

## CALCULATION EQUATION FOR FLOW RATE AND VELOCITY OF FLUID IN PIPES

Flow rate:  $Q = A \times C \times R^{\frac{1}{2}} \times I^{\frac{1}{2}}$

Chezy coefficient:  $C = \frac{1}{n} \times R^{\frac{1}{6}}$

$$Q = A \times \frac{1}{n} \times R^{\frac{2}{3}} \times I^{\frac{1}{2}}$$

Flow velocity:  $V = C \times R^{\frac{1}{2}} \times I^{\frac{1}{2}}$

$$V = \frac{1}{n} \times R^{\frac{2}{3}} \times I^{\frac{1}{2}}$$

Where is:

Q – the flow rate of the pipeline (l/s)

A – cross section (m<sup>2</sup>)

C - Chezy coefficient

R – hydraulic radius (m)

for full pipe R=D/4

D – diameter of pipe (m)

I – slope of trench (mm)

n – Manning number (n=0.010)

V – flow velocity

**FLOW RATE TABLE FOR PVC-KG SN4 PIPE  
FOR 95% FULLFILMENT**

| slope<br>m/m     | DN/OD   | 110   | 125   | 160   | 200   | 250    | 315    | 400    | 500    | 630     |
|------------------|---------|-------|-------|-------|-------|--------|--------|--------|--------|---------|
|                  | ID      | 103,6 | 118,6 | 152   | 190,2 | 237,6  | 299,6  | 380,4  | 475,4  | 599,2   |
| 1/1000<br>0,001  | Q (l/s) | 2,33  | 3,34  | 6,48  | 11,79 | 21,33  | 39,59  | 74,84  | 135,62 | 251,39  |
|                  | V (m/s) | 0,28  | 0,30  | 0,36  | 0,42  | 0,48   | 0,56   | 0,66   | 0,76   | 0,89    |
| 2/1000<br>0,002  | Q (l/s) | 3,30  | 4,73  | 9,17  | 16,67 | 30,17  | 55,99  | 105,84 | 191,79 | 355,52  |
|                  | V (m/s) | 0,39  | 0,43  | 0,51  | 0,59  | 0,68   | 0,79   | 0,93   | 1,08   | 1,26    |
| 3/1000<br>0,003  | Q (l/s) | 4,04  | 5,79  | 11,23 | 20,42 | 36,95  | 68,58  | 129,63 | 234,90 | 435,43  |
|                  | V (m/s) | 0,48  | 0,52  | 0,62  | 0,72  | 0,83   | 0,97   | 1,14   | 1,32   | 1,54    |
| 4/1000<br>0,004  | Q (l/s) | 4,66  | 6,69  | 12,97 | 23,57 | 42,67  | 79,18  | 149,68 | 271,24 | 502,79  |
|                  | V (m/s) | 0,55  | 0,61  | 0,71  | 0,83  | 0,96   | 1,12   | 1,32   | 1,53   | 1,78    |
| 5/1000<br>0,005  | Q (l/s) | 5,22  | 7,48  | 14,50 | 26,36 | 47,71  | 88,53  | 167,35 | 303,25 | 562,13  |
|                  | V (m/s) | 0,62  | 0,68  | 0,80  | 0,93  | 1,08   | 1,26   | 1,47   | 1,71   | 1,99    |
| 6/1000<br>0,006  | Q (l/s) | 5,71  | 8,19  | 15,88 | 28,87 | 52,26  | 96,98  | 183,32 | 332,20 | 615,79  |
|                  | V (m/s) | 0,68  | 0,74  | 0,88  | 1,02  | 1,18   | 1,38   | 1,61   | 1,87   | 2,18    |
| 7/1000<br>0,007  | Q (l/s) | 6,17  | 8,85  | 17,15 | 31,18 | 56,45  | 104,75 | 198,01 | 358,81 | 665,13  |
|                  | V (m/s) | 0,73  | 0,80  | 0,95  | 1,10  | 1,27   | 1,49   | 1,74   | 2,02   | 2,36    |
| 8/1000<br>0,008  | Q (l/s) | 6,60  | 9,46  | 18,34 | 33,34 | 60,34  | 111,98 | 211,68 | 383,59 | 711,05  |
|                  | V (m/s) | 0,78  | 0,86  | 1,01  | 1,17  | 1,36   | 1,59   | 1,86   | 2,16   | 2,52    |
| 9/1000<br>0,009  | Q (l/s) | 7,00  | 10,03 | 19,45 | 35,36 | 64,00  | 118,78 | 224,52 | 406,86 | 754,18  |
|                  | V (m/s) | 0,83  | 0,91  | 1,07  | 1,25  | 1,44   | 1,69   | 1,98   | 2,29   | 2,68    |
| 10/1000<br>0,01  | Q (l/s) | 7,38  | 10,58 | 20,50 | 37,27 | 67,47  | 125,20 | 236,67 | 428,87 | 794,98  |
|                  | V (m/s) | 0,88  | 0,96  | 1,13  | 1,31  | 1,52   | 1,78   | 2,08   | 2,42   | 2,82    |
| 15/1000<br>0,015 | Q (l/s) | 9,03  | 12,95 | 25,11 | 45,65 | 82,63  | 153,34 | 289,86 | 525,25 | 973,64  |
|                  | V (m/s) | 1,07  | 1,17  | 1,38  | 1,61  | 1,86   | 2,18   | 2,55   | 2,96   | 3,45    |
| 20/1000<br>0,02  | Q (l/s) | 10,43 | 14,96 | 28,99 | 52,71 | 95,41  | 177,06 | 334,70 | 606,51 | 1124,27 |
|                  | V (m/s) | 1,24  | 1,35  | 1,60  | 1,86  | 2,15   | 2,51   | 2,95   | 3,42   | 3,99    |
| 30/1000<br>0,03  | Q (l/s) | 12,77 | 18,32 | 35,51 | 64,56 | 116,86 | 216,85 | 409,92 | 742,82 | 1376,94 |
|                  | V (m/s) | 1,52  | 1,66  | 1,96  | 2,27  | 2,64   | 3,08   | 3,61   | 4,19   | 4,89    |
| 40/1000<br>0,04  | Q (l/s) | 14,75 | 21,16 | 41,00 | 74,55 | 134,93 | 250,40 | 473,33 | 857,73 | 1589,95 |
|                  | V (m/s) | 1,75  | 1,92  | 2,26  | 2,63  | 3,04   | 3,55   | 4,17   | 4,83   | 5,64    |
| 50/1000<br>0,05  | Q (l/s) | 16,49 | 23,65 | 45,84 | 83,34 | 150,86 | 279,96 | 529,20 | 958,97 | 1777,62 |
|                  | V (m/s) | 1,96  | 2,14  | 2,53  | 2,93  | 3,40   | 3,97   | 4,66   | 5,41   | 6,31    |