

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

December 27, 2020

Note: these corrections are for the first printing.

Some may have been corrected in subsequent printings

p15, In line 7, change the equation to $(1/hf)\sqrt{E/\rho} > 2$

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)

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

p16, In Eq. (1.5), change "332" to "331"

p26, Equation (1.49) should be:

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

p41, Table 1.3, line 5, replace " Z_d " with " Z_A "

p42, Heading 1.10.2, replace " Z " with " Z_s "

p45, 2 lines under Eq. (1.75) and in Eq. (1.76), remove the subscript, " t " from p_t .

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"

p89, In Equation (3.23), remove the "-" sign following the "=" sign

p101, Table 4.1 caption, change $N_{0,50}$ to N_{50}

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"

p108, The number "3" and "0.3" should be replaced by "3.01" and "0.301" respectively in Equations (4.24) to (4.27) inclusive

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 “2000 Hz and 4000 Hz” and change “three octave bands” to “four octave bands”
- p116, First line after the headings in Table 4.6, change “0.06” to “0.6”.
- p118, 6 lines above the page bottom, change 70 to 65.
- p119, Fig 4.8 caption, add “MAF” = minimum audible field.
- p123, 1 and 2 lines above Section 4.8 heading, change 30 to 35, change the reference to ASHRAE (2015) Handbook, Applications, Chapter 48 and change the table reference to 4.8.
- p124, table 4.9 last 2 lines should be:
- | | |
|---|-----|
| City or commercial areas or residences bordering industrial areas | +20 |
| Predominantly industrial areas | +25 |
- p125, Table 4.10 caption should read,
 “Estimated public reaction to noise when the measured sound pressure level exceeds the adjusted base sound pressure level (see Table 4.9 for adjustments to the base level of 40~dBA)”
- p130, Line above Eq. (5.6), change “ r ” to “ $r = a$ ”
- p130, In Eq (5.6), change “ r ” to “ a ”
- p130, In Eq. (5.7), change “ r ” to “ a ”
- p133, 6 lines under figure 5.1, replace “(x,y)” with “O” and label the observer as O in Figure 5.1
- 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, 2 lines above Eq. (5.71), add “each of which has a radius of a_i ” immediately after “sources”
- p145, 2 lines above Eq. (5.72), change “ a ” to “ a_i ”
- p145, Line above Eq. (5.72), change “ ka ” to “ ka_i ”
- p145, In Eq. (5.72), change “ a ” to “ a_i ” in 5 places
- p145 Eq. 5.71 and below, change Q to \bar{Q} in 4 places

- p145 second to last line add "amplitude" immediately after "velocity"
- p145, 2nd line from bottom of page, replace "displacement" with "velocity"
- p146 Eq 5.73 and below change Q to \bar{Q} in 2 places
- 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_I
- 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
- p164, add the following notes for Equation (5.133). As Equation (5.133) in this form is provided in Attenborough's paper, which uses negative time dependence, the result is actually the complex conjugate of the spherical wave reflection coefficient used in this book. In addition, to be consistent with the use of negative time dependence in Equation (5.133), it is also necessary to use the complex conjugate of R_p in place of R_p in Equation (5.133).
- p165, In Eq. 5.140, replace (1-j) with (1+j)
- p165, In Eq. 5.142, replace (1-j) with (1+j)
- p165, Replace Equation (5.144) and the line preceding it with:
 where $g(w)$ is the scaled complementary error function, $\operatorname{erfc}(\)$ is the complementary error function (Abramowitz and Stegun, 1965), and w , which is given by Equation (5.140), is a complex number.

The calculation of $g(w)$ in the equations to follow is only valid if the real part of w is less than 0 and the imaginary part is greater than 0 (that is, w is in the second quadrant of the complex plane). So any calculation begins with adjusting the value of w to w_a so that the real part is less than 0 and the imaginary part is greater than 0. As w_a is complex, we can write, $w_a = w_r + jw_i = \operatorname{Re}\{w_a\} + j \operatorname{Im}\{w_a\}$. The calculation of $g(w_a)$ is

then undertaken using Equations (5.144) to (5.146). If the original value of w did not need be adjusted to put w in the second quadrant of the complex plane, then $g(w) = g(w_a)$. If the original value of w before adjustment, was such that w was not in the second quadrant of the complex plane, then $g(w_a)$ must be adjusted to obtain $g(w)$, according to the following rules, with rule 1 applied first and rule 3 applied to the result after the application of rules 1 and 2.

1. If the imaginary part of w is less than 0, then $g(w_a)$ is replaced with $g(w) = 2\exp(-w_a^2) - g(w_a)$, where $g(w_a)$ is calculated using Equations (5.144) to (5.146);
2. If the imaginary part of w is greater than or equal to 0, then $g(w) = g(w_a)$;
3. If the product of the imaginary and real parts of w is greater than 0, then the sign of the imaginary part of $g(w_a)$ is changed (i.e., the complex conjugate of the $g(w)$ that was obtained using the preceding two rules is then the final $g(w)$).

For small w_r and w_i , where w_r is less than or equal to 3.9 and w_i is less than or equal to 3:

$$g(w_a) = g(w_r, jw_i) = K_1(w_i, w_r) + jK_2(w_i, w_r) \quad (5.144a)$$

where,

$$K_1(w_i, w_r) = \frac{hw_i}{\pi(w_r^2 + w_i^2)} + \left[\frac{2w_i h}{\pi} \sum_{n=1}^{\infty} \frac{e^{-n^2 h^2} (w_r^2 + w_i^2 + n^2 h^2)}{(w_i^2 - w_r^2 + n^2 h^2)^2 + 4w_r^2 w_i^2} \right] - \frac{w_i}{\pi} E(h) \quad (5.144b)$$

$+P$ if $w_i < \pi/h$
 $+0.5P$ if $w_i = \pi/h$
 $+0$ if $w_i > \pi/h$

$$K_2(w_i, w_r) = \frac{hw_r}{\pi(w_r^2 + w_i^2)} + \left[\frac{2w_r h}{\pi} \sum_{n=1}^{\infty} \frac{e^{-n^2 h^2} (w_r^2 + w_i^2 + n^2 h^2)}{(w_i^2 - w_r^2 + n^2 h^2)^2 + 4w_r^2 w_i^2} \right] + \frac{w_r}{\pi} E(h) \quad (5.144c)$$

$-F$ if $w_i < \pi/h$
 $-0.5F$ if $w_i = \pi/h$
 -0 if $w_i > \pi/h$

$$P = \frac{2}{\exp[w_r^2 + (2w_i \pi/h) - w_i^2]} \left[\frac{(A_1 C_1 - B_1 D_1)}{(C_1^2 + D_1^2)} \right] \quad (5.144d)$$

$$F = \frac{2}{\exp[w_r^2 + (2w_i \pi/h) - w_i^2]} \left[\frac{(A_1 D_1 + B_1 C_1)}{(C_1^2 + D_1^2)} \right] \quad (5.144e)$$

$$\begin{cases} A_1 = \cos(2w_r w_i) \\ B_1 = \sin(2w_r w_i) \\ C_1 = e^{-2w_i \pi/h} - \cos(2w_r \pi/h) \\ D_1 = \sin(2w_r \pi/h) \end{cases} \quad (5.144f)$$

The error bound can be estimated from:

$$E(h) \leq \frac{2\sqrt{\pi} e^{-(\pi^2/h^2)}}{(1 - e^{-(\pi^2/h^2)})} \quad (5.144g)$$

Note that h is a constant selected by the user. If $h=1$, then $E(h) \leq 2 \times 10^{-4}$ and only 3 or 4 terms are needed in the infinite sums included in the expressions for K_1 and K_2 . If h is reduced to 0.8, then $E(h) \leq 10^{-6}$ and 5 terms will be needed in the infinite sums included in the expressions for K_1 and K_2 . If h is reduced to 0.5, then $E(h) \leq 10^{-15}$ and 14 terms will be needed in the infinite sums included in the expressions for K_1 and K_2 . It is recommended that $h = 0.8$ be used.

p165, In Equations (5.145) and (5.146), replace $-jw$ with $+jw_a$ and replace w with w_a

p165, 1 and 2 lines above Equation (5.145), replace 3 with 3.9 and 2 with 3

p166, In Eq. 5.153, replace $(1-j)$ with $(1+j)$

p166, Replace the paragraph beginning with “The effect of turbulence” (including Equation (5.154) and the 3 lines following it) with the following:

The effect of atmospheric turbulence on sound over an acoustically smooth surface has been investigated by Clifford (1983) and by Raspet (1995). The presence or absence of turbulence may be included by a generalisation of their results to give the following general expression for the mean square sound pressure at a receiver located at a direct distance, r , from the source for a spherically symmetric sound source having unit far field sound pressure at 1 m:

$$\langle p^2 \rangle_t = \frac{1}{r^2} + \frac{|R_s|^2}{(r_1 + r_2)^2} + \frac{2|R_s|}{r(r_1 + r_2)} T \cos[\alpha_s - k(r_1 + r_2 - r)] \quad (\text{Pa}^2)$$

where: $\alpha_s = \tan^{-1} \frac{\text{Im}\{R_s\}}{\text{Re}\{R_s\}}$

and where the sign of k has been changed here to reflect that positive time dependence is used in this book, whereas negative time dependence has been used by Clifford (1983) and by Raspet (1995).

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 ”

p173, 3 lines under the 5.11.7 heading, change “Sutherland et al., 1974” to “Sutherland and Bass, 1979”

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)

p176, In Table 5.3 caption, change “Sutherland et al., 1974” to “Sutherland and Bass, 1979”

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, 2 lines under Equation (5.174), Z_s should be Z_m

p185, 10th line under equation 5.174, replace “two valves” with “the two values”

p186, 6th line from top, change “diffracted” to “refracted”

p188, Table 5.5, Footnote a , add “10 m above the ground” after “m/s”

p188, Table 5.6, $-3.0 < v < +0.5$ should be replaced with $-3.0 < v < -0.5$

p191, Table 5.7 caption, add “, A_m ” at the end

p197, Delete the sentence beginning 9 lines above Equation (6.5)

p199, line 5, replace “ $y (=$ ” 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

p211, 2 lines below Eq. 6.20, replace S_1 with $1/S_1$ and replace S_2 with $1/S_2$

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

p214, Table 6.4 second column title, “valume” should be “volume”

p215, In Fig 6.3, there are two curves labelled “4”. The lower curve should be labelled “5”

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 “ k_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"

p240, 4 lines above Eq. 7.52, change $\langle p_k^2(t) \rangle$ to $\langle p_k^2(0) \rangle$ and add "at time $t=0$ " after "mode k "

p240, 2 lines above Eq. 7.52, change $\langle p_k^2(t) \rangle$ to $\langle p_k^2(0) \rangle$

p240, In Eq. 7.52, change $\langle p_k^2(t) \rangle$ to $\langle p_k^2(0) \rangle$

p241, 3 lines above Eq. 7.55, change p_k to $p_k(0)$

p241 5 lines from the bottom, there should be a minus sign before \log_e

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}

p249, Caption of Figure 7.6, line 1, change "porous surface" to "rigidly backed porous material"

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

p250, 2 or 3 lines above the figure, after "additional data)", add "(see also equation E.7 for a more precise expression)"

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:

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

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, top line, change “1973” to “1988”

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

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

p278, Replace Equation (8.5) with $B = \frac{Eh^3}{12(1 - \nu^2)}$

p280, 15 lines above the bottom of the page, change “ASTM E90-66T” to “ASTM E413-87”

p283, In Equation (8.13), the last term in brackets should be multiplied by 2

p286, In equations 8.26 and 8.27, replace “5” with “5.5”

p287, Change x-axis label to f (Hz) (log scale)”

p287, Fig 8.6(b) frequency scale “ f_{c2} ” should be “ $2f_{c2}$ ”

p287, Figure caption, “53” should be “54”

p287, In part (b) of the caption, replace the sentence beginning with “For a well damped panel”, with the following, “For a well damped panel, see the discussion in the last paragraph on page 289.”

p288, In Equation (8.29), replace $\left[1 - \left(\frac{f}{f_{ci}} \right)^2 \right]$ with 1

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

p292, In Equation (8.41a), “77” should be “72”

p292, In Equation (8.41b), “99” should be “93”

p292, In Eq. 8.41a, replace $10 \log_{10} m_1$ with $20 \log_{10} m_1$

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"

p293, The existing equation for TL_{B1} is only valid for $f_{c1} < 2\pi f_\ell$.

For $f_{c1} \geq 2\pi f_\ell$, we use: $TL_{B1} = TL_A + 20\log_{10}(f_{c1}/f_0) + 20\log_{10}(f_{c1}/f_\ell) - 22$ (dB)

p293, first line of item (b) in the caption, change to "Line-point support (f_{c2} is the critical frequency of the point supported panel)"

p293, Under "Point B", item (a), replace " $30\log_{10}f_{c2}$ " with " $20\log_{10}f_{c1} + 10\log_{10}f_{c2}$ "

p293, Under "Point B", item (b), replace " $40\log_{10}f_{c2}$ " with " $20\log_{10}f_{c1} + 20\log_{10}f_{c2}$ "

p293, Eq (a) under "Point C", add the term, " $20\log_{10}(f_{c2}/f_{c1})$ " to the RHS of the equation

p293, last Eqn., change f_1 to f_ℓ

p294, To reflect Davy's latest model, beginning the paragraph above Equation (8.42) on page 294, and ending at the end of the paragraph finishing 3 lines above Equation (8.45) on page 294, replace everything with the following.

The transmission loss is found by calculating the transmission coefficients due to airborne sound, τ_{Fa} , and structure borne transmission, τ_{Fc} , respectively and then substituting those values into Equation (8.53a).

$$TL = -10\log_{10}(\tau_{Fa} + \tau_{Fc})$$

In the most recent Davy model (JASA, vol. 145, page 703, 2019) the mass-air-mass resonance frequency is calculated in a different way to how it is done in the Sharp model. First, the fundamental resonance frequencies of the panels on either side of the cavity are calculated by treating the leaves of the wall as rectangular plates that are simply supported on two opposite edges (the edges attached to the studs) and free on the other two edges. The expression used for the resonance frequency of the first bending mode for leaf i is:

$$f_i = \frac{X_m \pi}{2b^2} \sqrt{\frac{E_i h_i^2}{12\rho_{mi}(1 - \nu_i^2)}}, \dots, i=1, 2 \quad (8.42b)$$

where b is the spacing between the studs and X_m is a multiplier, used only for the Davy double wall TL model, where $X_m = 1.7$ for steel studs with a thickness greater than 0.5 mm and $X_m = 0.8$ for steel studs with a thickness less than 0.5 mm.

When the two leaves making up the double wall are identical, the Davy model calculates and uses a modified value, f_0' for the mass-air-mass resonance frequency.

$$f_0' = \sqrt{\frac{\rho c^2(m_1 + m_2)}{4\pi^2 dm_1 m_2} + f_1^2} \quad (8.42c)$$

When the panels are not identical, the calculation is slightly more complex. In this case:

$$f_0' = \sqrt{-0.5p + 0.5\sqrt{p^2 - 4q}} \quad (8.42d)$$

where $p = -(f_1^2 + f_2^2 + f_{a1}^2 + f_{a2}^2)$ and $q = f_1^2 f_2^2 + f_1^2 f_{a2}^2 + f_2^2 f_{a1}^2$ and

$$f_{ai} = \frac{1}{2\pi} \sqrt{\frac{\rho c^2}{dm_i}} \quad (8.42e)$$

Davy indirectly measured loss factors for gypsum plaster board that ranged from 0.03 to 0.04. These were the factors that resulted in best agreement with his TL model in the vicinity of the panel critical frequencies.

Below the adjusted mass-air-mass resonance frequency, f_0' , the double wall behaves like a single wall of the same mass and the single wall procedures may be used to estimate the TL below a frequency, $f = 2f_0'/3$. In this case, the TL is given by Equation~(8.29) in the textbook, where m is the total mass per unit area of the double wall leaves ($m_1 + m_2$).

$$a = \left(\frac{\pi f (m_1 + m_2)}{\rho c} \right) \quad (8.42f)$$

Between $f = 2f_0'/3$ and f_0' , a straight line is drawn on a plot of TL vs $\log_{10} f$ between the TL calculated at $f = 2f_0'/3$ and the TL calculated at $f = f_0'$. The TL at $f = 2f_0'/3$ is calculated using Equation (8.29) in the textbook (with $m = m_1 + m_2$) and Equation (8.42f) above for a single panel, with the mass per unit area, m , being the total mass per unit area of the construction. At $f = f_0'$, the TL is calculated using Equations (8.42a) above, Equation (8.45) in the textbook and Equations (8.42) (or Equation (8.42i)) below.

Above f_0' , the transmission from one leaf to the other consists of airborne energy through the cavity and structure-borne energy through the studs. For point connections, the structure-borne sound transmission coefficient for all frequencies equal to and above f_0' is:

$$\tau_{Fc} = \frac{16n\rho^2 c^4 QR}{\pi^5 f^2 [(m_1 f_{c2} + m_2 f_{c1})^2 + 64f^2 m_1^2 m_2^2 c^4 C_M^2]} \quad (8.42)$$

where n is the number of point connections per square metre and

$$Q = \begin{cases} 1+e & \text{if } f < f_{c1} \\ e & \text{if } f \geq f_{c1} \end{cases} \quad (8.42g)$$

and

$$R = \begin{cases} 1+r & \text{if } f < f_{c2} \\ r & \text{if } f \geq f_{c2} \end{cases} \quad (8.42h)$$

where $e = \pi f_{c1} \sigma_1 / (4f \eta_1)$, $r = \pi f_{c2} \sigma_2 / (4f \eta_2)$, f_{c1} and f_{c2} are the critical frequencies of panels 1 and 2 respectively, s_1 and s_2 are the radiation efficiencies of panels 1 and 2 respectively, calculated as described on page 254 (corrected) in the textbook, and m_1 and m_2 are the mass per unit area of panels 1 and 2 respectively. When calculating panel radiation efficiencies, the perimeter, P is the overall length of the panel perimeter plus twice the length of all the studs. A line of point connections can be

$$C_M = A f^{x_f} m_r^{x_m} b^{x_b} g^{x_g} S^{x_s}$$

treated as a stud.

For line connections, the structure-borne sound transmission coefficient for all frequencies equal to and above f_0' is:

$$\tau_{Fc} = \frac{8\rho^2 c^3 QR}{\left[g^2 + \left(8\pi f^{3/2} m_1 m_2 c C_M - g \right)^2 \right] b \pi^3 f^2} \quad (8.42i)$$

where b is the spacing between the studs, $e = \frac{\sigma_1}{2\eta_1} \sqrt{\frac{f_{c1}}{f}}$, $r = \frac{\sigma_2}{2\eta_2} \sqrt{\frac{f_{c2}}{f}}$, $f_{c1} \leq f_{c2}$ and

$$g = m_1 (f_{c2})^{1/2} + m_2 (f_{c1})^{1/2}$$

Davy has found that for wooden studs, the point connection model works best in all cases and the line connection model should not be used. For steel studs where the leaves are screwed to the studs, the line connection model should be used at frequencies for which the screw spacing is less than one-quarter of the leaf bending wavelength and the point connection model should be used at frequencies for which the screw spacing is greater than one-quarter of the leaf bending wavelength. The leaf bending wavelength may be calculated using $\lambda_B = c_B / f$, where c_B is defined in Equation (8.1) in the textbook.

Based on all of his work on developing empirical compliance models, Davy recommends that the model described in his 2019 JASA paper is the one that should be used for all steel studs, even though the model was derived only using steel C-section studs, 92 mm wide. There are two different models provided; one for point connections and one for line connections.

For the line connection model, the compliance, C_M is given by:

where $m_r = \frac{m_1 m_2}{m_1 + m_2}$, m_1 and m_2 are the mass per unit areas of leaves 1 and 2,

respectively, b is the stud spacing, g is the gauge of steel used in the stud and S is the area of one side of the wall.

For the point connection model, the compliance, C_M , is given by:

$$C_M = A f^{x_f} m_r^{x_m} n^{x_n} g^{x_g} S^{x_S}$$

where n is the number of point connections (number of screw connections) per square metre, Values of the constant, A and exponents corresponding to Equations (8.62a) and (8.62b) are listed in the following table for TC (channel section) type studs.

Coefficient	Line connection		Point connection	
	63 Hz–250 Hz	250 Hz–5000 Hz	63 Hz–250 Hz	250 Hz–5000 Hz
A	6.07×10^{-4}	2.58×10^{-4}	4.06×10^{-5}	4.94×10^{-7}
x_f	-1.04	-1.52	-0.76	-1.16
x_m	-1.4	-1.12	-1.96	-1.18
x_b	0.0	-0.257	0.0	0.0
x_n	0.0	0.0	0.0	0.747
x_g	0.666	1.52	1.68	2.49
x_S	0.0	0.0	0.0	0.355

Davy also investigated the effect of using different steel stud sections (see Figure~7.12 in the 5th edition textbook). They concluded that the compliance corresponding to these stud types can be obtained by multiplying the value of C_M for TC type studs by the factors listed in Table~7.4 in the 5th edition textbook, which indicates that AWS section studs will result in the highest TL values.

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

p295, In Equation (8.46), remove $\left[1 - \left(\frac{f}{f_{ci}} \right)^2 \right]$

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

$$\tau_{Fa} = \frac{\pi(\eta_2 \xi_1 + \eta_1 \xi_2)}{2\bar{a}_1^{-2} \bar{a}_2^{-2} \eta_1 \eta_2 (q_1^2 + q_2^2) \bar{a}^{-2}} \quad (8.48)$$

p295, replace Equation (8.51) with $q_1 = \eta_1 \xi_2 + \eta_2 \xi_1$

p295, replace Equation (8.52) with $q_2 = 2(\xi_1 - \xi_2)$

p295, first line after equation (8.52), insert after the word "panels" the following: " \bar{a} 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 ">"

p296, 6 lines above the figure, change "77" to "78" and "61" to "60" in 2 places

p296, 3 lines above the figure, change "61" to "60" and "52" to "51"

p313, Replace the example table with the following table

	Octave band centre frequency (Hz)							
	63	125	250	500	1000	2000	4000	8000
TL from Table 8.2	30	36	37	40	46	54	57	59
$\bar{\alpha}_w$ from Table 7.1	0.013	0.013	0.015	0.02	0.03	0.04	0.05	0.06
$\bar{\alpha}_f$ from Table 7.1	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03
$S_i \bar{\alpha}$ (m)	0.463	0.463	0.525	0.68	1.05	1.36	1.67	2.04
$S_E/S_i \bar{\alpha}_i$	67	67	59	45.6	29.5	22.8	18.6	15.2
$10\log_{10}(S_E/S_i \bar{\alpha}_i)$	18	18	18	17	15	14	13	12
NR (dB)	12	18	19	23	31	40	44	47

p313, Bottom equation, “30.5/30” should be “30.5/31”.

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”

p326, replace the four equations for A_b in parts (a) and (b) with the following in the same order

$$A_b = 15.8 + 20\log_{10}[5.8/4.5] = 18.0 \text{ dB}; A_R = 1.3 \text{ dB}; A_b + A_R = 19.3 \text{ dB}$$

$$A_b + A_R = 19.3 \text{ dB}$$

$$A_b = 19.8 + 20\log_{10}[7.2/4] = 24.9 \text{ dB}; A_R = 2.6 \text{ dB}; A_b + A_R = 27.5 \text{ dB}$$

$$A_b = 19.5 + 20\log_{10}[7.5/4.5] = 23.9 \text{ dB}; A_R = 5 \text{ dB}; A_b + A_R = 28.9 \text{ dB}$$

p326, 11 lines from the bottom, replace “4.6” with “4.7”

p326, in part (c) at the bottom of the page, replace the equation for A_b with the following

$$A_b = 12.0 + 20\log_{10}[4.5/4] = 13.0 \text{ dB}$$

p326, Item 3, lines 2 and 3, change the numbers to 19.3 dB, 19.3 dB, 27.5 dB, 28.9 dB, 28.9 dB, 13 dB, 24.9 dB and 24.9 dB

p326, Item 3, line 6, change “10 dB” to “12 dB”

p327, 3 lines from the top, replace the equation for A_b with the following

$$A_b = 19.8 + 20\log_{10}[7.2/4] = 24.9 \text{ dB}$$

p328, Add the following to the end of item 3, “As there are 3 diffracted paths around the building for sound arriving at the rear wall, the power level on the rear wall should be increased by $10\log_{10}(3)=4.8$ dB, so the total power on the rear wall becomes 71.8 dB.”

p328, Four lines above the equation preceding Section 8.5.2.2, change 67 to 71.8 and change 79 to 80

p328, 2 lines above the equation preceding Section 8.5.2.2, change 80 to 81

p328, In the equation preceding Section 8.5.2.2, change 80 to 81 and 74 to 75

p329, Figure 8.17, replace r with R

p330, Replace Eq. (8.79) with:

$$l'_s = R \theta \cos \alpha$$

$$h'_s = H_b - R \theta \sin \alpha$$

$$\alpha = \frac{1}{2}(\pi - \theta) - \beta$$

$$\beta = \cos^{-1}(H_b/A)$$

$$\theta = \pm \cos^{-1}[1 - (A^2/2R^2)], \quad |R| > A/2$$

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 ”.

p347, Line under Equation (9.21), change “static” to “absolute”.

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 $R_1 l / \rho c$

p387, Figure 9.20, x-axis label, change “ S ” to “ A ” and in the caption add “open” immediately before “duct”. Also add the following sentence. “Note that for a silencer with multiple baffles, A is the cross-sectional area of one airway, not the total silencer.”

p388, last line, change "0.9" to "1.1" and "9.0" to "11.0"

p389, In the equation 5 lines from the top, change “6” to “5”

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, 2 lines below the first equation, change “5.5” to “7”

p389, 6 lines below the first equation, change “12.5” to “13”

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 "13"

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", "1.2" to "1.0" and the word "thick" to "wide" (2 places).

p390, In first line of figure caption, replace "duct bend" with "90° duct bend"

p391, Figure 9.23 caption, last line, change “1992” to “1987”

p391, Replace Table 9.4 with the following:

Table 9.4 Approximate attenuation in unlined rectangular sheet metal ducts in dB/m^a.

Duct perimeter to area ratio (P/A) (m ⁻¹) ^b	Octave band centre frequency (Hz)			
	63	125	250	over 250
26	0.98	0.66	0.33	0.33
13	1.15	0.66	0.33	0.20
10	1.31	0.66	0.33	0.16
7	0.82	0.66	0.33	0.10
3	0.49	0.33	0.23	0.07
2	0.33	0.33	0.16	0.07

p391, In note a under Table 9.4, change “doubled” to “double”

p391, Replace Table 9.5 with the following:

Duct diameter (mm)	Octave band centre frequency (Hz)					
	63	125	250	500	1000	2000
150	18(20)	13(14)	8(9)	4(5)	1(2)	0(1)
200	16(18)	11(12)	6(7)	2(3)	1(1)	0(0)
250	14(16)	9(11)	5(6)	2(2)	1(1)	0(0)
300	13(14)	8(9)	4(5)	1(2)	0(1)	0(0)
400	10(12)	6(7)	2(3)	1(1)	0(0)	0(0)
510	9(10)	5(6)	2(2)	1(1)	0(0)	0(0)
610	8(9)	4(5)	1(2)	0(1)	0(0)	0(0)
710	7(8)	3(4)	1(1)	0(0)	0(0)	0(0)
810	6(7)	2(3)	1(1)	0(0)	0(0)	0(0)
910	5(6)	2(3)	1(1)	0(0)	0(0)	0(0)
1220	4(5)	1(2)	0(1)	0(0)	0(0)	0(0)
1830	2(3)	1(1)	0(0)	0(0)	0(0)	0(0)

p392, To avoid confusion with the discussion on p466, section 9.12.2, change f_0 to f_{0s} in three locations in the top 8 lines

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 Eq. 9.94

p397, second line from the top, add after "intensity", at the duct exit"

p397, In Equation (9.101), change $\langle p^2 \rangle$ to $\langle p_D^2 \rangle$

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, $\langle p_D^2 \rangle$ is the mean square sound pressure averaged over the plane of the outlet of the exhaust stack and $fd/c < 0.5$ "

p397, 3rd line after Eq. 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)”
- p410, In Equation (10.18) and 2 lines above it, replace “ e ” with “ q ” to avoid confusion with the distance, e , between spring supports.
- 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:
- $$L_w = C_F + 10 \log_{10} Q + 20 \log_{10} P - E/3 + 18 \text{ dB re } 10^{-12} \text{ W} \quad (11.1)$$
- p434, Table 11.2, the 8000 Hz column should be replaced with 13, 15, 18, 27, 35, 35, 26, 32, 32, 34, 42 and 44 respectively and the BFI column for the two tubeaxial entries should be “ 7 ”
- p435, Remove the paragraph containing Equation (11.2) and remove “(11.2)” in the second to bottom line.
- p447, replace the values in Table 2 with the following.

0	72	77	80	81	80	76	69	63
60	74	79	82	83	82	78	71	65
120	61	66	69	70	69	65	58	52
180	55	60	63	64	63	59	52	46

- p446, line above item 2, change “8.8” to “8.3”
- p449, The control valve noise section has been updated in later editions. Please do not use this version.
- 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:

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

$$L_w = 44 \log_{10} U + 17 \log_{10} \dot{m} + 55 \quad (\text{dB re } 10^{-12} \text{ W})$$

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

- p467, Replace the paragraph following Equation (11.78) with:
 where the values of C for relevant octave bands that are listed in Table 11.26 should have 2.4 dB subtracted from them. The measurement surface area used to obtain N_R is given by, $S = 1.25 \ell_m h$ (m^2), where h is the height of the transformer tank and ℓ_m is the length of the horizontal measurement contour along which the average overall A-weighted sound pressure level was measured to obtain N_R . The measurement contour is typically located 2 m laterally from a horizontal contour made by a tight string placed around the transformer tank and touching the tank or its protrusions in various places (IEEE Std C57.12.90, 2015). For a measurement contour located 2 m from the transformer tank, the contour length, ℓ_m , may be approximated as, $\ell_m = 2L + 2W + 11.2$ (m), where L is the transformer length and W is the width (or depth). The NEMA rating (A-weighted overall audible sound level), N_R , is the A-weighted sound pressure level averaged logarithmically along one or two measurement contours at different heights and maximum acceptable values are provided by NEMA Technical Report ST20-2014 (2014). Where possible, values of N_R supplied by the manufacturer should be used.

- p512, 3rd line from bottom, "E" for "polystyrene" should be 1.2 to 3.4 MPa, ρ should be 16 to 32 kg/m^3 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

$$c_L = \sqrt{E/\rho} / \sqrt{1 - \nu^2}$$

- p513, 2 lines above the page bottom, change “static” to “absolute”.

- p514, Equation C.1 could be written in a less ambiguous way as

$$R_1 = \rho \Delta PA / (\dot{m} \ell) = \Delta PA / (V_0 \ell)$$

- 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)"