

Wirefill Formula (Flush cover duct Types G, F, FS, D, H, MC, NNC, & TMC)

General Formula

PANDUIT® Wiring Duct wirefills are calculated using the following general formula:

$$50\% \text{ Wirefill} = 50\% \text{ of } \left(\frac{\text{Usable Duct Area}}{\text{Wire Area}} \right)$$

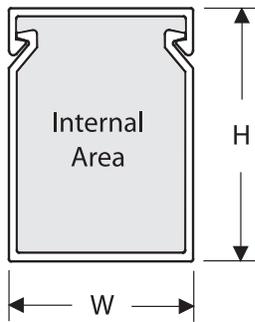
Why use a 50% Wirefill?

As specified in NFPA79-2002 section 14.5.2, *Percentage Fills of Raceways (Ducts)*, a 50% wirefill is given as the maximum wirefill capacity in all PANDUIT® Wiring Ducts. This helps ensure general safe wiring practices are followed. In actual practice, a 50% wirefill is the maximum amount of wiring the duct can hold given the additional airspace created between cables by non-uniform cable shapes, cable interlacing and cable packing factors.

What is the Usable Duct Area?

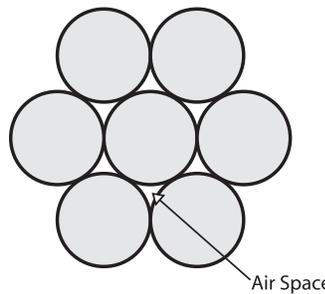
The usable area we define as the calculation of internal area that can be occupied by wires or cables.

Calculation of Internal Area



Since we use the outer channel dimensions in our calculation we make an adjustment in our formula for the thickness of material and for design elements that extend inside the channel.

Air Space Allotment



In our wirefill formula an adjustment is made to the channel internal area to account for “unusable” air space that will be present between cables when placed in the channel. Our formula assumes a uniform close packed or high-density cable arrangement (see diagram).¹

Considering these factors the usable duct area is equal to an average of 90% of the nominal area, or $(W \times H) \times .90$.

Wire Area

The wire area formula is converted to allow calculation using the cable diameter:

$$\begin{aligned} A_{\text{WIRE}} &= \pi r^2 \\ A_{\text{WIRE}} &= (\pi/4) \times D^2 \\ A_{\text{WIRE}} &= .785 \times D^2 \end{aligned}$$

Formula Derivation

Inserting the elements from above into the general formula results in the following:

$$50\% \text{ Wirefill} = .50 \left(\frac{(W \times H) \times 0.90}{.785 \times D^2} \right)$$

Simplifying this formula results in the formula used for wire fill calculation²:

$$50\% \text{ Wirefill} = \left(\frac{W \times H}{1.75 \times D^2} \right)$$

NOTE: When calculating wirefill capacity using the above formula, variables W, H, and D must be expressed in same units (i.e. mm or inches).

¹ This calculation does not account for additional airspace created between cables by non-uniform cable shapes, cable interlacing and cable packing factors.

² The resulting formula is used for all PANDUIT® Flush Cover Ducts, this excludes Type NE duct which has a different profile design that results in a divisor of $2.0 \times D^2$ (rather than $1.75 \times D^2$ as shown here) to be used in the wirefill calculation formula.