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I DT 1- M EAI ECTBECV FAEVEJM

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H	- & DUHEI	\$"% A BDHM
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7/ &3&0%&\$ \$) -J &0" -3 -%/(&\$" -;/ "I ?J 6&0% " @%\$ "9" "\$@%& &0"
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66" \$" %), "\$&%-\$ &0" %6"@@&\$%4 -\$? RK2% - -&\$ 6 / @%8%30@ " "%/\$ -
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6 -\$% -%B(& -3\$)% 6(@-% / " % &"88%"@ % @-&\$) \$9/ , -&\$I -%3" -%
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6-%8\$) - 0: /&"%&%, / " ,6/ &\$&& &0"& "%(80-\$.\$/3\$) 30-&2%-@&- : \$ &0"
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&0" / I @/ -\$&I -\$ 9 (" " % \$/ &0)"%P/6- -. '81 %0/ @%1 / &\$)M 8-:\$) &0-&
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^{AA} ? /6/% " @%\$ -& ACM
^{AD} ? /6/% " @%\$ -& AHM

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^A ? / 6 / % " @ % \$ - & EM
^{AH} - & DUH I \$ " % AEBD M
^{AT} - & DV I \$ " % BAHM

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, -Y, (, - /3-; " \$&' - - /3" ;: &" 5, " @&@& /9 4"@-\$@ K\$)"\$ "" %@ "
g4-\$-) \$) 8:%&', \$&') & /9 -%?6" \$"%g F584KM8JI 8"@&\$ TMU F -; " J 9/ &'%&
6 "%&6 "%(6 & AM/ & "%&" 45 ?M 0" @%&)\$&&& " ("%&' 45 ? - " 3&0\$ &0%
@&' /\$M 584K O AM8 0-%; ""\$ \$@ 6/ -&' ;: "\$@&" \$& &" 1G FIG AEDMJM

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/6" -&' -)-%-\$ " "@& @%&%", I - , -%6""@&9/ ""& " %6/\$% &'%- \$ "9" "\$@
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G-\$@&@ f(%&;"9/ " &" 0/ -:%M

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^{AJ} -& CDUB CDM

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&0%1/,,%&\$ 9" &&0-&? RK2%"\$"" & "%&' " &56 6 "%&6 " (" & (\$ " 9" c3\$&'
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c@%&d -@@(" ;: &0" 1/,,%&\$ %&99I %&99%4&&\$ &%"@%\$ &\$&9/ - "Y6"\$%%"\$
&0" " & 80/3 1-(%' Fc 81dJ \$ MAAMCNCAS :"& &0" @& /9 ? RK2%
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0-%&0" \$0" "\$&" (& ; " -(&/ & &) -\$& &0' /,9 &0" 1& /9 8-\$ 1- /%M "\$ &0-&
? RK 0-%; /()0& &0% ";-@" (6/\$ &0",%' "%0/&%\$)// @%@\$@ \$/ &/66/% 8-\$
1- /%2 , /&\$M

^{AV} @& ;" DAI DCA I 6MTII "\$%EBAHb 7/ ", ; DCAA II 66MDTD BDT b "\$%
AEBD I "\$%ABDC
^A D CCBD CHM
^{AE} 4/ &\$ 9/ ? RK & ", ; (%' KY6"\$%%" \$@ " /0)0 &0" 1/,,%&\$2% " &
& 80/3 1-(%' -& A F @& ;" AI DCA JM
8" " %&/9 1& /9 8-\$ 1- /%2 " (@ \$%+\$ %&99@%-&W
333M&/9%\$@ /%M)h "6&h-, \$%&-&"h9\$h@)"&h "9-(&M%I 5 /6& Q)" & 6 -&' GDCDA
6-)" EI ? G 6-)" A I %" KY0; & 5M

8-\$ 1- /% 6- &@- & \$ \$ &" ;9(@&' \$"VAH / @" \$)%%\$/ & /6&\$- 9/ &"
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-\$ \$"@%& : @\$% & \$&%-\$ "Y6" &%3 \$&& ;"" ;: 8-\$ 1- /% / (\$& :I ;(&/(&/9
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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
Material-property data available from tests	The actual material used was tested	<u>F1</u> 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+

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