Ch. 6 Sec. 2 [3.3] - Sectional modulus of main frames of single side bulk carriers in way of ballast hold.

The requirement for mid-span sectional modulus is given in [3.3.1]

Quote:
The net section modulus *w*, in cm^3, and the net shear sectional area A_{sh}, in cm^2, of side frames subjected to lateral pressure are to be not less, in the mid-span area, than the values obtained from the following formulae:

$$w = 1.125\alpha_m \frac{(p_S + p_W)s\ell^2}{m\lambda_S R_Y} 10^3 \qquad \text{(Eq1)}$$

$$A_{sh} = 1.1\alpha_S \frac{5(p_S + p_W)s\ell}{\tau_a \sin\phi}\left(\frac{\ell - 2\ell_B}{\ell}\right)$$

(..)
In addition to the above provision, the net section modulus *w*, in cm^3, and the net shear sectional area A_{sh} , in cm^2, of side frames subjected to lateral pressure in holds intended to carry ballast water are to be in accordance with [3.2.3].

Unquote.
We assume (p_s + p_w) is all intact pressures as specified in Ch. 6 Sec. 2 [1.3]. Please confirm.

The requirement of [3.2.3] is
Quote
The net section modulus *w*, in cm^3, and the net shear sectional area A_{sh}, in cm^2, of single span ordinary stiffeners subjected to lateral pressure are to be not less than the values obtained from the following formulae:

$$w = \frac{(p_S + p_W)s\ell^2}{m\lambda_S R_Y} 10^3 \qquad \text{(Eq2)}$$

$$A_{sh} = \frac{5(p_S + p_W)s\ell}{\tau_a \sin\phi}$$

Unqoute
We assume this is applicable for (p_s + p_w) from ballast inside the cargo hold only.
Our experience is that the ballast pressure is normally decisive for these main frames.

For a BCA vessel, the sectional modulus requirement of [3.3.1] can be written as:

$$w_{Eq1} = 1.125\alpha_m \frac{(p_S + p_W)s\ell^2}{m\lambda_S R_Y} 10^3 = 0.47 \frac{(p_S + p_W)s\ell^2}{m\lambda_S R_Y} 10^3 \approx \frac{w_{Eq2}}{2}$$

That is, the requirement from Eq2 is 2 x Eq1.

The requirement at ends are defined in [3.3.3] for Lower End and [3.3.4] for Upper End. Requirement for ends are required as 2 x [3.3.1] equation.

Q1: In the text above Eq1 it is quoted “in the mid span area”. Is the sectional modulus of Eq2 also intended to be satisfied in the mid span area?
Q2: The requirement of [3.3.3] and [3.3.4] specifies w_{END} to be two times the section modulus required for midspan area according to [3.3.1]. We assume this is 2 x Eq 1 only and not 2 x max(Eq1, Eq2). Please confirm.