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^{AU} -& CDUB CDM

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333M&/9%\$@ /%M)h "6&h- , \$%&-& "h9\$H@)"&h "9-(&M%I 5 /6& Q)" & 6 -&' GDCDA
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EXHIBIT A

MAOP by Design Pressure Calculation

$S = 33 \text{ ksi}$ Yield Strength if known (49 CFR 192.107)

$t = 0.25 \text{ in}$ Pipe Wall Thickness

$D = 20 \text{ in}$ Pipe Diameter

$F = 0.5$ Design Factor (49 CFR 192.111)

$E = 0.8$ Longitudinal Joint Factor (49 CFR 192.113)

$T = 1$ Temperature Factor (49 CFR 192.115)

$$\text{MAOP} = \frac{2 \cdot S \cdot t}{D} \cdot F \cdot E \cdot T$$
 Maximum Allowable Operating Pressure
Per Design at known $S = 33 \text{ ksi}$

$\text{MAOP} = 330 \text{ psi}$

$S = 24 \text{ ksi}$ Yield Strength if unknown (49 CFR 192.107)

$$\text{MAOP} = \frac{2 \cdot S \cdot t}{D} \cdot F \cdot E \cdot T$$
 Maximum Allowable Operating Pressure
Per Design if S unknown

$\text{MAOP} = 240 \text{ psi}$

MAOP by Hydrotest Pressure Calculation

$P_{\text{test}} = 607 \text{ psi}$ Hydrotest Pressure

$\text{Test_Factor} = 1.5$ Test Factor (49 CFR 192.619)

$$\text{MAOP} = \frac{P_{\text{test}}}{\text{Test_Factor}}$$
 Maximum Allowable Operating Pressure
Per Test Pressure

$\text{MAOP} = 404.67 \text{ psi}$

EXHIBIT B

Table 1-3 Factors Used to Determine a Safety Factor for Ductile Materials

Information	Quality of Information	Factor
		<u>F1</u>
Material-property data available from tests	The actual material used was tested	1.3
	Representative material test data are available	2
	Fairly representative material test data are available	3
	Poorly representative material test data are available	5+
		<u>F2</u>
Environmental conditions in which it will be used	Are identical to material test conditions	1.3
	Essentially room-ambient environment	2
	Moderately challenging environment	3
	Extremely challenging environment	5+
		<u>F3</u>
Analytical models for loading and stress	Models have been tested against experiments	1.3
	Models accurately represent system	2
	Models approximately represent system	3
	Models are crude approximations	5+

$$\text{Safety Factor} \equiv \text{MAX}(F1, F2, F3)$$