Important Temperature Stresses Formulas PDF

Formulas Examples with Units

List of 9
Important Temperature Stresses Formulas

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1) Coefficient of Thermal Expansion using Initial and Final Temperature of Water Pipe Formula

Evaluate Formula

Formula

$$\alpha = \frac{\sigma_t}{E_{gpa} \cdot (T_f - t_i)}$$

Example with Units

$$0.0004\,{}^{\circ}C^{-1} = \frac{1.4\,GPa}{200.0\,GPa \cdot (22\,{}^{\circ}C - 5.87\,{}^{\circ}C)}$$

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2) Coefficient of Thermal Expansion using Temperature Variation in Water Pipe Formula

Evaluate Formula

Formula

$$\alpha = \frac{\sigma_t}{E_{gpa} \cdot \Delta t}$$

Example with Units

$$0.0004\,{}^{\circ}C^{-1} = \frac{1.4\,GPa}{200.0\,GPa \cdot 16.12\,{}^{\circ}C}$$

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3) Final Temperature of Pipe Formula

Evaluate Formula

Formula

$$T_f = \left(\frac{\sigma_t}{E_{gpa} \cdot \alpha}\right) + t_i$$

Example with Units

$$21.999\,{}^{\circ}C = \left(\frac{1.4\,GPa}{200.0\,GPa \cdot 0.000434\,{}^{\circ}C^{-1}}\right) + 5.87\,{}^{\circ}C$$

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4) Initial Temperature of Pipe Formula

Evaluate Formula

Formula

$$t_i = T_f - \left(\frac{\sigma_t}{E_{gpa} \cdot \alpha}\right)$$

Example with Units

$$5.871\,{}^{\circ}C = 22\,{}^{\circ}C - \left(\frac{1.4\,GPa}{200.0\,GPa \cdot 0.000434\,{}^{\circ}C^{-1}}\right)$$

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5) Modulus of Elasticity of Pipe Material Formula

Evaluate Formula

Formula

$$E_{gpa} = \frac{\sigma_t}{\alpha \cdot \Delta t}$$

Example with Units

$$200.1121\,GPa = \frac{1.4\,GPa}{0.000434\,{}^{\circ}C^{-1} \cdot 16.12\,{}^{\circ}C}$$

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6) Modulus of Elasticity of Pipe Material using Initial and Final Temperature Formula

Formula

$$E_{gpa} = \frac{\sigma_t}{\alpha \cdot \left(T_f - t_i \right)}$$

Example with Units

$$199.988\,_{GPa} = \frac{1.4\,_{GPa}}{0.000434\,_{°C^{-1}} \cdot \left(22\,_{°C} - 5.87\,_{°C} \right)}$$

7) Temperature Stress using Initial and Final Temperature Formula

Formula

$$\sigma_t = E_{gpa} \cdot \alpha \cdot \left(T_f - t_i \right)$$

Example with Units

$$1.4001\,_{GPa} = 200.0\,_{GPa} \cdot 0.000434\,_{°C^{-1}} \cdot \left(22\,_{°C} - 5.87\,_{°C} \right)$$

8) Temperature Stress using Temperature Variation in Water Pipe Formula

Formula

$$\sigma_t = E_{gpa} \cdot \alpha \cdot \Delta t$$

Example with Units

$$1.3992\,_{GPa} = 200.0\,_{GPa} \cdot 0.000434\,_{°C^{-1}} \cdot 16.12\,_{°C}$$

9) Temperature Variation using Thermal Stress Developed in Pipes Formula

Formula

$$\Delta t = \frac{\sigma_t}{E_{gpa} \cdot \alpha}$$

Example with Units

$$16.129\,_{°C} = \frac{1.4\,_{GPa}}{200.0\,_{GPa} \cdot 0.000434\,_{°C^{-1}}}$$

Variables used in list of Temperature Stresses Formulas above

- E_{gpa} Modulus of Elasticity in Gpa *(Gigapascal)*
- T_f Final Temperature *(Celsius)*
- t_i Initial Temperature *(Celsius)*
- α Coefficient of Thermal Expansion *(Per Degree Celsius)*
- Δt Change in Temperature *(Degree Celsius)*
- $σ_t$ Thermal Stress *(Gigapascal)*

Constants, Functions, Measurements used in list of Temperature Stresses Formulas above

- Measurement: **Temperature** in Celsius (°C)
  Temperature Unit Conversion ➡
- Measurement: **Temperature Difference** in Degree Celsius (°C)
  Temperature Difference Unit Conversion ➡
- Measurement: **Temperature Coefficient of Resistance** in Per Degree Celsius (°C⁻¹)
  Temperature Coefficient of Resistance Unit Conversion ➡
- Measurement: **Stress** in Gigapascal (GPa)
  Stress Unit Conversion ➡

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