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( П-23-81)

*Утверждено  
приказом ЦНИИСК  
им. Кучеренко  
от 28.11.83 № 372/л*



1984

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1.

1.1.

1.2.

1.3.

2.

2.1 (3.4).

2.2.

2.3.

2.4.

2.5.

$R \quad f \quad R_{wun}$

$R \quad f \quad R_{un}$

3.

3.1.

3.2.

3.3 (11.2).

$$\begin{array}{r}
 N \beta_f k_f l_w \quad R_{wf} \gamma_{wf} \gamma_c \\
 N \beta_z k_f l_w \quad R_{wz} \gamma_{wz} \gamma_c \\
 l_w \quad \beta_f \quad \beta_z \\
 \gamma_{wf} \quad \gamma_{wz} \\
 R_{wun} \quad \gamma_{wf} \quad \gamma_{wz}
 \end{array}$$

3.4 (11.2).

$$\begin{array}{r}
 \beta_f \quad \beta_z \\
 R_{wz} \quad R_{wf} \quad R_{wz} \beta_z \quad \beta_f \\
 R_{wz} \quad R_{wf} \quad R_{wz} \beta_z \quad \beta_f \\
 R_{wz} \quad R_{wf} \quad R_{wz} \beta_z \quad \beta_f
 \end{array}$$

			$\beta_f \quad \beta_z$	
$d$				
$d$		$\beta_f$		
		$\beta_z$		
		$\beta_f$		
		$\beta_z$		
$d$		$\beta_f$		
		$\beta_z$		
		$\beta_f$		
		$\beta_z$		
		$\beta_f$		

$d$		$\beta_z$	
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3.5.

$$R_{wz} \quad R_{wf} \quad R_{wz} \quad R_{wf}$$

$$R_{wf} \quad R_{wz} \beta_z \quad \beta_f \quad R_{wf}$$

$$R_{wf} \quad R_{wz} \beta_z \quad \beta_f$$

(/2/<8

3.6.

$$R_{wf} \quad R_{wz} \quad \beta_f$$

$$R_{wun} \quad R_{un} \quad \beta_f$$

$$\beta_f \quad \beta_z$$

$$\beta_z = \sqrt{\beta_f - \beta_f +}$$

3.7.

$$\beta_z$$

3.8.

$f$

$z$

$$f \quad R_{wf} \gamma_{wf} \gamma_c$$

$$z \quad R_{wz} \gamma_{wz} \gamma_c$$

$R_{wun}$	$R_{un}$ $R_{un}$	$R_{un}$ $R_{un}$	$R_{un}$
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	$\beta_f$				$\beta_f$				$\beta_f$			

$R_{wun}$	$R_{un}$ $R_{un}$				$R_{un}$ $R_{un}$ $R_{un}$ $R_{un}$				$R_{un}$ $R_{un}$ $R_{un}$			
	$\beta_f$				$\beta_f$				$\beta_f$			

$R_{wun}$	$R_{un}$ $R_{un}$				$R_{un}$ $R_{un}$				$R_{un}$ $R_{un}$ $R_{un}$			
	$\beta_f$				$\beta_f$				$\beta_f$			

$R_{un}$   $R_{wun}$   $\beta_f$   $R_{un}$   $R_{wun}$

$R_{un}$

$R_{wun}$	$R_{un}$ $R_{un}$ $R_{un}$				$R_{un}$ $R_{un}$				$R_{un}$			
	$\beta_f$				$\beta_f$				$\beta_f$			

$R_{wun}$	$R_{un}$ $R_{un}$				$R_{un}$				$R_{un}$ $R_{un}$ $R_{un}$ $R_{un}$			
	$\beta_f$				$\beta_f$				$\beta_f$			

--	--	--	--	--	--	--	--	--	--	--	--

$R_{wun}$	$R_{un}$				$R_{un}$				$R_{un}$			
	$\beta_f$				$\beta_f$				$\beta_f$			

$R_{wun}$	$R_{un}$				$R_{un}$			
	$\beta_f$				$\beta_f$			

—  $R_{un}$   $wf$   $wz$

**3.9.**

—

$$N \quad hl_w \quad R_{wf} \gamma_{wf} \gamma_c$$

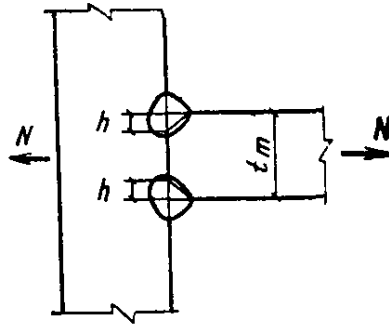
$$N \quad hl_w \quad R_{wz} \gamma_{wz} \gamma_c$$

$h$

$l_w$

$t_m$

$k_f$



3.10.

3-3

a

3-3

$$N = \frac{\beta_f k_f l_w}{k} R_{th} \gamma_c$$

3-3

b

$$N = t l_w R_{th} \gamma_c$$

b

$$N = h t l_w R_{th} \gamma_c$$

c

3-3

$$N = t l_w R_{th} \gamma_c$$

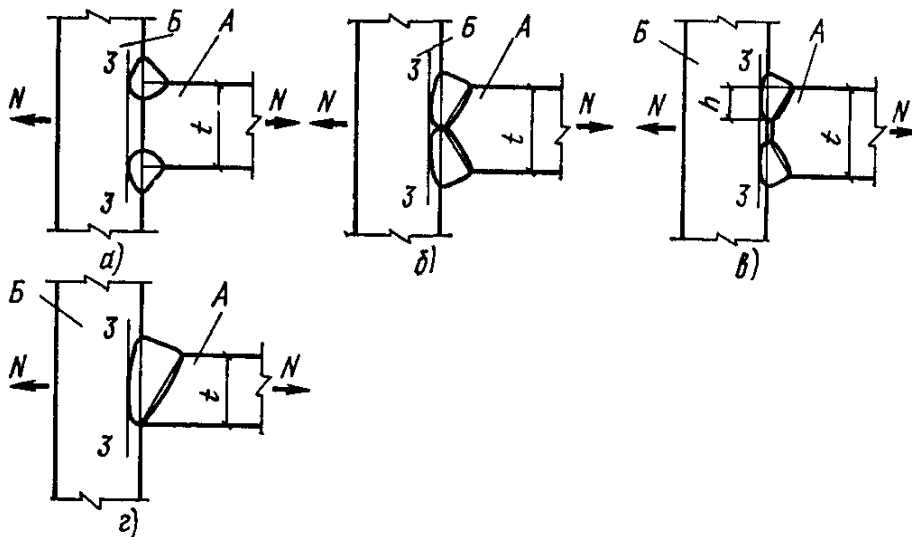
$l_w$   
 $h$

$t$

$R_{th}$

$R_{th}$

$R_u$



$a$   
 $\epsilon$

$R^A_{un}$   $R^B_{un}$

$k$

$R^A_{yn}$   $\delta$

$R^B_{un}$

4.

4.1.

4.2.

4.3.

$k_f$

$\kappa$

$k_f$

$k_f$   
 $k_f$

$k_f$

4.4 (12.9).

$k_f$

4.5 (12.10).

$\beta_f$   $\beta_z$

$k_f$

4.6.

$t$

$t$

$t$



4.7 (13.9).

*a t t*

4.8 (13.9).

*a -*

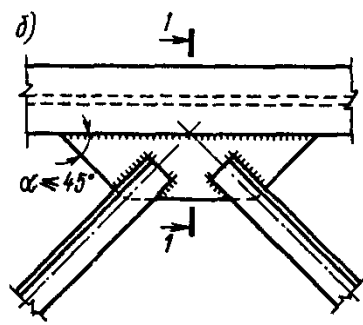
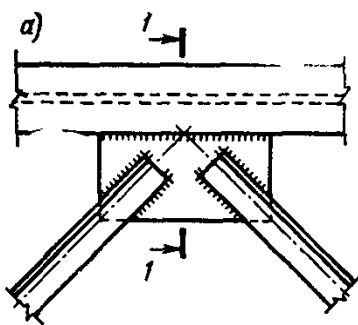
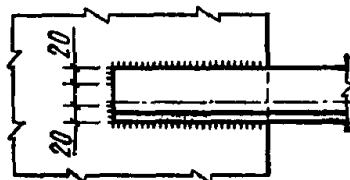
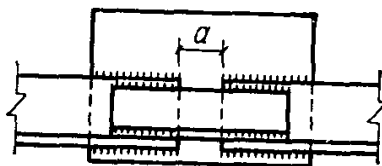
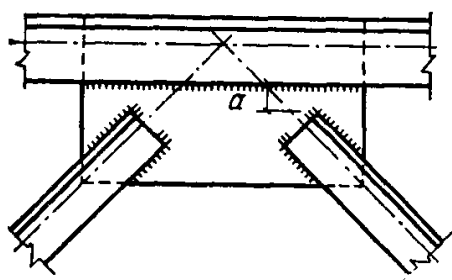
4.9.

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4.10 (13.10).

*-*

*б*



*a*

*б*

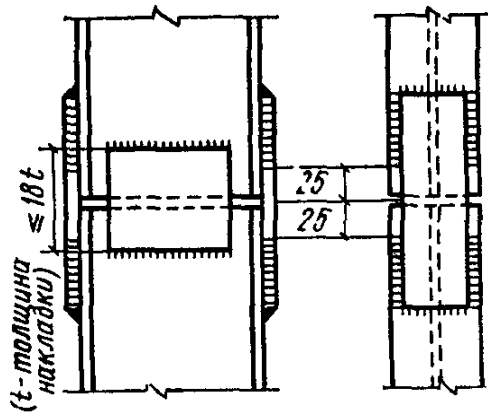
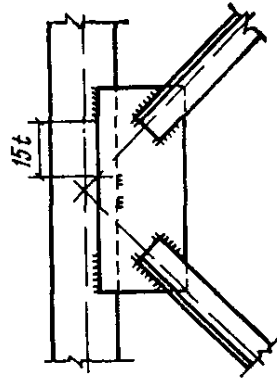
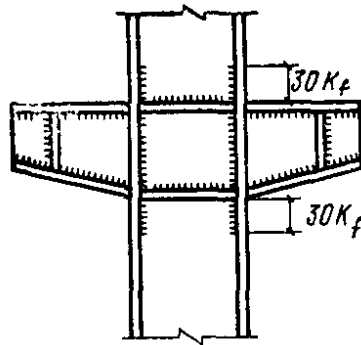
4.11.

4.12.

$k_f$

4.13 (13.13).

$t$



4.14.

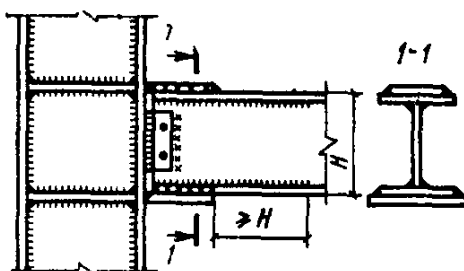
4.15.

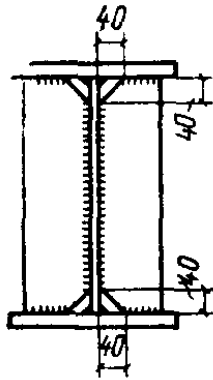
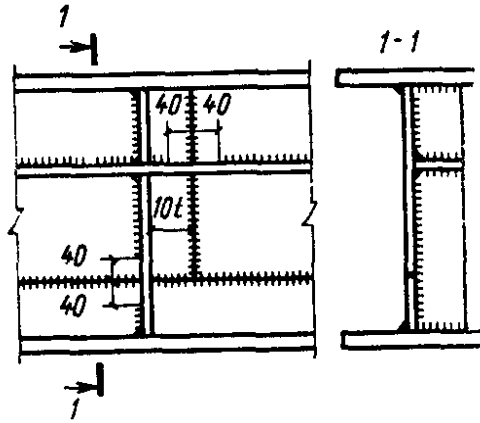
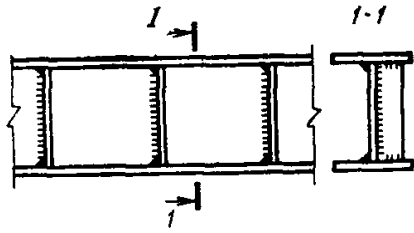
4.16 (13.25).

4.17.

4.18 (13.28).

4.19 (13.27).





4.20.




		$R_{wun}$	$R_{wf}$

$R_{wf}$

$k_f$

$R_{wf}$

$k_f$

$R_{wf}$  $k_f$ 

$R_{un}$	$R_{wz}$	$R_{un}$	$R_{wz}$	$R_{un}$	$R_{wz}$

2

		$R_{un}$											



$R_{wf}$   $R_{wz}$   $\beta_f$   $\beta_z$   $R_{wun}$   
 $wf$   $wz$   $c$   $wf$   
 $wz$   $c$

		$R_{un}$												

1.

$$R_{yn} \quad R_{un} \quad M \quad R_{wf} \quad \beta_f$$

$wf \quad c$

Решение.

$$M \quad W_f \quad R_{wf} \quad wf \quad c$$

$$W_f \quad I_f \quad y_{max}$$

$$I_f \approx \beta_f \left[ \frac{h_w k_f}{y_{max}} + b_f k_f \left( \frac{h + k_f}{h} \right) + b_{f-t_w} k_f \left( \frac{h_w - k_f}{h} \right) \right]$$

$$y_{max} \quad h \quad k_f$$

$$k_f$$

$$I_f$$

$$y_{max}$$

$$W_f$$

$$f \quad M \quad W_f$$

$$f \quad R_{wf}$$

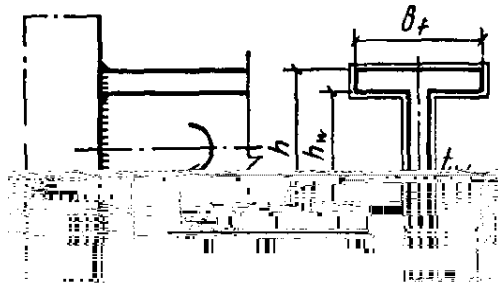
$$k_f$$

$$R_{wf}$$

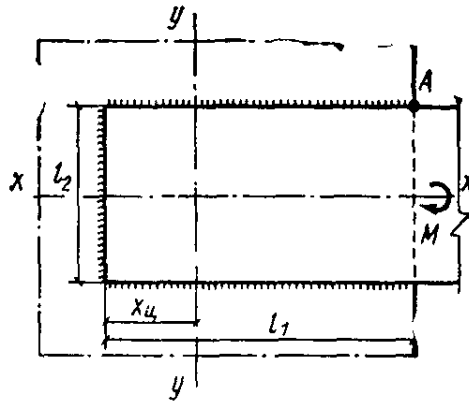
$$f$$

$$k_f$$





$b_f \quad t_f \quad t_w \quad h_w \quad h$



$l \quad l$

$k_f$

$I_f \quad y_{max} \quad W_f \quad f \quad M \quad W_f$

2.

$M$

$R_{wf}$

$\overline{R_{un}}$   
 $\beta_f$

$w_f \quad c$

Решение.

$$M \sqrt{I_{fx} + I_{fy}} \leq R_{wf} \gamma_{wf} \gamma_c$$

$x \quad l \quad l \quad k_f \quad l \quad l$

$k_f$

$x$

$A$

$y$

$x$

$$I_{fx} = \beta_f l k_f l \quad l k_f l \quad k_f$$

$$I_{fy} \approx \beta_f \left\{ \left[ \frac{l k_f}{l} + l k_f \left( \frac{l}{l} - x_u \right) \right] + l k_f \left( x_u + \frac{k_f}{l} \right) \right\}$$

$$\frac{k_f}{l}$$

$$I_{fx}$$

$$I_{fy}$$

A

$$\sqrt{x + y} = \sqrt{\quad + \quad} =$$

f

$$f R_{wf}$$

$$R_{wf} k_f$$

f

$$k_f$$

$$k_f$$

$$I_{fx}$$

$$I_{fy}$$

$$\sqrt{x + y}$$

f

3.

N

Q

$$\frac{R_{un}}{\beta_f}$$

$$R_{wf}$$

$$wf \quad c$$

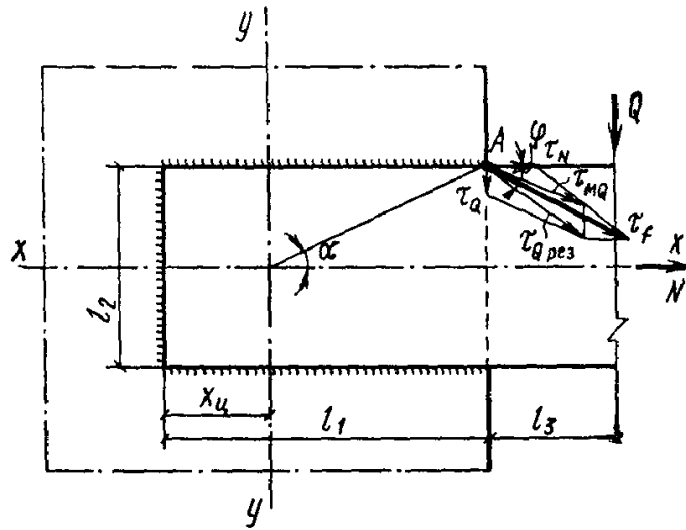
Решение.

$$k_f$$

$$\text{-----} f \quad wf \quad wf \quad c$$

$$N \tau_N \quad N \quad A_w$$

$$A_w \quad l \quad l \quad k_f \beta_f$$



$l \quad l \quad l$

$A_w$

$N$

$Q$

$Q \text{ pes}$

$Q$

$Q$

$M Q$

$Q \quad Q \quad A_w$

$$\tau_{MQ} = M \frac{I_{fx} + I_{fy} \sqrt{x + y}}{A_w}$$

$x \quad l \quad l k_f \quad l \quad l$

$A$

$x$

$y$

$$I_{fx} \quad \beta_f \quad l \quad k_f \quad l \quad k_f \quad l \quad k_f$$

$$I_{fy} \quad \beta_f \quad l \quad k_f \quad l \quad k_f \quad l \quad k_f \quad k_f$$

$$\sqrt{x + y} = \sqrt{\quad + \quad} =$$

$$\tau_{MQ} =$$

$$\tau_{Q_{pe3}} = \sqrt{\tau_Q + \tau_{MQ} + \tau_Q \tau_{MQ}} \quad \alpha$$

$$\tau_{Q_{pe3}} = \sqrt{\tau_N + \tau_{Q_{pe3}} + \tau_N \tau_{Q_{pe3}}} =$$

$$\varphi = \vec{a} \vec{b} (|\vec{a}| \cdot |\vec{b}|)$$

$$\vec{a} \quad \vec{b}$$

$$\vec{a} \quad \vec{b}$$

$$\vec{a} \quad \vec{b} \quad x \quad x \quad y \quad y$$

$$|\vec{a}| = \sqrt{x + y} \quad |\vec{b}| = \sqrt{x + y} \quad \varphi = (x \quad x + y \quad y) (\sqrt{x + y} \quad \sqrt{x + y})$$

$$\vec{\tau}_N \quad x \quad \tau_N \quad y$$

$$\vec{\tau}_{Q_{pe3}} \quad x$$

$$y \quad Q$$

$$y$$

$$y \quad Q$$

$$Q$$

$$\varphi = \tau_{MQ} \quad \alpha \sqrt{\tau_{MQ} \quad \alpha + \tau_{MQ} \quad \alpha + \tau_Q} =$$

$$= \cdot \sqrt{\cdot + \cdot +} =$$

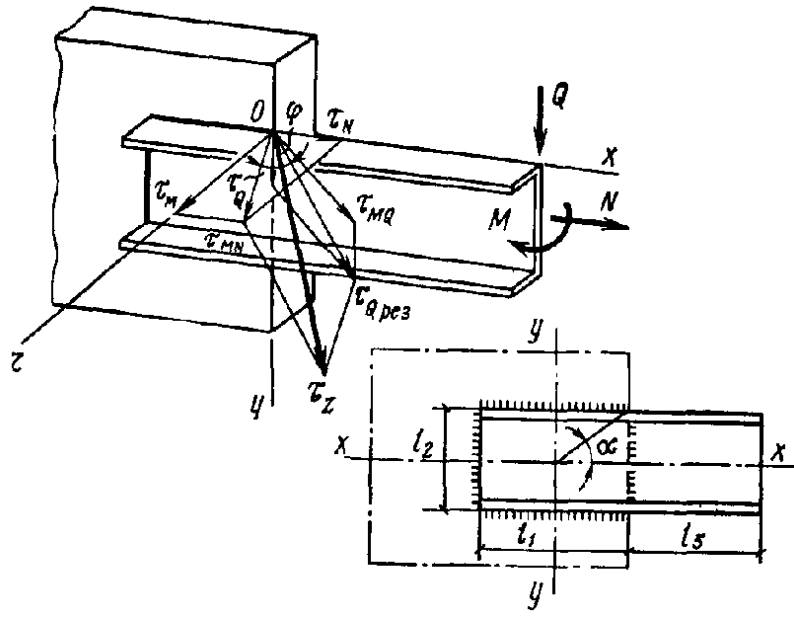
$$\tau_f = \sqrt{\tau_N + \tau_{Q_{pe3}} + \tau_N \tau_{Q_{pe3}}} \quad \varphi =$$

$$= \sqrt{+ + \cdot \cdot \cdot} =$$

$$f \quad R_{wf}$$

$$k_f$$

$$k_f$$



$$\tau_{Q \text{ рез}} = \sqrt{\frac{MQ}{A_w + \dots}} =$$

$$\tau_f = \sqrt{\frac{MQ}{A_w + \dots}} =$$

4.

$$N \quad R_{wf} \quad \beta_f \quad R_{un} \quad \beta_z \quad R_{wz}$$

c

Решение.

$$k_f \quad N \quad N \quad A_w$$

$$A_w \quad l \quad l \quad k_f \beta_z$$

$l \quad l$

$$A_w$$

$N$

$Q$

$Q_{pez}$

$Q$

$Q$

$MQ$

$$Q \quad Q \quad A_w$$

$$\tau_{MQ} = M \sqrt{x^2 + y^2} (I_{zx} + I_{zy})$$

$$I_{zx} \quad \beta_z \quad l \quad k_f \quad l \quad k_f \quad l \quad k_f$$

$$I_{zy} \quad \beta_z \quad l \quad k_f \quad l \quad k_f \quad l \quad k_f$$

$$\sqrt{x^2 + y^2} = \sqrt{\quad + \quad} =$$

$\tau_{MQ}$

$xoy$

$$\tau_{Q_{pez}} = \sqrt{\tau_Q^2 + \tau_{MQ}^2 + \tau_Q \tau_{MQ} \alpha}$$

$$\tau_{Q_{pez}} = \sqrt{\quad + \quad + \quad \cdot \quad \cdot \quad} =$$

$M$

$$M \quad My_{max} \quad I_{zy}$$

$$y_{max} \quad l \quad k_f$$

$M$

$N$

$M$

$xoz$

$$\tau_{MN} = \sqrt{\tau_M^2 + \tau_N^2} = \sqrt{\quad + \quad} =$$

$$\bar{\tau}_{MN} \quad \bar{\tau}_{Q_{pez}}$$

$$\varphi = \vec{a} \vec{b} (|\vec{a}| \cdot |\vec{b}|)$$

$\vec{a} \vec{b}$

$\vec{a} \vec{b}$

$\vec{a} \vec{b} \quad x \quad x \quad y \quad y$

$$|\vec{a}| = \sqrt{x^2 + y^2 + z^2}$$

$$\varphi = (x^2 + y^2 + z^2) (\sqrt{x^2 + y^2 + z^2} \sqrt{x^2 + y^2 + z^2})$$

$\vec{\tau}_{MN}$

$x \quad \tau_N \quad y \quad z \quad M$

$\vec{\tau}_{Q \text{ pe3}}$

$x \quad MQ \quad y \quad MQ \quad Q \quad z$

$$\varphi = \tau_N \tau_{MQ} \alpha \left[ \tau_{MQ} \sqrt{\tau_{MQ}^2 \alpha^2 + \tau_{MQ}^2 \alpha + \tau_Q^2 \alpha + \tau_Q^2} \right] =$$

$$= \cdot \cdot \left[ \sqrt{\cdot + \cdot + \cdot} \right] =$$

$$\tau_z = \sqrt{\tau_{MN}^2 + \tau_{Q \text{ pe3}}^2 + \tau_{MN} \tau_{Q \text{ pe3}}} \quad \varphi =$$

$$= \sqrt{\cdot + \cdot + \cdot} =$$

$z \quad R_{WZ}$

$k_f$

$k_f$

$k_f$

$k_f$

$A_w$

$N$

$Q$

$I_{zx}$

$I_{zy}$

$MQ$

$$\tau_{Q \text{ pe3}} = \sqrt{\cdot + \cdot + \cdot + \cdot} =$$

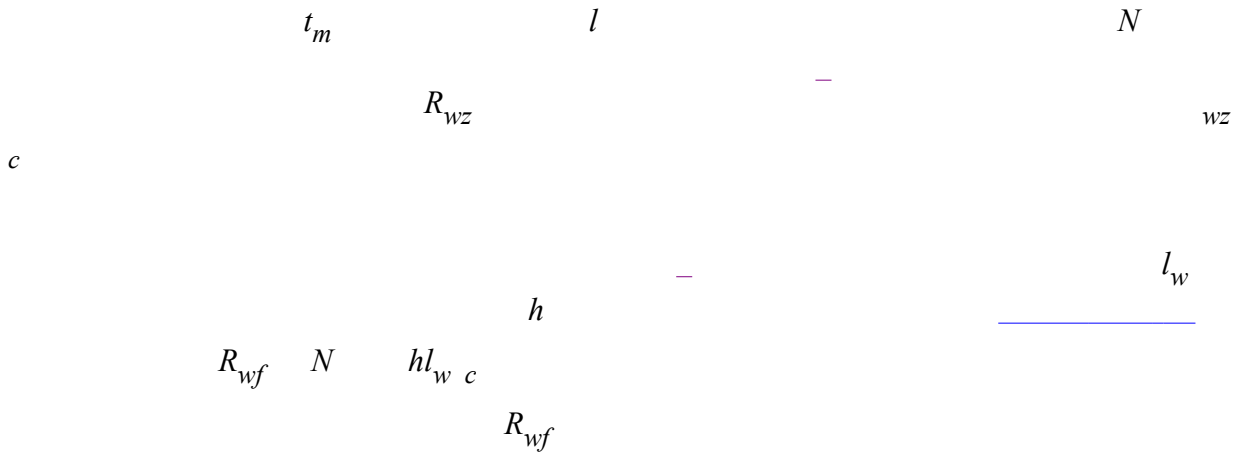
$M$

$$\tau_{MN} = \sqrt{\cdot + \cdot} =$$

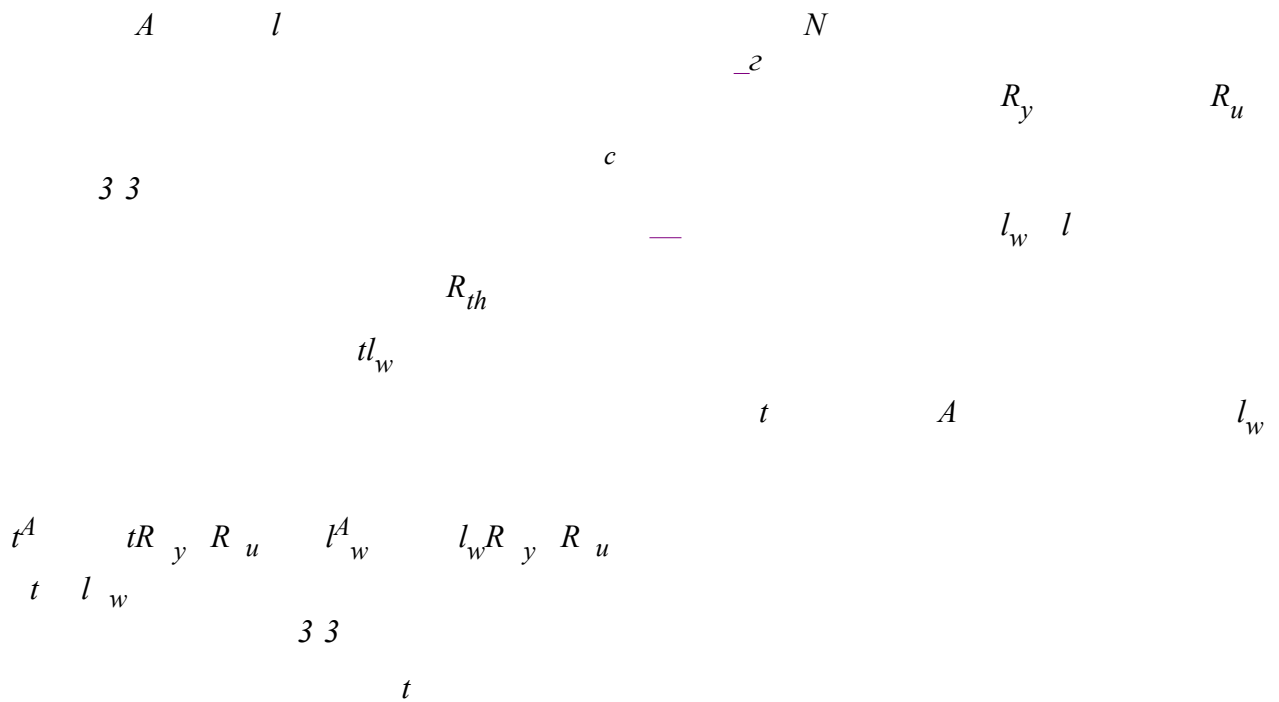
$$\varphi = \dots \left[ \sqrt{(\dots) + (\dots)} \right] =$$

$$\tau_z = \sqrt{\dots + \dots} =$$

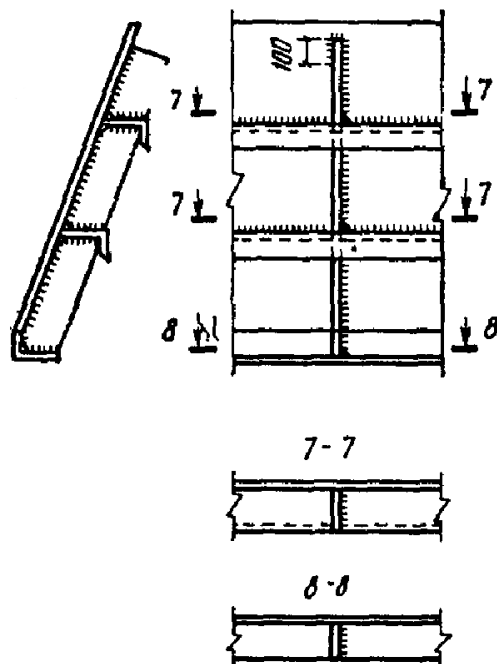
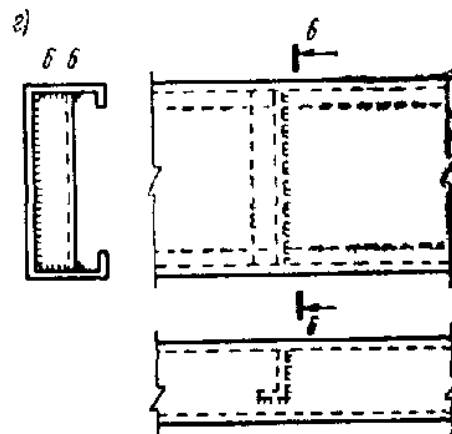
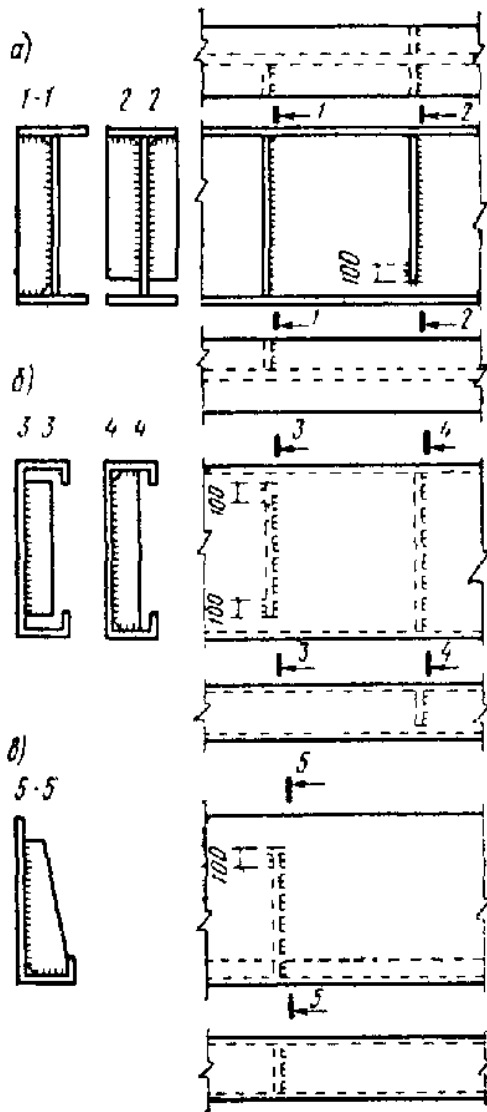
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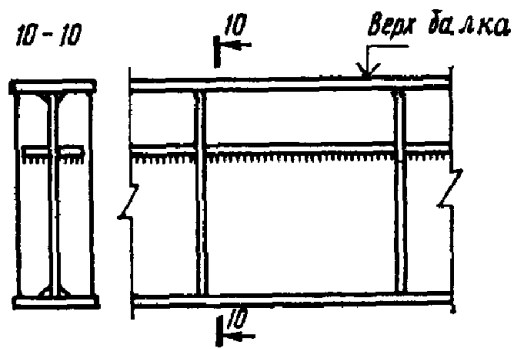


6.









5

$M$   
 $N$   
 $I_{fx}$   $I_{fy}$   
 $I_{zx}$   $I_{zy}$

$R_u$

$R_{un}$

6

$R_{wf}$   
 $R_{wu}$

$R_{wun}$   
 $R_{ws}$   
 $R_{wy}$

$R_{wz}$

$R_y$   
 $R_{yn}$

$w_f$   $w_z$

$k_f$   
 $l_w$   
 $t$   
 $\beta_f$   $\beta_z$

$c$

$m$

$u$

