D.6.2.4

Section D.6.2.4 of ACI 318-02 deals with a very unusual condition where the shear is directed toward a free edge but there are two other close edges perpendicular to the applied load and the member thickness is less than 1.5 times the edge distance that the shear is directed toward. Although an infrequent occurrence, the current wording of D.6.2.4 has caused concern and rightly so. There was a change back in 1997 that dropped a term from this section unintentionally. The 1997 CB 30 wording, the proposed revision to D.6.2.4, and a possible new figure are provided below.

October 11, 1997 CB 30 files:

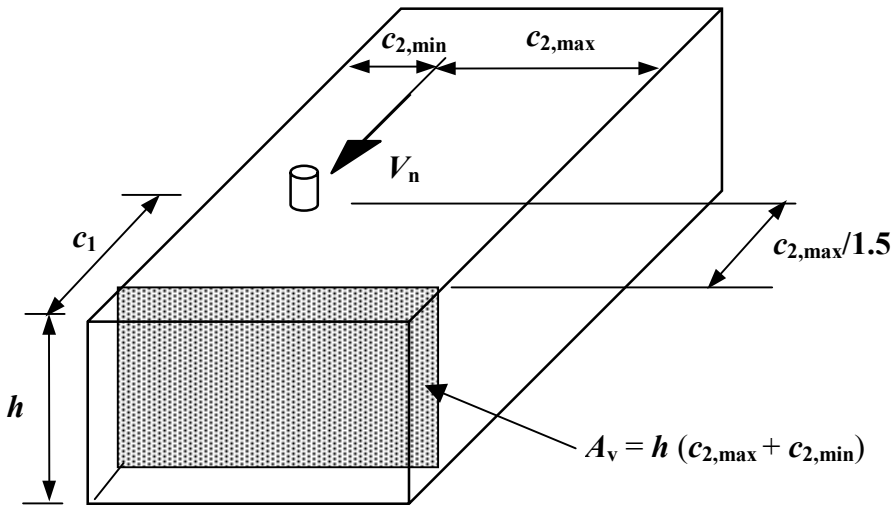
23.7.3 - For the special case of fastenings in a narrow, thin member with $c_{2,max} \leq 1.5\ c_1$, the edge distance c_1 used in Eqns. 23-13, 23-14, 23-15 and 23-16 shall be limited to the maximum of either $c_{2,max}/1.5$ or h/1.5.

R23.7.3 - For fasteners influenced by three or more edges where any edge distance is less than $1.5c_1$, the shear breakout strength computed by the ordinary CCD method which is the basis for Eq. 23-14 gives safe, but misleading results. These special cases were studied for the k-method [5] and the problem was pointed out by Lutz [14]. Similar to the approach used for tensile breakouts in Sec. 23.6.3, a correct evaluation of capacity is determined if the value of c_1 to be used in Eqs. 23-13, 23-14, 23-15 and 23-16 is limited to the larger of either $c_{2,max}/1.5$ or h/1.5.

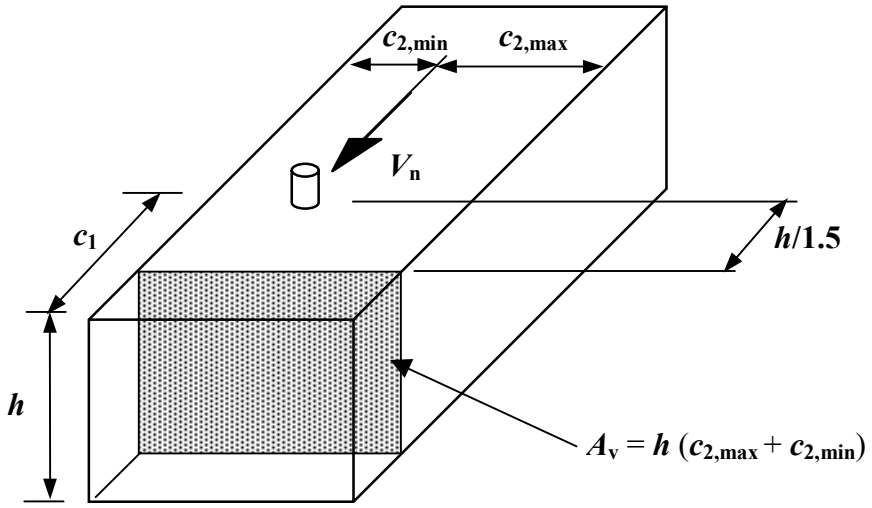
Proposed Revision to ACI 318-02 Appendix D:

D.6.2.4 - For the special case of anchors in a narrow ($c_{2,max} < 1.5c_1$), thin ($h < 1.5c_1$) member ~~influenced by three or more edges~~, the edge distance c_1 used in Eq. (D-22), (D-23), (D-24), (D-25), (D-26) and (D-27) shall be limited to $c_{2,max}/1.5$ if $c_{2,max} > h$ or $h/1.5$ if $c_{2,max} < h$.

RD.6.2.4 – For anchors in a narrow ($c_{2,max} < 1.5c_1$), thin ($h < 1.5c_1$) member ~~influenced by three or more edges where any edge distance is less than $1.5c_1$~~, the shear breakout strength computed by the basic CCD Method, which is the basis for Eq. (D-23) and (D-24), gives safe but misleading results. These special cases were studied for the κ Method[D.14] and the problem was pointed out by Lutz[D.20]. Similar to the approach used for tensile breakouts in D.5.2.3, a correct evaluation of the capacity is determined if the value of c_1 to be used in Eq. (D-22) to (D-27) is limited to $c_{2,max}/1.5$ if $c_{2,max} > h$ or $h/1.5$ if $c_{2,max} < h$. This is shown in Fig. RD.6.2.4.



$c_{2,max} > h$: Use $c_{2,max}$ /**1.5** for c_1 in Eq. (D-22) to (D-27)



$c_{2,max} < h$: Use h/**1.5** for c_1 in Eq. (D-22) to (D-27)

Fig. RD.6.2.4 - Shear in narrow ($c_{2,max} < 1.5c_1$), thin ($h < 1.5c_1$) members