Errata: CCPS Guidelines for Pressure Relief and Effluent Handling Systems (06/12/06)

Page	Location	Correction (changes are in bold)
42	Last para, 7th line	...Lai (1996)**, Table 2.4-5 (Page 57)**...
58	1st para.	…valves should be…
64	3rd para.	…set as high as **1.1** times the vessel MAWP.
71	§2.5.8, 1st line	Refer to §5.3.**4** for…
73	4th para.	Delete: the nozzle flow model with a discharge coefficient of 0.62 (see §3.6.5.2)
74	2nd para.	Add: … options (see §3.6.5.2, page 209)
74	2nd para.	Delete: …,either Kr = 0.1, or…
81	1st para.	Delete the last two sentences: "There is …
81	2nd para., 3rd line	…K_R values of **full-area** rupture disk devices **in gas service** has been…
81	After 2nd para.	Insert paragraph P1
81	3rd para.	Delete: …for both nozzle … coefficient is 0.62.
81	3rd para.	Replace sentence: In the pipe flow model, current certified K_R values (ASME PTC-25, 1994) represent the device flow resistance as that of a full-area flow element with the K_R value included in the total flow resistance of the piping system
81	Last para.	Delete the paragraph
82	1st para.	Delete the paragraph
82	2nd para.	Replace paragraph with P2
109	ASME address	The American Society of Mechanical Engineers, **3 Park Avenue**, New York, NY **10016-5990**
125	3rd para., last line	...in **§3B.4.2.1**.
129	Eq. (3.3-2)	$\beta = ((\rho_{flow} - \rho_2) / (T_{flow} - T_2)) / \rho_{flow}$
129	4th para.	For a liquid, β can be evaluated from the density change over a 5 °F temperature increment divided by the flowing density (ρ_{flow}).
129	Reference	(1993) API RP 520-I, Appendix C (1997) API RP 521, para. 3.14
131	References	(1993) API RP 520-I, para. 3.3.2 (1997) API RP 521, para. 3.15.1.1 (1993) API RP 520-I, para 3.3.3 (1997) API RP 521, para. 3.15.1.2 (1993) API RP 520-I, para. D.3.2 (1997) API RP 521, para. 3.15.1.2 (1993) API RP 520-I, para. D.5.2.4 (1997) API RP 521, para. 3.15.2.2
133	Table 3.3-2	Vent Rate (SCFH* AIR) Valid at approximately One Atmosphere Pressure
134	References	(1993) API RP 520-I, Table D-2 (1997) API RP 521, Table 4 (1993) API RP 520-I, Table D-3 (1997) API RP 521, Table 5
137	Eq. (3.3-10) and line above	…are approaching zero: **(Simpson, 1995a)** $W = \frac{C\,q}{T\,v_g\,\mathbf{(dP / dT)_{sat}}}$ {$(dP / dT)_{sat}$ should be in the denominator}
139	4th para., 3rd line	(Simpson, 1995**a**)
139	6th para., 5th line	…component by **the following approximation (Simpson, 1995a)**:
147	3rd para., 4th line	...(page **129)**...
148	2nd para., 5th line	... Table **3.3-2**...
148 *	2nd para., 7th line	… Eq (**3.3-2**)
157	1st para., 3rd line	...vend**o**rs...
161	1st para., 6th line	...point is illustrated... {omit be}
166	2nd line	$\tau = \frac{7998}{335.5} - \left[\frac{160.4 \times 1076}{13.69 \times 0.3451 \times 335.5}\right]^{1/2} = 13.4$ s
166	3rd line	= 3500 lbm {not lbm / s}
178	1st line	§3B.2.2.**5** (Page 269)
178	2nd para., 2nd line	§3B.4.**2.3** (Page 284)

178	§3.6.1.5, 1st line	See **§3B.3.1.6** (Page 277)
186	Ex., bottom of page	Ell KF = 0.2**7**; total KF = **0.83**; …from COMFLOW is **66.99** psia {not 67.13}
194	Table note, 3rd line	66.82 = 129.9X + (–13.9)(1 – X) {delete extra = sign}
197	Table	Liquid Wt %: Acetone – 50, Ethanol – 30, Water – 20
198	Last para., 1st sentence	Eq. (3B.2-**14**) (page 25**8**) {not Eq. (3B.2-6) (page 255)}
199	First two lines	The first two lines are duplicated from page 198
199	Eq. (3B.2-18) and (3B.2-19)	Constant should be **0.93028** (3 places)
200	1st line of Eq. (3B.2.21)	$k = (v / P)\ [(\partial P / \partial T)_v^2\ T / C_v - (\partial P / \partial \boldsymbol{v})_T]$ {missing – and T should be v}
201	1st line	Line is a duplicate of the last line on Page 200
201 *	Eq. (3.6-8)	Delete ***(1 - β⁴)*** in the denominator
202 *	Definition of β	DELETE
206	2nd para, 7th line	Eq. (**3.6-8)** (page **201**)
208	3.6.5.1 Heading	Delete GAS OR VAPOR
209	3.6.5.1	Add following the nomenclature: See 3.6.3 for liquid flow in nozzles
209	3.6.5.2 Heading	Delete GAS OR VAPOR
209	After1st para.	Insert paragraph P3
209	2nd para.	Delete “See 2.6.4 for…
209	Last para.	Add …through (r) for the given fluid (K_{RG}, K_{RL}, K_{RGL})
210	1st para.	Replace paragraph with P4
213	Footnote	Where D is i.d. (inches) of Schedule 40 standard pipe
231	Line after Eq. (3A.3-6)	...data over a **limited** temperature range (**Reid, et al., 1987)**.
238	Eq. (3A.5-1)	$dv = \left(\frac{\partial v}{\partial T}\right)_p dT + \left(\frac{\partial v}{\partial P}\right)_T dP$ {missing + ; misplaced + }
239	Eq. (3A.5-6)	$-\frac{dP}{dT} = \frac{(1/\rho)\ (\partial \rho / \partial T)_P + 3\alpha}{(D\ C_1 / e\ E) + (1/\rho)\ (\partial \rho\ /\ \partial P)_T}$ {ρ in place of P in partial derivative}
239 *	Middle of page	The modulus of elasticity is 3×10^7 {not 3×10^6}
239	Table 3A.5-1	dP/dT, psi / °C (acetic acid...water): **155, 155, 155, 166, 197, 164, 47**
246	Eq. (3A.6-6)	ϕ should be in the numerator, not the denominator
256	Eq. (3B.2-8)	$\frac{P_{in}^0}{P_{in}} = \left[\frac{\boldsymbol{v}_{\mathbf{in}}\ G^2\ (k-1)}{2\ g_c\ k\ P_{in}} + 1\right]^{k/(k-1)}$ {$\boldsymbol{v}_{\mathbf{in}}$ misplaced; no = sign}
258	Reference	(1993) API RP 520-I, para. 4.3.3.1 (2000) API RP 520-I, para. 3.6.3
259	Eq. (3B.2-21)	Last term should be $(dP\ /\ dT)_T$
260	References	(1993) API RP 520-I, para. 4.3.3.1 (2000) API RP 520-I, para. 3.6.3 (1993) API RP 520-I, para. 4.3.3.1 (2000) API RP 520-I, para. 3.6.2
262	Eq. (3B.2-29)	$-dP = \frac{1}{g_c} G^2\ dv + \left(\frac{dP}{dL}\right)_{\mathbf{fr}} dL + \frac{g}{g_c} \frac{1}{v} dZ$ {fr subscript; also in $\left(\frac{dP}{dL}\right)_{\mathbf{fr}}$ definition}
265	In place of text starting with “The Churchill values… and ending with Eq. (3B.2-36b)	The friction factor is calculated from the following BASIC-like procedure: $f_1 = 64 / N_{Re}$ If $N_{Re} < 1{,}000$ Then $f = f_1 / 4$ (laminar f) (3B.2-36) Else ($N_{Re} \geq 1{,}000$) $\varphi = -2 \log_{10} [(\varepsilon / D) / 3.7 + (7 / N_{Re})^{0.9}]$ $f_3 = \{-2 \log_{10} [(\varepsilon / D) / 3.7 + 2.51\ \varphi / N_{Re}]\}^{-2}$

		If N_{Re} < 10,000 Then $f_2 = (Re / 13{,}269)^2$ $f = [f_1^{12} + (f_2^{-8} + f_3^{-8})^{-3/2}]^{1/12} / 4$ (transitional f) (3B.2-36a) Else ($N_{Re} \geq 10{,}000$) $f = f_3 / 4$ (turbulent f) (3B.2-36b) End If (end of inner “If…Then…Else” statement) End If (end of outer “If…Then…Else” statement)
270	1st sentence	Add: For incompressible or two-phase flow, equation (3B.2-40) can be solved…
270	1st para.	Delete: …and close to unity for gas flow. Add: Do not follow the common practice of using $\omega = 1$ for gas flow.
270	1st para.	Delete the words: “For any fluid,” Add: “Using physical property information, the value of …”
270	After 1st para.	Insert paragraph P5
270	2nd para., 1st line	If the flow is choked at $\boldsymbol{P_1}$…
270	3rd para., 1st line	Some designers follow the practice of… {delete conservative}
270	Eq. (3B.2-42)	$\boldsymbol{G_c^2 = (-\partial P / \partial v)_s}$ {inverted P and v; subscript error; sq. rt. (t.)}
273	3rd para., 1st line	...program at each... {omit 2nd the}
273	Table 3B.3-1, Model C	$v / v_A - 1 = a$ **[**$(P_A / P)^b - 1]$ {missing bracket}
274	3rd line	✧ TPHEM then sets $b_1 = 1$, $c_0 = 0$, and computes a_0 and b_0 {$c_1 \neq 0$; b_0, not bo}
274	4th - 6th line (replace)	**For frozen flow use the two-point Model E with $X_B = X_A$ (see §3B.4.3.2.2).**
274	1st para., 3rd line	§3B.4.**2.3**
274	§3B.3.1.1, 3rd line	(somewhat more rigorous for gas flow **through pipes**).
274	3rd to last line	Table **3B.3-1** {not Table 3B.23-1}
274	2nd to last line	$X =$ **0**
275	Table 3B.3-2	Temperature $T_0 (P_0 / P)^{\boldsymbol{(k-1)/k}}$ T_0 {Error in power}
275	Table 3B.3-2	v_g $v_0 (P / P_0)^{-1/k}$ $v_0 (P / P_0)^{\boldsymbol{-1}}$ {Error in power}
279	Last para., reference	Eq. (3B.2-**29**)
282	Eq. (3B.4-7)	$G_t^2 = \dfrac{2 g_c P_0}{v_t^2}\left\{(1-X) v_f \left(1-\dfrac{P_t}{P_0}\right) + \dfrac{X v_{g0} k^*}{k^*-1}\left[1-\left(\dfrac{P_t}{P_0}\right)^{(k^*-1)/k^*}\right]\right\}$ {missing brackets and subscript 0 in v_{g0}; pressure term}
282	Below Eq. (3B.4-7)	$v_t = (1-X) v_f + X v_g (P_t / P_0)^{\boldsymbol{-1/k^*}}$ {last part should be raised to the power}
283	1st para.	Eq. (3B.2-18) should be Eq. (3B.2-44)
283	Eq. (3B.4-8)	$g_c G_c^{-2} = \dfrac{X v_g}{k P_c} + \dfrac{N_{ne} (v_{fg} / H_{fg})^2 (C_f T - X H_g)}{J}$ {missing – in –2 power}
283	2nd para., 2nd to last line	ft·lb$_m$ / **BTU**… {not ft·lb$_m$ / (lb$_f$·s^2)}
292	Table 3B.4-3	Replace ITPS with **IPTS** (two places)
292	3rd line	(Leung, **1995**)
292	Table 3B.4-3	For all options, see: “TPHEM – Supplement for Advanced Users” (attached)
294	--	Page is not numbered
294	Table 3B.4-5	For all options, see: “TPHEM – Supplement for Advanced Users” (attached)
294	Table 3B.4-5	Code IC, **3 = Advanced User**
295	Table 3b.4-6	Table 3**B**.4-6
295	Table 3B.4-6	For all options, see: “TPHEM – Supplement for Advanced Users” (attached)
296	Table 3B.4-7	**Enthalpy** {misspelled}

296 *	Table 3B.4-7	lbm / ft^3 {heading}
296	Table 3B.4-7	Replace Data Set with **State**
368	Fig. 5.4-3, 2nd right box	Read value of y from Figure **5.4-4** {wrong number}
369	2nd line	...(**5.4.10**) through (**5.4.12**)...
370	Eqs. (5.4.4) and (5.4.5); These equations are preferable.	$D = \sqrt{\dfrac{4\,Q_g\,(1-y)}{\pi\,C\,u_t\,(1-x)}}$ (5.5.4) $C = L / D$ (a user-specified length-to-diameter ratio) (5.5.5)
371	3rd para., 1st line	Figure **5.4-4**
386	3rd line from bottom	...sum of **partial** pressures...
387	P_1, P_q	**Should be partial pressures, except when the condensable and quench liquids are immiscible**
388	• *Gas holdup*	Replace bullet text with: • *Gas holdup* is the gas trapped in the bubbling liquid. • *Entrainment*. An allowance for additional gas volume (freeboard) is also needed to minimize entrainment losses.
393	Last symbol	$\boldsymbol{H}_{\mathbf{q0}}$ = enthalpy of quench liquid at initial temperature
396 397	P_1, P_q	**Should be partial pressures, except when the condensable and quench liquids are immiscible**
397	3rd line	Equation (**5.6.5**)...
403	2nd para., 4th line	...**partial** pressure...
403	P_{v1}, P_{v2}	= **partial** pressure of pool... {not vapor pressure}
434	Eq. (5.9.3)	$M_2 = 1.702 \times 10^{-5}\left(\dfrac{W}{P\,D^2}\right)\left(\dfrac{Z\,T}{k\,M_w}\right)^{\mathbf{1/2}}$ {missing ½ power}
461	Complete page	May be a duplicate of Pg. 460; see correct page (attached)
469	2nd para.	…each component in **the** vapor leaving…
487	Reference	API RP 520-I, **7th Ed. (Jan 2000)**
488	6th entry	ASME BPVC. Boiler and Pressure Vessel Code, Section VIII, Division 1, Pressure Vessels, **2001**, ASME, New York, NY
490	Reference	Bluhm, W. C. (**1962**)
492	Bottom of page	Some may have poor print quality; see correct page (attached)
506	Reference	Add: Schmidt, J. and Giesbrecht, H., “Design of Cyclone Separators for Emergency Relief Systems”, PSP, 20(1), 6-16 (March 2001)
508 *	Reference	Straitz (1987a) should be Straitz, J. F., (1977). “Make the Flare Protect the Environment”, Hydrocarbon Processing, (56), 131-135.

* New Addition Since 12/28/04