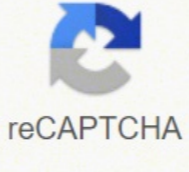




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# Punching shear calculation spreadshe



**RC Slab Punching Shear Stresses check & calculation of required shear reinforcement according to ACI 318M-11 Using USR from RamConcept to CSI SAFE programs** rev 0.0

Project :- **Project**      Designed by:- **M. Abu Shady**  
 Building :- **Building**      Checked by:- **M. Abu Shady**  
 Element:- **Element**      Date:- **22-May-17**  
 Location:- **Location**

**1- General Input:**  
 Slab Thk t = 800 mm       $f_y = 420$  N/mm<sup>2</sup>  
 Clear cover = 83 mm       $f_c' = 45$  N/mm<sup>2</sup>  
 d = 707 mm       $f_{y,stud} = 345$  N/mm<sup>2</sup>  
 Normal weight concrete  $\lambda = 1$

**Column Dimensions**  
 $c_1 = 1000$  mm       $b_c = 6828$  mm from RamConcept or CSI SAFE  
 $c_2 = 1000$  mm Parallel to edge for edge column

**Position Interior Column**  
 $\beta = 1.00$  ACI 11.11.2.1.a  
 $\alpha_s = 40$  ACI 11.11.2.1.b

Unreinforced Stress Ratio from RamConcept or CSI SAFE       $USR = \frac{v_u}{\phi v_c} = 1.380$        $v_u = 2.29$  MPa

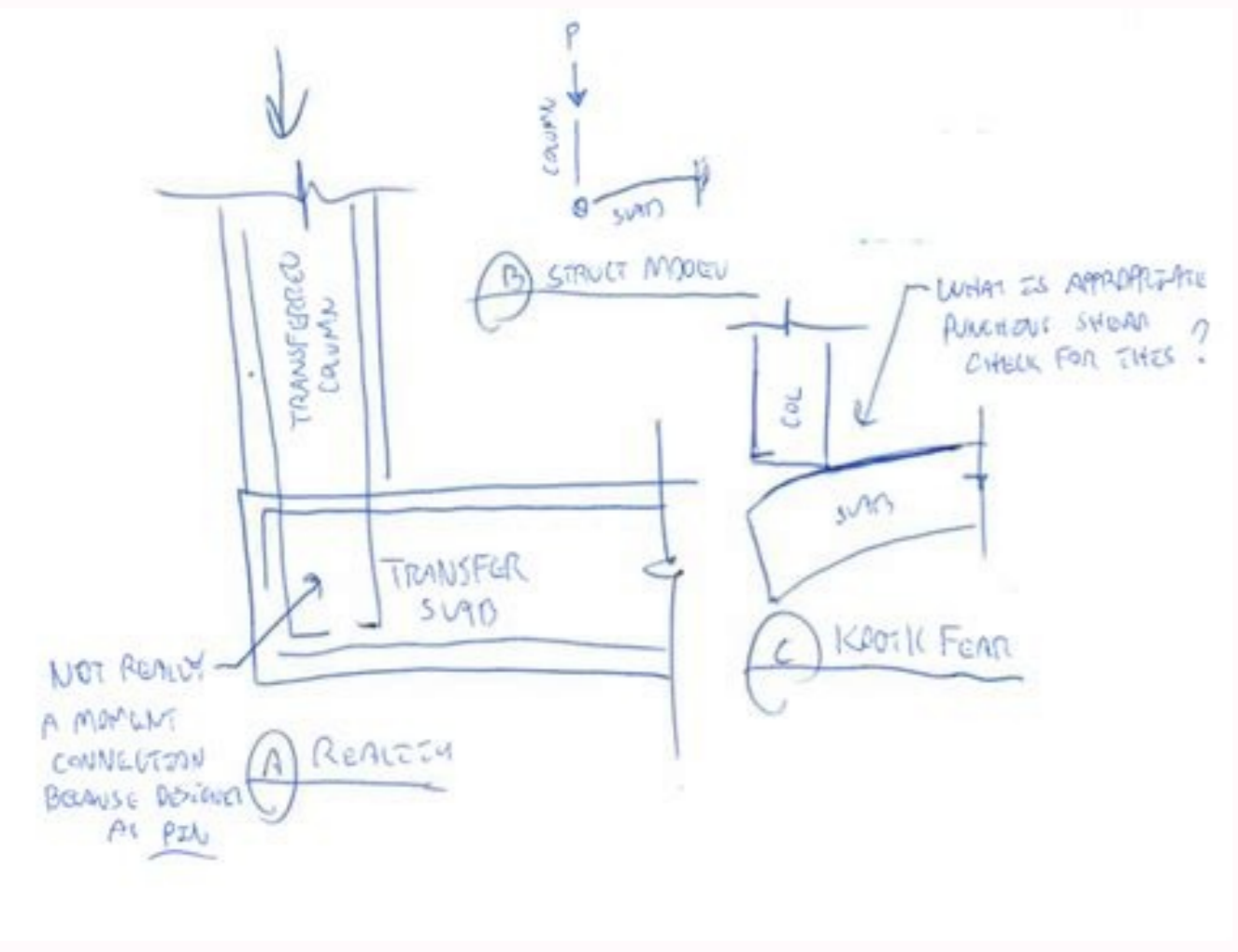
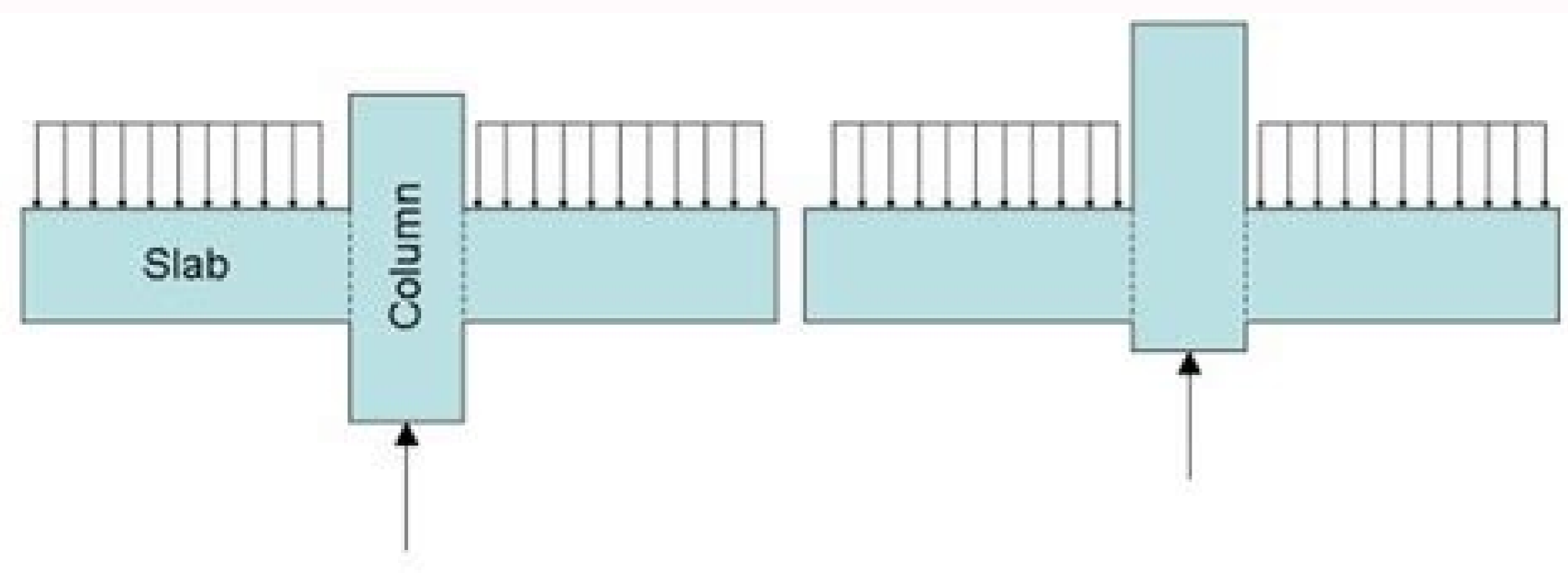
**2- The shear stress resistance provided by Concrete only:**  
 $\phi_{shear} = 0.75$  ACI 9.3.2.3 & ACI 9.3.4.a  
 $\phi v_c = \min. of \left\{ \begin{array}{l} \phi 0.17 \left( 1 + \frac{2}{\beta} \right) \lambda \sqrt{f_c'} = 2.57 \text{ MPa} \\ \phi 0.083 \left( \frac{\alpha_s d}{b_w} + 2 \right) \lambda \sqrt{f_c'} = 2.56 \text{ MPa} \\ \phi 0.33 \lambda \sqrt{f_c'} = 1.66 \text{ MPa} \end{array} \right\}$  ACI 318-11, CI 11.11.2.1

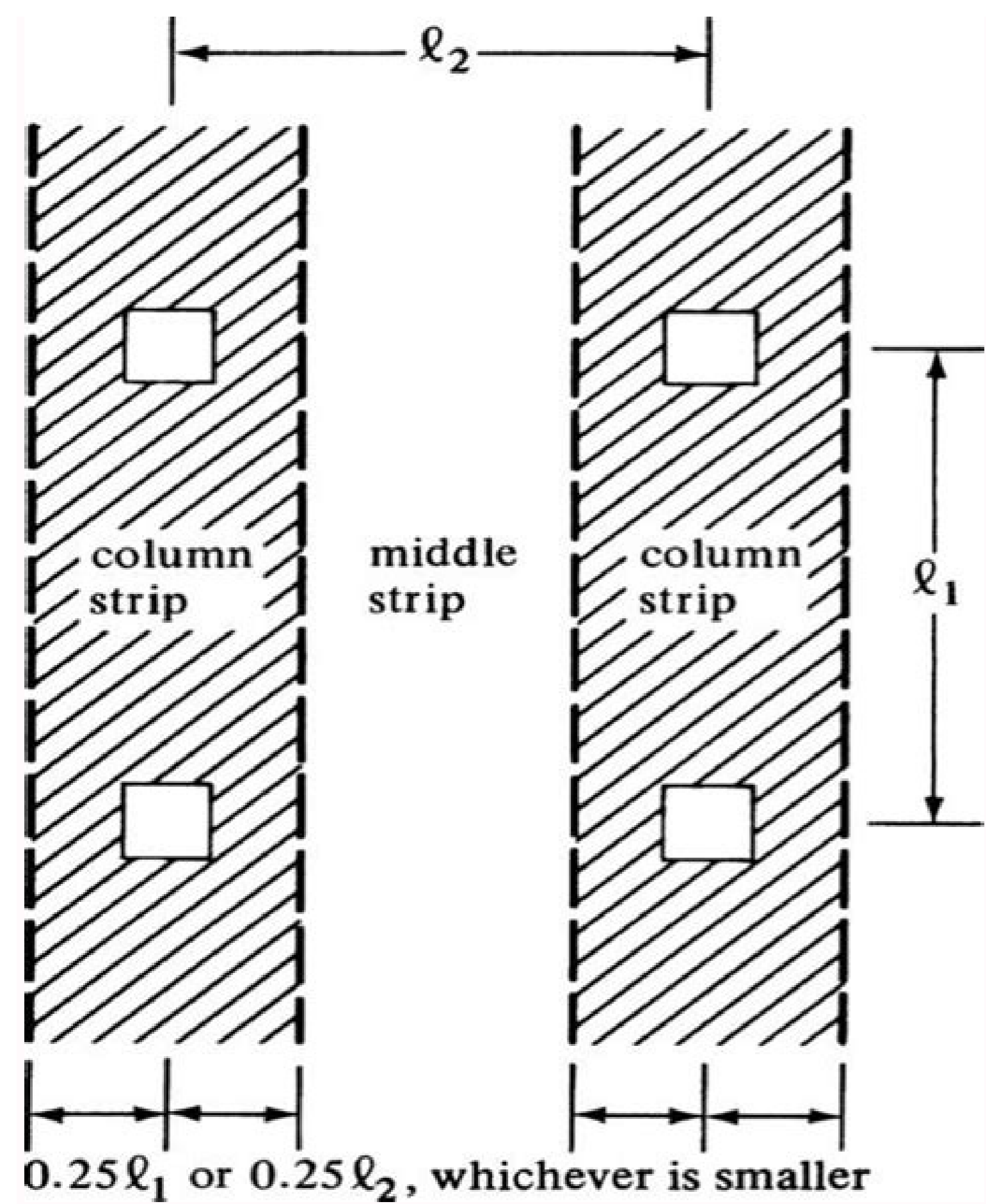
Therefore,  $\phi v_c = 1.66$  MPa       $\phi v_c < v_u$  Use Shear reinforcement or drop panel

**3- The maximum shear stress resistance provided by Concrete & shear reinforcement:**  
 $\phi v_{n,max} = \left\{ \begin{array}{l} \phi 0.5 \sqrt{f_c'} \text{ with rebar shear reinforcement, ACI 318 - 11, CI 11.11.3.2} = 2.52 \text{ MPa} \text{ APPLICABLE} \\ \phi 0.58 \sqrt{f_c'} \text{ with Steel I or C Shear heads, ACI 318 - 11, CI 11.11.4.B} = 2.92 \text{ MPa} \text{ APPLICABLE} \\ \phi 0.66 \sqrt{f_c'} \text{ with Headed Shear stud "SSR", ACI 318 - 11, CI 11.11.5.1} = 3.32 \text{ MPa} \text{ APPLICABLE} \end{array} \right\}$

**4- The maximum shear stress resistance provided by Concrete only in case of using shear reinforcement:**  
 $\phi v_c \text{ with shear rfs} = \left\{ \begin{array}{l} \phi 0.17 \sqrt{f_c'} \text{ with rebar shear reinforcement, ACI 318 - 11, CI 11.11.3.2} = 0.86 \text{ MPa} \\ \phi 0.33 \sqrt{f_c'} \text{ with Steel I or C Shear heads, ACI 318 - 11, CI 11.11.4.B} = 1.66 \text{ MPa} \\ \phi 0.25 \sqrt{f_c'} \text{ with Headed Shear stud "SSR", ACI 318 - 11, CI 11.11.5.1} = 1.26 \text{ MPa} \end{array} \right\}$

**5- Calculating shear stress to be resisted by shear reinforcement:**  
 $v_s = v_u - \phi v_c \text{ with shear rfs} = \left\{ \begin{array}{l} \text{for rebar shear reinforcement} = 1.44 \text{ MPa} \\ \text{for Steel I or C Shear heads} = 0.63 \text{ MPa} \\ \text{for Headed Shear stud "SSR"} = 1.03 \text{ MPa} \end{array} \right\}$





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