

ERRATA FOR "ENGINEERING NOISE CONTROL" 2nd Edn., 1st printing.

March 24, 2002

p16, 2 lines under the equation, "344" should be "343"

p16, 3 lines under the equation, "1.205" should be "1.206" and "415" should be "414".

p17, Equation 1.9 should be as shown below (plus sign replaced with minus sign)

$$p = \rho[\partial\phi/\partial t - U\partial\phi/\partial x]$$

p26, Equation (1.49) should be:

$$p(\mathbf{r},t) = P(\mathbf{r})e^{jk(ct + |\mathbf{r}| + \theta/k)} = P(\mathbf{r})e^{j(\omega t + \theta_p(\mathbf{r}))} = Ae^{j\omega t} \quad (1.49)$$

p73, table 3.1, number under "400" should be changed from "-4.2" to "-4.8" and the number under "10000" should be changed from "2.5" to "-2.5"

p105, 4th line from bottom, "4.15" should be "4.17"

p106, Figure 4.3 caption, change "100" to "1000"

p108, 10 lines after equation 4.23, change "3/5 and 3/4" to "3/4 and 3/5"

p109, After equation 4.28 add, "If the actual exposure time is greater than eight hours, then replace the "8" in the above equation with the actual exposure time (in hours)."

p110 3rd line, " T_A " should be T_a

p114, Figure 4.6 caption, change "S3.1-1977" to "S3.14-1977"

p114 6th line from top, change "and 2000Hz" to "2000Hz and 4000Hz" and change "three octave bands" to "four octave bands"

p124, table 4.9 last 2 lines should be:

| | |
|---|-----|
| City or commercial areas or residences bordering industrial areas | +20 |
| Predominantly industrial areas | +25 |

p133, equation 5.20, replace "=" with "≈"

p137, 3 lines above equation 5.41, remove "By introducing the constant 1/3 and"

p137, line above equation 5.41, replace "(1995)" with "(1955)"

p144, In equation 5.70 and in the line above the equation, change W to W_i

p145, 2nd line from bottom of page, replace "displacement" with "velocity"

- p146, 5th line after eq 5.73, insert "velocity" before the word "amplitude"
- p151, Equation in the caption for Figure 5.8 should read

$$Z_R = \rho c \pi a^2 [R_R(2ka) + jX_R(2ka)]$$
- p161, In figure 5.12, the transmitted wave should be labelled " r_T ", not " r_I "
- p163, 2nd line below equation 5.125, "5.115(b)" should be "5.115(b)"
- p163, 1st line below equation 5.127, "5.117, 5.118 and 5.119" should be "5.118, 5.119 and 5.120"
- p163, In equation 5.128, replace A_i with A_l
- p163, 1st line below equation 5.127, "5.117, 5.118 and 5.119" should be "5.118, 5.119 and 5.120"
- p164, Line 2, replace $|p_T|^2/|p_I|^2$ with $\rho c |p_T|^2/(|Z_m| |p_I|^2)$
- p164, 5th line, add the words "for real Z_m " before the colon
- p165, Equation 5.143, the quantity "erfc" should not be in italics as it is the error function
- p165, Immediately after equation 5.143, add "where erfc is the error function"
- p170, 13th line under section 5.11.3, " D_{IM} " should be " DI_M "
- p171, 3rd line from the top of the page, " D_{IM} " should be " DI_M "
- p174, The slope of the curve in figure 5.14(b) is incorrect. The start point at the bottom of the graph is correct and the graph is a straight line passing through the point (20,4)
- p177, Figure 5.17, the labels for the 63Hz and 200 Hz curves should be interchanged.
- p178, Figure 5.18 caption, add " and $\beta = 90 - \theta$ " after the word "horizontal"
- p185, 10th line under equation 5.174, replace "two valves" with "the two values"
- p191, Table 5.7 caption, add ", A_m " at the end
- p199, line 5, replace " $\gamma (=$ " with " $\gamma (=$ "
- p208, 2 lines under equation 6.13, "25" should be "20"
- p209, 3rd line in 2nd paragraph, replace " L_{pI} " with " L_{pR} "
- p211, In equation 6.20, there should be a subscript "1" on the r on the left hand side and a subscript "2" on the r on the right hand side

p214, In Table 6.3, “ S_1 ” should be “ S ”

p214, Table 6.4 second column title, "valume" should be "volume"

p215, equation 6.29, replace “ $(S\bar{\alpha})$ ” with “ $(S_R\bar{\alpha})$ ” and in the line below the equation, replace “ S ” with S_R

p226, line 2, replace “ k_2 ” with “ k^2 ”

p226, Equation 7.6, replace “ k^2 ” with “ \square_z^2 ”

p231, In equation 7.22, $\delta/2\pi$ should be δ/π

p234, 2nd line above equation 7.27, add "per unit area" immediately after "contribution"

p234, In Equation, 7.27, remove "dS"

p234, Immediately following equation 7.27, replace "where" with "The total energy is obtained by integrating the incremental energy contribution per unit area of sphere over the area of the sphere. The incremental area of sphere for use in integration is,"

p234, Delete the first sentence following equation 7.28.

p237, 1 line under equation 7.42, "412" should be "414" and "0.2dB" should be "0.1dB"

p248, Table 7.1, 3rd line from bottom, “0.018” should be “0.18”

p249, fig 7.6, y-axis label should be changed from $\bar{\alpha}$ to α_{st}

p250, 2 lines above the figure, after "additional data)", add "(see also equation E.7 for a more precise expression)"

p249, fig 7.6, y-axis label should be changed from $\bar{\alpha}$ to $\bar{\alpha}_{st}$

p 254, equation 7.73 should be

$$\bar{\alpha} = \frac{4V\pi f}{Sc} \left[\left| \left(\eta_A + \eta_{pA} \left(1 + \frac{n_p}{n_A} \right) + \eta_{pT} \right) - \left[\left(\eta_A + \eta_{pA} \left(\frac{n_p}{n_A} - 1 \right) - \eta_{pT} \right)^2 + 4 \frac{n_p}{n_A} \eta_{pA}^2 \right]^{1/2} \right| - 2\eta_A \right]$$

p254, 4 lines under equation 7.73, the expression for η_{pA} should be $\eta_{pA} = \rho c \sigma / 2\pi f m$

p254, Replace the line above Equation (7.74) and Equations 7.74 - 7.76 with:
For frequencies above twice the resonance frequency of the lowest order mode (see Equation (8.18)), the panel radiation ratio σ may be calculated using the following

equations (Maidanik, 1962, Price and Crocker, 1970). Above twice the fundamental resonance frequency of the panel and below the critical frequency:

$$\sigma = \left(\frac{2c^2}{f_c^2 A_p} g_1(\alpha) + \frac{Pc}{f_c A_p} g_2(\alpha) \right) \gamma ; \quad 2f_{1,1} < f < 0.99f_c \quad (7.74a)$$

where,

$$g_1(\alpha) = \begin{cases} \frac{4}{\pi^4} \frac{(1 - 2\alpha^2)}{\alpha(1 - \alpha^2)^{1/2}}; & f < f_c/2 \\ 0; & f > f_c/2 \end{cases} \quad (7.74b)$$

$$g_2(\alpha) = \frac{1}{4\pi^2} \left[\frac{(1 - \alpha^2) \log_e \left(\frac{1 + \alpha}{1 - \alpha} \right) + 2\alpha}{(1 - \alpha^2)^{3/2}} \right] \quad (7.74c)$$

Close to the critical frequency, the radiation ratio is:

$$\sigma \approx \sqrt{\frac{L_x f_c}{c}} + \sqrt{\frac{L_y f_c}{c}} ; \quad 0.99f_c < f < 1.01f_c \quad (7.75)$$

Above the critical frequency, the radiation ratio is:

$$\sigma = \left(1 - \frac{f_c}{f} \right)^{-1/2} ; \quad f > 1.01f_c \quad (7.76a)$$

Below the first resonance frequency of the panel, $f_{1,1}$, defined by Equation (8.21), the radiation ratio is (Beranek (1988):

$$\sigma = \frac{4A_p}{c^2} f^2 \quad (7.76b)$$

Between the lowest order modal resonance and twice that frequency, the radiation ratio is found by interpolating linearly (on a log σ vs log f plot).

p261, Interchange figure 7.11 with figure 7.16 on page 269, but leave the figure captions where they are now.

p264, In Table 7.2, interchange β_1 and β_2

p266, Equation 7.100 should be:

$$\langle p^2(\mathbf{r}) \rangle = \frac{W\rho c}{4\pi} \left[\frac{1}{r^2} + \sum_{m=1}^{\infty} \sum_{n=1}^{\infty} \frac{4\beta^{m+n}}{(ma)^2 + (nb)^2 + r^2} + \sum_{n=1}^{\infty} \frac{2\beta^n}{(nb)^2 + r^2} + \sum_{m=1}^{\infty} \frac{2\beta^m}{(ma)^2 + r^2} \right]$$

p266, The y-axis label in figure 7.14 should read $10\log_{10}\langle p^2(r) \rangle - 10\log_{10}(W\rho c/\pi a^2)$

p268, 6th line from the bottom of the page, "30 dB" should be "9 dB"

p269, 5th line under figure caption, change "strength" to "power"

p269, In equation 7.107, change "z" to "r"

p271, The heading "**Optimising reverberation control**" should be "**Optimising reverberation times**"

p274, equation 8.2(a,b), change the symbol vee "v" to the Greek letter nu, "ν" in two places

p277, Equation 8.4 has " b_n " missing. The equation should be

$$B = \frac{Eh}{(1 - \nu^2)l} \sum_n b_n \left(z_n^2 + \frac{h^2 + b_n^2}{24} + \frac{h^2 - b_n^2}{24} \cos 2\theta_n \right) \text{ (kg m}^2 \text{ s}^{-2}\text{)}$$

p286, in equations 8.26 and 8.27, replace "5" with "5.5"

p287, fig 8.6(b) frequency scale " f_{c2} " should be " $2f_{c2}$ "

p287, figure caption, "53" should be "54"

p288, Equation, 8.29, first line, "- 20log" should be "+ 20log"

p288, Equation, 8.29, second line, "+ 10log" should be "- 10log"

p292, In Equations (8.41), "77" should be "71" and "99" should be "93"

p293, In the figure, on the x-axis, " $0.5f_{c1}$ " should be " $0.5f_{c2}$ "

p293, Immediately under the third equation, the second " TL_B " in the first line should be " TL_{B1} ", so that the first line under the third equation should read "The transmission loss, TL_B , at point B is equal to TL_{B1} if no sound absorptive material is"

p294, In equation 8.45, " A " is the total area of the panel

p294, Remove β from the denominator of equation (8.42)

p294, Numerator in Equation 8.42 should be $64\rho^2c^3D$, where D is defined as

$$D = 2/\beta \text{ if } f < 0.9 \times \min(f_{c1} \text{ and } f_{c2}); \text{ otherwise, } D = \frac{\pi f_{c1} f_{c2}}{16f^2 \eta_1 \eta_2}$$

p294, Equation 8.44 should be written as

$$\beta = \left[1 - \left(\frac{f}{f_{c1}} \right)^2 \right]^2 \left[1 - \left(\frac{f}{f_{c2}} \right)^2 \right]^2$$

p295, 2 lines above equation 8.48, delete "the stud is assumed rigid and" and replace equation (8.48) with

$$\tau_F = \frac{\pi(\xi_1 + \xi_2)n}{4\bar{a}_1^2 \bar{a}_2^2 \eta_1 \eta_2 \xi_1 \xi_2 (n^2 + \nu^2) \bar{\alpha}^2} + \frac{64\rho^2 c^3 D}{\left[g^2 + \left(4(2\pi f)^{3/2} m_1 m_2 c C_M - g \right)^2 \right] b (2\pi f)^2}$$

p295, first line after equation (8.52), insert after the word "panels" the following: " $\bar{\alpha}$ is the Sabine absorption coefficient of the acoustic material in the cavity between the two walls"

p295, 2 lines above equation (8.47), change "0.05" to "0.1 to 0.15"

p295, Line directly above "example 8.1", change "<" to ">"

p313, second line of the solution, change "1" to "1.1"

p324, Figure 8.14. The letter "O" should be inserted on the figure to label the point where the solid line from S to R intersects the vertical line defining the edge of the barrier

p325, first line after equation 8.75, replace "b" with "b (> $\lambda/2$)"

p326, part 1, 4th line, add "from the horizontal" immediately after "angle of incidence"

p330, Equation 8.79, third line, "a" should be " α "

p334, in equation 8.90, "16.3" should be "226" and (m/h) should be $(m/h)^{1/2}$

p346, first line under equation 9.17, replace " $q > a$ " with " $q > 2a$ "

p346, equation 9.18, replace "0.44" with "0.43"

p346, In equation 9.19, replace "d" with "t" in two places; in the line above equation 9.20, replace "d" with "t"; in equation 9.20, replace "d" with "t"; and 5 lines from the bottom of the page, replace "d" with "t".

p350, Line beneath equation 9.27, replace "reactive impedance" with "square root of the product of the inductive and capacitive impedances"

p355, Equation 9.45, the upper case "V" should be lower case "v"

p357, Section 9.7.4, item 1, change U to U_0

p361, equation 9.62 should be $10\log_{10}[\dots\text{existing argument}\dots]^2$

- p375, Top line, change " h " to " $2h$ "
- p375, $R_1 l / \rho_c$ should be $R_1 l / \rho c$
- p388, last line, change "0.9" to "1.1" and "9.0" to "11.0"
- p389, After the first equation, add "where A_2/A_1 is the ratio of the total duct cross sectional area to the open cross sectional area"
- p389, beginning 4th line below 1st equation, change "9.0" to "11.0", "0.7" to "0.6", "6.3" to "6.6" and "12" to "12.5"
- p389, middle of page, change "0.45" to "0.6", "4.4" to "6.0", "1.25" to "1.6", "2.5" to "1.6" and "4.57" to "2.92".
- p389, 5th line above section 9.8.5. Change "5.5" to "9.5" and delete the phrase in brackets.
- p389, for the 4 lines above section 9.8.5, change "1.25" to "1.6" (2 places), "5.5" to "9.6", "0.7" to "0.6" and the word "thick" to "wide" (2 places).
- p390, In first line of figure caption, replace "duct bend" with "90° duct bend"
- p393, In equation 9.92, " $f < f_{cr}$ " should be " $f \geq f_{cr}$ "
- p393, First line after equation 9.94, " f_1 " should be " f_0 " in two places
- p393, Line above equation 9.96, " f_1 " should be " f_0 "
- p393, In equation 9.95b, replace l with L in two places; also in the line two above equation 9.94
- p397, replace " 2π " with 4π " in equations 9.102, 9.103, 9.105 and 9.106.
- p397, replace "hemispherical" with "spherical" in 8th and 9th lines after equation 9.101 and in second line after equation 9.102
- p397, first line after equation 9.102, replace "stack" with "stack and $fd/c < 0.5$ "
- p397, third line after equation 9.104, replace "exit" with "exit (including excess attenuation effects)"
- p397, add " $-A_E$ " to the right end of equation 9.105
- p397, divide the right side of equation 9.106 by $10^{A_E/10}$
- p397, 2 lines above equation 9.102, (P_M^2) should be $\langle p_M^2 \rangle$
- p398, line 2, replace "at location" with "at a location"

- p398, 2nd line from bottom of page, interchange the symbols “ r ” and “ r_0 ”
- p408, 9th line from bottom of page, replace “two rocking mode” with “rocking and horizontal”
- p408, 8th line from bottom of page, replace “roll and pitch” with “roll and horizontal motion”
- p409. Fig 10.5 caption, change “ Q ” to “ Ω ”
- p410, 2nd line, add after “10.4)” the phrase, “and with δ now the radius of gyration for rotation about the x-axis”
- p410, Equation 10.17, “(Hz)n” should be “(Hz)”
- p418, replace “ i ” everywhere with “ j ” in equation 10.21
- p418, 2nd line after equation 10.21, add “ f_1 ” after “frequency”
- p419, 14th line under 10.6, “ $d/\omega^2 = v/\omega = a$ ” should be “ $d\omega^2 = v\omega = a$ ”
- p419, 3rd line under equation 10.24, add “ y is the amplitude of mass m_2 ” after “10.5)”
- p430, In equation 10.36b, replace “4” with “2” and in equation 10.36c delete the “2”
- p431. 6th dot point, change “controls” to “control”
- p433, Table 11.1, the entry in the centre column next to “pumps” should be L_p , not L_w
- p434, Replace Equation 11.1 with:

$$L_w = C_F + 10 \log_{10} Q + 20 \log_{10} P - E/3 + 18 \text{ dB re } 10^{-12} \text{ W} \quad (11.1)$$

- p454, first line under equation 11.38, add after “ G_f ”, the phrase, “upstream of the valve”
- p456, In equations 11.54 and 11.55, “ f_0 ” should be “ f_{co} ” in two places in each equation
- p457, In equation 11.56, “ f_0 ” should be “ f_{co} ” in two places
- p462, Table 11.18 caption, replace “Equation 11.47” with “Equation 11.68”
- p465, Equations (11.71), (11.72) and (11.74) should be replaced respectively with the following equations:

$$L_p = 44 \log_{10} U + 17 \log_{10} \dot{m} + 44 \quad (\text{dB re } 20 \mu\text{Pa})$$

$$L_w = 44 \log_{10} U + 17 \log_{10} \dot{m} + 53 \quad (\text{dB re } 10^{-12} \text{ W})$$

$$W_a = 4.2 \eta \dot{M} H \quad (\text{W})$$

p512, 3rd line from bottom, "E" for "polystyrene" should be 1.2 to 3.4 MPa, ρ should be 16 to 32 kg/m³ and the speed of sound, c_L should be 270-330 m/s

p513, Third line under the table, the quantity " $c_L = \sqrt{E/\rho}\sqrt{1 - \nu^2}$ " should be " $c_L = \sqrt{E/\rho} / \sqrt{1 - \nu^2}$ "

p517, In Equation C5, change " $(\gamma - 1)$ " to " $(1 - \gamma)$ "

p517, In equation C7, change " $a(X_1)$ " to " $0.592 a(X_1)$ "

p524, The 4 equations immediately below the figure should be collectively numbered as "(D4)"

p526, The second "cos θ " in Equation (E.3) should be deleted.

p527, In equation E.6, change the minus sign to a plus sign.

p528, Third line under equation E.7, "All dimensions are in millimetres" should read, "All dimensions are in metres"

p528, 2nd line under equation E7, add the words, "including the porous liner" after "cavity"

p536, Last equation on the page should read

$$X(f_n) = \frac{1}{T} \int_{-T/2}^{T/2} g(t) e^{-j2\pi f_n t} dt \quad \text{and} \quad x(t) = \sum_{n=-\infty}^{\infty} X(f_n) e^{j2\pi f_n t}$$

p538, 3rd line below equation F.18, "Equation F.8" should be "Equation F.13"

p548, The Clifford reference should be "1973", not "1983"

p574, add to list of symbols, " $K_1()$ Modified Hankel function (Chapter 7)"