

Voorhaar Stress Engineering

FATIGUE COMPARISON STOOMW WITH CEN ACCORDING TO STOOMWEZEN D0105

Date: Ma 08-Feb-2021

Time: 08:44:33

Project: VARIOUS CALCULATIONS

Jobnr: PV2021

ABSTRACT:



REFERENCES:

CEN/TC 267 cyclic loading BS5500 ASME VIII div 2 Stoomwezen D0105 Stoomwezen D1110V

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50	0	PVo	Zo 24-Mrt-1996	First Issue	WSch		
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52	REV	BY	DATE	DESCRIPTION	CHECKED	PROJECT APPROVAL	THIRD PARTY APPROVAL
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58	A	Preliminary for information only		SP96006		1	A
59	B	For review					
60	C	Authorized for construction					
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$$i = 10, 11 \dots 80 \quad x = 1 \dots 2$$

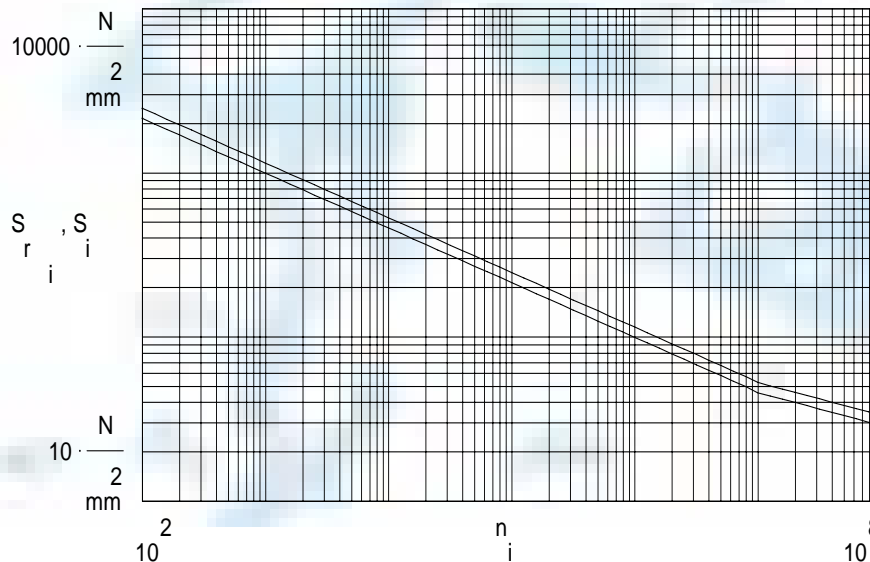
$$E_1 = 209000 \cdot \frac{N}{mm^2}$$

$$n_i = \frac{i}{10}$$

$$E_2 = 181300 \cdot \frac{N}{mm^2}$$

$$S_i = \text{if } \left[n_i \leq 10^7, \text{ if } \left[n_i < 10^7, \left[\frac{1.52 \cdot 10^{12}}{n_i} \right] \cdot \frac{N}{mm^2}, 53 \cdot \frac{N}{mm^2} \right], \left[\frac{4.18 \cdot 10^{15}}{n_i} \right] \cdot \frac{N}{mm^2} \right]$$

$$S_r = \frac{S_i E_2}{E_1}$$



$$S_r = 2148.817 \cdot \frac{N}{mm^2} \quad \text{at } n_i = 20$$

$$S_r = 45.976 \cdot \frac{N}{mm^2} \quad \text{at } n_i = 70$$

$$S_r = 29.006 \cdot \frac{N}{mm^2} \quad \text{at } n_i = 80$$

ording to BS5500 Class D

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According to Stoomwezen D0105



$$R_e = 250 \cdot \frac{N}{2 \text{ mm}} \quad R_m = 400 \cdot \frac{N}{2 \text{ mm}} \quad E_1 = 206000 \cdot \frac{N}{2 \text{ mm}} \quad z = 65 \%$$

$$R_{f,\infty} = 0.45 \cdot R_m \quad \text{From Schwagerer} \quad R_{f,\infty} = 180 \cdot \frac{N}{2 \text{ mm}}$$

$$R_f(n) = R_{f,\infty} + 0.25 \cdot \frac{E_1}{\sqrt{n}} \cdot \ln \left[\frac{100}{100 - z} \right] \quad E_2 = 183000 \cdot \frac{N}{2 \text{ mm}}$$

S_a is the smallest of the following:

$$f_1(n) = R_f(20 \cdot n)$$

$$f_2(n) = 0.5 \cdot R_f(n)$$

$$f_3(n) = 0.5 \cdot \frac{R_m - R_e}{R_m - R_f(n)} \cdot R_f(n)$$

f₃(n) to be positive so by making it large we exclude it:

$$f_3(n) = \text{if} \left[f_3(n) < 0 \cdot \frac{N}{2 \text{ mm}}, 10 \cdot \frac{N}{2 \text{ mm}}, f_3(n) \right]$$

$$\sigma_a(n) = \text{if} \left[f_1(n) < f_2(n), f_1(n), f_2(n) \right]$$

$$\sigma_a(n) = \text{if} \left[f_3(n) < \sigma_a(n), f_3(n), \sigma_a(n) \right]$$

$$\sigma_a(n) = \text{if} \left[n > 2 \cdot 10^6, \sigma_a \left[2 \cdot 10^6 \right], \sigma_a(n) \right]$$

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ASME VIII div 2

tabel = (580 410 275 205 155 105 83 64 48 38 31 23 20 16.5 13.5

tabeln = [10 20 50 100 200 500 1000 2000 5000 10000 20000 50000 10

Asme(n) = linterp (tabeln^T, tabel^T, n)

Asme(n) = if [n > 10⁶, Asme[10⁶], Asme(n)]

CEN Proposal

$$B = 7940 \cdot \frac{N}{2 \text{ mm}} \quad m' = 3 \quad \sigma_{\text{cen.}\infty} = 63 \cdot \frac{N}{2 \text{ mm}}$$

$$\sigma_{\text{cen}}(n) = \frac{B}{\frac{1}{2 \cdot n} \cdot m'} \quad \sigma_{\text{cen}}(n) = \text{if} \left[\sigma_{\text{cen}}(n) < \sigma_{\text{cen.}\infty}, \sigma_{\text{cen.}\infty}, \sigma_{\text{cen}} \right]$$

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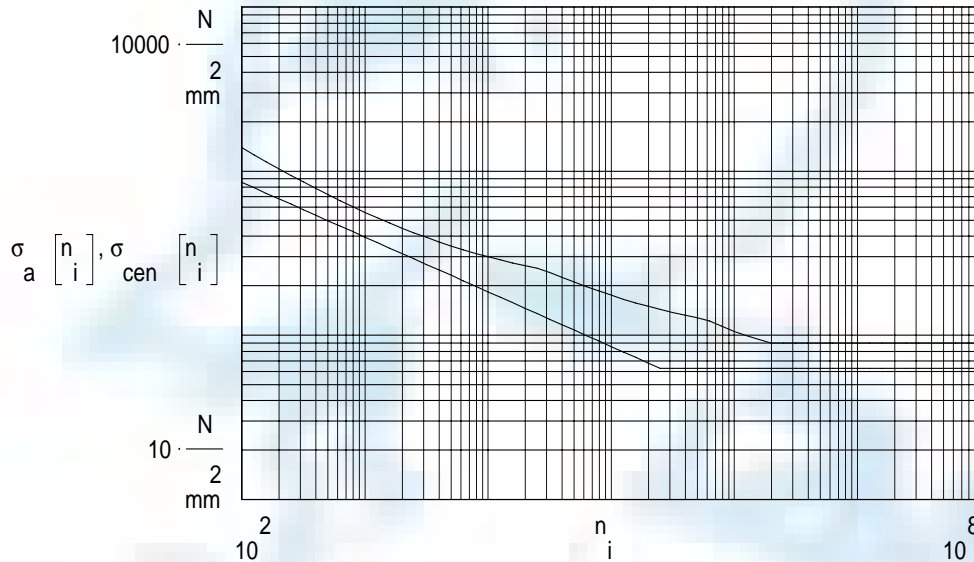
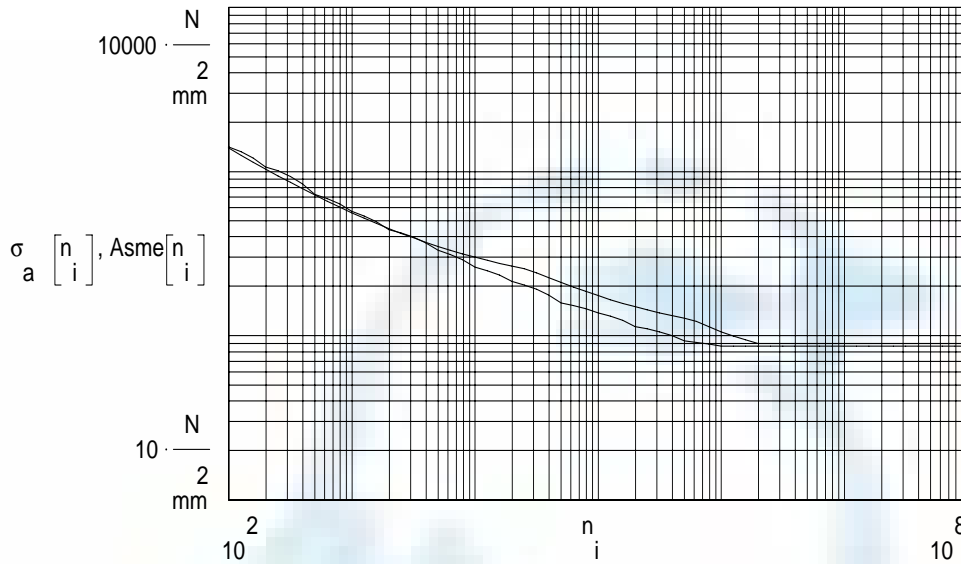
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$$N_{\text{Stoomw}} = \frac{1}{20} \cdot \left[\frac{E \cdot \ln \left[\frac{100}{100 - z} \right] \cdot 0.25}{\sigma_a (100) - R_{f,\infty}} \right]^2 \quad N_{\text{Stoomw}} = 100$$

$$N_{\text{asme}} = \frac{1}{20} \cdot \left[\frac{E \cdot \ln \left[\frac{100}{100 - z} \right] \cdot 0.25}{\text{Asme}(100) - R_{f,\infty}} \right]^2 \quad N_{\text{asme}} = 96.07$$

$$N_{\text{cen}} = \left[\frac{B}{2 \cdot \sigma_{\text{cen}} (100)} \right]^{m'} \quad N_{\text{cen}} = 100$$

$$\text{Asme}(100) = 1413.426 \cdot \frac{N}{\text{mm}^2} \quad \text{Asme}(10000) = 262.001 \cdot \frac{N}{\text{mm}^2}$$

$$\sigma_a (100) = 1388.949 \cdot \frac{N}{\text{mm}^2} \quad \sigma_a (10000) = 300.895 \cdot \frac{N}{\text{mm}^2}$$

$$\sigma_{\text{cen}} (100) = 855.311 \cdot \frac{N}{\text{mm}^2} \quad \sigma_{\text{cen}} (10000) = 184.271 \cdot \frac{N}{\text{mm}^2}$$

$$\text{Asme} \left[\frac{8}{10} \right] = 86.184 \cdot \frac{N}{\text{mm}^2}$$

$$\sigma_a \left[\frac{8}{10} \right] = 90.044 \cdot \frac{N}{\text{mm}^2} \quad \frac{R_{f,\infty}}{2} = 90 \cdot \frac{N}{\text{mm}^2}$$

$$\sigma_{\text{cen}} \left[\frac{8}{10} \right] = 63 \cdot \frac{N}{\text{mm}^2}$$

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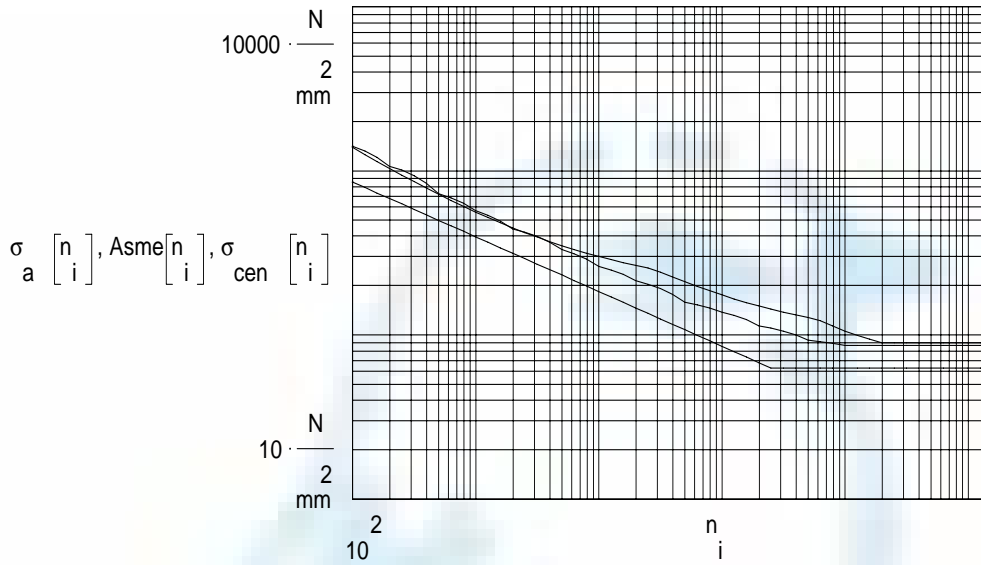
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