

4.01

4
7
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4,
144
7

| | |
|-------------------------------------|-------------------------------------|
| | |
| <p>-3.</p> <p>-</p> | <p>-</p> <p>;</p> <p>-</p> <p>-</p> |
| <p>-6.</p> <p>-</p> <p>-</p> | <p>-</p> <p>-</p> <p>-</p> <p>-</p> |
| <p>-2.</p> | <p>-</p> |

3.

4.

5.

| 1 | | 0,5 | 0,5 | 0 | 0 | 0 | 0 |
|---|--|------|-----|---|---|---|----|
| 2 | | 45,5 | 3,5 | 0 | 8 | 6 | 28 |
| 3 | | 16 | 2 | 0 | 2 | 2 | 10 |

| | | | | | | | |
|---|--|------------|-----------|----------|-----------|-----------|------------|
| | | | | | | | |
| 4 | | 34 | 4 | 0 | 2 | 2 | 25 |
| 5 | | 21 | 2 | 0 | 0 | 0 | 20 |
| | | 27 | 0 | 0 | 0 | 0 | 27 |
| | | 144 | 12 | 0 | 12 | 10 | 110 |

1. (0,5
2. 1,5
3. II
4. 1
5. 1
6. 1
7. 1
8. 1
9. 1
10. 0,5).
11. 0,5).
12. 2).

1.

2.

3.

1. $r_{CH_4}=0,13, r_{CO_2}=0,27, r_{CO}$

$t=70\text{ }^{\circ}\text{C}$

$$(\mu c_p)_{CH_4} = 37,7 \frac{\text{кДж}}{\text{кмоль} \cdot \text{К}};$$

$$(\mu c_p)_{CO_2} = 37,7 \frac{\text{кДж}}{\text{кмоль} \cdot \text{К}};$$

$$(\mu c_p)_{CO} = 29,3 \frac{\text{кДж}}{\text{кмоль} \cdot \text{К}}.$$

2.

$\frac{2}{N_2}$

$t_1=27\text{ }^{\circ}\text{C}$

1

2

n

$t_2,$

Q

G⁻³
v=20,8

3.

R

-V -S.

1.

0

0

0

t = 100⁰ t = 90⁰

2.

q^{2.}

0

0

0

3.

Q

l

h

t = 110⁰ t = 40⁰

4.

t=20⁰C

5.

q^{2.}

0

2

0

2

q_l=308

6.

7.

1.

2

t = 450⁰

t = 50⁰

t;

t.

2.

l=

t_{c1}=110⁰C

t_{c3}=25⁰C

$z=0,0465$

1

2

3. q 2.

1 2

$t = 1100^0$ $t = 50^0$

1 2 t 2

4. $t = 1000^0$

t = 110

1 2

1. q

2

λ_2 δ_2

$\lambda_2 = 300$

δ_3 λ_3 $\delta_4 =$

$\lambda_4 = 0.1$

δ_1 λ_1

2. q -

3.

4.

5.

1. 40^0 0

2

2. $t = 125^0$ $t = 10^0$

2 1=

2

1. q_1 q_2 2 q_1

d_3 2

$F_2/F_1=8;$

δ_1

1

$\delta_3=30$

λ_3

2.

q_1

3.

4.

5.

3

6.

q_1

7.

-

1.

0 0 0
0 0

2

2.

0
2

37^0

k

2

3.

$t_1=30^0C$ $t_2=100^0C$

2

2

4.

$t = 1400^0$

$t = 100^0$

$t = 1100^0$

2

2

2

5.

$2/d_1$

1

0

1

$2' = 5^0$

$2'' = 60^0$

2

6.

1.

2

2.

2.

2

2

c =

3.

=

4.

2

2

=

2

2

к к к ж

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лк б об

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- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.

$\begin{matrix} & & 2 \\ \bar{b} & & \kappa \end{matrix}$

$\begin{matrix} K & \kappa & \kappa & \delta\bar{b} & \delta & \text{л} & \delta & \bar{b}\bar{v} & \kappa\text{н} & \delta \\ \kappa & \kappa & & \bar{b} & \kappa\text{л} & \kappa\text{н} & & & & \end{matrix}$

-3.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.
- 11.
- 12.
- 13.
- 14.

$\begin{matrix} \bar{b} & & \kappa \end{matrix}$

$\begin{matrix} K & \kappa & \kappa & \delta\bar{b} & \delta & \text{л} & \delta & \bar{b}\bar{v} & \kappa\text{н} & \delta \end{matrix}$

$\begin{matrix} \kappa & \kappa & & \bar{b} & \kappa\text{л} & \kappa\text{н} \end{matrix}$

- 1.

- 2.
- 3.
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- 5.

- 6.
- 7.

- 8.

- 9.
- 10.

- 11.

(2

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б к

К к к дб д л д бв кн д

к к б кл кн

- 1.
- 2.
- 3.

- 4.
- 5.
- 6.

-
- 1.
 - 2.

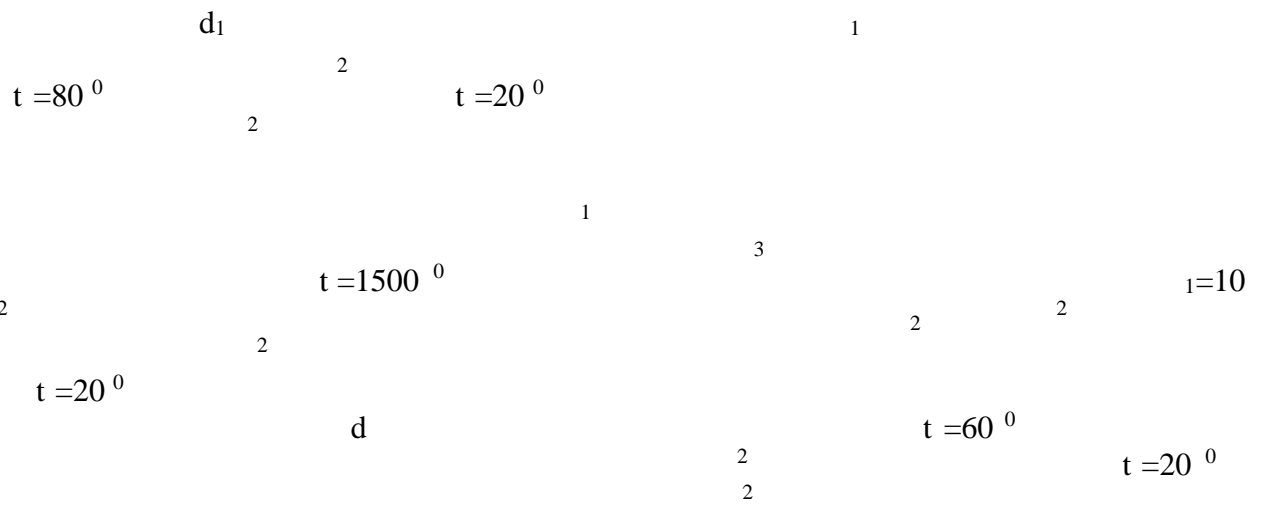
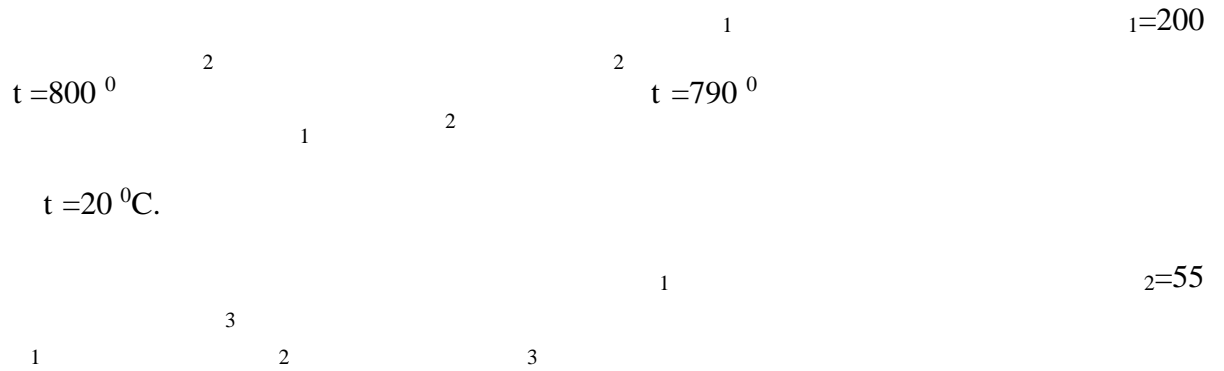
 - 3.

- 1.

2.

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1)



2)

3)

4)

:

75

75%

-

75%

| | |
|-----------|------------|
| | |
| | 10 |
| | 10 |
| | 10 |
| 1.4. | 10 |
| | 10 |
| | 10 |
| | 10 |
| | 10 |
| | 10 |
| 1. | 10 |
| | 10 |
| 3.2 | 10 |
| | 100 |

100 -
89-
69-

6.2.

1.
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- 51.
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- 54.
- 55.
- 56.
- 57.
- 58.

1.

0

$$t = 100^{\circ} \quad t = 90^{\circ}$$

2.

2

$$t = 450^{\circ}$$

$$t = 50^{\circ}$$

3.

$$r_{CH_4}=0,13, r_{CO_2}=0,27, r_{CO}$$

t.

$$t=70^{\circ}C.$$

4.

2

N₂

$$t_1=27^{\circ}C$$

1

G

-3

2

5.

2

t₂.

N₂

$$t_1=27^{\circ}C$$

1

G

-3

2

6.

h

Q

l

$$t = 110^{\circ}$$

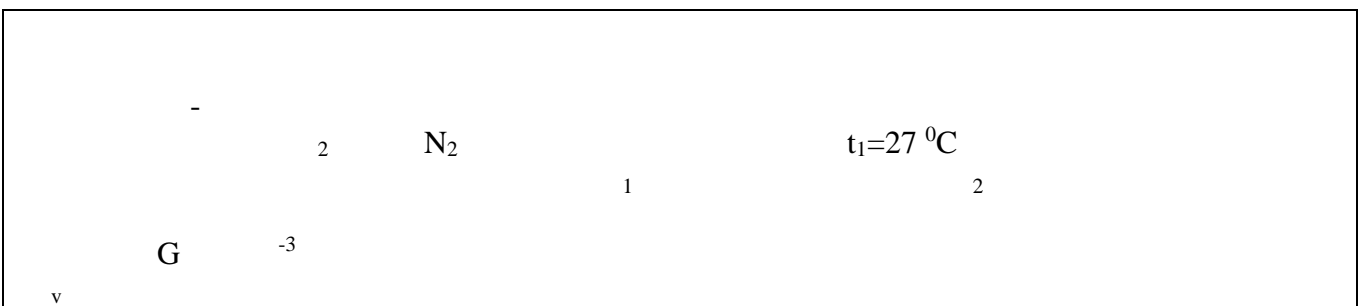
$$t = 40^{\circ}$$

7.

$$t=20^{\circ}C$$

$$q=145$$

2.



1. 2- ISBN 978-5-534-13322-6. URL: <https://urait.ru/bcode/476502>. 237 /
2. ISBN 978-5-9916-6992-4. URL: <https://urait.ru/bcode/469615>. 395
3. 2- ISBN 978-5-534-09295-0. URL: <https://urait.ru/bcode/474725>
4. 6- ISBN 978-5-534-11646-5. URL: <https://urait.ru/bcode/474246>

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2021. 392

7.2.

1. 188 с. ISBN 978-5-7264-1848-3.
URL: <https://www.iprbookshop.ru/86297.html>

2.

26 с. ISBN 2227-8397.
URL: <http://www.iprbookshop.ru/72583.html>

3.

220

ISBN 978-5-534-14716-2.
URL: <https://urait.ru/bcode/479361>

4.

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8.

-02-

2003.

7.3.

1. <https://docs.cntd.ru/>

2.

youtube.com).

MSPowerPoint.

MSWord

1

1-1

1.

0

0

2.

q

2.

=1,35

3.

q

2.

w1=100 °C

Rt

4.

Tw2.

1

1

3 3 3

3

5.

2
t=50 °C

t=450 °C

-5 t

1-2

1.

q=25000 2

2.

t1=0 °C t2=-15 °

2

3.

1

2

t2c=-20 °C?

3

1

2

3=10

1-2=120 °

2-3=45 °

4.

w1

w2.

1

1

3 3 3

3

5.

d
0

Q

-

-

1.

$$t_1=15\text{ }^{\circ}\text{C} \quad t_2=-15$$

$^{\circ}\text{C}$

2.



3.

1

1. $t_1=300\text{ }^{\circ}\text{C}$ $t_2=55\text{ }^{\circ}\text{C}$.

2. d $z=30$

3. d_1 d_2 d_3

4. $t_{c1}=106,9\text{ }^{\circ}$
 $t_{c3}=30,6\text{ }^{\circ}$

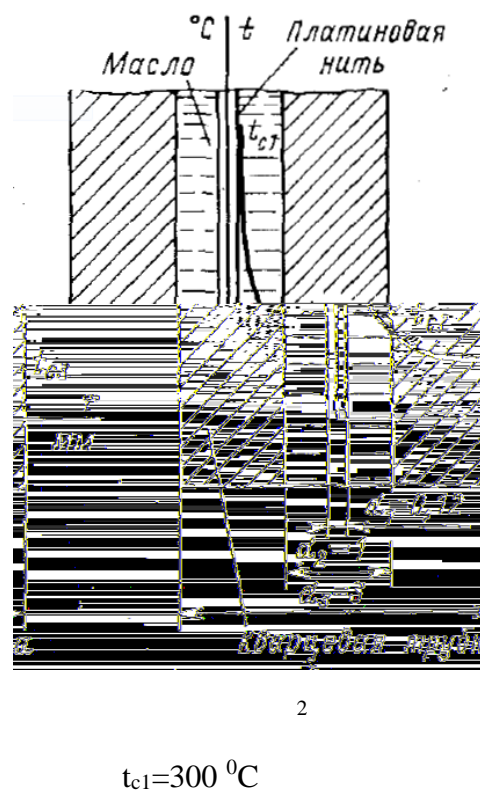
5. 60 °

d_1/d_2

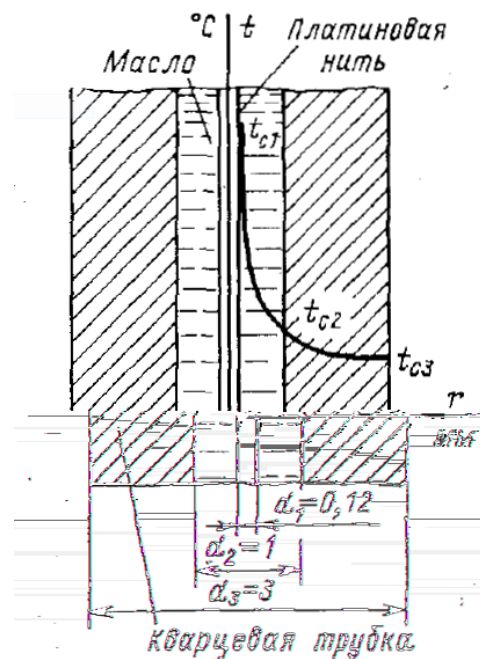
$t_{c4}=55\text{ }^{\circ}\text{C}$

1. $t_1=300\text{ }^{\circ}\text{C}$ $t_2=55\text{ }^{\circ}\text{C}$.

2. d $z=30$ $r=0,03$



2-2



2.

3.

4.

$t_c=104^{\circ}$

$t =22^{\circ}$

3-2

d l

$t =87,2^{\circ}$
 $t_c=15,3^{\circ}\text{C}$

$t =29^{\circ}$ G

2

d_1

$t =20^{\circ}$

| | | | | |
|---|------|------|------|-----|
| 2 | 2,0 | 5,0 | 10 | 10 |
| | 31,2 | 55,6 | 83,4 | 128 |

Nu Re_6^n

20°

0

Q

$t_c=65^{\circ}$

$t=25^{\circ}\text{C}$

d

2

2

3-3

d l

$t =87,2^{\circ}$
 $t_c=15,3^{\circ}\text{C}$

$t =29^{\circ}$ G

d

| | | | | | |
|--------------|-------|-------|-------|-------|-------|
| 2 | 11,75 | 12,34 | 12,87 | 13,34 | 13,75 |
| $t,^{\circ}$ | 210 | 250 | 290 | 330 | 370 |

0

Pr

Nu=f(Gr)

0

0

$t_c=450^{\circ}\text{C}$

d_2

$t =50^{\circ}$

$t_c=90\text{ }^{\circ}\text{C}$

d

$t =60\text{ }^{\circ}$

3-4

d
 $t_c=15,3\text{ }^{\circ}\text{C}$

l

$t =20\text{ }^{\circ}$

W

2

| | | | |
|------|------|------|-----|
| 2,0 | 3,14 | 4,65 | 8,8 |
| 50,4 | 68,6 | 90,6 | 141 |

$t =20\text{ }^{\circ}$

d

$Nu=f(Re).$

$t =50\text{ }^{\circ}$

$t_c=450\text{ }^{\circ}\text{C}$

d_2

q_{l2}/q_{l1}

$t_{c1}=115\text{ }^{\circ}$

$t =15\text{ }^{\circ}$

0

0

2

t

4-1

d_1/d_2
 $t_2=500\text{ }^{\circ}$

2

2

2

$t_1=900\text{ }^{\circ}\text{C}$

1

2

$t =18\text{ }^{\circ}$

2

$i=7,5$

$t =-30\text{ }^{\circ}$

2

2

2

$t_1=900\text{ }^{\circ}\text{C}$

1

2

$t_2=160\text{ }^{\circ}\text{C}$

2

2

$^{\circ}\text{C}$ 2 3 1 3 2 2 2 2
 $t_2 = -10^{\circ}\text{C}$ 1 1 2 2 2 2 2
 $t_1 = 22$
 $t_1 = 8,0$

4-2
 $d_1/d_2 = 140/165$

1 1 2 2 1 2 2 2 2
 $t_1 = 90^{\circ}$ 2 2 2 2 2 2 2 2
 $t_2 = -10^{\circ}\text{C}$
 $t = 18^{\circ}$ 2 2 2 2 2 2 2 2
 $t = -30^{\circ}$ 2 2 2 2 2 2 2 2
 t_{c1}, t_{c2} 2 2 2 2 2 2 2 2
 $t_1 = 7,5$

$t_2 = 160^{\circ}\text{C}$ 2 2 2 2 2 2 2 2
 $t_1 = 900^{\circ}\text{C}$ 1 2 2 2 2 2 2 2
 t_2 2 2 2 2 2 2 2 2
 600°
 $t_2 = 12$ 2 2 2 2 2 2 2 2
 $t_1 = 9,5$

4-3
 $d_1/d_2 = 140/165$

1 1 2 2 1 2 2 2 2
 $t_1 = 90^{\circ}$ 2 2 2 2 2 2 2 2
 $t_2 = -10^{\circ}\text{C}$ 1 2 2 2 2 2 2 2
 d_1/d_2 1 2 2 2 2 2 2 2
 $t_1 = 90^{\circ}$
 $t_2 = -10^{\circ}\text{C}$ 1 2 2 2 2 2 2 2
 $t_1 = 0,09$

$t_2 = 20^{\circ}\text{C}$ 2 2 2 2 2 2 2 2
 $t_1 = 600^{\circ}\text{C}$ 1 2 2 2 2 2 2 2
 $t = 19,5^{\circ}$ 1 2 2 2 2 2 2 2
 $t = -18^{\circ}$
 L

$\epsilon_1=5, \quad \epsilon_2$

$\epsilon_2 \quad \epsilon_2$

4-4

$Q=1,5 \cdot 10^6$

$t_1=115 \text{ } ^\circ\text{C}$

$t_2=77 \text{ } ^\circ$

d_1/d_2

$=2,0$

1

2

2

d_2/d_1

d_1/d_2

1

$t_1=90 \text{ } ^\circ\text{C},$
 $=60$
2

$t_2=-10 \text{ } ^\circ\text{C}$

1

2

2

$t_1=600 \text{ } ^\circ\text{C}$

2

$t_2=20 \text{ } ^\circ\text{C}$

2

2

1

$\epsilon_1=0$

1

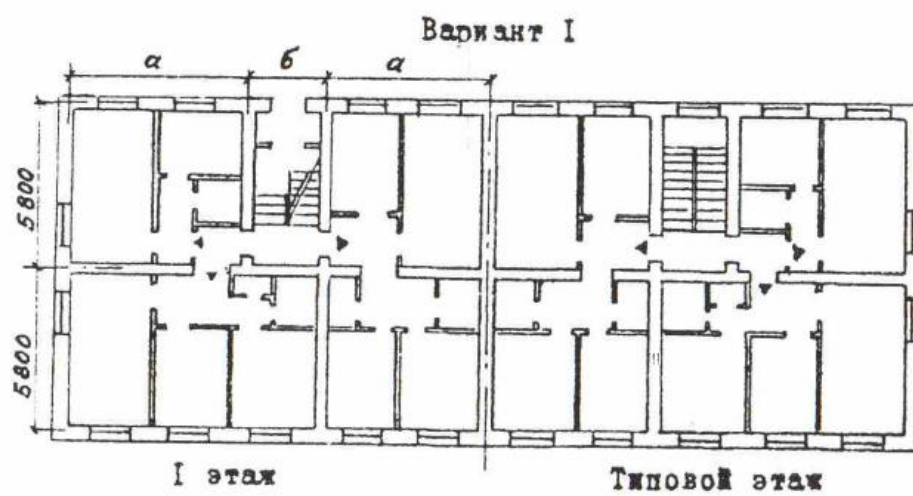
2

$t_2=80 \text{ } ^\circ$

$t_1=18 \text{ } ^\circ$

2

| | |
|--|--------|
| | |
| | |
| | 1 |
| | 2 |
| | 2 |
| | 10 |
| | 2 |
| | |
| | |
| | |
| | 150/70 |
| | 65 |

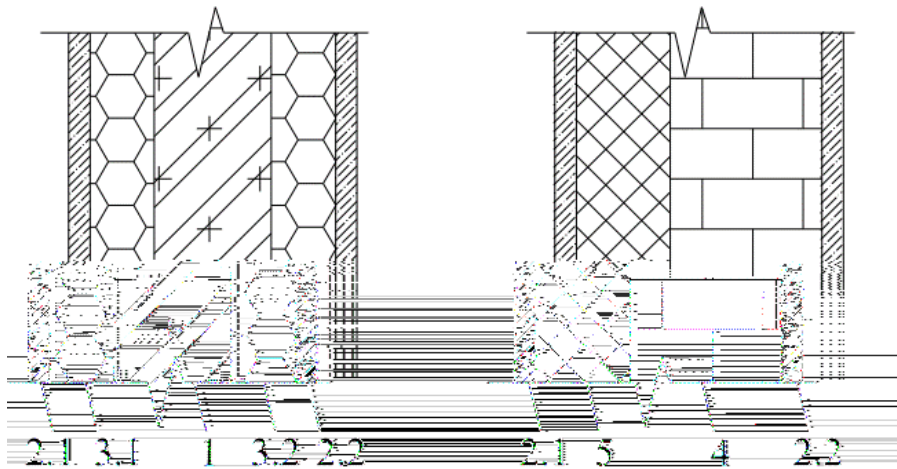


Строительные размеры здания.

| № варианта | Размер а, м | Размер б, м | Высота этажа, Нэт, м | Высота вентшахты, Нш, м |
|------------|-------------|-------------|----------------------|-------------------------|
| 1 | 6.0 | 3.0 | 2.9 | 4.0 |
| 2 | 6.0 | 3.0 | 2.9 | 3.8 |
| 3 | 5.9 | 2.9 | 3.2 | 3.9 |
| 4 | 5.8 | 3.1 | 3.2 | 3.9 |
| 5 | 5.9 | 3.0 | 3.0 | 3.7 |
| 6 | 6.1 | 3.0 | 3.0 | 3.8 |
| 7 | 6.1 | 3.1 | 3.1 | 4.1 |
| 8 | 5.8 | 3.1 | 3.1 | 4.1 |
| 9 | 6.2 | 3.1 | 3.1 | 4.1 |
| 10 | 5.8 | 3.0 | 3.1 | 4.0 |

Вариант 1.

Вариант 2.



| | | | | | |
|----|------------|--------------|----------------|--------------|-----------------------|
| | | | | | |
| / | | 2500 2500 | 1,92 2,04 | 0,03 0,03 | 1/100 |
| .. | | 1800 1800 | 0,76 0,93 | 0,09 0,09 | 2.1/10 2.2/10 |
| | | 30 30 | 0,038 0,044 | 0,05 0,05 | 10 3.1/? 3.2/50 |
| 80 | 530- .. | 1800 1800 | 0,70 0,81 | 0,11 0,11 | 4/250 |
| | | 75 75 | 0,042 0,047 | 0,51 0,51 | 5/? 10 |

ДОКУМЕНТ ПОДПИСАН
ЭЛЕКТРОННОЙ ПОДПИСЬЮ

Сертификат: 03B6A3C600B74D99B742A1E0A1DE7D81B0
Владелец: Артеменков Михаил Николаевич
Действителен: с 04.10.2021 до 07.10.2022