Fanning Friction Factor

The frictional head loss in pipes with full flow may be calculated by using the following formula and an appropriate Fanning friction factor.

$h_f = f_f (L/R_h) \times (v^2/2g)$

where:
h_f = head loss (m)
f_f = Fanning friction factor
L = length of pipe work (m)
R_h = hydraulic radius of pipe work (m)
v = velocity of fluid (m/s)
g = acceleration due to gravity (m/s²)

or:
h_f = head loss (ft)
f_f = Fanning friction factor
L = length of pipe work (ft)
R_h = hydraulic radius of pipe work (ft)
v = velocity of fluid (ft/s)
g = acceleration due to gravity (ft/s²)

The Fanning friction factor is not the same as the Darcy Friction factor (which is 4 times greater than the Fanning Friction factor)

The above formula is very similar to the Darcy-Weisbach formula but the Hydraulic Radius of the pipe work must used, not the pipe diameter.
The hydraulic radius calculation involves dividing the cross sectional area of flow by the wetted perimeter.

For a round pipe with full flow the hydraulic radius is equal to ¼ of the pipe diameter.
i.e. Cross sectional area of flow / Wetted perimeter = $(\pi \times d^2 / 4) / (\pi \times d) = d/4$

Published tables of Fanning friction factors are usually only applicable to the turbulent flow of water at 60º F (15.5º C).

The development of 'The Moody Chart' which enables engineers to plot the Darcy Friction factor and the use of the personnel computer to calculate the Darcy Friction factor has led to a large reduction in the use of Fanning friction factors.