

**Anexa B - Pod DN7 km 377+212****Verificarea sectiunii noi a podului - Sectiunea 17 (mijlocul deschiderii centrale)**

$$b_{dala} := 8.00m$$

Latimile de calcul ale fasciilor centrale si marginale sunt:

$$b_{A13\_central} := 1.40m \quad b_{S60\_central} := 2.65m \quad b_{A30\_central} := 1.50m \quad b_{V80\_central} := 2.75m$$

$$b_{A13\_marginal} := 1.45m \quad b_{S60\_marginal} := 2.00m \quad b_{A30\_marginal} := 1.55m \quad b_{V80\_marginal} := 2.10m$$

Sectiunea existenta dimensionata pentru clasa I (A13, S60):

$$q_{dala} := 178.95 \frac{kN}{m}$$

$$q_{cale} := 46.71 \frac{kN}{m}$$

$$M_{dala} := q_{dala} \cdot (-2.291 + 11.908 - 2.291) \cdot m^2 = 1311 \cdot kN \cdot m$$

$$M_{cale} := q_{cale} \cdot (-2.291 + 11.908 - 2.291) \cdot m^2 = 342 \cdot kN \cdot m$$

$$\psi := 1.24 \quad \text{coeficient dinamic}$$

$$M_{S60} := 60 \frac{kN}{m} \cdot (8.07) \cdot m^2 = 484 \cdot kN \cdot m$$

$$M_{A13} := \psi \cdot \left[ \frac{39}{2} kN \cdot (-0.069 + 0.589 - 0.069) \cdot m \dots \right. \\ \left. + \frac{91}{2} kN \cdot (-0.325 - 0.205) \cdot m + \frac{45.5}{2} kN \cdot (0.589)m + \frac{123.5}{2} kN \cdot (2.186)m \right] = 165 \cdot kN \cdot m$$

$$M_{oameni} := 5 \frac{kN}{m} \cdot (-2.291 + 11.908 - 2.291) \cdot m^2 = 37 \cdot kN \cdot m$$

$$M_{A13\_oameni} := M_{A13} + M_{oameni} = 202 \cdot kN \cdot m$$

$$M_{utile} := \max(M_{S60}, M_{A13\_oameni}) = 484 \cdot kN \cdot m$$

$$M_{c\_utile\_clasaIA13} := M_{A13\_oameni} = 202 \cdot kN \cdot m \quad \text{le luam unitare}$$

$$M_{c\_utile\_clasaIS60} := M_{S60} = 484 \cdot kN \cdot m$$

**Momentul de calcul in sectiunea 17 pentru fasia marginala, clasa IA13, este:**

$$M_{17\_marginal\_clasaIA13} := \frac{1.1 \cdot M_{dala} \cdot m}{b_{dala}} + \frac{1.5 \cdot M_{cale} \cdot m}{b_{dala}} + \frac{M_{c\_utile\_clasaIA13} \cdot m}{b_{A13\_marginal}} = 383 \cdot kN \cdot m$$

$$b := 1m$$

$$h := 0.8m$$

$$\phi := 20mm$$

$$c := 3\text{cm}$$

$$a := c + 0.01\text{m} + \frac{\phi}{2} = 5\cdot\text{cm}$$

$$h_0 := h - a = 75\cdot\text{cm}$$

$$r := 0.906 \quad k := 969.5$$

$$A_{a\_nec\_clasaIA13\_marginal} := \frac{r^2 \cdot M_{17\_marginal\_clasaIA13} \cdot 10^4 \cdot \text{cm}^2}{k \cdot h_0 \cdot \text{kN} \cdot 100} = 43.29 \cdot \text{cm}^2$$

Momentul de calcul in secțiunea 17 pentru fasia marginala, clasa I S60, este:

$$M_{17\_marginal\_clasaIS60} := \frac{1.1 \cdot M_{dala} \cdot \text{m}}{b_{dala}} + \frac{1.5 \cdot M_{cale} \cdot \text{m}}{b_{dala}} + \frac{M_{c\_utile\_clasaIS60} \cdot \text{m}}{b_{S60\_marginal}} = 487 \cdot \text{kN} \cdot \text{m}$$

$$b := 1\text{m}$$

$$h := 0.8\text{m}$$

$$\phi := 20\text{mm}$$

$$c := 3\text{cm}$$

$$a := c + 0.01\text{m} + \frac{\phi}{2} = 5\cdot\text{cm}$$

$$h_0 := h - a = 75\cdot\text{cm}$$

$$r := 0.906 \quad k := 969.5$$

$$A_{a\_nec\_clasaIS60\_marginal} := \frac{r^2 \cdot M_{17\_marginal\_clasaIS60} \cdot 10^4 \cdot \text{cm}^2}{k \cdot h_0 \cdot \text{kN} \cdot 100} = 54.923 \cdot \text{cm}^2$$

$$A_{a\_nec\_clasaI\_marginal} := \min(A_{a\_nec\_clasaIA13\_marginal}, A_{a\_nec\_clasaIS60\_marginal}) = 43.29 \cdot \text{cm}^2$$

Momentul de calcul in secțiunea 17 pentru fasia centrala, clasa I A13, este:

$$M_{17\_central\_clasaIA13} := \frac{1.1 \cdot M_{dala} \cdot \text{m}}{b_{dala}} + \frac{1.5 \cdot M_{cale} \cdot \text{m}}{b_{dala}} + \frac{M_{c\_utile\_clasaIA13} \cdot \text{m}}{b_{A13\_central}} = 388 \cdot \text{kN} \cdot \text{m}$$

$$b := 1\text{m}$$

$$h := 0.8\text{m}$$

$$\phi := 20\text{mm}$$

$$c := 3\text{cm}$$

$$\underline{a} := c + 0.01\text{m} + \frac{\phi}{2} = 5 \cdot \text{cm}$$

$$\underline{h_0} := h - a = 75 \cdot \text{cm}$$

$$\underline{r} := 0.906 \quad \underline{k} := 969.5$$

$$A_{a\_nec\_clasaIA13\_central} := \frac{r^2 \cdot M_{17\_central\_clasaIA13} \cdot 10^4 \cdot \text{cm}^2}{k \cdot h_0 \cdot \text{kN} \cdot 100} = 43.851 \cdot \text{cm}^2$$

Momentul de calcul in secțiunea 17 pentru fasia centrala, clasa I S60, este:

$$M_{17\_central\_clasaIS60} := \frac{1.1 \cdot M_{dala} \cdot \text{m}}{b_{dala}} + \frac{1.5 \cdot M_{cale} \cdot \text{m}}{b_{dala}} + \frac{M_{c\_utile\_clasaIS60} \cdot \text{m}}{b_{S60\_central}} = 427 \cdot \text{kN} \cdot \text{m}$$

$$\underline{b} := 1\text{m}$$

$$\underline{h} := 0.8\text{m}$$

$$\underline{\phi} := 20\text{mm}$$

$$\underline{c} := 3\text{cm}$$

$$\underline{a} := c + 0.01\text{m} + \frac{\phi}{2} = 5 \cdot \text{cm}$$

$$\underline{h_0} := h - a = 75 \cdot \text{cm}$$

$$\underline{r} := 0.906 \quad \underline{k} := 969.5$$

$$A_{a\_nec\_clasaIS60\_central} := \frac{r^2 \cdot M_{17\_central\_clasaIS60} \cdot 10^4 \cdot \text{cm}^2}{k \cdot h_0 \cdot \text{kN} \cdot 100} = 48.219 \cdot \text{cm}^2$$

$$A_{a\_nec\_clasaI\_central} := \min(A_{a\_nec\_clasaIA13\_central}, A_{a\_nec\_clasaIS60\_central}) = 43.851 \cdot \text{cm}^2$$

Secțiunea proiectată dimensionată Clasa E (A30, V80):

$$q_{dala} := 223.03 \frac{\text{kN}}{\text{m}}$$

$$q_{cale} := 37.10 \frac{\text{kN}}{\text{m}}$$

$$M_{dala} := q_{dala} \cdot (-2.291 + 11.908 - 2.291) \cdot \text{m}^2 = 1634 \cdot \text{kN} \cdot \text{m}$$

$$M_{cale} := q_{cale} \cdot (-2.291 + 11.908 - 2.291) \cdot \text{m}^2 = 272 \cdot \text{kN} \cdot \text{m}$$

$$M_{V80} := \frac{200}{2} \text{kN} \cdot (1.368 + 1.896 + 1.896 + 1.368) \cdot \text{m} = 653 \cdot \text{kN} \cdot \text{m}$$

$$\psi := 1.24 \quad \text{coeficient dinamic}$$

$$M_{A30} := \psi \cdot \left[ \frac{60}{2} \text{kN} \cdot (0.093 - 0.335) \cdot \text{m} \dots \right] = 256 \cdot \text{kN} \cdot \text{m}$$

$$+ \frac{120}{2} \text{kN} \cdot (-0.069 + 2.186 + 1.451) \cdot \text{m}$$

$$M_{oameni} := 5 \frac{\text{kN}}{\text{m}} \cdot (-2.291 + 11.908 - 2.291) \cdot \text{m}^2 = 37 \cdot \text{kN} \cdot \text{m}$$

$$M_{A30\_oameni} := M_{A30} + M_{oameni} = 293 \cdot \text{kN} \cdot \text{m}$$

$$M_{utile} := \max(M_{V80}, M_{A30\_oameni}) = 653 \cdot \text{kN} \cdot \text{m}$$

$$M_{c\_utile\_clasaE} := \max(1.2M_{V80}, 1.4M_{A30\_oameni}) = 783 \cdot \text{kN} \cdot \text{m}$$

**Momentul de calcul în secțiunea 17 pentru fasia marginală, clasa E, este:**

$$M_{17\_marginal\_clasaE} := \frac{1.1 \cdot M_{dala} \cdot \text{m}}{b_{dala}} + \frac{1.5 \cdot M_{cale} \cdot \text{m}}{b_{dala}} + \frac{M_{c\_utile\_clasaE} \cdot \text{m}}{b_{V80\_marginal}} = 649 \cdot \text{kN} \cdot \text{m}$$

$$R_a := 300 \frac{\text{N}}{\text{mm}^2} \quad R_c := 12.5 \frac{\text{N}}{\text{mm}^2}$$

$$b := 1.00 \text{m}$$

$$h := 990 \text{mm}$$

$$\phi := 20 \text{mm}$$

$$c := 3 \text{cm}$$

$$a := c + 0.01 \text{m} + \frac{\phi}{2} = 5 \cdot \text{cm}$$

$$h_0 := h - a = 0.94 \text{m}$$

$$x := h_0 - \sqrt{h_0^2 - \frac{2 \cdot M_{17\_marginal\_clasaE}}{b \cdot R_c}} = 57 \cdot \text{mm}$$

$$A_{a\_nec\_clasaE\_marg} := \frac{b \cdot x \cdot R_c}{R_a} = 23.72 \cdot \text{cm}^2$$

$$\phi_{a1} := 20 \text{ mm} \quad A_{1\phi a1} := \frac{\pi \cdot \phi_{a1}^2}{4} = 3.14 \cdot \text{cm}^2 \quad nr_{nec1} := \frac{A_{a\_nec\_clasaE\_marg}}{A_{1\phi a1}} = 7.6$$

Disponem 11Φ20/ml:  $nr_{real} := 11$   $A_{a1\_real\_clasaE\_marg} := nr_{real} \cdot A_{1\phi a1} = 35 \cdot \text{cm}^2$

$$x_{real} := \frac{A_{a1\_real\_clasaE\_marg} \cdot R_a}{b \cdot R_c} = 82.9 \cdot \text{mm}$$

$$M_{cap1} := A_{a1\_real\_clasaE\_marg} \cdot R_a \cdot \left( h_0 - \frac{x_{real}}{2} \right) = 932 \cdot \text{kN} \cdot \text{m}$$

$$CP1 := \frac{M_{cap1}}{M_{17\_marginal\_clasaE}} = 1.44$$

Momentul de calcul in secțiunea 17 pentru fasia centrala, clasa E, este:

$$M_{17\_central\_clasaE} := \frac{1.1 \cdot M_{dala} \cdot m}{b_{dala}} + \frac{1.5 \cdot M_{cale} \cdot m}{b_{dala}} + \frac{M_{c\_utile\_clasaE} \cdot m}{b_{V80\_central}} = 560 \cdot \text{kN} \cdot \text{m}$$

$$\tilde{x} := h_0 - \sqrt{h_0^2 - \frac{2 \cdot M_{17\_central\_clasaE}}{b \cdot R_c}} = 49 \cdot \text{mm}$$

$$A_{a\_nec\_clasaE\_central} := \frac{b \cdot x \cdot R_c}{R_a} = 20.407 \cdot \text{cm}^2$$

$$\tilde{\phi}_{a1} := 20 \text{ mm} \quad \tilde{A}_{1\phi a1} := \frac{\pi \cdot \phi_{a1}^2}{4} = 3.14 \cdot \text{cm}^2 \quad \tilde{nr}_{nec1} := \frac{A_{a\_nec\_clasaE\_central}}{A_{1\phi a1}} = 6.5$$

Disponem 8Φ20/ml:  $\tilde{nr}_{real} := 8$   $A_{a1\_real\_clasaE\_central} := \tilde{nr}_{real} \cdot A_{1\phi a1} = 25 \cdot \text{cm}^2$

$$\tilde{x}_{real} := \frac{A_{a1\_real\_clasaE\_central} \cdot R_a}{b \cdot R_c} = 60.3 \cdot \text{mm}$$

$$\tilde{M}_{cap1} := A_{a1\_real\_clasaE\_central} \cdot R_a \cdot \left( h_0 - \frac{x_{real}}{2} \right) = 686 \cdot \text{kN} \cdot \text{m}$$

$$\tilde{CP1} := \frac{\tilde{M}_{cap1}}{M_{17\_central\_clasaE}} = 1.22$$

$$A_{a\_nec\_clasaI\_marginal} > A_{a\_nec\_clasaE\_marg} = 1$$

$$A_{a\_nec\_clasaI\_central} > A_{a\_nec\_clasaE\_central} = 1$$