

### B31.4 - Node 182

Pressure:

$$P := 152 \text{ bar}$$

$$D_o := 323.85 \text{ mm}$$

$$w := 21.44 \text{ mm}$$

$$cor := 0 \text{ mm}$$

$$E_c := 194800000 \text{ kPa} \quad \text{Cold Elastic Modulus}$$

$$Temp := 55 \text{ }^{\circ}\text{C}$$

$$Ambient := 25 \text{ }^{\circ}\text{C}$$

$$\nu := 0.292 \quad \text{Poisson ratio}$$

$$S_y := 207 \text{ MPa} \quad \text{Yield Strength, } S_y = 207 \text{ N/mm}^2$$

$$T_n := w - cor = 21.44 \text{ mm}$$

$$D_i := D_o - 2 \cdot T_n = 280.97 \text{ mm}$$

$$A := \frac{\pi}{4} \cdot (D_o^2 - D_i^2) = 0.02 \text{ m}^2 \quad Z := \left( \frac{\pi}{32} \right) \cdot \left( \frac{D_o^4 - D_i^4}{D_o} \right) = 0.001 \text{ m}^3$$

$$Slp := \frac{P \cdot D_o}{4 \cdot T_n} = 57.399 \text{ MPa}$$

F/A

$$F := 1955413 \text{ N}$$

$$Sa := \frac{F}{A} = 96 \text{ MPa}$$

$$Axial := Slp + Sa = 153.398 \text{ MPa}$$

Torsion

$$St := 0 \text{ MPa}$$

Bending Stress

$$Sb := 0 \text{ MPa}$$

Hoop

$$\frac{D_o}{T_n} = 15.105 \quad (Do/Tn < 20)$$

$$Shoop := P \cdot \left( \frac{D_o}{2 \cdot T_n} - 0.5 \right) = 107.2 \text{ MPa}$$

Thermal Expansion stress

$$EC := 0.0000164 \frac{\text{mm}}{\text{mm} \cdot \text{C}}$$

$$SE := -E_c \cdot EC \cdot (Temp - Ambient) = -96 \text{ MPa}$$

## Longitudinal stress

$$Sl := SE + Sb + pois \cdot Shoop = -64.54 \text{ MPa}$$

## Equivalent Combined - if using "Max 3D shear" config switch

$$Seq := 2 \cdot \max \left( \sqrt{\left( \frac{Sl - Shoop}{2} \right)^2 + St^2} \right) = 171.737 \text{ MPa}$$

## Equivalent Combined - if using "Von Mises" config switch

$$Seq1 := \sqrt{Shoop^2 - Shoop \cdot Sl + Sl^2 + 3 \cdot St^2} = 150.251 \text{ MPa}$$

(1)B31.4 Stresses (Multiple Code/Allow.)

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B31.4 STRESSES (MULTIPLE CODE/ALLOW.) REPORT: Stresses (Multiple Code/Allow.) on Elements

CASE 1 (OPE) W+D1+T1+P1

Node	Hoop mPa	Hoop Allow. mPa	Hoop Ratio %	Long. mPa	Long. Allow. mPa	Long. Ratio %	Comb. mPa	Comb. Allow. mPa	Comb. Ratio %	Status
179	107.2	149.0	71.9	-64.7	186.3	34.7	171.9	186.3	92.3	R
179	107.2	149.0	71.9	-64.7	186.3	34.7	171.9	186.3	92.3	R
180	107.2	149.0	71.9	-64.7	186.3	34.7	171.9	186.3	92.3	R
180	107.2	149.0	71.9	-64.7	186.3	34.7	171.9	186.3	92.3	R
165	107.2	149.0	71.9	-64.7	186.3	34.7	171.9	186.3	92.3	R
165	107.2	149.0	71.9	-64.7	186.3	34.7	171.9	186.3	92.3	R
181	107.2	149.0	71.9	-64.7	186.3	34.7	171.9	186.3	92.3	R
181	107.2	149.0	71.9	-64.7	186.3	34.7	171.9	186.3	92.3	R
182	107.2	149.0	71.9	-64.7	186.3	34.7	171.9	186.3	92.3	R
182	107.2	149.0	71.9	-64.7	186.3	34.7	171.9	186.3	92.3	R
183	107.2	149.0	71.9	-64.7	186.3	34.7	171.9	186.3	92.3	R
183	107.2	149.0	71.9	-64.7	186.3	34.7	171.9	186.3	92.3	R
184	107.2	149.0	71.9	-64.7	186.3	34.7	171.9	186.3	92.3	R
184	107.2	149.0	71.9	-64.7	186.3	34.7	171.9	186.3	92.3	R
184	107.2	149.0	71.9	-64.7	186.3	34.7	171.9	186.3	92.3	R
185	107.2	149.0	71.9	-64.7	186.3	34.7	171.9	186.3	92.3	R