



**American Water Works
Association**

Errata to
AWWA Manual M49

Quarter-Turn Valves: Head Loss, Torque, and Cavitation Analysis *(May 2017)*

1. Page 3, Diameter Assumptions, towards the end of the 3rd paragraph it should read: The user is cautioned to evaluate and convert such data to the proper format and units of measure. For instance, some BFV manufacturers provide a dynamic torque coefficient for use in the formula, $T_d = C_1 \times \Delta P$. When equated to the basic formula used herein, $T_d = C_t \times D^3 \times \Delta P$, it follows that $C_1 = C_t \times D^3$ or $C_t = C_1/D^3$.
2. Page 47, Equation 3-5 should read: $T_s = U_{C2} \times (C_{sc} + C_{sp} \times \Delta P_{max}) \times D_d^2$
3. Page 52, Equation 3-14 should read: $T_{b0} = U_{C2} \times \frac{(\pi \times D_d^2 \times \Delta P_{\theta} + W_{d\&s}) \times d_s \times C_f}{8}$
4. Page 53, Equation 3-16 should read: $T_{b0} = U_{C2} \times \frac{\pi \times D_d^2 \times (\Delta P_{\theta} + P_{EW}) \times d_s \times C_f}{8}$
5. Page 56, Equation 3-22 should read: $T_h = S_c \times U_{C1} \times \frac{\rho \times \pi}{5.333} \times \left(\frac{D_d}{12}\right)^4 \times \left(1 + \frac{8 \times \epsilon_2}{D_d}\right)$
6. Page 57, Equation 3-23 should read: $T_h = S_c \times \frac{\rho \times \pi \times g}{64} \times (U_{C1} \times D_d)^4 \times \left(1 + \frac{8 \times \epsilon_2}{D_d}\right)$
7. Page 57, Equation 3-24 should read: $T_h = S_c \times U_{C1} \times 0.0017726 \times (D_d)^4 \times \left(1 + \frac{8 \times \epsilon_2}{D_d}\right)$

Continued . . .

8. Page 57, Equation 3-25 should read: $T_h = S_c \times 481.322 \times (U_{C1} \times D_d)^4 \times \left(1 + \frac{8 \times \varepsilon_2}{D_d}\right)$
7. Page 73 Torque Calculation Methodology Example, under Valve Input Data, should read:
Valve Input Data
 - 24-in. AWWA class 150B butterfly valve with 24-in.-diameter single-off-set disc, seat-side flow (valve is installed in a horizontal line with a vertically orientated shaft)
 - K_{v0} are listed in chapter 2, Table 2-2
8. Page 86 - Item 5, should read:
 5. Flow testing determines flow resistance coefficient values, K or K_v ; flow coefficient values, C_v ; cavitation indices, σ ; and dynamic torque coefficients, C_t . The flow testing must be conducted in accordance with ANSI/ISA S75.02.01-2008 except that piping manifold losses are subtracted to determine the net K_v for a valve. K values based on the direct measurements without subtracting the piping manifold losses will be referred to as gross K_v but will not be used in this methodology.
9. Page 87 - Test Procedure, Item 1, 2nd to the last line, should read:
 1. The quarter-turn valve design or scale model should be checked to verify that it has the minimum amount of packing torque on the shaft to provide a reasonable seal. A small amount of packing leakage can be tolerated if it assists in lowering the packing torque, provided it does not affect the flow measurement accuracy or other instrumentation during the test. Rotate the valve in mid-range, measure, and record any running, packing, and/or hub seal torque, T_{pt} , with the valve full of water but zero flow.
10. Page 88 - Item 6, "in the minimum of 4 ft/s", should read:
 6. With the quarter-turn valve at the fully open position, subject the valve to flow in the range of 4 to 16 ft/s (1.3 to 5.2 m/s) and record flow and head loss. Repeat the test of fully open flow at a minimum of three different flow rates. Calculate the flow coefficient, K_v , for the valve at each test point. Subtract the pipe head loss from the pressure measurement to obtain ΔH_v . The flow equation is Eq 5-1. Compute the mathematical average of the calculated K_v values and round the result to two decimal places (e.g., 0.32). Repeat the flow coefficient test for lower angles at 10° or 10% (or smaller) increments.