



Number of Connectors in Bridges Formulas

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Examples!

Conversions!

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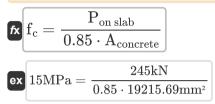




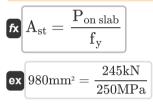
List of 29 Number of Connectors in Bridges Formulas

Number of Connectors in Bridges 🕑

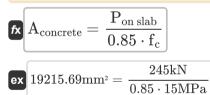
1) 28-day Compressive Strength of Concrete given Force in Slab 🚰



2) Area of Longitudinal Reinforcing given Force in Slab at Maximum Negative Moments 💪



3) Effective Concrete Area given Force in Slab 🕑



4) Force in Slab at Maximum Negative Moments given Minimum Number of Connectors for Bridges

fx
$$\mathrm{P}_3 = \mathrm{N} \cdot \Phi \cdot \mathrm{S}_{\mathrm{ultimate}} - \mathrm{P}_{\mathrm{on\ slab}}$$

ex
$$10 \mathrm{kN} = 15.0 \cdot 0.85 \cdot 20.0 \mathrm{kN} - 245 \mathrm{kN}$$

5) Force in Slab at Maximum Negative Moments given Reinforcing Steel Yield Strength 💪

fx
$$P_{on slab} = A_{st} \cdot f_y$$

ex $245 kN = 980 mm^2 \cdot 250 MPa$





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6) Force in Slab at Maximum Positive Moments given Minimum Number of Connectors for Bridges 🕑 fx $P_{on slab} = N \cdot \Phi \cdot S_{ultimate} - P_3$ Open Calculator 🕑 $245 \text{kN} = 15.0 \cdot 0.85 \cdot 20.0 \text{kN} - 10 \text{kN}$ 7) Force in Slab given Effective Concrete Area 🖸 Open Calculator fx $P_{on slab} = 0.85 \cdot A_{concrete} \cdot f_c$ ex $245 \text{kN} = 0.85 \cdot 19215.69 \text{mm}^2 \cdot 15 \text{MPa}$ 8) Force in Slab given Number of Connectors in Bridges 💪 Open Calculator $\mathbf{f}_{\mathbf{x}} \mathbf{P}_{\mathrm{on \ slab}} = \mathbf{N} \cdot \mathbf{\Phi} \cdot \mathbf{S}_{\mathrm{ultimate}}$ ex $255 \text{kN} = 15.0 \cdot 0.85 \cdot 20.0 \text{kN}$ 9) Force in Slab given Total Area of Steel Section 🖸 Open Calculator fx $\mathrm{P}_{\mathrm{on\ slab}} = \mathrm{A}_{\mathrm{st}} \cdot \mathrm{f}_{\mathrm{y}}$ ex $245 \text{kN} = 980 \text{mm}^2 \cdot 250 \text{MPa}$ 10) Minimum Number of Connectors for Bridges Open Calculator fx $\mathrm{N} = rac{\mathrm{P_{on\,slab}} + \mathrm{P_{3}}}{\Phi \cdot \mathrm{S_{ultimate}}}$ ex $15 = \frac{245 \text{kN} + 10 \text{kN}}{0.85 \cdot 20.0 \text{kN}}$ 11) Number of Connectors in Bridges Open Calculator fx $\mathrm{N} = rac{\mathrm{P_{on\,slab}}}{\Phi \cdot \mathrm{S_{ultimate}}}$

ex
$$14.41176 = \frac{245 \mathrm{kN}}{0.85 \cdot 20.0 \mathrm{kN}}$$

12) Reduction Factor given Minimum Number of Connectors in Bridges 🕑

$$fx \Phi = \frac{P_{on \, slab} + P_3}{S_{ultimate} \cdot N}$$

$$ex 0.85 = \frac{245kN + 10kN}{20.0kN \cdot 15.0}$$
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13) Reduction Factor given Number of Connectors in Bridges 🖒

$$fz \Phi = \frac{P_{on slab}}{N \cdot S_{ultimate}}$$
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$$ex 0.816667 = \frac{245 \text{kN}}{15.0 \cdot 20.0 \text{kN}}$$

14) Reinforcing Steel Yield Strength given Force in Slab at Maximum Negative Moments 💪



15) Steel Yield Strength given Total Area of Steel Section 🕑



16) Total Area of Steel Section given Force in Slab





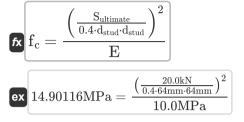
17) Ultimate Shear Connector Strength given Minimum Number of Connectors in Bridges 🕑





Ultimate Shear Strength of Connectors in Bridges 🕑

21) 28-day Compressive Strength given Ultimate Shear Connector Strength for Welded Studs 🗹



22) 28-day Compressive Strength of Concrete given Ultimate Shear Connector Strength for Channels

$$\mathbf{f_c} = \left(\frac{S_{ultimate}}{17.4 \cdot w \cdot \left(h + \frac{t_w}{2}\right)}\right)^2$$

$$\mathbf{ex} \quad 15.44222 \text{MPa} = \left(\frac{20.0 \text{kN}}{17.4 \cdot 1500 \text{mm} \cdot \left(150 \text{mm} + \frac{90 \text{mm}}{2}\right)}\right)^2$$

9

23) Average Channel Flange Thickness given Ultimate Shear Connector Strength for Channels

$$f_{X} h = \frac{S_{ultimate}}{17.4 \cdot w \cdot ((f_{c})^{0.5})} - \frac{t_{w}}{2}$$

$$e_{X} 152.8536 \text{mm} = \frac{20.0 \text{kN}}{17.4 \cdot 1500 \text{mm} \cdot ((15 \text{MPa})^{0.5})} - \frac{90 \text{mm}}{2}$$

24) Channel Length given Ultimate Shear Connector Strength for Channels 🖸

$$\begin{aligned} & \mathbf{fx} \mathbf{w} = \frac{\mathbf{S}_{\text{ultimate}}}{17.4 \cdot \sqrt{\mathbf{f_c}} \cdot \left(\mathbf{h} + \frac{\mathbf{t_w}}{2}\right)} \\ & \mathbf{ex} \mathbf{1521.95mm} = \frac{20.0 \text{kN}}{17.4 \cdot \sqrt{15 \text{MPa}} \cdot \left(150 \text{mm} + \frac{90 \text{mm}}{2}\right)} \end{aligned}$$



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25) Channel Web Thickness given Ultimate Shear Connector Strength for Channels 🕑

$$\begin{aligned} & \textbf{fx} \quad \textbf{t}_w = \left(\left(\frac{S_{ultimate}}{17.4 \cdot w \cdot \sqrt{f_c}} \right) - \textbf{h} \right) \cdot 2 \end{aligned} \end{aligned}$$

26) Diameter of connector given Ultimate Shear Connector Strength for Welded Studs 🕑

$$\mathbf{fx} \mathbf{d}_{stud} = \sqrt{\frac{\mathbf{S}_{ultimate}}{0.4 \cdot \sqrt{\mathbf{E} \cdot \mathbf{f_c}}}}$$

$$\mathbf{ex} \mathbf{63.89431mm} = \sqrt{\frac{20.0 \text{kN}}{0.4 \cdot \sqrt{10.0 \text{MPa} \cdot 15 \text{MPa}}}}$$

27) Elastic Modulus of Concrete given Ultimate Shear Connector Strength for Welded Studs 🕑

$$\mathbf{fx} \mathbf{E} = \left(\frac{\left(\frac{S_{ultimate}}{0.4 \cdot d_{stud} \cdot d_{stud}}\right)^2}{f_c}\right)$$

$$\mathbf{ex} 9.934107 \text{MPa} = \left(\frac{\left(\frac{20.0 \text{kN}}{0.4 \cdot 64 \text{mm} \cdot 64 \text{mm}}\right)^2}{15 \text{MPa}}\right)$$

28) Ultimate Shear Connector Strength for Channels 🕑

fx
$$S_{
m ultimate} = 17.4 \cdot {
m w} \cdot \left({\left({{
m f}_{
m c}}
ight)^{0.5}}
ight) \cdot \left({
m h} + rac{{
m t}_{
m w}}{2}
ight)$$

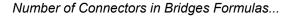
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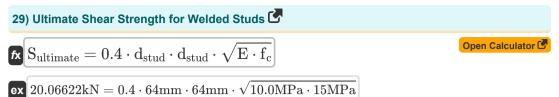
ex
$$19.71155 \mathrm{kN} = 17.4 \cdot 1500 \mathrm{mm} \cdot \left((15 \mathrm{MPa})^{0.5} \right) \cdot \left(150 \mathrm{mm} + \frac{90 \mathrm{mm}}{2} \right)$$



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Variables Used

- a Clear Distance between Transverse Stiffeners (Meter)
- Aconcrete Effective Concrete Area (Square Millimeter)
- Ast Area of Steel Reinforcement (Square Millimeter)
- bw Breadth of Web (Millimeter)
- C Shear Buckling Coefficient C
- d Depth of Cross Section (Millimeter)
- dstud Stud Diameter (Millimeter)
- E Modulus Elasticity of Concrete (Megapascal)
- fc 28 Day Compressive Strength of Concrete (Megapascal)
- fv Yield Strength of Steel (Megapascal)
- h Average Flange Thickness (Millimeter)
- H Cross Section's Height (Meter)
- N No of Connector in Bridge
- P₃ Force in Slab at Negative Moment Point (Kilonewton)
- Pon slab Slab Force (Kilonewton)
- Sultimate Ultimate Shear Connector Stress (Kilonewton)
- t_w Web Thickness (Millimeter)
- V_u Shear Capacity (Kilonewton)
- W Channel Length (Millimeter)





Constants, Functions, Measurements used

- Function: **sqrt**, sqrt(Number) Square root function
- Measurement: Length in Millimeter (mm), Meter (m) Length Unit Conversion
- Measurement: Area in Square Millimeter (mm²) Area Unit Conversion
- Measurement: Pressure in Megapascal (MPa) Pressure Unit Conversion
- Measurement: Force in Kilonewton (kN) Force Unit Conversion
- Measurement: Stress in Megapascal (MPa) Stress Unit Conversion

Check other formula lists

- Additional Bridge Column Formulas
- Allowable Stress Design for Bridges
 Formulas
- Bearing on Milled Surfaces and Bridge Fasteners Formulas
- Composite Construction in Highway Bridges
 Formulas
- Load Factor Design (LFD) Formulas G
- Number of Connectors in Bridges
 Formulas
- Stiffeners on Bridge Girders Formulas G
- Suspension Cables Formulas C

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