5.13.2.3—Detailing Requirements for Deep Beams

The factored tensile resistance, N_R in kips, of transverse pair of reinforcing bars shall satisfy:

$$N_R = \phi f_y A_s \geq 0.12 b_v s \qquad (5.13.2.3\text{-}1)$$

where:

b_v = width of web (in.)
f_y = yield strength of reinforcing steel (ksi)
A_s = area of steel in distance s (in.^{2})
ϕ = resistance factor specified in Article 5.5.4.2
s = spacing of reinforcement (in.)

C5.13.2.3

Figure C5.13.2.3-1 shows an application of the strut-and-tie model to analysis of deep beams.

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1. What are "transverse pair of reinforcing bars"? Is this a limit of minimum stirrup in deep beam?

The spacing of transverse reinforcement, s, shall not exceed $d/4$ or 12.0 in.

Bonded longitudinal bars shall be well distributed over each face of the vertical elements in pairs. The tensile resistance of a bonded reinforcement pair shall not be less than that specified in Eq. 5.13.2.3-1. The vertical spacing between each pair of reinforcement, s, shall not exceed either $d/3$ or 12.0 in. For components whose width is less than 10.0 in., a single bar of the required tensile resistance may be used in lieu of a pair of longitudinal bars.
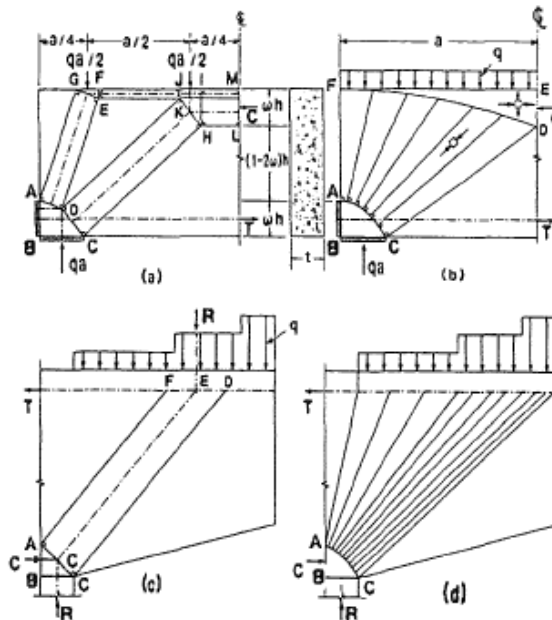

Figure C5.13.2.3-1—Fan Action: (a) Strut-and-Tie Model of Uniformly-Loaded Deep Beam; (b) Fan-Shaped Stress Field; (c) Strut-and-Tie System for Equivalent Single-Load R Replacing Distributed-Load q; (d) Continuous Fan Developed from Discrete Strut

2. What are the "bonded longitudinal bars? Are they also stirrups, but placed longitudinally? Here "bonded" means bonded with concrete?
3. Can I understand that section 5.13.2.3 specifies minimum transverse/longitudinal stirrups?