

RESULTADOS DO ENSAIO DA VIGA DE CONCRETO PROTENDIDO

1- RESISTÊNCIAS DO CONCRETO:

idade 26 dias

Ensaio de compressão simples (CP 15x30):

22,1 – 23,1 – 24,2 Média $\Rightarrow f_c = 23,1 \text{ MPa}$

Ensaio de compressão diametral (CP 15x30):

2,27 – 2,30 – 2,30 Média $\Rightarrow f_{ct,sp} = 2,29 \text{ MPa}$

Convertendo para tração simples (NBR-6118/2003):

$$f_{ct} = 0,9 f_{ct,sp} = 0,9 \times 2,29 = 2,06 \text{ MPa}$$

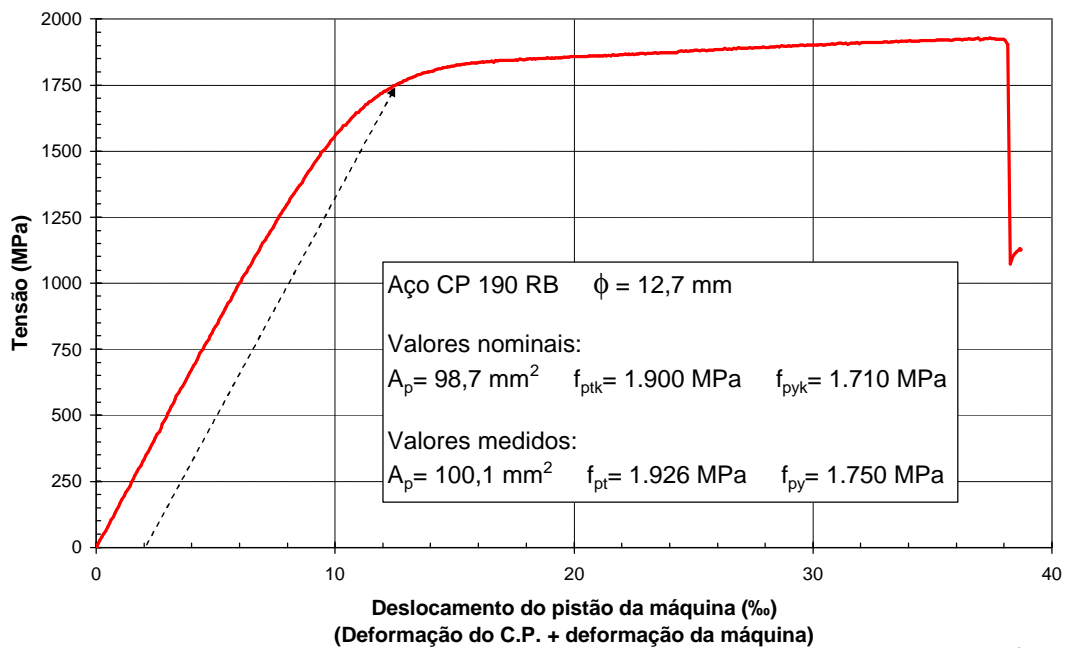
Previsão de f_{ct} a partir de f_c (NBR-6118/2003):

$$f_{ct,m} = 0,3 f_c^{2/3} = 0,3 \times 23,1^{2/3} = 2,43 \text{ MPa}$$

$$f_{ct,inf} = 0,7 f_{ct,m} = 0,7 \times 2,43 = 1,70 \text{ MPa}$$

1

2- RESISTÊNCIA DA ARMADURA DE PROTENSÃO



2

3- E. L. S. – Descompressão

$$\begin{aligned} f_c &= 23 \text{ MPa} & f_{ct} &= 2,06 \text{ MPa} & E_{ci} &= 26.857 \text{ MPa} & E_{cs} &= 22.828 \text{ MPa} \\ A_c &= 264 \text{ cm}^2 & I_c &= 32.400 \text{ cm}^4 & W_1 &= -W_2 & &= 2.160 \text{ cm}^3 \\ P &= -90 \text{ kN} & e_p &= 12,75 \text{ cm} & & & & \end{aligned}$$

$$\sigma_{1p} = -90 (1/264 + 12,75/2.160) = -0,872 \text{ kN/cm}^2$$

$$\sigma_{1p} + \sigma_{1M} = 0 \Rightarrow \sigma_{1M} = 0,872$$

$$\Rightarrow M = 0,872 \times 2.160 = 1.884 \text{ kN.cm} \Rightarrow F = 1.884 / 125 = 15 \text{ kN}$$

4- E. L. S. – Formação de fissuras

$$\sigma_{1p} + \sigma_{1M} = 1,2 f_{ct} \Rightarrow \sigma_{1M} = 0,872 + 1,2 \times 0,206 = 1,119 \text{ kN/cm}^2$$

$$\Rightarrow M_r = 1,119 \times 2.160 = 2.417 \text{ kN.cm} \Rightarrow F_r = 2.417 / 125 = 19 \text{ kN}$$

Valor observado no ensaio: $F_r = 22 \text{ kN}$

3

5- CARGA DE RUPTURA \Rightarrow Estádio III

$$\begin{aligned} \text{Dados: } f_c &= 23 \text{ MPa} & f_{sy} &= 680 \text{ MPa} & A_s &= 0,62 \text{ cm}^2 & (2 \phi 6,3\text{mm}) \\ f_{py} &= 1.750 \text{ MPa} & f_{pt} &= 1.926 \text{ MPa} & A_p &= 1,001 \text{ cm}^2 & (1\phi 12,7\text{mm}) \end{aligned}$$

O E.L. Último é atingido no domínio 2:

$$\begin{aligned} \sigma_s &= 680 \text{ MPa} & \varepsilon_s &= 10\text{‰} & R_{st} &= 0,62 \times 68,0 = 42,16 \text{ kN} \\ \sigma_p &= 1.750 \text{ MPa} & \varepsilon_p &= 10\text{‰} & R_{pt} &= 1,001 \times 175,0 = 175,18 \text{ kN} \\ \sigma_c &= 23 \text{ MPa} & \varepsilon_c &= 3,44\text{‰} & R_{cc} &= 217,3 \text{ kN} \\ A_{cc} &= 94,49 \text{ cm}^2 & y &= 5,69 \text{ cm} & x &= 7,11 \text{ cm} & z &= 24,91 \text{ cm} \end{aligned}$$

$$M_u = (R_{st} + R_{pt}) \cdot z = R_{cc} \cdot z = 5.414 \text{ kN.cm} \Rightarrow F_u = 5.414 / 125 = 43 \text{ kN}$$

Valor obtido no ensaio: $F_u = 49 \text{ kN}$

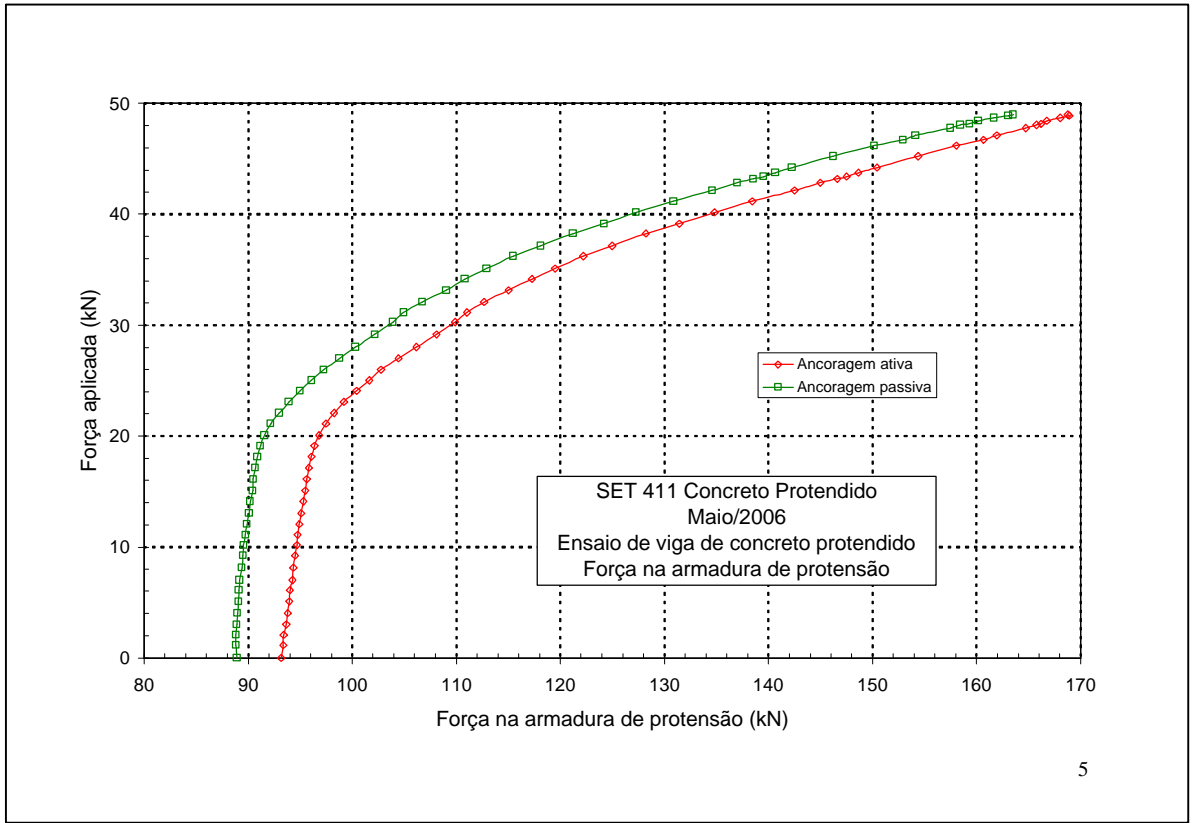
$$\text{Viga de C.P.: } R_{st} + R_{pt} = 217 \text{ kN}$$

$$\text{Viga de C.A.: } R_{st} = 3,6 \times 60,0 = 216 \text{ kN}$$

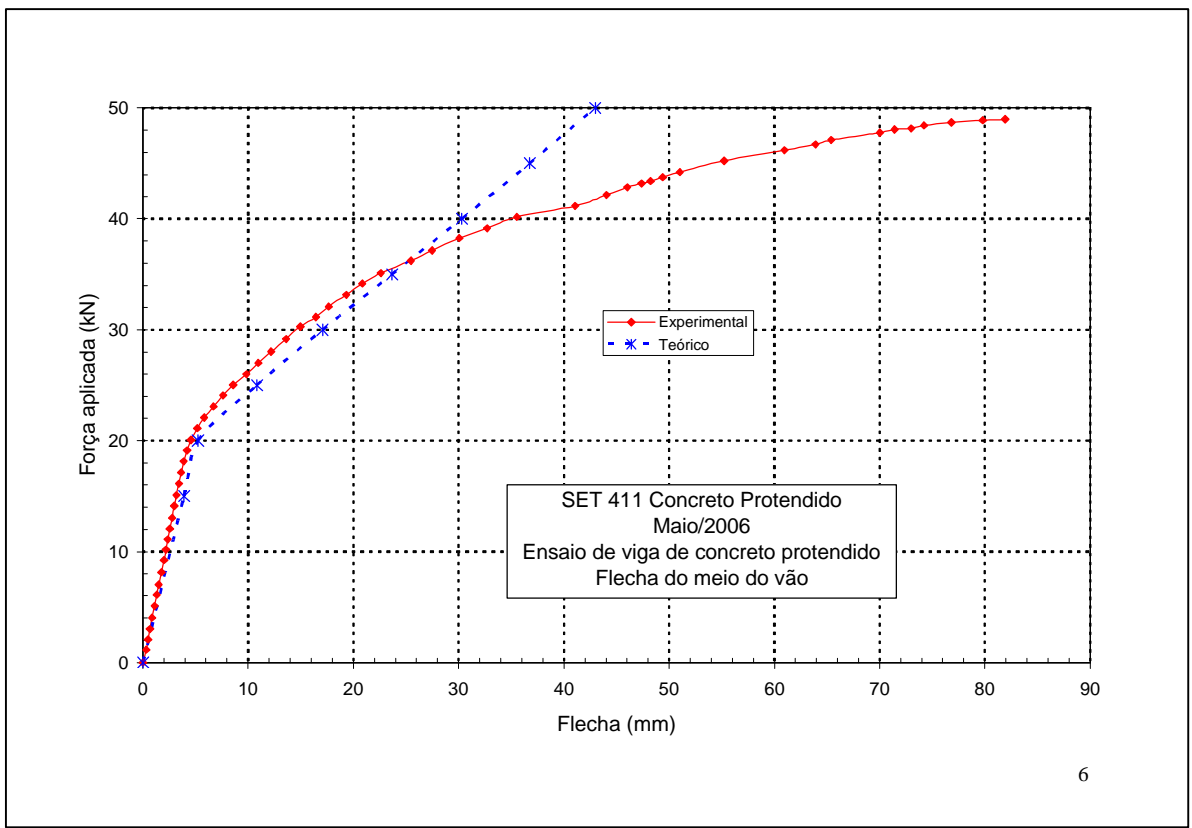
$$R_{st} + R_{pt} (\text{viga C.P.}) \approx R_{st} (\text{viga C.A.})$$

$$M_u (\text{viga C.P.}) \approx M_u (\text{viga C.A.}) = 5.485 \text{ kN.cm}$$

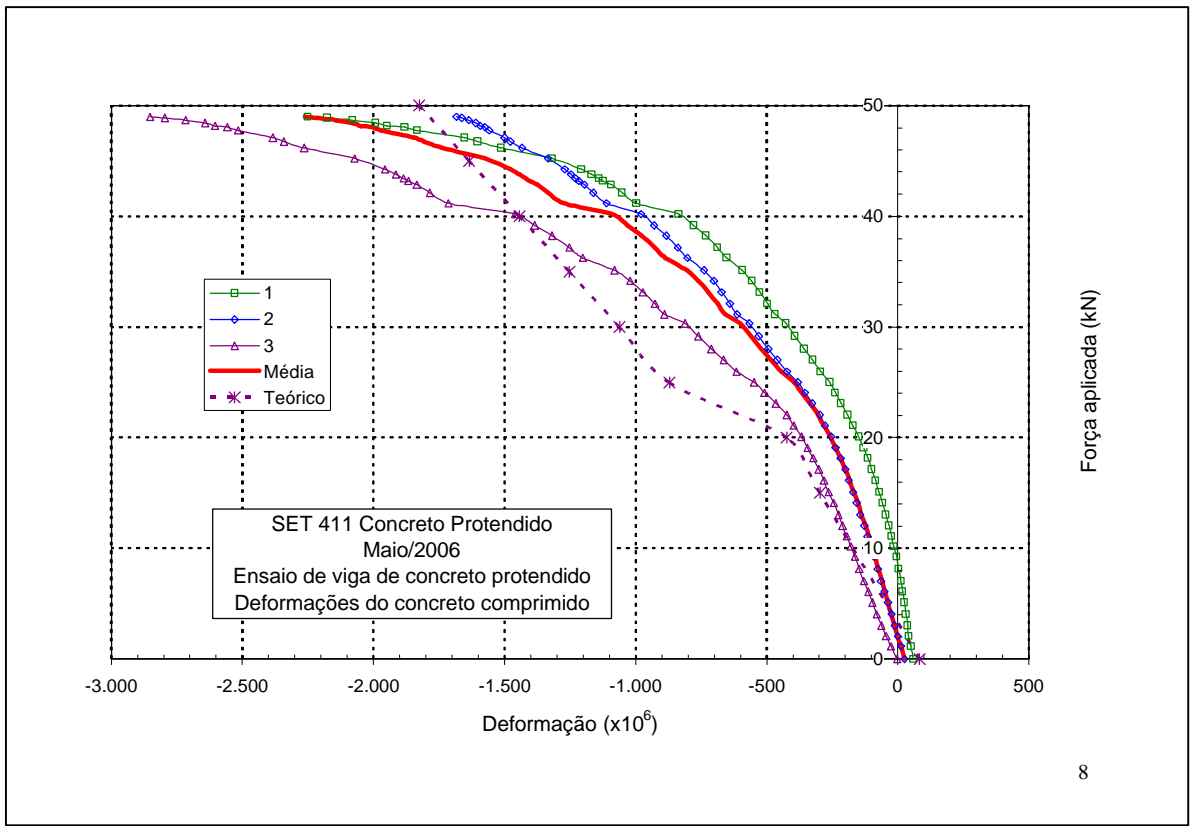
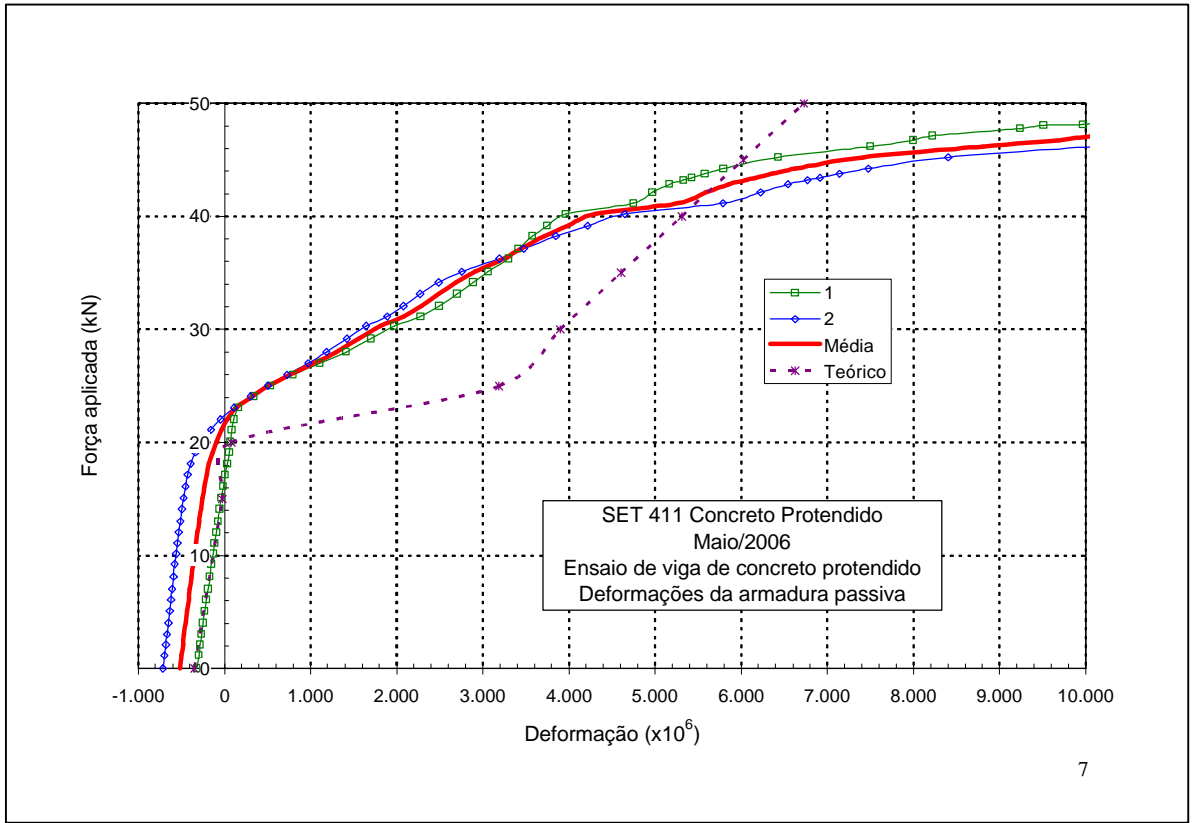
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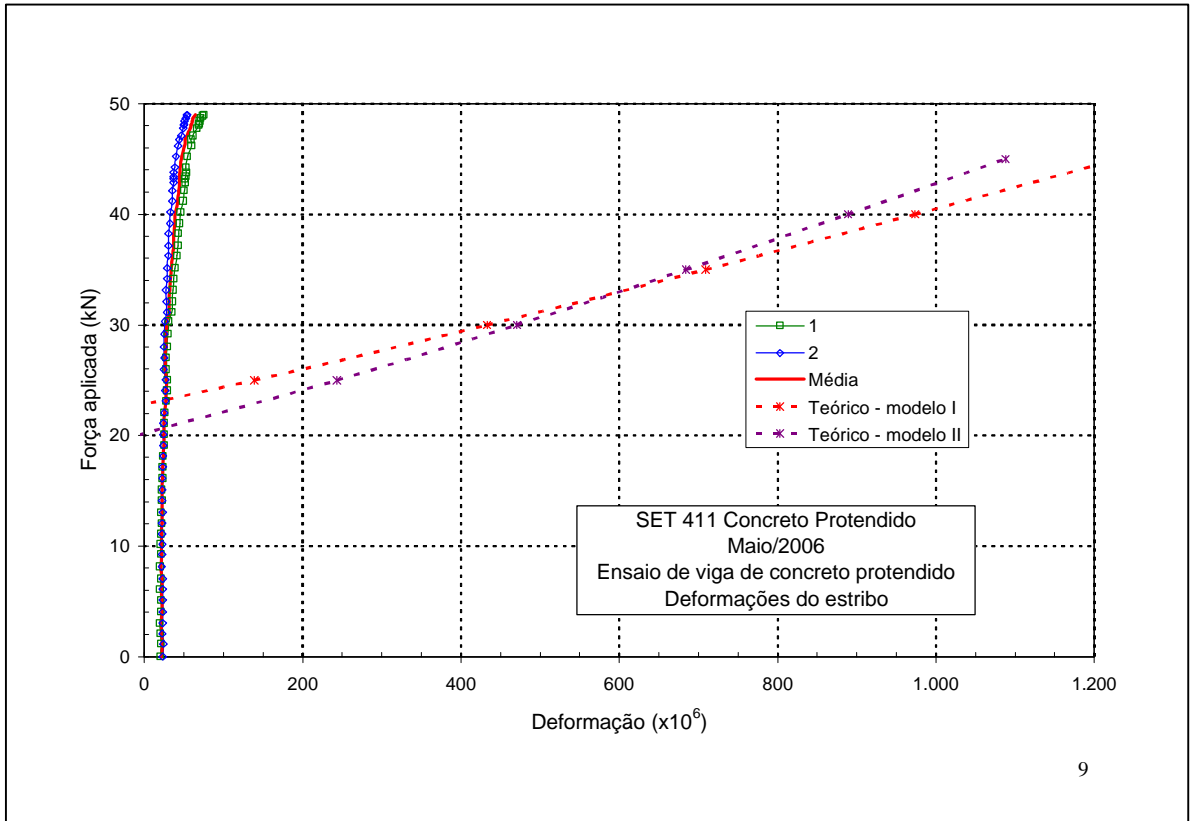


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