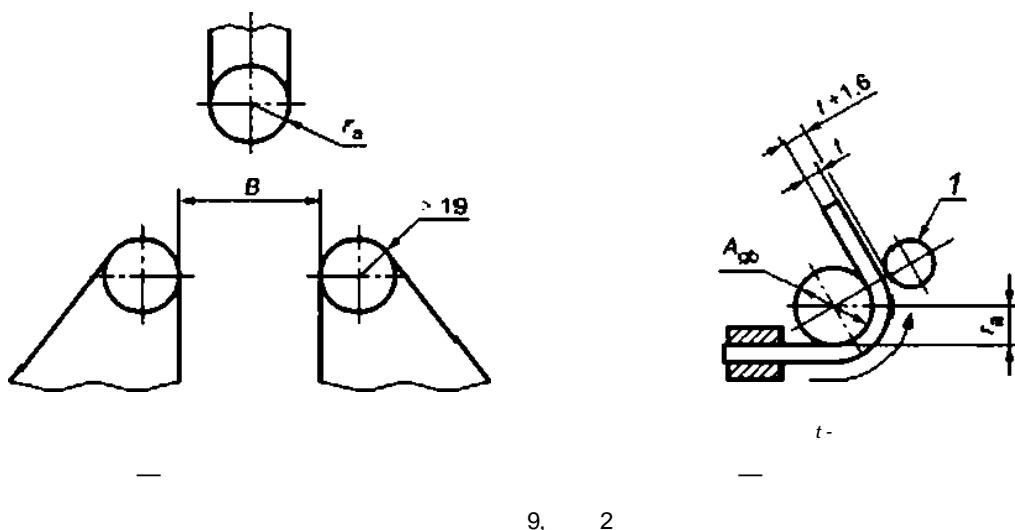
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| 320N. 3200. 320<br>320N. 3200. 320 |  | 3.5/ | 4.5/+1.6 | 9.0/+3.2  |
| 360N. 3600. 360<br>360N. 3600. 360 |  | 4.0/ | 5.0/+1.6 | 10.0/+3.2 |
| 3900. 390<br>3900. 390             |  | 4.0/ | 5.0/+1.6 | 10.0/+3.2 |
| 415Q. 415<br>4150. 415             |  | 4.5/ | 5.5/+1.6 | 11.0/+3.2 |
| 450Q. 450<br>4500. 450             |  | 4.5/ | 5.5/+1.6 | 11.0/+3.2 |
| 4650. 465<br>4850. 485             |  | 5.0/ | 6.0/+1.6 | 12.0/+32  |
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$$S_h = \frac{P(D - t_{min})}{2t_{min}} \quad (10)$$

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$$S_i = \frac{N}{A_s} \quad (11)$$

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$$\% = \frac{*(D-f)t}{4} \quad (12)$$

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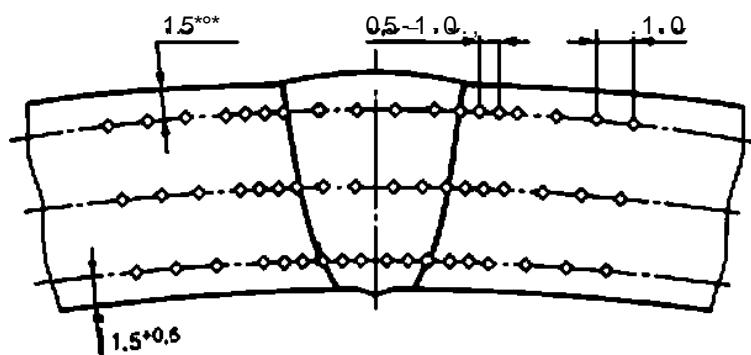
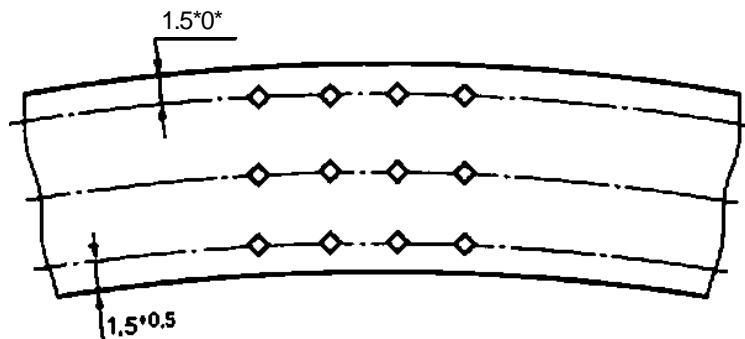
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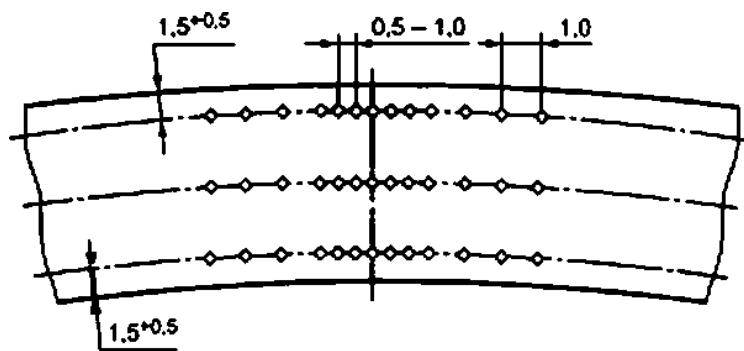
10.4.9.2

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10.4.15.4

10.4.15.5

10.4.15.6

25 %,

(MPS)

10.4.15.7

(HAZ)

HFW

(CVN)

10.4.15.3.

10.4.15.8

10.4.15.9

11

11.1

11.1.1

11.1.2

11.2

11.2.1

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X;

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 ( 1):  
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 (6.1);  
 )
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 Z.

X 31444—2012 SMLS 168 7,5 485QSYZ  
 X 31444—2012 SAWL508 16 360 FS YZ

11.2.2 11.2.3 11.2.4.

)
 D £ 48.3

1)  
 2)  
 3)  
 4)

D > 48.3

48.3 < < 406.4

1) 11.2.1,  
 2) 150

)
 0^406.4

1) 11.2.1,  
 2) 150

11.2.3

)
 150  
 ;
 ) 25  
 ;
 ) ( 100 \* )

11.2.4

11.2.5 (12.2)

11.2.6 11.2.1.

)
 D 548.3
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 D > 48.3
 ( )

1)  
 2)

11.2.7

20.

50

20.

20 —

|                                    |  |
|------------------------------------|--|
|                                    |  |
| 320N. 3200. 320<br>320N. 320Q. 320 |  |
| 360N. 3600. 360<br>360N. 360Q. 360 |  |
| 3900, 390<br>3900. 390             |  |
| 4150. 415M<br>4150. 415            |  |
| 450Q. 450<br>4500. 450             |  |
| 485Q. 485<br>4850. 485             |  |
| 5550. 5S5M<br>5550. 555            |  |

12

12.1

12.1.1

12.1.2 —12.1.4.

12.1.2

12.1.3

12.1.4

12.2

13

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14

[21] [22].

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(F)

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.1.1

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1 (CVN)

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.1.2  
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1120

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16

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(CVN)

(CVN).

(DWT).

.3.1

(CVN)

(

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V-

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|-------------------------------|--------------|-------------|----------------|-----|
|                               | 1530 mm\     |             |                |     |
|                               | >0 1         | 610 < D 820 | 820 < D i 1120 | «   |
| 245N. 245Q. 24SM<br>245Q. 245 | 24SN.<br>245 | 40          | 40             | 40  |
| 290N. 2900. 290<br>2900. 290  | 290N.<br>290 | 40          | 43             | 52  |
| 360N. 3600.<br>360N. 3600,    | 360          | 50          | 61             | 75  |
| 4150. 415<br>4150. 415        |              | 64          | 77             | 95  |
| 4500. 450<br>4500. 450        |              | 73          | 69             | 109 |
| 4650. 485<br>MKH485Q. 485     |              | 82          | 100            | 124 |
| 6550. 555<br>5550. 555        |              | 103         | 126            | 155 |

"

50 %

21

75 %

.3.2 , (CVN) {  
 ), {CVN) } )  
 1.

1 , 250  
 500 8  
 <7,0,6 \* 360 (DWT).  
 ) 65 % { 75 %.

.3.4 ,  
 (F). 0 5 2 450 (S).  
 (DWT) .4  
 MPQT,

2.

.2—

F

|  |  |  |      |
|--|--|--|------|
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|  |  |  | .11* |

.5  
 .5.1 (CVN) 10.3.2.3.  
 .5.2 (CVN) 10.3.2.3.  
 .5.3 (DWT) (23).

19,0

.6  
 .6.1 (CVN) 10.4.3  
 .6.2 (CVN) [2]  
 10.4.3  
 .6.3 (DWT) (23)

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11.1,

F.

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(S)

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(24)

[25]. (26).

(26].

(26).

.2

- 1) ( .4.1.1 .4.1.2);  
 2) N / > 25,0 ( .4.1.1)  
 3)  $t > 35,0$  ( .4.1.2);  
 4) 275 HV10 [ .1 .2. 3)—6)]; 9  
 5) ( .4.2. .7.1.3); ( .4.3); (HIC)  
 6) ( .4.4); HIC ( .7.1.4); (SSC)  
 7) ( .4.4); ( .4.4. .6.2. .7.2.2). (SSC)

.3.1

.3.2

( )

- .3.3  
 (WPS) ,  
 .4  
 .4.1  
 .4.1.1 f£ 25.0 N  
 f > 25.0 N Q ,  
 .1.

| -                | 44.  |      |      |       |                  |      |      |      |       | %    |                   |
|------------------|------|------|------|-------|------------------|------|------|------|-------|------|-------------------|
|                  | '>   | Si   | '>   |       | S <sup>1</sup> ' | V    |      |      | „4”   |      |                   |
| 245N<br>MKR245N  | 0.14 | 0.40 | 1.35 | 0.020 | 0.003            | 5)   | 5)   | 0,04 |       | 0,36 | 0.19              |
| 290N<br>MKI1290N | 0.14 | 0.40 | 1.35 | 0.020 | 0.003            | 0.05 | 0.05 | 0,04 |       | 0,36 | 0.19              |
| 320N<br>MKr320N  | 0.14 | 0.40 | 1.40 | 0.020 | 0.003            | 0.07 | 0.05 | 0,04 |       | 0.38 | 0.20              |
| 360N<br>MKI1360N | 0.16 | 0.45 | 1.65 | 0.020 | 0.003            | 0.10 | 0.05 | 0,04 |       | 0.43 | 0.22              |
| 245Q<br>MKT1245Q | 0.14 | 0.40 | 1.35 | 0.020 | 0.003            | 0.04 | 0.04 | 0,04 |       | 0.34 | 0,19              |
| 2900<br>2900     | 0.14 | 0.40 | 1.35 | 0.020 | 0.003            | 0.04 | 0.04 | 0,04 |       | 0.34 | 0,19              |
| 320Q<br>3200     | 0.15 | 0.45 | 1.40 | 0.020 | 0.003            | 0.05 | 0.05 | 0,04 |       | 0.36 | 0,20              |
| 360Q<br>3600     | 0.16 | 0.45 | 1.65 | 0.020 | 0.003            | 0.07 | 0.05 | 0,04 |       | 0.39 | 0,20              |
| 390Q<br>390Q     | 0.16 | 0.45 | 1.65 | 0.020 | 0.003            | 0.07 | 0.05 | 0,04 |       | 0.40 | 0,21              |
| 415Q<br>415Q     | 0.16 | 0.45 | 1.65 | 0.020 | 0.003            | .    | 0.05 | 0,04 | . 6)  | 0.41 | 0,22              |
| 4500<br>4500     | 0.16 | 0.45 | 1.65 | 0.020 | 0.003            | 0.09 | 0.05 | 0,06 | . )   | 0.42 | 0,22              |
| 4850<br>46SQ     | 0.16 | 0.45 | 1.65 | 0.020 | 0.003            | 0.09 | 0.05 | 0,06 | . «1, | 0.42 | 0.22 <sup>7</sup> |

"

0.01 %

0.05 %

0.20 %.

3,

0,00ft %

0.006 %

Ca/S.

)

£ 0,15 %.

£ 0,10 %.

4,

Ca/\*S 21.5

S &gt; 0,0015 %.

£ 0,006 %.

⇒

£ 0,35 %.

&gt;

£ 0,45 % Ni £ 0,50 %.

7)

0,22

0,25

.4.1.2

t £ 5.0

.2.

t &gt; 35.0

,

.2.

.2—

(£ 35.0

|     |     | .%.  |      |      |       |       |      |      |      | ^.%. |
|-----|-----|------|------|------|-------|-------|------|------|------|------|
|     |     | "    | &    | "    |       | S*†   | V    | Nb   | Ti   |      |
| 245 | 245 | 0.10 | 0.40 | 1.25 | 0.020 | 0.002 | 0.04 | 0.04 | 0.04 | 0.19 |
| 290 | 290 | 0.10 | 0.40 | 1.35 | 0.020 | 0.002 | 0.04 | 0.04 | 0.04 | 0.19 |
| 320 | 320 | 0.10 | 0.45 | 1.35 | 0.020 | 0.002 | 0.05 | 0.05 | 0.04 | 0.20 |
| 60  | 360 | 0.10 | 0.45 | 1.45 | 0.020 | 0.002 | 0.05 | 0.06 | 0.04 | 0.20 |
| 390 | 390 | 0.10 | 0.45 | 1.45 | 0.020 | 0.002 | 0.06 | 0.08 | 0.04 | 0.21 |
| 415 | 415 | 0.10 | 0.45 | 1.45 | 0.020 | 0.002 | 0.08 | 0.08 | 0.06 | 0.21 |
| 450 | 450 | 0.10 | 0.45 | 1.45 | 0.020 | 0.002 | 0.10 | 0.08 | 0.06 | 8.6> |
| 485 | 485 | 0.10 | 0.45 | 1.45 | 0.020 | 0.002 | 0.10 | 0.08 | 0.06 | 51 ) |
|     |     |      |      |      |       |       |      |      |      | 0.22 |

"

0.01 %

0.05 %

0.20 %.

2)

,

0.008%

0.006 %

Ca/S.

3&gt;

£ 0.15 %.

&amp; 0.10 %.

4&gt;

S &gt; 0,0015 %.

£ 0,006 %.

Ca/S 1.5

5&gt;

,

Mo £ 0.35 %.

&gt;

,

£ 0.45 %.

.4.2

(HIC)

)

( ) ( . . . (27]):

)

CSR £ 2 %:

)

CLR £ 15%;

CTR £ 5 %.

(HIU)

(b./i.4j

.4.3

(HAZ)

250 KV10.

(HAZ)

275 HV10.

9

.4.4

(SSC)

SSC ( .7.2.1).

10.

.4.5

50

) 250 HV10  
) 275 HV10

) ).

4.6 HFW

0.3 +0,051.  
.5(KIC)  
(SSC)

|       |         |            |              |
|-------|---------|------------|--------------|
|       |         | &          |              |
|       |         |            |              |
| (HIC) | SAWhHFW | 1<br>10-   | .4.2         |
| (HIC) | SAWhHFW | (3 )<br>11 | .4.2<br>.4.4 |
| (SSC) |         |            |              |

\*\*

10-  
10-  
nitudouK, i i  
i i >1 1 \* >  
Ca/S ( 0.0015 %, ) 0.0015 %.  
Ca/S.

.6  
.6.1  
.6.2

[27].

(HIC)

(SSC)

[28] [29].

115 15 5

.7  
 .7.1  
 .7.1.1 (HIC)  
 (HIC)  
 (27).  
 .7.1.2 .7.1.3. ,  
 {27}.  
 .7.1.3 , ( :  
 ) {26].). (27]  
 ) H<sub>2</sub>S.  
 :  
 } , .4.2.  
 .7.1.4  
 .  
 .7.2 (SSC)  
 .7.2.1 .7.2.2. , [28] (29].  
 [30].  
 720 .  
 .7.22.  
 72 %  
 — (SSC) , 72 %  
 — [26].  
 .7.2.2 (SSC) , ) {  
 . [31]).  
 .6 , 11.1.  
 S.

( )

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 , — 1.0 %. 5.0 %.  
 2.0%.  
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 ( .6.2).  
 .3.1 05 S 450  
 .3.2.  
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 . , ,  $\beta\text{O}_4$  100 :  
 ) 0.90. ;  
 ) 20 %.  
 $a_{\text{fS}} > 450$   
 .3.2 SAW HFW  
 a)  
 6:  
 b) 15 %;  
 c) (CVN)  
 7.  
 .3.3 (S) /  
 (F). /  
 , .4 /  
 .4.1 -  
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|  |  |               |  |
|  |  |               |  |
|  |  | 50/100“,<br>“ |  |

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|-----|-----------|-------|-----------|
|     |           |       |           |
|     |           |       |           |
|     |           |       | .6        |
|     |           |       | .6        |
|     |           |       |           |
| 100 | $D < 508$ | 50    | $D > 508$ |
| 3>  |           | 0,002 |           |

.5  
 .5.1  
 .5.2  
 «12 »      «5 — 7 »  
 .5.3  
 10006.      5.65   i^T.       $F_0$  —  
 .5.4      (CVN)  
 10.3.2.3.  
 .5.5   put ib      1      | »      1  
 10.3.2.7.  
 .6  
 .6.1      (CVN)  
 8.  
 10.4.2. 10.4.3 10.4.9  
 .6.2      {2}  
 .7      ,      11.1,

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(D)

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|                        |             |               | 1'  | 21                |
|------------------------|-------------|---------------|-----|-------------------|
| SMLS, HFW.SAWL<br>SAWH |             |               |     | 10                |
|                        | . DA £75    | 610 <0 £ 1422 |     | 0,00750,<br>.5.0  |
| SMLS                   | 15 £ 1 <25  |               |     | 0.1251<br>-0.1001 |
|                        | 1 25        |               |     | ± 0.1001.<br>3,0  |
| SAWL -SAWH             | 1 <6        |               |     | ± 0.8             |
|                        | 6 < 1 £ 10  |               |     | ± 0.6             |
|                        | 10 < 1 £ 20 |               |     | ± 0.8             |
|                        | 1 > 20      |               |     | ± 1.0             |
|                        | ( )         |               | 10% | 0.0050 1.5        |
|                        |             |               |     |                   |

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.2.2

.2.2.1

Orosmin ° 1.030<sub>rt</sub> 6mOT.

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.2.2.3

.2.3.2.

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.2.3.1

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Oto.smv

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O<sub>2</sub> 6tw4,

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10.3.2.2 10.4.2

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MPS

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MPQT

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( .4.4);

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MPS.

MPS

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(WPQR):

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18) / / .  
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 20) ( , -  
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|            |                                                      |   |                       |
|------------|------------------------------------------------------|---|-----------------------|
|            |                                                      |   |                       |
|            |                                                      |   | 14                    |
| (CVN)      | SMLS <sup>1</sup> 11<br>25                           |   | 7 8                   |
|            |                                                      | * | 6 <sup>®1</sup> 9.3.2 |
| (CTOD) “*> | SAWnHFW                                              |   | 0.15                  |
| (CVN)      |                                                      |   | 7                     |
|            |                                                      |   | F                     |
| (CVN)      |                                                      |   | 1                     |
| (CVN)      | SAWnHFW                                              |   | 1                     |
| (DWT)      | SAW HFW<br>$D > 500$<br>$f >$<br>$\alpha_{ff} > 360$ |   | A3.3.A.3.4            |

£. 1

|        |         |       |                   |
|--------|---------|-------|-------------------|
|        |         |       |                   |
| S      |         |       |                   |
| (SSC)  |         | (3 )  | .4.4              |
| (H )   | SAWhHFW |       | .4.2              |
| ( )    |         |       |                   |
|        |         |       | .3.2 <sup>g</sup> |
| (CVN)  |         |       |                   |
|        |         |       |                   |
| (CVN)  | SAWhHFW |       | .3.2              |
|        |         |       |                   |
| 10.    |         |       |                   |
| 2>     |         | — .5. |                   |
| )      |         |       |                   |
| *      |         |       |                   |
| S)     |         |       |                   |
| 6> HFW |         |       |                   |
| 7)     |         |       |                   |
| %      |         |       |                   |
| 9)     |         |       |                   |
| 91     |         |       | [32].             |

.4.3

5 %

V-

.4.4

7.

{ , , . . . .).

.4.5

.4.6

1)  
 2)  
 3) + 5 % / - 10 %:  
 4)  $\pm 0.02 \%$  ..  
 5)  
 6)  
 7) HFW WPS 115 %.  
 1)  
 2)  
 3)  $\pm 5 \%$ ;  
 4)

MPS  
 .5  
 .5.1  
 25  
 — 10.3.2.3 10.4.3.  
 .5.2  
 .5. 13 ( ) 10.3.2.2 10.4.2.  
 7^ (33) (34)  
 10 (HAZ) on SAW —  
 (SEN) (33) (34). SAW —  
 HFW —

(HAZ)  
 .5.4 (CVN) 0,15  
 5 %  
 .5.5. V-  
 (CVN) — 10.3.2.3 10.4.3.  
 .5.5. 250 "0

.5.6 (2) ( )  
 .5.7 (F) (S) &

( )

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« »

10 %

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0.5

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SAW

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SAW.

.4.3

5 %

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150

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150

100

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.1.1 ( ).  
.1.2

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.1.3

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.1.4

(WPS)

SAW:

HFW.

.1.5

.1.6

.1.7

(WPS)

(WPQR).

.2

.2.1

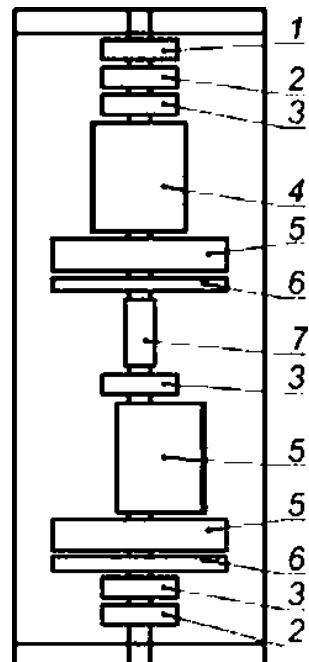
.2.1.1

pWPS

.2.1.2

.1.

, ,



— 2 —  
3 —  
S —

; 4 —  
; 7 —

.1 —

### .2.1.3

(WPQ)

#### 2.1.4

### 2.1.5

## 2.1.6

WPS

«12 » (

•

pWPS:

217

(WPS)

### 2.1.1— 2.1.7.

50 "

8

22

(WPQ).

1)

2)  
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1)

- 290                    290                    ..
- . 290    450                    .                    290                    450;
- 450                    450                    ..





.2.3.1.5

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.2.3.1.6

.2.3.1.7

.2.3.2

.2.3.2.1

100%-

100%-

100%-

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.2.3.3

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10.3.2.2 10.4.2.

.2.3.3.1.2

0.4 %.  
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&lt;\* »

80

18 %.  
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10.3.2.2 10.4.2.

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10.3.2.4 10.4.4.

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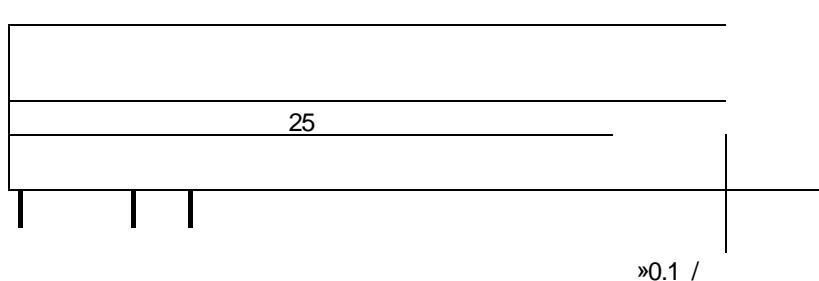
(35].

.2.

25

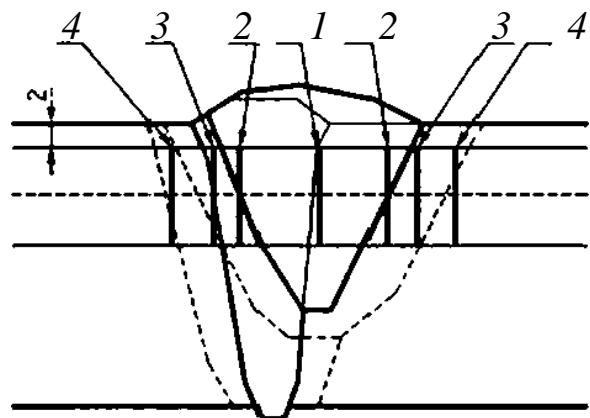
10

0.1/.



.2—





$X -$  ; 2 ~ ( 50 % 4 - 5 HAZ): 3 - 2

.5— V-

### **.2.3.3.5**

.HAZ

- 325 HV10—
- 250 HV10—

12 ).

(  
275 HV10

HAZ.

1

### 10.3.2.7 10.4.9.

### **.2.3.3.6**

( , 5\*

,

(4).  
10.3.2.6 10.4.7.

2337

(SSC)  
{26}.

### **.2.3.3.6**

50

31

3.1.1

### 3.1.1.1

(36)

### 3.1.1.2

[38]. [39]

.3.2

)

)  
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( .2.3.3).

.3.2

,  
.3.2.

.3.4

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8



#. 1

|     |    | 2' | , %                  |        |
|-----|----|----|----------------------|--------|
| HFW |    | UT | 100                  | .4.5.1 |
|     |    | UT | 100                  |        |
|     |    | UT | 100 10 <sup>61</sup> |        |
|     | *, | ST | 100 10 »             |        |
| SAW |    |    | 100                  | .4.5.2 |
|     | *, |    | 100                  |        |
|     |    |    | 100                  |        |
| SO  |    |    | 100                  | .4.5.3 |
|     | *, |    | 100                  |        |
|     |    |    | 100                  |        |
|     |    | ST | 100 »                |        |
|     |    | RT | 100                  |        |

11

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: UT—

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.4.

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315%

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SO

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&gt; 100 %

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\*» 100 %

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.3.2

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.4.1

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12

#### 4.1.2

### 4.1.3

#### 4.1.4

#### 4.1.5

PRF—  
 $W_c$ —  
 $V_e S W_c \cdot PRF/3$ .  
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| 111  | P                                        | 9001:2008                                                                                                                               |                                                                          |
| (2)  | DNV-OS-101 — 2007<br>(DNV-OS-F-101-2007) | (Submarine pipeline systems)                                                                                                            |                                                                          |
| (3)  | 404<br>(ISO 404)                         | (Steel and steel products — General technical delivery requirements)                                                                    |                                                                          |
| (4)  | 5817:2003                                |                                                                                                                                         | ( ).                                                                     |
|      | (ISO 5817:2003)                          | (Welding — Fusion-welded joints in steel, nickel, titanium and their alloys (beam welding excluded) — duality levels for imperfections) |                                                                          |
| (5)  | 14284                                    |                                                                                                                                         |                                                                          |
|      | (ISO 14284)                              | (Steel and iron — Sampling and preparation of samples for the determination of chemical composition)                                    |                                                                          |
| [6]  | 370                                      |                                                                                                                                         |                                                                          |
| [7]  | (ASTMA370)<br>148-1                      | (Standard Test Methods and Definitions for Mechanical Testing of Steel Products)                                                        |                                                                          |
|      | (ISO 148-1)                              | 1.                                                                                                                                      | (Metallic materials — Charpy pendulum impact test — Part 1: Test method) |
| [8]  | 7438                                     |                                                                                                                                         | (Metallic materials — Bend test)                                         |
| (9)  | 6492                                     |                                                                                                                                         | (Metallic materials — Tube — Fattening test)                             |
| (10) | / 9769:1991                              |                                                                                                                                         | (Steel and iron — Review of available methods of analysis)               |
| (11) | (SSO/TR 9769:1991)<br>6892:1998          |                                                                                                                                         |                                                                          |
| (12) | (ISO 6892:1998)<br>2566-1                | (MetaSic materials — Tensile testing at ambient temperature)                                                                            | 1.                                                                       |
| (13) | (ISO 2566-1)<br>6506 ( )                 | (Steel — Conversion of elongation values — Part 1: Carbon and low alloy steels)                                                         |                                                                          |
| (14) | (ISO 6506 (alt parts))<br>6507 ( )       | (Metallic materials — Brineil hardness test)                                                                                            |                                                                          |
| (15) | (ISO 6507 (all parts))<br>0 050 ( < ,1 ) | (Metallic materials — Vickers hardness test)                                                                                            |                                                                          |
| (16) | (ISO 6508 (alt parts))<br>956            | leebuevm<br>(Metallic materials — Rockwell hardness lest)                                                                               |                                                                          |
| (17) | (ASTMA956)<br>1038                       | (Standard Test Method for Leeb Hardness Testing of Steel Products)                                                                      |                                                                          |
| (18) | (ASTMA1038)                              | (Standard Practice for Portable Hardness Testing by the Ultrasonic Contact Impedance Method)                                            |                                                                          |
| (19) | 110                                      |                                                                                                                                         |                                                                          |
|      | (ASTME 110)                              | (Standard Test Method for Indentation Hardness of Metalic Materials by Portable Hardness Testers)                                       |                                                                          |
| (20) | 17637                                    |                                                                                                                                         |                                                                          |
|      | (ISO 17637)<br>EH 473                    | (Non destructive testing of welds — Visual testing of fusion — welded joints)                                                           |                                                                          |
|      | (EN 473)                                 | (Non destructive testing — Qualification and certrfication of NDT personnel — General principles)                                       |                                                                          |
| (21) | APIRP5L1                                 | Railroad Transportation of Line Pipe                                                                                                    |                                                                          |
| (22) | APIRP5LW                                 | Recommended Practice for Transportation of Line Pipe on Barges and Marine Ves sels                                                      |                                                                          |
| (23) | APIRP5L3                                 | Recommended Practice for Conducting Drop-Weight Tear Tests on Line Pipe                                                                 |                                                                          |

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|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| (24) NACE MR0175/ISO 15156-1 | Petroleum and Natural Gas Industries — Materials for Use in H <sub>2</sub> S Containing Environments in Oil and Gas Production — Part 1: General Principles for Selection of Cracking-Resistant Materials            |
| (25) EFC Publication 16      | Guidelines on materials requirements for carbon and low alloy steels for H <sub>2</sub> S-containing environments in oil and gas production                                                                          |
| (26) 15156-2:2003            |                                                                                                                                                                                                                      |
|                              | 2.                                                                                                                                                                                                                   |
| (ISO 15156-2:2003)           | (Petroleum and natural gas industries — Materials for use in H <sub>2</sub> S-containing environments in oil and gas production — Part 2: Cracking-resistant carbon and low alloy steels, and the use of cast irons) |
| (27) NACE TM 0284            | Evaluation of Pipeline Steel for Resistance to Stepwise Cracking                                                                                                                                                     |
| (28) 7539-2:89               |                                                                                                                                                                                                                      |
| (ISO 7539-2:89)              |                                                                                                                                                                                                                      |
| (29) 39                      |                                                                                                                                                                                                                      |
| (ASTMG39)                    | (Standard Practice for Preparation and Use of Bent-Beam Stress-Corrosion Test Specimens)                                                                                                                             |
| (30) NACE TM 0177:2005       |                                                                                                                                                                                                                      |
| (NACE TM 0177:2005)          | H <sub>2</sub> S-co                                                                                                                                                                                                  |
| (31) 15156-1:2001            | (Laboratory Testing of Metals for Resistance to Sulfide Stress Cracking and Stress Corrosion Cracking in H <sub>2</sub> S Environments)                                                                              |
|                              | 1.                                                                                                                                                                                                                   |
| (ISO 15156-1:2001)           | (Petroleum and natural gas industries — Materials for use in H <sub>2</sub> S-containing environments in oil and gas production — Part 1: General principles for selection of cracking-resistant materials)          |
| (32) 0 6892                  |                                                                                                                                                                                                                      |
| (ISO 6892)                   | (Metallic materials — Tensile testing at ambient temperature)                                                                                                                                                        |
| (33) BS 7446-2:1997          |                                                                                                                                                                                                                      |
| (BS 7446-2:1997)             | CTOD ( J )<br>(Fracture mechanics toughness tests. Part 2: Method for determination of K <sub>c</sub> , critical CTOD and critical J values of welds in metallic materials)                                          |
| (34) ASTM E 1820             | Standard Test Method for Measurement of Fracture Toughness                                                                                                                                                           |
| (35) 5173:2009               |                                                                                                                                                                                                                      |
| (ISO 5173:2009)              | (Destructive tests on welds in metallic materials — Bend tests)                                                                                                                                                      |
| (36) EH 1418                 |                                                                                                                                                                                                                      |
| (EN 1416)                    | (Welding personnel — Approval testing of welding operators for fusion welding and resistance weld setters for fully mechanized and automatic welding of metallic materials)                                          |
| (37) 14732:1998              |                                                                                                                                                                                                                      |
| (ISO 14732:1998)             | (Welding personnel — Approval testing of welding operators for fusion welding and of resistance weld setters for fully mechanized and automatic welding of metallic materials)                                       |
| (38) ISO 9606-1              | Approval testing of welders — Fusion welding — Part 1: Steels                                                                                                                                                        |
| (39) EN 287-1                | Approval testing of welders — Fusion welding — Part 1: Steels                                                                                                                                                        |

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 (ISO 9712:2005) (Non-destructive testing — Qualification and certification of personnel)
- (42) ASNT SNT-TC-1A  
 (ASNT SNT-TC-1A) No SNT-TC-1A.  
 (Recommended Practice No. SNT-TC-1A-Non-Destructive Testing)
- (43) 9402:1989  
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- (45) 9304:1989  
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- (46) 9303:1989  
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- (48) 11496  
 (ISO 11496) (Seamless and welded steel tubes for pressure purposes — Ultrasonic testing of tube ends for the detection of laminar imperfections)
- (49) 13063:1995  
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- (50) 12094:1994  
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- (51) 9764:1989  
 (ISO 9764:1989) (Electric resistance and induction welded steel tubes for pressure purposes — Ultrasonic testing of the weld seam for the detection of longitudinal imperfections)
- (52) 9765:1990  
 (ISO 9765:1990) (Submerged arc-welded steel tubes for pressure purposes — Ultrasonic testing of the weld seam for the detection of longitudinal and/or transverse imperfections)

- (53) 13664  
 (ISO 13664) (Seamless and welded steel tubes For pressure purposes — Magnetic particle inspection of the tube ends for the detection of laminar imperfections)
- (54) 13665  
 (ISO 13665) (Seamless and welded steel tubes for pressure purposes — Magnetic particle inspection of the tube body for the detection of surface imperfections)
- (55) 12096  
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- (56) 19232-1:2004  
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- (57) EH 13068 {  
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- (58) ASTMA577  
 (59) 10375:1997 Standard Specification for Ultrasonic Angle-Beam Examination of Steel Plates
- (ISO 10375:1997) (Non-destructive testing — Ultrasonic inspection — Characterization of search unit and sound field)
- (60) 12715:1999  
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