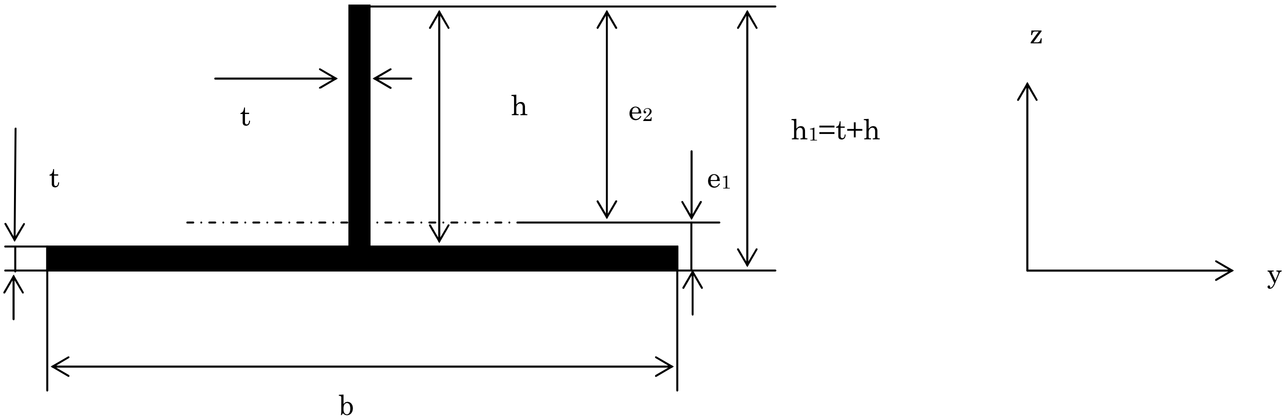
The background of formula for net section modulus of web stiffener in Ch 6 Sec 2 [4.1.2]

Model　Web stiffener is flat bar type and the web thickness of the web stiffener is equal to that of the attached plate



In this case, the moment of inertia of the stiffener with attached panel is given by the following equations.

Moment of inertia $$I_y = \frac{h_1^{\,3} t + (b-t)t^3}{3} - t(b+h) * e_1^{\,2} \tag{1}$$

$$e_1 = \frac{1}{2}\frac{h_1^{\,2} + (b-t)t}{b+h} \quad \text{and} \quad e_2 = h_1 - e_1 \tag{2}$$

Minimum Section modulus $$Z = I_y / e_2 \tag{3}$$

Normally, $t << b, and\ t << h$, then the equation (3) for the section modulus can be expresses by the following equation

$$Z = \frac{th^2}{6}\frac{1+4b/h}{1+2b/h} = \frac{th^2}{6}\left(2 - \frac{1}{1+2b/h}\right) = \frac{th^2}{3}\left(1 - \frac{0.5}{1+2b/h}\right) \tag{4}$$

If the term $\left(1 - \frac{0.5}{1+2b/h}\right)$ is assumed to be proportional to the square of a spacing Ss, in m, of web stiffener and the height of web stiffener can be assumed to be $\ell/12$, where ℓ is the length of web stiffener, according to the requirement in Ch 3 Sec 6 5.2.1, then we can get the following equation.

$$Z = \frac{th^2}{3}\left(1 - \frac{0.5}{1+2b/h}\right) = \frac{t}{3}\left(\frac{\ell}{12}\right)^2 S_s^{\,2} = \frac{1}{432} t\ell^3 S_s^{\,2} \approx 2.5 * 10^{-3} t\ell^2 S_s^{\,2} \tag{5}$$

Considering the used units of symbols, we can get the rule formula in Ch 6 Sec 2 [4.1.2].