

Unless otherwise noted, the content of this course material is licensed under a Creative Commons Attribution 3.0 License.  
<http://creativecommons.org/licenses/by/3.0/>

© 2009, Peter Von Buelow

You assume all responsibility for use and potential liability associated with any use of the material. Material contains copyrighted content, used in accordance with U.S. law. Copyright holders of content included in this material should contact [open.michigan@umich.edu](mailto:open.michigan@umich.edu) with any questions, corrections, or clarifications regarding the use of content. The Regents of the University of Michigan do not license the use of third party content posted to this site unless such a license is specifically granted in connection with particular content. Users of content are responsible for their compliance with applicable law. Mention of specific products in this material solely represents the opinion of the speaker and does not represent an endorsement by the University of Michigan. For more information about how to cite these materials visit <https://open.umich.edu/education/about/terms-of-use>.

Any medical information in this material is intended to inform and educate and is not a tool for self-diagnosis or a replacement for medical evaluation, advice, diagnosis or treatment by a healthcare professional. You should speak to your physician or make an appointment to be seen if you have questions or concerns about this information or your medical condition. Viewer discretion is advised: Material may contain medical images that may be disturbing to some viewers.

15-1

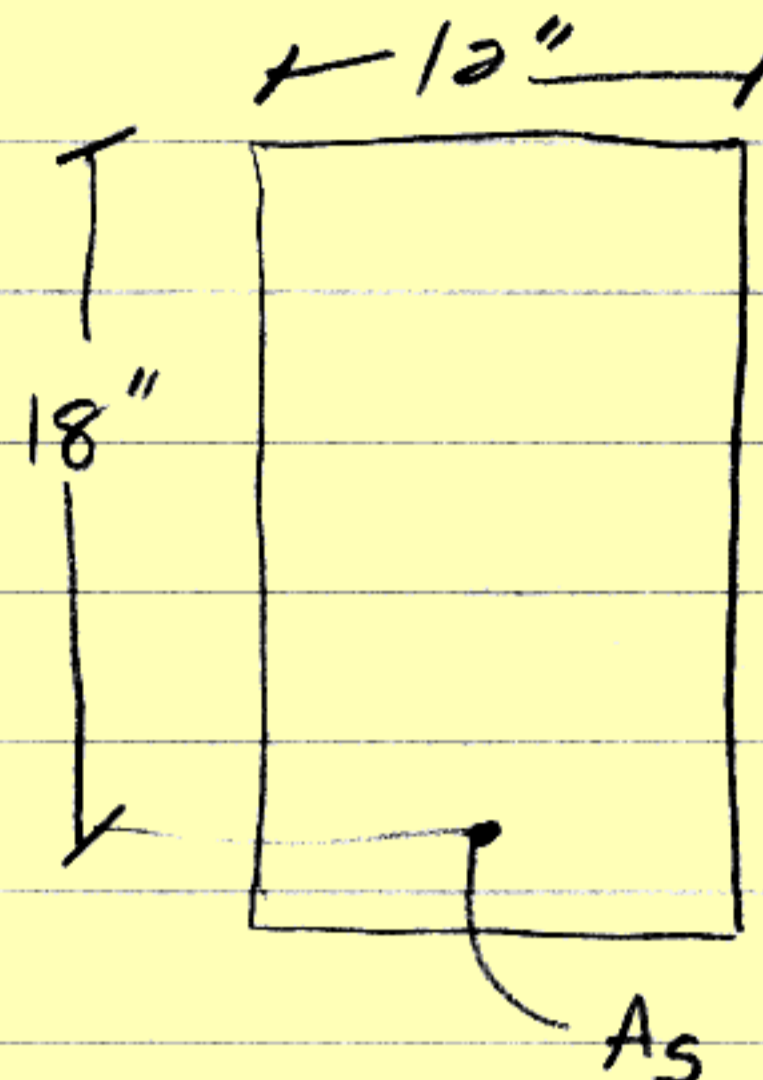
A.2) find  $M_u$

$$f'_c = 3000 \text{ PSI}$$

$$k_1 = 0.85$$

$$f_y = 60 \text{ KSI}$$

$$A_s = 3 \times \#8$$



1)  $A_s = \# \text{ bars (area of 1 bar)}$

$$A_s = 3 (0.79) = 2.37 \text{ in}^2$$

↑ from table p341

2) find limit of a (depth of the stress block)

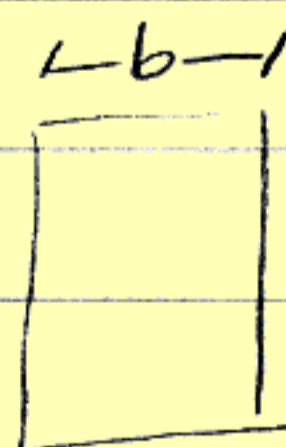
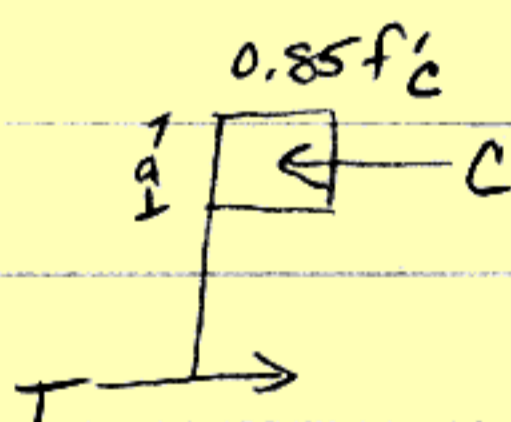
$$a = k_1 \left[ \frac{87}{87 + f_y} \right] d (0.75)$$

based on strength concrete

$$a = 0.85 \left[ \frac{87}{87 + 60} \right] 18 (0.75) \quad a = 6.79''$$

using

$$a = \frac{A_s f_y}{0.85 f'_c b}$$



$$C = T$$

$$0.85 f'_c a b = A_s f_y$$

$$a = \frac{A_s f_y}{0.85 f'_c b}$$

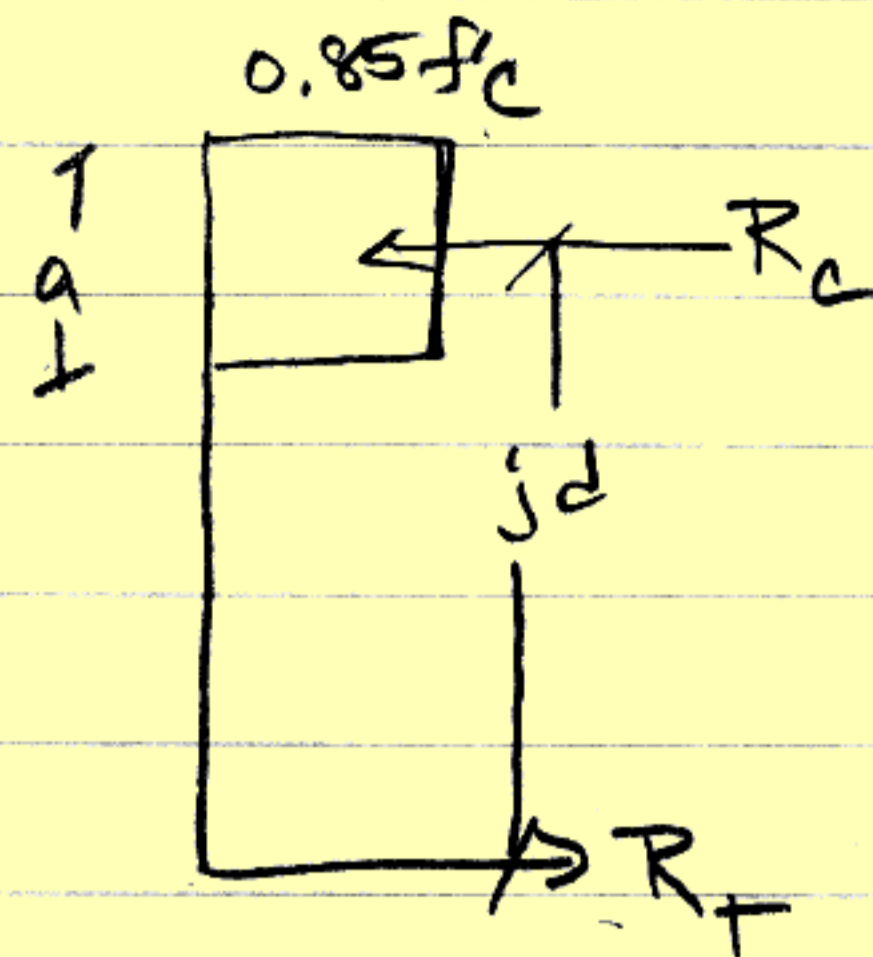
$$a = \frac{2.37 (60)}{0.85 (3) (12)} = 4.65$$

< limit so steel is yielding before compressive failure in concrete

4) find moment capacity

$$\bar{M} = A_s f_y j d = 0.85 f'_c a b j d$$

for a rectangular section  $j d = d - a/2$



$$\bar{M} = M_n = A_s f_y \left( d - \frac{a}{2} \right) = 2.37 (60) \left( 18 - \frac{4.65}{2} \right)$$

$$M_n = 2228.99 \text{ K}'' = 185.75 \text{ K}'$$

$$5) M_u = 0.9 M_n \quad M_u = 0.9 (185.75) = 167.18 \text{ K}'$$