TECHNICAL BULLETIN

RUPTURE DISC SIZING

The objective of this bulletin is to provide detailed guidance for sizing rupture discs using standard methodologies found in ASME Section VIII Div. 1, API RP520, and Crane TP-410. To assist in the sizing process, Fike offers DisCalc™, a web based sizing program. See www.fike.com.

OVERPRESSURE ALLOWANCE

When sizing pressure relief devices, the ASME Code defines the maximum pressure that may build up in the pressure vessel while the device is relieving. This pressure varies depending on the application of the device. The following table defines the various overpressure allowances. See technical bulletin TB8100 for ASME application requirements.

Primary (Sole Relieving Device) Ref. UG-125(c)	**Secondary (Multiple Devices)** Ref. UG-125(c)(1)	**External Fire (Unexpected Source of External Heat)** Ref. UG-125(c)(2)	**External Fire (Storage Vessels Only)** Ref. UG-125(c)(3)
10% or 3 PSIG, whichever is greater, above the vessel MAWP	16% or 4 PSIG, whicever is greater, or above the vessel MAWP	21% above the vessel MAWP	20% above the vessel MAWP

RUPTURE DISC SIZING METHODOLOGIES

Three basic methodologies for sizing rupture disc devices are described below. These methods assume single phase, non-reactive fluid flow. Resources such as API RP520 Part 1, the DIERS Project Manual, and CCPS Guidelines for Pressure Relief and Effluent Handling Systems provide other methods for two-phase, flashing, reactive, and otherwise non-steady state conditions.

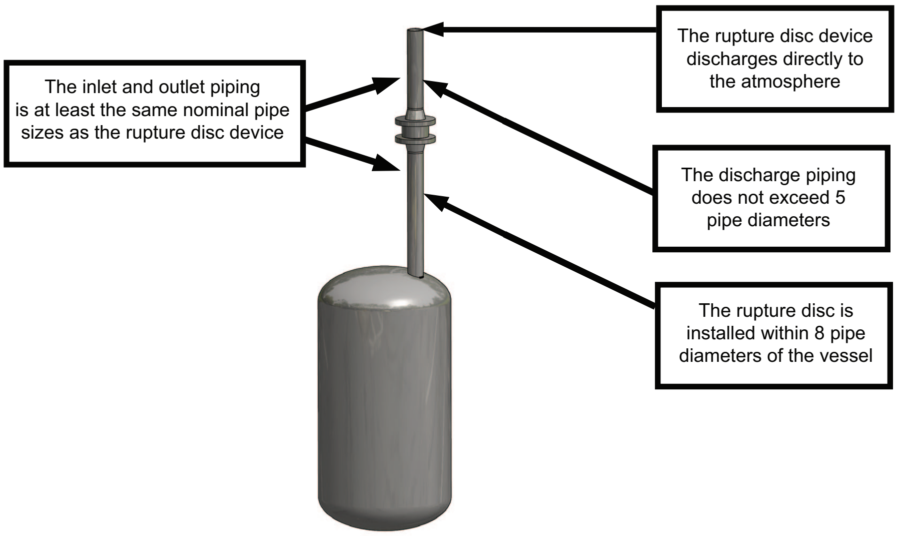
Coefficient of discharge method (K_D) - The K_D is the coefficient of discharge that is applied to the theoretical flow rate to arrive at a rated flow rate for simple systems.

Resistant to flow method (K_R) - The K_R represents the velocity head loss due to the rupture disc device. This head loss is included in the overall system loss calculations to determine the size of the relief system.

Combination capacity method - When a rupture disc device is installed in combination with a pressure relief valve (PRV), the valve capacity is derated by a default value of 0.9 or a tested value for the disc/valve combination. See technical bulletin TB8105 for specific application requirements when using rupture disc devices in combination with PRV's. A listing of Fike certified combination factors can be found in technical bulletin TB8103.

COEFFICIENT OF DISCHARGE METHOD (K_D)

Use this method for simple systems where the following conditions are true (8 & 5 Rule). This method takes into account the vessel entrance effects, 8 pipe diameters of inlet piping, 5 pipe diameters of discharge piping, and effects of discharging to atmosphere.



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GAS/VAPOR SIZING

Determination of Critical vs. Subcritical Flow per API RP520

Critical Pressure:

$$P_{cf} = P\left(\frac{2}{(k+1)}\right)^{k/(k-1)}$$

If $P_e \leq P_{cf}$ use critical flow equations

Calculations per ASME Section VIII (assumes critical flow)

Critical Flow:

$$W = K_D \cdot C \cdot A \cdot P\sqrt{\frac{M}{T \cdot Z}}$$

$$A = \frac{W}{K_D \cdot C \cdot P}\sqrt{\frac{T \cdot Z}{M}}$$

Calculation per API RP520

Subcritical Flow:

$$A = \frac{W}{735 \cdot F_2 \cdot K_D}\sqrt{\frac{T \cdot Z}{M \cdot P(P - P_e)}}$$

$$A = \frac{V}{4645 \cdot F_2 \cdot K_D}\sqrt{\frac{T \cdot Z \cdot M}{P(P - P_e)}}$$

$$A = \frac{V}{864 \cdot F_2 \cdot K_D}\sqrt{\frac{T \cdot Z \cdot SG}{P(P - P_e)}}$$

Critical Flow:

$$A = \frac{W}{K_D \cdot C \cdot P}\sqrt{\frac{T \cdot Z}{M}}$$

$$A = \frac{V\sqrt{T \cdot Z \cdot M}}{6.32 \cdot K_D \cdot C \cdot P}$$

$$A = \frac{V\sqrt{T \cdot Z \cdot SG}}{1.175 \cdot K_D \cdot C \cdot P}$$

W = rated flow capacity, (lb/hr)
V = rated flow capacity, (SCFM)
A = minimum net flow area, (sq. in.)
C = constant based on the ratio of specific heats k
k = c_p/c_v
K_D = coefficient of discharge 0.62 for rupture disc devices

$$F_2 = \sqrt{\left(\frac{k}{k-1}\right)(r)^{2/k}\left[\frac{1-r^{(k-1)/k}}{1-r}\right]}$$

$$r = \frac{P_e}{P}$$

P = set pressure plus overpressure allowance plus atmospheric pressure (psia)
P_e = exit pressure, (psia)
M = molecular weight
SG = specific gravity of gas at standard conditions, SG=1.00 for air at 14.7 psia and 60°F
T = absolute temperature at inlet (R=°F + 460°F)
Z = compressibility factor for corresponding to P and T. use 1.0 if unknown.

TABLE 1
Gas Constants

Gas or Vapor	Molecular Weight	$k = c_p/c_v$
Air	28.97	1.40
Acetic Acid	60	1.15
Acetylene	26.04	1.26
Ammonia	17.03	1.33
Argon	40	1.67
Benzene	78.1	1.12
N-Butane	58.12	1.094
ISO- Butane	58.12	1.094
Butane	56.1	1.10
Carbon Monoxide	28	1.40
Carbon Disulfide	76	1.21
Carbon Dioxide	44.01	1.30
Chlorine	70.9	1.36
Cyclohexane	84.16	1.09
Ethane	30.07	1.22
Ethyl Alcohol	46.07	1.13
Ethyl Chloride	64.5	1.19
Ethylene	28.05	1.26
Helium	4	1.66
Hydrochloric Acid	36.5	1.41
Hydrogen	2.016	1.41
Hydrogen Sulfide	34.07	1.32
Methane	16.04	1.31
Methyl Alcohol	32.04	1.20
Methyl Chloride	50.48	1.20
Natural Gas (Avg.)	19	1.27
Nitric Acid	30	1.40
Nitrogen	28	1.404
Oxygen	32	1.40
Pentane	72.15	1.07
Propane	44.09	1.13
Sulfur Dioxide	64.06	1.29
Water Vapor	18.02	1.324

TABLE 2
Gas Flow Constant C for Sonic Flow STEAM SIZING

k	C	k	C
1.00	315	1.40	356
1.02	318	1.42	358
1.04	320	1.44	360
1.06	322	1.46	361
1.08	325	1.48	363
1.10	327	1.50	365
1.12	329	1.52	366
1.14	331	1.54	368
1.16	333	1.56	369
1.18	335	1.58	371
1.20	337	1.60	373
1.22	339	1.62	374
1.24	341	1.64	376
1.26	343	1.66	377
1.28	345	1.68	379
1.30	347	1.70	380
1.32	349	2.00	400
1.34	351	2.10	406
1.36	352	2.20	412
1.38	354		

STEAM SIZING

Calculation per ASME Section VIII

Steam:

$$W = 51.5 \cdot A \cdot P \cdot K_D \cdot K_N$$

$$A = \frac{W}{51.5 \cdot P \cdot K_D \cdot K_N}$$

Calculation per API RP520

Steam:

$$A = \frac{W}{51.5 \cdot P \cdot K_D \cdot K_N \cdot K_{SH}}$$

K_N = Correction factor for steam

K_N = when $P \leq$ 1500 psia

K_N = $\left(\dfrac{0.1906P - 1000}{0.2292P - 1061}\right)$ when $P > 1500$ psia and $P \leq 3200$ psia

K_{SH} = See Table 3 for superheat steam correction factors. For saturated steam use 1.0.

TABLE 3
Superheat Correction Factors, K_{SH} (API RP520 Part 1 Table 9)

Burst Pressure (psig)	Temperature °F									
	300	400	500	600	700	800	900	1000	1100	1200
15	1.00	.98	.93	.88	.84	.80	.77	.74	.72	.70
20	1.00	.98	.93	.88	.84	.80	.77	.74	.72	.70
40	1.00	.99	.93	.88	.84	.81	.77	.74	.72	.70
60	1.00	.99	.93	.88	.84	.81	.77	.75	.72	.70
80	1.00	.99	.93	.88	.84	.81	.77	.75	.72	.70
100	1.00	.99	.94	.89	.84	.81	.77	.75	.72	.70
120	1.00	.99	.94	.89	.84	.81	.78	.75	.72	.70
140	1.00	.99	.94	.89	.85	.81	.78	.75	.72	.70
160	1.00	.99	.94	.89	.85	.81	.78	.75	.72	.70
180	1.00	.99	.94	.89	.85	.81	.78	.75	.72	.70
200	1.00	.99	.95	.89	.85	.81	.78	.75	.72	.70
220	1.00	.99	.95	.89	.85	.81	.78	.75	.72	.70
240	-	1.00	.95	.90	.85	.81	.78	.75	.72	.70
260	-	1.00	.95	.90	.85	.81	.78	.75	.72	.70
280	-	1.00	.96	.90	.85	.81	.78	.75	.72	.70
300	-	1.00	.96	.90	.85	.81	.78	.75	.72	.70
350	-	1.00	.96	.90	.86	.82	.78	.75	.72	.70
400	-	1.00	.96	.91	.86	.82	.78	.75	.72	.70
500	-	1.00	.96	.92	.86	.82	.78	.75	.73	.70
600	-	1.00	.97	.92	.87	.82	.79	.75	.73	.70
800	-	-	1.00	.95	.88	.83	.79	.76	.73	.70
1000	-	-	1.00	.96	.89	.84	.78	.76	.73	.71
1250	-	-	1.00	.97	.91	.85	.80	.77	.74	.71
1500	-	-	-	1.00	.93	.86	.81	.77	.74	.71
1750	-	-	-	1.00	.94	.86	.81	.77	.73	.70
2000	-	-	-	1.00	.95	.86	.80	.76	.72	.69
2500	-	-	-	1.00	.95	.85	.78	.73	.69	.66
3000	-	-	-	-	1.00	.82	.74	.69	.65	.62

LIQUID SIZING

Calculation per ASME Section VIII

Water:

$$W = 2407 \cdot A \cdot K_D \sqrt{(P - P_e)w}$$

$$A = \frac{W}{2407 \cdot K_D \sqrt{(P - P_e)w}}$$

Calculation per API RP520

Non-viscous liquid:

$$A_R = \frac{Q}{38 \cdot K_D \cdot K_V} \sqrt{\frac{SG}{P - P_e}}$$

Viscous liquid:

$$A_V = \frac{A_R}{K_V}$$

For viscous liquid sizing, first calculate A_R using K_V of 1.0. Apply the area A of the next larger size disc to the Reynolds number calculations to arrive at K_V. Then re-calculate required area A_V using the derived K_V.

Q	=	rated capacity, (gal.min)
A_R	=	required Area without viscosity corrections (in^2)
A_V	=	required Area with viscosity corrections (in^2)
W	=	Specific weight of water, (lb/ft^3)
K_V	=	$\left(0.9935 + \frac{2.878}{R^{0.5}} + \frac{342.75}{R^{1.5}}\right)^{-1.0}$, viscosity correction factor
R_e	=	$\frac{Q(2800 \cdot SG)}{u\sqrt{A}}$ Reynolds Number (u is in centipoises)
or		
R_e	=	$\frac{12700 \cdot Q}{U\sqrt{A}}$ (U is in Saybolt Universal Seconds, SSU)

RESISTANCE TO FLOW METHOD (K_R)

Use this method when the 8 & 5 Rule does not apply and the rupture disc is not installed in combination with a pressure relief valve. This type of calculation is the responsibility of the system designer. DisCalc™ does not perform this type of calculation.

Characteristics of the Resistance to Flow Method

- Sizing is done on a relief system basis not by capacity of individual components
- Rupture disc is treated as another component in the relief system
- Each device or family of devices has a unit-less resistance value (K_R) that represents the expected resistance to flow that is independent of the fluid flowing
- System relief capacity must be multiplied by a factor of 0.90

Types of K_R

Because many rupture discs have different opening characteristics depending on whether they are opened with a compressed vapor or incompressible liquid, there are certified K_R values that are denoted by the applicable service media. The K_R values for different media are a result of differences in how the rupture disc opens with different media and test methods that have been standardized in ASME PTC25. A list of Fike certified K_R factors can be found in technical bulletin TB8104.

- Air or gas service – K_{RG}
  Use K_{RG} when the media is a gas or vapor, or when the media is liquid but there is a significant vapor volume directly in contact with the disc at the time of rupture
- Liquid service – K_{RL}
  Use K_{RL} when the media is liquid and the liquid is against the disc at the time of rupture
- Air or gas and liquid service – K_{RGL}
  K_{RGL} can be used for any service conditions

The following examples will illustrate how K_R values are used to establish the flow capacity of a pressure relief piping system.

Vapor Sizing

The following example, see Figure 1, assumes that $k = c_p/c_v = 1.4$ which results in a conservative calculation. The example shown is based on Crane TP-410 methods. It also assumes a steady state relieving condition where the vessel volume is large relative to the relieving capacity.

Given information:

- Pressure vessel MAWP = 1000 psig
- Relieving pressure as allowed by ASME Section VIII Div. 1 = 110% x MAWP = 1114.7 psia = P'1
- Back pressure (outlet pressure) = 14.7 psia
- Working fluid - air ($k = c_p/c_v = 1.4$)
- Air temperature at disc rupture = 500°F = 960R = T_1
- Maximum flow rate into the vessel = 20,000 SCFM
- Rupture Disc - Fike 3" SRX-GI g $K_{RG} = 0.99$

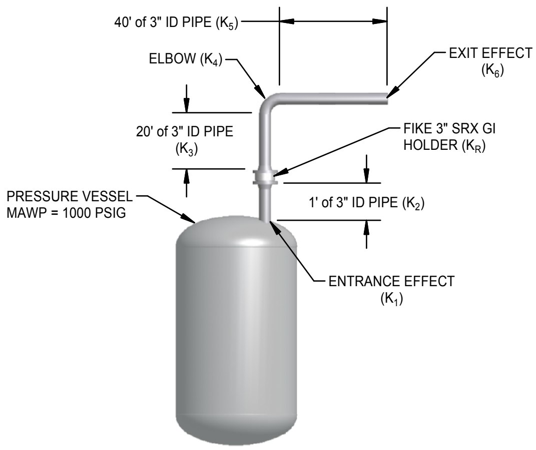

Figure 1

DETERMINE THE TOTAL PIPING SYSTEM RESISTANCE FACTOR:

Piping Component or Feature	Flow Resistance Value (K)	Reference
Entrance - Sharp Edged	K_1 = .50	Crane 410 pg A-29
1 ft of 3” Sch. 40 Pipe	K_2 = .07	K=fL/D: f = .018 (Crane 410 Pg A-26 L= 1 ft. ID = 3.068/12 ft
Fike 3” SRX-GI Rupture Disc	K_{RG} = 0.99	National Board Cert. No. FIK-M80277
20 ft or 3” Sch. 40 Pipe	K_3 = 1.41	K=fL/D: f = .018 (Crane 410 Pg A-26 L= 1 ft. ID = 3.068/12 ft
3” Sch. 40 Standard 90° Elbow	K_4 = 0.54	Crane 410 Pg A-29
40 ft of 3” Sch. 40 Pipe	K_5 = 2.82	K=fL/D: f = .018 (Crane 410 Pg A-26 L= 1 ft. ID = 3.068/12 ft
Pipe exit - Sharp Edged	K_6 = 1.00	Crane 410 Pg A-29
Total System Flow Resistance	K_T = 7.33	$K_T = K_1 + K_2 + K_{RG} + K_3 + K_4 + K_5 + K_6$

The Darcy Equation defines the discharge of compressible fluids through valves, fittings and pipes. Since the flow rate into the example vessel is defined in SCFM, the following form of the Darcy equation is used:

Crane Equation 3-20

$$q'_m = 678 \cdot Y \cdot d^2 \sqrt{\frac{\Delta P \cdot P'_1}{K \cdot T_1 \cdot SG}}$$

q'_m	=	rate of flow in cubic feet per minute at standard conditions, (SCFM) (14.7 psia and 60°F)
Y	=	net expansion factor for compressible flow through orifices, nozzles and pipes (Crane 410 Pg A-22)
d	=	internal diameter of pipe, (in)
ΔP	=	change in pressure entrance to exit, (psia)
P'_1	=	pressure at entrance, (psia)
K	=	loss coefficient
T_1	=	absolute temperature at entrance, (R)

To determine Y, first it must be determined if the flow will be sonic or subsonic. This is determined by comparing the actual DP/P'$_1$ to the limiting DP/P'$_1$ for sonic flow. Crane Table A-22 shows limiting factors for k=1.4 for sonic flow at the known value of K_T.
If $(DP/P'_1)_{sonic} < (DP/P'_1)_{actual}$, then the flow will be sonic.

K	$\Delta P/P'_1$	Y
1.2	.552	.588
1.5	.576	.606
2.0	.612	.622
3	.662	.639
4	.697	.649
6	.737	.671
8	.762	.685
10	.784	.695
15	.818	.702
20	.839	.710
40	.883	.710
100	.926	.710

Limiting Factors for Sonic Velocity (k=1.4) Excerpt from Crane 410, Pg A-22

For this example:

$$\left(\Delta P / P_1^{'}\right)_{actual} = \frac{1114.7 - 14.7}{1114.7} = 0.9868$$

From table A-22 at K_T=7.33

$$K_T = 7.33$$

$$\left(\Delta P / P_1^{'}\right)_{sonic} = 0.754$$

Since $(DP/P'_1)_{sonic}$ = 0.754, then DP = 0.754 * P'$_1$ = 0.754 * 1114.7 = 840.5 psig
Calculating the system capacity is completed by substituting the known values into Crane 410 Equation 3-20.

$$q_m^{'} = 678 \cdot Y \cdot d^2 \sqrt{\frac{\Delta P \cdot P_1^{'}}{K \cdot T_1 \cdot SG}}$$

$$q_m^{'} = 678 \cdot 0.680 \cdot (3.068)^2 \sqrt{\frac{840.5 \cdot 1114.7}{7.33 \cdot 960 \cdot 1}}$$

$$q_m^{'} = 50{,}074 \text{ SCFM}$$

The ASME Pressure Vessel Code, Section VIII, Division 1, paragraph UG-127(a)(2), also requires that the calculated system capacity using the resistance to flow method must also be multiplied by a factor of 0.90 or less to account for uncertainties inherent with this method.

$$q_{m-ASME}^{'} = 50{,}074 \cdot 0.90 = 45{,}066 \text{ SCFM}$$

Thus, the system capacity is greater than the required process capacity (20,000 SCFM)

Subsonic Flow Case
In the case where the flow is subsonic, or $(\Delta P/P'_1)_{sonic}$ > $(\Delta P/P'_1)_{actual}$, simply read the value of Y_{actual} from Crane 410 chart A-22, Substitute $(\Delta P/P'_1)_{actual}$ and Y_{actual} into the calculations

LIQUID SIZING

For this example Figure 2 is assumed, water will be considered the flow media. The example shown is based on Crane TP-410 methods. It also assumes a steady state relieving condition where the vessel volume is large relative to the relieving capacity.

Given information:

- Pressure vessel MAWP = 500 psig
- Relieving pressure as allowed by ASME Section VIII Div. 1 = 110% x MAWP = 550 psig = P_1
- Back pressure (outlet pressure) = 1 psig = P_2
- Working fluid - water
- Temperature = 70°F
- Maximum flow rate into the vessel = 50 ft^3/min
- Rupture disc - Fike 2" SRL-GI → K_{RGL} = 0.59

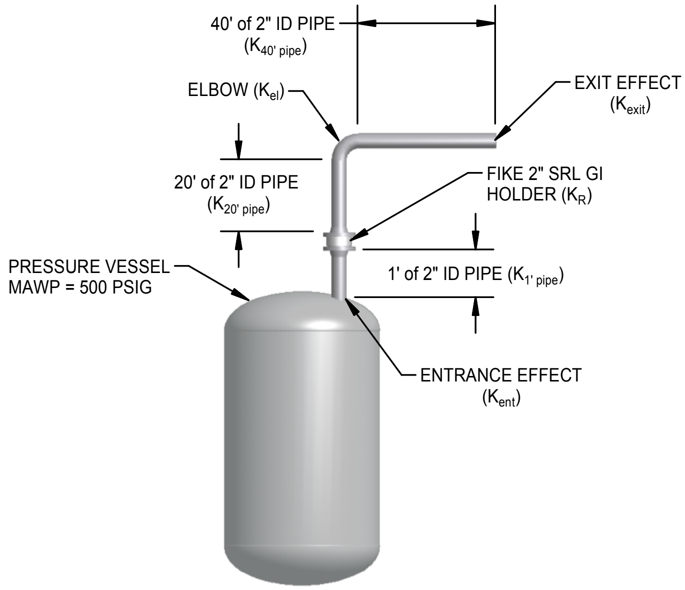

Figure 2

From Crane 410:

"Bernoulli's Theorem is a means of expressing the application of the law of conservation of energy to the flow of fluids in a conduit (piping). The total energy at any particular point, above some arbitrary horizontal datum plane, is equal to the sum of the elevation head (Z), the pressure head (P), the velocity head (V).

In real applications, there are energy losses in piping systems between states (or location) 1 and 2. Those losses are accounted for in the term h_L, which are predominately frictional head losses. The energy balance is then expressed:

Crane Equation 1-3

$$Z_1 + \frac{144 \cdot P_1}{\rho_1} + \frac{V_1^2}{2 \cdot g} = Z_2 + \frac{144 \cdot P_2}{\rho_2} + \frac{V_2^2}{2 \cdot g} + h_L$$

Z_1 and Z_2	=	elevation head at states 1 and 2 (ft)
P_1 and P_2	=	pressure at states 1 and 2 (psig)
V_1 and V_2	=	velocity at states 1 and 2 (ft/sec)
ρ_1 and ρ_2	=	fluid density at states 1 and 2 (lb/ft^3)
g	=	acceleration due to gravity (32.2 ft/sec^2)
h_L	=	frictional head loss (ft)

As in the previous example, head losses due to friction in the piping and the head losses due to fittings are proportional to the sum of the flow resistances:

$$h_L = \sum K$$

Since the acutal head loss is velocity dependent,

$$h_L = \sum K \left(\frac{V^2}{2 \cdot g} \right)$$

Frictional loss coefficients and fitting loss coefficients for the example are as follows:

Piping Component or Feature	Flow Resistance Value (K)	Reference
Piping Frictional Losses		
1 ft of 2" Sch. 40 Pipe	$K_{1' pipe} = 0.11$	K=fL/D; f = .019 (Crane 410 Pg A-26) L = 1 ft, ID = 2.067/12 ft
20 ft of 2: Sch. 40 Pipe	$K_{20' pipe} = 2.21$	K=fL/D; f = .019 (Crane 410 Pg A-26) L = 20 ft, ID = 2.067/12 ft
40 ft of 2" Sch. 40 Pipe	$K_{40' pipe} = 4.41$	K=fL/D; f = .019 (Crane 410 Pg A-26) L = 40 ft, ID = 2.067/12 ft
Fitting Losses		
Entrance - r/d = 0.10	K_{ent} - 0.09	Crane 410 Pg A-29
Fike 2" SRL - GI Rupture Disc	$K_{RGL} = 0.59$	National Board Cert. No. FIK-M80031
2" Sch. 40 Standard 90° Elbow	$K_{el} = 0.57$	Crane 410 Pg A-29
Pipe exit - Sharp Edged	$K_{exit} = 1.00$	Crane 410 Pg A-29
Total Losses	$K_T = 8.98$	

Thus,

$$h_L = 8.98\left(\frac{V^2}{2 \cdot g}\right)$$

Other known conditions:

$$\begin{aligned}
V_{vessel} &= 0 \text{ ft/sec} \\
Z_{vessel} &= 0 \text{ ft} \\
Z_{vessel} &= 1 \text{ ft} + 20 \text{ ft} = 21 \text{ ft} = \text{elevation change of piping} \\
P_{exit} &= 0 \text{ ft/sec} \\
\rho_1 &= \rho_2 = 62.3 \text{ lb/ft}^3 \text{ for water at room temperature}
\end{aligned}$$

Substituting values into Equation 1-3,

$$0 + \frac{144 \cdot 550}{62.3} + 0 = 21 + 0 + \frac{V_2^2}{2 \cdot 32.2} + \left[8.98 \cdot \left(\frac{V_2^2}{2 \cdot 32.2}\right)\right]$$

Solving for V_2 (exit velocity),

$$V_2 = 89.82 \text{ ft/sec}$$

The friction factor used earlier in the calculations for piping frictional losses assumed that the flow in the pipes was fully turbulent flow. The value of the friction factor is related to the Reynolds Number (R_e) of the resulting flow (Ref: Crane 410 pg 1-1). For R_e< 2000, the flow is laminar and the friction factor is a function of Reynolds Number, only. For R_e >4000, the flow is fully turbulent and the friction factor is also a function of the character of the piping wall (relative roughness).

The friction factor used earlier must be verified. First calculate the Reynolds Number:

$$R_e = \frac{V \cdot d}{v} = \frac{89.82 \cdot 2.067\left(1/12\right)}{.000011}$$

$$\begin{aligned}
V &= \text{fluid velocity} = 89.82 \text{ ft/sec} \\
d &= \text{pipe diameter} = 2.067 \text{ in/12 in/ft} \\
v &= \text{kinematic viscosity} = 0.000011 \text{ ft}^2\text{/sec}
\end{aligned}$$

Since the Reynolds Number is >4000, the flow is turbulent, and the friction factor is now a function of the relative roughness of the pipe. From Crane 410 Figure A-23, the friction factor, f, for 2” commercial steel pipe in fully turbulent flow is 0.019. This verifies the original assumption for friction factor.

> Laminar Flow Considerations
>
> If the flow had been laminar, $R_e < 2000$, the friction factor is calculated as:
>
> $$f = 64 / R_e$$
>
> If this friction factor had not been close to the same value used to determine frictional loss coefficients used earlier, the calculation must be repeated and iteratively solved until the assumed friction factor equals the calculted friction factor.

Now that the fluid velocity is known, the volumetric flow rate can be calculated.

$$Q = A \cdot V$$

Where:

Q = volumetric flow rate (ft^3/sec)
A = area of pipe (ft^2) - $\pi d^2/4$
V = fluid velocity (ft/sec)

Substituting values,

$$Q = \frac{\pi}{4} \cdot \left(2.067/12\right)^2 \cdot 89.82$$

$$Q_{calc} = 2.09 \text{ ft}^3\text{/sec} = 125.6 \text{ ft}^3\text{/min}$$

Per the ASME Code, the rated system capacity is,

$$Q_{rated} = Q_{calc} \cdot (0.90) = 125.6 \cdot (0.90) = 113.04 \text{ ft}^3\text{/min}$$

Therefore, the relief system can flow the required 50 ft^3/min.

References:
American Society of Mechanical Engineers, Boiler and Pressure Vessel Code Section VIII, Division 1
American Society of Mechanical Engineers, PTC25
American Petroleum Institute, RP520
Crane Valves, Technical Paper 410
Crane Valves, Crane Companion Computer Program
Fike Technical Bulletin TB8100 ASME Code and Rupture Discs
Fike Technical Bulletin TB8103 Certified Combination Capacity Factors
Fike Technical Bulletin TB8104 Certified K_R and MNFA Values
Fike Technical Bulletin TB8105 Best Practices for RD & PRV Combinations
DIERS Project Manual
CCPS Guidelines for Pressure Relief Effluent Handling Systems

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