Hunter® UNIVERSITY

# Handbook of Technical Irrigation Information

A Complete Reference Guide for Professionals

$$P_r = \frac{96.25 \times \text{Total GPM}}{\text{Total Area}}$$

$$DU = 100 \times \left(\frac{MQ1}{M}\right)$$

$$= F_f \frac{P_o \times P_v}{L_c}$$

$$ETWU^{(d)} \text{ (Annual Gallons Required)} = ET_o \times 0.62 \times ETAF \times \text{Area}$$


$$T = \frac{60 \times D \times E_o \times K_c}{PR \times IE}$$

## PREFACE

Hunter's *Handbook of Technical Irrigation Information* is a reference guide for all irrigation professionals. Contractors, architects, designers, and engineers alike can now benefit from a wide spectrum of information that has been gathered from numerous sources and compiled into a single document.

For more information about irrigation, visit **hunterindustries.com**.

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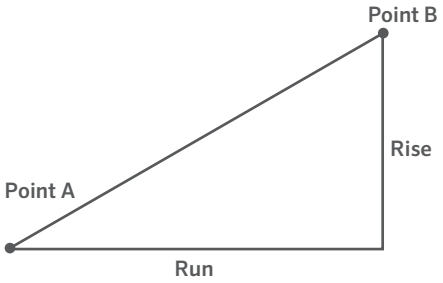
# FORMULAS

## GENERAL
## SLOPE

Slope, as used in irrigation, is a measure of the incline of an area. It can be described as (1) a percent, formula "A," (2) a degree, formulas "B" and "C," or (3) a ratio, formula "D." The greater the incline, the greater the tendency for runoff.

**A. The percent of slope** can be determined by dividing the net change in elevation between two points (rise) by the horizontal distance between those two points (run).

$$S = \frac{Rise}{Run}$$




**Where:**

S = Percent of slope

Rise = Net elevation change in elevation between two points

Run = Horizontal distance between the two points

*Note: The units for rise and run can be any unit of linear measure, but they must be the same for both the rise and run.*

**Example:**

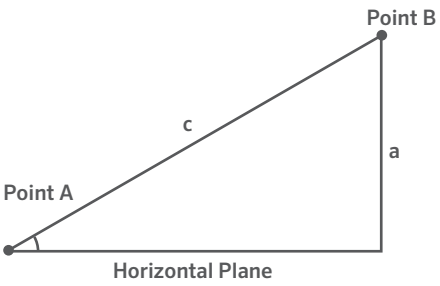
What is the slope for a bank 40' wide (run) on which the elevation at the top (point "B") is 20' higher than the toe of the slope (point "A")

$$S = \frac{20}{40}$$

$$S = 0.50 \; or \; 50\%$$

**B. The degree of slope** describes a slope as the angle of the slope (at "A") from the horizontal plane. This method is useful when taking field measurements as "c" represents the measured distance up a slope and "a" equals the elevation change.

$$\sin A = \frac{a}{c}$$




**Where:**

A = Angle

a = Height of the right triangle

c = Length of the hypotenuse of a right triangle

**Example:**

a = 20'

c = 44.72'

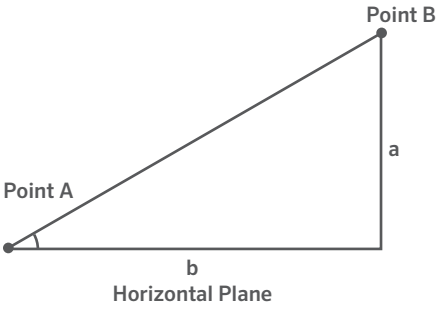
$$\sin A = \frac{20}{44.72}$$

$$\sin A = 0.4472 \qquad A = 26^\circ 34'$$

# SLOPE *(continued)*

**C. The degree of slope** describes a slope as the angle of the slope (at "A") from the horizontal plane. This method is useful when determining the slope from plot plans that include elevation. In this diagram, "b" represents the horizontal distance between points "A" and "B" and "a" equals the elevation change between points "A" and "B."

$$\tan A = \frac{a}{b}$$




**Where:**

A = Angle

a = Height of the right triangle

b = Horizontal distance

**Example:**

a = 20.0'

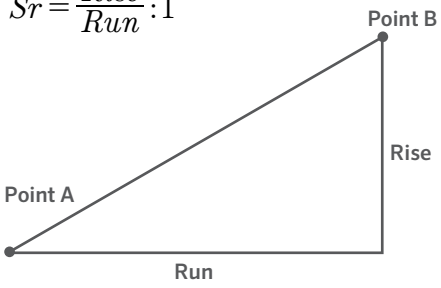
b = 40.0'

$$\tan A = \frac{20.0}{40.0}$$

$$\tan A = 0.4472 \qquad A = 26^{\circ}34'$$

**D. Describing a slope** as a ratio such as 2:1, 1:1, or 4:1 indicates the number of feet of run for every 1' of rise. For instance, a 2:1 slope indicates there would be 2' of horizontal distance for every 1' change of elevation. A 1:1 would change 1' of elevation for every 1' of horizontal run. This can be calculated by dividing the amount of elevation change by the horizontal distance over which this change occurred.

$$Sr = \frac{Rise}{Run} : 1$$




**Where:**

Sr = Slope ratio

Rise = Net elevation change between two points

Run = Horizontal distance between the two points

Note: The units for rise and run can be any unit of linear measure, but they must be the same for both the rise and run.

**Example:**

A slope on a project is 20′ high (rise) over a distance of 40′ (run). What is the slope ratio?

$$Sr = \frac{40}{20} : 1$$

$$Sr = 2 : 1$$

*Note: See pages 52 and 53 for more information on slopes.*

# DYNAMIC PRESSURE DETERMINATION



**Dynamic pressure** is the pressure when water is flowing in the system. Dynamic pressure in a system can be determined by flow tests, pressure gauges, or calculation if information on pipe types and sizes, valves, meters, or other relevant components is known. The dynamic pressure can be calculated at a given point in the system by starting with a known dynamic pressure at a given point, adjusting for elevation change, and subtracting friction losses in pipe, fittings, valves, meters, etc., as shown below:

$$Dynamic\ Pressure = (PSI_{dynamic} \pm h_{e\ elevation}) - h_{f\ pipe} - h_{f\ fittings} - h_{f\ valves}$$

**Where:**

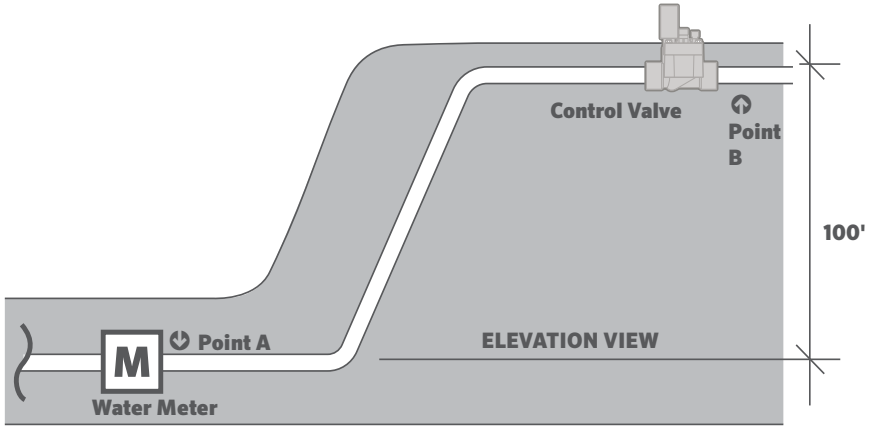
$PSI_{dynamic}$ = Known dynamic pressure at a given point in PSI

$h_{e\ elevation}$ = Pressure change due to elevation in PSI

$h_{f\ pipe}$ = PSI loss due to friction losses in the pipe

$h_{f\ fittings}$ = PSI loss due to friction losses in fittings

$h_{f\ valves}$ = PSI loss due to friction losses in valves, meters, or other relevant components between the source and the given point in the system




**Example:**

In the diagram above, the dynamic pressure at point “A” is 90 PSI. The pipe is 2" class 315 PVC, 200' from point “A” to point “B” with a flow rate of 40 GPM. According to the manufacturer, the control valve will lose 1.0 PSI at 40 GPM.

| | |
|---|---|
| 90.00 | PSI at point “A” |
| − 43.30 | PSI loss due to elevation gain (100 ft. x 0.433 PSI per foot) |
| 46.70 | PSI at point “B” |
| − 2.82 | PSI friction loss in pipe (1.41 PSI loss per 100' x 200' / 100) |
| 43.88 | Subtotal |
| − 0.28 | PSI friction loss in fittings (estimate, 10% of friction loss in pipe) |
| 43.60 | Subtotal |
| − 1.00 | PSI loss in valve (from manufacturer data) |
| 42.60 | PSI dynamic pressure at point “B” |

# FRICTION FACTOR PIPE SIZING

**Friction Factor** is used to determine the maximum flow in gallons per minute through any section of lateral line pipe below a predetermined pressure variation. To minimize uneven distribution, sprinklers should operate with pressure variation between sprinklers of not more than ± 10 to ± 20% of the desired sprinkler operating pressure.

$$F_f = \frac{P_0 \times P_v}{L_c}$$

**Where:**

$F_f$ = Friction Factor, the allowable pressure loss per 100' of pipe, in PSI

$P_O$ = Sprinkler operating pressure in PSI

$P_V$ = Pressure Variation allowed between the valve and the last sprinkler on the circuit being sized, usually 10% or 20% of the desired sprinkler operating pressure

$L_C$ = Critical Length of pipe from control valve to farthest head in hundreds of feet

**Example:**

**A) You must determine the amount of pressure variation you can allow between the valve and the last sprinkler head.** This is usually 10% to 20% of the operating pressure of the sprinklers on that particular section. For this example we will use 10% (0.10) variation.

If a control valve operates a group of sprinklers that require 30 PSI to operate (operating pressure = $P_O$), the 10% pressure variation (pressure variation = $P_V$) would allow a total variation of 3.0 PSI from the valve to the farthest head (0.10 x 30 PSI = 3.0 PSI).

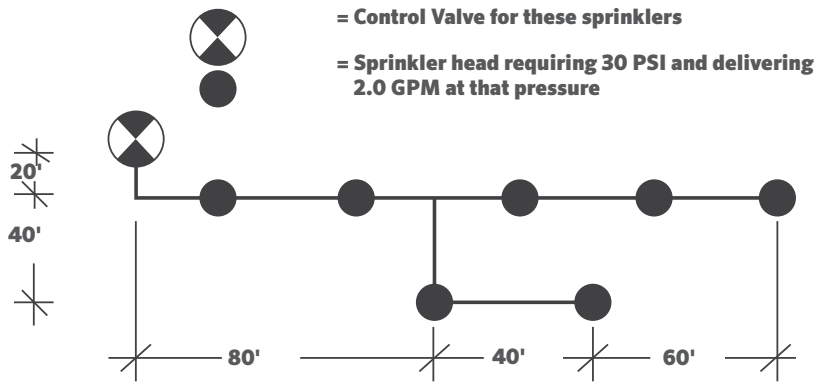
**B) Determine the Critical Length ($L_C$)**

Next, you must determine the distance the water travels from the control valve to the farthest head. That distance is not necessarily the total length of pipe in the section, but simply the length of the pipe through which the water flows from the valve to the farthest head. Divide this number by 100 to determine the hundreds of feet from the valve to the farthest head.

This is called Critical Length and represents the hundreds of feet of pipe in which you can afford to lose the pressure you determined was acceptable for pressure variation in step "A."

**Figure 1**

In this diagram, you must determine the path the water flows from the valve to the farthest head and calculate that distance in feet. The water flow path is shown in Figure 2 and is represented by the pipe with the check pattern. Note that the distance of the branch line is not included. This is because the water flowing to the farthest head does not travel down that length of pipe, and therefore any pressure loss occurring in the branch does not affect the pressure in the Critical Length.



# FRICTION FACTOR PIPE SIZING *(continued)*

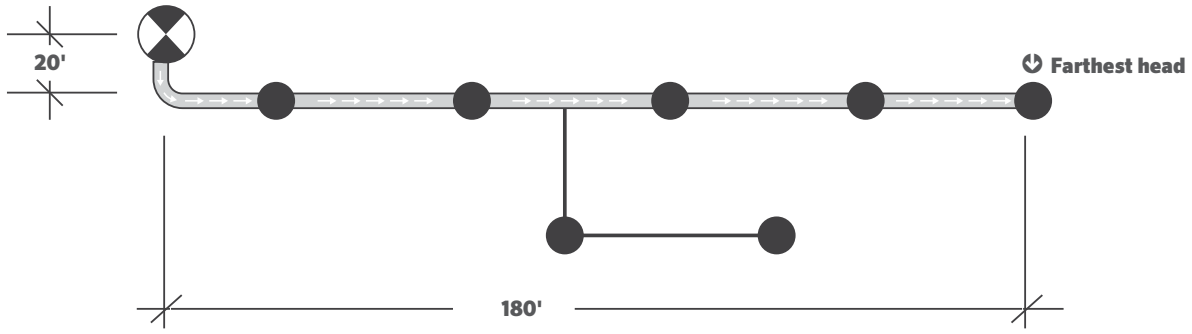



**Figure 2**

In Figure 2, the water traveling from the valve to the farthest head must pass through 200' of pipe. This divided by 100 gives a Critical Length ($L_C$) in hundreds of feet of 2.0.

**C) Determine the rate at which you can lose pressure in the pipe.** This is called Friction Factor ($F_f$), which is the allowable PSI loss per 100' of pipe. You can determine this allowable rate of loss by dividing the allowable pressure loss (in PSI) by Critical Length (in hundreds of feet) by using the formula below.

The sprinklers mentioned in Figure 1 require 30 PSI to operate and a distance of 200' from the valve to the farthest head. Using the formula below we can determine the Friction Factor.

$$F_f = \frac{P_o \times P_v}{L_c / 100'}$$

$$F_f = \frac{30 \times 0.10}{200/100}$$

$$F_f = \frac{3}{2}$$

$$F_f = 1.5 \; allowable \; PSI \; loss \; per \; 100 \; ft \; of \; pipe$$

The Friction Factor indicates that the pipe should be sized so that no section of pipe exceeds a pressure loss of 1.5 PSI per 100'. This ensures that over the 200' from the valve to the farthest head, the total PSI loss will not exceed the 3.0 PSI allowable loss (10% of the sprinkler operating pressure). The Friction Factor can be used like a budget. It provides a guideline by which you can size the pipe without having excessive pressure loss in any section.

For the lateral pipes (those downstream of the control valve), use Class 315 PVC for ½" pipe and Class 200 PVC for all larger sizes. Although this requirement for Class 315 and Class 200 is not mandatory and may vary on many larger installations, it is typical for landscape projects ranging from residential through medium-sized commercial projects in the Southern and Western United States.

At this point, turn to the Friction Factor Shortcuts charts in the Tables section on page 58. Find the chart for the Friction Factor closest to the one calculated for your sprinkler system section. (In this case there is a chart for a Friction Factor of 1.5 PSI allowable loss per 100'. When there is no chart for the exact Friction Factor calculated, round the Friction Factor to the nearest chart value.)

# FRICTION FACTOR PIPE SIZING *(continued)*

Figure 3 represents a portion of the Friction Factor Shortcut chart from page 58. The chart in the appendix should look like Figure 3 shown below.

| Friction Factor | 1.50 Max. GPM |
|---|---|
| ½" CL 315 PVC | 2.8 |
| ¾" CL 200 PVC | 5.7 |
| 1" CL 200 PVC | 10.8 |
| 1¼" CL 200 PVC | 19.9 |
| 1½" CL 200 PVC | 28.5 |
| 2" CL 200 PVC | 51.1 |
| 2½" CL 200 PVC | 84.3 |
| 3" CL 200 PVC | 141.4 |

**Figure 3**

The "Max. GPM" listed in the chart represent the maximum GPM that each pipe type/size can sustain without exceeding a loss of 1.5 PSI per 100'.

Using the maximum flow rates in the chart as guides, the lateral line pipes can be sized with the assurance that the total PSI loss from the control valve to the farthest sprinkler will not exceed 10% of the sprinkler operating pressure (3.0 PSI).

First, determine the quantity of water in GPM passing through each section of pipe. A given section may need to be sized differently if there is any change in the GPM, so it is important to determine the flows carefully. Figure 4 lists the GPM flowing through each section of pipe. Notice the section labeled 10 GPM. This value is the flow to all sprinkler heads beyond that point and includes both the straight run and the branch line.

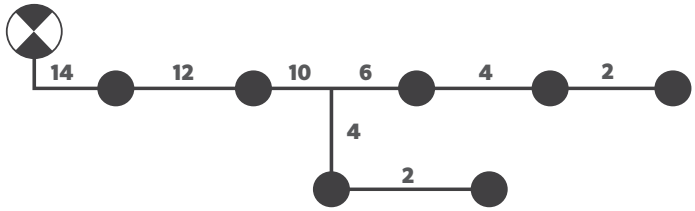



**Figure 4**

Using the chart (Figure 3) as a guide, assign sizes to each pipe section.

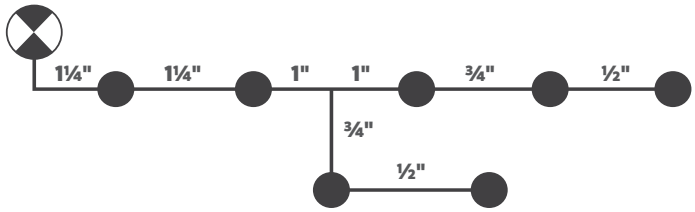



**Figure 5**

Note that in the section with 6 GPM, we used 1" pipe. The chart allows up to 5.7 GPM in ¾" pipe and some designers may choose to use ¾" instead of 1". It is acceptable to use ¾" pipe, even though it exceeds the allowable loss (the Friction Factor), because pressure is conserved in some sections where the flow is below the maximum allowed.

## FRICTION LOSS IN PIPE

**The Hazen-Williams equation** can be expressed as follows and is the most commonly used formula for calculating pressure loss in PVC pipe.

$$h_f = 0.00090914 \left(\frac{100}{C}\right)^{1.852} \frac{Q^{1.852}}{d^{4.866}} L$$

**Where:**

$h_f$ = Head loss due to friction in pounds per square inch (PSI)

C = Hazen-Williams coefficient for roughness of the inside of the pipe

Q = Flow in gallons per minute (GPM)

d = Inside diameter of pipe in inches

L = Length of pipe in feet

**Example:**
A 2" class 200 PVC pipe (I.D. = 2.129") that is 500′ in length will deliver 50 GPM to an irrigation system. Compute the friction loss in the pipeline.

$$h_f = 0.00090194 \left(\frac{100}{150}\right)^{1.852} \left(\frac{50^{1.852}}{2.129^{500}}\right) 500$$

$$h_f = 7.544\ PSI$$

## STATIC PRESSURE DETERMINATION

**Static pressure** is the measure of pressure when the water is at rest. This pressure is determined by the weight of a column of water resting on one square inch and expressed as the pounds per square inch (PSI). The weight of a column of water 1' high will create 0.433 pounds of pressure over every square inch. Static pressure can be determined as follows:

$$P_s = A \pm 0.433\ H$$

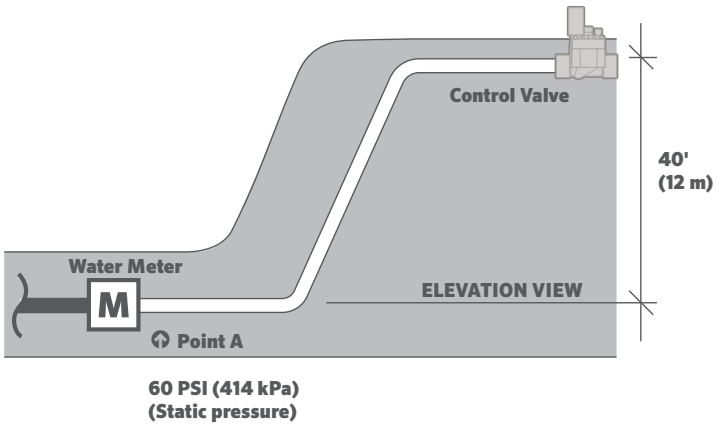
**Where:**

$P_S$ = Static pressure at a given point in the system, in pounds per square inch (PSI)

A = Static pressure at starting point in PSI

0.433 = A constant representing the weight of water in a column 1' high as expressed in pounds per square inch

H = Net vertical change in elevation from the surface of the water to the given point in the system in feet, increase in elevation, uphill, results in PSI loss (–0.433) downhill results PSI gain (+0.433)



## STATIC PRESSURE DETERMINATION *(continued)*

**Example:**
Determine static pressure at the entrance to the control valve if the static pressure at the meter is 60 PSI. (Note: If change in elevation is downhill, the elevation change (H) would be a positive).

$$P_s = 60 - (0.433 \times 40)$$
$$P_s = 42.68\ PSI$$

**For static pressure in metric units, use:**

$$P_s = A - 9.79\,H$$
$$P_s = 414 - (9.79 \times 12)$$
$$P_s = 296.52\ kPa$$

**Where:**

$P_S$ = Static pressure at a given point in the system in kilopascals (kPa)

A = Static pressure at the starting point in kPa

9.79 = A constant representing the weight of water in a column one meter high as expressed in kPa

H = The net vertical change in elevation from the surface of the water to the given point in the system in meters

## VELOCITY HEAD

**The velocity head** is the pressure required to move the water through the system.

$$H_v = V^2/2g$$

**Where:**

$H_V$ = Velocity head, the energy required to move the water at the intended velocity, in feet

V = Water velocity, in feet per second

g = Acceleration due to gravity (32.2)

**Example:**
What is the Velocity Head required to move 40 GPM through a 2" Class 315 PVC pipe?

$$H_v = (4.15)^2/64.4$$
$$H_v = 0.27\ feet$$

## VELOCITY OF FLOW

**Velocity of flow** is a calculation of the speed of water moving in a closed pipe system.

$$V = 0.408\,\frac{Q}{d^2}$$

**Where:**

V = Flow velocity in feet per second (fps)

Q = Flow in gallons per minute (GPM)

d = Inside diameter of pipe in inches

0.408 = Constant used to convert units into feet per second

**Example:**
What is the velocity of flow for a 1" class 200 PVC pipe (1.169" I.D.) with a flow rate of 10 GPM?

$$V = 0.408\left(\frac{10}{(1.169)^2}\right)$$
$$V = 2.99\ fps$$

# WATER HAMMER

This formula is used to estimate the total surge pressure developed when there is a sudden reduction or cessation in the velocity of flow. This is typical when a control valve closes.

$$P_t = P_o + \left(\frac{V \times L \times 0.07}{t}\right)$$

**Where:**

$P_t$ = Total pressure developed, in PSI

$P_o$ = Operating pressure at the time of valve closing, in PSI

V = Velocity at the time the reduction in velocity occurred, in feet per second

L = Length of straight pipe between source and point where reduction in velocity occurred, this would be the longest section, in feet (straight pipe means no tee or ell fittings)

t = Seconds during which the velocity was reduced, for example, a valve that closes in a half second would have a value for "t" of 0.5

0.07 = Constant used to convert velocity, length, and time into pressure

**Example:**

An electric remote control valve has a hydraulic closure time of 0.8 seconds. The main line leading to the valve is 450' long with a velocity of 4.2 fps. The system is operating at 65 PSI at the time of valve closure. What is the total surge pressure?

$$P_t = 65 + \left(\frac{4.2 \times 450 \times 0.07}{0.8}\right)$$

$$P_t = 65 + \frac{132.3}{0.8}$$

$$P_t = 230.38\ PSI$$

# AB 1881, CALIFORNIA CALCULATION OF MAXIMUM APPLIED WATER ALLOWANCE (MAWA)



**Maximum Applied Water Allowance (MAWA)** is used to determine the amount of water a project is allowed to use for landscape purposes. This determines the limit for projected water use. Projects must be designed with an Estimated Total Water Use (ETWU) that is less than the limit allowed in the MAWA calculation. The use of this formula is mandated by California State Assembly Bill 1881 (the Water Conservation in Landscaping Act of 2006).

$$MAWA^{(e)}\,(Annual\,Gallons\,Allowed) = (ET_o)\,(0.62)\,[(ETAF \times LA) + ((1 - ETAF) \times SLA)]$$

**Where:**

MAWA = Maximum Applied Water Allowance (gallons per year)

$ET_o$ = Reference Evapotranspiration (inches per year)

0.62 = Conversion Factor (to gallons)

ETF (for WAWA only) = ET Adjustment Factor (ETAF)

- ETAF (Schools) = 0.65
- ETAF (Residential) = 0.55
- ETAF (Non-residential) = 0.45

LA = Landscape Area Including SLA (square feet)

SLA = Special Landscape Area (square feet)

**Example:**

(1) A hypothetical landscape project in Fresno, California, with an irrigated landscape area of 50,000 ft² without any Special Landscape Area (SLA= 0, no edible plants, recreational areas, or use of recycled water). To calculate MAWA, the annual reference evapotranspiration value for Fresno is 51.1".

$$\begin{aligned} MAWA &= (51.1\,in)\,(0.62)\,[(0.55 \times 50{,}000) + ((1 - 0.55) \times 0)] \\ &= 871{,}255\,gallons\,per\,year\,or\,1{,}165\,hundred\,cubic\,feet \end{aligned}$$

**To convert from gallons per year to hundred-cubic-feet per year:**

$$= \frac{1{,}108{,}870}{748} = 1{,}482\,hundred\text{-}cubic\text{-}feet\,per\,year$$

$$(100\,cubic\text{-}feet = 784\,gallons)$$

(2) In the next hypothetical example, the landscape project in Fresno, California, has the same $ET_o$ value of 51.1" and a total landscape area of 50,000 ft². Within the 50,000 ft² project, there is now a 2,000 ft² area planted with edible plants. This 2,000 ft² area is then considered to be a Special Landscape Area.

$$\begin{aligned} MAWA &= (51.1\,in)\,(0.62)\,[(0.55 \times 50{,}000) + ((1 - 0.55) \times 2{,}000)] \\ &= 31.682 \times [27{,}500 + 900] \\ &= 31.682 \times 28{,}400 \\ &= 899{,}769\,gallons\,per\,year\,or\,1{,}203\,hundred\,cubic\,feet \end{aligned}$$

For complete information about the California Model Water Efficient Landscape Ordinance, visit the California Department of Water Resources website at: **https://water.ca.gov/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency/Model-Water-Efficient-Landscape-Ordinance**

# AB 1881, CALIFORNIA CALCULATION OF ESTIMATED TOTAL WATER USE (ETWU)

**This formula is used to calculate the estimated amount of water used in a landscape.** The ETWU must be less than the Maximum Applied Water Allowance (MAWA), as shown in the previous formula, in order to receive project approval. The use of this formula is mandated by California State Assembly Bill 1881.

$$ETWU^{(d)}\,(Annual\ Gallons\ Required) = Et_O \times 0.62 \times ETAF \times Area$$

**Where:**

ETWU = Estimated Total Water Use per year (gallons)

$ET_o$ = Reference Evapotranspiration (inches)

LA = Landscape Area (square feet)

0.62 = Conversion Factor

ETAF = PF/IE

- PF = Plant Factor
- IE = Irrigation Efficiency
  - Overhead Irrigation = 0.75
  - Drip Irrigation = 0.81

**Example:**

Determine the ETWU of an irrigated landscape area of 50,000 ft² without any Special Landscape Areas (SLA=0, no edible plants, recreational areas, or use of recycled water). The $ET_o$ value is 51.1" annually, and the plant water use type, plant factor, and hydrozone area are shown in the table below

| Hydrozone | Sprinkler Type | Plant Water Use Type(s) | Irrigation Efficiency | Plant Factor (PF)* | Hydrozone Area (HA) (square feet) | ETWU Gallons Per Year (HCF Per Year) |
|---|---|---|---|---|---|---|
| 1 | Overhead | High | .75 | 0.8 | 7,000 | 236,559 (317) |
| 2 | Overhead | High | .75 | 0.7 | 10,000 | 295,699 (369) |
| 3 | Drip | Medium | .81 | 0.5 | 16,000 | 312,908 (419) |
| 4 | Drip | Low | .81 | 0.3 | 7,000 | 82,138 (110) |
| 5 | Drip | Low | .81 | 0.2 | 10,000 | 78,228 (105) |
| | | | | | **ETWU Sum** | **1,005,532 (1,345)** |

*Plant Factor from WUCOLS

$$ETWU = (51.1)(0.62)\left(\frac{24,700+0}{0.71}\right)$$
$$= 1,102,176\ gallons\ per\ year$$

**Compare ETWU with MAWA:** For this example, MAWA = (51.1in)(0.62)[(0.55 x 50,000) + ((1 - 0.55) x 2,000)] = 871,255 gallons per year. The ETWU (1,005,532 gallons per year) is more than MAWA (871,255 gallons per year). In this example, the water budget does not comply with the MAWA.

**ETWU Per Hydrozone**

HZ 1 = (51.1)(0.62)(0.8 / 0.75)(7,000)
HZ 1 = 236,559 gallons per year or 317 hundred cubic feet per year

HZ 2 = (51.1)(0.62)(0.7 / 0 .75)(10,000)
HZ 2 = 295,699 gallons per year or 369 hundred cubic feet per year

HZ 3 = (51.1)(0.62)(0.5 / 0.81)(16,000)
HZ 3 = 312,908 gallons per year or 419 hundred cubic feet per year

HZ 4 = (51.1)(0.62)(0.3 / 0.81)(7,000)
HZ 4 = 82,138 gallons per year or 110 hundred cubic feet per year

HZ 5 = (51.1)(0.62)(0.2 / 0.81)(10,000)
HZ 5 = 78,228 gallons per year or 105 hundred cubic feet per year

Average ETAF = 0.63

Sum of all hydrozones = 1,005,532 gallons per year or 1,345 hundred cubic feet per year

# AB 1881, CALIFORNIA CALCULATION OF ESTIMATED TOTAL WATER USE (ETWU) *(continued)*

Using example 2 from page 13, determine the ETWU of an irrigated landscape area of 50,000 ft² with 2,000 ft² of edible plants (Special Landscape Area). The $ET_o$ value is 51.1" annually, and the plant water use type, plant factor, and hydrozone area are shown in the table below.

| Hydrozone | Plant Water Use Type(s) | Plant Factor (PF)* | Hydrozone Area (HA) (square feet) | PF x HA (square feet) |
|---|---|---|---|---|
| 1 | High | 0.8 | 7,000 | 5,600 |
| 2 | High | 0.7 | 9,000 | 6,300 |
| 3 | Medium | 0.5 | 15,000 | 7,500 |
| 4 | Low | 0.3 | 7,000 | 2,100 |
| 5 | Low | 0.2 | 10,000 | 2,000 |
| | | | **Sum** | **23,500** |
| 6 | SLA | 1.0 | 2,000 | 2,000 |

*Plant Factor from WUCOLS

$$\begin{aligned} ETWU &= (51.1)(0.62)\left(\frac{23,500}{0.71} + 2,000\right) \\ &= (31.68)(33,099 + 2,000) \\ &= 1,111,993\ gallons\ per\ year \end{aligned}$$

**Compare ETWU with MAWA. For this example:**

$$\begin{aligned} MAWA &= (51.1)(0.62)[(0.7 \times 50,000) + (0.3 \times 2,000)] \\ &= 31.68 \times [35,000 + 600] \\ &= 31.68 + 35,600 \\ &= 1,127,808\ gallons\ per\ year \end{aligned}$$

The ETWU (1,111,993 gallons per year) is less than MAWA (1,127,808 gallons per year). In this example, the water budget complies with the MAWA.

For complete information about the California Model Water Efficient Landscape Ordinance, visit the California Department of Water Resources website at:

**https://water.ca.gov/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency/Model-Water-Efficient-Landscape-Ordinance**

For Appendix A - Reference Evapotranspiration ($ET_o$) Table, please visit https://www.hunterindustries.com/resource-guide.

For the most up-to-date ET data in your region, visit https://cimis.water.ca.gov/

# APPENDIX A. SAMPLE WATER EFFICIENT LANDSCAPE WORKSHEET

## WATER EFFICIENT LANDSCAPE WORKSHEET

This worksheet is filled out by the project applicant and it is a required element of the Landscape Documentation Package.

**Reference Evapotranspiration (ETo)** _____

| Hydrozone # /Planting Description[a] | Plant Factor (PF) | Irrigation Method[b] | Irrigation Efficiency (IE)[c] | ETAF (PF/IE) | Landscape Area (sq, ft,) | ETAF x Area | Estimated Total Water Use (ETWU)[e] |
|---|---|---|---|---|---|---|---|
| **Regular Landscape Areas** | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | Totals | (A) | (B) | |
| **Special Landscape Areas** | | | | | | | |
| | | | | 1 | | | |
| | | | | 1 | | | |
| | | | | 1 | | | |
| | | | | Totals | (C) | (D) | |
| | | | | | | ETWU Total | |
| | | | | | | Maximum Allowed Water Allowance (MAWA)[e] | |

[a] ***Hydrozone #/Planting Description***
*E.g*
*1.) front lawn*
*2.) low water use plantings*
*3.) medium water use planting*

[b] ***Irrigation Method***
*overhead spray or drip*

[c] ***Irrigation Efficiency***
*0.75 for spray head*
*0.81 for drip*

[d] ***ETWU*** **(Annual Gallons Required) =**
*Eto x 0.62 x ETAF x Area*
where 0.62 is a conversion factor that acre-inches per acre per year to gallons per square foot per year.

[e] ***MAWA (Annual Gallons Allowed) =*** *(Eto) ( 0.62) [ (ETAF x LA) + ((1-ETAF) x SLA)]*
where 0.62 is a conversion factor that acre-inches per acre per year to gallons per square foot per year, LA is the total landscape area in square feet, SLA is the total special landscape area in square feet,
and ETAF is .55 for residential areas and 0.45 for non-residential areas.

### ETAF Calculations

Regular Landscape Areas

| | |
|---|---|
| Total ETAF x Area | (B) |
| Total Area | (A) |
| **Average ETAF** | **B ÷ A** |

**Average ETAF for Regular Landscape Areas must be 0.55 or below for residential areas, and 0.45 or below for non-residential areas.**

All Landscape Areas

| | |
|---|---|
| Total ETAF x Area | (B+D) |
| Total Area | (A+C) |
| **Sitewide ETAF** | **(B+D) ÷ (A+C)** |

0.55 For

# APPENDIX B. SAMPLE CERTIFICATE OF COMPLETION

## CERTIFICATE OF COMPLETION

This certificate is filled out by the project applicant upon completion of the landscape project.

### PART 1. PROJECT INFORMATION SHEET

| | | |
|---|---|---|
| Date | | |
| Project Name | | |
| Name of Project Applicant | Telephone No. | |
| | Fax No. | |
| Title | Email Address | |
| Company | Street Address | |
| City | State | Zip Code |

### Project Address and Location:

| | | |
|---|---|---|
| Street Address | | Parcel, tract or lot number, if available. |
| City | | Latitude/Longitude (optional) |
| State | Zip Code | |

### Property Owner or his/her designee:

| | | |
|---|---|---|
| Name | Telephone No. | |
| | Fax No. | |
| Title | Email Address | |
| Company | Street Address | |
| City | State | Zip Code |

### Property Owner

"I/we certify that I/we have received copies of all the documents within the Landscape Documentation Package and the Certificate of Completion and that it is our responsibility to see that the project is maintained in accordance with the Landscape and Irrigation Maintenance Schedule."

_____

Property Owner Signature Date

**Please answer the questions below:**

1. Date the Landscape Documentation Package was submitted to the local agency_____
2. Date the Landscape Documentation Package was approved by the local agency_____
3. Date that a copy of the Water Efficient Landscape Worksheet (including the Water Budget Calculation) was submitted to the local water purveyor_____

# APPENDIX B. SAMPLE CERTIFICATE OF COMPLETION *(continued)*

## PART 2. CERTIFICATION OF INSTALLATION ACCORDING TO THE LANDSCAPE DOCUMENTATION PACKAGE

"I/we certify that based upon periodic site observations, the work has been completed in accordance with the ordinance and that the landscape planting and irrigation installation conform with the criteria and specifications of the approved Landscape Documentation Package."

| | | |
|---|---|---|
| Signature* | Date | |
| Name (print) | Telephone No. | |
| | Fax No. | |
| Title | Email Address | |
| License No. or Certification No. | | |
| Company | Street Address | |
| City | State | Zip Code |

*Signer of the landscape design plan, signer of the irrigation plan, or a licensed landscape contractor.

## PART 3. IRRIGATION SCHEDULING

Attach parameters for setting the irrigation schedule on controller per ordinance Section 492.10.

## PART 4. SCHEDULE OF LANDSCAPE AND IRRIGATION MAINTENANCE

Attach schedule of Landscape and Irrigation Maintenance per ordinance Section 492.11.

## PART 5. LANDSCAPE IRRIGATION AUDIT REPORT

Attach Landscape Irrigation Audit Report per ordinance Section 492.12.

## PART 6. SOIL MANAGEMENT REPORT

Attach soil analysis report, if not previously submitted with the Landscape Documentation Package per ordinance Section 492.6.
Attach documentation verifying implementation of recommendations from soil analysis report per ordinance Section 492.6.

# APPENDIX C. PRESCRIPTIVE COMPLIANCE OPTION

(a) This appendix contains prescriptive requirements which may be used as a compliance option to the Model Water Efficient Landscape Ordinance.

(b)Compliance with the following items is mandatory and must be documented on a landscape plan in order to use the prescriptive compliance option:

(1) Submit a Landscape Documentation Package which includes the following elements:

(A) date

(B) project applicant

(C) project address (if available, parcel and/or lot number(s))

(D) total landscape area (square feet), including a breakdown of turf and plant material

(E) project type (e.g., new, rehabilitated, public, private, cemetery, homeowner-installed)

(F) water supply type (e.g., potable, recycled, well) and identify the local retail water purveyor if the applicant is not served by a private well

(G) contact information for the project applicant and property owner

(H) applicant signature and date with statement, "I agree to comply with the requirements of the prescriptive compliance option to the MWELO".

(2) Incorporate compost at a rate of at least four cubic yards per 1,000 square feet to a depth of six inches into landscape area (unless contra-indicated by a soil test);

(3) Plant material shall comply with all of the following;

(A) For residential areas, install climate adapted plants that require occasional, little or no summer water (average WUCOLS plant factor 0.3) for 75% of the plant area excluding edibles and areas using recycled water; For non-residential areas, install climate adapted plants that require occasional, little or no summer water (average WUCOLS plant factor 0.3) for 100% of the plant area excluding edibles and areas using recycled water;

(B) A minimum three inch (3″) layer of mulch shall be applied on all exposed soil surfaces of planting areas except in turf areas, creeping or rooting groundcovers, or direct seeding applications where mulch is contraindicated.

(4) Turf shall comply with all of the following:

(A) Turf shall not exceed 25% of the landscape area in residential areas, and there shall be no turf in non-residential areas;

(B) Turf shall not be planted on sloped areas which exceed a slope of 1 foot vertical elevation change for every 4 feet of horizontal length;

(C) Turf is prohibited in parkways less than 10 feet wide, unless the parkway is adjacent to a parking strip and used to enter and exit vehicles. Any turf in parkways must be irrigated by sub-surface irrigation or by other technology that creates no overspray or runoff.

(5) Irrigation systems shall comply with the following:

(A) Automatic irrigation controllers are required and must use evapotranspiration or soil moisture sensor data.

(B) Irrigation controllers shall be of a type which does not lose programming date in the event the primary power source is interrupted.

(C) Pressure regulators shall be installed on the irrigation system to ensure the dynamic pressure of the system is within the manufacturers recommended pressure range.

(D) Manual shut-off valves (such as a gate valve, ball valve, or butterfly valve) shall be installed as close as possible to the point of connection of the water supply.

(E) All irrigation emission devices must meet the requirements set in the ANSI standard, ASABE/ICC 802-2014. "Landscape Irrigation Sprinkler and Emitter Standard," All sprinkler heads installed in the landscape must document a distribution uniformity low quarter of 0.65 or higher using the protocol defined in ASABE/ICC 802-2014.

(c) At the time of final inspection, the permit applicant must provide the owner of the property with a certificate of completion, certificate of installation, irrigation schedule and a schedule of landscape and irrigation maintenance.

# MAXIMUM SYSTEM CAPACITY REQUIREMENT

The following formula is to be used to determine gallons per minute (GPM) necessary for peak water demand periods. While an area might survive for short periods with less water by utilizing soil moisture reserves, extended periods of drought require the maximum system capacity. The formulas below are a guide—the answer is no better than the factors that go into the formula (e.g., Reference Evapotranspiration Rate, Area, Distribution Uniformity, etc.).

**GPM per hydrozone(s):** This formula is used to determine the maximum amount of water required, in GPM, from the source based on the hydrozone's characteristics.

$$GPM = \frac{0.0104 \times Et_o \times Area \times K_c}{DU \times Hrs.\,Available}$$

**Variable Value Ranges:**

GPM = Gallons per minute required

$ET_o$ = Peak daily evapotranspiration for the worst case scenario in inches

Area = Area to be irrigated in square feet

$K_c$ = Crop Coefficient (use 1.0 if actual crop coefficient is not known)

DU = Distribution uniformity or irrigation efficiency

Hrs. Available = Hours available for irrigation each day in the worst case

0.0104 = Constant for conversion of area, flow and inches per day, etc. into common units

**Example:**

A park has been designed with 450,000 $ft^2$ of turf, and all areas must be irrigated between 10 p.m. and 6 a.m. The crop coefficient is 60% (0.6) with an average peak evapotranspiration rate of 0.35" per day. The system distribution uniformity has been estimated to be 65%. What is the maximum GPM required for the park?

$$GPM = \frac{0.0104 \times 0.35 \times 450{,}000 \times 0.60}{0.65 \times 8}$$

$$GPM = 189$$

**Total Area for Given GPM:** This formula may be used to determine the area that can be irrigated if you know the gallons per minute of the water supply.

$$Area = \frac{GPM \times DU \times Hrs.\,Available}{0.0104 \times Et_o \times K_c}$$

**Where:**

Area = Area to be irrigated in square feet

GPM = gallons per minute available from the water supply

DU = Distribution Uniformity or Irrigation Efficiency

Hrs. Available = hours available for irrigation on the worst case day

$ET_o$ = Peak daily evapotranspiration for the worst case scenario

$K_c$ = Crop Coefficient (use 1.0 if actual crop coefficient is not known)

0.0104 = Constant for conversion of area, flow, and inches per day into common units

**Example:**

A developer has a well on the site of a proposed golf course. The well will produces 350 GPM. The course will be designed with a distribution uniformity of 75%, and a watering window of 12 hours. The peak evapotranspiration rate in the area is 0.30" per day and the turf has a crop coefficient of 80% (0.80). How large an area can be watered with the existing well?

$$Area = \frac{350 \times 0.75 \times 12}{0.0104 \times 0.30 \times 0.80}$$

$$Area = 1{,}262{,}019\ ft^2\ (approx.\ 29\ acres)$$

# MAXIMUM SYSTEM CAPACITY REQUIREMENT *(continued)*

**Total Area for Given Gallons Per Day:** This formula may be used to determine the area that can be irrigated if you know the gallons available per day. This is the case in some water rationing systems, or where a well's capacity is the limiting factor.

$$Area = \frac{DU \times Gallons}{0.62333 \times Et_o \times K_c}$$

**Where:**

Area = Area to be irrigated in square feet

DU = Distribution Uniformity or Irrigation Efficiency

Gallons = Gallons available from the water supply on the worst case day

$ET_o$ = Evapotranspiration for the worst case scenario

$K_c$ = Crop Coefficient – use 1.0 if actual crop coefficient is not known

0.62333 = Constant for conversion of area, flow and inches per day, etc., into common units

**Example:**

The city has developed guidelines that allot a commercial project 36,000 gallons of water per day during a period of extended drought. The area being watered has a distribution uniformity of 60%, an average evapotranspiration rate of 0.22" per day, and an average crop coefficient of 70% (0.70). How much of the project can be sustained with the city's water allotment?

$$Area = \frac{0.60 \times 36,000}{0.62333 \times 0.22 \times 0.70}$$

$$Area = 225,017\ ft^2\ (approx. 5.2\ acres)$$

PUMPS

# BRAKE HORSEPOWER

This formula determines the amount of power required at the pump shaft based on the pump's efficiency. It does not take into account any losses in the engine or electric motor.

$$BHP = \frac{Q \times h}{3960 \times E_f}$$

**Where:**

BHP = Brake horsepower (1 HP = 550 ft-lbs/sec)

Q = Pump discharge in gallons per minute (GPM)

h = Total dynamic head in feet

3960 = Constant for conversion of units to brake horsepower

$E_f$ = Pump efficiency (decimal)

**Example:**
A pump with an efficiency of 85% is pumping 500 GPM with a total dynamic head of 230'. What is the brake horsepower required to drive the pump?

$$BHP = \frac{500 \times 230}{3960 \times 0.85}$$

$$BHP = 34.17$$

# HORSEPOWER REQUIRED WITH WATER PUMPING

This formula is used to determine brake horsepower requirements.

$$BHP = \frac{ft \times GPM}{3960 \times E_f}$$

**Where:**

BHP = Brake horsepower

ft = Number of feet the water is lifted from the surface of the water source to the discharge point

GPM = Gallons per minute being pumped

3960 = Constant for conversion to horsepower

$E_f$ = Pump efficiency (decimal)

**Example:**
A pump system is needed to pump 500 GPM from a river 70' up to a golf course water reservoir. What is the minimum horsepower required to pump the water? The pump is rated at 75% efficient.

$$HP = \frac{70 \times 500}{3960 \times 0.75}$$

$$HP = 11.78 \approx 12$$

Brake horsepower is the power required at the pump shaft to drive the pump.

# NET POSITIVE HEAD AVAILABLE

**Net Positive Suction Head available** is the absolute pressure available at the pump impeller. Net Positive Suction Head Available (NPSHA) must exceed the Net Positive Suction Head Requirement (NPSHR) or cavitation will cause damage to the pump impeller. NPSHR is determined by the pump manufacturer and is dependent upon pump design and operating conditions.

$$NPSHA = (H_o - H_v) - H_s - H_f$$

**Where:**

$H_O$ = Atmospheric pressure in feet of water

$H_V$ = Saturation vapor pressure in feet of water

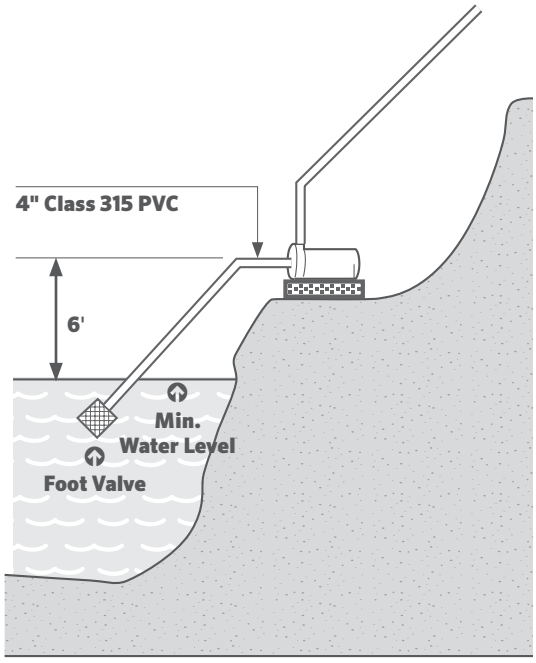
$H_S$ = Vertical height of the impeller eye above the water surface in feet

$h_f$ = Pressure loss due to friction in the suction (intake) line in feet of head (pressure losses in PSI must be multiplied by 2.31 to convert to feet)

**Example:**
Use the diagram and the chart below to determine the Net Positive Suction Head Available. The pump is located 3,000' above sea level, and the water temperature is 60°F. The intake line is 20' long and the flow rate is 100 GPM. Pressure loss through the foot valve is 1.5 PSI, and the pressure loss through the fittings is estimated at 0.5 PSI.

$$NPSHA = 30 - 6 - (1.5 \times 2.31) - (0.33 \times 0.2 \times 2.31) - (0.5 \times 2.31)$$
$$NPSHA = 19.21 \; feet\ of\ head$$

Net Positive Suction Head Available (NPSHA) can be calculated using the formula above, while the Net Positive Suction Head Required (NPSHR) varies from one pump model to another and can be found with the pump performance curves provided by the manufacturer. For any given pumping situation and pump model, the NPSHA must exceed the pump's NPSHR in order for the pump to operate properly and avoid cavitation.




**($H_o$–$H_v$) FOR A RANGE OF TEMPERATURES AND ELEVATIONS**

| Water Temp. °F | Elevation Above Sea Level (ft) | | | | | | |
|---|---|---|---|---|---|---|---|
| | 0 | 1000 | 2000 | 3000 | 4000 | 5000 | 6000 |
| 40° | 33.7 | 32.5 | 31.4 | 30.3 | 29.2 | 28.1 | 27.0 |
| 50° | 33.6 | 32.4 | 31.3 | 30.2 | 29.1 | 28.0 | 26.9 |
| 60° | 33.4 | 32.2 | 31.1 | 30.0 | 28.9 | 27.8 | 26.7 |
| 70° | 33.2 | 32.0 | 30.9 | 29.8 | 28.7 | 27.6 | 26.5 |
| 80° | 32.8 | 31.6 | 31.5 | 29.4 | 28.3 | 27.2 | 26.1 |
| 90° | 32.4 | 31.2 | 30.1 | 29.0 | 27.9 | 26.8 | 25.7 |
| 100° | 31.8 | 30.6 | 29.5 | 28.4 | 27.3 | 26.2 | 25.1 |
| 110° | 31.1 | 29.9 | 28.8 | 27.7 | 26.6 | 25.5 | 24.4 |
| 120° | 30.1 | 28.9 | 27.8 | 26.7 | 25.6 | 24.5 | 23.4 |
| 130° | 28.9 | 27.7 | 26.6 | 25.5 | 24.5 | 23.3 | 22.2 |
| 140° | 27.3 | 26.1 | 25.0 | 23.9 | 22.8 | 21.7 | 20.6 |
| 150° | 25.4 | 24.2 | 23.1 | 22.0 | 20.9 | 19.8 | 18.7 |

# TOTAL DYNAMIC HEAD

**Total Dynamic Head** is the amount of pressure that one pump must generate for proper sprinkler system operation. It represents the total of all pressure losses and requirements, including: 1) pressure change due to elevation, 2) sprinkler operating pressure, 3) friction loss in pipes, fittings, and valves, and 4) the pressure required to move the water.

$$TDH = H_s + H_p + h_f + H_v$$

**Where:**

TDH = Total Dynamic Head is the maximum pressure the pump will be required to generate.

$H_S$ = Static Head is the vertical distance in feet from the surface of the water source to the point of discharge in feet.

$H_P$ = Pressure Head is the pressure required at the discharge point (sprinkler, emitter or discharge pipe) in feet. (If sprinkler PSI is used it must be multiplied by 2.31 to convert to feet).

$h_f$ = Friction Head is the pressure lost due to friction in pipe, valves, and fittings from the water intake to the discharge point, in feet. (If pressure loss is calculated in PSI, it must be multiplied by 2.31 to convert to feet).

$H_V$ = Velocity Head is the energy required to move the water at the intended velocity (see velocity head) in feet. Because this is an insignificant loss in Total Dynamic Head, it is sometimes ignored in these calculations.

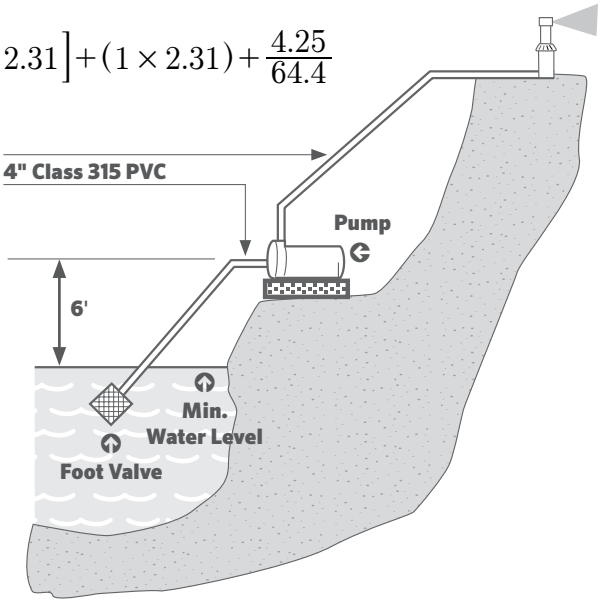
**Example:**

Determine the Total Dynamic Head where the sprinkler operating pressure is 50 PSI, the maximum flow is 150 GPM, the intake line is 35' long, and the discharge line is 450'. The pressure loss in the foot valve at that flow rate is given by the manufacturer to be 1 PSI. In this sample problem, we ignore the pressure loss in fittings.

$$TDH = H_s + H_p + h_f + H_v$$

$$TDH = (90 + 6)(50 + 2.31) + \left[(35 + 450) \times \left(\frac{0.69}{100}\right) \times 2.31\right] + (1 \times 2.31) + \frac{4.25}{64.4}$$

$$TDH = 221.82 \; feet$$



# WATER HORSEPOWER REQUIREMENTS

This formula, also called Theoretical Horsepower, is used to calculate the amount of power required to pump a given volume of water at a specified head.

$$WHP = \frac{GPM \times TDH}{3960}$$

**Where:**

WHP = Horsepower output required

GPM = Gallons per minute flow from the pump

TDH = Total Dynamic Head in feet of head

3960 = Constant used to convert flow and head into horsepower

**Example:**

What is the water horsepower requirement to pump 200 GPM at 350' of head?

$$WHP = \frac{200 \times 350}{3960}$$

$$WHP = 17.7$$

# SCHEDULING
# COEFFICIENT OF UNIFORMITY

This formula is used to measure the variability of water distribution over a given area. It is calculated by using a series of catchments, comparing the average (mean) catchment and the deviation from that average.

$$C_u = 100\left(1.0\frac{\Sigma x}{mn}\right)$$

**Where:**

$C_u$ = Uniformity Coefficient

x = Deviation of individual observations or catchments

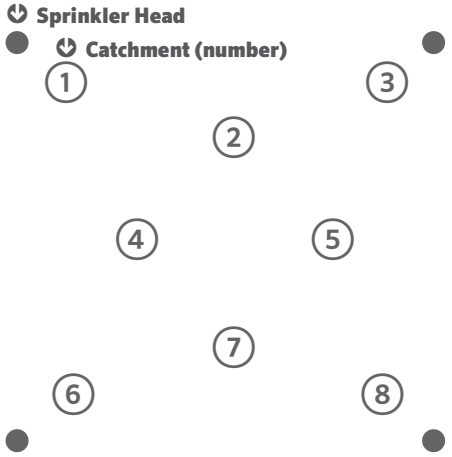
$\Sigma x$ = Sum of the deviations of individual observations from the mean value, *m*

*m* = Mean value of all observations in the distribution

*n* = Number of observations in the distribution

100 = Constant for conversion to percent

Note: Catchment may be expressed in any convenient unit of measurement (e.g., milliliters, ounces, etc.), as long as all catchments are measured in the same units.




**Example:**
In a landscape area, eight catchments are placed between sprinklers and the above observations recorded. What is the Coefficient of Uniformity?

$$C_u = 100\left(\frac{1.0 - 26.00}{46.75 \times 8}\right)$$

$$C_u = 93.0$$

| Catchment # | Catchment Quantity (ml) | Deviation From Mean (mean = 46.75 ml) |
|---|---|---|
| 1 | 48 | 1.25 |
| 2 | 51 | 4.25 |
| 3 | 44 | 2.75 |
| 4 | 41 | 5.75 |
| 5 | 45 | 1.75 |
| 6 | 44 | 2.75 |
| 7 | 50 | 3.25 |
| 8 | 51 | 4.25 |
| | **Total** | **26.00** |

# DISTRIBUTION UNIFORMITY

This formula is one of several that are titled Distribution Uniformity. It is used to estimate the variation in water application between sprinklers resulting from pressure variation, improper nozzle selection, or lack of maintenance.

$$DU = 100 \times \left( \frac{MQ1}{M} \right)$$

**Where:**

DU = Distribution Uniformity expressed as a percent

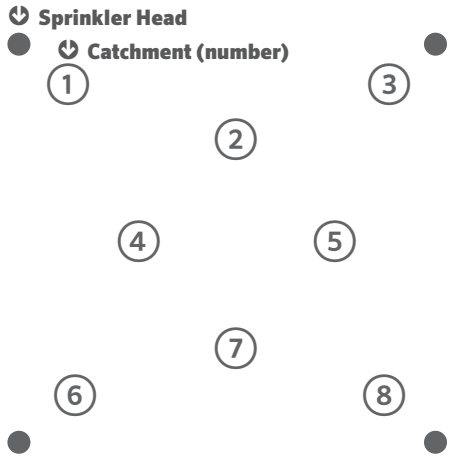
MQ1 = Mean of observations in lowest 25% of the distribution

M = Mean of distribution

100 = Constant for conversion to percent

**Example:**

| Catchment # | Catchment Quantity after 15 Minutes in Milliliters |
|---|---|
| 1 | 13* |
| 2 | 18* |
| 3 | 22 |
| 4 | 17* |
| 5 | 19 |
| 6 | 23 |
| 7 | 19 |
| 8 | 21 |
| 9 | 22 |
| 10 | 23 |
| 11 | 24 |
| 12 | 22 |
| **Total** | **243** |




* Lowest ¼ = 48

Note: Catchment may be measured in any units of measurement (inches, ounces, millimeters, etc.).

$$DU = 100 \times \left( \frac{48 \div 3}{241 \div 12} \right)$$

$$DU = 100 \times \left( \frac{16}{20.25} \right)$$

$$DU = 100 \times 0.79$$

$$DU = 79\%$$

# PRECIPITATION RATE

Two formulas are shown below. The first is most useful when comparing precipitation rates between different types of sprinklers or calculating precipitation rates on areas with a single type of sprinkler and uniform head and row spacing. The second method is better suited to areas where sprinkler head flows or spacing varies. **Metric versions are shown in parentheses.**

**Method #1: Individual Head Method**

$$PR = \frac{34650 \times GPM\ (for\ any\ arc)}{Degrees\ Arc \times Head\ Spacing \times Row\ Spacing}$$

$$\left( PR = \frac{m^3/hr\ (for\ any\ arc) \times 360{,}000}{Degrees\ of\ Arc \times Head\ Spacing\ (m) \times Row\ Spacing\ (m)} = mm/hr \right)$$

$$\left( PR = \frac{l/\min\ (for\ any\ arc) \times 21{,}600}{Degrees\ of\ Arc \times Head\ spacing\ (m) \times Row\ Spacing\ (m)} = mm/hr \right)$$

**Where:**

| | | |
|---|---|---|
| PR | = | Precipitation rate in inches per hour |
| GPM | = | Flow for a given sprinkler of any arc, in gallons per minute |
| Degrees Arc | = | Arc of the given sprinkler in degrees |
| Head Spacing | = | Space between the heads in a row, in feet |
| Row Spacing | = | Space between rows of heads, in feet |
| 34,650 | = | Constant for conversion of area and flow into common units |

**Example:**
What is the precipitation rate for a 270° sprinkler with 6.8 GPM spaced at 28' by 30'?

$$PR = \frac{34{,}650 \times 6.8}{270 \times 28 \times 30}$$

$$PR = 1.04\ inches\ per\ hour$$

**Method #2 : Total Area Method**

$$PR = \frac{96.25 \times Total\ GPM}{Total\ Area} \quad \left( PR = \frac{Total\ m^3/hr\ GPM}{Total\ Area\ (m^2)} = mm/hr \right) \quad \left( PR = \frac{Total\ l/\min \times 60}{Total\ Area (m^2)} = mm/hr \right)$$

**Where:**

| | | |
|---|---|---|
| PR | = | Precipitation rate in inches per hour |
| Total GPM | = | Total flow from all sprinklers in the given area in gallons per minute |
| Total Area | = | Given irrigated area in square feet |
| 96.25 | = | Constant for conversion of area and flow into common units |

**Example:**
What is the average precipitation rate for a section of turf 325' by 80' if the total flow from all sprinklers in the area is 112 GPM?

$$PR = \frac{96.25 \times 112}{(325 \times 80)}$$

$$PR = 0.41\ inches\ per\ hour$$

# PRECIPITATION RATE *(continued)*

This formula is used to determine the minimum precipitation rate than can be used to deliver the required amount of water needed during a peak period of water usage.

$$Minimum\ PR = \frac{ET \times Total\ Acres}{Hours\ Avail. \times Acre\ per\ Section \times Valves \times Efficiency}$$

**Where:**

| | | |
|---|---|---|
| Minimum PR | = | Minimum required precipitation rate in inches per hour |
| ET | = | Amount of water to be applied in inches per day, including crop coefficient |
| Total Acres | = | Area to be irrigated in acres |
| Hours Avail. | = | Hours available for irrigation each day |
| Acres per Section | = | Average area covered by one control valve in acres |
| Valves | = | Number of valves operating at one time |
| Efficiency | = | System operating efficiency in decimal equivalent of percent |

**Example:**
What is the minimum precipitation rate that will deliver 0.28" of water to 15 acres under the following conditions:

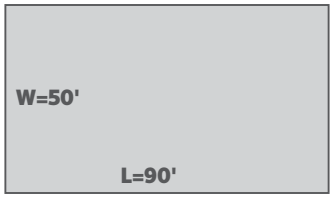
- during a 12-hour period
- the average section is 0.40 acres (17,424 $ft^2$)
- two valves wil be operating simultaneously
- the system efficiency is 75%

$$\frac{0.28 \times 15}{12 \times 0.40 \times 2 \times 0.75}$$

$$= 0.58\ inches\ per\ hour\ min imum\ precipitation\ rate\ required$$

# HOW TO CALCULATE AREAS

### Square or rectangle




$$A = L \times W$$

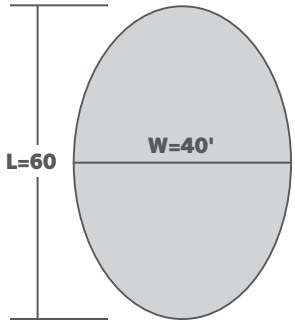
**Where:**
L = Length
W = Width

**Example:**

$$A = 90\ ft \times 50\ ft$$
$$A = 4{,}500\ ft^2$$

### Ovals or egg shapes (within 5% accuracy)

$$A = 0.8\ L \times W$$



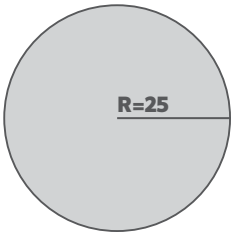

**Where:**
L = Length
W = Width at midpoint

**Example:**

$$A = 0.8 \times 60 \times 40$$
$$A = 1{,}920\ ft^2$$

### Circle (within 5% accuracy)

$$A = 0.8\ D^2$$




**Where:**
D = Diameter

**Example:**

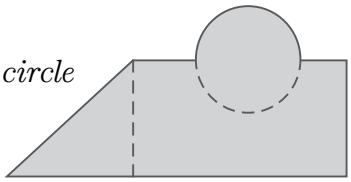
$$A = 0.8 \times 50\ ft \times 50\ ft$$
$$A = 2{,}000\ ft^2$$

### Unusual shapes

Divide the area into regular geometric shapes, calculate the area of each section, then total:

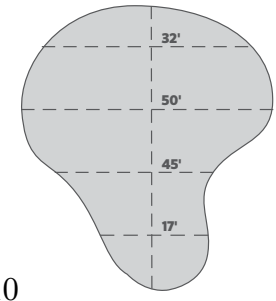
**Example:**

$$Area\ of\ triangle$$
$$+\ Area\ of\ rectangle$$
$$+\ Area\ of\ one\text{-}half\ of\ circle$$
$$=\ Total\ area$$



### Irregular shapes

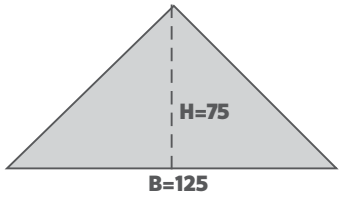
Find the length of the longest line across the area. Every 10' along the length line, measure the width of the area at right angles to the length line. Total all widths and multiply by 10.




$$Area = (A + B + C, etc) \times 10$$
$$Area = (32\ ft + 50\ ft + 45\ ft + 17\ ft\ ) \times 10$$
$$Area = 144 \times 10$$
$$Area = 1{,}440\ ft^2$$

### Triangle

$$Area = 0.5 \times B \times H$$



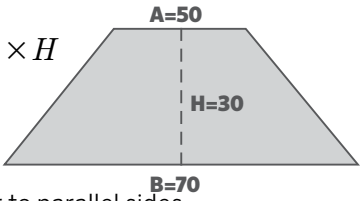

**Where:**
B = Base
H = Height

**Example:**

$$Area = 0.5 \times 125\ ft \times 75\ ft$$
$$Area = 4{,}687\ ft^2$$

### Trapezoid

$$Area = 0.5 \times (A + B) \times H$$



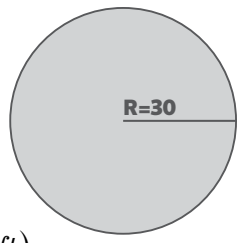

**Where:**
A = One parallel side
B = Second parallel side
H = Height perpendicular to parallel sides

**Example:**

$$Area = 0.5 \times (50\ ft + 70\ ft) \times 30\ ft$$
$$Area = 0.5 \times 120\ ft \times 30\ ft$$
$$Area = 1{,}800\ ft^2$$

### Circle

$$Area = \pi r^2$$




**Where:**
π = 3.14
R = Radius

**Example:**

$$Area = 3.14 \times (30\ ft \times 30\ ft)$$
$$Area = 2{,}826\ ft^2$$

# DRIP CALCULATIONS

### Application Rate

The following table lists application rates for various line spacing:

**EMITTER FLOW RATE – 0.9 GPH**

| Row Spacing (in.) | Emitter Spacing (in.) 12 | 18 | 24 |
|---|---|---|---|
| **12** | 1.44 | 0.96 | 0.72 |
| **14** | 1.24 | 0.83 | 0.62 |
| **16** | 1.08 | 0.72 | 0.54 |
| **18** | 0.96 | 0.64 | 0.48 |
| **20** | 0.87 | 0.64 | 0.43 |
| **24** | 0.72 | 0.48 | 0.36 |

**EMITTER FLOW RATE – 0.6 GPH**

| Row Spacing (in.) | Emitter Spacing (in.) 12 | 18 | 24 |
|---|---|---|---|
| **12** | 0.96 | 0.64 | 0.48 |
| **14** | 0.83 | 0.55 | 0.41 |
| **16** | 0.72 | 0.48 | 0.36 |
| **18** | 0.64 | 0.43 | 0.32 |
| **20** | 0.58 | 0.39 | 0.29 |
| **24** | 0.48 | 0.32 | 0.24 |

**EMITTER FLOW RATE – 0.4 GPH**

| Row Spacing (in.) | Emitter Spacing (in.) 12 | 18 | 24 |
|---|---|---|---|
| **12** | 0.64 | 0.43 | 0.32 |
| **14** | 0.55 | 0.37 | 0.28 |
| **16** | 0.48 | 0.32 | 0.24 |
| **18** | 0.43 | 0.29 | 0.21 |
| **20** | 0.39 | 0.26 | 0.19 |
| **24** | 0.32 | 0.21 | 0.16 |

**Notes**
Application rates in inches per hour

For other spacing, calculate the application rate of each similar zone by using the following formula:

$$\frac{231.1 \times \text{Emitter Flow Rate (GPH)}}{\text{Emitter Spacing (in.)} \times \text{Line Spacing (in.)}}$$

### Total Flow within a Zone

Total zone flow can be calculated by either the area method or total length method:

**Zone Flow by Area Method (estimate)**

$$\frac{\text{Irrigated Area (ft}^2\text{)} \times 144}{\text{Emitter Spacing (in.)} \times \text{Line Spacing (in.)}} \times \text{Emitter Flow Rate (GPH)} \div 60 = \text{Zone flow (GPM)}$$

**Zone Flow Total Length Method**

$$\frac{\text{Total Length} \times \text{Emitter Flow Rate (GPH)}}{\text{Emitter Spacing (in.)}} \div 60 = \text{Zone flow (GPM)}$$

### Total Length within an Area (Estimated)

$$\frac{\text{Irrigated Area (ft}^2\text{)} \times 12}{\text{Minimum Row Spacing (in.)}} = \text{Estimate of total length (ft.)}$$

### Maximum Inline Tubing Length Based on Flow

$$\frac{\text{Available flow (GPM)}}{\text{Flow per 100'}} \times 100 = \text{Maximum length (ft.)}$$

### Quantity of Emitters within a Zone

$$\frac{\text{Total length} \times 12}{\text{Emitter spacing}} = \text{Number of emitters in a zone}$$

**NOTES:** *Consider conservatively adjusting estimates upward to account for decreased line spacing at edges and unforeseen conditions.*

# SCHEDULING COEFFICIENT

**A scheduling coefficient** is used to measure the uniformity of water distribution by relating the lowest precipitation rate for any contiguous region within an irrigated area to the overall precipitation rate of the entire area.

$$SC = \frac{PR}{LPR}$$

**Where:**

SC = Scheduling Coefficient, 1.0 would be perfect uniformity

PR = Precipitation Rate

LPR = Lowest Precipitation Rate in the irrigated area

**Example:**
In a catchment test, collectors are placed at 2' intervals. The average precipitation rate is calculated to be 1.6" per hour. The lowest precipitation rate of all catchments was 0.8" per hour. What is the Scheduling Coefficient?

$$SC = \frac{1.6}{0.8} \qquad SC = 2.0$$

# IRRIGATION FREQUENCY

The Irrigation Frequency Formula calculates the maximum interval allowed between irrigation cycles. This irrigation interval is dependent on soil type, root zone depth, and water lost by evapotranspiration of a specific crop. The frequency, or "Set Days To Water," is calculated using the following formula:

$$F = \frac{AWHC \times RZ \times MAD}{ET_o \times K_c}$$

**Where:**

F = Irrigation frequency

AWHC = Available Water Holding Capacity is the moisture level in the soil which is above the plant's permanent wilting point, and below the soil's field capacity, in inches per foot

RZ = Root zone, in feet

MAD = Management Allowable Depletion of water from the AWHC percent. MAD of 30-50% will sustain a healthy landscape.

$ET_o$ = Reference evapotranspiration rate, in inches per day

$K_c$ = Crop coefficient, decimal

**Example:**
A zone in your system is irrigating established warm season turf which is growing in a sandy loam on a slight slope with an available water holding capacity of 1" per foot of soil. The root depth of the turf is 9". The average precipitation rate is 0.49" per hour. The system is located in San Marcos, California, where daily moisture loss ($ET_o$) to be replenished is 0.20". The crop coefficient ($K_c$) is set at 70%. The allowable water depletion will be 50%.

$$F = \frac{1.0" \times 0.75' \times 50\%}{0.20" \times 0.70} = \frac{1.0 \times 0.75 \times 0.50}{0.20 \times 0.70}$$

$$F = 2.68$$

$$F = 2\,days$$

# SPRINKLER RUN TIME

The sprinkler run time formula calculates the number of minutes required to apply enough water to replace the water lost by evapotranspiration for a specific crop irrigated with a system at a particular precipitation rate and efficiency.

The run time is calculated using the following formula:

$$T = \frac{60 \times D \times ET_o \times K_c}{PR \times IE}$$

**Where:**

T = Sprinkler run time in minutes

60 = Constant for conversion of area, flow, inches per hour, and inches per day into common units

D = Watering frequency in days

$ET_o$ = Reference evapotranspiration rate, in inches per day

$K_c$ = Crop coefficient, decimal

PR = Precipitation rate of the area, in inches per hour

IE = Application efficiency of the system, percent

**Example:**

Determine the sprinkler run time for an athletic field with a daily $ET_o$ of 0.15" and a crop coefficient for the warm season turf of 0.70. The watering schedule is set for every three days. The sprinkler precipitation rate is 0.50" per hour with an application efficiency of 75%.

$$T = \frac{60 \times 3 \times 0.15" \times 0.70}{0.50" \times 75\%} \qquad = \frac{60 \times 30 \times 0.15 \times 0.70}{0.50 \times 0.75}$$

$$T = 50 \; minutes \; every \; 3 \; days$$

# CONVERSIONS

## VARIABLES AND UNITS

| Symbol | Definition | Imperial Units | Metric Units |
|---|---|---|---|
| a | Cross-sectional area of pipe flow | $inches^2$ | $mm^2$ |
| $A_r$ | Area of land | $feet^2$ acres | $m^2$, ha |
| $A_e$ | Area of land | $feet^2$ | $m^2$ |
| AW | Available soil water | iches | centimeters |
| BP | Barometric pressure | feet | meters |
| C | Hazen-Williams friction coefficient | none | none |
| $C_u$ | Coefficient of uniformity | percent | percent |
| d | Inside diameter of a pipe | inches | millimeters |
| $d_v$ | Difference between an observed value and the mean value | $inches^3$ | mL |
| $D_t$ | Diameter of throw of sprinkler | feet | meters |
| DU | Distribution uniformity | percent | percent |
| E | Elevation of a point | feet | meters |
| EA | Application Efficiency | percent | percent |
| $ET_c$ | Crop Evapotranspiration | inches per day | millimeters per day |
| $ET_o$ | Reference Evapotranspiration | inches per day | millimeters per day |
| H | Energy head, usually sum of elevation and pressure | feet | meters |
| I | Electrical current | amps | A |
| ID | Inside diameter of pipe | inches | meters/meters |
| $h_f$ | Energy loss due to friction | feet/feet | meters/meters |
| $K_c$ | Crop Coefficient | percent | percent |
| kPa | Kilopascals | PSI | bar |
| $k_s$ | Constant used to compute sprinkler spacing | none | none |
| L | Spacing between lateral lines | feet | meters |
| MAD | Management allowed depletion | none | none |
| MC | Maximum coverage for single-row sprinklers | feet | meters |
| n | Number of observations in a uniformity test | none | none |
| NPSHA | Net positive suction head available | feet | meters |
| NPSHR | Net positive suction head required | feet | meters |
| OD | Outside diameter of pipe | inches | millimeters |
| P | Pressure of water | pounds per $inch^2$ (PSI) | kPa, bar |
| Pal | Allowable loss in pressure | pounds per $inch^2$ (PSI) | kPa, bar |
| Pav | Average pressure in a zone | pounds per $inch^2$ (PSI) | kPa, bar |

# CONVERSION TABLE *(continued)*

| Symbol | Definition | Imperial Units | Metric Units |
|---|---|---|---|
| PET | Potential evapotranspiration | inches per day | millimeters per day |
| PSI | Pounds per square inch | | |
| PR | Precipitation rate | inches per hour | millimeters per hour |
| PL | Pressure losses due to friction | feet | meters |
| $P_o$ | Sprinkler operating pressure | PSI | kPa, bar |
| $P_v$ | Pressure Variation | percent | percent |
| $P_s$ | Static Pressure | PSI | kPa, bar |
| Q | Flow of water in a pipe or from a sprinkler | gallons per minute | liters per second |
| $q_e$ | Flow of water | gallons per minute | 1/minute, $m^3$/hr |
| R | Electrical resistance | ohms | |
| $R_t$ | Radius of throw of sprinkler | feet | meters |
| RAW | Readily available water | inches | millimeters |
| S | Sprinkler spacing | feet | meters |
| SC | Scheduling coefficient | ratio | ratio |
| SD | Scalloped distance | feet | meters |
| t | Time of application or other timed events | h | h |
| TDH | Total dynamic head | feet | meters |
| v | Average velocity of water in a pipe | feet per second (fps) | meters per second |
| $V_o$ | Electrical voltage | volts | V |
| VP | Vapor pressure of water | feet | meters |
| X | Mean of all values in Cu eq. | | |
| $X_{LQ}$ | Mean of the lower one-fourth of the application values, Du eq. | | |
| z | Change in elevation between two points | feet | meters |

# CONVERSION TABLE

**Note:** Conversions listed in this manual are not exact. Refer to sources such as *Handbook of Chemistry and Physics* and *C.R.C. Standard Math Tables* by the Chemical Rubber Company, *Scientific Tables* by Ciba-Geigy Ltd., *Websters Desk Encyclopedia* by Griesewood and Dempsey, *Field Geologists Manual* by the Australian Institute of Mining and Metallurgy, *Conversion Factors* by Forney's Inc., *Conversions* by Cahn Instruments, and *Technical Reference Handbook* by E.P. Rasis for more detailed conversions and specifications.

| Convert From | Into | Multiply By |
|---|---|---|
| **AREA** | | |
| **acres** | hectares or square hectometer | 0.4047 |
| | square feet | 43,560 |
| | square meters | 4,047 |
| | square miles | 0.0015625 |
| | square yards | 4,840 |
| | square inches | 6,272,640 |
| **hectares** | acres | 2.471 |
| | square centimeter | 100,000,000 |
| | square feet | 107,629 |
| | square meters | 10,000 |
| | square miles | 0.00386 |
| **square centimeters** | acres | $2.4702 \times 10^{-8}$ |
| | square feet | 0.001076 |
| | square inches | 0.155 |
| | square millimeters | 100 |
| | square miles | $3.861 \times 10^{-11}$ |
| | square yards | 0.0001196 |
| **square feet** | acres | $2.2957 \times 10^{-5}$ |
| | square centimeters | 929.03 |
| | square inches | 144 |
| | square meters | 0.0929 |
| | square miles | $3.58701 \times 10^{-8}$ |
| | square millimeters | $9.29 \times 10^{4}$ |
| | square yards | 0.1111 |
| **square inches** | acres | $1.594 \times 10^{-7}$ |
| | square centimeters | 6.4516 |
| | square feet | 0.00694 |
| | square meters | 0.000645 |
| | square miles | $2.491 \times 10^{-10}$ |
| | square millimeters | 645.16 |
| **square kilometers** | acres | 247.105 |
| | square centimeters | $1.0 \times 10^{10}$ |
| | square feet | $1.07639 \times 10^{7}$ |
| | square inches | $1.550003 \times 10^{9}$ |
| | square meters | $1.0 \times 10^{6}$ |
| | square miles | 0.3861 |
| | square yards | $1.196 \times 10^{6}$ |

# CONVERSION TABLE *(continued)*

| Convert From | Into | Multiply By |
|---|---|---|
| **AREA** *(continued)* | | |
| **square meters** | acres | 0.000247 |
| | hectares | 0.0001 |
| | square centimeters | 10,000 |
| | square feet | 10.7639 |
| | square inches | 1,550.003 |
| | square kilometers | $1.0 \times 10^{-6}$ |
| | square miles | $3.86 \times 10^{-7}$ |
| | square millimeters | $1 \times 10^{6}$ |
| | square yards | 1.195961 |
| **square miles** | acres | 640 |
| | hectares | 258.999 |
| | square feet | $2.78783 \times 10^{7}$ |
| | square kilometers | 2.58999 |
| | square meters | 258,999 |
| | square yards | 3,098,000 ($3.098 \times 10^{6}$) |
| **square millimeters** | square centimeters | 0.01 |
| | square feet | $1.076 \times 10^{-5}$ |
| | square inches | 0.00155 |
| | square meters | $1.0 \times 10^{-6}$ |
| **square yards** | acres | 0.000207 |
| | hectares | $8.3613 \times 10^{-5}$ |
| | square centimeters | 8,361.27 |
| | square feet | 9 |
| | square inches | 1296 |
| | square meters | 0.8361 |
| | square miles | $3.228 \times 10^{-7}$ |
| **CONCENTRATION** | | |
| **kilograms per hectare** | pounds per acre | 0.8924 |
| **part per million** | grams per liter | 0.001 |
| | milligrams per liter | 1 |
| | ounces per ton (short) | 0.0292 |
| | percent | 0.0001 |
| | pounds per million gallons | 8.345 |
| **pounds per cubic foot** | grams per cubic centimeter | 0.016018 |
| | kilograms per cubic meter | 16.018 |
| | pounds per cubic inch | $5.787 \times 10^{-4}$ |
| | pounds per cubic yard | 27 |
| **FLOW** | | |
| **cubic feet per minute** | acre-feet per hour | 0.00138 |
| | acre-feet per minute | $2.2956 \times 10^{-5}$ |
| | cubic meters per second | 0.00047195 |
| | gallons (U.S.) per minute | 7.48052 |
| | liters per second | 0.47193 |

# CONVERSION TABLE *(continued)*

| Convert From | Into | Multiply By |
|---|---|---|
| **FLOW** *(continued)* | | |
| **cubic feet per second** | acre-inches per hour | 0.99173 |
| | cubic meters per second | 0.02832 |
| | gallons (U.S.) per minute | 448.83 |
| | liters per minute | 1,698.96 |
| | liters per second | 28.316 |
| | millions gallons (U.S.) per day | 0.64632 |
| **gallons (U.S.) per day** | cubic feet per hour | 0.00557 |
| **gallons (British) per hour** | cubic meters per minute | $7.5768 \times 10^{-5}$ |
| **gallons (U.S.) per hour** | acre-feet per hour | $3.0689 \times 10^{-6}$ |
| | cubic feet per hour | 0.13368 |
| | cubic meters per minute | $6.309 \times 10^{-5}$ |
| | gallons per minute | 0.0166667 |
| | liters per hour | 3.7853 |
| **gallons (U.S.) per minute** | acre-feet per day | 0.0044192 |
| | cubic feet per hour | 8.0208 |
| | cubic feet per second | 0.002228 |
| | cubic meters per hour | 0.2268 |
| | cubic meters per second | 0.000063 |
| | gallons (U.S.) per hour | 60 |
| | liters per minute | 3.7853 |
| | liters per second | 0.06308 |
| **liters per minute** | cubic feet per minute | 0.0353 |
| | cubic feet per second | 0.000588 |
| | gallons per minute | 0.26418 |
| | gallons per second | 0.004403 |
| **liters per second** | cubic feet per minute | 2.1189 |
| | cubic feet per second | 0.0353 |
| | cubic yards per minute | 0.07848 |
| **liters per second-square meter** | gallons per minute-square foot | 1.4726 |
| **millions of gallons per day** | acre feet per day | 3.0689 |
| | acre inches per day | 36.8266 |
| | acre inches per hour | 1.53444 |
| | cubic feet per hour | 5,570.023 |
| | cubic feet per minute | 92.834 |
| | cubic feet per second | 1.547 |
| | gallons per hour | 41,666.667 |
| | gallons per minute | 694.4444 |
| **pounds of water per minute** | cubic feet per second | 0.000267 |
| **LENGTH** | | |
| **centimeters** | feet | 0.03281 |
| | inches | 0.3937 |
| | meters | 0.01 |
| | microns | 10,000 |

# CONVERSION TABLE *(continued)*

| Convert From | Into | Multiply By |
|---|---|---|
| **LENGTH** *(continued)* | | |
| **centimeters** | miles (statute) | $6.2137 \times 10^{-6}$ |
| | millimeters | 10 |
| | mils | 393.7 |
| | picas (printers) | 2.371 |
| | points (printers) | 28.4528 |
| | yards | 0.01094 |
| **feet** | centimeters | 30.48 |
| | inches | 12 |
| | kilometers | $3.048 \times 10^{-4}$ |
| | meters | 0.3048 |
| | microns | 304,800 |
| | miles (statute) | 0.000189 |
| | millimeters | 304.8 |
| | yards | 0.333333 |
| **inches** | centimeters | 2.54 |
| | feet | 0.08333 |
| | meters | 0.0254 |
| | microns | 25,400 |
| | miles | $1.578 \times 10^{-5}$ |
| | millimeters | 25.4 |
| | mils | 1,000 |
| | yards | 0.0278 |
| **kilometers** | centimeters | 100,000 |
| | feet | 3,280.84 |
| | inches | 39,370 |
| | miles | 0.62137 |
| | millimeters | $10^6$ |
| | yards | 1,093.61 |
| **meters** | centimeters | 100 |
| | fathoms | 0.54681 |
| | feet | 3.28084 |
| | furlongs | 0.00497 |
| | inches | 39.3701 |
| | kilometers | 0.001 |
| | miles | 0.000621 |
| | millimeters | 1,000 |
| | mils | 39,370.08 |
| | yards | 1.0936 |
| **microns** | centimeters | 0.0001 |
| | feet | $3.2808 \times 10^{-6}$ |
| | inches | $3.937 \times 10^{-5}$ |
| | meters | $1 \times 10^{-6}$ |
| | millimeters | 0.001 |

# CONVERSION TABLE *(continued)*

| Convert From | Into | Multiply By |
|---|---|---|
| **LENGTH** *(continued)* | | |
| **miles (statute)** | centimeters | 160,934 |
| | feet | 5,280 |
| | furlongs | 8 |
| | inches | 63,360 |
| | kilometers | 1.609344 |
| | light years | $1.701 \times 10^{-12}$ |
| | meters | 1,609.344 |
| | yards | 1,760 |
| **millimeters** | centimeters | 0.1 |
| | feet | 0.00328 |
| | inches | 0.03937 |
| | meters | 0.001 |
| | mils | 39.37 |
| | yards | $1.094 \times 10^{-3}$ |
| **mils** | centimeters | $2.54 \times 10^{-3}$ |
| | feet | $8.333 \times 10^{-5}$ |
| | inches | 0.001 |
| | kilometer | $2.54 \times 10^{-8}$ |
| | yards | $2.778 \times 10^{-5}$ |
| **yards** | centimeters | 91.44 |
| | fathoms | 0.5 |
| | feet | 3 |
| | furlongs | 0.004545 |
| | inches | 36 |
| | kilometers | $9.144 \times 10^{-4}$ |
| | meters | 0.9144 |
| | miles | $5.682 \times 10^{-4}$ |
| | millimeters | 914.4 |
| **LIGHT INTENSITY** | | |
| **foot-candles** | foot-lamberts | 1 |
| | lumens per square foot | 1 |
| | lumens per square meter | 10.7639 |
| | lux | 10.7639 |
| **lumens** | candlepower | 0.07958 |
| | watt | 0.0015 |
| **lumens per square foot** | foot-candles | 1 |
| | foot-lamberts | 1 |
| | lumens per square meter | 10.7639 |
| **lumens per square meter** | foot-candles | 0.0929 |
| | lumens per square foot | 0.0929 |
| **lux** | foot-candles | 0.0929 |
| | lumens per square meter | 1 |

# CONVERSION TABLE *(continued)*

| Convert From | Into | Multiply By |
|---|---|---|
| **POWER** | | |
| **BTU** | foot-pounds | 777.649 |
| | horsepower-hours | 0.00039 |
| | kilowatt-hours | 0.00029287 |
| | kilowatt-hours (international) | 0.00029283 |
| | joules | 1,054.35 |
| | joules (international) | 1,054.18 |
| | therms | 0.00001 |
| **BTU per hour** | horsepower per hours | 0.00039 |
| | kilowatts | 0.00029 |
| | watts | 0.29287 |
| **BTU per minute** | foot-pounds per second | 12.96 |
| | horsepower | 0.02356 |
| | kilowatts | 0.01757 |
| | watts | 17.5725 |
| **foot-pounds** | horsepower-hours | $5.05 \times 10^{-7}$ |
| | kilowatt-hours | $3.766 \times 10^{-7}$ |
| **horsepower (mechanical)** | BTU per minute | 42.436 |
| | feet-pounds per min | 33,000 |
| | feet-pounds per second | 550 |
| | horsepower (electric) | 0.9996 |
| | horsepower (metric) | 1.0139 |
| | horsepower (water) | 0.99954 |
| | kilograms-calories per minute | 10.68 |
| | kilowatts | 0.7457 |
| | watts | 745.7 |
| **kilowatts** | BTU per hour | 3414.4 |
| | foot-pounds per hour | 2,655,000 |
| | horsepower | 1.341 |
| | horsepower (boiler) | 0.1019 |
| | horsepower (electric) | 1.34 |
| | horsepower (metric) | 1.3596 |
| | kilowatts (international) | 0.99983 |
| **kilowatt-hours** | BTU | 3414.4 |
| | horsepower-hours | 1.341 |
| | foot-pounds | 2,655,000 |
| | kilogram-meters | 367,098 |
| **watts** | BTU per hour | 3.4144 |
| | horsepower | 0.00134 |
| | horsepower (electric) | 0.00134 |
| | horsepower (metric) | 0.0013596 |
| | kilowatts | 0.001 |
| | watts (international) | 0.9998 |

# CONVERSION TABLE *(continued)*

| Convert From | Into | Multiply By |
|---|---|---|
| **PRESSURE** | | |
| **atmosphere** | bar | 1.01325 |
| | centimeter of mercury at 0°C | 76 |
| | centimeter of water at 4°C | 1,033.26 |
| | dynes per square centimeter | 1,013,250 |
| | feet of water at 39.2°F | 33.8995 |
| | inches of mercury at 32°F | 29.9213 |
| | kilograms per square centimeter | 1.0332 |
| | kilograms per square meter | 10,332 |
| | meters of water at 4°C | 10.3326 |
| | mm of mercury at 0°C | 760 |
| | pounds per square inch | 14.696 |
| **bar** | atmospheres | 0.98692 |
| | centimeter of mercury at 0°C | 75.0062 |
| | dynes per square centimeter | 1,000,000 |
| | feet water at 60°F | 33.4883 |
| | inches of mercury at 32°F | 29.53 |
| | pounds per square foot | 2,089 |
| | pounds per square in | 14.5038 |
| **dynes per square centimeter** | atmospheres | $9.869 \times 10^{-7}$ |
| | bar | $1 \times 10^{-6}$ |
| | centimeters of mercury at 0°C | $7.500617 \times 10^{-5}$ |
| | centimeters of water at 4°C | 0.00101975 |
| | inches of mercury at 32°F | $2.953 \times 10^{-5}$ |
| | inches of water at 4°C | 0.000401 |
| | pounds per square inch | $1.45 \times 10^{-5}$ |
| **feet of water at 4°C** | atmospheres | 0.0295 |
| | centimeter of mercury at 0°C | 2.2419 |
| | dynes per square centimeter | 29,889.80 |
| | grams per square centimeter | 30.479 |
| | inches of mercury at 32°F | 0.8826 |
| | kilograms per square meter | 304.79 |
| | pounds per square inch | 0.433501 |
| **inches of mercury at 32°F** | atmospheres | 0.03342 |
| | bar | 0.03386 |
| | dynes per square centimeter | 33,864 |
| | feet of air at 1 atm, 60°F | 926.2 |
| | feet of water at 39.2°F | 1.1329 |
| | grams per square centimeter | 34.532 |
| | kilograms per square meter | 345.32 |
| | millimeters of mercury at 60°F | 25.4 |
| | ounces per square inch | 7.858 |
| | pounds per square inch | 70.7264 |

# CONVERSION TABLE *(continued)*

| Convert From | Into | Multiply By |
|---|---|---|
| **PRESSURE** *(continued)* | | |
| **inches of water at 4°C** | atmospheres | 0.002458 |
| | dynes per square centimeter | 2,490.80 |
| | inches of mercury at 32°F | 0.07355 |
| | kilograms per square centimeter | 0.00254 |
| | kilograms per square meter | 25.399 |
| | ounces per square foot | 83.235 |
| | ounces per square inch | 0.57802 |
| | pounds per square foot | 5.20218 |
| | pounds per square inch | 0.03613 |
| **kilograms per cubic meter** | grams per cubic centimeter | 0.001 |
| | pounds per cubic foot | 0.0624 |
| **kilograms per square centimeter** | atmospheres | 0.967 |
| | bar | 0.98066 |
| | centimeters of mercury at 0°C | 73.556 |
| | dynes per square centimeter | 98,066 |
| | feet of water at 39.2°F | 32.809 |
| | inches of mercury at 32°F | 28.959 |
| | pounds per square foot | 2,048 |
| | pounds per square inch | 14.22 |
| **kilograms per square meter** | atmospheres | $9.678 \times 10^{-5}$ |
| | bar | $9.8066 \times 10^{-5}$ |
| | dynes per square centimeter | 98.066 |
| | feet of water at 39.2°F | 0.00328 |
| | inches of mercury at 32°F | 0.0029 |
| | kilopascals | $9.80665 \times 10^{-3}$ |
| | millimeters of mercury at 0°C | 0.07356 |
| | pascals | 9.8066 |
| | pounds per square foot | 0.20482 |
| | pounds per square inch | 0.00142 |
| | pounds per square yard | 1.8433 |
| **kilopascals (kPa)** | bar | 0.01 |
| | feet of water | 0.33458 |
| | kilograms per square centimeter | 0.0102 |
| | kilograms per square meter | 101.97 |
| | meters of head | 0.1021 |
| | pounds per square inch | 0.14503 |
| | centimeters of mercury at 0°C | 0.75 |
| | centimeters of water at 4°C | 10.197 |
| | dynes per square centimeter | 10,000 |
| | grams per square centimeter | 10.197 |
| | inches of mercury at 32°F | 0.2953 |
| | inches of water at 39.2°F | 4.014788 |
| | pounds per square foot | 20.88 |
| | millimeter of mercury at 0°C | 7.5 |

# CONVERSION TABLE *(continued)*

| Convert From | Into | Multiply By |
|---|---|---|
| **PRESSURE** *(continued)* | | |
| **millibar** | atmospheres | 0.000987 |
| | bar | 0.001 |
| | dynes per square centimeter | 1,000 |
| | inches of mercury at 32°F | 0.0295 |
| | pounds per square foot | 2.0885 |
| **Newtons** | dynes | 100,000 |
| | pounds | 0.2248089 |
| **Pascal** | Newton per square meter | 1 |
| | pounds per square inch | 0.000145 |
| **pounds per square inch** | atmospheres | 0.06805 |
| | bar | 0.06895 |
| | centimeters of mercury at 0°C | 5.17149 |
| | centimeters of water at 4°C | 70.3089 |
| | dynes per square centimeter | 68,947 |
| | feet of water | 2.307 |
| | grams per square centimeter | 70.307 |
| | inches of mercury at 32°F | 2.036 |
| | inches of water at 39.2°F | 27.681 |
| | kilograms per square centimeter | 0.07031 |
| | kilopascals (kPa) | 6.895 |
| | pounds per square foot | 144 |
| | millimeters of mercury at 0°C | 51.715 |
| **PRESSURE LOSS** | | |
| **bar per 100 meters** | kilopascals per 100 meters | 100.004 |
| | meters per 100 meters | 10.211 |
| | PSI per 100' | 4.421 |
| **kilopascals (kPa) per 100 meters** | bar per 100 meters | 0.010 |
| | meters per 100 meters | 0.1021 |
| | PSI per 100' | 0.0442 |
| **meters per 100 meters** | bar per 100 meters | 0.0979 |
| | kilopascals per 100 meters | 9.79 |
| | PSI per 100' | 0.433 |
| **pounds per square inch (PSI) per 100'.** | bar per 100 meters | 0.226 |
| | kilopascals per 100 meters | 22.621 |
| | meters per 100 meters | 2.31 |
| **TEMPERATURE** | | |
| **Celsius** | Fahrenheit | (°C x 1.8) + 32 |
| **Fahrenheit** | Celsius | (°F - 32) / 1.8 |
| **VELOCITY** | | |
| **cubic meters per minute** | gallons (British) per minute | 219.969 |
| | gallons (U.S.) per minute | 264.172 |
| | liters per minute | 1000 |

# CONVERSION TABLE *(continued)*

| Convert From | Into | Multiply By |
|---|---|---|
| **VELOCITY** *(continued)* | | |
| **feet per minute** | centimeters per second | 0.508 |
| | kilometers per hour | 0.018288 |
| | kilometers per minute | 0.000348 |
| | meters per minute | 0.3048 |
| | meters per second | 0.00508 |
| | miles per hour | 0.011364 |
| **feet per second** | centimeters per second | 30.48 |
| | kilometers per hour | 1.09728 |
| | kilometers per minute | 0.01829 |
| | meters per minute | 18.288 |
| | meters per second | 0.3048 |
| | miles per hour | 0.681818 |
| **feet per (second x second)** | centimeters per (second x second) | 30.48 |
| | kilometers per (hour x second) | 1.0973 |
| | meters per (second x second) | 0.3048 |
| **gravity constant** | centimeter per (second x second) | 980.6 |
| | feet per (second x second) | 32.17 |
| **inches per hour** | centimeters per hour | 2.54 |
| | feet per hour | 0.0833 |
| | miles per hour | $1.5783 \times 10^{-5}$ |
| **inches per minute** | centimeters per hour | 152.4 |
| | feet per hour | 5 |
| | feet per second | 0.0013889 |
| | miles per hour | 0.000947 |
| **kilometers per hour** | centimeters per second | 27.778 |
| | feet per hour | 3,280.84 |
| | feet per minute | 54.6807 |
| | meters per second | 0.2778 |
| | miles per hour | 0.62137 |
| **meters per hour** | feet per hour | 3.2808 |
| | feet per minute | 0.05468 |
| | knots | 0.00054 |
| | miles per hour | 0.000621 |
| **meters per minute** | centimeters per second | 1.66667 |
| | feet per minute | 3.2808 |
| | feet per second | 0.05468 |
| | kilometers per hour | 0.06 |
| | miles per hour | 0.03728 |
| **meters per second** | feet per minute | 196.85 |
| | feet per second | 3.2818 |
| | kilometers per hour | 3.6 |
| | miles per hour | 2.2369 |
| | miles per minute | 0.03728 |

# CONVERSION TABLE *(continued)*

| Convert From | Into | Multiply By |
|---|---|---|
| **VELOCITY** *(continued)* | | |
| **miles per hour** | centimeters per second | 44.704 |
| | feet per hour | 5,280 |
| | feet per minute | 88 |
| | feet per second | 1.4667 |
| | kilometers per hour | 1.6094 |
| | kilometers per minute | 0.0268 |
| | knots (international) | 0.86897 |
| | meters per minute | 26.822 |
| | miles per minute | 0.01667 |
| **VOLUME** | | |
| **acre-feet** | cubic feet | 43,560 |
| | cubic meters | 1,233.482 |
| | cubic yards | 1,613.33 |
| | gallons (U.S.) | 325,900 |
| | liters | 1,233,455.5 |
| **acre inches** | cubic feet | 3,630 |
| | cubic meters | 102.79033 |
| | gallons (U.S.) | 27,154.29 |
| **bushels (British)** | bushels (U.S.) | 1.03206 |
| | cubic feet | 1.28435 |
| | gallons (British) | 8 |
| | liters | 36.3677 |
| **bushels (U.S.)** | bushels (British) | 0.96894 |
| | cubic feet | 1.24446 |
| | gallons (U.S. dry) | 8 |
| | gallons (U.S. liquid) | 9.30918 |
| **cubic centimeters** | cubic feet | $3.5315 \times 10^{-5}$ |
| | cubic inches | 0.06102 |
| | cubic meters | $1 \times 10^{-6}$ |
| | gallons (British) | 0.00022 |
| | gallons (U.S. dry) | 0.00023 |
| | gallons (U.S. liquid) | 0.00026 |
| | liters | 0.001 |
| | ounces (British liquid) | 0.03519 |
| | ounces (U.S. liquid) | 0.03381 |
| **cubic feet** | acre-feet | $2.296 \times 10^{-5}$ |
| | cubic centimeters | 28,316.8 |
| | cubic inches | 1,728 |
| | cubic meters | 0.02832 |
| | gallons (U.S. dry) | 6.42851 |
| | gallons (U.S. liquid) | 7.48052 |
| | liters | 28.316 |
| | ounces (British fluid) | 996.614 |
| | ounces (U.S. fluid) | 957.506 |

# CONVERSION TABLE *(continued)*

| Convert From | Into | Multiply By |
|---|---|---|
| **VOLUME** *(continued)* | | |
| **cubic feet** | pints (U.S. dry) | 51.4281 |
| | pints (U.S. liquid) | 59.8442 |
| | quarts (U.S. dry) | 25.714 |
| | quarts (U.S. liquid) | 29.922 |
| **cubic feet of water at 60°F** | pounds of water | 63.367 |
| **cubic inches** | cubic centimeters | 16.3871 |
| | cubic meters | $1.639 \times 10^{-5}$ |
| | cubic yards | $2.143 \times 10^{-5}$ |
| | gallons (U.S. dry) | 0.00372 |
| | gallons (U.S. liquid) | 0.00433 |
| | liters | 0.01639 |
| | milliliters | 16.3866 |
| | ounces (British liquid) | 0.57674 |
| | ounces (U.S. liquid) | 0.55411 |
| | quarts (U.S. dry) | 0.01488 |
| | quarts (U.S. liquid) | 0.01732 |
| **cubic meters** | acre-feet | 0.00081 |
| | cubic centimeters | 1,000,000 |
| | cubic feet | 35.3147 |
| | cubic inches | 61,023.70 |
| | cubic yards | 1.30795 |
| | gallons (British) | 219.969 |
| | gallons (U.S. liquid) | 264.172 |
| | liters | 1,000 |
| | quarts (U.S. liquid) | 1,056.69 |
| **cubic yards** | cubic feet | 27 |
| | cubic meters | 0.76455 |
| | gallons (British) | 168.179 |
| | gallons (U.S. dry) | 173.569 |
| | gallons (U.S. liquid) | 201.974 |
| | liters | 764.533 |
| **cup** | gallons | 0.0625 |
| | pints | 0.5 |
| | milliliters | 284.13 |
| | quarts | 0.25 |
| | tablespoons | 16 |
| | teaspoons | 48 |
| **gallons (British)** | barrels (British) | 0.0277 |
| | bushels | 0.125 |
| | cubic centimeters | 4,546.09 |
| | cubic feet | 0.1605 |
| | cubic inches | 277.419 |
| | gallons (U.S. liquid) | 1.2009 |
| | liters | 4.546 |

# CONVERSION TABLE *(continued)*

| Convert From | Into | Multiply By |
|---|---|---|
| **VOLUME** *(continued)* | | |
| **gallons (British)** | ounces (British liquid) | 160 |
| | ounces (U.S. liquid) | 153.721 |
| | pounds of water at 62°F | 10 |
| **gallons (U.S. dry)** | barrels (U.S. dry) | 0.038096 |
| | barrels (U.S. liquid) | 0.03694 |
| | cubic centimeters | 4,404.88 |
| | cubic feet | 0.15556 |
| | gallons (U.S. liquid) | 1.163647 |
| | liters | 4.4048 |
| **gallons (U.S. liquid)** | acre-feet | $3.0688 \times 10^{-6}$ |
| | barrels (U.S. liquid) | 0.031746 |
| | barrels (U.S. petroleum) | 0.023809 |
| | cubic centimeters | 3,785.41 |
| | cubic feet | 0.13368 |
| | cubic inches | 231 |
| | cubic meters | 0.00378 |
| | cubic yards | 0.00495 |
| | gallons (British) | 0.83267 |
| | gallons (U.S. dry) | 0.85937 |
| | gallons (U.S. wine) | 1 |
| | liters | 3.7853 |
| | ounces (U.S. liquid) | 128 |
| | pints (U.S. liquid) | 8 |
| | quarts (U.S. liquid) | 4 |
| **gallons (U.S.) of water at 4°C** | pounds of water | 8.34517 |
| **gallons (U.S.) of water at 60°F** | pounds of water | 8.32823 |
| **liters** | bushels (British) | 0.0275 |
| | bushels (U.S.) | 0.02838 |
| | cubic centimeters | 1,000 |
| | cubic feet | 0.03532 |
| | cubic inches | 61.002 |
| | cubic meters | 0.001 |
| | cubic yards | 0.001308 |
| | gallons (British) | 0.21998 |
| | gallons (U.S. dry) | 0.22703 |
| | gallons (U.S. liquid) | 0.26418 |
| | ounces (British fluid) | 35.196 |
| | ounces (U.S. fluid) | 33.81497 |
| | pints (British) | 1.7598 |
| | pints (U.S. dry) | 1.8162 |
| | pints (U.S. liquid) | 2.1134 |
| | quarts (British) | 0.8799 |
| | quarts (U.S. dry) | 0.9081 |
| | quarts (U.S. liquid) | 1.0567 |

# CONVERSION TABLE *(continued)*

| Convert From | Into | Multiply By |
|---|---|---|
| **VOLUME** *(continued)* | | |
| **ounces (U.S. liquid)** | cubic centimeters | 29.5737 |
| | cubic inches | 1.80469 |
| | cups | 0.1698 |
| | cubic meters | $2.9574 \times 10^{-5}$ |
| | drops | 360.14 |
| | gallons (U.S. liquid) | 0.00781 |
| | liters | 0.02957 |
| | milliliters | 29.57 |
| | quarts (U.S. liquid) | 0.0312 |
| | teaspoons | 6 |
| | tablespoons | 2 |
| **pint (U.S. liquid)** | cubic centimeters | 473.176 |
| | cubic feet | 0.01671 |
| | cubic inches | 28.875 |
| | cups | 2 |
| | fifths | 0.625 |
| | gallons (U.S. liquid) | 0.125 |
| | liters | 0.473176 |
| | millimeters | 473.163 |
| | ounces (U.S. liquid) | 16 |
| | quarts (U.S. liquid) | 0.5 |
| | teaspoons | 96 |
| | tablespoons | 32 |
| **quarts (U.S. liquid)** | cubic centimeters | 946.353 |
| | cubic feet | 0.0334 |
| | cubic inches | 57.75 |
| | cubic meters | $0.464 \times 10^{-4}$ |
| | cubic yards | 0.001238 |
| | fifth | 1.25 |
| | gallons (U.S. liquid) | .25 |
| | liters | 0.9463 |
| | magnums | 0.5 |
| | ounces (U.S. liquid) | 32 |
| | pints (U.S. liquid) | 2 |
| | quarts (British) | 0.859367 |
| | shots | 32 |
| **tablespoons** | cups | 0.0625 |
| | drops | 180 |
| | ounces (U.S. liquid) | 0.5 |
| | quarts | 0.01562 |
| | teaspoons | 3 |
| **teaspoons** | cups | 0.02083 |
| | drops | 60 |
| | ounces (U.S. liquid) | 0.1666 |

# CONVERSION TABLE *(continued)*

| Convert From | Into | Multiply By |
|---|---|---|
| **VOLUME** *(continued)* | | |
| **teaspoons** | pinch | 3 to 4 |
| | pints | 0.01042 |
| | quarts | 0.00521 |
| | tablespoons | 0.3333 |
| **WEIGHT** | | |
| **dynes** | kilograms | $1.02 \times 10^{-6}$ |
| | pounds | $2.248 \times 10^{-6}$ |
| **grams** | dynes | 980.66 |
| | ounces | 0.03527 |
| | pounds | 0.0022046 |
| **kilograms** | drams | 564.38 |
| | dynes | 980,665 |
| | grams | 1,000 |
| | ounces | 35.27396 |
| | pounds | 2.20462 |
| | tons (short) | 0.001102 |
| **milligrams** | grams | 0.001 |
| | ounces | $3.527 \times 10^{-5}$ |
| | pounds | $2.205 \times 10^{-6}$ |
| **ounces** | grams | 28.349 |
| | kilograms | 0.02835 |
| | pounds | 0.0625 |
| | tons (metric) | $2.835 \times 10^{-5}$ |
| | tons (short) | $3.125 \times 10^{-5}$ |
| **pounds** | drams | 256 |
| | dynes | 444,800 |
| | grains | 7,000 |
| | grams | 453.59 |
| | kilograms | 0.4536 |
| | ounces | 16 |
| | tons (long) | 0.0004464 |
| | tons (metric) | 0.0004536 |
| | tons (short) | 0.0005 |
| **pounds of water** | cubic feet | 0.01602 |
| | cubic inches | 27.68 |
| | gallons | 0.1198 |
| | liters | 0.4545 |
| **tons (metric)** | dynes | $9.807 \times 10^{8}$ |
| | kilograms | 1,000 |
| | ounces | 35,273.95 |
| | pounds | 2,204.62 |
| | tons (short) | $8.8964 \times 10^{8}$ |

## CONVERSION TABLE *(continued)*

| Convert From | Into | Multiply By |
|---|---|---|
| **WEIGHT** *(continued)* | | |
| **tons (short)** | dynes | 1.1023 |
| | kilograms | 907.18 |
| | ounces | 32,000 |
| | pounds | 2,000 |
| | tons (long) | 0.89286 |
| | tons (metric) | 0.90718 |

## DECIMAL AND METRIC EQUIVALENTS OF COMMON FRACTIONS

| Fractions of an Inch | Decimals of an Inch | Millimeters | Fractions of an Inch | Decimals of an Inch | Millimeters |
|---|---|---|---|---|---|
| 1/64 | 0.015625 | 0.397 | 33/64 | 0.515625 | 13.097 |
| 1/32 | 0.03125 | 0.794 | 17/32 | 0.523125 | 13.494 |
| 3/64 | 0.046875 | 1.191 | 35/64 | 0.546875 | 13.891 |
| 1/16 | 0.0625 | 1.588 | 9/16 | 0.5625 | 14.288 |
| 5/64 | 0.078125 | 1.984 | 37/64 | 0.578125 | 14.684 |
| 3/32 | 0.09375 | 2.381 | 19/32 | 0.59375 | 15.081 |
| 7/64 | 0.109375 | 2.778 | 39/64 | 0.609375 | 15.478 |
| 1/8 | 0.125 | 3.175 | 5/8 | 0.625 | 15.875 |
| 9/64 | 0.140625 | 3.572 | 41/64 | 0.640625 | 16.272 |
| 5/32 | 0.15625 | 3.969 | 21/32 | 0.65625 | 16.669 |
| 11/64 | 0.171875 | 4.366 | 43/64 | 0.671875 | 17.066 |
| 3/16 | 0.1875 | 4.763 | 11/16 | 0.6875 | 17.463 |
| 13/64 | 0.203125 | 5.159 | 45/64 | 0.703125 | 17.859 |
| 7/32 | 0.21875 | 5.556 | 23/32 | 0.71875 | 18.256 |
| 15/64 | 0.234375 | 5.953 | 47/64 | 0.734375 | 18.653 |
| 1/4 | 0.250 | 6.350 | 3/4 | 0.750 | 19.050 |
| 17/64 | 0.265625 | 6.747 | 49/64 | 0.765625 | 19.447 |
| 9/32 | 0.28125 | 7.144 | 15/32 | 0.78125 | 19.844 |
| 19/64 | 0.296875 | 7.541 | 51/64 | 0.796875 | 20.241 |
| 5/16 | 0.3125 | 7.938 | 13/16 | 0.8125 | 20.638 |
| 21/64 | 0.328125 | 8.334 | 53/64 | 0.828125 | 21.034 |
| 11/32 | 0.34375 | 8.731 | 17/32 | 0.84375 | 21.431 |
| 23/64 | 0.359375 | 9.128 | 55/64 | 0.859375 | 21.828 |
| 3/8 | 0.375 | 9.525 | 7/8 | 0.875 | 22.225 |
| 25/64 | 0.390625 | 9.922 | 57/64 | 0.890625 | 22.622 |
| 13/32 | 0.40625 | 10.319 | 29/32 | .090625 | 23.019 |
| 27/64 | 0.421875 | 10.716 | 59/64 | 0.921875 | 23.416 |
| 7/16 | 0.4375 | 11.113 | 15/16 | 0.9375 | 23.813 |
| 29/64 | 0.453125 | 11.509 | 61/64 | 0.953125 | 24.209 |
| 15/32 | 0.46875 | 11.906 | 31/32 | 0.96875 | 24.606 |
| 31/64 | 0.484375 | 12.303 | 63/64 | 0.984375 | 25.003 |
| 1/2 | 0.500 | 12.700 | 1 | 1.000 | 25.400 |

# TABLES

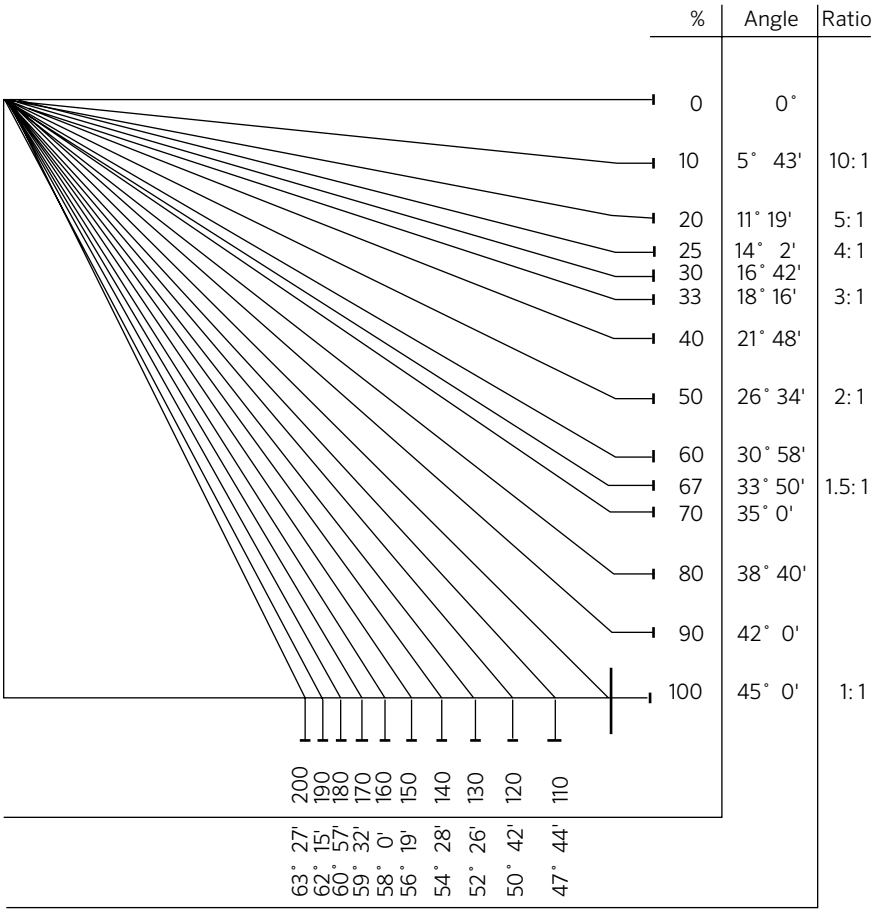
## SLOPE COMPARISON

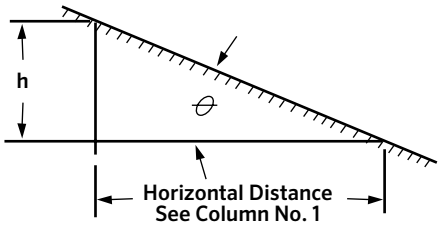
| Amount of Rise in 100' of Run | Percent Slope | Slope Ratio | Slope Angle Degrees | | Plan to Slope Factor* |
|---|---|---|---|---|---|
| 5 | 5 | 20:1 | 2° | 52' | 1.001 |
| 10 | 10 | 10:1 | 5° | 43' | 1.005 |
| 14 | 14 | | 7° | 58' | 1.010 |
| 15 | 15 | | 8° | 32' | 1.011 |
| 17 | 17 | | 9° | 39' | 1.014 |
| 20 | 20 | 5:1 | 11° | 19' | 1.020 |
| 25 | 25 | 4:1 | 14° | 2' | 1.031 |
| 30 | 30 | | 16° | 42' | 1.044 |
| 33 | 33 | 3:1 | 18° | 16' | 1.053 |
| 35 | 35 | | 19° | 17' | 1.059 |
| 40 | 40 | 2.5:1 | 21° | 48' | 1.077 |
| 45 | 45 | | 24° | 14' | 1.097 |
| 50 | 50 | 2:1 | 26° | 34' | 1.118 |
| 55 | 55 | | 28° | 49' | 1.141 |
| 60 | 60 | | 30° | 58' | 1.166 |
| 65 | 65 | 1.5:1 | 33° | 1' | 1.193 |
| 70 | 70 | | 35° | 0' | 1.221 |
| 75 | 75 | | 36° | 52' | 1.250 |
| 80 | 80 | | 38° | 40' | 1.281 |
| 85 | 85 | | 40° | 22' | 1.312 |
| 90 | 90 | | 41° | 59' | 1.345 |
| 95 | 95 | | 43° | 32' | 1.379 |
| 100 | 100 | 1:1 | 45° | 0' | 1.414 |
| 105 | 105 | | 46° | 24' | 1.450 |
| 110 | 110 | | 47° | 44' | 1.487 |
| 115 | 115 | | 48° | 59' | 1.524 |
| 120 | 120 | | 50° | 12' | 1.562 |
| 125 | 125 | 0.8:1 | 51° | 20' | 1.601 |
| 130 | 130 | | 52° | 26' | 1.640 |
| 135 | 135 | | 53° | 28' | 1.680 |
| 140 | 140 | | 54° | 28' | 1.720 |
| 145 | 145 | | 55° | 24' | 1.761 |
| 150 | 150 | 0.67:1 | 56° | 19' | 1.803 |

* Plan to Slope Factor: To convert from a plan dimension (horizontal measure) to actual slope distance, multiply by this factor. For example: plan indicates a 2:1 (50%) slope measuring 100' from the top to the toe of the slope on the plan. The actual distance from the top to the toe of the slope is 100' x 1.118 = 111.8'.

Plan to Slope Factor: To convert from an actual soil measurement, divide by this factor. For example: If the soil measurement is 12', and the slope ratio is 1.5:1, the actual distance on the plan will be 12 ÷ 1.193 = 10'.

# SLOPE REFERENCE CHART: PERCENT, ANGLE, AND RATIO




h = Vertical rise in feet

Percent of grade or slope: Equals vertical rise in feet per 100' of horizontal distance

= Angle of slope: Angle of inclination with respect to horizontal plane (ie) tan = h/horizontal distance

Ratio of slope = $\frac{\text{horizontal distance}}{h}$

# MAXIMUM PRECIPITATION RATES FOR SLOPES

The maximum precipitation values listed below are those suggested by the United States Department of Agriculture. The values are average and may vary with respect to actual soil condition and condition of ground cover.

## Maximum Precipitation Rates: Inches per Hour

| Soil Texture | 0 to 5% slope | | 5 to 8% slope | | 8 to 12% slope | | 12% + slope | |
|---|---|---|---|---|---|---|---|---|
| | Cover | Bare | Cover | Bare | Cover | Bare | Cover | Bare |
| Coarse sandy soils | 2.00 | 2.00 | 2.00 | 1.50 | 1.50 | 1.00 | 1.00 | 0.50 |
| Coarse sandy soils over compact subsoils | 1.75 | 1.50 | 1.25 | 1.00 | 1.00 | 0.75 | 0.75 | 0.40 |
| Light sandy loams uniform | 1.75 | 1.00 | 1.25 | 0.80 | 1.00 | 0.60 | 0.75 | 0.40 |
| Light sandy loams over compact subsoils | 1.25 | 0.75 | 1.00 | 0.50 | 0.75 | 0.40 | 0.50 | 0.30 |
| Uniform silt loams | 1.00 | 0.50 | 0.80 | 0.40 | 0.60 | 0.30 | 0.40 | 0.20 |
| Silt loams over compact subsoil | 0.60 | 0.30 | 0.50 | 0.25 | 0.40 | 0.15 | 0.30 | 0.10 |
| Heavy clay or clay loam | 0.20 | 0.15 | 0.15 | 0.10 | 0.12 | 0.08 | 0.10 | 0.06 |

# USING THE WATER SUPPLY REQUIREMENTS TABLE

The Water Supply Requirements table (page 55) provides a quick estimate of the gallons per minute (GPM) required to irrigate one acre at 70% efficiency for a variety of potential evapotranspiration (PET) rates for varying hours of operation. This can be used to estimate the water needs of large areas for water service meter size or pump station requirement.

**How to Use the Table**

1) Determine the approximate PET for the project. This should be the peak $ET_o$ and should include a crop coefficient. For example if the peak $ET_o$ were 0.34"/day and the irrigated area was a warm season turf grass with a crop coefficient of 60% (0.60) the PET would be 0.20"/day (0.34 x 0.60 = 0.20).

   Find the PET Average in in./day in the second column from the left.

   **Example:** 0.20"/day

2) Read across to the column under the "Average Hours of Operation/Day"

   **Example:** 12

3) Under the column for 12 Average Hours of Operation/Day, the "Minimum GPM per Acre" represents the minimum number of gallons per minute required to deliver 0.20" of water per day for one acre using an irrigation system with 70% efficiency.

   **Example:** 0.8 GPM minimum per acre required at peak demand.

4) Multiply the minimum GPM per acre times the number of acres in the project, if the project being designed had a total of 20 acres.

   **Example:** 20 x 10.8 = 216 GPM

# WATER SUPPLY REQUIREMENTS

| PET Average | | | Available Hours of Operation per Day | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 24 | 20 | 16 | 12 | 10 | 8 | 6 |
| Inches per Month | Inches per Day | Gallons per Acre/Day | Minimum GPM per Acre | Minimum GPM per Acre | Minimum GPM per Acre | Minimum GPM per Acre | Minimum GPM per Acre | Minimum GPM per Acre | Minimum GPM per Acre |
| 0.30 | 0.01 | 388 | 0.3 | 0.3 | 0.4 | 0.5 | 0.6 | 0.8 | 1.1 |
| 0.60 | 0.02 | 776 | 0.5 | 0.6 | 0.8 | 1.1 | 1.3 | 1.6 | 2.2 |
| 0.90 | 0.03 | 1164 | 0.8 | 1.0 | 1.2 | 1.6 | 1.9 | 2.4 | 3.2 |
| 1.20 | 0.04 | 1552 | 1.1 | 1.3 | 1.6 | 2.2 | 2.6 | 3.2 | 4.3 |
| 1.50 | 0.05 | 1940 | 1.3 | 1.6 | 2.0 | 2.7 | 3.2 | 4.0 | 5.4 |
| 1.80 | 0.06 | 2328 | 1.6 | 1.9 | 2.4 | 3.2 | 3.9 | 4.8 | 6.5 |
| 2.10 | 0.07 | 2715 | 1.9 | 2.3 | 2.8 | 3.8 | 4.5 | 5.7 | 7.5 |
| 2.40 | 0.08 | 3103 | 2.2 | 2.6 | 3.2 | 4.3 | 5.2 | 6.5 | 8.6 |
| 2.70 | 0.09 | 3491 | 2.4 | 2.9 | 3.6 | 4.8 | 5.8 | 7.3 | 9.7 |
| 3.00 | 0.10 | 3879 | 2.7 | 3.2 | 4.0 | 5.4 | 6.5 | 8.1 | 10.8 |
| 3.30 | 0.11 | 4267 | 3.0 | 3.6 | 4.4 | 5.9 | 7.1 | 8.9 | 11.9 |
| 3.60 | 0.12 | 4655 | 3.2 | 3.9 | 4.8 | 6.5 | 7.8 | 9.7 | 12.9 |
| 3.90 | 0.13 | 5043 | 3.5 | 4.2 | 5.3 | 7.0 | 8.4 | 10.5 | 14.0 |
| 4.20 | 0.14 | 5431 | 3.8 | 4.5 | 5.7 | 7.5 | 9.1 | 11.3 | 15.1 |
| 4.50 | 0.15 | 5819 | 4.0 | 4.8 | 6.1 | 8.1 | 9.7 | 12.1 | 16.2 |
| 4.80 | 0.16 | 6207 | 4.3 | 5.2 | 6.5 | 8.6 | 10.3 | 12.9 | 17.2 |
| 5.10 | 0.17 | 6595 | 4.6 | 5.5 | 6.9 | 9.2 | 11.0 | 13.7 | 18.3 |
| 5.40 | 0.18 | 6983 | 4.8 | 5.8 | 7.3 | 9.7 | 11.6 | 14.5 | 19.4 |
| 5.70 | 0.19 | 7370 | 5.1 | 6.1 | 7.7 | 10.2 | 12.3 | 15.4 | 20.5 |
| 6.00 | 0.20 | 7758 | 5.4 | 6.5 | 8.1 | 10.8 | 12.9 | 16.2 | 21.6 |
| 6.30 | 0.21 | 8146 | 5.7 | 6.8 | 8.5 | 11.3 | 13.6 | 17.0 | 22.6 |
| 6.60 | 0.22 | 8534 | 5.9 | 7.1 | 8.9 | 11.9 | 14.2 | 17.8 | 23.7 |
| 6.90 | 0.23 | 8922 | 6.2 | 7.4 | 9.3 | 12.4 | 14.9 | 18.6 | 24.8 |
| 7.20 | 0.24 | 9310 | 6.5 | 7.8 | 9.7 | 12.9 | 15.5 | 19.4 | 25.9 |
| 7.50 | 0.25 | 9698 | 6.7 | 8.1 | 10.1 | 13.5 | 16.2 | 20.2 | 26.9 |
| 7.80 | 0.26 | 10086 | 7.0 | 8.4 | 10.5 | 14.0 | 16.8 | 21.0 | 28.0 |
| 8.40 | 0.28 | 10862 | 7.5 | 9.1 | 11.3 | 15.1 | 18.1 | 22.6 | 30.2 |
| 9.00 | 0.30 | 11638 | 8.1 | 9.7 | 12.1 | 16.2 | 19.4 | 24.2 | 32.3 |
| 9.60 | 0.32 | 12413 | 8.6 | 10.3 | 12.9 | 17.2 | 20.7 | 25.9 | 34.5 |
| 10.20 | 0.34 | 13189 | 9.2 | 11.0 | 13.7 | 18.3 | 22.0 | 27.5 | 36.6 |
| 10.80 | 0.36 | 13965 | 9.7 | 11.6 | 14.5 | 19.4 | 23.3 | 29.1 | 38.8 |
| 11.40 | 0.38 | 14741 | 10.2 | 12.3 | 15.4 | 20.5 | 24.6 | 30.7 | 40.9 |
| 12.00 | 0.40 | 15517 | 10.8 | 12.9 | 16.2 | 21.6 | 25.9 | 32.3 | 43.1 |
| 12.60 | 0.42 | 16293 | 11.3 | 13.6 | 17.0 | 22.6 | 27.2 | 33.9 | 45.3 |
| 13.20 | 0.44 | 17068 | 11.9 | 14.2 | 17.8 | 23.7 | 28.4 | 35.6 | 47.4 |

*****Note: Required GPM assumes a 70% system efficiency.

# FRICTION FACTOR SHORTCUTS

The Friction Factor Method of sizing lateral line pipe is based on the premise that the operating pressure of all heads on a circuit should not vary by more than 10% to 20% of their designed operating pressure. This will provide the most uniform application of water.

The following is a simplified way to determine the maximum flow (GPM) allowed in lateral lines using the Friction Factor pipe sizing method. The example is based on lateral lines of Class 315 PVC for ½" and Class 200 PVC for ¾" to 3". Additional charts for lateral lines of Class 160 PVC and Polethylene are on pages 60 and 62.

Determination of appropriate pipe size is dependent upon three factors: the sprinkler operating pressure in (PSI), the acceptable pressure variation between sprinklers on the circuit (10% to 20%), and the distance from the valve to the farthest sprinkler head on the circuit (note: in some cases this distance can be the distance between the first and last sprinklers on a circuit).

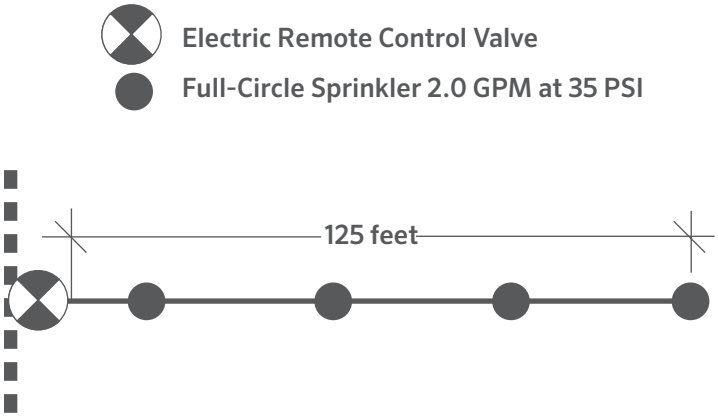
The Friction Factor is the allowable PSI loss per 100' of pipe. With Friction Factor, pipe can be sized to avoid excessive pressure loss. Friction factor is calculated using the following formula:

$$Friction\ Factor = \frac{Sprinkler\ Operating\ Pressure \times Allowable\ \%\ of\ PSI\ Variation}{Critical\ Length\ (from\ valve\ to\ farthest\ head)\ in\ 100s\ of\ feet}$$

$$F_f = \frac{P_o \times P_v}{L_c / 100'}$$

1) Determine the Friction Factor

**Example:**




Sprinkler operating pressure = 35 PSI

Allowable pressure loss = 10%

Critical Length = 125'

$$Friction\ Factor = \frac{35 \times 0.10}{125/100}$$

$$Friction\ Factor = \frac{3.5}{1.25}$$

$$Friction\ Factor = 2.8\ allowable\ PSI\ loss\ from\ valve\ to\ farthest\ head$$

**Round off Friction Factor to the nearest ¼ PSI.**

**Example:** 2.8 is rounded off to 2.75

This represents an allowable rate of PSI loss from the valve to the farthest head of 2.75 PSI per 100' of pipe.

2) Find the Shortcut chart on the following pages that matches the Friction Factor above (2.75 PSI loss per 100').

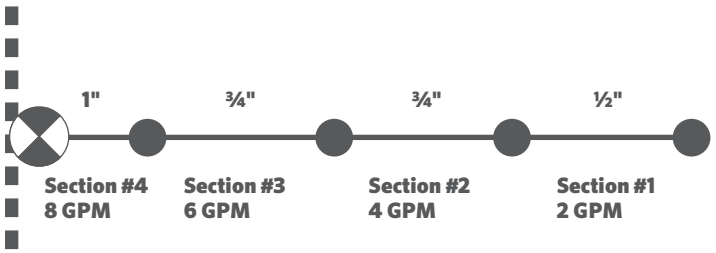
**Example:**

| **Friction Factor** | **2.75** |
|---|---|
| | **Max. GPM** |
| ½" CL 315 PVC | 3.9 |
| ¾" CL 200 PVC | 7.8 |
| 1" CL 200 PVC | 15.0 |
| 1¼" CL 200 PVC | 27.6 |
| 1½" CL 200 PVC | 39.5 |
| 2" CL 200 PVC | 70.9 |
| 2½" CL 200 PVC | 117.0 |
| 3" CL 200 PVC | 196.1 |

The "Max. GPM" represents the maximum GPM that can flow through the various sizes of lateral line pipe without exceeding the 2.75 PSI allowable loss per 100'.

3) Starting with the pipe sections farthest from the valve, determine the flow in each section and find the smallest pipe that can carry that flow.

**Example:**




Pipe section #1 = 2 GPM, lateral line pipe should be ½" CL 315 PVC

Pipe section #2 = 4 GPM, lateral line pipe should be ¾" CL 200 PVC

Pipe section #3 = 6 GPM, lateral line pipe should be ¾" CL 200 PVC

Pipe section #4 = 8 GPM, lateral line pipe should be 1" CL 200 PVC

# FRICTION FACTOR SHORTCUTS FOR CLASS 200 PVC*

## Maximum GPM for Various Friction Factors

| Friction Factor | 0.25 | 0.50 | 0.75 | 1 | 1.25 | 1.50 | 1.75 | 2 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" CL 315 PVC | 1.1 | 1.6 | 2.0 | 2.3 | 2.6 | 2.8 | 3.1 | 3.3 |
| ¾" CL 200 PVC | 2.1 | 3.1 | 3.9 | 4.5 | 5.1 | 5.7 | 6.1 | 6.6 |
| 1" CL 200 PVC | 4.1 | 6.0 | 7.4 | 8.7 | 9.8 | 10.8 | 11.7 | 12.6 |
| 1¼" CL 200 PVC | 7.6 | 11.0 | 13.7 | 16.0 | 18.1 | 19.9 | 21.7 | 23.3 |
| 1½" CL 200 PVC | 10.8 | 15.7 | 19.6 | 22.9 | 25.8 | 28.5 | 30.9 | 33.2 |
| 2" CL 200 PVC | 19.4 | 28.2 | 35.1 | 41.0 | 46.3 | 51.1 | 55.5 | 59.7 |
| 2½" CL 200 PVC | 32.1 | 46.6 | 58.0 | 67.8 | 76.4 | 84.3 | 91.7 | 98.5 |
| 3" CL 200 PVC | 53.7 | 78.1 | 97.2 | 113.6 | 128.1 | 141.4 | 153.7 | 165.1 |

| Friction Factor | 2.25 | 2.50 | 2.75 | 3 | 3.25 | 3.50 | 3.75 | 4 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" CL 315 PVC | 3.5 | 3.7 | 3.9 | 4.1 | 4.3 | 4.5 | 4.7 | 4.8 |
| ¾" CL 200 PVC | 7.0 | 7.5 | 7.8 | 8.2 | 8.6 | 8.9 | 9.3 | 9.6 |
| 1" CL 200 PVC | 13.4 | 14.2 | 15.0 | 15.7 | 16.4 | 17.0 | 17.7 | 18.3 |
| 1¼" CL 200 PVC | 24.8 | 26.3 | 27.6 | 29.0 | 30.3 | 31.5 | 32.7 | 33.8 |
| 1½" CL 200 PVC | 35.4 | 37.5 | 39.5 | 41.4 | 43.2 | 45.0 | 46.7 | 48.3 |
| 2" CL 200 PVC | 63.6 | 67.3 | 70.9 | 74.3 | 77.5 | 80.7 | 83.8 | 86.7 |
| 2½" CL 200 PVC | 105.0 | 111.1 | 117.0 | 122.6 | 128.1 | 133.3 | 138.3 | 143.2 |
| 3" CL 200 PVC | 176.0 | 186.3 | 196.1 | 205.6 | 214.6 | 223.4 | 231.9 | 240.1 |

| Friction Factor | 4.25 | 4.50 | 4.75 | 5 | 5.25 | 5.50 | 5.75 | 6 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" CL 315 PVC | 5.0 | 5.1 | 5.3 | 5.5 | 5.6 | 5.7 | 5.9 | 6.0 |
| ¾" CL 200 PVC | 9.9 | 10.2 | 10.5 | 10.8 | 11.1 | 11.4 | 11.7 | 12.0 |
| 1" CL 200 PVC | 18.9 | 19.5 | 20.1 | 20.7 | 21.2 | 21.8 | 22.3 | 22.8 |
| 1¼" CL 200 PVC | 35.0 | 36.1 | 37.1 | 38.2 | 39.2 | 40.2 | 41.2 | 42.1 |
| 1½" CL 200 PVC | 49.9 | 51.5 | 53.0 | 54.5 | 56.0 | 57.4 | 58.8 | 60.2 |
| 2" CL 200 PVC | 89.6 | 92.4 | 95.2 | 97.9 | 100.5 | 103.0 | 105.5 | 108.0 |
| 2½" CL 200 PVC | 148.0 | 152.7 | 157.2 | 161.6 | 165.9 | 170.1 | 174.3 | 178.3 |
| 3" CL 200 PVC | 248.1 | 255.9 | 263.4 | 270.8 | 278.1 | 285.1 | 292.1 | 298.9 |

| Friction Factor | 6.25 | 6.50 | 6.75 | 7 | 7.25 | 7.50 | 7.75 | 8 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" CL 315 PVC | 6.1 | 6.3 | 6.4 | 6.5 | 6.7 | 6.8 | 6.9 | 7.0 |
| ¾" CL 200 PVC | 12.2 | 12.5 | 12.7 | 13.0 | 13.2 | 13.5 | 13.7 | 14.0 |
| 1" CL 200 PVC | 23.3 | 23.8 | 24.3 | 24.8 | 25.3 | 25.7 | 26.2 | 26.6 |
| 1¼" CL 200 PVC | 43.1 | 44.0 | 44.9 | 45.8 | 46.7 | 47.5 | 48.4 | 49.2 |
| 1½" CL 200 PVC | 61.5 | 62.8 | 64.1 | 65.4 | 66.6 | 67.9 | 69.1 | 70.3 |
| 2" CL 200 PVC | 110.4 | 112.7 | 115.1 | 117.4 | 119.6 | 121.8 | 124.0 | 126.1 |
| 2½" CL 200 PVC | 182.3 | 186.2 | 190.0 | 193.8 | 197.5 | 201.1 | 204.7 | 208.3 |
| 3" CL 200 PVC | 305.5 | 312.1 | 318.5 | 324.8 | 331.0 | 337.1 | 343.2 | 349.1 |

*Note: ½" pipe is Class 315 PVC because wall thickness must be at least 0.060" and Class 200 has a SDR of 21, which would result in a wall thickness in ½" pipe of less than 0.060".

# FRICTION FACTOR SHORTCUTS FOR CLASS 200 PVC* *(continued)*

## Maximum GPM for Various Friction Factors

| Friction Factor | 8.25 | 8.50 | 8.75 | 9 | 9.25 | 9.50 | 9.75 | 10 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" CL 315 PVC | 7.1 | 7.3 | 7.4 | 7.5 | 7.6 | 7.7 | 7.8 | 7.9 |
| ¾" CL 200 PVC | 14.2 | 14.4 | 14.7 | 14.9 | 15.1 | 15.3 | 15.5 | 15.8 |
| 1" CL 200 PVC | 27.1 | 27.5 | 28.0 | 28.4 | 28.8 | 29.2 | 29.6 | 30.0 |
| 1¼" CL 200 PVC | 50.0 | 50.8 | 51.7 | 52.4 | 53.2 | 54.0 | 54.8 | 55.5 |
| 1½" CL 200 PVC | 71.4 | 72.6 | 73.7 | 74.9 | 76.0 | 77.1 | 78.2 | 79.3 |
| 2" CL 200 PVC | 128.2 | 130.3 | 132.4 | 134.4 | 136.4 | 138.4 | 140.3 | 142.3 |
| 2½" CL 200 PVC | 211.8 | 215.2 | 218.6 | 221.9 | 225.3 | 228.5 | 231.8 | 234.9 |
| 3" CL 200 PVC | 354.9 | 360.7 | 366.4 | 372.0 | 377.6 | 383.0 | 388.4 | 393.8 |

| Friction Factor | 10.25 | 10.50 | 10.75 | 11 | 11.25 | 11.50 | 11.75 | 12 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" CL 315 PVC | 8.0 | 8.1 | 8.2 | 8.3 | 8.4 | 8.5 | 8.6 | 8.7 |
| ¾" CL 200 PVC | 16.0 | 16.2 | 16.4 | 16.6 | 16.8 | 17.0 | 17.2 | 17.4 |
| 1" CL 200 PVC | 30.4 | 30.8 | 31.2 | 31.6 | 32.0 | 32.4 | 32.8 | 33.2 |
| 1¼" CL 200 PVC | 56.3 | 57.0 | 57.7 | 58.4 | 59.2 | 59.9 | 60.6 | 61.3 |
| 1½" CL 200 PVC | 80.3 | 81.4 | 82.4 | 83.4 | 84.5 | 85.5 | 86.5 | 87.5 |
| 2" CL 200 PVC | 144.2 | 146.1 | 147.9 | 149.8 | 151.6 | 153.4 | 155.2 | 157.0 |
| 2½" CL 200 PVC | 238.1 | 241.2 | 244.3 | 247.3 | 250.4 | 253.4 | 256.3 | 259.2 |
| 3" CL 200 PVC | 399.1 | 404.3 | 409.5 | 414.6 | 419.6 | 424.7 | 429.6 | 434.5 |

| Friction Factor | 12.25 | 12.50 | 12.75 | 13 | 13.25 | 13.50 | 13.75 | 14 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" CL 315 PVC | 8.8 | 8.9 | 9.0 | 9.1 | 9.2 | 9.3 | 9.4 | 9.5 |
| ¾" CL 200 PVC | 17.6 | 17.8 | 18.0 | 18.2 | 18.3 | 18.5 | 18.7 | 18.9 |
| 1" CL 200 PVC | 33.5 | 33.9 | 34.3 | 34.6 | 35.0 | 35.3 | 35.7 | 36.0 |
| 1¼" CL 200 PVC | 61.9 | 62.6 | 63.3 | 64.0 | 64.6 | 65.3 | 65.9 | 66.6 |
| 1½" CL 200 PVC | 88.4 | 89.4 | 90.4 | 91.3 | 92.3 | 93.2 | 94.1 | 95.0 |
| 2" CL 200 PVC | 158.8 | 160.5 | 162.2 | 163.9 | 165.6 | 167.3 | 169.0 | 170.6 |
| 2½" CL 200 PVC | 262.1 | 265.0 | 267.9 | 270.7 | 273.5 | 276.3 | 279.0 | 281.7 |
| 3" CL 200 PVC | 439.4 | 444.2 | 449.0 | 453.7 | 458.4 | 463.1 | 467.7 | 472.2 |

| Friction Factor | 14.25 | 14.50 | 14.75 | 15 | 15.25 | 15.50 | 15.75 | 16 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" CL 315 PVC | 9.6 | 9.7 | 9.8 | 9.9 | 10.0 | 10.0 | 10.1 | 10.2 |
| ¾" CL 200 PVC | 19.1 | 19.3 | 19.4 | 19.6 | 19.8 | 20.0 | 20.1 | 20.3 |
| 1" CL 200 PVC | 36.4 | 36.7 | 37.1 | 37.4 | 37.7 | 38.1 | 38.4 | 38.7 |
| 1¼" CL 200 PVC | 67.2 | 67.8 | 68.5 | 69.1 | 69.7 | 70.3 | 70.9 | 71.6 |
| 1½" CL 200 PVC | 96.0 | 96.9 | 97.8 | 98.7 | 99.5 | 100.4 | 101.3 | 102.2 |
| 2" CL 200 PVC | 172.3 | 173.9 | 175.5 | 177.1 | 178.7 | 180.3 | 181.8 | 183.4 |
| 2½" CL 200 PVC | 284.5 | 287.1 | 289.8 | 292.4 | 295.1 | 297.7 | 300.2 | 302.8 |
| 3" CL 200 PVC | 476.8 | 481.3 | 485.7 | 490.2 | 494.6 | 498.9 | 503.3 | 507.6 |

*Note: ½" pipe is Class 315 PVC because wall thickness must be at least 0.060" and Class 200 has a SDR of 21, which would result in a wall thickness in ½" pipe of less than 0.060".

# FRICTION FACTOR SHORTCUTS FOR CLASS 160 PVC*

## Maximum GPM for Various Friction Factors

| Friction Factor | 0.25 | 0.50 | 0.75 | 1 | 1.25 | 1.50 | 1.75 | 2 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" CL 315 PVC | 1.1 | 1.6 | 2.0 | 2.3 | 2.6 | 2.8 | 3.1 | 3.3 |
| ¾" CL 200 PVC | 2.1 | 3.1 | 3.9 | 4.5 | 5.1 | 5.7 | 6.1 | 6.6 |
| 1" CL 160 PVC | 4.2 | 6.0 | 7.5 | 8.8 | 9.9 | 10.9 | 11.9 | 12.8 |
| 1¼" CL 160 PVC | 8.0 | 11.6 | 14.4 | 16.9 | 19.0 | 21.0 | 22.8 | 24.5 |
| 1½" CL 160 PVC | 11.4 | 16.6 | 20.6 | 24.1 | 27.1 | 30.0 | 32.6 | 35.0 |
| 2" CL 160 PVC | 20.5 | 29.8 | 37.1 | 43.3 | 48.8 | 53.9 | 58.6 | 62.9 |
| 2½" CL 160 PVC | 33.8 | 49.2 | 61.2 | 71.5 | 80.7 | 89.0 | 96.8 | 104.0 |
| 3" CL 160 PVC | 56.6 | 82.3 | 102.5 | 119.7 | 135.0 | 149.0 | 161.9 | 174.1 |

| Friction Factor | 2.25 | 2.50 | 2.75 | 3 | 3.25 | 3.50 | 3.75 | 4 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" CL 315 PVC | 3.5 | 3.7 | 3.9 | 4.1 | 4.3 | 4.5 | 4.7 | 4.8 |
| ¾" CL 200 PVC | 7.0 | 7.5 | 7.8 | 8.2 | 8.6 | 8.9 | 9.3 | 9.6 |
| 1" CL 160 PVC | 13.6 | 14.4 | 15.2 | 15.9 | 16.6 | 17.3 | 17.9 | 18.6 |
| 1¼" CL 160 PVC | 26.1 | 27.7 | 29.1 | 30.5 | 31.9 | 33.2 | 34.4 | 35.7 |
| 1½" CL 160 PVC | 37.3 | 39.5 | 41.6 | 43.6 | 45.5 | 47.3 | 49.1 | 50.9 |
| 2" CL 160 PVC | 67.1 | 71.0 | 74.7 | 78.3 | 81.8 | 85.1 | 88.4 | 91.5 |
| 2½" CL 160 PVC | 110.8 | 117.3 | 123.5 | 129.4 | 135.2 | 140.7 | 146.0 | 151.2 |
| 3" CL 160 PVC | 185.5 | 196.3 | 206.7 | 216.7 | 226.2 | 235.5 | 244.4 | 253.1 |

| Friction Factor | 4.25 | 4.50 | 4.75 | 5 | 5.25 | 5.50 | 5.75 | 6 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" CL 315 PVC | 5.0 | 5.1 | 5.3 | 5.5 | 5.6 | 5.7 | 5.9 | 6.0 |
| ¾" CL 200 PVC | 9.9 | 10.2 | 10.5 | 10.8 | 11.1 | 11.4 | 11.7 | 12.0 |
| 1" CL 160 PVC | 19.2 | 19.8 | 20.4 | 20.9 | 21.5 | 22.0 | 22.6 | 23.1 |
| 1¼" CL 160 PVC | 36.8 | 38.0 | 39.1 | 40.2 | 41.3 | 42.3 | 43.4 | 44.4 |
| 1½" CL 160 PVC | 52.6 | 54.2 | 55.8 | 57.4 | 58.9 | 60.4 | 61.9 | 63.3 |
| 2" CL 160 PVC | 94.5 | 97.5 | 100.4 | 103.2 | 106.0 | 108.7 | 111.3 | 113.9 |
| 2½" CL 160 PVC | 156.2 | 161.1 | 165.9 | 170.6 | 175.1 | 179.6 | 183.9 | 188.2 |
| 3" CL 160 PVC | 261.5 | 269.7 | 277.7 | 285.5 | 293.1 | 300.5 | 307.8 | 315.0 |

| Friction Factor | 6.25 | 6.50 | 6.75 | 7 | 7.25 | 7.50 | 7.75 | 8 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" CL 315 PVC | 6.1 | 6.3 | 6.4 | 6.5 | 6.7 | 6.8 | 6.9 | 7.0 |
| ¾" CL 200 PVC | 12.2 | 12.5 | 12.7 | 13.0 | 13.2 | 13.5 | 13.7 | 14.0 |
| 1" CL 160 PVC | 23.6 | 24.1 | 24.6 | 25.1 | 25.6 | 26.1 | 26.5 | 27.0 |
| 1¼" CL 160 PVC | 45.4 | 46.3 | 47.3 | 48.2 | 49.2 | 50.1 | 51.0 | 51.8 |
| 1½" CL 160 PVC | 64.7 | 66.1 | 67.5 | 68.8 | 70.1 | 71.4 | 72.7 | 74.0 |
| 2" CL 160 PVC | 116.4 | 118.9 | 121.4 | 123.8 | 126.1 | 128.5 | 130.8 | 133.0 |
| 2½" CL 160 PVC | 182.4 | 196.5 | 200.6 | 204.5 | 208.4 | 212.3 | 216.1 | 219.8 |
| 3" CL 160 PVC | 322.0 | 328.9 | 335.7 | 342.3 | 348.9 | 355.3 | 361.7 | 367.9 |

*Note: ½" pipe is Class 315 PVC and ¾" pipe is CL 200 PVC because wall thickness must be at least 0.060" and Class 160 has a SDR of 26, which would result in a wall thickness in ½" an ¾" pipe of less than 0.060".

# FRICTION FACTOR SHORTCUTS FOR CLASS 160 PVC* *(continued)*

## Maximum GPM for Various Friction Factors

| Friction Factor | 8.25 | 8.50 | 8.75 | 9 | 9.25 | 9.50 | 9.75 | 10 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" CL 315 PVC | 7.1 | 7.3 | 7.4 | 7.5 | 7.6 | 7.7 | 7.8 | 7.9 |
| ¾" CL 200 PVC | 14.2 | 14.4 | 14.7 | 14.9 | 15.1 | 15.3 | 15.5 | 15.8 |
| 1" CL 160 PVC | 27.4 | 27.9 | 28.3 | 28.8 | 29.2 | 29.6 | 30.0 | 30.4 |
| 1¼" CL 160 PVC | 52.7 | 53.6 | 54.4 | 55.2 | 56.1 | 56.9 | 57.7 | 58.5 |
| 1½" CL 160 PVC | 75.2 | 76.4 | 77.6 | 78.8 | 80.0 | 81.2 | 82.3 | 83.4 |
| 2" CL 160 PVC | 135.3 | 137.5 | 139.6 | 141.8 | 143.9 | 146.0 | 148.0 | 150.1 |
| 2½" CL 160 PVC | 223.5 | 227.1 | 230.7 | 234.3 | 237.8 | 241.2 | 244.6 | 248.0 |
| 3" CL 160 PVC | 374.1 | 380.2 | 386.2 | 392.1 | 397.9 | 403.7 | 409.4 | 415.1 |

| Friction Factor | 10.25 | 10.50 | 10.75 | 11 | 11.25 | 11.50 | 11.75 | 12 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" CL 315 PVC | 8.0 | 8.1 | 8.2 | 8.3 | 8.4 | 8.5 | 8.6 | 8.7 |
| ¾" CL 200 PVC | 16.0 | 16.2 | 16.4 | 16.6 | 16.8 | 17.0 | 17.2 | 17.4 |
| 1" CL 160 PVC | 30.9 | 31.3 | 31.7 | 32.1 | 32.4 | 32.8 | 33.2 | 33.6 |
| 1¼" CL 160 PVC | 59.3 | 60.0 | 60.8 | 61.6 | 62.3 | 63.1 | 63.8 | 64.5 |
| 1½" CL 160 PVC | 84.6 | 85.7 | 86.8 | 87.8 | 88.9 | 90.0 | 91.0 | 92.1 |
| 2" CL 160 PVC | 152.1 | 154.1 | 156.0 | 158.0 | 159.9 | 161.8 | 163.7 | 165.6 |
| 2½" CL 160 PVC | 251.3 | 254.6 | 257.8 | 261.1 | 264.3 | 267.4 | 270.5 | 273.6 |
| 3" CL 160 PVC | 420.6 | 426.1 | 431.6 | 437.0 | 442.3 | 447.6 | 452.8 | 458.0 |

| Friction Factor | 12.25 | 12.50 | 12.75 | 13 | 13.25 | 13.50 | 13.75 | 14 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" CL 315 PVC | 8.8 | 8.9 | 9.0 | 9.1 | 9.2 | 9.3 | 9.4 | 9.5 |
| ¾" CL 200 PVC | 17.6 | 17.8 | 18.0 | 18.2 | 18.3 | 18.5 | 18.7 | 18.9 |
| 1" CL 160 PVC | 34.0 | 34.3 | 34.7 | 35.1 | 35.4 | 35.8 | 36.2 | 36.5 |
| 1¼" CL 160 PVC | 65.2 | 66.0 | 66.7 | 67.4 | 68.1 | 68.8 | 69.4 | 70.1 |
| 1½" CL 160 PVC | 93.1 | 94.1 | 95.1 | 96.1 | 97.1 | 98.1 | 99.1 | 100.1 |
| 2" CL 160 PVC | 167.4 | 169.3 | 171.1 | 172.9 | 174.7 | 176.5 | 178.2 | 180.0 |
| 2½" CL 160 PVC | 276.7 | 279.7 | 282.7 | 285.7 | 288.7 | 291.6 | 294.5 | 297.4 |
| 3" CL 160 PVC | 463.1 | 468.2 | 473.2 | 478.2 | 483.2 | 488.1 | 492.9 | 497.7 |

| Friction Factor | 14.25 | 14.50 | 14.75 | 15 | 15.25 | 15.50 | 15.75 | 16 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" CL 315 PVC | 9.6 | 9.7 | 9.8 | 9.9 | 10.0 | 10.0 | 10.1 | 10.2 |
| ¾" CL 200 PVC | 19.1 | 19.3 | 19.4 | 19.6 | 19.8 | 20.0 | 20.1 | 20.3 |
| 1" CL 160 PVC | 36.9 | 37.2 | 37.6 | 37.9 | 38.2 | 38.6 | 38.9 | 39.2 |
| 1¼" CL 160 PVC | 70.8 | 71.5 | 72.1 | 72.8 | 73.4 | 74.1 | 74.7 | 75.4 |
| 1½" CL 160 PVC | 101.0 | 102.0 | 102.9 | 103.9 | 104.8 | 105.7 | 106.6 | 107.5 |
| 2" CL 160 PVC | 181.7 | 183.4 | 185.1 | 186.8 | 188.5 | 190.1 | 191.8 | 193.4 |
| 2½" CL 160 PVC | 300.2 | 303.1 | 305.9 | 308.7 | 311.4 | 314.2 | 316.9 | 319.6 |
| 3" CL 160 PVC | 502.5 | 507.3 | 512.0 | 516.6 | 521.3 | 525.9 | 530.4 | 535.0 |

*Note: ½" pipe is Class 315 PVC and ¾" pipe is CL 200 PVC because wall thickness must be at least 0.060" and Class 160 has a SDR of 26, which would result in a wall thickness in ½" an ¾" pipe of less than 0.060".

# FRICTION FACTOR SHORT CUTS FOR POLYETHYLENE (PE) – SDR-7 (IPS) PRESSURE-RATED TUBE

## Maximum GPM for Various Friction Factors

| Friction Factor | 0.25 | 0.50 | 0.75 | 1 | 1.25 | 1.50 | 1.75 | 2 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" SDR-Poly | 0.7 | 1.0 | 1.3 | 1.5 | 1.7 | 1.8 | 2.0 | 2.1 |
| ¾" SDR-Poly | 1.5 | 2.1 | 2.6 | 3.1 | 3.5 | 3.8 | 4.2 | 4.5 |
| 1" SDR-Poly | 2.8 | 4.0 | 5.0 | 5.8 | 6.6 | 7.2 | 7.9 | 8.5 |
| 1¼" SDR-Poly | 5.7 | 8.2 | 10.2 | 12.0 | 13.5 | 14.9 | 16.2 | 17.4 |
| 1½" SDR-Poly | 8.5 | 12.3 | 15.4 | 17.9 | 20.2 | 22.3 | 24.3 | 26.1 |
| 2" SDR-Poly | 16.4 | 23.8 | 29.6 | 34.6 | 39.0 | 43.0 | 46.8 | 50.3 |
| 2½" SDR-Poly | 26.1 | 37.9 | 47.2 | 55.2 | 62.2 | 68.7 | 74.6 | 80.2 |
| 3" SDR-Poly | 46.2 | 67.1 | 83.6 | 97.6 | 110.1 | 121.5 | 132.0 | 141.9 |

| Friction Factor | 2.25 | 2.50 | 2.75 | 3 | 3.25 | 3.50 | 3.75 | 4 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" SDR-Poly | 2.3 | 2.4 | 2.5 | 2.7 | 2.8 | 2.9 | 3.0 | 3.1 |
| ¾" SDR-Poly | 4.8 | 5.1 | 5.3 | 5.6 | 5.8 | 6.1 | 6.3 | 6.5 |
| 1" SDR-Poly | 9.0 | 9.5 | 10.0 | 10.5 | 11.0 | 11.4 | 11.9 | 12.3 |
| 1¼" SDR-Poly | 18.5 | 19.6 | 20.7 | 21.6 | 22.6 | 23.5 | 24.4 | 25.3 |
| 1½" SDR-Poly | 27.8 | 29.4 | 31.0 | 32.5 | 33.9 | 35.3 | 36.6 | 37.9 |
| 2" SDR-Poly | 53.6 | 56.7 | 59.7 | 62.6 | 65.3 | 68.0 | 70.6 | 73.1 |
| 2½" SDR-Poly | 85.5 | 90.5 | 95.2 | 99.8 | 104.2 | 108.5 | 112.6 | 116.6 |
| 3" SDR-Poly | 151.2 | 160.1 | 168.5 | 176.6 | 185.5 | 192.0 | 199.3 | 206.3 |

| Friction Factor | 4.25 | 4.50 | 4.75 | 5 | 5.25 | 5.50 | 5.75 | 6 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" SDR-Poly | 3.2 | 3.3 | 3.4 | 3.5 | 3.6 | 3.7 | 3.8 | 3.9 |
| ¾" SDR-Poly | 6.7 | 7.0 | 7.2 | 7.4 | 7.6 | 7.7 | 7.9 | 8.1 |
| 1" SDR-Poly | 12.7 | 13.1 | 13.5 | 13.9 | 14.2 | 14.6 | 15.0 | 15.3 |
| 1¼" SDR-Poly | 26.1 | 26.9 | 27.7 | 28.5 | 29.3 | 30.0 | 30.8 | 31.5 |
| 1½" SDR-Poly | 39.2 | 40.4 | 41.6 | 42.8 | 43.9 | 45.0 | 46.1 | 47.2 |
| 2" SDR-Poly | 75.5 | 77.9 | 80.2 | 82.5 | 84.7 | 86.8 | 88.9 | 91.0 |
| 2½" SDR-Poly | 120.5 | 124.3 | 127.9 | 131.6 | 135.0 | 138.5 | 141.8 | 145.1 |
| 3" SDR-Poly | 213.2 | 219.9 | 226.4 | 232.7 | 239.0 | 245.0 | 251.0 | 256.8 |

| Friction Factor | 6.25 | 6.50 | 6.75 | 7 | 7.25 | 7.50 | 7.75 | 8 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" SDR-Poly | 4.0 | 4.0 | 4.1 | 4.2 | 4.3 | 4.4 | 4.5 | 4.5 |
| ¾" SDR-Poly | 8.3 | 8.5 | 8.7 | 8.8 | 9.0 | 9.2 | 9.3 | 9.5 |
| 1" SDR-Poly | 15.7 | 16.0 | 16.3 | 16.6 | 17.0 | 17.3 | 17.6 | 17.9 |
| 1¼" SDR-Poly | 32.2 | 32.9 | 33.5 | 34.2 | 34.9 | 35.5 | 36.1 | 36.8 |
| 1½" SDR-Poly | 48.2 | 49.3 | 50.3 | 51.3 | 52.3 | 53.2 | 54.2 | 55.1 |
| 2" SDR-Poly | 93.0 | 95.0 | 97.0 | 98.9 | 100.8 | 102.6 | 104.5 | 106.3 |
| 2½" SDR-Poly | 148.4 | 151.5 | 154.7 | 157.7 | 160.8 | 163.7 | 166.6 | 169.5 |
| 3" SDR-Poly | 262.5 | 268.2 | 273.7 | 279.1 | 284.5 | 289.7 | 294.9 | 300.0 |

# FRICTION FACTOR SHORT CUTS FOR POLYETHYLENE (PE) – SDR-7 (IPS) PRESSURE-RATED TUBE *(continued)*

## Maximum GPM for Various Friction Factors

| Friction Factor | 8.25 | 8.50 | 8.75 | 9 | 9.25 | 9.50 | 9.75 | 10 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" SDR-Poly | 4.6 | 4.7 | 4.8 | 4.8 | 4.9 | 5.0 | 5.0 | 5.1 |
| ¾" SDR-Poly | 9.6 | 9.8 | 10.0 | 10.1 | 10.3 | 10.4 | 10.6 | 10.7 |
| 1" SDR-Poly | 18.2 | 18.5 | 18.8 | 19.1 | 19.3 | 19.6 | 19.9 | 20.2 |
| 1¼" SDR-Poly | 37.4 | 38.0 | 38.6 | 39.2 | 39.8 | 40.3 | 40.9 | 41.5 |
| 1½" SDR-Poly | 56.0 | 57.0 | 57.9 | 58.7 | 59.6 | 60.5 | 61.3 | 62.2 |
| 2" SDR-Poly | 108.1 | 109.8 | 111.5 | 113.3 | 114.9 | 116.6 | 118.3 | 119.9 |
| 2½" SDR-Poly | 172.4 | 175.2 | 177.9 | 180.7 | 183.4 | 186.0 | 188.6 | 191.2 |
| 3" SDR-Poly | 305.0 | 310.0 | 314.9 | 319.7 | 324.4 | 329.1 | 333.8 | 338.4 |

| Friction Factor | 10.25 | 10.50 | 10.75 | 11 | 11.25 | 11.50 | 11.75 | 12 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" SDR-Poly | 5.2 | 5.2 | 5.3 | 5.4 | 5.4 | 5.5 | 5.6 | 5.6 |
| ¾" SDR-Poly | 10.8 | 11.0 | 11.1 | 11.3 | 11.4 | 11.5 | 11.7 | 11.8 |
| 1" SDR-Poly | 20.4 | 20.7 | 21.0 | 21.2 | 21.5 | 21.8 | 22.0 | 22.3 |
| 1½" SDR-Poly | 42.0 | 42.6 | 43.1 | 43.7 | 44.2 | 44.7 | 45.2 | 45.8 |
| 1½" SDR-Poly | 63.0 | 63.8 | 64.7 | 65.5 | 66.3 | 67.1 | 67.8 | 68.6 |
| 2" SDR-Poly | 121.5 | 123.1 | 124.7 | 126.2 | 127.8 | 129.3 | 130.8 | 132.3 |
| 2½" SDR-Poly | 193.8 | 196.3 | 198.8 | 201.3 | 203.8 | 206.2 | 208.6 | 211.0 |
| 3" SDR-Poly | 342.9 | 347.4 | 351.9 | 356.3 | 360.6 | 364.9 | 369.2 | 373.4 |

| Friction Factor | 12.25 | 12.50 | 12.75 | 13 | 13.25 | 13.50 | 13.75 | 14 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" SDR-Poly | 5.7 | 5.8 | 5.8 | 5.9 | 5.9 | 6.0 | 6.1 | 9.5 |
| ½" SDR-Poly | 11.9 | 12.1 | 12.2 | 12.3 | 12.5 | 12.6 | 12.7 | 18.9 |
| 1" SDR-Poly | 22.5 | 22.8 | 23.0 | 23.2 | 23.5 | 23.7 | 24.0 | 36.5 |
| 1½" SDR-Poly | 46.3 | 46.8 | 47.3 | 47.8 | 48.3 | 48.8 | 49.3 | 70.1 |
| 1½" SDR-Poly | 69.4 | 70.1 | 70.9 | 71.6 | 72.4 | 73.1 | 73.8 | 100.1 |
| 2" SDR-Poly | 133.8 | 135.2 | 136.7 | 138.1 | 139.6 | 141.0 | 142.4 | 180.0 |
| 2½" SDR-Poly | 213.4 | 215.7 | 218.0 | 220.3 | 222.6 | 224.9 | 227.1 | 297.4 |
| 3" SDR-Poly | 377.6 | 381.7 | 385.8 | 389.9 | 393.9 | 397.9 | 401.9 | 497.7 |

| Friction Factor | 14.25 | 14.50 | 14.75 | 15 | 15.25 | 15.50 | 15.75 | 16 |
|---|---|---|---|---|---|---|---|---|
| | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM | Max. GPM |
| ½" SDR-Poly | 6.2 | 6.2 | 6.3 | 6.4 | 6.4 | 6.5 | 6.5 | 6.6 |
| ½" SDR-Poly | 13.0 | 13.1 | 13.2 | 13.3 | 13.4 | 13.6 | 13.7 | 13.8 |
| 1" SDR-Poly | 24.4 | 24.7 | 24.9 | 25.1 | 25.3 | 25.6 | 25.8 | 26.0 |
| 1½" SDR-Poly | 50.2 | 50.7 | 51.2 | 51.6 | 52.1 | 52.5 | 53.0 | 53.5 |
| 1½" SDR-Poly | 75.3 | 76.0 | 76.7 | 77.4 | 78.1 | 78.8 | 79.5 | 80.1 |
| 2" SDR-Poly | 145.2 | 146.5 | 147.9 | 149.2 | 150.6 | 151.9 | 153.2 | 154.5 |
| 2½" SDR-Poly | 231.5 | 233.7 | 235.9 | 238.0 | 240.2 | 242.3 | 244.4 | 246.5 |
| 3" SDR-Poly | 409.7 | 413.6 | 417.4 | 421.2 | 425.0 | 428.7 | 432.5 | 436.2 |

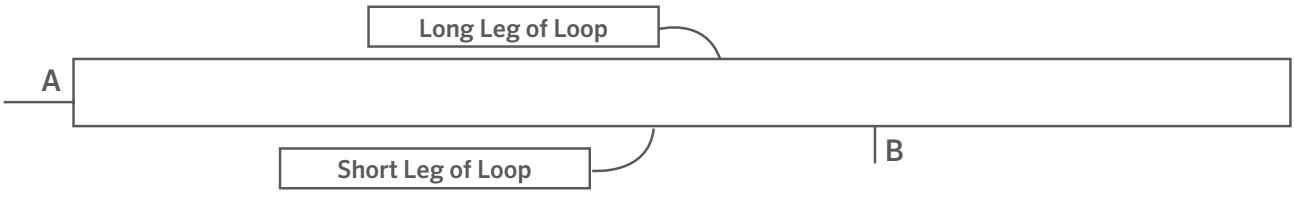
# APPROXIMATE FLOW RATES IN SIMPLE LOOPED MAIN LINES*

| Length Ratio † Long to Short | Flow Rate Short Leg | Flow Rate Long Leg |
|---|---|---|
| 1 to 1 | 50.0% | 50.0% |
| 2 to 1 | 59.4% | 40.6% |
| 3 to 1 | 64.4% | 35.6% |
| 4 to 1 | 67.8% | 32.2% |
| 5 to 1 | 70.4% | 29.6% |
| 6 to 1 | 72.4% | 27.6% |
| 7 to 1 | 74.0% | 26.0% |
| 8 to 1 | 75.4% | 24.6% |
| 9 to 1 | 76.6% | 23.4% |
| 10 to 1 | 77.6% | 22.4% |
| 12 to 1 | 79.2% | 20.8% |
| 15 to 1 | 81.2% | 18.8% |
| 20 to 1 | 83.4% | 16.6% |
| 25 to 1 | 85.0% | 15.0% |
| 30 to 1 | 86.2% | 13.8% |
| 35 to 1 | 87.2% | 12.8% |
| 40 to 1 | 88.0% | 12.0% |
| 45 to 1 | 88.6% | 11.4% |
| 50 to 1 | 89.2% | 10.8% |

* A simple looped main line would have one inlet and one outlet, and all pipe would be the same size. The type of pipe does not affect flow percentages as long as pipe type and size remain constant.

† Length Ratio is the ratio of the short leg of the loop to the long leg of the loop. To find the Length Ratio, divide the length of the long leg by the length of the short leg.

**Example:**




**Example:**
The entrance to the loop is at point “A” and the outlet is at point “B.” Point “B” could be thought of as the location of a remote control valve. In the loop above, the longer side of the loop is about twice as long as the shorter side. In using the chart above, a ratio of 2:1 would indicate the flow in the short leg to be approximately 59.4% and the flow in the long leg to be approximately 40.6% of the total flow in the loop. If the total flow to point “B” is 50 gallons, the flow in the short leg would be approximately 29.7 GPM while the flow in the long leg would be approximately 20.3 GPM. Unequal flow rates occur because the pressure losses in each leg of the loop must be equal.

# AVERAGE NUMBER OF SPRINKLERS PER ACRE

## Square and/or Rectangular Spacing

| Spacing in Feet | Heads Per Acre |
|---|---|
| 10 x 10 | 435.6 |
| 11 x 11 | 360.0 |
| 12 x 12 | 302.4 |
| 13 x 13 | 257.6 |
| 14 x 14 | 222.3 |
| 15 x 15 | 193.5 |
| 16 x 16 | 170.0 |
| 17 x 17 | 150.8 |
| 18 x 18 | 134.3 |
| 19 x 19 | 120.6 |
| 20 x 20 | 109.0 |
| 20 x 30 | 72.7 |
| 20 x 40 | 54.5 |
| 20 x 50 | 43.5 |
| 20 x 60 | 36.3 |
| 25 x 25 | 69.7 |
| 30 x 30 | 48.4 |
| 30 x 40 | 36.3 |
| 30 x 50 | 29.0 |

| Spacing In Feet | Heads Per Acre |
|---|---|
| 30 x 60 | 24.2 |
| 40 x 40 | 27.2 |
| 40 x 50 | 21.8 |
| 40 x 60 | 18.2 |
| 40 x 80 | 13.6 |
| 50 x 50 | 17.4 |
| 50 x 60 | 14.5 |
| 50 x 70 | 12.4 |
| 50 x 80 | 10.9 |
| 60 x 60 | 12.1 |
| 60 x 70 | 10.4 |
| 60 x 80 | 9.1 |
| 70 x 70 | 8.9 |
| 70 x 80 | 7.8 |
| 70 x 90 | 6.9 |
| 80 x 80 | 6.8 |
| 80 x 90 | 6.1 |
| 80 x 100 | 5.5 |
| 100 x 100 | 4.4 |

# AVERAGE NUMBER OF SPRINKLERS PER ACRE

## Equilateral Triangular Spacing

| Spacing In Feet | Heads Per Acre |
|---|---|
| 10 | 504 |
| 11 | 418 |
| 12 | 348 |
| 13 | 296 |
| 14 | 256 |
| 15 | 224 |
| 16 | 196 |
| 17 | 175 |
| 18 | 155 |
| 19 | 140 |
| 20 | 125 |
| 21 | 114 |
| 22 | 105 |
| 23 | 96 |
| 24 | 87 |
| 25 | 80 |
| 26 | 74 |
| 27 | 69 |
| 28 | 64 |
| 29 | 60 |
| 30 | 56 |
| 32 | 49 |
| 34 | 44 |
| 36 | 39 |
| 38 | 35 |
| 40 | 31 |
| 42 | 28.5 |
| 44 | 26.0 |
| 46 | 23.7 |
| 48 | 21.8 |
| 50 | 20.0 |
| 52 | 18.6 |
| 54 | 17.2 |
| 56 | 16.0 |
| 58 | 15.0 |
| 60 | 14.0 |
| 62 | 13.1 |
| 64 | 12.3 |

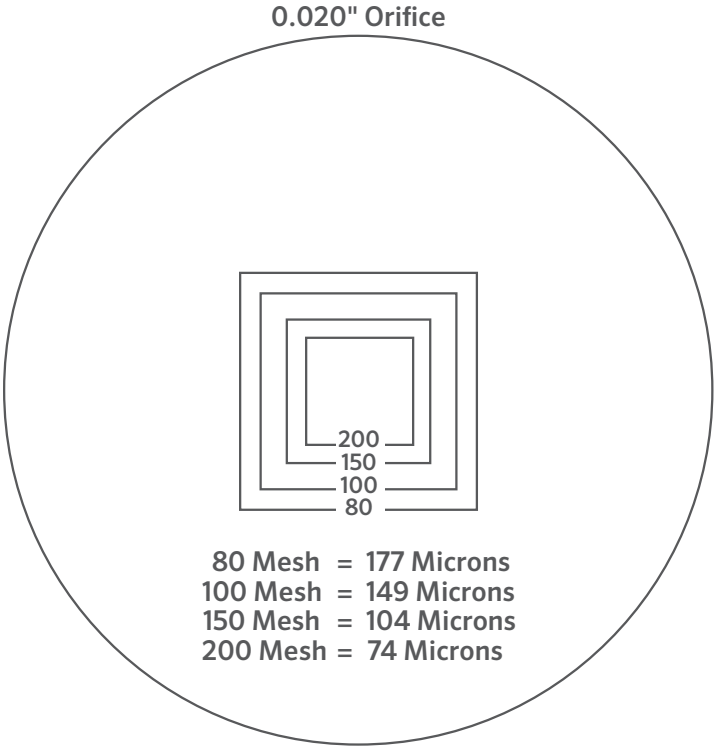
| Spacing In Feet | Heads Per Acre |
|---|---|
| 66 | 11.5 |
| 68 | 10.9 |
| 70 | 10.3 |
| 72 | 9.7 |
| 74 | 9.2 |
| 76 | 8.7 |
| 78 | 8.3 |
| 80 | 7.9 |
| 82 | 7.5 |
| 84 | 7.1 |
| 86 | 6.8 |
| 88 | 6.5 |
| 90 | 6.2 |
| 92 | 5.9 |
| 94 | 5.7 |
| 96 | 5.5 |
| 98 | 5.2 |
| 100 | 5.0 |
| 102 | 4.8 |
| 104 | 4.6 |
| 106 | 4.5 |
| 108 | 4.3 |
| 110 | 4.2 |
| 112 | 4.0 |
| 114 | 3.9 |
| 116 | 3.7 |
| 118 | 3.6 |
| 120 | 3.5 |
| 122 | 3.4 |
| 124 | 3.3 |
| 126 | 3.2 |
| 128 | 3.1 |
| 130 | 3.0 |
| 132 | 2.9 |
| 134 | 2.8 |
| 136 | 2.7 |
| 138 | 2.6 |
| 140 | 2.5 |

The theoretical figures above represent the minimum number of sprinklers required to cover a square acre (208.7' x 208.7') with the most economical placement of sprinklers possible. Actual layouts to match individual field conditions may require additional sprinklers. This table should only be used for estimating purposes.

# SCREEN FILTER MESH EQUIVALENTS

| Mesh Size | Microns | Inches | mm |
|---|---|---|---|
| 4 | 5205 | 0.2030 | 5.16 |
| 6 | 3175 | 0.125 | 3.18 |
| 8 | 2487 | 0.0970 | 2.46 |
| 10 | 1923 | 0.0750 | 1.90 |
| 11 | 1778 | 0.070 | 1.78 |
| 14 | 1307 | 0.0510 | 1.30 |
| 18 | 1000 | 0.0394 | 1.00 |
| 20 | 840 | 0.0331 | 0.84 |
| 24 | 813 | 0.032 | 0.81 |
| 25 | 710 | 0.0280 | 0.71 |
| 30 | 590 | 0.025 | 0.59 |
| 35 | 500 | 0.0197 | 0.50 |
| 40 | 420 | 0.0165 | 0.42 |
| 45 | 350 | 0.0138 | 0.35 |
| 50 | 297 | 0.0117 | 0.30 |
| 60 | 250 | 0.0098 | 0.25 |
| 70 | 210 | 0.0083 | 0.21 |
| 80 | 177 | 0.0070 | 0.18 |
| 100 | 149 | 0.0059 | 0.15 |
| 120 | 125 | 0.0049 | 0.12 |
| 140 | 105 | 0.0041 | 0.10 |
| 170 | 88 | 0.0035 | 0.08 |
| 200 | 74 | 0.0029 | 0.07 |
| 230 | 62 | 0.0024 | 0.06 |
| 270 | 53 | 0.0021 | 0.05 |
| 325 | 44 | 0.0017 | 0.04 |
| 400 | 37 | 0.0015 | 0.04 |
| 550 | 25 | 0.0009 | 0.02 |
| 800 | 15 | 0.0006 | 0.01 |
| 1250 | 10 | 0.0004 | 0.01 |

## Screen Mesh Sizes Compared to 0.020" Orifice



# APPROXIMATE COST OF PUMP OPERATION

| Pump HP | Average Kilowatt-Hour Input | | Approximate Cost of Operation per Hour at Kilowatt-Hour Rate of: | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | $0.0150 | | $0.0200 | | $ 0.0250 | | $0 .0400 | | $0.0500 | | $0.0600 | | $0.0800 | | $0.1000 | | $0.1200 | |
| | Single Phase | Three Phase | Single Phase | Three Phase | Single Phase | Three Phase | Single Phase | Three Phase | Single Phase | Three Phase | Single Phase | Three Phase | Single Phase | Three Phase | Single Phase | Three Phase | Single Phase | Three Phase | Single Phase | Three Phase | Single Phase | Three Phase |
| ¼ | 0.305 | | 0.0046 | | 0.0062 | | 0.0078 | | 0.0122 | | 0.0153 | | 0.0183 | | 0.0244 | | 0.0305 | | 0.0366 | |
| ⅓ | 0.408 | | 0.0062 | | 0.0082 | | 0.0103 | | 0.0163 | | 0.0204 | | 0.0245 | | 0.0326 | | 0.0408 | | 0.0490 | |
| ½ | 0.535 | 0.520 | 0.0081 | 0.0078 | 0.0108 | 0.0104 | 0.0135 | 0.0130 | 0.0214 | 0.0208 | 0.0268 | 0.0260 | 0.0321 | 0.0312 | 0.0428 | 0.0416 | 0.0535 | 0.0520 | 0.0642 | 0.0642 |
| ¾ | 0.760 | 0.768 | 0.0114 | 0.0116 | 0.0152 | 0.0154 | 0.0190 | 0.0193 | 0.0304 | 0.0307 | 0.0380 | 0.0384 | 0.0456 | 0.0461 | 0.0608 | 0.0614 | 0.0760 | 0.0768 | 0.0912 | 0.0922 |
| 1 | 1.000 | 0.960 | 0.0150 | 0.0144 | 0.0200 | 0.0192 | 0.0250 | 0.0240 | 0.0400 | 0.0384 | 0.0500 | 0.0480 | 0.0600 | 0.0576 | 0.0800 | 0.0768 | 0.1000 | 0.0960 | 0.1200 | 0.1152 |
| 1½ | 1.500 | 1.42 | 0.0225 | 0.0213 | 0.0300 | 0.0284 | 0.0375 | 0.0335 | 0.0600 | 0.0568 | 0.0750 | 0.0710 | 0.0900 | 0.0852 | 0.1200 | 0.1136 | 0.1500 | 0.1420 | 0.1800 | 0.1704 |
| 2 | 1.980 | 1.83 | 0.0297 | 0.0275 | 0.0396 | 0.0366 | 0.0495 | 0.0458 | 0.0792 | 0.0732 | 0.0990 | 0.0915 | 0.1188 | 0.1098 | 0.1584 | 0.1464 | 0.1980 | 0.1830 | 0.2376 | 0.2196 |
| 3 | 2.95 | 2.70 | 0.0443 | 0.0405 | 0.0590 | 0.0540 | 0.0738 | 0.0675 | 0.1180 | 0.1080 | 0.1475 | 0.1350 | 0.1770 | 0.1620 | 0.2360 | 0.2160 | 0.2950 | 0.2700 | 0.3540 | 0.3240 |
| 5 | 4.65 | 4.50 | 0.0698 | 0.0675 | 0.0930 | 0.0900 | 0.1163 | 0.1125 | 0.1860 | 0.1800 | 0.2325 | 0.2250 | 0.2790 | 0.2700 | 0.3720 | 0.3600 | 0.4650 | 0.4500 | 0.5580 | 0.5400 |
| 7½ | 6.9 | 6.75 | 0.1035 | 0.1013 | 0.1380 | 0.1350 | 0.1725 | 0.1688 | 0.2760 | 0.2700 | 0.3450 | 0.3375 | 0.4140 | 0.4050 | 0.5520 | 0.5400 | 0.6900 | 0.6750 | 0.8280 | 0.8100 |
| 10 | 9.3 | 9.0 | 0.1395 | 0.1350 | 0.1860 | 0.1800 | 0.2325 | 0.2250 | 0.3720 | 0.3600 | 0.4650 | 0.4500 | 0.5580 | 0.5400 | 0.7440 | 0.7200 | 0.9300 | 0.9000 | 1.1160 | 1.0800 |
| 15 | | 12.8 | | 0.1920 | | 0.2560 | | 0.3200 | | 0.5120 | | 0.6400 | | 0.7680 | | 1.0240 | | 1.2800 | | 1.5360 |
| 20 | | 16.9 | | 0.2535 | | 0.3380 | | 0.4225 | | 0.6760 | | 0.8450 | | 1.0140 | | 1.3520 | | 1.6900 | | 2.0280 |
| 25 | | 20.8 | | 0.3120 | | 0.4160 | | 0.5200 | | 0.8320 | | 1.0400 | | 1.2480 | | 1.6640 | | 2.0800 | | 2.4960 |
| 30 | | 25.0 | | 0.3750 | | 0.5000 | | 0.6250 | | 1.0000 | | 1.2500 | | 1.5000 | | 2.0000 | | 2.5000 | | 3.0000 |
| 40 | | 33.2 | | 0.4980 | | 0.6640 | | 0.8300 | | 1.3280 | | 1.6600 | | 1.9920 | | 2.6560 | | 3.3200 | | 3.9840 |
| 50 | | 41.3 | | 0.6195 | | 0.8260 | | 1.0325 | | 1.6520 | | 2.0650 | | 2.4780 | | 3.3040 | | 4.1300 | | 4.9560 |
| 60 | | 49.5 | | 0.7425 | | 0.9900 | | 1.2375 | | 1.9800 | | 2.4750 | | 2.9700 | | 3.9600 | | 4.9500 | | 5.9400 |
| 75 | | 61.5 | | 0.9225 | | 1.2300 | | 1.5375 | | 2.4600 | | 3.0750 | | 3.6900 | | 4.9200 | | 6.1500 | | 7.3800 |
| 100 | | 81.5 | | 1.225 | | 1.6300 | | 2.0375 | | 3.2600 | | 4.0750 | | 4.8900 | | 6.5200 | | 8.1500 | | 9.7800 |

Note: To calculate approximate cost of operation at a cost factor not listed above, multiply the second column rate of $0.02 per kWh by the actual rate in effect, then divide by 2.

**Example:**
The cost of operating a 3 hp single phase pump at a rate of $0.07 per kWh would be
0.0590 x 7 ÷ 2 = $0.2065 per hour

These charts are based upon 100% motor efficiencies.

To determine actual cost factors, divide by actual pump and motor efficiency, as indicated above.

# TABLE OF PUMP HORSEPOWER REQUIREMENTS (WHP) (AT 100% PUMP EFFICIENCY)

| | | Flow – GPM | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Head (Feet) | Pressure (PSI) | 25 | 50 | 75 | 100 | 150 | 200 | 250 | 300 | 350 | 400 | 500 |
| 10 | 4.33 | 0.063 | 0.126 | 0.189 | 0.253 | 0.379 | 0.505 | 0.631 | 0.758 | 0.884 | 1.01 | 1.26 |
| 15 | 6.50 | 0.095 | 0.189 | 0.284 | 0.379 | 0.568 | 0.758 | 0.947 | 1.136 | 1.326 | 1.52 | 1.89 |
| 20 | 8.66 | 0.126 | 0.253 | 0.379 | 0.505 | 0.758 | 1.010 | 1.26 | 1.52 | 1.77 | 2.02 | 2.53 |
| 25 | 10.83 | 0.158 | 0.316 | 0.473 | 0.631 | 0.947 | 1.26 | 1.58 | 1.89 | 2.21 | 2.53 | 3.16 |
| 30 | 12.99 | 0.189 | 0.379 | 0.57 | 0.76 | 1.14 | 1.52 | 1.89 | 2.27 | 2.65 | 3.03 | 3.79 |
| 35 | 15.16 | 0.22 | 0.44 | 0.66 | 0.88 | 1.33 | 1.77 | 2.21 | 2.65 | 3.09 | 3.54 | 4.42 |
| 40 | 17.32 | 0.25 | 0.51 | 0.76 | 1.01 | 1.52 | 2.02 | 2.53 | 3.03 | 3.54 | 4.04 | 5.05 |
| 45 | 19.49 | 0.28 | 0.57 | 0.85 | 1.14 | 1.70 | 2.27 | 2.84 | 3.41 | 3.98 | 4.55 | 5.68 |
| 50 | 21.65 | 0.32 | 0.63 | 0.95 | 1.26 | 1.89 | 2.53 | 3.16 | 3.79 | 4.42 | 5.05 | 6.31 |
| 60 | 25.98 | 0.38 | 0.76 | 1.14 | 1.52 | 2.27 | 3.03 | 3.79 | 4.55 | 5.30 | 6.06 | 7.58 |
| 70 | 30.31 | 0.44 | 0.88 | 1.33 | 1.77 | 2.65 | 3.54 | 4.42 | 5.30 | 6.19 | 7.07 | 8.84 |
| 80 | 34.64 | 0.51 | 1.01 | 1.52 | 2.02 | 3.03 | 4.04 | 5.05 | 6.06 | 7.07 | 8.08 | 10.10 |
| 90 | 38.97 | 0.57 | 1.14 | 1.70 | 2.27 | 3.41 | 4.55 | 5.68 | 6.82 | 7.95 | 9.09 | 11.36 |
| 100 | 43.30 | 0.63 | 1.26 | 1.89 | 2.53 | 3.79 | 5.05 | 6.31 | 7.58 | 8.84 | 10.10 | 12.63 |
| 120 | 51.96 | 0.76 | 1.52 | 2.27 | 3.03 | 4.55 | 6.06 | 7.58 | 9.09 | 10.61 | 12.12 | 15.15 |
| 140 | 60.62 | 0.88 | 1.77 | 2.65 | 3.54 | 5.30 | 7.07 | 8.84 | 10.61 | 12.37 | 14.14 | 17.68 |
| 160 | 69.28 | 1.01 | 2.02 | 3.03 | 4.04 | 6.06 | 8.08 | 10.10 | 12.12 | 14.14 | 16.16 | 20.20 |
| 180 | 77.94 | 1.14 | 2.27 | 3.41 | 4.55 | 6.82 | 9.09 | 11.36 | 13.64 | 15.91 | 18.18 | 22.73 |
| 200 | 86.60 | 1.26 | 2.53 | 3.79 | 5.05 | 7.58 | 10.10 | 12.63 | 15.15 | 17.68 | 20.20 | 25.25 |
| 220 | 95.26 | 1.39 | 2.78 | 4.17 | 5.56 | 8.33 | 11.11 | 13.89 | 16.67 | 19.44 | 22.22 | 27.78 |
| 240 | 103.92 | 1.52 | 3.03 | 4.55 | 6.06 | 9.09 | 12.12 | 15.15 | 18.18 | 21.21 | 24.24 | 30.30 |
| 260 | 112.58 | 1.64 | 3.28 | 4.92 | 6.57 | 9.85 | 13.13 | 16.41 | 19.70 | 22.98 | 26.26 | 32.83 |
| 280 | 121.24 | 1.77 | 3.54 | 5.30 | 7.07 | 10.61 | 14.14 | 17.68 | 21.21 | 24.75 | 28.28 | 35.35 |
| 300 | 129.90 | 1.89 | 3.79 | 5.68 | 7.58 | 11.36 | 15.15 | 18.94 | 22.73 | 26.52 | 30.30 | 37.88 |
| 325 | 140.73 | 2.05 | 4.10 | 6.16 | 8.21 | 12.31 | 16.41 | 20.52 | 24.62 | 28.72 | 32.83 | 41.04 |
| 350 | 151.55 | 2.21 | 4.42 | 6.63 | 8.84 | 13.26 | 17.68 | 22.10 | 26.52 | 30.93 | 35.35 | 44.19 |
| 375 | 162.38 | 2.37 | 4.73 | 7.10 | 9.47 | 14.20 | 18.94 | 23.67 | 28.41 | 33.14 | 37.88 | 47.35 |
| 400 | 173.20 | 2.53 | 5.05 | 7.58 | 10.10 | 15.15 | 20.20 | 25.25 | 30.30 | 35.35 | 40.40 | 50.51 |
| 425 | 184.03 | 2.68 | 5.37 | 8.05 | 10.73 | 16.10 | 21.46 | 26.83 | 32.20 | 37.56 | 42.93 | 53.66 |
| 450 | 194.85 | 2.84 | 5.68 | 8.52 | 11.36 | 17.05 | 22.73 | 28.41 | 34.09 | 39.77 | 45.45 | 56.82 |
| 475 | 205.68 | 3.00 | 6.00 | 9.00 | 11.99 | 17.99 | 23.99 | 29.99 | 35.98 | 41.98 | 47.98 | 59.97 |
| 500 | 216.50 | 3.16 | 6.31 | 9.47 | 12.63 | 18.94 | 25.25 | 31.57 | 37.88 | 44.19 | 50.50 | 63.13 |

*Notes:*

1.The (WHP) water horsepower requirements charted above have been calculated by either of the following formulas.

$$WHP = \frac{GPM \times HEAD\,(feet)}{3960}$$

$$WHP = \frac{GPM \times Pressure\,(PSI)}{1714}$$

2.The specific brake horsepower requirement is calculated by dividing the WHP above by the actual pump efficiency.

$$BHP = \frac{WHP}{efficiency}$$

**Example:**

100 GPM at 90' of head requires 2.27 horsepower at 100% efficiency. If the pump is 70% efficient, the actual (BHP) required is:

$$\frac{2.27}{0.70} = 3.25\ BHP$$

# BASIC ELECTRICITY AND OHM'S LAW

**Electrical Terminology:**

**Ampere (A or I):** Unit of measure for the rate of current flow.

**Volt (V or E):** A measure of electromotive force/potential.

**Ohm (Ω):** A measure of resistance, or the opposition to current flow in a DC or AC circuit. An ohm is the amount of resistance that allows one amp of current to flow when the applied voltage is one volt.

**Ohm's Law:** It takes one volt to push one amp of current through one ohm of resistance. Expressed mathematically:

**Voltage:** $V = I \times R$ **Amperage:** $I = V \div R$ **Resistance:** $R = V \div I$

**Direct Current (DC):** DC voltage is a unidirectional continuous flow of electric charge that does not reverse polarity and therefore has no frequency.

**Alternating Current (AC):** AC voltage alternates between a positive and negative charge in an S-wave pattern. The frequency at which the current alternates is known as hertz.

# WIRE DATA: STANDARD ANNEALED COPPER AT 20°C

| American Wire Gauge | Metric Wire Gauge | Diameter Mils | Diameter mm | Resistance Per mft Ohms | Resistance Per km Ohms |
|---|---|---|---|---|---|
| 1 | | 289.3 | 7.348 | 0.9239 | 0.4065 |
| | 7.0 | | 7.000 | | 0.4480 |
| 2 | | 257.6 | 6.543 | 0.1563 | 0.5128 |
| | 6.0 | | 6.000 | | 0.6098 |
| 3 | | 229.4 | 5.827 | 0.1971 | 0.6466 |
| 4 | | 204.3 | 5.189 | 0.2485 | 0.8152 |
| | 5.0 | | 5.000 | | 0.08781 |
| 5 | | 181.9 | 4.620 | 0.3134 | 1.028 |
| | 4.5 | | 4.500 | | 1.084 |
| 6 | | 162.0 | 4.115 | 0.3952 | 1.297 |
| | 4.0 | | 4.000 | | 1.372 |
| 7 | | 144.3 | 3.665 | 0.4981 | 1.634 |
| | 3.5 | | 3.500 | | 1.792 |
| 8 | | 128.5 | 3.264 | 0.6281 | 2.061 |
| | 3.0 | | 3.000 | | 2.439 |
| 9 | | 114.4 | 2.906 | 0.7925 | 2.600 |
| 10 | | 101.9 | 2.588 | 0.9988 | 3.277 |
| | 2.5 | | 2.500 | | 3.512 |
| 11 | | 90.7 | 2.30 | 1.26 | 4.14 |
| 12 | | 80.8 | 2.05 | 1.59 | 5.21 |
| | 2.0 | | 2.00 | | 5.49 |
| 13 | | 72.0 | 1.83 | 2.00 | 6.56 |
| | 1.8 | | 1.80 | | 6.78 |
| 14 | | 64.1 | 1.63 | 2.52 | 8.28 |
| | 1.6 | | 1.60 | | 8.58 |
| 15 | | 57.1 | 1.45 | 3.18 | 10.4 |
| | 1.4 | | 1.40 | | 11.2 |
| 16 | | 50.8 | 1.29 | 4.02 | 13.2 |
| | 1.2 | | 1.20 | | 15.2 |
| 17 | | 45.3 | 1.15 | 5.05 | 16.6 |
| 18 | | 40.3 | 1.02 | 6.39 | 21.0 |
| | 1.0 | | 1.000 | | 22.0 |
| 19 | | 35.9 | 0.912 | 8.05 | 26.4 |
| | 0.9 | | 0.900 | | 27.1 |
| 20 | | 32.0 | 0.813 | 10.1 | 33.2 |

# TABLE OF VOLTAGE LOSSES FOR ANNEALED COPPER WIRE 25°C (77°F) (LOSS PER 1,000' OF WIRE)

| AMPERES | 18 | 16 | 14 | 12 | 10 | 8 | 6 | 4 | 2 |
|---|---|---|---|---|---|---|---|---|---|
| 0.1 | 0.65 | 0.41 | 0.26 | 0.16 | 0.10 | 0.06 | 0.04 | 0.03 | 0.02 |
| 0.15 | 0.98 | 0.61 | 0.39 | 0.24 | 0.15 | 0.10 | 0.06 | 0.04 | 0.02 |
| 0.2 | 1.30 | 0.82 | 0.52 | 0.32 | 0.20 | 0.13 | 0.08 | 0.05 | 0.03 |
| 0.25 | 1.63 | 1.02 | 0.65 | 0.41 | 0.26 | 0.16 | 0.10 | 0.06 | 0.04 |
| 0.3 | 1.95 | 1.23 | 0.77 | 0.49 | 0.31 | 0.19 | 0.12 | 0.08 | 0.05 |
| 0.35 | 2.28 | 1.43 | 0.90 | 0.57 | 0.36 | 0.22 | 0.14 | 0.09 | 0.06 |
| 0.4 | 2.60 | 1.64 | 1.03 | 0.65 | 0.41 | 0.26 | 0.16 | 0.10 | 0.06 |
| 0.45 | 2.93 | 1.84 | 1.16 | 0.73 | 0.46 | 0.29 | 0.18 | 0.11 | 0.07 |
| 0.5 | 3.26 | 2.05 | 1.29 | 0.81 | 0.51 | 0.32 | 0.20 | 0.13 | 0.08 |
| 0.6 | 3.91 | 2.45 | 1.55 | 0.97 | 0.61 | 0.38 | 0.24 | 0.15 | 0.10 |
| 0.7 | 4.56 | 2.86 | 1.81 | 1.13 | 0.71 | 0.45 | 0.28 | 0.18 | 0.11 |
| 0.8 | 5.21 | 3.27 | 2.06 | 1.30 | 0.82 | 0.51 | 0.32 | 0.20 | 0.13 |
| 0.9 | 5.86 | 3.68 | 2.32 | 1.46 | 0.92 | 0.58 | 0.36 | 0.23 | 0.14 |
| 1.0 | 6.51 | 4.09 | 2.58 | 1.62 | 1.02 | 0.64 | 0.40 | 0.25 | 0.16 |
| 1.1 | 7.16 | 4.50 | 2.84 | 1.78 | 1.12 | 0.71 | 0.44 | 0.28 | 0.17 |
| 1.2 | 7.81 | 4.91 | 3.10 | 1.94 | 1.22 | 0.77 | 0.48 | 0.30 | 0.19 |
| 1.3 | 8.46 | 5.32 | 3.35 | 2.11 | 1.33 | 0.83 | 0.52 | 0.33 | 0.21 |
| 1.4 | 9.11 | 5.73 | 3.61 | 2.27 | 1.43 | 0.90 | 0.56 | 0.35 | 0.22 |
| 1.5 | 9.77 | 6.14 | 3.87 | 2.43 | 1.53 | 0.96 | 0.60 | 0.38 | 0.24 |
| 1.6 | 10.42 | 6.54 | 4.13 | 2.59 | 1.63 | 1.03 | 0.77 | 0.40 | 0.25 |
| 1.7 | 11.07 | 6.95 | 4.39 | 2.75 | 1.73 | 1.09 | 0.69 | 0.43 | 0.27 |
| 1.8 | 11.72 | 7.36 | 4.64 | 2.92 | 1.84 | 1.15 | 0.73 | 0.46 | 0.29 |
| 1.9 | 12.37 | 7.77 | 4.90 | 3.08 | 1.94 | 1.22 | 0.77 | 0.48 | 0.30 |
| 2.0 | 13.02 | 8.18 | 5.16 | 3.24 | 2.04 | 1.28 | 0.81 | 0.51 | 0.32 |
| 2.1 | 13.67 | 8.59 | 5.42 | 3.40 | 2.14 | 1.35 | 0.85 | 0.53 | 0.33 |
| 2.2 | 14.32 | 9.00 | 5.68 | 3.56 | 2.24 | 1.41 | 0.89 | 0.56 | 0.35 |
| 2.3 | 14.97 | 9.41 | 5.93 | 3.73 | 2.35 | 1.47 | 0.93 | 0.58 | 0.37 |
| 2.4 | 15.62 | 9.82 | 6.19 | 3.89 | 2.45 | 1.54 | 0.97 | 0.61 | 0.38 |
| 2.5 | 16.28 | 10.23 | 6.45 | 4.05 | 2.55 | 1.60 | 1.01 | 0.63 | 0.40 |
| 2.6 | 16.93 | 10.63 | 6.71 | 4.21 | 2.65 | 1.67 | 1.05 | 0.66 | 0.41 |
| 2.7 | 17.58 | 11.04 | 6.97 | 4.37 | 2.75 | 1.73 | 1.09 | 0.68 | 0.43 |
| 2.8 | 18.23 | 11.45 | 7.22 | 4.54 | 2.86 | 1.79 | 1.13 | 0.71 | 0.45 |
| 2.9 | 18.88 | 11.86 | 7.48 | 4.70 | 2.96 | 1.86 | 1.17 | 0.73 | 0.46 |
| 3.0 | 19.53 | 12.27 | 7.74 | 4.86 | 3.06 | 1.92 | 1.21 | 0.76 | 0.48 |
| 3.2 | 20.83 | 13.09 | 8.26 | 5.18 | 3.26 | 2.05 | 1.29 | 0.81 | 0.51 |
| 3.4 | 22.13 | 13.91 | 8.77 | 5.51 | 3.47 | 2.18 | 1.37 | 0.86 | 0.54 |
| 3.6 | 23.44 | 14.72 | 9.29 | 5.83 | 3.67 | 2.31 | 1.45 | 0.91 | 0.57 |
| 3.8 | 24.74 | 15.54 | 9.80 | 6.16 | 3.88 | 2.44 | 1.53 | 0.96 | 0.60 |
| 4.0 | 26.04 | 16.36 | 10.32 | 6.48 | 4.08 | 2.56 | 1.61 | 1.01 | 0.64 |
| 4.2 | 27.34 | 17.18 | 10.84 | 6.80 | 4.28 | 2.69 | 1.69 | 1.06 | 0.67 |
| 4.4 | 28.64 | 18.00 | 11.35 | 7.13 | 4.49 | 2.82 | 1.77 | 1.11 | 0.70 |
| 4.6 | 29.95 | 18.81 | 11.87 | 7.45 | 4.69 | 2.95 | 1.85 | 1.16 | 0.73 |
| 4.8 | 31.25 | 19.63 | 12.38 | 7.78 | 4.90 | 3.08 | 1.93 | 1.21 | 0.76 |
| 5.0 | 32.55 | 20.45 | 12.90 | 8.10 | 5.10 | 3.21 | 2.02 | 1.27 | 0.80 |
| 5.2 | 33.85 | 21.27 | 13.42 | 8.42 | 5.30 | 3.33 | 2.10 | 1.32 | 0.83 |
| 5.4 | 35.15 | 22.09 | 13.93 | 8.75 | 5.51 | 3.46 | 2.18 | 1.37 | 0.86 |
| 5.6 | 36.46 | 22.90 | 14.45 | 9.07 | 5.71 | 3.59 | 2.26 | 1.42 | 0.89 |
| 5.8 | 37.76 | 23.72 | 14.96 | 9.40 | 5.92 | 3.72 | 2.34 | 1.47 | 0.92 |
| 6.0 | 39.06 | 24.54 | 15.48 | 9.72 | 6.12 | 3.85 | 2.42 | 1.52 | 0.95 |
| 6.2 | 40.36 | 25.36 | 16.00 | 10.04 | 6.32 | 3.97 | 2.50 | 1.57 | 0.99 |
| 6.4 | 41.66 | 26.18 | 16.51 | 10.37 | 6.53 | 4.10 | 2.58 | 1.62 | 1.02 |
| 6.6 | 42.97 | 26.99 | 17.03 | 10.69 | 6.73 | 4.23 | 2.66 | 1.67 | 1.05 |
| 6.8 | 44.27 | 27.81 | 17.54 | 11.02 | 6.94 | 4.36 | 2.74 | 1.72 | 1.08 |
| 7.0 | 45.57 | 28.63 | 18.06 | 11.34 | 7.14 | 4.49 | 2.82 | 1.77 | 1.11 |

To find the voltage loss for a two wire circuit, multiply the loss per 1,000' figure above by **twice** the actual wire length expressed in thousands. For a single wire, multiply the loss per 1,000' value above by the actual wire length in thousands.

Note: Remember, amperages are additive along a wire where current is demanded by more than one appliance.

Note: Voltage losses are calculated from the formula:

**Where:** V = IR  I = Current in amperes  R = Resistance in ohms per 1,000'  V = Voltage

# APPROXIMATE NUMBER OF WIRES TO BE INSTALLED IN CONDUIT OR TUBING MAXIMUM NUMBER OF WIRES IN CONDUIT OR SLEEVING

| WIRE SIZE (AWG) | ½ | ¾ | 1 | 1¼ | 1½ | 2 | 2½ | 3 | 3½ | 4 | 5 | 6 | WIRE SIZE (AWG) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 | 6 | 12 | 20 | 35 | 49 | 80 | 110 | 175 | | | | | 18 |
| 16 | 5 | 10 | 16 | 30 | 42 | 67 | 97 | 150 | | | | | 16 |
| 14 | 4 | 6 | 10 | 18 | 25 | 40 | 56 | 88 | 120 | 150 | | | 14 |
| 12 | 3 | 5 | 7 | 15 | 20 | 33 | 50 | 75 | 102 | 130 | 205 | | 12 |
| 10 | 1 | 3 | 6 | 13 | 16 | 27 | 40 | 63 | 85 | 110 | 170 | | 10 |
| 8 | 1 | 2 | 4 | 6 | 9 | 16 | 25 | 35 | 50 | 65 | 105 | 150 | 8 |
| 6 | 1 | 1 | 3 | 3 | 5 | 10 | 15 | 22 | 32 | 40 | 63 | 92 | 6 |
| 4 | | 1 | 1 | 2 | 4 | 7 | 10 | 16 | 24 | 30 | 48 | 70 | 4 |
| 2 | | 1 | 1 | 2 | 2 | 5 | 9 | 12 | 18 | 22 | 36 | 54 | 2 |
| 0 | | | 1 | 1 | 2 | 3 | 5 | 8 | 12 | 15 | 24 | 36 | 0 |
| 00 | | | 1 | 1 | 1 | 2 | 4 | 7 | 10 | 14 | 21 | 31 | 00 |
| 000 | | | | 1 | 1 | 2 | 3 | 6 | 8 | 11 | 18 | 26 | 000 |
| 0000 | | | | 1 | 1 | 1 | 2 | 5 | 7 | 10 | 15 | 22 | 0000 |

# ESTIMATING PIPE SIZE

| Nominal Pipe Size | Approximate String Length in Inches | | |
|---|---|---|---|
| | Copper Pipe | Galvanized (Sch. 40 Steel) | PVC Pipe |
| ½" | 2" | 2⅝" | 2⅝" |
| ⅝" | 2⅜" | | |
| ¾" | 2¾" | 3⅝" | 3⅝" |
| 1" | 3½" | 4⅛" | 4⅛" |
| 1¼" | 4⅝" | 5⅜" | 5⅜" |
| 1½" | 5⅛" | 6" | 6" |
| 2" | 6¾" | 7⅞" | 7⅞" |

To determine the nominal size of a pipe, wrap a string around the pipe and compare its length to the chart above.

# OPERATING PRESSURES FOR PVC, POLYETHYLENE PIPE AND COPPER TUBE PRESSURE RATING (PSI) AT 73.4°F (23°C)

| Nominal Size | Sch 80 PVC* | Sch 40 PVC* | (SDR 13.5) CL 315 | (SDR 21) CL 200 | (SDR 26) CL 160 | (SDR 32.5) CL 125 | Sch 40 PE |
|---|---|---|---|---|---|---|---|
| ½" | 850 | 600 | 315 | *** | *** | *** | 190 |
| ¾" | 690 | 480 | 315 | 200 | *** | *** | 150 |
| 1" | 630 | 450 | 315 | 200 | 160 | *** | 140 |
| 1¼" | 520 | 370 | 315 | 200 | 160 | *** | 120 |
| 1½" | 470 | 330 | 315 | 200 | 160 | *** | 100 |
| 2" | 400 | 280 | 315 | 200 | 160 | *** | 90 |
| 2½" | 420 | 300 | 315 | 200 | 160 | *** | 100 |
| 3" | 370 | 260 | 315 | 200 | 160 | 125 | 80 |
| 4" | 320 | 220 | 315 | 200 | 160 | 125 | 70 |
| 6" | 280 | 180 | 315 | 200 | 160 | 125 | 60 |
| 8" | 250 | 160 | 315 | 200 | 160 | 125 | ++ |
| 10" | 230 | 140 | 315 | 200 | 160 | 125 | ++ |
| 12" | 230 | 130 | 315 | 200 | 160 | 125 | ++ |

Note:

1) Pressure ratings are the maximum that should be applied; surge pressures should be included
2) Pressure ratings must be reduced for temperatures over 23°C (73.4°F)
3) These ratings do not apply for threaded pipe; do not thread Sch 40 pipe
4) "***" indicates pipe not listed because wall thickness less than 0.060 minimum
5) Burst pressures are generally about 2.5 to 2.8 times the maximum pressure rating
6) PVC 1120, 1220 code designations
7) Non-threaded pipe
8) "*" Sch 80 and Sch 40 pipe rounded to the nearest ten

# COPPER TUBE

| Nominal Size | Type M | | Type L | | Type K | |
|---|---|---|---|---|---|---|
| | Annealed | Hard Drawn | Annealed | Hard Drawn | Annealed | Hard Drawn |
| ½" | 430 | 760 | 625 | 1105 | 780 | 1375 |
| ¾" | 350 | 610 | 495 | 875 | 750 | 1315 |
| 1" | 295 | 515 | 440 | 770 | 575 | 1010 |
| 1¼" | 295 | 515 | 385 | 680 | 465 | 820 |
| 1½" | 290 | 510 | 355 | 630 | 435 | 765 |
| 2" | 300 | 450 | 315 | 555 | 380 | 665 |
| 2½" | 235 | 410 | 295 | 520 | 355 | 520 |
| 3" | 220 | 385 | 275 | 490 | 340 | 605 |
| 4" | 215 | 380 | 255 | 450 | 315 | 555 |
| 6" | 190 | 335 | 215 | 385 | 305 | 540 |
| 8" | 200 | 350 | 240 | 420 | 325 | 580 |
| 10" | 205 | 355 | 240 | 425 | 330 | 585 |
| 12" | 205 | 360 | 225 | 395 | 330 | 585 |

Rated Internal Working Pressure for Copper Tube for Service Temperatures up to 150°F, PSI

# PVC SCHEDULE 40 AND SCHEDULE 80 PIPE AND INJECTION MOLDED FITTINGS SUGGESTED MAXIMUM INTERNAL PRESSURE RATINGS PRESSURE RATING (PSI) AT 73.4°F (23°C)

| | Suggested PVC Pipe and Injection Molded Fittings Internal Pressure Ratings | | | | | |
|---|---|---|---|---|---|---|
| | Schedule 40 | | | Schedule 80 | | |
| Nominal Size | Pipe | Solvent Cemented Joint | Threaded Joint | Pipe | Solvent Cemented Joint | Threaded Joint |
| ½" | 596 | 358 | 179 | 848 | 509 | 254 |
| ¾" | 482 | 289 | 144 | 688 | 413 | 206 |
| 1" | 450 | 270 | 135 | 630 | 378 | 189 |
| 1¼" | 368 | 221 | 110 | 520 | 312 | 156 |
| 1½" | 330 | 198 | 99 | 471 | 282 | 141 |
| 2" | 277 | 166 | 83 | 404 | 243 | 121 |
| 2½" | 304 | 182 | 91 | 425 | 255 | 127 |
| 3" | 263 | 158 | 79 | 375 | 225 | 112 |
| 3½" | 240 | 144 | 72 | 345 | 207 | 103 |
| 4" | 222 | 133 | 66 | 324 | 194 | 97 |
| 6" | 177 | 106 | 53 | 279 | 167 | 83 |
| 8" | 155 | 93 | 46 | 246 | 148 | |
| 10" | 141 | 150 | | 234 | 200 | |
| 12" | 132 | 150 | | 228 | 200 | |

This table is for use as a general guide only. Actual Internal Pressure Ratings may vary widely with field conditions. Elevated operating temperatures will necessitate a devaluation of the above ratings.

Note: Historically, manufactures have assumed that fittings have the same internal pressure rating as pipe. An engineering study* by Keller-Bleisner Engineering of Logan, Utah, indicates that while the fittings do meet the minimum burst requirements of pipe, actual operating conditions may require a devaluation of the internal pressure rating for fittings. The devaluation is due to the applied stress loads to the fitting caused by the operating parameters of the system. The maximum internal pressure ratings are admittedly based on limited data but it is the most resent study pertaining to fitting internal pressure ratings.

*The above study was funded by Dura, Eslon, LCP, Lasco, Nibco, R&G Sloane, and Spears.

# AFFINITY LAWS

The total dynamic head (TDH) discharge capacity (flow) and brake horsepower (BHP) from a pump are a function of impeller diameter and rotational speed (RPM). When selecting a pump model, it is uncommon to find the exact match of TDH and capacity. Affinity Laws can be used to determine the appropriate RPM, impeller diameter, or brake horsepower (BHP) for a given flow and TDH requirement.

The relationship between pump capacity, TDH, BHP, and horsepower for different RPMs and impeller diameters are as follows: flow varies directly with speed (or impeller diameter), pressure varies as the square of speed (or impeller diameter), power varies as the square of speed (or impeller diameter), and power varies as the cube of speed (or impeller diameter). A mathematical representation of the Affinity Laws is shown below:

With the rise in popularity of Variable-Frequency Drives (VFDs) in pumping applications, it is important to understand the effect that a change in rotational speed has on flow (GPM), pressure (PSI), and power requirement (BHP). Affinity Laws are a set of formulas that accurately predict the impact of a change in rotational speed. If a pump's performance characteristics are known at certain speed, Affinity Laws can be used to accurately predict performance at a different speed. Similarly, Affinity Laws can also be used to determine the effect of a change in impeller diameter (this is called "trimming" the impeller).

Affinity Laws are stated as follows:

1. Flow varies directly with the change in speed or impeller diameter (i.e., a 10% increase in speed results in a 10% increase in flow).
2. Pressure varies with the square of the change in speed or impeller diameter (i.e., a 10% increase in speed results in a 21% increase in pressure).
3. Power requirement varies with the cube of the change in speed or impeller diameter (i.e., a 10% increase in speed results in a 33% increase in power requirement).

$$\frac{Q_1}{Q_2} = \left[\frac{N_1}{N_2}\right] \qquad \frac{H_1}{H_2} = \left[\frac{N_1}{N_2}\right]^2 \qquad \frac{BHP_1}{BHP_2} = \left[\frac{N_1}{N_2}\right]^3$$

$$\frac{Q_1}{Q_2} = \left[\frac{D_1}{D_2}\right] \qquad \frac{H_1}{H_2} = \left[\frac{D_1}{D_2}\right]^2 \qquad \frac{BHP_1}{BHP_2} = \left[\frac{H_1}{H_2}\right]^3$$

**Where:**

Q = Pump Capacity (GPM)

H = Total Dynamic Head (feet)

BHP = Brake Horsepower (foot-pound/second)

N = Impeller Rotational Velocity (rpm)

D = Impeller Diameter (inches)

# FRICTION LOSS CHARTS

## IRRIGATION ASSOCIATION FRICTION LOSS AND VELOCITY CHARTS 2008

Tables are based upon the following:

**Hazen-Williams Equation:**

$$H_f = (0.2083)(100/C)^{1.852}(Q^{1.852}/D^{4.866})$$

The result is multiplied by 0.433 to give PSI loss for 100' of pipe.

**The velocity values were derived using the following equation:**

$$V = \left(\frac{0.408 \times Q_{GPM}}{d^2}\right)$$

The average inside diameter of OD-controlled pipe is determined by subtracting two times the minimum wall thickness plus one-half of the wall thickness from the outside diameter.

**Data on pipe diameters and wall thickness are taken from:**

- ASABE Standards 2007, ANSI/ASAE S376.2 Design, Installation and Performance of Underground, Thermoplastic Irrigation Pipes
- Uni-Bell Handbook of PVC Pipe, Uni-Bell PVC Pipe Association
- Appropriate ASTM standards for non-plastic pipes

Pressure ratings for plastic pipes are based on 23°C or 73.4°F

Head loss decreases (increases) approximately 1% for every 3°F above (below) the reference temparature (73.4°F).

# WATER METER PRESSURE LOSS CHART

**Typical Pressure Losses (PSI)**

| | Nominal Size | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Flow GPM** | **5/8"** | **3/4"** | **1"** | **1-1/2"** | **2"** | **3"** | **4"** | **Flow GPM** |
| 1 | 0.2 | 0.1 | | | | | | 1 |
| 2 | 0.3 | 0.2 | | | | | | 2 |
| 3 | 0.4 | 0.3 | | | | | | 3 |
| 4 | 0.6 | 0.5 | 0.1 | | | | | 4 |
| 5 | 0.9 | 0.6 | 0.2 | | | | | 5 |
| 6 | 1.3 | 0.7 | 0.3 | | | | | 6 |
| 7 | 1.8 | 0.8 | 0.4 | | | | | 7 |
| 8 | 2.3 | 1.0 | 0.5 | | | | | 8 |
| 9 | 3.0 | 1.3 | 0.6 | | | | | 9 |
| 10 | 3.7 | 1.6 | 0.7 | | | | | 10 |
| 11 | 4.4 | 1.9 | 0.8 | | | | | 11 |
| 12 | 5.1 | 2.2 | 0.9 | | | | | 12 |
| 13 | 6.1 | 2.6 | 1.0 | | | | | 13 |
| 14 | 7.2 | 3.1 | 1.1 | | | | | 14 |
| 15 | 8.3 | 3.6 | 1.2 | | | | | 15 |
| 16 | 9.4 | 4.1 | 1.4 | 0.4 | | | | 16 |
| 17 | 10.7 | 4.6 | 1.6 | 0.5 | | | | 17 |
| 18 | 12.0 | 5.2 | 1.8 | 0.6 | | | | 18 |
| 19 | 13.4 | 5.8 | 2.0 | 0.7 | | | | 19 |
| 20 | 15.0 | 6.5 | 2.2 | 0.8 | | | | 20 |
| 22 | | 7.9 | 2.8 | 1.0 | | | | 22 |
| 24 | | 9.5 | 3.4 | 1.2 | | | | 24 |
| 26 | | 11.2 | 4.0 | 1.4 | | | | 26 |
| 28 | | 13.0 | 4.6 | 1.6 | | | | 28 |
| 30 | | 15.0 | 5.3 | 1.8 | 0.7 | | | 30 |
| 32 | | | 6.0 | 2.1 | 0.8 | | | 32 |
| 34 | | | 6.9 | 2.4 | 0.9 | | | 34 |
| 36 | | | 7.8 | 2.7 | 1.0 | | | 36 |
| 38 | | | 8.7 | 3.0 | 1.2 | | | 38 |
| 40 | | | 9.6 | 3.3 | 1.3 | | | 40 |
| 42 | | | 10.6 | 3.6 | 1.4 | | | 42 |
| 44 | | | 11.7 | 3.9 | 1.5 | | | 44 |
| 46 | | | 12.8 | 4.2 | 1.6 | | | 46 |
| 48 | | | 13.9 | 4.5 | 1.7 | | | 48 |
| 50 | | | 15.0 | 4.9 | 1.9 | | | 50 |
| 52 | | | | 5.3 | 2.1 | | | 52 |
| 54 | | | | 5.7 | 2.2 | | | 54 |
| 56 | | | | 6.2 | 2.3 | | | 56 |
| 58 | | | | 6.7 | 2.5 | | | 58 |
| 60 | | | | 7.2 | 2.7 | 1.0 | | 60 |
| 65 | | | | 8.3 | 3.2 | 1.1 | | 65 |
| 70 | | | | 9.8 | 3.7 | 1.3 | | 70 |
| 75 | | | | 11.3 | 4.3 | 1.5 | | 75 |
| 80 | | | | 12.8 | 4.9 | 1.6 | 0.7 | 80 |
| 90 | | | | 16.1 | 6.2 | 2.0 | 0.8 | 90 |
| 100 | | | | 20.0 | 7.8 | 2.5 | 0.9 | 100 |
| 110 | | | | | 9.5 | 2.9 | 1.0 | 110 |
| 120 | | | | | 11.3 | 3.4 | 1.2 | 120 |
| 130 | | | | | 13.0 | 3.9 | 1.4 | 130 |
| 140 | | | | | 15.1 | 4.5 | 1.6 | 140 |
| 150 | | | | | 17.3 | 5.1 | 1.8 | 150 |
| 160 | | | | | 20.0 | 5.8 | 2.1 | 160 |
| 170 | | | | | | 6.5 | 2.4 | 170 |
| 180 | | | | | | 7.2 | 2.7 | 180 |
| 190 | | | | | | 8.0 | 3.0 | 190 |
| 200 | | | | | | 9.0 | 3.2 | 200 |
| 220 | | | | | | 11.0 | 3.9 | 220 |
| 240 | | | | | | 13.0 | 4.7 | 240 |
| 260 | | | | | | 15.0 | 5.5 | 260 |
| 280 | | | | | | 17.3 | 6.3 | 280 |
| 300 | | | | | | 20.0 | 7.2 | 300 |
| 350 | | | | | | | 10.0 | 350 |
| 400 | | | | | | | 13.0 | 400 |
| 450 | | | | | | | 16.2 | 450 |
| 500 | | | | | | | 20.0 | 500 |
| **75% of Max Meter Capacity** | **15 GMP** | **22.5 GMP** | **37.5 GMP** | **75 GMP** | **120 GMP** | **225 GMP** | **375 GMP** | **75% of Max Meter Capacity** |

Note: The shaded areas exceed 75% of maximum safe meter capacity

# PRESSURE LOSS THROUGH WATER METERS

**Pressure Loss in Kilopascals: (kPa)**

| | Meter Size | | | | |
|---|---|---|---|---|---|
| **Flow L/min** | **15mm** | **20mm** | **25mm** | **40mm** | **Flow L/min** |
| 3.8 | 1.38 | 0.69 | | | 3.8 |
| 7.6 | 2.07 | 1.38 | | | 7.6 |
| 11.4 | 2.76 | 2.07 | | | 11.4 |
| 15.1 | 4.14 | 3.45 | 0.69 | | 15.1 |
| 19.0 | 6.21 | 4.14 | 1.38 | | 19.0 |
| 22.7 | 8.96 | 4.83 | 2.07 | | 22.7 |
| 26.5 | 12.41 | 5.52 | 2.76 | | 26.5 |
| 30.3 | 15.86 | 6.90 | 3.45 | | 30.3 |
| 34.1 | 20.69 | 8.96 | 4.14 | | 34.1 |
| 37.8 | 25.51 | 11.03 | 4.83 | | 37.8 |
| 41.6 | 30.34 | 13.10 | 5.52 | | 41.6 |
| 45.4 | 35.16 | 15.17 | 6.21 | | 45.4 |
| 49.2 | 42.06 | 17.93 | 6.90 | | 49.2 |
| 53.0 | 49.64 | 21.37 | 7.58 | | 53.0 |
| 56.8 | 57.23 | 24.82 | 8.27 | | 56.8 |
| 60.6 | 64.81 | 28.27 | 9.65 | 2.76 | 60.6 |
| 64.4 | 73.78 | 31.72 | 11.03 | 3.45 | 64.4 |
| 68.1 | 82.74 | 35.85 | 12.41 | 4.14 | 68.1 |
| 72.0 | 92.39 | 39.99 | 13.79 | 4.83 | 72.0 |
| 75.7 | 103.43 | 44.82 | 15.17 | 5.52 | 75.7 |
| 83.3 | | 54.47 | 19.31 | 6.90 | 83.3 |
| 90.8 | | 65.50 | 23.44 | 8.27 | 90.8 |
| 98.4 | | 77.22 | 27.58 | 9.65 | 98.4 |
| 106.0 | | 89.64 | 31.72 | 11.03 | 106.0 |
| 113.6 | | 103.43 | 36.54 | 12.41 | 113.6 |
| 121.1 | | | 41.37 | 14.48 | 121.1 |
| 128.7 | | | 47.58 | 16.55 | 128.7 |
| 136.3 | | | 53.78 | 18.62 | 136.3 |
| 143.8 | | | 59.99 | 20.69 | 143.8 |
| 151.4 | | | 66.19 | 22.75 | 151.4 |
| 159.0 | | | 73.09 | 24.82 | 159.0 |
| 166.5 | | | 80.67 | 26.89 | 166.5 |
| 174.1 | | | 88.26 | 28.96 | 174.1 |
| 181.7 | | | 95.84 | 31.03 | 181.7 |
| 189.3 | | | 103.43 | 33.79 | 189.3 |
| 196.8 | | | | 36.54 | 196.8 |
| 204.4 | | | | 39.30 | 204.4 |
| 212.0 | | | | 42.75 | 212.0 |
| 219.5 | | | | 46.20 | 219.5 |
| 227.1 | | | | 49.64 | 227.1 |
| 246.0 | | | | 57.23 | 246.0 |
| 265.0 | | | | 67.57 | 265.0 |
| 283.9 | | | | 77.91 | 283.9 |
| 302.8 | | | | 88.26 | 302.8 |

Note: The greatest pressure loss reflects the maximum safe capacity for the meter.

# TYPE K COPPER TUBING

**ASTM B88 C=140**

**PSI Loss per 100' of Pipe**

| Nominal Size | 1/2" | | 5/8" | | 3/4" | | 1" | | 1 1/4" | | 1 1/2" | | 2" | | 2 1/2" | | 3" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe ID | 0.527 | | 0.652 | | 0.745 | | 0.995 | | 1.245 | | 1.481 | | 1.959 | | 2.435 | | 2.907 | |
| Pipe OD | 0.625 | | 0.750 | | 0.875 | | 1.125 | | 1.375 | | 1.625 | | 2.125 | | 2.625 | | 3.125 | |
| Avg. Wall | 0.049 | | 0.049 | | 0.065 | | 0.065 | | 0.065 | | 0.072 | | 0.083 | | 0.095 | | 0.109 | |
| Flow GPM | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS |
| 1 | 1.47 | 1.09 | 0.96 | 0.39 | 0.74 | 0.20 | 0.41 | 0.05 | 0.26 | 0.02 | | | | | | | | |
| 2 | 2.94 | 3.94 | 1.92 | 1.40 | 1.47 | 0.73 | 0.82 | 0.18 | 0.53 | 0.06 | | | | | | | | |
| 3 | 4.41 | 8.35 | 2.88 | 2.97 | 2.21 | 1.55 | 1.24 | 0.38 | 0.79 | 0.13 | | | | | | | | |
| 4 | 5.88 | 14.23 | 3.84 | 5.05 | 2.94 | 2.64 | 1.65 | 0.65 | 1.05 | 0.22 | | | | | | | | |
| 5 | 7.35 | 21.51 | 4.80 | 7.64 | 3.68 | 3.99 | 2.06 | 0.98 | 1.32 | 0.33 | | | | | | | | |
| 6 | 8.81 | 30.15 | 5.76 | 10.70 | 4.41 | 5.59 | 2.47 | 1.37 | 1.58 | 0.46 | 1.12 | 0.20 | | | | | | |
| 7 | 10.28 | 40.12 | 6.72 | 14.24 | 5.15 | 7.44 | 2.88 | 1.82 | 1.84 | 0.61 | 1.30 | 0.26 | | | | | | |
| 8 | 11.75 | 51.37 | 7.68 | 18.24 | 5.88 | 9.53 | 3.30 | 2.33 | 2.11 | 0.78 | 1.49 | 0.34 | | | | | | |
| 9 | 13.22 | 63.90 | 8.64 | 22.68 | 6.62 | 11.85 | 3.71 | 2.90 | 2.37 | 0.97 | 1.67 | 0.42 | | | | | | |
| 10 | 14.69 | 77.66 | 9.60 | 27.57 | 7.35 | 14.41 | 4.12 | 3.52 | 2.63 | 1.18 | 1.86 | 0.51 | | | | | | |
| 12 | | | 11.52 | 38.64 | 8.82 | 20.20 | 4.95 | 4.94 | 3.16 | 1.66 | 2.23 | 0.71 | 1.28 | 0.18 | | | | |
| 14 | | | 13.44 | 51.41 | 10.29 | 26.87 | 5.77 | 6.57 | 3.69 | 2.21 | 2.60 | 0.95 | 1.49 | 0.24 | | | | |
| 16 | | | 15.36 | 65.83 | 11.76 | 34.41 | 6.59 | 8.42 | 4.21 | 2.83 | 2.98 | 1.22 | 1.70 | 0.31 | | | | |
| 18 | | | 17.28 | 81.88 | 13.23 | 42.80 | 7.42 | 10.47 | 4.74 | 3.52 | 3.35 | 1.51 | 1.91 | 0.39 | | | | |
| 20 | | | | | 14.70 | 52.02 | 8.24 | 12.72 | 5.26 | 4.28 | 3.72 | 1.84 | 2.13 | 0.47 | | | | |
| 22 | | | | | 16.17 | 62.06 | 9.07 | 15.18 | 5.79 | 5.10 | 4.09 | 2.19 | 2.34 | 0.56 | 1.51 | 0.19 | 1.06 | 0.08 |
| 24 | | | | | 17.64 | 72.91 | 9.89 | 17.84 | 6.32 | 5.99 | 4.46 | 2.58 | 2.55 | 0.66 | 1.65 | 0.23 | 1.16 | 0.10 |
| 26 | | | | | | | 10.71 | 20.69 | 6.84 | 6.95 | 4.84 | 2.99 | 2.76 | 0.77 | 1.79 | 0.27 | 1.26 | 0.11 |
| 28 | | | | | | | 11.54 | 23.73 | 7.37 | 7.97 | 5.21 | 3.43 | 2.98 | 0.88 | 1.93 | 0.30 | 1.35 | 0.13 |
| 30 | | | | | | | 12.36 | 26.96 | 7.90 | 9.06 | 5.58 | 3.89 | 3.19 | 1.00 | 2.06 | 0.35 | 1.45 | 0.15 |
| 32 | | | | | | | 13.19 | 30.39 | 8.42 | 10.21 | 5.95 | 4.39 | 3.40 | 1.12 | 2.20 | 0.39 | 1.54 | 0.16 |
| 34 | | | | | | | 14.01 | 34.00 | 8.95 | 11.42 | 6.32 | 4.91 | 3.61 | 1.26 | 2.34 | 0.44 | 1.64 | 0.18 |
| 36 | | | | | | | 14.84 | 37.79 | 9.48 | 12.70 | 6.70 | 5.46 | 3.83 | 1.40 | 2.48 | 0.49 | 1.74 | 0.20 |
| 38 | | | | | | | 15.66 | 41.77 | 10.00 | 14.04 | 7.07 | 6.03 | 4.04 | 1.55 | 2.61 | 0.54 | 1.83 | 0.23 |
| 40 | | | | | | | 16.48 | 45.94 | 10.53 | 15.43 | 7.44 | 6.63 | 4.25 | 1.70 | 2.75 | 0.59 | 1.93 | 0.25 |
| 42 | | | | | | | 17.31 | 50.28 | 11.06 | 16.89 | 7.81 | 7.26 | 4.47 | 1.86 | 2.89 | 0.65 | 2.03 | 0.27 |
| 44 | | | | | | | | | 11.58 | 18.41 | 8.18 | 7.91 | 4.68 | 2.03 | 3.03 | 0.70 | 2.12 | 0.30 |
| 46 | | | | | | | | | 12.11 | 19.99 | 8.56 | 8.59 | 4.89 | 2.20 | 3.17 | 0.76 | 2.22 | 0.32 |
| 48 | | | | | | | | | 12.63 | 21.63 | 8.93 | 9.30 | 5.10 | 2.38 | 3.30 | 0.83 | 2.32 | 0.35 |
| 50 | | | | | | | | | 13.16 | 23.33 | 9.30 | 10.03 | 5.32 | 2.57 | 3.44 | 0.89 | 2.41 | 0.38 |
| 55 | | | | | | | | | 14.48 | 27.84 | 10.23 | 11.96 | 5.85 | 3.07 | 3.78 | 1.06 | 2.66 | 0.45 |
| 60 | | | | | | | | | 15.79 | 32.70 | 11.16 | 14.05 | 6.38 | 3.60 | 4.13 | 1.25 | 2.90 | 0.53 |
| 65 | | | | | | | | | 17.11 | 37.93 | 12.09 | 16.30 | 6.91 | 4.18 | 4.47 | 1.45 | 3.14 | 0.61 |
| 70 | | | | | | | | | 18.43 | 43.51 | 13.02 | 18.70 | 7.44 | 4.79 | 4.82 | 1.66 | 3.38 | 0.70 |
| 75 | | | | | | | | | | | 13.95 | 21.24 | 7.97 | 5.45 | 5.16 | 1.89 | 3.62 | 0.80 |
| 80 | | | | | | | | | | | 14.88 | 23.94 | 8.51 | 6.14 | 5.50 | 2.13 | 3.86 | 0.90 |
| 85 | | | | | | | | | | | 15.81 | 26.79 | 9.04 | 6.87 | 5.85 | 2.38 | 4.10 | 1.01 |
| 90 | | | | | | | | | | | 16.74 | 29.78 | 9.57 | 7.63 | 6.19 | 2.65 | 4.35 | 1.12 |
| 95 | | | | | | | | | | | 17.67 | 32.91 | 10.10 | 8.44 | 6.54 | 2.93 | 4.59 | 1.24 |
| 100 | | | | | | | | | | | 18.60 | 36.19 | 10.63 | 9.28 | 6.88 | 3.22 | 4.83 | 1.36 |
| 110 | | | | | | | | | | | | | 11.69 | 11.07 | 7.57 | 3.84 | 5.31 | 1.62 |
| 120 | | | | | | | | | | | | | 12.76 | 13.01 | 8.26 | 4.51 | 5.79 | 1.91 |
| 130 | | | | | | | | | | | | | 13.82 | 15.08 | 8.95 | 5.23 | 6.28 | 2.21 |
| 140 | | | | | | | | | | | | | 14.88 | 17.30 | 9.63 | 6.00 | 6.76 | 2.54 |
| 150 | | | | | | | | | | | | | 15.95 | 19.66 | 10.32 | 6.82 | 7.24 | 2.88 |
| 160 | | | | | | | | | | | | | 17.01 | 22.16 | 11.01 | 7.69 | 7.72 | 3.25 |
| 170 | | | | | | | | | | | | | 18.07 | 24.79 | 11.70 | 8.60 | 8.21 | 3.63 |
| 180 | | | | | | | | | | | | | | | 12.39 | 9.56 | 8.69 | 4.04 |
| 190 | | | | | | | | | | | | | | | 13.07 | 10.57 | 9.17 | 4.46 |
| 200 | | | | | | | | | | | | | | | 13.76 | 11.62 | 9.66 | 4.91 |
| 220 | | | | | | | | | | | | | | | 15.14 | 13.87 | 10.62 | 5.86 |
| 240 | | | | | | | | | | | | | | | 16.51 | 16.29 | 11.59 | 6.88 |
| 260 | | | | | | | | | | | | | | | 17.89 | 18.90 | 12.55 | 7.98 |
| 280 | | | | | | | | | | | | | | | 19.27 | 21.68 | 13.52 | 9.15 |
| 300 | | | | | | | | | | | | | | | | | 14.48 | 10.40 |
| 320 | | | | | | | | | | | | | | | | | 15.45 | 11.72 |
| 340 | | | | | | | | | | | | | | | | | 16.42 | 13.11 |
| 360 | | | | | | | | | | | | | | | | | 17.38 | 14.58 |
| 380 | | | | | | | | | | | | | | | | | 18.35 | 16.11 |
| 400 | | | | | | | | | | | | | | | | | | |
| 420 | | | | | | | | | | | | | | | | | | |
| 440 | | | | | | | | | | | | | | | | | | |
| 460 | | | | | | | | | | | | | | | | | | |
| 480 | | | | | | | | | | | | | | | | | | |
| 500 | | | | | | | | | | | | | | | | | | |

**The shaded area represents velocities over 7 fps.**
**Use with caution where water hammer is a concern.**

# TYPE L COPPER TUBING

**ASTM B88 C=140**

**PSI Loss per 100' of Pipe**

| Nominal Size | 1/2" | | 5/8" | | 3/4" | | 1" | | 1 1/4" | | 1 1/2" | | 2" | | 2 1/2" | | 3" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe ID | 0.545 | | 0.666 | | 0.785 | | 1.025 | | 1.265 | | 1.505 | | 1.985 | | 2.465 | | 2.945 | |
| Pipe OD | 0.625 | | 0.750 | | 0.875 | | 1.125 | | 1.375 | | 1.625 | | 2.125 | | 2.625 | | 3.125 | |
| Avg. Wall | 0.040 | | 0.042 | | 0.045 | | 0.050 | | 0.055 | | 0.060 | | 0.070 | | 0.080 | | 0.090 | |
| Flow GPM | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS |
| 1 | 1.37 | 0.93 | 0.92 | 0.35 | 0.66 | 0.16 | 0.39 | 0.04 | 0.25 | 0.02 | | | | | | | | |
| 2 | 2.75 | 3.35 | 1.84 | 1.26 | 1.32 | 0.57 | 0.78 | 0.15 | 0.51 | 0.06 | | | | | | | | |
| 3 | 4.12 | 7.09 | 2.76 | 2.67 | 1.99 | 1.20 | 1.17 | 0.33 | 0.76 | 0.12 | | | | | | | | |
| 4 | 5.49 | 12.09 | 3.68 | 4.56 | 2.65 | 2.05 | 1.55 | 0.56 | 1.02 | 0.20 | | | | | | | | |
| 5 | 6.87 | 18.27 | 4.60 | 6.89 | 3.31 | 3.09 | 1.94 | 0.85 | 1.27 | 0.30 | | | | | | | | |
| 6 | 8.24 | 25.61 | 5.52 | 9.65 | 3.97 | 4.34 | 2.33 | 1.18 | 1.53 | 0.43 | 1.08 | 0.18 | | | | | | |
| 7 | 9.62 | 34.07 | 6.44 | 12.84 | 4.63 | 5.77 | 2.72 | 1.58 | 1.78 | 0.57 | 1.26 | 0.24 | | | | | | |
| 8 | 10.99 | 43.63 | 7.36 | 16.45 | 5.30 | 7.39 | 3.11 | 2.02 | 2.04 | 0.72 | 1.44 | 0.31 | | | | | | |
| 9 | 12.36 | 54.26 | 8.28 | 20.45 | 5.96 | 9.19 | 3.50 | 2.51 | 2.29 | 0.90 | 1.62 | 0.39 | | | | | | |
| 10 | 13.74 | 65.95 | 9.20 | 24.86 | 6.62 | 11.17 | 3.88 | 3.05 | 2.55 | 1.10 | 1.80 | 0.47 | | | | | | |
| 12 | | | 11.04 | 34.85 | 7.95 | 15.66 | 4.66 | 4.28 | 3.06 | 1.54 | 2.16 | 0.66 | 1.24 | 0.17 | | | | |
| 14 | | | 12.88 | 46.36 | 9.27 | 20.83 | 5.44 | 5.69 | 3.57 | 2.04 | 2.52 | 0.88 | 1.45 | 0.23 | | | | |
| 16 | | | 14.72 | 59.37 | 10.59 | 26.68 | 6.21 | 7.28 | 4.08 | 2.62 | 2.88 | 1.12 | 1.66 | 0.29 | | | | |
| 18 | | | 16.56 | 73.84 | 11.92 | 33.18 | 6.99 | 9.06 | 4.59 | 3.25 | 3.24 | 1.40 | 1.86 | 0.36 | | | | |
| 20 | | | | | 13.24 | 40.33 | 7.77 | 11.01 | 5.10 | 3.96 | 3.60 | 1.70 | 2.07 | 0.44 | | | | |
| 22 | | | | | 14.57 | 48.11 | 8.54 | 13.14 | 5.61 | 4.72 | 3.96 | 2.03 | 2.28 | 0.53 | 1.48 | 0.18 | 1.03 | 0.08 |
| 24 | | | | | 15.89 | 56.53 | 9.32 | 15.44 | 6.12 | 5.55 | 4.32 | 2.38 | 2.49 | 0.62 | 1.61 | 0.22 | 1.13 | 0.09 |
| 26 | | | | | | | 10.10 | 17.90 | 6.63 | 6.43 | 4.68 | 2.76 | 2.69 | 0.72 | 1.75 | 0.25 | 1.22 | 0.11 |
| 28 | | | | | | | 10.87 | 20.54 | 7.14 | 7.38 | 5.04 | 3.17 | 2.90 | 0.82 | 1.88 | 0.29 | 1.32 | 0.12 |
| 30 | | | | | | | 11.65 | 23.33 | 7.65 | 8.38 | 5.40 | 3.60 | 3.11 | 0.94 | 2.01 | 0.33 | 1.41 | 0.14 |
| 32 | | | | | | | 12.43 | 26.30 | 8.16 | 9.45 | 5.76 | 4.06 | 3.31 | 1.05 | 2.15 | 0.37 | 1.51 | 0.15 |
| 34 | | | | | | | 13.20 | 29.42 | 8.67 | 10.57 | 6.12 | 4.54 | 3.52 | 1.18 | 2.28 | 0.41 | 1.60 | 0.17 |
| 36 | | | | | | | 13.98 | 32.71 | 9.18 | 11.75 | 6.48 | 5.05 | 3.73 | 1.31 | 2.42 | 0.46 | 1.69 | 0.19 |
| 38 | | | | | | | 14.76 | 36.15 | 9.69 | 12.99 | 6.84 | 5.58 | 3.93 | 1.45 | 2.55 | 0.51 | 1.79 | 0.21 |
| 40 | | | | | | | 15.53 | 39.75 | 10.20 | 14.28 | 7.21 | 6.13 | 4.14 | 1.59 | 2.69 | 0.56 | 1.88 | 0.23 |
| 42 | | | | | | | 16.31 | 43.51 | 10.71 | 15.63 | 7.57 | 6.71 | 4.35 | 1.75 | 2.82 | 0.61 | 1.98 | 0.26 |
| 44 | | | | | | | | | 11.22 | 17.04 | 7.93 | 7.32 | 4.56 | 1.90 | 2.95 | 0.66 | 2.07 | 0.28 |
| 46 | | | | | | | | | 11.73 | 18.50 | 8.29 | 7.94 | 4.76 | 2.07 | 3.09 | 0.72 | 2.16 | 0.30 |
| 48 | | | | | | | | | 12.24 | 20.02 | 8.65 | 8.60 | 4.97 | 2.24 | 3.22 | 0.78 | 2.26 | 0.33 |
| 50 | | | | | | | | | 12.75 | 21.59 | 9.01 | 9.27 | 5.18 | 2.41 | 3.36 | 0.84 | 2.35 | 0.35 |
| 55 | | | | | | | | | 14.02 | 25.76 | 9.91 | 11.06 | 5.70 | 2.88 | 3.69 | 1.00 | 2.59 | 0.42 |
| 60 | | | | | | | | | 15.30 | 30.26 | 10.81 | 13.00 | 6.21 | 3.38 | 4.03 | 1.18 | 2.82 | 0.50 |
| 65 | | | | | | | | | 16.57 | 35.10 | 11.71 | 15.07 | 6.73 | 3.92 | 4.36 | 1.37 | 3.06 | 0.57 |
| 70 | | | | | | | | | 17.85 | 40.26 | 12.61 | 17.29 | 7.25 | 4.50 | 4.70 | 1.57 | 3.29 | 0.66 |
| 75 | | | | | | | | | | | 13.51 | 19.65 | 7.77 | 5.11 | 5.04 | 1.78 | 3.53 | 0.75 |
| 80 | | | | | | | | | | | 14.41 | 22.14 | 8.28 | 5.76 | 5.37 | 2.01 | 3.76 | 0.84 |
| 85 | | | | | | | | | | | 15.31 | 24.77 | 8.80 | 6.44 | 5.71 | 2.25 | 4.00 | 0.94 |
| 90 | | | | | | | | | | | 16.21 | 27.54 | 9.32 | 7.16 | 6.04 | 2.50 | 4.23 | 1.05 |
| 95 | | | | | | | | | | | 17.11 | 30.44 | 9.84 | 7.91 | 6.38 | 2.76 | 4.47 | 1.16 |
| 100 | | | | | | | | | | | 18.01 | 33.47 | 10.35 | 8.70 | 6.71 | 3.03 | 4.70 | 1.28 |
| 110 | | | | | | | | | | | | | 11.39 | 10.38 | 7.39 | 3.62 | 5.17 | 1.52 |
| 120 | | | | | | | | | | | | | 12.43 | 12.20 | 8.06 | 4.25 | 5.65 | 1.79 |
| 130 | | | | | | | | | | | | | 13.46 | 14.15 | 8.73 | 4.93 | 6.12 | 2.07 |
| 140 | | | | | | | | | | | | | 14.50 | 16.23 | 9.40 | 5.66 | 6.59 | 2.38 |
| 150 | | | | | | | | | | | | | 15.53 | 18.44 | 10.07 | 6.43 | 7.06 | 2.70 |
| 160 | | | | | | | | | | | | | 16.57 | 20.78 | 10.74 | 7.24 | 7.53 | 3.05 |
| 170 | | | | | | | | | | | | | 17.60 | 23.25 | 11.41 | 8.11 | 8.00 | 3.41 |
| 180 | | | | | | | | | | | | | | | 12.09 | 9.01 | 8.47 | 3.79 |
| 190 | | | | | | | | | | | | | | | 12.76 | 9.96 | 8.94 | 4.19 |
| 200 | | | | | | | | | | | | | | | 13.43 | 10.95 | 9.41 | 4.61 |
| 220 | | | | | | | | | | | | | | | 14.77 | 13.07 | 10.35 | 5.50 |
| 240 | | | | | | | | | | | | | | | 16.12 | 15.35 | 11.29 | 6.46 |
| 260 | | | | | | | | | | | | | | | 17.46 | 17.80 | 12.23 | 7.49 |
| 280 | | | | | | | | | | | | | | | 18.80 | 20.42 | 13.17 | 8.59 |
| 300 | | | | | | | | | | | | | | | | | 14.11 | 9.76 |
| 320 | | | | | | | | | | | | | | | | | 15.05 | 11.00 |
| 340 | | | | | | | | | | | | | | | | | 15.99 | 12.31 |
| 360 | | | | | | | | | | | | | | | | | 16.94 | 13.69 |
| 380 | | | | | | | | | | | | | | | | | 17.88 | 15.13 |
| 400 | | | | | | | | | | | | | | | | | | |
| 420 | | | | | | | | | | | | | | | | | | |
| 440 | | | | | | | | | | | | | | | | | | |
| 460 | | | | | | | | | | | | | | | | | | |
| 480 | | | | | | | | | | | | | | | | | | |
| 500 | | | | | | | | | | | | | | | | | | |

**The shaded area represents velocities over 7 fps.**
**Use with caution where water hammer is a concern.**

# TYPE M COPPER TUBING

**ASTM B88 C=140**

**PSI Loss per 100' of Pipe**

| Nominal Size | 1/2" | | 5/8" | | 3/4" | | 1" | | 1 1/4" | | 1 1/2" | | 2" | | 2 1/2" | | 3" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe ID | 0.569 | | 0.690 | | 0.811 | | 1.055 | | 1.291 | | 1.527 | | 2.009 | | 2.495 | | 2.981 | |
| Pipe OD | 0.625 | | 0.750 | | 0.875 | | 1.125 | | 1.375 | | 1.625 | | 2.125 | | 2.625 | | 3.125 | |
| Avg. Wall | 0.028 | | 0.030 | | 0.032 | | 0.035 | | 0.042 | | 0.049 | | 0.058 | | 0.065 | | 0.072 | |
| Flow GPM | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS |
| 1 | 1.26 | 0.75 | 0.86 | 0.29 | 0.62 | 0.13 | 0.37 | 0.04 | 0.24 | 0.01 | | | | | | | | |
| 2 | 2.52 | 2.71 | 1.71 | 1.06 | 1.24 | 0.48 | 0.73 | 0.13 | 0.49 | 0.05 | | | | | | | | |
| 3 | 3.78 | 5.75 | 2.57 | 2.25 | 1.86 | 1.03 | 1.10 | 0.29 | 0.73 | 0.11 | | | | | | | | |
| 4 | 5.04 | 9.80 | 3.43 | 3.83 | 2.48 | 1.75 | 1.47 | 0.49 | 0.98 | 0.18 | | | | | | | | |
| 5 | 6.30 | 14.81 | 4.28 | 5.80 | 3.10 | 2.64 | 1.83 | 0.73 | 1.22 | 0.27 | | | | | | | | |
| 6 | 7.56 | 20.76 | 5.14 | 8.13 | 3.72 | 3.70 | 2.20 | 1.03 | 1.47 | 0.39 | 1.05 | 0.17 | | | | | | |
| 7 | 8.82 | 27.62 | 6.00 | 10.81 | 4.34 | 4.92 | 2.57 | 1.37 | 1.71 | 0.51 | 1.22 | 0.23 | | | | | | |
| 8 | 10.08 | 35.37 | 6.86 | 13.84 | 4.96 | 6.31 | 2.93 | 1.75 | 1.96 | 0.66 | 1.40 | 0.29 | | | | | | |
| 9 | 11.34 | 44.00 | 7.71 | 17.22 | 5.58 | 7.84 | 3.30 | 2.18 | 2.20 | 0.82 | 1.57 | 0.36 | | | | | | |
| 10 | 12.60 | 53.48 | 8.57 | 20.93 | 6.20 | 9.53 | 3.67 | 2.65 | 2.45 | 0.99 | 1.75 | 0.44 | | | | | | |
| 12 | | | 10.28 | 29.33 | 7.44 | 13.36 | 4.40 | 3.72 | 2.94 | 1.39 | 2.10 | 0.61 | 1.21 | 0.16 | | | | |
| 14 | | | 12.00 | 39.02 | 8.68 | 17.78 | 5.13 | 4.94 | 3.43 | 1.85 | 2.45 | 0.82 | 1.42 | 0.22 | | | | |
| 16 | | | 13.71 | 49.97 | 9.93 | 22.77 | 5.87 | 6.33 | 3.92 | 2.37 | 2.80 | 1.05 | 1.62 | 0.28 | | | | |
| 18 | | | 15.43 | 62.15 | 11.17 | 28.32 | 6.60 | 7.87 | 4.41 | 2.95 | 3.15 | 1.30 | 1.82 | 0.34 | | | | |
| 20 | | | 17.14 | 75.55 | 12.41 | 34.42 | 7.33 | 9.57 | 4.90 | 3.58 | 3.50 | 1.58 | 2.02 | 0.42 | | | | |
| 22 | | | | | 13.65 | 41.06 | 8.06 | 11.42 | 5.39 | 4.28 | 3.85 | 1.89 | 2.22 | 0.50 | 1.44 | 0.17 | 1.01 | 0.07 |
| 24 | | | | | 14.89 | 48.24 | 8.80 | 13.41 | 5.88 | 5.02 | 4.20 | 2.22 | 2.43 | 0.58 | 1.57 | 0.20 | 1.10 | 0.09 |
| 26 | | | | | | | 9.53 | 15.56 | 6.36 | 5.83 | 4.55 | 2.57 | 2.63 | 0.68 | 1.70 | 0.24 | 1.19 | 0.10 |
| 28 | | | | | | | 10.26 | 17.85 | 6.85 | 6.68 | 4.90 | 2.95 | 2.83 | 0.78 | 1.84 | 0.27 | 1.29 | 0.11 |
| 30 | | | | | | | 11.00 | 20.28 | 7.34 | 7.59 | 5.25 | 3.35 | 3.03 | 0.88 | 1.97 | 0.31 | 1.38 | 0.13 |
| 32 | | | | | | | 11.73 | 22.85 | 7.83 | 8.56 | 5.60 | 3.78 | 3.23 | 0.99 | 2.10 | 0.35 | 1.47 | 0.15 |
| 34 | | | | | | | 12.46 | 25.57 | 8.32 | 9.57 | 5.95 | 4.23 | 3.44 | 1.11 | 2.23 | 0.39 | 1.56 | 0.16 |
| 36 | | | | | | | 13.20 | 28.42 | 8.81 | 10.64 | 6.30 | 4.70 | 3.64 | 1.24 | 2.36 | 0.43 | 1.65 | 0.18 |
| 38 | | | | | | | 13.93 | 31.42 | 9.30 | 11.76 | 6.65 | 5.20 | 3.84 | 1.37 | 2.49 | 0.48 | 1.74 | 0.20 |
| 40 | | | | | | | 14.66 | 34.55 | 9.79 | 12.94 | 7.00 | 5.71 | 4.04 | 1.50 | 2.62 | 0.52 | 1.84 | 0.22 |
| 42 | | | | | | | 15.40 | 37.81 | 10.28 | 14.16 | 7.35 | 6.26 | 4.25 | 1.65 | 2.75 | 0.57 | 1.93 | 0.24 |
| 44 | | | | | | | | | 10.77 | 15.43 | 7.70 | 6.82 | 4.45 | 1.79 | 2.88 | 0.63 | 2.02 | 0.26 |
| 46 | | | | | | | | | 11.26 | 16.76 | 8.05 | 7.40 | 4.65 | 1.95 | 3.01 | 0.68 | 2.11 | 0.29 |
| 48 | | | | | | | | | 11.75 | 18.13 | 8.40 | 8.01 | 4.85 | 2.11 | 3.15 | 0.73 | 2.20 | 0.31 |
| 50 | | | | | | | | | 12.24 | 19.56 | 8.75 | 8.64 | 5.05 | 2.27 | 3.28 | 0.79 | 2.30 | 0.33 |
| 55 | | | | | | | | | 13.46 | 23.33 | 9.62 | 10.31 | 5.56 | 2.71 | 3.60 | 0.95 | 2.53 | 0.40 |
| 60 | | | | | | | | | 14.69 | 27.41 | 10.50 | 12.11 | 6.07 | 3.19 | 3.93 | 1.11 | 2.75 | 0.47 |
| 65 | | | | | | | | | 15.91 | 31.79 | 11.37 | 14.04 | 6.57 | 3.70 | 4.26 | 1.29 | 2.98 | 0.54 |
| 70 | | | | | | | | | 17.14 | 36.47 | 12.25 | 16.11 | 7.08 | 4.24 | 4.59 | 1.48 | 3.21 | 0.62 |
| 75 | | | | | | | | | | | 13.12 | 18.31 | 7.58 | 4.82 | 4.92 | 1.68 | 3.44 | 0.71 |
| 80 | | | | | | | | | | | 14.00 | 20.63 | 8.09 | 5.43 | 5.24 | 1.89 | 3.67 | 0.80 |
| 85 | | | | | | | | | | | 14.87 | 23.08 | 8.59 | 6.07 | 5.57 | 2.12 | 3.90 | 0.89 |
| 90 | | | | | | | | | | | 15.75 | 25.66 | 9.10 | 6.75 | 5.90 | 2.35 | 4.13 | 0.99 |
| 95 | | | | | | | | | | | 16.62 | 28.36 | 9.60 | 7.46 | 6.23 | 2.60 | 4.36 | 1.09 |
| 100 | | | | | | | | | | | 17.50 | 31.19 | 10.11 | 8.21 | 6.55 | 2.86 | 4.59 | 1.20 |
| 110 | | | | | | | | | | | | | 11.12 | 9.79 | 7.21 | 3.41 | 5.05 | 1.44 |
| 120 | | | | | | | | | | | | | 12.13 | 11.51 | 7.87 | 4.01 | 5.51 | 1.69 |
| 130 | | | | | | | | | | | | | 13.14 | 13.34 | 8.52 | 4.65 | 5.97 | 1.96 |
| 140 | | | | | | | | | | | | | 14.15 | 15.31 | 9.18 | 5.33 | 6.43 | 2.24 |
| 150 | | | | | | | | | | | | | 15.16 | 17.39 | 9.83 | 6.06 | 6.89 | 2.55 |
| 160 | | | | | | | | | | | | | 16.17 | 19.60 | 10.49 | 6.83 | 7.35 | 2.87 |
| 170 | | | | | | | | | | | | | 17.18 | 21.93 | 11.14 | 7.64 | 7.81 | 3.21 |
| 180 | | | | | | | | | | | | | | | 11.80 | 8.50 | 8.26 | 3.57 |
| 190 | | | | | | | | | | | | | | | 12.45 | 9.39 | 8.72 | 3.95 |
| 200 | | | | | | | | | | | | | | | 13.11 | 10.33 | 9.18 | 4.34 |
| 220 | | | | | | | | | | | | | | | 14.42 | 12.32 | 10.10 | 5.18 |
| 240 | | | | | | | | | | | | | | | 15.73 | 14.47 | 11.02 | 6.09 |
| 260 | | | | | | | | | | | | | | | 17.04 | 16.79 | 11.94 | 7.06 |
| 280 | | | | | | | | | | | | | | | 18.35 | 19.25 | 12.86 | 8.10 |
| 300 | | | | | | | | | | | | | | | | | 13.77 | 9.20 |
| 320 | | | | | | | | | | | | | | | | | 14.69 | 10.37 |
| 340 | | | | | | | | | | | | | | | | | 15.61 | 11.60 |
| 360 | | | | | | | | | | | | | | | | | 16.53 | 12.90 |
| 380 | | | | | | | | | | | | | | | | | 17.45 | 14.26 |
| 400 | | | | | | | | | | | | | | | | | | |
| 420 | | | | | | | | | | | | | | | | | | |
| 440 | | | | | | | | | | | | | | | | | | |
| 460 | | | | | | | | | | | | | | | | | | |
| 480 | | | | | | | | | | | | | | | | | | |
| 500 | | | | | | | | | | | | | | | | | | |

**The shaded area represents velocities over 7 fps.**
**Use with caution where water hammer is a concern.**

# SCHEDULE 40 STEEL

**ASTM B53 C=100**

**PSI Loss per 100' of Pipe**

| Nominal Size | 1/2" | | 3/4" | | 1" | | 1 1/4" | | 1 1/2" | | 2" | | 2 1/2" | | 3" | | 4" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe ID | 0.622 | | 0.824 | | 1.049 | | 1.38 | | 1.610 | | 2.067 | | 2.469 | | 3.068 | | 4.026 | |
| Pipe OD | 0.842 | | 1.050 | | 1.315 | | 1.660 | | 1.900 | | 2.375 | | 2.875 | | 3.500 | | 4.500 | |
| Avg. Wall | 0.110 | | 0.113 | | 0.133 | | 0.140 | | 0.145 | | 0.154 | | 0.203 | | 0.216 | | 0.237 | |
| Flow GPM | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS |
| 1 | 1.05 | 0.91 | 0.60 | 0.23 | 0.37 | 0.07 | 0.21 | 0.02 | 0.16 | 0.01 | | | | | | | | |
| 2 | 2.11 | 3.28 | 1.20 | 0.84 | 0.74 | 0.26 | 0.43 | 0.07 | 0.31 | 0.03 | | | | | | | | |
| 3 | 3.16 | 6.95 | 1.80 | 1.77 | 1.11 | 0.55 | 0.64 | 0.14 | 0.47 | 0.07 | | | | | | | | |
| 4 | 4.22 | 11.85 | 2.40 | 3.02 | 1.48 | 0.93 | 0.86 | 0.25 | 0.63 | 0.12 | | | | | | | | |
| 5 | 5.27 | 17.91 | 3.00 | 4.56 | 1.85 | 1.41 | 1.07 | 0.37 | 0.79 | 0.18 | | | | | | | | |
| 6 | 6.33 | 25.10 | 3.61 | 6.39 | 2.22 | 1.97 | 1.29 | 0.52 | 0.94 | 0.25 | 0.57 | 0.07 | | | | | | |
| 7 | 7.38 | 33.40 | 4.21 | 8.50 | 2.60 | 2.63 | 1.50 | 0.69 | 1.10 | 0.33 | 0.67 | 0.10 | | | | | | |
| 8 | 8.44 | 42.77 | 4.81 | 10.88 | 2.97 | 3.36 | 1.71 | 0.89 | 1.26 | 0.42 | 0.76 | 0.12 | | | | | | |
| 9 | 9.49 | 53.19 | 5.41 | 13.54 | 3.34 | 4.18 | 1.93 | 1.10 | 1.42 | 0.52 | 0.86 | 0.15 | | | | | | |
| 10 | 10.55 | 64.65 | 6.01 | 16.45 | 3.71 | 5.08 | 2.14 | 1.34 | 1.57 | 0.63 | 0.95 | 0.19 | | | | | | |
| 12 | 12.65 | 90.62 | 7.21 | 23.06 | 4.45 | 7.12 | 2.57 | 1.88 | 1.89 | 0.89 | 1.15 | 0.26 | 0.80 | 0.11 | | | | |
| 14 | | | 8.41 | 30.68 | 5.19 | 9.48 | 3.00 | 2.50 | 2.20 | 1.18 | 1.34 | 0.35 | 0.94 | 0.15 | | | | |
| 16 | | | 9.61 | 39.29 | 5.93 | 12.14 | 3.43 | 3.20 | 2.52 | 1.51 | 1.53 | 0.45 | 1.07 | 0.19 | | | | |
| 18 | | | 10.82 | 48.87 | 6.67 | 15.10 | 3.86 | 3.97 | 2.83 | 1.88 | 1.72 | 0.56 | 1.20 | 0.23 | | | | |
| 20 | | | 12.02 | 59.40 | 7.42 | 18.35 | 4.28 | 4.83 | 3.15 | 2.28 | 1.91 | 0.68 | 1.34 | 0.28 | | | | |
| 22 | | | 13.22 | 70.87 | 8.16 | 21.89 | 4.71 | 5.76 | 3.46 | 2.72 | 2.10 | 0.81 | 1.47 | 0.34 | 0.95 | 0.12 | 0.55 | 0.03 |
| 24 | | | | | 8.90 | 25.72 | 5.14 | 6.77 | 3.78 | 3.20 | 2.29 | 0.95 | 1.61 | 0.40 | 1.04 | 0.14 | 0.60 | 0.04 |
| 26 | | | | | 9.64 | 29.83 | 5.57 | 7.85 | 4.09 | 3.71 | 2.48 | 1.10 | 1.74 | 0.46 | 1.13 | 0.16 | 0.65 | 0.04 |
| 28 | | | | | 10.38 | 34.22 | 6.00 | 9.01 | 4.41 | 4.25 | 2.67 | 1.26 | 1.87 | 0.53 | 1.21 | 0.18 | 0.70 | 0.05 |
| 30 | | | | | 11.12 | 38.88 | 6.43 | 10.24 | 4.72 | 4.83 | 2.86 | 1.43 | 2.01 | 0.60 | 1.30 | 0.21 | 0.76 | 0.06 |
| 32 | | | | | 11.86 | 43.81 | 6.86 | 11.54 | 5.04 | 5.45 | 3.06 | 1.62 | 2.14 | 0.68 | 1.39 | 0.24 | 0.81 | 0.06 |
| 34 | | | | | 12.61 | 49.02 | 7.28 | 12.91 | 5.35 | 6.10 | 3.25 | 1.81 | 2.28 | 0.76 | 1.47 | 0.26 | 0.86 | 0.07 |
| 36 | | | | | 13.35 | 54.49 | 7.71 | 14.35 | 5.67 | 6.78 | 3.44 | 2.01 | 2.41 | 0.85 | 1.56 | 0.29 | 0.91 | 0.08 |
| 38 | | | | | | | 8.14 | 15.86 | 5.98 | 7.49 | 3.63 | 2.22 | 2.54 | 0.94 | 1.65 | 0.33 | 0.96 | 0.09 |
| 40 | | | | | | | 8.57 | 17.44 | 6.30 | 8.24 | 3.82 | 2.44 | 2.68 | 1.03 | 1.73 | 0.36 | 1.01 | 0.10 |
| 42 | | | | | | | 9.00 | 19.09 | 6.61 | 9.02 | 4.01 | 2.67 | 2.81 | 1.13 | 1.82 | 0.39 | 1.06 | 0.10 |
| 44 | | | | | | | 9.43 | 20.81 | 6.93 | 9.83 | 4.20 | 2.91 | 2.94 | 1.23 | 1.91 | 0.43 | 1.11 | 0.11 |
| 46 | | | | | | | 9.86 | 22.59 | 7.24 | 10.67 | 4.39 | 3.16 | 3.08 | 1.33 | 1.99 | 0.46 | 1.16 | 0.12 |
| 48 | | | | | | | 10.28 | 24.44 | 7.56 | 11.55 | 4.58 | 3.42 | 3.21 | 1.44 | 2.08 | 0.50 | 1.21 | 0.13 |
| 50 | | | | | | | 10.71 | 26.36 | 7.87 | 12.45 | 4.77 | 3.69 | 3.35 | 1.55 | 2.17 | 0.54 | 1.26 | 0.14 |
| 55 | | | | | | | 11.78 | 31.45 | 8.66 | 14.86 | 5.25 | 4.40 | 3.68 | 1.85 | 2.38 | 0.64 | 1.38 | 0.17 |
| 60 | | | | | | | 12.85 | 36.95 | 9.44 | 17.45 | 5.73 | 5.17 | 4.02 | 2.18 | 2.60 | 0.76 | 1.51 | 0.20 |
| 65 | | | | | | | 13.93 | 42.86 | 10.23 | 20.24 | 6.21 | 6.00 | 4.35 | 2.53 | 2.82 | 0.88 | 1.64 | 0.23 |
| 70 | | | | | | | | | 11.02 | 23.22 | 6.68 | 6.88 | 4.69 | 2.90 | 3.03 | 1.01 | 1.76 | 0.27 |
| 75 | | | | | | | | | 11.81 | 26.39 | 7.16 | 7.82 | 5.02 | 3.29 | 3.25 | 1.14 | 1.89 | 0.31 |
| 80 | | | | | | | | | 12.59 | 29.74 | 7.64 | 8.82 | 5.35 | 3.71 | 3.47 | 1.29 | 2.01 | 0.34 |
| 85 | | | | | | | | | 13.38 | 33.27 | 8.12 | 9.86 | 5.69 | 4.15 | 3.68 | 1.44 | 2.14 | 0.38 |
| 90 | | | | | | | | | | | 8.59 | 10.96 | 6.02 | 4.62 | 3.90 | 1.60 | 2.27 | 0.43 |
| 95 | | | | | | | | | | | 9.07 | 12.12 | 6.36 | 5.10 | 4.12 | 1.77 | 2.39 | 0.47 |
| 100 | | | | | | | | | | | 9.55 | 13.33 | 6.69 | 5.61 | 4.33 | 1.95 | 2.52 | 0.52 |
| 110 | | | | | | | | | | | 10.50 | 15.90 | 7.36 | 6.70 | 4.77 | 2.33 | 2.77 | 0.62 |
| 120 | | | | | | | | | | | 11.46 | 18.68 | 8.03 | 7.87 | 5.20 | 2.73 | 3.02 | 0.73 |
| 130 | | | | | | | | | | | 12.41 | 21.66 | 8.70 | 9.12 | 5.63 | 3.17 | 3.27 | 0.85 |
| 140 | | | | | | | | | | | 13.37 | 24.85 | 9.37 | 10.47 | 6.07 | 3.64 | 3.52 | 0.97 |
| 150 | | | | | | | | | | | | | 10.04 | 11.89 | 6.50 | 4.13 | 3.78 | 1.10 |
| 160 | | | | | | | | | | | | | 10.71 | 13.40 | 6.94 | 4.66 | 4.03 | 1.24 |
| 170 | | | | | | | | | | | | | 11.38 | 15.00 | 7.37 | 5.21 | 4.28 | 1.39 |
| 180 | | | | | | | | | | | | | 12.05 | 16.67 | 7.80 | 5.79 | 4.53 | 1.54 |
| 190 | | | | | | | | | | | | | 12.72 | 18.43 | 8.24 | 6.40 | 4.78 | 1.71 |
| 200 | | | | | | | | | | | | | 13.39 | 20.26 | 8.67 | 7.04 | 5.03 | 1.88 |
| 220 | | | | | | | | | | | | | | | 9.54 | 8.40 | 5.54 | 2.24 |
| 240 | | | | | | | | | | | | | | | 10.40 | 9.87 | 6.04 | 2.63 |
| 260 | | | | | | | | | | | | | | | 11.27 | 11.45 | 6.54 | 3.05 |
| 280 | | | | | | | | | | | | | | | 12.14 | 13.13 | 7.05 | 3.50 |
| 300 | | | | | | | | | | | | | | | 13.00 | 14.92 | 7.55 | 3.98 |
| 320 | | | | | | | | | | | | | | | 13.87 | 16.81 | 8.05 | 4.48 |
| 340 | | | | | | | | | | | | | | | | | 8.56 | 5.01 |
| 360 | | | | | | | | | | | | | | | | | 9.06 | 5.57 |
| 380 | | | | | | | | | | | | | | | | | 9.57 | 6.16 |
| 400 | | | | | | | | | | | | | | | | | 10.07 | 6.77 |
| 420 | | | | | | | | | | | | | | | | | 10.57 | 7.42 |
| 440 | | | | | | | | | | | | | | | | | 11.08 | 8.08 |
| 460 | | | | | | | | | | | | | | | | | 11.58 | 8.78 |
| 480 | | | | | | | | | | | | | | | | | 12.08 | 9.50 |
| 500 | | | | | | | | | | | | | | | | | 12.59 | 10.24 |

**The shaded area represents velocities over 7 fps.**
**Use with caution where water hammer is a concern.**

# SCHEDULE 80 STEEL

**ASTM B53 C=100**
**PSI Loss per 100' of Pipe**

| Nominal Size | 1/2" | | 3/4" | | 1" | | 1 1/4" | | 1 1/2" | | 2" | | 2 1/2" | | 3" | | 4" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe ID | 0.546 | | 0.742 | | 0.957 | | 1.278 | | 1.500 | | 1.939 | | 2.323 | | 2.900 | | 3.826 | |
| Pipe OD | 0.840 | | 1.050 | | 1.315 | | 1.660 | | 1.900 | | 2.375 | | 2.875 | | 3.500 | | 4.500 | |
| Avg. Wall | 0.147 | | 0.154 | | 0.179 | | 0.191 | | 0.200 | | 0.218 | | 0.276 | | 0.300 | | 0.337 | |
| Flow GPM | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS |
| 1 | 1.37 | 1.71 | 0.74 | 0.39 | 0.45 | 0.11 | 0.25 | 0.03 | 0.18 | 0.01 | | | | | | | | |
| 2 | 2.74 | 6.19 | 1.48 | 1.39 | 0.89 | 0.40 | 0.50 | 0.10 | 0.36 | 0.05 | | | | | | | | |
| 3 | 4.11 | 13.11 | 2.22 | 2.95 | 1.34 | 0.85 | 0.75 | 0.21 | 0.54 | 0.10 | | | | | | | | |
| 4 | 5.47 | 22.34 | 2.96 | 5.02 | 1.78 | 1.46 | 1.00 | 0.36 | 0.73 | 0.16 | | | | | | | | |
| 5 | 6.84 | 33.77 | 3.71 | 7.59 | 2.23 | 2.20 | 1.25 | 0.54 | 0.91 | 0.25 | | | | | | | | |
| 6 | 8.21 | 47.33 | 4.45 | 10.64 | 2.67 | 3.08 | 1.50 | 0.75 | 1.09 | 0.35 | 0.65 | 0.10 | | | | | | |
| 7 | 9.58 | 62.97 | 5.19 | 14.16 | 3.12 | 4.10 | 1.75 | 1.00 | 1.27 | 0.46 | 0.76 | 0.13 | | | | | | |
| 8 | 10.95 | 80.63 | 5.93 | 18.13 | 3.56 | 5.26 | 2.00 | 1.29 | 1.45 | 0.59 | 0.87 | 0.17 | | | | | | |
| 9 | | | 6.67 | 22.54 | 4.01 | 6.54 | 2.25 | 1.60 | 1.63 | 0.73 | 0.98 | 0.21 | | | | | | |
| 10 | | | 7.41 | 27.40 | 4.45 | 7.94 | 2.50 | 1.94 | 1.81 | 0.89 | 1.09 | 0.26 | | | | | | |
| 12 | | | 8.89 | 38.41 | 5.35 | 11.14 | 3.00 | 2.73 | 2.18 | 1.25 | 1.30 | 0.36 | 0.91 | 0.15 | | | | |
| 14 | | | 10.37 | 51.10 | 6.24 | 14.81 | 3.50 | 3.63 | 2.54 | 1.66 | 1.52 | 0.48 | 1.06 | 0.20 | | | | |
| 16 | | | 11.86 | 65.44 | 7.13 | 18.97 | 4.00 | 4.64 | 2.90 | 2.13 | 1.74 | 0.61 | 1.21 | 0.25 | | | | |
| 18 | | | 13.34 | 81.39 | 8.02 | 23.60 | 4.50 | 5.78 | 3.26 | 2.65 | 1.95 | 0.76 | 1.36 | 0.32 | | | | |
| 20 | | | | | 8.91 | 28.68 | 5.00 | 7.02 | 3.63 | 3.22 | 2.17 | 0.92 | 1.51 | 0.38 | | | | |
| 22 | | | | | 9.80 | 34.22 | 5.50 | 8.37 | 3.99 | 3.84 | 2.39 | 1.10 | 1.66 | 0.46 | 1.07 | 0.16 | 0.61 | 0.04 |
| 24 | | | | | 10.69 | 40.20 | 6.00 | 9.84 | 4.35 | 4.51 | 2.60 | 1.29 | 1.81 | 0.54 | 1.16 | 0.18 | 0.67 | 0.05 |
| 26 | | | | | 11.58 | 46.62 | 6.49 | 11.41 | 4.71 | 5.23 | 2.82 | 1.50 | 1.97 | 0.62 | 1.26 | 0.21 | 0.72 | 0.05 |
| 28 | | | | | 12.47 | 53.48 | 6.99 | 13.09 | 5.08 | 6.00 | 3.04 | 1.72 | 2.12 | 0.71 | 1.36 | 0.24 | 0.78 | 0.06 |
| 30 | | | | | 13.36 | 60.77 | 7.49 | 14.87 | 5.44 | 6.82 | 3.26 | 1.96 | 2.27 | 0.81 | 1.46 | 0.28 | 0.84 | 0.07 |
| 32 | | | | | | | 7.99 | 16.76 | 5.80 | 7.69 | 3.47 | 2.20 | 2.42 | 0.92 | 1.55 | 0.31 | 0.89 | 0.08 |
| 34 | | | | | | | 8.49 | 18.75 | 6.17 | 8.60 | 3.69 | 2.47 | 2.57 | 1.02 | 1.65 | 0.35 | 0.95 | 0.09 |
| 36 | | | | | | | 8.99 | 20.85 | 6.53 | 9.56 | 3.91 | 2.74 | 2.72 | 1.14 | 1.75 | 0.39 | 1.00 | 0.10 |
| 38 | | | | | | | 9.49 | 23.04 | 6.89 | 10.57 | 4.12 | 3.03 | 2.87 | 1.26 | 1.84 | 0.43 | 1.06 | 0.11 |
| 40 | | | | | | | 9.99 | 25.34 | 7.25 | 11.62 | 4.34 | 3.33 | 3.02 | 1.38 | 1.94 | 0.47 | 1.11 | 0.12 |
| 42 | | | | | | | 10.49 | 27.74 | 7.62 | 12.72 | 4.56 | 3.65 | 3.18 | 1.51 | 2.04 | 0.51 | 1.17 | 0.13 |
| 44 | | | | | | | 10.99 | 30.23 | 7.98 | 13.87 | 4.77 | 3.98 | 3.33 | 1.65 | 2.13 | 0.56 | 1.23 | 0.15 |
| 46 | | | | | | | 11.49 | 32.83 | 8.34 | 15.06 | 4.99 | 4.32 | 3.48 | 1.79 | 2.23 | 0.61 | 1.28 | 0.16 |
| 48 | | | | | | | 11.99 | 35.52 | 8.70 | 16.29 | 5.21 | 4.67 | 3.63 | 1.94 | 2.33 | 0.66 | 1.34 | 0.17 |
| 50 | | | | | | | 12.49 | 38.31 | 9.07 | 17.57 | 5.43 | 5.04 | 3.78 | 2.09 | 2.43 | 0.71 | 1.39 | 0.18 |
| 55 | | | | | | | 13.74 | 45.70 | 9.97 | 20.96 | 5.97 | 6.01 | 4.16 | 2.50 | 2.67 | 0.85 | 1.53 | 0.22 |
| 60 | | | | | | | | | 10.88 | 24.63 | 6.51 | 7.06 | 4.54 | 2.93 | 2.91 | 1.00 | 1.67 | 0.26 |
| 65 | | | | | | | | | 11.79 | 28.56 | 7.05 | 8.19 | 4.91 | 3.40 | 3.15 | 1.16 | 1.81 | 0.30 |
| 70 | | | | | | | | | 12.69 | 32.77 | 7.60 | 9.40 | 5.29 | 3.90 | 3.40 | 1.33 | 1.95 | 0.34 |
| 75 | | | | | | | | | 13.60 | 37.23 | 8.14 | 10.68 | 5.67 | 4.43 | 3.64 | 1.51 | 2.09 | 0.39 |
| 80 | | | | | | | | | | | 8.68 | 12.03 | 6.05 | 4.99 | 3.88 | 1.70 | 2.23 | 0.44 |
| 85 | | | | | | | | | | | 9.22 | 13.46 | 6.43 | 5.59 | 4.12 | 1.90 | 2.37 | 0.49 |
| 90 | | | | | | | | | | | 9.77 | 14.97 | 6.80 | 6.21 | 4.37 | 2.11 | 2.51 | 0.55 |
| 95 | | | | | | | | | | | 10.31 | 16.54 | 7.18 | 6.87 | 4.61 | 2.33 | 2.65 | 0.61 |
| 100 | | | | | | | | | | | 10.85 | 18.19 | 7.56 | 7.55 | 4.85 | 2.57 | 2.79 | 0.67 |
| 110 | | | | | | | | | | | 11.94 | 21.70 | 8.32 | 9.01 | 5.34 | 3.06 | 3.07 | 0.79 |
| 120 | | | | | | | | | | | 13.02 | 25.50 | 9.07 | 10.58 | 5.82 | 3.60 | 3.34 | 0.93 |
| 130 | | | | | | | | | | | 14.11 | 29.57 | 9.83 | 12.27 | 6.31 | 4.17 | 3.62 | 1.08 |
| 140 | | | | | | | | | | | | | 10.58 | 14.08 | 6.79 | 4.78 | 3.90 | 1.24 |
| 150 | | | | | | | | | | | | | 11.34 | 16.00 | 7.28 | 5.44 | 4.18 | 1.41 |
| 160 | | | | | | | | | | | | | 12.10 | 18.03 | 7.76 | 6.13 | 4.46 | 1.59 |
| 170 | | | | | | | | | | | | | 12.85 | 20.17 | 8.25 | 6.85 | 4.74 | 1.78 |
| 180 | | | | | | | | | | | | | 13.61 | 22.43 | 8.73 | 7.62 | 5.02 | 1.98 |
| 190 | | | | | | | | | | | | | 14.37 | 24.79 | 9.22 | 8.42 | 5.30 | 2.19 |
| 200 | | | | | | | | | | | | | | | 9.70 | 9.26 | 5.57 | 2.40 |
| 220 | | | | | | | | | | | | | | | 10.67 | 11.05 | 6.13 | 2.87 |
| 240 | | | | | | | | | | | | | | | 11.64 | 12.98 | 6.69 | 3.37 |
| 260 | | | | | | | | | | | | | | | 12.61 | 15.05 | 7.25 | 3.91 |
| 280 | | | | | | | | | | | | | | | 13.58 | 17.27 | 7.80 | 4.48 |
| 300 | | | | | | | | | | | | | | | 14.55 | 19.62 | 8.36 | 5.10 |
| 320 | | | | | | | | | | | | | | | | | 8.92 | 5.74 |
| 340 | | | | | | | | | | | | | | | | | 9.48 | 6.42 |
| 360 | | | | | | | | | | | | | | | | | 10.03 | 7.14 |
| 380 | | | | | | | | | | | | | | | | | 10.59 | 7.89 |
| 400 | | | | | | | | | | | | | | | | | 11.15 | 8.68 |
| 420 | | | | | | | | | | | | | | | | | 11.71 | 9.50 |
| 440 | | | | | | | | | | | | | | | | | 12.26 | 10.36 |
| 460 | | | | | | | | | | | | | | | | | 12.82 | 11.25 |
| 480 | | | | | | | | | | | | | | | | | 13.38 | 12.17 |
| 500 | | | | | | | | | | | | | | | | | 13.94 | 13.12 |

**The shaded area represents velocities over 7 fps.**
**Use with caution where water hammer is a concern.**

# CAST IRON PIPE - CLASS 150

**C=100**

**PSI Loss per 100' (PSI) Sizes 3" through 12"**

| Nominal Size | 3" | | 4" | | 6" | | 8" | | 10" | | 12" | | Nominal Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe ID<br>Pipe O.D.<br>Wall Thick | 3.32<br>3.96<br>0.32 | | 4.10<br>4.80<br>0.35 | | 6.14<br>6.90<br>0.38 | | 8.23<br>9.05<br>0.41 | | 10.22<br>11.10<br>0.44 | | 12.24<br>13.20<br>0.48 | | Pipe ID<br>Pipe O.D.<br>Wall Thick |
| Flow GPM | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Flow GPM |
| 5 | 0.19 | **0.01** | 0.12 | **0.00** | | | | | | | | | 5 |
| 10 | 0.37 | **0.02** | 0.24 | **0.01** | | | | | | | | | 10 |
| 15 | 0.56 | **0.04** | 0.36 | **0.01** | | | | | | | | | 15 |
| 20 | 0.74 | **0.07** | 0.49 | **0.02** | 0.22 | **0.00** | | | | | | | 20 |
| 25 | 0.93 | **0.10** | 0.61 | **0.04** | 0.27 | **0.01** | | | | | | | 25 |
| 30 | 1.11 | **0.14** | 0.73 | **0.05** | 0.32 | **0.01** | | | | | | | 30 |
| 40 | 1.48 | **0.24** | 0.97 | **0.09** | 0.43 | **0.01** | | | | | | | 40 |
| 50 | 1.85 | **0.37** | 1.21 | **0.13** | 0.54 | **0.02** | 0.30 | **0.00** | | | | | 50 |
| 60 | 2.22 | **0.52** | 1.46 | **0.18** | 0.65 | **0.03** | 0.36 | **0.01** | | | | | 60 |
| 70 | 2.59 | **0.69** | 1.70 | **0.25** | 0.76 | **0.03** | 0.42 | **0.01** | | | | | 70 |
| 80 | 2.96 | **0.88** | 1.94 | **0.31** | 0.87 | **0.04** | 0.48 | **0.01** | | | | | 80 |
| 90 | 3.33 | **1.09** | 2.18 | **0.39** | 0.97 | **0.05** | 0.54 | **0.01** | 0.35 | **0.00** | | | 90 |
| 100 | 3.70 | **1.33** | 2.43 | **0.48** | 1.08 | **0.07** | 0.60 | **0.02** | 0.39 | **0.01** | | | 100 |
| 125 | 4.63 | **2.01** | 3.03 | **0.72** | 1.35 | **0.10** | 0.75 | **0.02** | 0.49 | **0.01** | | | 125 |
| 150 | 5.55 | **2.81** | 3.64 | **1.01** | 1.62 | **0.14** | 0.90 | **0.03** | 0.59 | **0.01** | 0.41 | **0.00** | 150 |
| 175 | 6.48 | **3.74** | 4.25 | **1.34** | 1.89 | **0.19** | 1.05 | **0.05** | 0.68 | **0.02** | 0.48 | **0.01** | 175 |
| 200 | 7.40 | **4.80** | 4.85 | **1.72** | 2.16 | **0.24** | 1.20 | **0.06** | 0.78 | **0.02** | 0.54 | **0.01** | 200 |
| 225 | 8.33 | **5.96** | 5.46 | **2.14** | 2.44 | **0.30** | 1.36 | **0.07** | 0.88 | **0.03** | 0.61 | **0.01** | 225 |
| 250 | 9.25 | **7.25** | 6.07 | **2.60** | 2.71 | **0.36** | 1.51 | **0.09** | 0.98 | **0.03** | 0.68 | **0.01** | 250 |
| 275 | 10.18 | **8.65** | 6.67 | **3.10** | 2.98 | **0.43** | 1.66 | **0.10** | 1.07 | **0.04** | 0.75 | **0.02** | 275 |
| 300 | 11.10 | **10.16** | 7.28 | **3.64** | 3.25 | **0.51** | 1.81 | **0.12** | 1.17 | **0.04** | 0.82 | **0.02** | 300 |
| 350 | 12.96 | **13.52** | 8.49 | **4.84** | 3.79 | **0.68** | 2.11 | **0.16** | 1.37 | **0.06** | 0.95 | **0.02** | 350 |
| 400 | 14.81 | **17.31** | 9.71 | **6.20** | 4.33 | **0.87** | 2.41 | **0.21** | 1.56 | **0.07** | 1.09 | **0.03** | 400 |
| 450 | 16.66 | **21.53** | 10.92 | **7.71** | 4.87 | **1.08** | 2.71 | **0.26** | 1.76 | **0.09** | 1.23 | **0.04** | 450 |
| 500 | 18.51 | **26.17** | 12.14 | **9.37** | 5.41 | **1.31** | 3.01 | **0.32** | 1.95 | **0.11** | 1.36 | **0.05** | 500 |
| 550 | | | 13.35 | **11.18** | 5.95 | **1.57** | 3.31 | **0.38** | 2.15 | **0.13** | 1.50 | **0.05** | 550 |
| 600 | | | 14.56 | **13.14** | 6.49 | **1.84** | 3.61 | **0.44** | 2.34 | **0.15** | 1.63 | **0.06** | 600 |
| 650 | | | 15.78 | **15.24** | 7.03 | **2.14** | 3.92 | **0.51** | 2.54 | **0.18** | 1.77 | **0.07** | 650 |
| 700 | | | 16.99 | **17.48** | 7.58 | **2.45** | 4.22 | **0.59** | 2.73 | **0.21** | 1.91 | **0.09** | 700 |
| 750 | | | 18.20 | **19.86** | 8.12 | **2.78** | 4.52 | **0.67** | 2.93 | **0.23** | 2.04 | **0.10** | 750 |
| 800 | | | 19.42 | **22.38** | 8.66 | **3.14** | 4.82 | **0.75** | 3.12 | **0.26** | 2.18 | **0.11** | 800 |
| 900 | | | | | 9.74 | **3.90** | 5.42 | **0.94** | 3.52 | **0.33** | 2.45 | **0.14** | 900 |
| 1000 | | | | | 10.82 | **4.74** | 6.02 | **1.14** | 3.91 | **0.40** | 2.72 | **0.17** | 1000 |
| 1100 | | | | | 11.90 | **5.66** | 6.63 | **1.36** | 4.30 | **0.47** | 3.00 | **0.20** | 1100 |
| 1200 | | | | | 12.99 | **6.65** | 7.23 | **1.60** | 4.69 | **0.56** | 3.27 | **0.23** | 1200 |
| 1300 | | | | | 14.07 | **7.71** | 7.83 | **1.85** | 5.08 | **0.65** | 3.54 | **0.27** | 1300 |
| 1400 | | | | | 15.15 | **8.84** | 8.43 | **2.13** | 5.47 | **0.74** | 3.81 | **0.31** | 1400 |
| 1500 | | | | | 16.23 | **10.05** | 9.04 | **2.42** | 5.86 | **0.84** | 4.08 | **0.35** | 1500 |
| 1600 | | | | | 17.32 | **11.32** | 9.64 | **2.72** | 6.25 | **0.95** | 4.36 | **0.39** | 1600 |
| 1700 | | | | | 18.40 | **12.67** | 10.24 | **3.05** | 6.64 | **1.06** | 4.63 | **0.44** | 1700 |
| 1800 | | | | | 19.48 | **14.08** | 10.84 | **3.39** | 7.03 | **1.18** | 4.90 | **0.49** | 1800 |
| 2000 | | | | | | | 12.05 | **4.11** | 7.81 | **1.43** | 5.45 | **0.60** | 2000 |
| 2200 | | | | | | | 13.25 | **4.91** | 8.59 | **1.71** | 5.99 | **0.71** | 2200 |
| 2400 | | | | | | | 14.46 | **5.77** | 9.37 | **2.01** | 6.54 | **0.84** | 2400 |
| 2600 | | | | | | | 15.66 | **6.69** | 10.16 | **2.33** | 7.08 | **0.97** | 2600 |
| 2800 | | | | | | | 16.87 | **7.67** | 10.94 | **2.68** | 7.63 | **1.11** | 2800 |
| 3000 | | | | | | | 18.07 | **8.72** | 11.72 | **3.04** | 8.17 | **1.26** | 3000 |
| 3200 | | | | | | | 19.28 | **9.83** | 12.50 | **3.43** | 8.71 | **1.42** | 3200 |
| 3400 | | | | | | | | | 13.28 | **3.83** | 9.26 | **1.59** | 3400 |
| 3600 | | | | | | | | | 14.06 | **4.26** | 9.80 | **1.77** | 3600 |
| 3800 | | | | | | | | | 14.84 | **4.71** | 10.35 | **1.96** | 3800 |
| 4000 | | | | | | | | | 15.62 | **5.18** | 10.89 | **2.15** | 4000 |
| 4500 | | | | | | | | | 17.58 | **6.44** | 12.25 | **2.68** | 4500 |
| 5000 | | | | | | | | | 19.53 | **7.83** | 13.62 | **3.25** | 5000 |
| 5500 | | | | | | | | | | | 14.98 | **3.88** | 5500 |
| 6000 | | | | | | | | | | | 16.34 | **4.56** | 6000 |
| 6500 | | | | | | | | | | | 17.70 | **5.29** | 6500 |
| 7000 | | | | | | | | | | | 19.06 | **6.07** | 7000 |

**The shaded area represents velocities over 5 fps. Use with caution where water hammer is a concern.**

# CAST-IRON PIPE – CLASS 150

**C=100**

**Pressure Loss per 100' of Pipe (PSI)  Sizes 14" through 24"**

| Nominal Size | 14" | | 16" | | 18" | | 20" | | 24" | | Nominal Size |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe ID<br>Pipe O.D.<br>Wall Thick | 14.28<br>15.30<br>0.51 | | 16.32<br>17.40<br>0.54 | | 18.34<br>19.50<br>0.58 | | 20.36<br>21.60<br>0.62 | | 24.34<br>25.80<br>0.73 | | Pipe ID<br>Pipe O.D.<br>Wall Thick |
| Flow GPM | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Flow GPM |
| 200 | 0.40 | **0.00** | | | | | | | | | 200 |
| 300 | 0.60 | **0.01** | 0.46 | **0.00** | | | | | | | 300 |
| 400 | 0.80 | **0.01** | 0.61 | **0.01** | 0.49 | **0.00** | | | | | 400 |
| 500 | 1.00 | **0.02** | 0.77 | **0.01** | 0.61 | **0.01** | 0.49 | **0.00** | | | 500 |
| 600 | 1.20 | **0.03** | 0.92 | **0.02** | 0.73 | **0.01** | 0.59 | **0.01** | | | 600 |
| 700 | 1.40 | **0.04** | 1.07 | **0.02** | 0.85 | **0.01** | 0.69 | **0.01** | | | 700 |
| 800 | 1.60 | **0.05** | 1.23 | **0.03** | 0.97 | **0.02** | 0.79 | **0.01** | | | 800 |
| 900 | 1.80 | **0.06** | 1.38 | **0.03** | 1.09 | **0.02** | 0.89 | **0.01** | 0.62 | **0.00** | 900 |
| 1000 | 2.00 | **0.08** | 1.53 | **0.04** | 1.21 | **0.02** | 0.98 | **0.01** | 0.69 | **0.01** | 1000 |
| 1100 | 2.20 | **0.09** | 1.69 | **0.05** | 1.33 | **0.03** | 1.08 | **0.02** | 0.76 | **0.01** | 1100 |
| 1200 | 2.40 | **0.11** | 1.84 | **0.06** | 1.46 | **0.03** | 1.18 | **0.02** | 0.83 | **0.01** | 1200 |
| 1300 | 2.60 | **0.13** | 1.99 | **0.07** | 1.58 | **0.04** | 1.28 | **0.02** | 0.90 | **0.01** | 1300 |
| 1400 | 2.80 | **0.15** | 2.14 | **0.08** | 1.70 | **0.04** | 1.38 | **0.03** | 0.96 | **0.01** | 1400 |
| 1500 | 3.00 | **0.17** | 2.30 | **0.09** | 1.82 | **0.05** | 1.48 | **0.03** | 1.03 | **0.01** | 1500 |
| 1600 | 3.20 | **0.19** | 2.45 | **0.10** | 1.94 | **0.06** | 1.57 | **0.03** | 1.10 | **0.01** | 1600 |
| 1700 | 3.40 | **0.21** | 2.60 | **0.11** | 2.06 | **0.06** | 1.67 | **0.04** | 1.17 | **0.02** | 1700 |
| 1800 | 3.60 | **0.23** | 2.76 | **0.12** | 2.18 | **0.07** | 1.77 | **0.04** | 1.24 | **0.02** | 1800 |
| 1900 | 3.80 | **0.26** | 2.91 | **0.13** | 2.30 | **0.08** | 1.87 | **0.05** | 1.31 | **0.02** | 1900 |
| 2000 | 4.00 | **0.28** | 3.06 | **0.15** | 2.43 | **0.08** | 1.97 | **0.05** | 1.38 | **0.02** | 2000 |
| 2250 | 4.50 | **0.35** | 3.45 | **0.18** | 2.73 | **0.10** | 2.21 | **0.06** | 1.55 | **0.03** | 2250 |
| 2500 | 5.00 | **0.43** | 3.83 | **0.22** | 3.03 | **0.13** | 2.46 | **0.08** | 1.72 | **0.03** | 2500 |
| 2750 | 5.50 | **0.51** | 4.21 | **0.27** | 3.34 | **0.15** | 2.71 | **0.09** | 1.89 | **0.04** | 2750 |
| 3000 | 6.00 | **0.60** | 4.60 | **0.31** | 3.64 | **0.18** | 2.95 | **0.11** | 2.07 | **0.04** | 3000 |
| 3250 | 6.50 | **0.69** | 4.98 | **0.36** | 3.94 | **0.20** | 3.20 | **0.12** | 2.24 | **0.05** | 3250 |
| 3500 | 7.00 | **0.79** | 5.36 | **0.41** | 4.25 | **0.24** | 3.44 | **0.14** | 2.41 | **0.06** | 3500 |
| 3750 | 7.50 | **0.90** | 5.74 | **0.47** | 4.55 | **0.27** | 3.69 | **0.16** | 2.58 | **0.07** | 3750 |
| 4000 | 8.00 | **1.02** | 6.13 | **0.53** | 4.85 | **0.30** | 3.94 | **0.18** | 2.75 | **0.08** | 4000 |
| 4250 | 8.50 | **1.14** | 6.51 | **0.59** | 5.16 | **0.34** | 4.18 | **0.20** | 2.93 | **0.08** | 4250 |
| 4500 | 9.00 | **1.26** | 6.89 | **0.66** | 5.46 | **0.37** | 4.43 | **0.23** | 3.10 | **0.09** | 4500 |
| 4750 | 9.50 | **1.40** | 7.28 | **0.73** | 5.76 | **0.41** | 4.68 | **0.25** | 3.27 | **0.10** | 4750 |
| 5000 | 10.00 | **1.54** | 7.66 | **0.80** | 6.07 | **0.45** | 4.92 | **0.27** | 3.44 | **0.11** | 5000 |
| 5250 | 10.50 | **1.68** | 8.04 | **0.88** | 6.37 | **0.50** | 5.17 | **0.30** | 3.62 | **0.13** | 5250 |
| 5500 | 11.00 | **1.83** | 8.43 | **0.96** | 6.67 | **0.54** | 5.41 | **0.33** | 3.79 | **0.14** | 5500 |
| 5750 | 11.50 | **1.99** | 8.81 | **1.04** | 6.97 | **0.59** | 5.66 | **0.35** | 3.96 | **0.15** | 5750 |
| 6000 | 12.00 | **2.15** | 9.19 | **1.13** | 7.28 | **0.64** | 5.91 | **0.38** | 4.13 | **0.16** | 6000 |
| 6500 | 13.01 | **2.50** | 9.96 | **1.30** | 7.88 | **0.74** | 6.40 | **0.44** | 4.48 | **0.19** | 6500 |
| 7000 | 14.01 | **2.87** | 10.72 | **1.50** | 8.49 | **0.85** | 6.89 | **0.51** | 4.82 | **0.21** | 7000 |
| 7500 | 15.01 | **3.26** | 11.49 | **1.70** | 9.10 | **0.96** | 7.38 | **0.58** | 5.17 | **0.24** | 7500 |
| 8000 | 16.01 | **3.67** | 12.25 | **1.92** | 9.70 | **1.09** | 7.87 | **0.65** | 5.51 | **0.27** | 8000 |
| 8500 | 17.01 | **4.11** | 13.02 | **2.14** | 10.31 | **1.22** | 8.37 | **0.73** | 5.85 | **0.31** | 8500 |
| 9000 | 18.01 | **4.57** | 13.79 | **2.38** | 10.92 | **1.35** | 8.86 | **0.81** | 6.20 | **0.34** | 9000 |
| 10000 | | | 15.32 | **2.90** | 12.13 | **1.64** | 9.84 | **0.99** | 6.89 | **0.41** | 10000 |
| 11000 | | | 16.85 | **3.46** | 13.34 | **1.96** | 10.83 | **1.18** | 7.58 | **0.49** | 11000 |
| 12000 | | | 18.38 | **4.06** | 14.56 | **2.30** | 11.81 | **1.38** | 8.26 | **0.58** | 12000 |
| 13000 | | | 19.91 | **4.71** | 15.77 | **2.67** | 12.80 | **1.61** | 8.95 | **0.67** | 13000 |
| 14000 | | | | | 16.98 | **3.06** | 13.78 | **1.84** | 9.64 | **0.77** | 14000 |
| 15000 | | | | | 18.20 | **3.48** | 14.76 | **2.09** | 10.33 | **0.88** | 15000 |
| 16000 | | | | | 19.41 | **3.92** | 15.75 | **2.36** | 11.02 | **0.99** | 16000 |
| 17000 | | | | | | | 16.73 | **2.64** | 11.71 | **1.11** | 17000 |
| 18000 | | | | | | | 17.72 | **2.93** | 12.40 | **1.23** | 18000 |
| 19000 | | | | | | | 18.70 | **3.24** | 13.08 | **1.36** | 19000 |
| 20000 | | | | | | | 19.68 | **3.57** | 13.77 | **1.50** | 20000 |
| 21000 | | | | | | | | | 14.46 | **1.64** | 21000 |
| 22000 | | | | | | | | | 15.15 | **1.78** | 22000 |
| 23000 | | | | | | | | | 15.84 | **1.94** | 23000 |
| 24000 | | | | | | | | | 16.53 | **2.10** | 24000 |
| 25000 | | | | | | | | | 17.22 | **2.26** | 25000 |
| 26000 | | | | | | | | | 17.91 | **2.43** | 26000 |
| 27000 | | | | | | | | | 18.59 | **2.61** | 27000 |
| 28000 | | | | | | | | | 19.28 | **2.79** | 28000 |
| 29000 | | | | | | | | | 19.97 | **2.98** | 29000 |

**The shaded area represents velocities over 5 fps. Use with caution where water hammer is a concern.**

# CLASS 160 PVC IPS PLASTIC PIPE

**ASTM D2241 (1120, 1220) SDR 26 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | Class 315 1/2" | | Class 200 3/4" | | 1" | | 1 1/4" | | 1 1/2" | | 2" | | 2 1/2" | | 3" | | 4" | | 6" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 0.696 | | 0.910 | | 1.175 | | 1.512 | | 1.734 | | 2.173 | | 2.635 | | 3.21 | | 4.134 | | 6.084 | |
| Pipe OD | 0.840 | | 1.050 | | 1.315 | | 1.660 | | 1.900 | | 2.375 | | 2.875 | | 3.500 | | 4.500 | | 6.625 | |
| Avg. Wall | 0.072 | | 0.070 | | 0.070 | | 0.074 | | 0.083 | | 0.101 | | 0.120 | | 0.145 | | 0.183 | | 0.271 | |
| Min. Wall | 0.062 | | 0.060 | | 0.060 | | 0.064 | | 0.073 | | 0.091 | | 0.110 | | 0.135 | | 0.173 | | 0.255 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 1 | 0.84 | 0.25 | 0.49 | 0.07 | 0.30 | 0.02 | 0.18 | 0.01 | 0.14 | 0.00 | | | | | | | | | | |
| 2 | 1.68 | 0.90 | 0.99 | 0.24 | 0.59 | 0.07 | 0.36 | 0.02 | 0.27 | 0.01 | 0.17 | 0.00 | | | | | | | | |
| 3 | 2.53 | 1.90 | 1.48 | 0.52 | 0.89 | 0.15 | 0.54 | 0.04 | 0.41 | 0.02 | 0.26 | 0.01 | | | | | | | | |
| 4 | 3.37 | 3.24 | 1.97 | 0.88 | 1.18 | 0.25 | 0.71 | 0.07 | 0.54 | 0.04 | 0.35 | 0.01 | 0.24 | 0.00 | | | | | | |
| 5 | 4.21 | 4.89 | 2.46 | 1.33 | 1.48 | 0.38 | 0.89 | 0.11 | 0.68 | 0.06 | 0.43 | 0.02 | 0.29 | 0.01 | | | | | | |
| 6 | 5.05 | 6.86 | 2.96 | 1.86 | 1.77 | 0.54 | 1.07 | 0.16 | 0.81 | 0.08 | 0.52 | 0.03 | 0.35 | 0.01 | 0.24 | 0.00 | | | | |
| 7 | 5.90 | 9.12 | 3.45 | 2.47 | 2.07 | 0.71 | 1.25 | 0.21 | 0.95 | 0.11 | 0.60 | 0.04 | 0.41 | 0.01 | 0.28 | 0.01 | | | | |
| 8 | 6.74 | 11.68 | 3.94 | 3.17 | 2.36 | 0.91 | 1.43 | 0.27 | 1.09 | 0.14 | 0.69 | 0.05 | 0.47 | 0.02 | 0.32 | 0.01 | | | | |
| 9 | 7.58 | 14.53 | 4.43 | 3.94 | 2.66 | 1.14 | 1.61 | 0.33 | 1.22 | 0.17 | 0.78 | 0.06 | 0.53 | 0.02 | 0.36 | 0.01 | | | | |
| 10 | 8.42 | 17.66 | 4.93 | 4.79 | 2.96 | 1.38 | 1.78 | 0.40 | 1.36 | 0.21 | 0.86 | 0.07 | 0.59 | 0.03 | 0.40 | 0.01 | | | | |
| 12 | 10.11 | 24.75 | 5.91 | 6.71 | 3.55 | 1.94 | 2.14 | 0.57 | 1.63 | 0.29 | 1.04 | 0.10 | 0.71 | 0.04 | 0.48 | 0.01 | | | | |
| 14 | 11.79 | 32.93 | 6.90 | 8.93 | 4.14 | 2.58 | 2.50 | 0.76 | 1.90 | 0.39 | 1.21 | 0.13 | 0.82 | 0.05 | 0.55 | 0.02 | | | | |
| 16 | 13.48 | 42.16 | 7.88 | 11.44 | 4.73 | 3.30 | 2.86 | 0.97 | 2.17 | 0.50 | 1.38 | 0.17 | 0.94 | 0.06 | 0.63 | 0.02 | 0.38 | 0.01 | | |
| 18 | 15.16 | 52.44 | 8.87 | 14.23 | 5.32 | 4.10 | 3.21 | 1.20 | 2.44 | 0.62 | 1.56 | 0.21 | 1.06 | 0.08 | 0.71 | 0.03 | 0.43 | 0.01 | | |
| 20 | | | 9.85 | 17.29 | 5.91 | 4.99 | 3.57 | 1.46 | 2.71 | 0.75 | 1.73 | 0.25 | 1.18 | 0.10 | 0.79 | 0.04 | 0.48 | 0.01 | | |
| 22 | | | 10.84 | 20.63 | 6.50 | 5.95 | 3.93 | 1.74 | 2.99 | 0.90 | 1.90 | 0.30 | 1.29 | 0.12 | 0.87 | 0.04 | 0.53 | 0.01 | | |
| 24 | | | 11.82 | 24.24 | 7.09 | 6.99 | 4.28 | 2.05 | 3.26 | 1.05 | 2.07 | 0.35 | 1.41 | 0.14 | 0.95 | 0.05 | 0.57 | 0.02 | | |
| 26 | | | 12.81 | 28.11 | 7.68 | 8.11 | 4.64 | 2.38 | 3.53 | 1.22 | 2.25 | 0.41 | 1.53 | 0.16 | 1.03 | 0.06 | 0.62 | 0.02 | | |
| 28 | | | 13.80 | 32.25 | 8.27 | 9.30 | 5.00 | 2.73 | 3.80 | 1.40 | 2.42 | 0.47 | 1.65 | 0.18 | 1.11 | 0.07 | 0.67 | 0.02 | | |
| 30 | | | 14.78 | 36.64 | 8.87 | 10.57 | 5.35 | 3.10 | 4.07 | 1.59 | 2.59 | 0.53 | 1.76 | 0.21 | 1.19 | 0.08 | 0.72 | 0.02 | | |
| 32 | | | | | 9.46 | 11.91 | 5.71 | 3.49 | 4.34 | 1.79 | 2.76 | 0.60 | 1.88 | 0.23 | 1.27 | 0.09 | 0.76 | 0.03 | 0.35 | 0.00 |
| 34 | | | | | 10.05 | 13.32 | 6.07 | 3.91 | 4.61 | 2.01 | 2.94 | 0.67 | 2.00 | 0.26 | 1.35 | 0.10 | 0.81 | 0.03 | 0.37 | 0.00 |
| 36 | | | | | 10.64 | 14.81 | 6.42 | 4.34 | 4.88 | 2.23 | 3.11 | 0.74 | 2.12 | 0.29 | 1.43 | 0.11 | 0.86 | 0.03 | 0.40 | 0.00 |
| 38 | | | | | 11.23 | 16.37 | 6.78 | 4.80 | 5.16 | 2.46 | 3.28 | 0.82 | 2.23 | 0.32 | 1.50 | 0.12 | 0.91 | 0.04 | 0.42 | 0.01 |
| 40 | | | | | 11.82 | 18.00 | 7.14 | 5.28 | 5.43 | 2.71 | 3.46 | 0.90 | 2.35 | 0.35 | 1.58 | 0.14 | 0.95 | 0.04 | 0.44 | 0.01 |
| 42 | | | | | 12.41 | 19.70 | 7.50 | 5.78 | 5.70 | 2.97 | 3.63 | 0.99 | 2.47 | 0.39 | 1.66 | 0.15 | 1.00 | 0.04 | 0.46 | 0.01 |
| 44 | | | | | 13.00 | 21.47 | 7.85 | 6.30 | 5.97 | 3.23 | 3.80 | 1.08 | 2.59 | 0.42 | 1.74 | 0.16 | 1.05 | 0.05 | 0.48 | 0.01 |
| 46 | | | | | 13.59 | 23.32 | 8.21 | 6.84 | 6.24 | 3.51 | 3.97 | 1.17 | 2.70 | 0.46 | 1.82 | 0.18 | 1.10 | 0.05 | 0.51 | 0.01 |
| 48 | | | | | 14.18 | 25.23 | 8.57 | 7.40 | 6.51 | 3.80 | 4.15 | 1.27 | 2.82 | 0.50 | 1.90 | 0.19 | 1.15 | 0.06 | 0.53 | 0.01 |
| 50 | | | | | 14.78 | 27.21 | 8.92 | 7.98 | 6.78 | 4.10 | 4.32 | 1.37 | 2.94 | 0.53 | 1.98 | 0.20 | 1.19 | 0.06 | 0.55 | 0.01 |
| 55 | | | | | | | 9.82 | 9.52 | 7.46 | 4.89 | 4.75 | 1.63 | 3.23 | 0.64 | 2.18 | 0.24 | 1.31 | 0.07 | 0.61 | 0.01 |
| 60 | | | | | | | 10.71 | 11.18 | 8.14 | 5.74 | 5.18 | 1.91 | 3.53 | 0.75 | 2.38 | 0.29 | 1.43 | 0.08 | 0.66 | 0.01 |
| 65 | | | | | | | 11.60 | 12.97 | 8.82 | 6.66 | 5.62 | 2.22 | 3.82 | 0.87 | 2.57 | 0.33 | 1.55 | 0.10 | 0.72 | 0.01 |
| 70 | | | | | | | 12.49 | 14.88 | 9.50 | 7.64 | 6.05 | 2.55 | 4.11 | 1.00 | 2.77 | 0.38 | 1.67 | 0.11 | 0.77 | 0.02 |
| 75 | | | | | | | 13.38 | 16.90 | 10.18 | 8.68 | 6.48 | 2.89 | 4.41 | 1.13 | 2.97 | 0.43 | 1.79 | 0.13 | 0.83 | 0.02 |
| 80 | | | | | | | 14.28 | 19.05 | 10.86 | 9.78 | 6.91 | 3.26 | 4.70 | 1.28 | 3.17 | 0.49 | 1.91 | 0.14 | 0.88 | 0.02 |
| 85 | | | | | | | | | 11.53 | 10.94 | 7.34 | 3.65 | 4.99 | 1.43 | 3.37 | 0.55 | 2.03 | 0.16 | 0.94 | 0.02 |
| 90 | | | | | | | | | 12.21 | 12.16 | 7.78 | 4.06 | 5.29 | 1.59 | 3.56 | 0.61 | 2.15 | 0.18 | 0.99 | 0.03 |
| 95 | | | | | | | | | 12.89 | 13.45 | 8.21 | 4.48 | 5.58 | 1.76 | 3.76 | 0.67 | 2.27 | 0.20 | 1.05 | 0.03 |
| 100 | | | | | | | | | 13.57 | 14.79 | 8.64 | 4.93 | 5.88 | 1.93 | 3.96 | 0.74 | 2.39 | 0.22 | 1.10 | 0.03 |
| 110 | | | | | | | | | 14.93 | 17.64 | 9.50 | 5.88 | 6.46 | 2.30 | 4.36 | 0.88 | 2.63 | 0.26 | 1.21 | 0.04 |
| 120 | | | | | | | | | | | 10.37 | 6.91 | 7.05 | 2.71 | 4.75 | 1.04 | 2.86 | 0.30 | 1.32 | 0.05 |
| 130 | | | | | | | | | | | 11.23 | 8.02 | 7.64 | 3.14 | 5.15 | 1.20 | 3.10 | 0.35 | 1.43 | 0.05 |
| 140 | | | | | | | | | | | 12.10 | 9.20 | 8.23 | 3.60 | 5.54 | 1.38 | 3.34 | 0.40 | 1.54 | 0.06 |
| 150 | | | | | | | | | | | 12.96 | 10.45 | 8.81 | 4.09 | 5.94 | 1.57 | 3.58 | 0.46 | 1.65 | 0.07 |
| 160 | | | | | | | | | | | 13.82 | 11.77 | 9.40 | 4.61 | 6.34 | 1.76 | 3.82 | 0.52 | 1.76 | 0.08 |
| 170 | | | | | | | | | | | 14.69 | 13.17 | 9.99 | 5.16 | 6.73 | 1.97 | 4.06 | 0.58 | 1.87 | 0.09 |
| 180 | | | | | | | | | | | | | 10.58 | 5.73 | 7.13 | 2.19 | 4.30 | 0.64 | 1.98 | 0.10 |
| 190 | | | | | | | | | | | | | 11.16 | 6.34 | 7.52 | 2.42 | 4.54 | 0.71 | 2.09 | 0.11 |
| 200 | | | | | | | | | | | | | 11.75 | 6.97 | 7.92 | 2.67 | 4.77 | 0.78 | 2.20 | 0.12 |
| 220 | | | | | | | | | | | | | 12.93 | 8.31 | 8.71 | 3.18 | 5.25 | 0.93 | 2.42 | 0.14 |
| 240 | | | | | | | | | | | | | 14.10 | 9.77 | 9.50 | 3.74 | 5.73 | 1.09 | 2.65 | 0.17 |
| 260 | | | | | | | | | | | | | | | 10.29 | 4.33 | 6.21 | 1.27 | 2.87 | 0.19 |
| 280 | | | | | | | | | | | | | | | 11.09 | 4.97 | 6.68 | 1.45 | 3.09 | 0.22 |
| 300 | | | | | | | | | | | | | | | 11.88 | 5.65 | 7.16 | 1.65 | 3.31 | 0.25 |
| 320 | | | | | | | | | | | | | | | 12.67 | 6.37 | 7.64 | 1.86 | 3.53 | 0.28 |
| 340 | | | | | | | | | | | | | | | 13.46 | 7.12 | 8.12 | 2.08 | 3.75 | 0.32 |
| 360 | | | | | | | | | | | | | | | 14.25 | 7.92 | 8.59 | 2.31 | 3.97 | 0.35 |
| 380 | | | | | | | | | | | | | | | | | 9.07 | 2.56 | 4.19 | 0.39 |
| 400 | | | | | | | | | | | | | | | | | 9.55 | 2.81 | 4.41 | 0.43 |
| 420 | | | | | | | | | | | | | | | | | 10.03 | 3.08 | 4.63 | 0.47 |
| 440 | | | | | | | | | | | | | | | | | 10.50 | 3.35 | 4.85 | 0.51 |
| 460 | | | | | | | | | | | | | | | | | 10.98 | 3.64 | 5.07 | 0.56 |
| 480 | | | | | | | | | | | | | | | | | 11.46 | 3.94 | 5.29 | 0.60 |
| 500 | | | | | | | | | | | | | | | | | 11.94 | 4.25 | 5.51 | 0.65 |

The shaded area represents velocities over 5 fps. Use with caution.

# CLASS 160 PVC IPS PLASTIC PIPE

**ANSI/ASAE S376.2 ASTM 2241 SDR 26 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 6" | | 8" | | 10" | | 12" | | 14" | | 16" | | 18" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 6.084 | | 7.921 | | 9.874 | | 11.710 | | 12.860 | | 14.696 | | 16.532 | |
| Pipe OD | 6.625 | | 8.625 | | 10.750 | | 12.750 | | 14.000 | | 16.000 | | 18.000 | |
| Avg. Wall | 0.271 | | 0.352 | | 0.438 | | 0.520 | | 0.570 | | 0.652 | | 0.734 | |
| Min. Wall | 0.255 | | 0.332 | | 0.413 | | 0.490 | | 0.538 | | 0.615 | | 0.692 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 20 | 0.22 | 0.00 | 0.13 | 0.00 | 0.08 | 0.00 | 0.06 | 0.00 | 0.05 | 0.00 | 0.04 | 0.00 | 0.03 | 0.00 |
| 40 | 0.44 | 0.01 | 0.26 | 0.00 | 0.17 | 0.00 | 0.12 | 0.00 | 0.10 | 0.00 | 0.08 | 0.00 | 0.06 | 0.00 |
| 60 | 0.66 | 0.01 | 0.39 | 0.00 | 0.25 | 0.00 | 0.18 | 0.00 | 0.15 | 0.00 | 0.11 | 0.00 | 0.09 | 0.00 |
| 80 | 0.88 | 0.02 | 0.52 | 0.01 | 0.33 | 0.00 | 0.24 | 0.00 | 0.20 | 0.00 | 0.15 | 0.00 | 0.12 | 0.00 |
| 100 | 1.10 | 0.03 | 0.65 | 0.01 | 0.42 | 0.00 | 0.30 | 0.00 | 0.25 | 0.00 | 0.19 | 0.00 | 0.15 | 0.00 |
| 150 | 1.65 | 0.07 | 0.98 | 0.02 | 0.63 | 0.01 | 0.45 | 0.00 | 0.37 | 0.00 | 0.28 | 0.00 | 0.22 | 0.00 |
| 200 | 2.20 | 0.12 | 1.30 | 0.03 | 0.84 | 0.01 | 0.60 | 0.00 | 0.49 | 0.00 | 0.38 | 0.00 | 0.30 | 0.00 |
| 250 | 2.76 | 0.18 | 1.63 | 0.05 | 1.05 | 0.02 | 0.74 | 0.01 | 0.62 | 0.00 | 0.47 | 0.00 | 0.37 | 0.00 |
| 300 | 3.31 | 0.25 | 1.95 | 0.07 | 1.26 | 0.02 | 0.89 | 0.01 | 0.74 | 0.01 | 0.57 | 0.00 | 0.45 | 0.00 |
| 350 | 3.86 | 0.33 | 2.28 | 0.09 | 1.46 | 0.03 | 1.04 | 0.01 | 0.86 | 0.01 | 0.66 | 0.00 | 0.52 | 0.00 |
| 400 | 4.41 | 0.43 | 2.60 | 0.12 | 1.67 | 0.04 | 1.19 | 0.02 | 0.99 | 0.01 | 0.76 | 0.01 | 0.60 | 0.00 |
| 450 | 4.96 | 0.53 | 2.93 | 0.15 | 1.88 | 0.05 | 1.34 | 0.02 | 1.11 | 0.01 | 0.85 | 0.01 | 0.67 | 0.00 |
| 500 | 5.51 | 0.65 | 3.25 | 0.18 | 2.09 | 0.06 | 1.49 | 0.03 | 1.23 | 0.02 | 0.94 | 0.01 | 0.75 | 0.01 |
| 550 | 6.06 | 0.77 | 3.58 | 0.21 | 2.30 | 0.07 | 1.64 | 0.03 | 1.36 | 0.02 | 1.04 | 0.01 | 0.82 | 0.01 |
| 600 | 6.61 | 0.91 | 3.90 | 0.25 | 2.51 | 0.09 | 1.79 | 0.04 | 1.48 | 0.02 | 1.13 | 0.01 | 0.90 | 0.01 |
| 650 | 7.16 | 1.05 | 4.23 | 0.29 | 2.72 | 0.10 | 1.93 | 0.04 | 1.60 | 0.03 | 1.23 | 0.01 | 0.97 | 0.01 |
| 700 | 7.72 | 1.21 | 4.55 | 0.33 | 2.93 | 0.11 | 2.08 | 0.05 | 1.73 | 0.03 | 1.32 | 0.02 | 1.04 | 0.01 |
| 750 | 8.27 | 1.37 | 4.88 | 0.38 | 3.14 | 0.13 | 2.23 | 0.06 | 1.85 | 0.04 | 1.42 | 0.02 | 1.12 | 0.01 |
| 800 | 8.82 | 1.55 | 5.20 | 0.43 | 3.35 | 0.15 | 2.38 | 0.06 | 1.97 | 0.04 | 1.51 | 0.02 | 1.19 | 0.01 |
| 850 | 9.37 | 1.73 | 5.53 | 0.48 | 3.56 | 0.16 | 2.53 | 0.07 | 2.10 | 0.05 | 1.61 | 0.02 | 1.27 | 0.01 |
| 900 | | | 5.85 | 0.53 | 3.77 | 0.18 | 2.68 | 0.08 | 2.22 | 0.05 | 1.70 | 0.03 | 1.34 | 0.01 |
| 950 | | | 6.18 | 0.59 | 3.98 | 0.20 | 2.83 | 0.09 | 2.34 | 0.06 | 1.79 | 0.03 | 1.42 | 0.02 |
| 1000 | | | 6.50 | 0.65 | 4.18 | 0.22 | 2.98 | 0.10 | 2.47 | 0.06 | 1.89 | 0.03 | 1.49 | 0.02 |
| 1050 | | | 6.83 | 0.71 | 4.39 | 0.24 | 3.12 | 0.11 | 2.59 | 0.07 | 1.98 | 0.04 | 1.57 | 0.02 |
| 1100 | | | 7.15 | 0.77 | 4.60 | 0.26 | 3.27 | 0.12 | 2.71 | 0.07 | 2.08 | 0.04 | 1.64 | 0.02 |
| 1150 | | | | | 4.81 | 0.29 | 3.42 | 0.13 | 2.84 | 0.08 | 2.17 | 0.04 | 1.72 | 0.02 |
| 1200 | | | | | 5.02 | 0.31 | 3.57 | 0.14 | 2.96 | 0.09 | 2.27 | 0.04 | 1.79 | 0.03 |
| 1250 | | | | | 5.23 | 0.34 | 3.72 | 0.15 | 3.08 | 0.09 | 2.36 | 0.05 | 1.87 | 0.03 |
| 1300 | | | | | 5.44 | 0.36 | 3.87 | 0.16 | 3.21 | 0.10 | 2.46 | 0.05 | 1.94 | 0.03 |
| 1350 | | | | | 5.65 | 0.39 | 4.02 | 0.17 | 3.33 | 0.11 | 2.55 | 0.06 | 2.02 | 0.03 |
| 1400 | | | | | 5.86 | 0.41 | 4.17 | 0.18 | 3.45 | 0.11 | 2.64 | 0.06 | 2.09 | 0.03 |
| 1450 | | | | | 6.07 | 0.44 | 4.31 | 0.19 | 3.58 | 0.12 | 2.74 | 0.06 | 2.16 | 0.04 |
| 1500 | | | | | 6.28 | 0.47 | 4.46 | 0.20 | 3.70 | 0.13 | 2.83 | 0.07 | 2.24 | 0.04 |
| 1600 | | | | | 6.70 | 0.53 | 4.76 | 0.23 | 3.95 | 0.15 | 3.02 | 0.08 | 2.39 | 0.04 |
| 1700 | | | | | 7.11 | 0.59 | 5.06 | 0.26 | 4.19 | 0.16 | 3.21 | 0.09 | 2.54 | 0.05 |
| 1800 | | | | | | | 5.36 | 0.29 | 4.44 | 0.18 | 3.40 | 0.10 | 2.69 | 0.05 |
| 1900 | | | | | | | 5.65 | 0.32 | 4.69 | 0.20 | 3.59 | 0.11 | 2.84 | 0.06 |
| 2000 | | | | | | | 5.95 | 0.35 | 4.93 | 0.22 | 3.78 | 0.12 | 2.99 | 0.07 |
| 2100 | | | | | | | 6.25 | 0.38 | 5.18 | 0.24 | 3.97 | 0.13 | 3.13 | 0.07 |
| 2200 | | | | | | | 6.55 | 0.42 | 5.43 | 0.26 | 4.16 | 0.14 | 3.28 | 0.08 |
| 2300 | | | | | | | 6.84 | 0.45 | 5.67 | 0.29 | 4.34 | 0.15 | 3.43 | 0.08 |
| 2400 | | | | | | | 7.14 | 0.49 | 5.92 | 0.31 | 4.53 | 0.16 | 3.58 | 0.09 |
| 2500 | | | | | | | 7.44 | 0.53 | 6.17 | 0.33 | 4.72 | 0.17 | 3.73 | 0.10 |
| 2600 | | | | | | | 7.74 | 0.57 | 6.41 | 0.36 | 4.91 | 0.19 | 3.88 | 0.11 |
| 2700 | | | | | | | 8.03 | 0.61 | 6.66 | 0.39 | 5.10 | 0.20 | 4.03 | 0.11 |
| 2800 | | | | | | | 8.33 | 0.65 | 6.91 | 0.41 | 5.29 | 0.22 | 4.18 | 0.12 |
| 2900 | | | | | | | 8.63 | 0.69 | 7.15 | 0.44 | 5.48 | 0.23 | 4.33 | 0.13 |
| 3000 | | | | | | | 8.93 | 0.74 | 7.40 | 0.47 | 5.67 | 0.24 | 4.48 | 0.14 |
| 3100 | | | | | | | 9.22 | 0.79 | 7.65 | 0.50 | 5.86 | 0.26 | 4.63 | 0.15 |
| 3200 | | | | | | | 9.52 | 0.83 | 7.89 | 0.53 | 6.05 | 0.28 | 4.78 | 0.16 |
| 3300 | | | | | | | | | 8.14 | 0.56 | 6.23 | 0.29 | 4.93 | 0.16 |
| 3400 | | | | | | | | | 8.39 | 0.59 | 6.42 | 0.31 | 5.08 | 0.17 |
| 3500 | | | | | | | | | 8.63 | 0.62 | 6.61 | 0.33 | 5.22 | 0.18 |
| 3600 | | | | | | | | | 8.88 | 0.66 | 6.80 | 0.34 | 5.37 | 0.19 |
| 3700 | | | | | | | | | 9.13 | 0.69 | 6.99 | 0.36 | 5.52 | 0.20 |
| 3800 | | | | | | | | | | | 7.18 | 0.38 | 5.67 | 0.21 |
| 3900 | | | | | | | | | | | 7.37 | 0.40 | 5.82 | 0.22 |
| 4000 | | | | | | | | | | | 7.56 | 0.42 | 5.97 | 0.24 |
| 4100 | | | | | | | | | | | 7.75 | 0.44 | 6.12 | 0.25 |
| 4200 | | | | | | | | | | | 7.93 | 0.46 | 6.27 | 0.26 |
| 4300 | | | | | | | | | | | | | 6.42 | 0.27 |
| 4400 | | | | | | | | | | | | | 6.57 | 0.28 |
| 4500 | | | | | | | | | | | | | 6.72 | 0.29 |
| 4600 | | | | | | | | | | | | | 6.87 | 0.30 |
| 4700 | | | | | | | | | | | | | 7.02 | 0.32 |

**The shaded area represents velocities over 5 fps. Use with caution.**

# CLASS 200 PVC IPS PLASTIC PIPE

**ASTM D2241 (1120, 1220) SDR 21 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | Class 315 1/2" | | 3/4" | | 1" | | 1 1/4" | | 1 1/2" | | 2" | | 2 1/2" | | 3" | | 4" | | 6" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 0.696 | | 0.910 | | 1.169 | | 1.482 | | 1.700 | | 2.129 | | 2.581 | | 3.146 | | 4.046 | | 5.955 | |
| Pipe OD | 0.840 | | 1.050 | | 1.315 | | 1.660 | | 1.900 | | 2.375 | | 2.875 | | 3.500 | | 4.500 | | 6.625 | |
| Avg.Wall | 0.072 | | 0.070 | | 0.073 | | 0.089 | | 0.100 | | 0.123 | | 0.147 | | 0.177 | | 0.227 | | 0.335 | |
| Min. Wall | 0.062 | | 0.060 | | 0.063 | | 0.079 | | 0.090 | | 0.113 | | 0.137 | | 0.167 | | 0.214 | | 0.316 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 1 | 0.84 | 0.25 | 0.49 | 0.07 | 0.30 | 0.02 | 0.19 | 0.01 | 0.14 | 0.00 | | | | | | | | | | |
| 2 | 1.68 | 0.90 | 0.99 | 0.24 | 0.60 | 0.07 | 0.37 | 0.02 | 0.28 | 0.01 | 0.18 | 0.00 | | | | | | | | |
| 3 | 2.53 | 1.90 | 1.48 | 0.52 | 0.90 | 0.15 | 0.56 | 0.05 | 0.42 | 0.02 | 0.27 | 0.01 | | | | | | | | |
| 4 | 3.37 | 3.24 | 1.97 | 0.88 | 1.19 | 0.26 | 0.74 | 0.08 | 0.56 | 0.04 | 0.36 | 0.01 | 0.24 | 0.01 | | | | | | |
| 5 | 4.21 | 4.89 | 2.46 | 1.33 | 1.49 | 0.39 | 0.93 | 0.12 | 0.71 | 0.06 | 0.45 | 0.02 | 0.31 | 0.01 | | | | | | |
| 6 | 5.05 | 6.86 | 2.96 | 1.86 | 1.79 | 0.55 | 1.11 | 0.17 | 0.85 | 0.09 | 0.54 | 0.03 | 0.37 | 0.01 | 0.25 | 0.00 | | | | |
| 7 | 5.90 | 9.12 | 3.45 | 2.47 | 2.09 | 0.73 | 1.30 | 0.23 | 0.99 | 0.12 | 0.63 | 0.04 | 0.43 | 0.02 | 0.29 | 0.01 | | | | |
| 8 | 6.74 | 11.68 | 3.94 | 3.17 | 2.39 | 0.94 | 1.49 | 0.30 | 1.13 | 0.15 | 0.72 | 0.05 | 0.49 | 0.02 | 0.33 | 0.01 | | | | |
| 9 | 7.58 | 14.53 | 4.43 | 3.94 | 2.69 | 1.17 | 1.67 | 0.37 | 1.27 | 0.19 | 0.81 | 0.06 | 0.55 | 0.02 | 0.37 | 0.01 | | | | |
| 10 | 8.42 | 17.66 | 4.93 | 4.79 | 2.99 | 1.42 | 1.86 | 0.45 | 1.41 | 0.23 | 0.90 | 0.08 | 0.61 | 0.03 | 0.41 | 0.01 | | | | |
| 12 | 10.11 | 24.75 | 5.91 | 6.71 | 3.58 | 1.98 | 2.23 | 0.63 | 1.69 | 0.32 | 1.08 | 0.11 | 0.73 | 0.04 | 0.49 | 0.02 | | | | |
| 14 | 11.79 | 32.93 | 6.90 | 8.93 | 4.18 | 2.64 | 2.60 | 0.83 | 1.98 | 0.43 | 1.26 | 0.14 | 0.86 | 0.06 | 0.58 | 0.02 | | | | |
| 16 | 13.48 | 42.16 | 7.88 | 11.44 | 4.78 | 3.38 | 2.97 | 1.07 | 2.26 | 0.55 | 1.44 | 0.18 | 0.98 | 0.07 | 0.66 | 0.03 | 0.40 | 0.01 | | |
| 18 | 15.16 | 52.44 | 8.87 | 14.23 | 5.37 | 4.21 | 3.34 | 1.33 | 2.54 | 0.68 | 1.62 | 0.23 | 1.10 | 0.09 | 0.74 | 0.03 | 0.45 | 0.01 | | |
| 20 | | | 9.85 | 17.29 | 5.97 | 5.11 | 3.72 | 1.61 | 2.82 | 0.83 | 1.80 | 0.28 | 1.22 | 0.11 | 0.82 | 0.04 | 0.50 | 0.01 | | |
| 22 | | | 10.84 | 20.63 | 6.57 | 6.10 | 4.09 | 1.92 | 3.11 | 0.99 | 1.98 | 0.33 | 1.35 | 0.13 | 0.91 | 0.05 | 0.55 | 0.01 | | |
| 24 | | | 11.82 | 24.24 | 7.17 | 7.17 | 4.46 | 2.26 | 3.39 | 1.16 | 2.16 | 0.39 | 1.47 | 0.15 | 0.99 | 0.06 | 0.60 | 0.02 | | |
| 26 | | | 12.81 | 28.11 | 7.76 | 8.31 | 4.83 | 2.62 | 3.67 | 1.34 | 2.34 | 0.45 | 1.59 | 0.18 | 1.07 | 0.07 | 0.65 | 0.02 | | |
| 28 | | | 13.80 | 32.25 | 8.36 | 9.53 | 5.20 | 3.01 | 3.95 | 1.54 | 2.52 | 0.52 | 1.71 | 0.20 | 1.15 | 0.08 | 0.70 | 0.02 | | |
| 30 | | | 14.78 | 36.64 | 8.96 | 10.83 | 5.57 | 3.41 | 4.24 | 1.75 | 2.70 | 0.59 | 1.84 | 0.23 | 1.24 | 0.09 | 0.75 | 0.03 | | |
| 32 | | | | | 9.55 | 12.21 | 5.94 | 3.85 | 4.52 | 1.97 | 2.88 | 0.66 | 1.96 | 0.26 | 1.32 | 0.10 | 0.80 | 0.03 | 0.37 | 0.00 |
| 34 | | | | | 10.15 | 13.66 | 6.32 | 4.31 | 4.80 | 2.21 | 3.06 | 0.74 | 2.08 | 0.29 | 1.40 | 0.11 | 0.85 | 0.03 | 0.39 | 0.00 |
| 36 | | | | | 10.75 | 15.18 | 6.69 | 4.79 | 5.08 | 2.45 | 3.24 | 0.82 | 2.20 | 0.32 | 1.48 | 0.12 | 0.90 | 0.04 | 0.41 | 0.01 |
| 38 | | | | | 11.35 | 16.78 | 7.06 | 5.29 | 5.36 | 2.71 | 3.42 | 0.91 | 2.33 | 0.36 | 1.57 | 0.14 | 0.95 | 0.04 | 0.44 | 0.01 |
| 40 | | | | | 11.94 | 18.45 | 7.43 | 5.82 | 5.65 | 2.98 | 3.60 | 1.00 | 2.45 | 0.39 | 1.65 | 0.15 | 1.00 | 0.04 | 0.46 | 0.01 |
| 42 | | | | | 12.54 | 20.20 | 7.80 | 6.37 | 5.93 | 3.27 | 3.78 | 1.09 | 2.57 | 0.43 | 1.73 | 0.16 | 1.05 | 0.05 | 0.48 | 0.01 |
| 44 | | | | | 13.14 | 22.02 | 8.17 | 6.94 | 6.21 | 3.56 | 3.96 | 1.19 | 2.69 | 0.47 | 1.81 | 0.18 | 1.10 | 0.05 | 0.51 | 0.01 |
| 46 | | | | | 13.73 | 23.91 | 8.55 | 7.54 | 6.49 | 3.86 | 4.14 | 1.29 | 2.82 | 0.51 | 1.90 | 0.19 | 1.15 | 0.06 | 0.53 | 0.01 |
| 48 | | | | | 14.33 | 25.87 | 8.92 | 8.15 | 6.78 | 4.18 | 4.32 | 1.40 | 2.94 | 0.55 | 1.98 | 0.21 | 1.20 | 0.06 | 0.55 | 0.01 |
| 50 | | | | | 14.93 | 27.90 | 9.29 | 8.79 | 7.06 | 4.51 | 4.50 | 1.51 | 3.06 | 0.59 | 2.06 | 0.23 | 1.25 | 0.07 | 0.58 | 0.01 |
| 55 | | | | | | | 10.22 | 10.49 | 7.76 | 5.38 | 4.95 | 1.80 | 3.37 | 0.71 | 2.27 | 0.27 | 1.37 | 0.08 | 0.63 | 0.01 |
| 60 | | | | | | | 11.15 | 12.33 | 8.47 | 6.32 | 5.40 | 2.11 | 3.67 | 0.83 | 2.47 | 0.32 | 1.50 | 0.09 | 0.69 | 0.01 |
| 65 | | | | | | | 12.07 | 14.30 | 9.18 | 7.33 | 5.85 | 2.45 | 3.98 | 0.96 | 2.68 | 0.37 | 1.62 | 0.11 | 0.75 | 0.02 |
| 70 | | | | | | | 13.00 | 16.40 | 9.88 | 8.41 | 6.30 | 2.81 | 4.29 | 1.10 | 2.89 | 0.42 | 1.74 | 0.12 | 0.81 | 0.02 |
| 75 | | | | | | | 13.93 | 18.63 | 10.59 | 9.56 | 6.75 | 3.20 | 4.59 | 1.25 | 3.09 | 0.48 | 1.87 | 0.14 | 0.86 | 0.02 |
| 80 | | | | | | | 14.86 | 21.00 | 11.29 | 10.77 | 7.20 | 3.60 | 4.90 | 1.41 | 3.30 | 0.54 | 1.99 | 0.16 | 0.92 | 0.02 |
| 85 | | | | | | | | | 12.00 | 12.05 | 7.65 | 4.03 | 5.21 | 1.58 | 3.50 | 0.60 | 2.12 | 0.18 | 0.98 | 0.03 |
| 90 | | | | | | | | | 12.71 | 13.40 | 8.10 | 4.48 | 5.51 | 1.76 | 3.71 | 0.67 | 2.24 | 0.20 | 1.04 | 0.03 |
| 95 | | | | | | | | | 13.41 | 14.81 | 8.55 | 4.95 | 5.82 | 1.94 | 3.92 | 0.74 | 2.37 | 0.22 | 1.09 | 0.03 |
| 100 | | | | | | | | | 14.12 | 16.28 | 9.00 | 5.45 | 6.12 | 2.13 | 4.12 | 0.81 | 2.49 | 0.24 | 1.15 | 0.04 |
| 110 | | | | | | | | | | | 9.90 | 6.50 | 6.74 | 2.55 | 4.53 | 0.97 | 2.74 | 0.29 | 1.27 | 0.04 |
| 120 | | | | | | | | | | | 10.80 | 7.63 | 7.35 | 2.99 | 4.95 | 1.14 | 2.99 | 0.34 | 1.38 | 0.05 |
| 130 | | | | | | | | | | | 11.70 | 8.85 | 7.96 | 3.47 | 5.36 | 1.32 | 3.24 | 0.39 | 1.50 | 0.06 |
| 140 | | | | | | | | | | | 12.60 | 10.16 | 8.57 | 3.98 | 5.77 | 1.52 | 3.49 | 0.45 | 1.61 | 0.07 |
| 150 | | | | | | | | | | | 13.50 | 11.54 | 9.19 | 4.52 | 6.18 | 1.73 | 3.74 | 0.51 | 1.73 | 0.08 |
| 160 | | | | | | | | | | | 14.40 | 13.01 | 9.80 | 5.10 | 6.60 | 1.95 | 3.99 | 0.57 | 1.84 | 0.09 |
| 170 | | | | | | | | | | | | | 10.41 | 5.70 | 7.01 | 2.18 | 4.24 | 0.64 | 1.96 | 0.10 |
| 180 | | | | | | | | | | | | | 11.02 | 6.34 | 7.42 | 2.42 | 4.49 | 0.71 | 2.07 | 0.11 |
| 190 | | | | | | | | | | | | | 11.64 | 7.01 | 7.83 | 2.67 | 4.74 | 0.79 | 2.19 | 0.12 |
| 200 | | | | | | | | | | | | | 12.25 | 7.71 | 8.24 | 2.94 | 4.98 | 0.86 | 2.30 | 0.13 |
| 220 | | | | | | | | | | | | | 13.47 | 9.19 | 9.07 | 3.51 | 5.48 | 1.03 | 2.53 | 0.16 |
| 240 | | | | | | | | | | | | | 14.70 | 10.80 | 9.89 | 4.12 | 5.98 | 1.21 | 2.76 | 0.18 |
| 260 | | | | | | | | | | | | | | | 10.72 | 4.78 | 6.48 | 1.41 | 2.99 | 0.21 |
| 280 | | | | | | | | | | | | | | | 11.54 | 5.48 | 6.98 | 1.61 | 3.22 | 0.25 |
| 300 | | | | | | | | | | | | | | | 12.37 | 6.23 | 7.48 | 1.83 | 3.45 | 0.28 |
| 320 | | | | | | | | | | | | | | | 13.19 | 7.02 | 7.98 | 2.06 | 3.68 | 0.31 |
| 340 | | | | | | | | | | | | | | | 14.02 | 7.86 | 8.47 | 2.31 | 3.91 | 0.35 |
| 360 | | | | | | | | | | | | | | | 14.84 | 8.73 | 8.97 | 2.57 | 4.14 | 0.39 |
| 380 | | | | | | | | | | | | | | | | | 9.47 | 2.84 | 4.37 | 0.43 |
| 400 | | | | | | | | | | | | | | | | | 9.97 | 3.12 | 4.60 | 0.48 |
| 420 | | | | | | | | | | | | | | | | | 10.47 | 3.42 | 4.83 | 0.52 |
| 440 | | | | | | | | | | | | | | | | | 10.97 | 3.72 | 5.06 | 0.57 |
| 460 | | | | | | | | | | | | | | | | | 11.46 | 4.04 | 5.29 | 0.62 |
| 480 | | | | | | | | | | | | | | | | | 11.96 | 4.37 | 5.52 | 0.67 |
| 500 | | | | | | | | | | | | | | | | | 12.46 | 4.72 | 5.75 | 0.72 |

**The shaded area represents velocities over 5 fps. Use with caution.**

# CLASS 200 PVC IPS PLASTIC PIPE

**ANSI/ASAE S376.2 ASTM 2241 SDR 21 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 6" | | 8" | | 10" | | 12" | | 14" | | 16" | | 18" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 5.955 | | 7.755 | | 9.666 | | 11.464 | | 12.588 | | 14.384 | | 15.246 | |
| Pipe OD | 6.625 | | 8.625 | | 10.750 | | 12.750 | | 14.000 | | 16.000 | | 18.000 | |
| Avg. Wall | 0.335 | | 0.435 | | 0.542 | | 0.643 | | 0.706 | | 0.808 | | 1.377 | |
| Min. Wall | 0.316 | | 0.410 | | 0.511 | | 0.606 | | 0.666 | | 0.762 | | 0.857 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 20 | 0.23 | 0.00 | 0.14 | 0.00 | 0.09 | 0.00 | 0.06 | 0.00 | 0.05 | 0.00 | 0.04 | 0.00 | 0.04 | 0.00 |
| 40 | 0.46 | 0.01 | 0.27 | 0.00 | 0.17 | 0.00 | 0.12 | 0.00 | 0.10 | 0.00 | 0.08 | 0.00 | 0.07 | 0.00 |
| 60 | 0.69 | 0.01 | 0.41 | 0.00 | 0.26 | 0.00 | 0.19 | 0.00 | 0.15 | 0.00 | 0.12 | 0.00 | 0.11 | 0.00 |
| 80 | 0.92 | 0.02 | 0.54 | 0.01 | 0.35 | 0.00 | 0.25 | 0.00 | 0.21 | 0.00 | 0.16 | 0.00 | 0.14 | 0.00 |
| 100 | 1.15 | 0.04 | 0.68 | 0.01 | 0.44 | 0.00 | 0.31 | 0.00 | 0.26 | 0.00 | 0.20 | 0.00 | 0.18 | 0.00 |
| 150 | 1.73 | 0.08 | 1.02 | 0.02 | 0.66 | 0.01 | 0.47 | 0.00 | 0.39 | 0.00 | 0.30 | 0.00 | 0.26 | 0.00 |
| 200 | 2.30 | 0.13 | 1.36 | 0.04 | 0.87 | 0.01 | 0.62 | 0.01 | 0.51 | 0.00 | 0.39 | 0.00 | 0.35 | 0.00 |
| 250 | 2.88 | 0.20 | 1.70 | 0.06 | 1.09 | 0.02 | 0.78 | 0.01 | 0.64 | 0.01 | 0.49 | 0.00 | 0.44 | 0.00 |
| 300 | 3.45 | 0.28 | 2.04 | 0.08 | 1.31 | 0.03 | 0.93 | 0.01 | 0.77 | 0.01 | 0.59 | 0.00 | 0.53 | 0.00 |
| 350 | 4.03 | 0.37 | 2.37 | 0.10 | 1.53 | 0.04 | 1.09 | 0.02 | 0.90 | 0.01 | 0.69 | 0.01 | 0.61 | 0.00 |
| 400 | 4.60 | 0.48 | 2.71 | 0.13 | 1.75 | 0.05 | 1.24 | 0.02 | 1.03 | 0.01 | 0.79 | 0.01 | 0.70 | 0.00 |
| 450 | 5.18 | 0.59 | 3.05 | 0.16 | 1.97 | 0.06 | 1.40 | 0.02 | 1.16 | 0.02 | 0.89 | 0.01 | 0.79 | 0.01 |
| 500 | 5.75 | 0.72 | 3.39 | 0.20 | 2.18 | 0.07 | 1.55 | 0.03 | 1.29 | 0.02 | 0.99 | 0.01 | 0.88 | 0.01 |
| 550 | 6.33 | 0.86 | 3.73 | 0.24 | 2.40 | 0.08 | 1.71 | 0.04 | 1.42 | 0.02 | 1.08 | 0.01 | 0.97 | 0.01 |
| 600 | 6.90 | 1.01 | 4.07 | 0.28 | 2.62 | 0.10 | 1.86 | 0.04 | 1.54 | 0.03 | 1.18 | 0.01 | 1.05 | 0.01 |
| 650 | 7.48 | 1.17 | 4.41 | 0.32 | 2.84 | 0.11 | 2.02 | 0.05 | 1.67 | 0.03 | 1.28 | 0.02 | 1.14 | 0.01 |
| 700 | 8.05 | 1.34 | 4.75 | 0.37 | 3.06 | 0.13 | 2.17 | 0.06 | 1.80 | 0.04 | 1.38 | 0.02 | 1.23 | 0.01 |
| 750 | 8.63 | 1.52 | 5.09 | 0.42 | 3.28 | 0.14 | 2.33 | 0.06 | 1.93 | 0.04 | 1.48 | 0.02 | 1.32 | 0.02 |
| 800 | 9.20 | 1.72 | 5.43 | 0.48 | 3.49 | 0.16 | 2.48 | 0.07 | 2.06 | 0.04 | 1.58 | 0.02 | 1.40 | 0.02 |
| 850 | 9.78 | 1.92 | 5.77 | 0.53 | 3.71 | 0.18 | 2.64 | 0.08 | 2.19 | 0.05 | 1.68 | 0.03 | 1.49 | 0.02 |
| 900 | | | 6.11 | 0.59 | 3.93 | 0.20 | 2.79 | 0.09 | 2.32 | 0.06 | 1.77 | 0.03 | 1.58 | 0.02 |
| 950 | | | 6.44 | 0.65 | 4.15 | 0.22 | 2.95 | 0.10 | 2.45 | 0.06 | 1.87 | 0.03 | 1.67 | 0.02 |
| 1000 | | | 6.78 | 0.72 | 4.37 | 0.25 | 3.10 | 0.11 | 2.57 | 0.07 | 1.97 | 0.04 | 1.76 | 0.03 |
| 1050 | | | 7.12 | 0.79 | 4.59 | 0.27 | 3.26 | 0.12 | 2.70 | 0.07 | 2.07 | 0.04 | 1.84 | 0.03 |
| 1100 | | | 7.46 | 0.86 | 4.80 | 0.29 | 3.41 | 0.13 | 2.83 | 0.08 | 2.17 | 0.04 | 1.93 | 0.03 |
| 1150 | | | | | 5.02 | 0.32 | 3.57 | 0.14 | 2.96 | 0.09 | 2.27 | 0.05 | 2.02 | 0.03 |
| 1200 | | | | | 5.24 | 0.34 | 3.73 | 0.15 | 3.09 | 0.10 | 2.37 | 0.05 | 2.11 | 0.04 |
| 1250 | | | | | 5.46 | 0.37 | 3.88 | 0.16 | 3.22 | 0.10 | 2.46 | 0.05 | 2.19 | 0.04 |
| 1300 | | | | | 5.68 | 0.40 | 4.04 | 0.17 | 3.35 | 0.11 | 2.56 | 0.06 | 2.28 | 0.04 |
| 1350 | | | | | 5.90 | 0.43 | 4.19 | 0.19 | 3.48 | 0.12 | 2.66 | 0.06 | 2.37 | 0.05 |
| 1400 | | | | | 6.11 | 0.46 | 4.35 | 0.20 | 3.60 | 0.13 | 2.76 | 0.07 | 2.46 | 0.05 |
| 1450 | | | | | 6.33 | 0.49 | 4.50 | 0.21 | 3.73 | 0.14 | 2.86 | 0.07 | 2.55 | 0.05 |
| 1500 | | | | | 6.55 | 0.52 | 4.66 | 0.23 | 3.86 | 0.14 | 2.96 | 0.08 | 2.63 | 0.06 |
| 1600 | | | | | 6.99 | 0.59 | 4.97 | 0.26 | 4.12 | 0.16 | 3.16 | 0.08 | 2.81 | 0.06 |
| 1700 | | | | | 7.42 | 0.66 | 5.28 | 0.29 | 4.38 | 0.18 | 3.35 | 0.09 | 2.98 | 0.07 |
| 1800 | | | | | | | 5.59 | 0.32 | 4.63 | 0.20 | 3.55 | 0.11 | 3.16 | 0.08 |
| 1900 | | | | | | | 5.90 | 0.35 | 4.89 | 0.22 | 3.75 | 0.12 | 3.34 | 0.09 |
| 2000 | | | | | | | 6.21 | 0.39 | 5.15 | 0.25 | 3.94 | 0.13 | 3.51 | 0.10 |
| 2100 | | | | | | | 6.52 | 0.42 | 5.41 | 0.27 | 4.14 | 0.14 | 3.69 | 0.11 |
| 2200 | | | | | | | 6.83 | 0.46 | 5.66 | 0.29 | 4.34 | 0.15 | 3.86 | 0.12 |
| 2300 | | | | | | | 7.14 | 0.50 | 5.92 | 0.32 | 4.54 | 0.17 | 4.04 | 0.13 |
| 2400 | | | | | | | 7.45 | 0.54 | 6.18 | 0.34 | 4.73 | 0.18 | 4.21 | 0.14 |
| 2500 | | | | | | | 7.76 | 0.59 | 6.44 | 0.37 | 4.93 | 0.19 | 4.39 | 0.15 |
| 2600 | | | | | | | 8.07 | 0.63 | 6.69 | 0.40 | 5.13 | 0.21 | 4.56 | 0.16 |
| 2700 | | | | | | | 8.38 | 0.67 | 6.95 | 0.43 | 5.32 | 0.22 | 4.74 | 0.17 |
| 2800 | | | | | | | 8.69 | 0.72 | 7.21 | 0.46 | 5.52 | 0.24 | 4.91 | 0.18 |
| 2900 | | | | | | | 9.00 | 0.77 | 7.47 | 0.49 | 5.72 | 0.26 | 5.09 | 0.19 |
| 3000 | | | | | | | 9.31 | 0.82 | 7.72 | 0.52 | 5.92 | 0.27 | 5.27 | 0.20 |
| 3100 | | | | | | | 9.62 | 0.87 | 7.98 | 0.55 | 6.11 | 0.29 | 5.44 | 0.22 |
| 3200 | | | | | | | 9.93 | 0.92 | 8.24 | 0.59 | 6.31 | 0.31 | 5.62 | 0.23 |
| 3300 | | | | | | | | | 8.50 | 0.62 | 6.51 | 0.32 | 5.79 | 0.24 |
| 3400 | | | | | | | | | 8.75 | 0.66 | 6.70 | 0.34 | 5.97 | 0.26 |
| 3500 | | | | | | | | | 9.01 | 0.69 | 6.90 | 0.36 | 6.14 | 0.27 |
| 3600 | | | | | | | | | 9.27 | 0.73 | 7.10 | 0.38 | 6.32 | 0.29 |
| 3700 | | | | | | | | | 9.53 | 0.77 | 7.30 | 0.40 | 6.49 | 0.30 |
| 3800 | | | | | | | | | | | 7.49 | 0.42 | 6.67 | 0.32 |
| 3900 | | | | | | | | | | | 7.69 | 0.44 | 6.85 | 0.33 |
| 4000 | | | | | | | | | | | 7.89 | 0.46 | 7.02 | 0.35 |
| 4100 | | | | | | | | | | | 8.09 | 0.48 | 7.20 | 0.37 |
| 4200 | | | | | | | | | | | 8.28 | 0.51 | 7.37 | 0.38 |
| 4300 | | | | | | | | | | | | | 7.55 | 0.40 |
| 4400 | | | | | | | | | | | | | 7.72 | 0.42 |
| 4500 | | | | | | | | | | | | | 7.90 | 0.43 |
| 4600 | | | | | | | | | | | | | 8.07 | 0.45 |
| 4700 | | | | | | | | | | | | | 8.25 | 0.47 |

**The shaded area represents velocities over 5 fps. Use with caution.**

# CLASS 315 PVC IPS PLASTIC PIPE

**ASTM D2241 (1120, 1220) SDR 13.5 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 1/2" | | 3/4" | | 1" | | 1 1/4" | | 1 1/2" | | 2" | | 2 1/2" | | 3" | | 4" | | 6" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 0.696 | | 0.874 | | 1.101 | | 1.394 | | 1.598 | | 1.983 | | 2.423 | | 2.948 | | 3.794 | | 5.583 | |
| Pipe OD | 0.840 | | 1.050 | | 1.315 | | 1.660 | | 1.900 | | 2.375 | | 2.875 | | 3.500 | | 4.500 | | 6.625 | |
| Avg. Wall | 0.072 | | 0.088 | | 0.107 | | 0.133 | | 0.151 | | 0.196 | | 0.226 | | 0.274 | | 0.353 | | 0.521 | |
| Min. Wall | 0.062 | | 0.078 | | 0.097 | | 0.123 | | 0.141 | | 0.176 | | 0.213 | | 0.259 | | 0.333 | | 0.491 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 1 | 0.84 | 0.25 | 0.53 | 0.08 | 0.34 | 0.03 | 0.21 | 0.01 | 0.16 | 0.00 | | | | | | | | | | |
| 2 | 1.68 | 0.90 | 1.07 | 0.30 | 0.67 | 0.10 | 0.42 | 0.03 | 0.32 | 0.02 | 0.21 | 0.01 | | | | | | | | |
| 3 | 2.53 | 1.90 | 1.60 | 0.63 | 1.01 | 0.20 | 0.63 | 0.06 | 0.48 | 0.03 | 0.31 | 0.01 | | | | | | | | |
| 4 | 3.37 | 3.24 | 2.14 | 1.07 | 1.35 | 0.35 | 0.84 | 0.11 | 0.64 | 0.06 | 0.42 | 0.02 | 0.28 | 0.01 | | | | | | |
| 5 | 4.21 | 4.89 | 2.67 | 1.61 | 1.68 | 0.53 | 1.05 | 0.17 | 0.80 | 0.09 | 0.52 | 0.03 | 0.35 | 0.01 | | | | | | |
| 6 | 5.05 | 6.86 | 3.20 | 2.26 | 2.02 | 0.74 | 1.26 | 0.23 | 0.96 | 0.12 | 0.62 | 0.04 | 0.42 | 0.02 | 0.28 | 0.01 | | | | |
| 7 | 5.90 | 9.12 | 3.74 | 3.01 | 2.36 | 0.98 | 1.47 | 0.31 | 1.12 | 0.16 | 0.73 | 0.06 | 0.49 | 0.02 | 0.33 | 0.01 | | | | |
| 8 | 6.74 | 11.68 | 4.27 | 3.86 | 2.69 | 1.25 | 1.68 | 0.40 | 1.28 | 0.20 | 0.83 | 0.07 | 0.56 | 0.03 | 0.38 | 0.01 | | | | |
| 9 | 7.58 | 14.53 | 4.81 | 4.80 | 3.03 | 1.56 | 1.89 | 0.49 | 1.44 | 0.25 | 0.93 | 0.09 | 0.63 | 0.03 | 0.42 | 0.01 | | | | |
| 10 | 8.42 | 17.66 | 5.34 | 5.83 | 3.37 | 1.90 | 2.10 | 0.60 | 1.60 | 0.31 | 1.04 | 0.11 | 0.69 | 0.04 | 0.47 | 0.02 | | | | |
| 12 | 10.11 | 24.75 | 6.41 | 8.17 | 4.04 | 2.66 | 2.52 | 0.84 | 1.92 | 0.43 | 1.25 | 0.15 | 0.83 | 0.06 | 0.56 | 0.02 | | | | |
| 14 | 11.79 | 32.93 | 7.48 | 10.87 | 4.71 | 3.53 | 2.94 | 1.12 | 2.24 | 0.58 | 1.45 | 0.20 | 0.97 | 0.08 | 0.66 | 0.03 | | | | |
| 16 | 13.48 | 42.16 | 8.55 | 13.92 | 5.39 | 4.53 | 3.36 | 1.44 | 2.56 | 0.74 | 1.66 | 0.26 | 1.11 | 0.10 | 0.75 | 0.04 | 0.45 | 0.01 | | |
| 18 | 15.16 | 52.44 | 9.61 | 17.32 | 6.06 | 5.63 | 3.78 | 1.79 | 2.88 | 0.92 | 1.87 | 0.32 | 1.25 | 0.12 | 0.85 | 0.05 | 0.51 | 0.01 | | |
| 20 | | | 10.68 | 21.05 | 6.73 | 6.84 | 4.20 | 2.17 | 3.20 | 1.12 | 2.08 | 0.39 | 1.39 | 0.15 | 0.94 | 0.06 | 0.57 | 0.02 | | |
| 22 | | | 11.75 | 25.11 | 7.40 | 8.16 | 4.62 | 2.59 | 3.52 | 1.33 | 2.28 | 0.47 | 1.53 | 0.18 | 1.03 | 0.07 | 0.62 | 0.02 | | |
| 24 | | | 12.82 | 29.50 | 8.08 | 9.59 | 5.04 | 3.04 | 3.83 | 1.57 | 2.49 | 0.55 | 1.67 | 0.21 | 1.13 | 0.08 | 0.68 | 0.02 | | |
| 26 | | | 13.89 | 34.21 | 8.75 | 11.12 | 5.46 | 3.53 | 4.15 | 1.82 | 2.70 | 0.64 | 1.81 | 0.24 | 1.22 | 0.09 | 0.74 | 0.03 | | |
| 28 | | | 14.96 | 39.25 | 9.42 | 12.76 | 5.88 | 4.05 | 4.47 | 2.08 | 2.91 | 0.73 | 1.95 | 0.27 | 1.31 | 0.11 | 0.79 | 0.03 | | |
| 30 | | | 16.02 | 44.60 | 10.10 | 14.50 | 6.30 | 4.60 | 4.79 | 2.37 | 3.11 | 0.83 | 2.08 | 0.31 | 1.41 | 0.12 | 0.85 | 0.04 | | |
| 32 | | | | | 10.77 | 16.34 | 6.72 | 5.18 | 5.11 | 2.67 | 3.32 | 0.93 | 2.22 | 0.35 | 1.50 | 0.14 | 0.91 | 0.04 | 0.42 | 0.01 |
| 34 | | | | | 11.44 | 18.28 | 7.14 | 5.80 | 5.43 | 2.98 | 3.53 | 1.04 | 2.36 | 0.39 | 1.60 | 0.15 | 0.96 | 0.04 | 0.45 | 0.01 |
| 36 | | | | | 12.12 | 20.32 | 7.56 | 6.45 | 5.75 | 3.32 | 3.74 | 1.16 | 2.50 | 0.44 | 1.69 | 0.17 | 1.02 | 0.05 | 0.47 | 0.01 |
| 38 | | | | | 12.79 | 22.46 | 7.98 | 7.13 | 6.07 | 3.67 | 3.94 | 1.28 | 2.64 | 0.48 | 1.78 | 0.19 | 1.08 | 0.05 | 0.50 | 0.01 |
| 40 | | | | | 13.46 | 24.70 | 8.40 | 7.84 | 6.39 | 4.03 | 4.15 | 1.41 | 2.78 | 0.53 | 1.88 | 0.20 | 1.13 | 0.06 | 0.52 | 0.01 |
| 42 | | | | | 14.14 | 27.04 | 8.82 | 8.58 | 6.71 | 4.41 | 4.36 | 1.54 | 2.92 | 0.58 | 1.97 | 0.22 | 1.19 | 0.07 | 0.55 | 0.01 |
| 44 | | | | | 14.81 | 29.47 | 9.24 | 9.35 | 7.03 | 4.81 | 4.57 | 1.68 | 3.06 | 0.63 | 2.07 | 0.24 | 1.25 | 0.07 | 0.58 | 0.01 |
| 46 | | | | | 15.48 | 32.00 | 9.66 | 10.15 | 7.35 | 5.22 | 4.77 | 1.83 | 3.20 | 0.69 | 2.16 | 0.27 | 1.30 | 0.08 | 0.60 | 0.01 |
| 48 | | | | | 16.16 | 34.62 | 10.08 | 10.98 | 7.67 | 5.65 | 4.98 | 1.98 | 3.34 | 0.75 | 2.25 | 0.29 | 1.36 | 0.08 | 0.63 | 0.01 |
| 50 | | | | | 16.83 | 37.34 | 10.50 | 11.85 | 7.99 | 6.09 | 5.19 | 2.13 | 3.47 | 0.80 | 2.35 | 0.31 | 1.42 | 0.09 | 0.65 | 0.01 |
| 55 | | | | | | | 11.55 | 14.13 | 8.79 | 7.27 | 5.71 | 2.54 | 3.82 | 0.96 | 2.58 | 0.37 | 1.56 | 0.11 | 0.72 | 0.02 |
| 60 | | | | | | | 12.60 | 16.60 | 9.59 | 8.54 | 6.23 | 2.99 | 4.17 | 1.13 | 2.82 | 0.43 | 1.70 | 0.13 | 0.79 | 0.02 |
| 65 | | | | | | | 13.65 | 19.26 | 10.39 | 9.91 | 6.74 | 3.47 | 4.52 | 1.31 | 3.05 | 0.50 | 1.84 | 0.15 | 0.85 | 0.02 |
| 70 | | | | | | | 14.70 | 22.09 | 11.18 | 11.37 | 7.26 | 3.98 | 4.86 | 1.50 | 3.29 | 0.58 | 1.98 | 0.17 | 0.92 | 0.03 |
| 75 | | | | | | | 15.75 | 25.10 | 11.98 | 12.91 | 7.78 | 4.52 | 5.21 | 1.70 | 3.52 | 0.66 | 2.13 | 0.19 | 0.98 | 0.03 |
| 80 | | | | | | | 16.80 | 28.29 | 12.78 | 14.55 | 8.30 | 5.09 | 5.56 | 1.92 | 3.76 | 0.74 | 2.27 | 0.22 | 1.05 | 0.03 |
| 85 | | | | | | | | | 13.58 | 16.28 | 8.82 | 5.70 | 5.91 | 2.15 | 3.99 | 0.83 | 2.41 | 0.24 | 1.11 | 0.04 |
| 90 | | | | | | | | | 14.38 | 18.10 | 9.34 | 6.33 | 6.25 | 2.39 | 4.23 | 0.92 | 2.55 | 0.27 | 1.18 | 0.04 |
| 95 | | | | | | | | | 15.18 | 20.01 | 9.86 | 7.00 | 6.60 | 2.64 | 4.46 | 1.02 | 2.69 | 0.30 | 1.24 | 0.05 |
| 100 | | | | | | | | | 15.98 | 22.00 | 10.38 | 7.70 | 6.95 | 2.90 | 4.69 | 1.12 | 2.83 | 0.33 | 1.31 | 0.05 |
| 110 | | | | | | | | | | | 11.41 | 9.18 | 7.64 | 3.46 | 5.16 | 1.33 | 3.12 | 0.39 | 1.44 | 0.06 |
| 120 | | | | | | | | | | | 12.45 | 10.79 | 8.34 | 4.07 | 5.63 | 1.57 | 3.40 | 0.46 | 1.57 | 0.07 |
| 130 | | | | | | | | | | | 13.49 | 12.51 | 9.03 | 4.72 | 6.10 | 1.82 | 3.68 | 0.53 | 1.70 | 0.08 |
| 140 | | | | | | | | | | | 14.53 | 14.35 | 9.73 | 5.41 | 6.57 | 2.08 | 3.97 | 0.61 | 1.83 | 0.09 |
| 150 | | | | | | | | | | | 15.56 | 16.31 | 10.42 | 6.15 | 7.04 | 2.37 | 4.25 | 0.69 | 1.96 | 0.11 |
| 160 | | | | | | | | | | | 16.60 | 18.38 | 11.12 | 6.93 | 7.51 | 2.67 | 4.54 | 0.78 | 2.09 | 0.12 |
| 170 | | | | | | | | | | | | | 11.81 | 7.76 | 7.98 | 2.99 | 4.82 | 0.87 | 2.23 | 0.13 |
| 180 | | | | | | | | | | | | | 12.51 | 8.62 | 8.45 | 3.32 | 5.10 | 0.97 | 2.36 | 0.15 |
| 190 | | | | | | | | | | | | | 13.20 | 9.53 | 8.92 | 3.67 | 5.39 | 1.08 | 2.49 | 0.16 |
| 200 | | | | | | | | | | | | | 13.90 | 10.48 | 9.39 | 4.03 | 5.67 | 1.18 | 2.62 | 0.18 |
| 220 | | | | | | | | | | | | | 15.29 | 12.50 | 10.33 | 4.81 | 6.24 | 1.41 | 2.88 | 0.22 |
| 240 | | | | | | | | | | | | | 16.68 | 14.69 | 11.27 | 5.66 | 6.80 | 1.66 | 3.14 | 0.25 |
| 260 | | | | | | | | | | | | | | | 12.21 | 6.56 | 7.37 | 1.92 | 3.40 | 0.29 |
| 280 | | | | | | | | | | | | | | | 13.15 | 7.52 | 7.94 | 2.20 | 3.67 | 0.34 |
| 300 | | | | | | | | | | | | | | | 14.08 | 8.55 | 8.50 | 2.50 | 3.93 | 0.38 |
| 320 | | | | | | | | | | | | | | | 15.02 | 9.64 | 9.07 | 2.82 | 4.19 | 0.43 |
| 340 | | | | | | | | | | | | | | | 15.96 | 10.78 | 9.64 | 3.16 | 4.45 | 0.48 |
| 360 | | | | | | | | | | | | | | | 16.90 | 11.98 | 10.20 | 3.51 | 4.71 | 0.54 |
| 380 | | | | | | | | | | | | | | | | | 10.77 | 3.88 | 4.97 | 0.59 |
| 400 | | | | | | | | | | | | | | | | | 11.34 | 4.27 | 5.24 | 0.65 |
| 420 | | | | | | | | | | | | | | | | | 11.90 | 4.67 | 5.50 | 0.71 |
| 440 | | | | | | | | | | | | | | | | | 12.47 | 5.09 | 5.76 | 0.78 |
| 460 | | | | | | | | | | | | | | | | | 13.04 | 5.53 | 6.02 | 0.84 |
| 480 | | | | | | | | | | | | | | | | | 13.61 | 5.98 | 6.28 | 0.91 |
| 500 | | | | | | | | | | | | | | | | | 14.17 | 6.45 | 6.54 | 0.98 |

**The shaded area represents velocities over 5 fps. Use with caution.**

# SCHEDULE 40 PVC IPS PLASTIC PIPE

**ASTM D1785 (1120, 1220) C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 1/2" | | 3/4" | | 1" | | 1 1/4" | | 1 1/2" | | 2" | | 2 1/2" | | 3" | | 4" | | 6" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 0.602 | | 0.804 | | 1.029 | | 1.360 | | 1.590 | | 2.047 | | 2.445 | | 3.042 | | 3.998 | | 6.031 | |
| Pipe OD | 0.840 | | 1.050 | | 1.315 | | 1.660 | | 1.900 | | 2.375 | | 2.875 | | 3.500 | | 4.500 | | 6.625 | |
| Avg. Wall | 0.119 | | 0.123 | | 0.143 | | 0.150 | | 0.155 | | 0.164 | | 0.215 | | 0.229 | | 0.251 | | 0.297 | |
| Min. Wall | 0.109 | | 0.113 | | 0.133 | | 0.140 | | 0.145 | | 0.154 | | 0.203 | | 0.216 | | 0.237 | | 0.280 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 1 | 1.13 | 0.50 | 0.63 | 0.12 | 0.39 | 0.04 | 0.22 | 0.01 | 0.16 | 0.00 | | | | | | | | | | |
| 2 | 2.25 | 1.82 | 1.26 | 0.44 | 0.77 | 0.13 | 0.44 | 0.03 | 0.32 | 0.02 | 0.19 | 0.00 | | | | | | | | |
| 3 | 3.38 | 3.85 | 1.89 | 0.94 | 1.16 | 0.28 | 0.66 | 0.07 | 0.48 | 0.03 | 0.29 | 0.01 | | | | | | | | |
| 4 | 4.50 | 6.55 | 2.52 | 1.60 | 1.54 | 0.48 | 0.88 | 0.12 | 0.65 | 0.06 | 0.39 | 0.02 | 0.27 | 0.01 | | | | | | |
| 5 | 5.63 | 9.91 | 3.16 | 2.42 | 1.93 | 0.73 | 1.10 | 0.19 | 0.81 | 0.09 | 0.49 | 0.03 | 0.34 | 0.01 | | | | | | |
| 6 | 6.75 | 13.89 | 3.79 | 3.40 | 2.31 | 1.02 | 1.32 | 0.26 | 0.97 | 0.12 | 0.58 | 0.04 | 0.41 | 0.02 | 0.26 | 0.01 | | | | |
| 7 | 7.88 | 18.48 | 4.42 | 4.52 | 2.70 | 1.36 | 1.54 | 0.35 | 1.13 | 0.16 | 0.68 | 0.05 | 0.48 | 0.02 | 0.31 | 0.01 | | | | |
| 8 | 9.01 | 23.66 | 5.05 | 5.79 | 3.08 | 1.74 | 1.76 | 0.45 | 1.29 | 0.21 | 0.78 | 0.06 | 0.55 | 0.03 | 0.35 | 0.01 | | | | |
| 9 | 10.13 | 29.43 | 5.68 | 7.20 | 3.47 | 2.17 | 1.99 | 0.56 | 1.45 | 0.26 | 0.88 | 0.08 | 0.61 | 0.03 | 0.40 | 0.01 | | | | |
| 10 | 11.26 | 35.77 | 6.31 | 8.75 | 3.85 | 2.63 | 2.21 | 0.68 | 1.61 | 0.32 | 0.97 | 0.09 | 0.68 | 0.04 | 0.44 | 0.01 | | | | |
| 12 | 13.51 | 50.14 | 7.57 | 12.27 | 4.62 | 3.69 | 2.65 | 0.95 | 1.94 | 0.44 | 1.17 | 0.13 | 0.82 | 0.05 | 0.53 | 0.02 | | | | |
| 14 | 15.76 | 66.71 | 8.84 | 16.32 | 5.39 | 4.91 | 3.09 | 1.26 | 2.26 | 0.59 | 1.36 | 0.17 | 0.96 | 0.07 | 0.62 | 0.03 | | | | |
| 16 | 18.01 | 85.42 | 10.10 | 20.90 | 6.17 | 6.29 | 3.53 | 1.62 | 2.58 | 0.76 | 1.56 | 0.22 | 1.09 | 0.09 | 0.71 | 0.03 | 0.41 | 0.01 | | |
| 18 | 20.26 | 106.24 | 11.36 | 25.99 | 6.94 | 7.82 | 3.97 | 2.01 | 2.90 | 0.94 | 1.75 | 0.28 | 1.23 | 0.12 | 0.79 | 0.04 | 0.46 | 0.01 | | |
| 20 | | | 12.62 | 31.59 | 7.71 | 9.51 | 4.41 | 2.45 | 3.23 | 1.14 | 1.95 | 0.33 | 1.36 | 0.14 | 0.88 | 0.05 | 0.51 | 0.01 | | |
| 22 | | | 13.89 | 37.69 | 8.48 | 11.35 | 4.85 | 2.92 | 3.55 | 1.37 | 2.14 | 0.40 | 1.50 | 0.17 | 0.97 | 0.06 | 0.56 | 0.02 | | |
| 24 | | | 15.15 | 44.28 | 9.25 | 13.33 | 5.29 | 3.43 | 3.87 | 1.60 | 2.34 | 0.47 | 1.64 | 0.20 | 1.06 | 0.07 | 0.61 | 0.02 | | |
| 26 | | | 16.41 | 51.36 | 10.02 | 15.46 | 5.74 | 3.98 | 4.20 | 1.86 | 2.53 | 0.54 | 1.77 | 0.23 | 1.15 | 0.08 | 0.66 | 0.02 | | |
| 28 | | | 17.67 | 58.91 | 10.79 | 17.73 | 6.18 | 4.56 | 4.52 | 2.13 | 2.73 | 0.62 | 1.91 | 0.26 | 1.23 | 0.09 | 0.71 | 0.02 | | |
| 30 | | | 18.94 | 66.94 | 11.56 | 20.15 | 6.62 | 5.19 | 4.84 | 2.42 | 2.92 | 0.71 | 2.05 | 0.30 | 1.32 | 0.10 | 0.77 | 0.03 | | |
| 32 | | | | | 12.33 | 22.71 | 7.06 | 5.85 | 5.16 | 2.73 | 3.12 | 0.80 | 2.18 | 0.34 | 1.41 | 0.12 | 0.82 | 0.03 | 0.36 | 0.00 |
| 34 | | | | | 13.10 | 25.41 | 7.50 | 6.54 | 5.49 | 3.06 | 3.31 | 0.89 | 2.32 | 0.38 | 1.50 | 0.13 | 0.87 | 0.03 | 0.38 | 0.00 |
| 36 | | | | | 13.87 | 28.24 | 7.94 | 7.27 | 5.81 | 3.40 | 3.51 | 0.99 | 2.46 | 0.42 | 1.59 | 0.14 | 0.92 | 0.04 | 0.40 | 0.01 |
| 38 | | | | | 14.64 | 31.22 | 8.38 | 8.04 | 6.13 | 3.76 | 3.70 | 1.10 | 2.59 | 0.46 | 1.68 | 0.16 | 0.97 | 0.04 | 0.43 | 0.01 |
| 40 | | | | | 15.41 | 34.33 | 8.82 | 8.84 | 6.46 | 4.13 | 3.89 | 1.21 | 2.73 | 0.51 | 1.76 | 0.18 | 1.02 | 0.05 | 0.45 | 0.01 |
| 42 | | | | | 16.18 | 37.58 | 9.26 | 9.67 | 6.78 | 4.52 | 4.09 | 1.32 | 2.87 | 0.56 | 1.85 | 0.19 | 1.07 | 0.05 | 0.47 | 0.01 |
| 44 | | | | | 16.95 | 40.96 | 9.71 | 10.54 | 7.10 | 4.93 | 4.28 | 1.44 | 3.00 | 0.61 | 1.94 | 0.21 | 1.12 | 0.06 | 0.49 | 0.01 |
| 46 | | | | | 17.73 | 44.47 | 10.15 | 11.45 | 7.42 | 5.35 | 4.48 | 1.57 | 3.14 | 0.66 | 2.03 | 0.23 | 1.17 | 0.06 | 0.52 | 0.01 |
| 48 | | | | | 18.50 | 48.12 | 10.59 | 12.39 | 7.75 | 5.79 | 4.67 | 1.69 | 3.28 | 0.71 | 2.12 | 0.25 | 1.23 | 0.07 | 0.54 | 0.01 |
| 50 | | | | | 19.27 | 51.90 | 11.03 | 13.36 | 8.07 | 6.25 | 4.87 | 1.83 | 3.41 | 0.77 | 2.20 | 0.27 | 1.28 | 0.07 | 0.56 | 0.01 |
| 55 | | | | | | | 12.13 | 15.94 | 8.88 | 7.45 | 5.36 | 2.18 | 3.75 | 0.92 | 2.42 | 0.32 | 1.40 | 0.08 | 0.62 | 0.01 |
| 60 | | | | | | | 13.24 | 18.72 | 9.68 | 8.75 | 5.84 | 2.56 | 4.09 | 1.08 | 2.65 | 0.37 | 1.53 | 0.10 | 0.67 | 0.01 |
| 65 | | | | | | | 14.34 | 21.72 | 10.49 | 10.15 | 6.33 | 2.97 | 4.44 | 1.25 | 2.87 | 0.43 | 1.66 | 0.11 | 0.73 | 0.02 |
| 70 | | | | | | | 15.44 | 24.91 | 11.30 | 11.65 | 6.82 | 3.41 | 4.78 | 1.43 | 3.09 | 0.50 | 1.79 | 0.13 | 0.79 | 0.02 |
| 75 | | | | | | | 16.54 | 28.31 | 12.10 | 13.23 | 7.30 | 3.87 | 5.12 | 1.63 | 3.31 | 0.56 | 1.91 | 0.15 | 0.84 | 0.02 |
| 80 | | | | | | | 17.65 | 31.90 | 12.91 | 14.91 | 7.79 | 4.36 | 5.46 | 1.84 | 3.53 | 0.63 | 2.04 | 0.17 | 0.90 | 0.02 |
| 85 | | | | | | | | | 13.72 | 16.69 | 8.28 | 4.88 | 5.80 | 2.06 | 3.75 | 0.71 | 2.17 | 0.19 | 0.95 | 0.03 |
| 90 | | | | | | | | | 14.52 | 18.55 | 8.76 | 5.43 | 6.14 | 2.29 | 3.97 | 0.79 | 2.30 | 0.21 | 1.01 | 0.03 |
| 95 | | | | | | | | | 15.33 | 20.50 | 9.25 | 6.00 | 6.48 | 2.53 | 4.19 | 0.87 | 2.42 | 0.23 | 1.07 | 0.03 |
| 100 | | | | | | | | | 16.14 | 22.55 | 9.74 | 6.59 | 6.82 | 2.78 | 4.41 | 0.96 | 2.55 | 0.25 | 1.12 | 0.03 |
| 110 | | | | | | | | | | | 10.71 | 7.87 | 7.51 | 3.31 | 4.85 | 1.14 | 2.81 | 0.30 | 1.23 | 0.04 |
| 120 | | | | | | | | | | | 11.68 | 9.24 | 8.19 | 3.89 | 5.29 | 1.34 | 3.06 | 0.36 | 1.35 | 0.05 |
| 130 | | | | | | | | | | | 12.66 | 10.72 | 8.87 | 4.52 | 5.73 | 1.56 | 3.32 | 0.41 | 1.46 | 0.06 |
| 140 | | | | | | | | | | | 13.63 | 12.30 | 9.55 | 5.18 | 6.17 | 1.79 | 3.57 | 0.47 | 1.57 | 0.06 |
| 150 | | | | | | | | | | | 14.61 | 13.97 | 10.24 | 5.89 | 6.61 | 2.03 | 3.83 | 0.54 | 1.68 | 0.07 |
| 160 | | | | | | | | | | | 15.58 | 15.75 | 10.92 | 6.63 | 7.05 | 2.29 | 4.08 | 0.61 | 1.79 | 0.08 |
| 170 | | | | | | | | | | | | | 11.60 | 7.42 | 7.50 | 2.56 | 4.34 | 0.68 | 1.91 | 0.09 |
| 180 | | | | | | | | | | | | | 12.28 | 8.25 | 7.94 | 2.85 | 4.59 | 0.75 | 2.02 | 0.10 |
| 190 | | | | | | | | | | | | | 12.97 | 9.12 | 8.38 | 3.15 | 4.85 | 0.83 | 2.13 | 0.11 |
| 200 | | | | | | | | | | | | | 13.65 | 10.03 | 8.82 | 3.46 | 5.11 | 0.92 | 2.24 | 0.12 |
| 220 | | | | | | | | | | | | | 15.01 | 11.96 | 9.70 | 4.13 | 5.62 | 1.09 | 2.47 | 0.15 |
| 240 | | | | | | | | | | | | | 16.38 | 14.06 | 10.58 | 4.85 | 6.13 | 1.28 | 2.69 | 0.17 |
| 260 | | | | | | | | | | | | | | | 11.46 | 5.63 | 6.64 | 1.49 | 2.92 | 0.20 |
| 280 | | | | | | | | | | | | | | | 12.35 | 6.46 | 7.15 | 1.71 | 3.14 | 0.23 |
| 300 | | | | | | | | | | | | | | | 13.23 | 7.34 | 7.66 | 1.94 | 3.37 | 0.26 |
| 320 | | | | | | | | | | | | | | | 14.11 | 8.27 | 8.17 | 2.19 | 3.59 | 0.30 |
| 340 | | | | | | | | | | | | | | | 14.99 | 9.25 | 8.68 | 2.45 | 3.81 | 0.33 |
| 360 | | | | | | | | | | | | | | | 15.87 | 10.29 | 9.19 | 2.72 | 4.04 | 0.37 |
| 380 | | | | | | | | | | | | | | | | | 9.70 | 3.01 | 4.26 | 0.41 |
| 400 | | | | | | | | | | | | | | | | | 10.21 | 3.31 | 4.49 | 0.45 |
| 420 | | | | | | | | | | | | | | | | | 10.72 | 3.62 | 4.71 | 0.49 |
| 440 | | | | | | | | | | | | | | | | | 11.23 | 3.95 | 4.94 | 0.53 |
| 460 | | | | | | | | | | | | | | | | | 11.74 | 4.28 | 5.16 | 0.58 |
| 480 | | | | | | | | | | | | | | | | | 12.25 | 4.64 | 5.38 | 0.63 |
| 500 | | | | | | | | | | | | | | | | | 12.76 | 5.00 | 5.61 | 0.68 |
| Working Pressure | 600 PSI | | 480 PSI | | 450 PSI | | 370 PSI | | 330 PSI | | 280 PSI | | 300 PSI | | 260 PSI | | 220 PSI | | 180 PSI | |

**The shaded area represents velocities over 5 fps. Use with caution.**

# SCHEDULE 40 PVC IPS PLASTIC PIPE

**ASTM D1785 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 4" | | 6" | | 8" | | 10" | | 12" | |
|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 3.998 | | 6.031 | | 7.942 | | 9.976 | | 11.889 | |
| Pipe OD | 4.500 | | 6.625 | | 8.625 | | 10.750 | | 12.750 | |
| Avg. Wall | 0.251 | | 0.297 | | 0.342 | | 0.387 | | 0.431 | |
| Min. Wall | 0.237 | | 0.280 | | 0.322 | | 0.365 | | 0.406 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 10 | 0.26 | 0.00 | 0.11 | 0.00 | 0.06 | 0.00 | 0.04 | 0.00 | 0.03 | 0.00 |
| 20 | 0.51 | 0.01 | 0.22 | 0.00 | 0.13 | 0.00 | 0.08 | 0.00 | 0.06 | 0.00 |
| 30 | 0.77 | 0.03 | 0.34 | 0.00 | 0.19 | 0.00 | 0.12 | 0.00 | 0.09 | 0.00 |
| 40 | 1.02 | 0.05 | 0.45 | 0.01 | 0.26 | 0.00 | 0.16 | 0.00 | 0.12 | 0.00 |
| 50 | 1.28 | 0.07 | 0.56 | 0.01 | 0.32 | 0.00 | 0.20 | 0.00 | 0.14 | 0.00 |
| 60 | 1.53 | 0.10 | 0.67 | 0.01 | 0.39 | 0.00 | 0.25 | 0.00 | 0.17 | 0.00 |
| 70 | 1.79 | 0.13 | 0.79 | 0.02 | 0.45 | 0.00 | 0.29 | 0.00 | 0.20 | 0.00 |
| 80 | 2.04 | 0.17 | 0.90 | 0.02 | 0.52 | 0.01 | 0.33 | 0.00 | 0.23 | 0.00 |
| 90 | 2.30 | 0.21 | 1.01 | 0.03 | 0.58 | 0.01 | 0.37 | 0.00 | 0.26 | 0.00 |
| 100 | 2.55 | 0.25 | 1.12 | 0.03 | 0.65 | 0.01 | 0.41 | 0.00 | 0.29 | 0.00 |
| 120 | 3.06 | 0.36 | 1.35 | 0.05 | 0.78 | 0.01 | 0.49 | 0.00 | 0.35 | 0.00 |
| 140 | 3.57 | 0.47 | 1.57 | 0.06 | 0.91 | 0.02 | 0.57 | 0.01 | 0.40 | 0.00 |
| 160 | 4.08 | 0.61 | 1.79 | 0.08 | 1.03 | 0.02 | 0.66 | 0.01 | 0.46 | 0.00 |
| 180 | 4.59 | 0.75 | 2.02 | 0.10 | 1.16 | 0.03 | 0.74 | 0.01 | 0.52 | 0.00 |
| 200 | 5.11 | 0.92 | 2.24 | 0.12 | 1.29 | 0.03 | 0.82 | 0.01 | 0.58 | 0.00 |
| 225 | 5.74 | 1.14 | 2.52 | 0.15 | 1.46 | 0.04 | 0.92 | 0.01 | 0.65 | 0.01 |
| 250 | 6.38 | 1.39 | 2.80 | 0.19 | 1.62 | 0.05 | 1.02 | 0.02 | 0.72 | 0.01 |
| 275 | 7.02 | 1.65 | 3.08 | 0.22 | 1.78 | 0.06 | 1.13 | 0.02 | 0.79 | 0.01 |
| 300 | 7.66 | 1.94 | 3.37 | 0.26 | 1.94 | 0.07 | 1.23 | 0.02 | 0.87 | 0.01 |
| 325 | 8.30 | 2.25 | 3.65 | 0.30 | 2.10 | 0.08 | 1.33 | 0.03 | 0.94 | 0.01 |
| 350 | 8.93 | 2.58 | 3.93 | 0.35 | 2.26 | 0.09 | 1.43 | 0.03 | 1.01 | 0.01 |
| 375 | | | 4.21 | 0.40 | 2.43 | 0.10 | 1.54 | 0.03 | 1.08 | 0.01 |
| 400 | | | 4.49 | 0.45 | 2.59 | 0.12 | 1.64 | 0.04 | 1.15 | 0.02 |
| 425 | | | 4.77 | 0.50 | 2.75 | 0.13 | 1.74 | 0.04 | 1.23 | 0.02 |
| 450 | | | 5.05 | 0.56 | 2.91 | 0.15 | 1.84 | 0.05 | 1.30 | 0.02 |
| 475 | | | 5.33 | 0.62 | 3.07 | 0.16 | 1.95 | 0.05 | 1.37 | 0.02 |
| 500 | | | 5.61 | 0.68 | 3.23 | 0.18 | 2.05 | 0.06 | 1.44 | 0.02 |
| 550 | | | 6.17 | 0.81 | 3.56 | 0.21 | 2.25 | 0.07 | 1.59 | 0.03 |
| 600 | | | 6.73 | 0.95 | 3.88 | 0.25 | 2.46 | 0.08 | 1.73 | 0.03 |
| 650 | | | 7.29 | 1.10 | 4.20 | 0.29 | 2.66 | 0.09 | 1.88 | 0.04 |
| 700 | | | 7.85 | 1.26 | 4.53 | 0.33 | 2.87 | 0.11 | 2.02 | 0.05 |
| 750 | | | | | 4.85 | 0.38 | 3.07 | 0.12 | 2.16 | 0.05 |
| 800 | | | | | 5.17 | 0.42 | 3.28 | 0.14 | 2.31 | 0.06 |
| 850 | | | | | 5.50 | 0.47 | 3.48 | 0.16 | 2.45 | 0.07 |
| 900 | | | | | 5.82 | 0.53 | 3.69 | 0.17 | 2.60 | 0.07 |
| 950 | | | | | 6.15 | 0.58 | 3.89 | 0.19 | 2.74 | 0.08 |
| 1000 | | | | | 6.47 | 0.64 | 4.10 | 0.21 | 2.89 | 0.09 |
| 1050 | | | | | 6.79 | 0.70 | 4.30 | 0.23 | 3.03 | 0.10 |
| 1150 | | | | | 7.44 | 0.83 | 4.71 | 0.27 | 3.32 | 0.12 |
| 1200 | | | | | 7.76 | 0.90 | 4.92 | 0.30 | 3.46 | 0.13 |
| 1250 | | | | | | | 5.12 | 0.32 | 3.61 | 0.14 |
| 1300 | | | | | | | 5.33 | 0.34 | 3.75 | 0.15 |
| 1350 | | | | | | | 5.53 | 0.37 | 3.90 | 0.16 |
| 1400 | | | | | | | 5.74 | 0.39 | 4.04 | 0.17 |
| 1500 | | | | | | | 6.15 | 0.45 | 4.33 | 0.19 |
| 1550 | | | | | | | 6.35 | 0.47 | 4.47 | 0.20 |
| 1600 | | | | | | | 6.56 | 0.50 | 4.62 | 0.21 |
| 1650 | | | | | | | 6.76 | 0.53 | 4.76 | 0.23 |
| 1700 | | | | | | | 6.97 | 0.56 | 4.91 | 0.24 |
| 1750 | | | | | | | 7.17 | 0.59 | 5.05 | 0.25 |
| 1800 | | | | | | | | | 5.20 | 0.27 |
| 1850 | | | | | | | | | 5.34 | 0.28 |
| 1900 | | | | | | | | | 5.48 | 0.29 |
| 1950 | | | | | | | | | 5.63 | 0.31 |
| 2000 | | | | | | | | | 5.77 | 0.32 |
| 2100 | | | | | | | | | 6.06 | 0.35 |
| 2200 | | | | | | | | | 6.35 | 0.39 |
| 2300 | | | | | | | | | 6.64 | 0.42 |
| 2400 | | | | | | | | | 6.93 | 0.45 |
| 2500 | | | | | | | | | 7.22 | 0.49 |
| 2600 | | | | | | | | | | |
| 2700 | | | | | | | | | | |
| 2800 | | | | | | | | | | |
| 2900 | | | | | | | | | | |
| 3000 | | | | | | | | | | |

**The shaded area represents velocities over 5 fps. Use with caution.**

# SCHEDULE 80 PVC IPS PLASTIC PIPE

**ASTM D1785 (1120, 1220) C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 1/2" | | 3/4" | | 1" | | 1 1/4" | | 1 1/2" | | 2" | | 2 1/2" | | 3" | | 4" | | 6" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 0.526 | | 0.722 | | 0.935 | | 1.254 | | 1.476 | | 1.913 | | 2.289 | | 2.864 | | 3.786 | | 5.709 | |
| Pipe OD | 0.840 | | 1.050 | | 1.315 | | 1.660 | | 1.900 | | 2.375 | | 2.875 | | 3.500 | | 4.500 | | 6.625 | |
| Avg. Wall | 0.157 | | 0.164 | | 0.190 | | 0.203 | | 0.212 | | 0.231 | | 0.293 | | 0.318 | | 0.357 | | 0.458 | |
| Min. Wall | 0.147 | | 0.154 | | 0.179 | | 0.191 | | 0.200 | | 0.218 | | 0.276 | | 0.300 | | 0.337 | | 0.432 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 1 | 1.47 | 0.97 | 0.78 | 0.21 | 0.47 | 0.06 | 0.26 | 0.01 | 0.19 | 0.01 | | | | | | | | | | |
| 2 | 2.95 | 3.50 | 1.57 | 0.75 | 0.93 | 0.21 | 0.52 | 0.05 | 0.37 | 0.02 | 0.22 | 0.01 | | | | | | | | |
| 3 | 4.42 | 7.42 | 2.35 | 1.59 | 1.40 | 0.45 | 0.78 | 0.11 | 0.56 | 0.05 | 0.33 | 0.01 | | | | | | | | |
| 4 | 5.90 | 12.64 | 3.13 | 2.71 | 1.87 | 0.77 | 1.04 | 0.18 | 0.75 | 0.08 | 0.45 | 0.02 | 0.31 | 0.01 | | | | | | |
| 5 | 7.37 | 19.11 | 3.91 | 4.09 | 2.33 | 1.16 | 1.30 | 0.28 | 0.94 | 0.13 | 0.56 | 0.04 | 0.39 | 0.01 | | | | | | |
| 6 | 8.85 | 26.78 | 4.70 | 5.74 | 2.80 | 1.63 | 1.56 | 0.39 | 1.12 | 0.18 | 0.67 | 0.05 | 0.47 | 0.02 | 0.30 | 0.01 | | | | |
| 7 | 10.32 | 35.63 | 5.48 | 7.63 | 3.27 | 2.17 | 1.82 | 0.52 | 1.31 | 0.24 | 0.78 | 0.07 | 0.55 | 0.03 | 0.35 | 0.01 | | | | |
| 8 | 11.80 | 45.63 | 6.26 | 9.77 | 3.73 | 2.78 | 2.08 | 0.67 | 1.50 | 0.30 | 0.89 | 0.09 | 0.62 | 0.04 | 0.40 | 0.01 | | | | |
| 9 | 13.27 | 56.75 | 7.04 | 12.15 | 4.20 | 3.45 | 2.34 | 0.83 | 1.69 | 0.37 | 1.00 | 0.11 | 0.70 | 0.04 | 0.45 | 0.01 | | | | |
| 10 | 14.75 | 68.98 | 7.83 | 14.77 | 4.67 | 4.20 | 2.59 | 1.01 | 1.87 | 0.46 | 1.11 | 0.13 | 0.78 | 0.05 | 0.50 | 0.02 | | | | |
| 12 | | | 9.39 | 20.70 | 5.60 | 5.88 | 3.11 | 1.41 | 2.25 | 0.64 | 1.34 | 0.18 | 0.93 | 0.08 | 0.60 | 0.03 | | | | |
| 14 | | | 10.96 | 27.55 | 6.53 | 7.83 | 3.63 | 1.88 | 2.62 | 0.85 | 1.56 | 0.24 | 1.09 | 0.10 | 0.70 | 0.03 | | | | |
| 16 | | | 12.52 | 35.27 | 7.47 | 10.03 | 4.15 | 2.40 | 3.00 | 1.09 | 1.78 | 0.31 | 1.25 | 0.13 | 0.80 | 0.04 | 0.46 | 0.01 | | |
| 18 | | | 14.09 | 43.87 | 8.40 | 12.47 | 4.67 | 2.99 | 3.37 | 1.35 | 2.01 | 0.38 | 1.40 | 0.16 | 0.90 | 0.05 | 0.51 | 0.01 | | |
| 20 | | | 15.65 | 53.32 | 9.33 | 15.16 | 5.19 | 3.63 | 3.75 | 1.64 | 2.23 | 0.47 | 1.56 | 0.19 | 0.99 | 0.07 | 0.57 | 0.02 | | |
| 22 | | | | | 10.27 | 18.08 | 5.71 | 4.33 | 4.12 | 1.96 | 2.45 | 0.56 | 1.71 | 0.23 | 1.09 | 0.08 | 0.63 | 0.02 | | |
| 24 | | | | | 11.20 | 21.24 | 6.23 | 5.09 | 4.49 | 2.30 | 2.68 | 0.65 | 1.87 | 0.27 | 1.19 | 0.09 | 0.68 | 0.02 | | |
| 26 | | | | | 12.13 | 24.64 | 6.75 | 5.91 | 4.87 | 2.67 | 2.90 | 0.76 | 2.02 | 0.32 | 1.29 | 0.11 | 0.74 | 0.03 | | |
| 28 | | | | | 13.07 | 28.26 | 7.26 | 6.77 | 5.24 | 3.06 | 3.12 | 0.87 | 2.18 | 0.36 | 1.39 | 0.12 | 0.80 | 0.03 | | |
| 30 | | | | | 14.00 | 32.12 | 7.78 | 7.70 | 5.62 | 3.48 | 3.34 | 0.99 | 2.34 | 0.41 | 1.49 | 0.14 | 0.85 | 0.04 | | |
| 32 | | | | | 14.93 | 36.19 | 8.30 | 8.68 | 5.99 | 3.92 | 3.57 | 1.11 | 2.49 | 0.46 | 1.59 | 0.16 | 0.91 | 0.04 | 0.40 | 0.01 |
| 34 | | | | | 15.87 | 40.49 | 8.82 | 9.71 | 6.37 | 4.39 | 3.79 | 1.24 | 2.65 | 0.52 | 1.69 | 0.17 | 0.97 | 0.04 | 0.43 | 0.01 |
| 36 | | | | | | | 9.34 | 10.79 | 6.74 | 4.88 | 4.01 | 1.38 | 2.80 | 0.58 | 1.79 | 0.19 | 1.02 | 0.05 | 0.45 | 0.01 |
| 38 | | | | | | | 9.86 | 11.93 | 7.12 | 5.40 | 4.24 | 1.53 | 2.96 | 0.64 | 1.89 | 0.21 | 1.08 | 0.06 | 0.48 | 0.01 |
| 40 | | | | | | | 10.38 | 13.11 | 7.49 | 5.93 | 4.46 | 1.68 | 3.11 | 0.70 | 1.99 | 0.24 | 1.14 | 0.06 | 0.50 | 0.01 |
| 42 | | | | | | | 10.90 | 14.35 | 7.87 | 6.49 | 4.68 | 1.84 | 3.27 | 0.77 | 2.09 | 0.26 | 1.20 | 0.07 | 0.53 | 0.01 |
| 44 | | | | | | | 11.42 | 15.65 | 8.24 | 7.08 | 4.91 | 2.00 | 3.43 | 0.84 | 2.19 | 0.28 | 1.25 | 0.07 | 0.55 | 0.01 |
| 46 | | | | | | | 11.94 | 16.99 | 8.61 | 7.69 | 5.13 | 2.18 | 3.58 | 0.91 | 2.29 | 0.31 | 1.31 | 0.08 | 0.58 | 0.01 |
| 48 | | | | | | | 12.45 | 18.38 | 8.99 | 8.32 | 5.35 | 2.35 | 3.74 | 0.98 | 2.39 | 0.33 | 1.37 | 0.08 | 0.60 | 0.01 |
| 50 | | | | | | | 12.97 | 19.83 | 9.36 | 8.97 | 5.57 | 2.54 | 3.89 | 1.06 | 2.49 | 0.36 | 1.42 | 0.09 | 0.63 | 0.01 |
| 55 | | | | | | | 14.27 | 23.65 | 10.30 | 10.70 | 6.13 | 3.03 | 4.28 | 1.27 | 2.74 | 0.43 | 1.57 | 0.11 | 0.69 | 0.01 |
| 60 | | | | | | | 15.57 | 27.79 | 11.24 | 12.57 | 6.69 | 3.56 | 4.67 | 1.49 | 2.98 | 0.50 | 1.71 | 0.13 | 0.75 | 0.02 |
| 65 | | | | | | | | | 12.17 | 14.58 | 7.25 | 4.13 | 5.06 | 1.72 | 3.23 | 0.58 | 1.85 | 0.15 | 0.81 | 0.02 |
| 70 | | | | | | | | | 13.11 | 16.73 | 7.80 | 4.74 | 5.45 | 1.98 | 3.48 | 0.66 | 1.99 | 0.17 | 0.88 | 0.02 |
| 75 | | | | | | | | | 14.05 | 19.01 | 8.36 | 5.38 | 5.84 | 2.25 | 3.73 | 0.76 | 2.13 | 0.19 | 0.94 | 0.03 |
| 80 | | | | | | | | | 14.98 | 21.42 | 8.92 | 6.06 | 6.23 | 2.53 | 3.98 | 0.85 | 2.28 | 0.22 | 1.00 | 0.03 |
| 85 | | | | | | | | | 15.92 | 23.96 | 9.48 | 6.78 | 6.62 | 2.83 | 4.23 | 0.95 | 2.42 | 0.24 | 1.06 | 0.03 |
| 90 | | | | | | | | | | | 10.03 | 7.54 | 7.01 | 3.15 | 4.48 | 1.06 | 2.56 | 0.27 | 1.13 | 0.04 |
| 95 | | | | | | | | | | | 10.59 | 8.34 | 7.40 | 3.48 | 4.73 | 1.17 | 2.70 | 0.30 | 1.19 | 0.04 |
| 100 | | | | | | | | | | | 11.15 | 9.17 | 7.79 | 3.83 | 4.97 | 1.29 | 2.85 | 0.33 | 1.25 | 0.04 |
| 110 | | | | | | | | | | | 12.26 | 10.94 | 8.57 | 4.57 | 5.47 | 1.53 | 3.13 | 0.39 | 1.38 | 0.05 |
| 120 | | | | | | | | | | | 13.38 | 12.85 | 9.34 | 5.37 | 5.97 | 1.80 | 3.42 | 0.46 | 1.50 | 0.06 |
| 130 | | | | | | | | | | | 14.49 | 14.90 | 10.12 | 6.22 | 6.47 | 2.09 | 3.70 | 0.54 | 1.63 | 0.07 |
| 140 | | | | | | | | | | | 15.61 | 17.09 | 10.90 | 7.14 | 6.96 | 2.40 | 3.98 | 0.62 | 1.75 | 0.08 |
| 150 | | | | | | | | | | | | | 11.68 | 8.11 | 7.46 | 2.73 | 4.27 | 0.70 | 1.88 | 0.10 |
| 160 | | | | | | | | | | | | | 12.46 | 9.14 | 7.96 | 3.07 | 4.55 | 0.79 | 2.00 | 0.11 |
| 170 | | | | | | | | | | | | | 13.24 | 10.23 | 8.46 | 3.44 | 4.84 | 0.88 | 2.13 | 0.12 |
| 180 | | | | | | | | | | | | | 14.02 | 11.37 | 8.95 | 3.82 | 5.12 | 0.98 | 2.25 | 0.13 |
| 190 | | | | | | | | | | | | | 14.80 | 12.57 | 9.45 | 4.22 | 5.41 | 1.09 | 2.38 | 0.15 |
| 200 | | | | | | | | | | | | | 15.57 | 13.82 | 9.95 | 4.64 | 5.69 | 1.19 | 2.50 | 0.16 |
| 220 | | | | | | | | | | | | | | | 10.94 | 5.54 | 6.26 | 1.42 | 2.75 | 0.19 |
| 240 | | | | | | | | | | | | | | | 11.94 | 6.51 | 6.83 | 1.67 | 3.00 | 0.23 |
| 260 | | | | | | | | | | | | | | | 12.93 | 7.55 | 7.40 | 1.94 | 3.25 | 0.26 |
| 280 | | | | | | | | | | | | | | | 13.93 | 8.66 | 7.97 | 2.23 | 3.51 | 0.30 |
| 300 | | | | | | | | | | | | | | | 14.92 | 9.84 | 8.54 | 2.53 | 3.76 | 0.34 |
| 320 | | | | | | | | | | | | | | | 15.92 | 11.09 | 9.11 | 2.85 | 4.01 | 0.39 |
| 340 | | | | | | | | | | | | | | | | | 9.68 | 3.19 | 4.26 | 0.43 |
| 360 | | | | | | | | | | | | | | | | | 10.25 | 3.55 | 4.51 | 0.48 |
| 380 | | | | | | | | | | | | | | | | | 10.82 | 3.92 | 4.76 | 0.53 |
| 400 | | | | | | | | | | | | | | | | | 11.39 | 4.31 | 5.01 | 0.58 |
| 420 | | | | | | | | | | | | | | | | | 11.95 | 4.72 | 5.26 | 0.64 |
| 440 | | | | | | | | | | | | | | | | | 12.52 | 5.14 | 5.51 | 0.70 |
| 460 | | | | | | | | | | | | | | | | | 13.09 | 5.59 | 5.76 | 0.76 |
| 480 | | | | | | | | | | | | | | | | | 13.66 | 6.04 | 6.01 | 0.82 |
| 500 | | | | | | | | | | | | | | | | | 14.23 | 6.52 | 6.26 | 0.88 |
| Working Pressure | 850 PSI | | 690 PSI | | 630 PSI | | 520 PSI | | 470 PSI | | 400 PSI | | 420 PSI | | 370 PSI | | 320 PSI | | 280 PSI | |

**The shaded area represents velocities over 5 fps. Use with caution.**

# SCHEDULE 80 PVC IPS PLASTIC PIPE

**ASTM D1785 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 4" | | 6" | | 8" | | 10" | | 12" | |
|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 3.786 | | 5.709 | | 7.565 | | 9.493 | | 11.294 | |
| Pipe OD | 4.500 | | 6.625 | | 8.625 | | 10.750 | | 12.750 | |
| Avg. Wall | 0.357 | | 0.458 | | 0.530 | | 0.629 | | 0.728 | |
| Min. Wall | 0.337 | | 0.432 | | 0.500 | | 0.593 | | 0.687 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 10 | 0.28 | 0.00 | 0.13 | 0.00 | 0.07 | 0.00 | 0.05 | 0.00 | 0.03 | 0.00 |
| 20 | 0.57 | 0.02 | 0.25 | 0.00 | 0.14 | 0.00 | 0.09 | 0.00 | 0.06 | 0.00 |
| 30 | 0.85 | 0.04 | 0.38 | 0.00 | 0.21 | 0.00 | 0.14 | 0.00 | 0.10 | 0.00 |
| 40 | 1.14 | 0.06 | 0.50 | 0.01 | 0.29 | 0.00 | 0.18 | 0.00 | 0.13 | 0.00 |
| 50 | 1.42 | 0.09 | 0.63 | 0.01 | 0.36 | 0.00 | 0.23 | 0.00 | 0.16 | 0.00 |
| 60 | 1.71 | 0.13 | 0.75 | 0.02 | 0.43 | 0.00 | 0.27 | 0.00 | 0.19 | 0.00 |
| 70 | 1.99 | 0.17 | 0.88 | 0.02 | 0.50 | 0.01 | 0.32 | 0.00 | 0.22 | 0.00 |
| 80 | 2.28 | 0.22 | 1.00 | 0.03 | 0.57 | 0.01 | 0.36 | 0.00 | 0.26 | 0.00 |
| 90 | 2.56 | 0.27 | 1.13 | 0.04 | 0.64 | 0.01 | 0.41 | 0.00 | 0.29 | 0.00 |
| 100 | 2.85 | 0.33 | 1.25 | 0.04 | 0.71 | 0.01 | 0.45 | 0.00 | 0.32 | 0.00 |
| 120 | 3.42 | 0.46 | 1.50 | 0.06 | 0.86 | 0.02 | 0.54 | 0.01 | 0.38 | 0.00 |
| 140 | 3.98 | 0.62 | 1.75 | 0.08 | 1.00 | 0.02 | 0.63 | 0.01 | 0.45 | 0.00 |
| 160 | 4.55 | 0.79 | 2.00 | 0.11 | 1.14 | 0.03 | 0.72 | 0.01 | 0.51 | 0.00 |
| 180 | 5.12 | 0.98 | 2.25 | 0.13 | 1.28 | 0.03 | 0.81 | 0.01 | 0.58 | 0.00 |
| 200 | 5.69 | 1.19 | 2.50 | 0.16 | 1.43 | 0.04 | 0.91 | 0.01 | 0.64 | 0.01 |
| 225 | 6.40 | 1.49 | 2.82 | 0.20 | 1.60 | 0.05 | 1.02 | 0.02 | 0.72 | 0.01 |
| 250 | 7.12 | 1.81 | 3.13 | 0.24 | 1.78 | 0.06 | 1.13 | 0.02 | 0.80 | 0.01 |
| 275 | 7.83 | 2.15 | 3.44 | 0.29 | 1.96 | 0.07 | 1.25 | 0.02 | 0.88 | 0.01 |
| 300 | 8.54 | 2.53 | 3.76 | 0.34 | 2.14 | 0.09 | 1.36 | 0.03 | 0.96 | 0.01 |
| 325 | 9.25 | 2.94 | 4.07 | 0.40 | 2.32 | 0.10 | 1.47 | 0.03 | 1.04 | 0.01 |
| 350 | 9.96 | 3.37 | 4.38 | 0.46 | 2.50 | 0.12 | 1.58 | 0.04 | 1.12 | 0.02 |
| 375 | | | 4.69 | 0.52 | 2.67 | 0.13 | 1.70 | 0.04 | 1.20 | 0.02 |
| 400 | | | 5.01 | 0.58 | 2.85 | 0.15 | 1.81 | 0.05 | 1.28 | 0.02 |
| 425 | | | 5.32 | 0.65 | 3.03 | 0.17 | 1.92 | 0.06 | 1.36 | 0.02 |
| 450 | | | 5.63 | 0.73 | 3.21 | 0.18 | 2.04 | 0.06 | 1.44 | 0.03 |
| 475 | | | 5.95 | 0.80 | 3.39 | 0.20 | 2.15 | 0.07 | 1.52 | 0.03 |
| 500 | | | 6.26 | 0.88 | 3.56 | 0.22 | 2.26 | 0.07 | 1.60 | 0.03 |
| 550 | | | 6.88 | 1.05 | 3.92 | 0.27 | 2.49 | 0.09 | 1.76 | 0.04 |
| 600 | | | 7.51 | 1.24 | 4.28 | 0.31 | 2.72 | 0.10 | 1.92 | 0.04 |
| 650 | | | 8.14 | 1.44 | 4.63 | 0.36 | 2.94 | 0.12 | 2.08 | 0.05 |
| 700 | | | 8.76 | 1.65 | 4.99 | 0.42 | 3.17 | 0.14 | 2.24 | 0.06 |
| 750 | | | | | 5.35 | 0.48 | 3.40 | 0.16 | 2.40 | 0.07 |
| 800 | | | | | 5.70 | 0.54 | 3.62 | 0.18 | 2.56 | 0.08 |
| 850 | | | | | 6.06 | 0.60 | 3.85 | 0.20 | 2.72 | 0.09 |
| 900 | | | | | 6.42 | 0.67 | 4.07 | 0.22 | 2.88 | 0.09 |
| 950 | | | | | 6.77 | 0.74 | 4.30 | 0.24 | 3.04 | 0.10 |
| 1000 | | | | | 7.13 | 0.81 | 4.53 | 0.27 | 3.20 | 0.12 |
| 1050 | | | | | 7.49 | 0.89 | 4.75 | 0.29 | 3.36 | 0.13 |
| 1150 | | | | | 8.20 | 1.05 | 5.21 | 0.35 | 3.68 | 0.15 |
| 1200 | | | | | 8.56 | 1.14 | 5.43 | 0.38 | 3.84 | 0.16 |
| 1250 | | | | | | | 5.66 | 0.41 | 4.00 | 0.17 |
| 1300 | | | | | | | 5.89 | 0.44 | 4.16 | 0.19 |
| 1350 | | | | | | | 6.11 | 0.47 | 4.32 | 0.20 |
| 1400 | | | | | | | 6.34 | 0.50 | 4.48 | 0.22 |
| 1500 | | | | | | | 6.79 | 0.57 | 4.80 | 0.24 |
| 1550 | | | | | | | 7.02 | 0.60 | 4.96 | 0.26 |
| 1600 | | | | | | | 7.24 | 0.64 | 5.12 | 0.28 |
| 1650 | | | | | | | 7.47 | 0.68 | 5.28 | 0.29 |
| 1700 | | | | | | | 7.70 | 0.72 | 5.44 | 0.31 |
| 1750 | | | | | | | 7.92 | 0.76 | 5.60 | 0.33 |
| 1800 | | | | | | | | | 5.76 | 0.34 |
| 1850 | | | | | | | | | 5.92 | 0.36 |
| 1900 | | | | | | | | | 6.08 | 0.38 |
| 1950 | | | | | | | | | 6.24 | 0.40 |
| 2000 | | | | | | | | | 6.40 | 0.42 |
| 2100 | | | | | | | | | 6.72 | 0.46 |
| 2200 | | | | | | | | | 7.04 | 0.50 |
| 2300 | | | | | | | | | 7.36 | 0.54 |
| 2400 | | | | | | | | | 7.68 | 0.58 |
| 2500 | | | | | | | | | 8.00 | 0.63 |
| 2600 | | | | | | | | | | |
| 2700 | | | | | | | | | | |
| 2800 | | | | | | | | | | |
| 2900 | | | | | | | | | | |
| 3000 | | | | | | | | | | |

**The shaded area represents velocities over 5 fps. Use with caution.**

# POLYETHYLENE PLASTIC PIPE ID CONTROLLED

**PE 3408 ASTM D2239 C=140**

**PSI Loss per 100' of Pipe**

| Nominal Size | 1/2" | | 3/4" | | 1" | | 1 1/4" | | 1 1/2" | | 2" | | 2 1/2" | | 3" | | 4" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 0.622 | | 0.824 | | 1.049 | | 1.380 | | 1.610 | | 2.067 | | 2.469 | | 3.068 | | 4.026 | |
| Flow GPM | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS | Velocity FPS | PSI LOSS |
| 1 | 1.05 | 0.49 | 0.60 | 0.12 | 0.37 | 0.04 | 0.21 | 0.01 | 0.16 | 0.00 | | | | | | | | |
| 2 | 2.11 | 1.76 | 1.20 | 0.45 | 0.74 | 0.14 | 0.43 | 0.04 | 0.31 | 0.02 | 0.19 | 0.01 | | | | | | |
| 3 | 3.16 | 3.73 | 1.80 | 0.95 | 1.11 | 0.29 | 0.64 | 0.08 | 0.47 | 0.04 | 0.29 | 0.01 | | | | | | |
| 4 | 4.22 | 6.35 | 2.40 | 1.62 | 1.48 | 0.50 | 0.86 | 0.13 | 0.63 | 0.06 | 0.38 | 0.02 | 0.27 | 0.01 | | | | |
| 5 | 5.27 | 9.60 | 3.00 | 2.44 | 1.85 | 0.76 | 1.07 | 0.20 | 0.79 | 0.09 | 0.48 | 0.03 | 0.33 | 0.01 | | | | |
| 6 | 6.33 | 13.46 | 3.61 | 3.43 | 2.22 | 1.06 | 1.29 | 0.28 | 0.94 | 0.13 | 0.57 | 0.04 | 0.40 | 0.02 | 0.26 | 0.01 | | |
| 7 | 7.38 | 17.91 | 4.21 | 4.56 | 2.60 | 1.41 | 1.50 | 0.37 | 1.10 | 0.18 | 0.67 | 0.05 | 0.47 | 0.02 | 0.30 | 0.01 | | |
| 8 | 8.44 | 22.93 | 4.81 | 5.84 | 2.97 | 1.80 | 1.71 | 0.47 | 1.26 | 0.22 | 0.76 | 0.07 | 0.54 | 0.03 | 0.35 | 0.01 | | |
| 9 | 9.49 | 28.52 | 5.41 | 7.26 | 3.34 | 2.24 | 1.93 | 0.59 | 1.42 | 0.28 | 0.86 | 0.08 | 0.60 | 0.03 | 0.39 | 0.01 | | |
| 10 | 10.55 | 34.67 | 6.01 | 8.82 | 3.71 | 2.73 | 2.14 | 0.72 | 1.57 | 0.34 | 0.95 | 0.10 | 0.67 | 0.04 | 0.43 | 0.01 | | |
| 12 | | | 7.21 | 12.37 | 4.45 | 3.82 | 2.57 | 1.01 | 1.89 | 0.48 | 1.15 | 0.14 | 0.80 | 0.06 | 0.52 | 0.02 | | |
| 14 | | | 8.41 | 16.45 | 5.19 | 5.08 | 3.00 | 1.34 | 2.20 | 0.63 | 1.34 | 0.19 | 0.94 | 0.08 | 0.61 | 0.03 | | |
| 16 | | | 9.61 | 21.07 | 5.93 | 6.51 | 3.43 | 1.71 | 2.52 | 0.81 | 1.53 | 0.24 | 1.07 | 0.10 | 0.69 | 0.04 | 0.40 | 0.01 |
| 18 | | | 10.82 | 26.21 | 6.67 | 8.10 | 3.86 | 2.13 | 2.83 | 1.01 | 1.72 | 0.30 | 1.20 | 0.13 | 0.78 | 0.04 | 0.45 | 0.01 |
| 20 | | | 12.02 | 31.85 | 7.42 | 9.84 | 4.28 | 2.59 | 3.15 | 1.22 | 1.91 | 0.36 | 1.34 | 0.15 | 0.87 | 0.05 | 0.50 | 0.01 |
| 22 | | | | | 8.16 | 11.74 | 4.71 | 3.09 | 3.46 | 1.46 | 2.10 | 0.43 | 1.47 | 0.18 | 0.95 | 0.06 | 0.55 | 0.02 |
| 24 | | | | | 8.90 | 13.79 | 5.14 | 3.63 | 3.78 | 1.72 | 2.29 | 0.51 | 1.61 | 0.21 | 1.04 | 0.07 | 0.60 | 0.02 |
| 26 | | | | | 9.64 | 16.00 | 5.57 | 4.21 | 4.09 | 1.99 | 2.48 | 0.59 | 1.74 | 0.25 | 1.13 | 0.09 | 0.65 | 0.02 |
| 28 | | | | | 10.38 | 18.35 | 6.00 | 4.83 | 4.41 | 2.28 | 2.67 | 0.68 | 1.87 | 0.28 | 1.21 | 0.10 | 0.70 | 0.03 |
| 30 | | | | | 11.12 | 20.85 | 6.43 | 5.49 | 4.72 | 2.59 | 2.86 | 0.77 | 2.01 | 0.32 | 1.30 | 0.11 | 0.76 | 0.03 |
| 32 | | | | | 11.86 | 23.50 | 6.86 | 6.19 | 5.04 | 2.92 | 3.06 | 0.87 | 2.14 | 0.36 | 1.39 | 0.13 | 0.81 | 0.03 |
| 34 | | | | | 12.61 | 26.29 | 7.28 | 6.92 | 5.35 | 3.27 | 3.25 | 0.97 | 2.28 | 0.41 | 1.47 | 0.14 | 0.86 | 0.04 |
| 36 | | | | | | | 7.71 | 7.69 | 5.67 | 3.63 | 3.44 | 1.08 | 2.41 | 0.45 | 1.56 | 0.16 | 0.91 | 0.04 |
| 38 | | | | | | | 8.14 | 8.50 | 5.98 | 4.02 | 3.63 | 1.19 | 2.54 | 0.50 | 1.65 | 0.17 | 0.96 | 0.05 |
| 40 | | | | | | | 8.57 | 9.35 | 6.30 | 4.42 | 3.82 | 1.31 | 2.68 | 0.55 | 1.73 | 0.19 | 1.01 | 0.05 |
| 42 | | | | | | | 9.00 | 10.24 | 6.61 | 4.83 | 4.01 | 1.43 | 2.81 | 0.60 | 1.82 | 0.21 | 1.06 | 0.06 |
| 44 | | | | | | | 9.43 | 11.16 | 6.93 | 5.27 | 4.20 | 1.56 | 2.94 | 0.66 | 1.91 | 0.23 | 1.11 | 0.06 |
| 46 | | | | | | | 9.86 | 12.12 | 7.24 | 5.72 | 4.39 | 1.70 | 3.08 | 0.71 | 1.99 | 0.25 | 1.16 | 0.07 |
| 48 | | | | | | | 10.28 | 13.11 | 7.56 | 6.19 | 4.58 | 1.84 | 3.21 | 0.77 | 2.08 | 0.27 | 1.21 | 0.07 |
| 50 | | | | | | | 10.71 | 14.14 | 7.87 | 6.68 | 4.77 | 1.98 | 3.35 | 0.83 | 2.17 | 0.29 | 1.26 | 0.08 |
| 55 | | | | | | | 11.78 | 16.87 | 8.66 | 7.97 | 5.25 | 2.36 | 3.68 | 0.99 | 2.38 | 0.35 | 1.38 | 0.09 |
| 60 | | | | | | | 12.85 | 19.82 | 9.44 | 9.36 | 5.73 | 2.77 | 4.02 | 1.17 | 2.60 | 0.41 | 1.51 | 0.11 |
| 65 | | | | | | | | | 10.23 | 10.86 | 6.21 | 3.22 | 4.35 | 1.36 | 2.82 | 0.47 | 1.64 | 0.13 |
| 70 | | | | | | | | | 11.02 | 12.45 | 6.68 | 3.69 | 4.69 | 1.55 | 3.03 | 0.54 | 1.76 | 0.14 |
| 75 | | | | | | | | | 11.81 | 14.15 | 7.16 | 4.19 | 5.02 | 1.77 | 3.25 | 0.61 | 1.89 | 0.16 |
| 80 | | | | | | | | | 12.59 | 15.95 | 7.64 | 4.73 | 5.35 | 1.99 | 3.47 | 0.69 | 2.01 | 0.18 |
| 85 | | | | | | | | | 13.38 | 17.84 | 8.12 | 5.29 | 5.69 | 2.23 | 3.68 | 0.77 | 2.14 | 0.21 |
| 90 | | | | | | | | | | | 8.59 | 5.88 | 6.02 | 2.48 | 3.90 | 0.86 | 2.27 | 0.23 |
| 95 | | | | | | | | | | | 9.07 | 6.50 | 6.36 | 2.74 | 4.12 | 0.95 | 2.39 | 0.25 |
| 100 | | | | | | | | | | | 9.55 | 7.15 | 6.69 | 3.01 | 4.33 | 1.05 | 2.52 | 0.28 |
| 110 | | | | | | | | | | | 10.50 | 8.53 | 7.36 | 3.59 | 4.77 | 1.25 | 2.77 | 0.33 |
| 120 | | | | | | | | | | | 11.46 | 10.02 | 8.03 | 4.22 | 5.20 | 1.47 | 3.02 | 0.39 |
| 130 | | | | | | | | | | | 12.41 | 11.62 | 8.70 | 4.89 | 5.63 | 1.70 | 3.27 | 0.45 |
| 140 | | | | | | | | | | | 13.37 | 13.33 | 9.37 | 5.61 | 6.07 | 1.95 | 3.52 | 0.52 |
| 150 | | | | | | | | | | | | | 10.04 | 6.38 | 6.50 | 2.22 | 3.78 | 0.59 |
| 160 | | | | | | | | | | | | | 10.71 | 7.19 | 6.94 | 2.50 | 4.03 | 0.67 |
| 170 | | | | | | | | | | | | | 11.38 | 8.04 | 7.37 | 2.79 | 4.28 | 0.74 |
| 180 | | | | | | | | | | | | | 12.05 | 8.94 | 7.80 | 3.11 | 4.53 | 0.83 |
| 190 | | | | | | | | | | | | | 12.72 | 9.88 | 8.24 | 3.43 | 4.78 | 0.92 |
| 200 | | | | | | | | | | | | | 13.39 | 10.87 | 8.67 | 3.78 | 5.03 | 1.01 |
| 220 | | | | | | | | | | | | | | | 9.54 | 4.50 | 5.54 | 1.20 |
| 240 | | | | | | | | | | | | | | | 10.40 | 5.29 | 6.04 | 1.41 |
| 260 | | | | | | | | | | | | | | | 11.27 | 6.14 | 6.54 | 1.64 |
| 280 | | | | | | | | | | | | | | | 12.14 | 7.04 | 7.05 | 1.88 |
| 300 | | | | | | | | | | | | | | | 13.00 | 8.00 | 7.55 | 2.13 |
| 320 | | | | | | | | | | | | | | | 13.87 | 9.02 | 8.05 | 2.40 |
| 340 | | | | | | | | | | | | | | | | | 8.56 | 2.69 |
| 360 | | | | | | | | | | | | | | | | | 9.06 | 2.99 |
| 380 | | | | | | | | | | | | | | | | | 9.57 | 3.30 |
| 400 | | | | | | | | | | | | | | | | | 10.07 | 3.63 |
| 420 | | | | | | | | | | | | | | | | | 10.57 | 3.98 |
| 440 | | | | | | | | | | | | | | | | | 11.08 | 4.33 |
| 460 | | | | | | | | | | | | | | | | | 11.58 | 4.71 |
| 480 | | | | | | | | | | | | | | | | | 12.08 | 5.09 |
| 500 | | | | | | | | | | | | | | | | | 12.59 | 5.49 |

**The shaded area represents velocities over 5 fps. Use with caution.**

# HDPE DR 7 265 PSI (IPS SIZE, OD CONTROLLED)

**ANSI/ASAE S376.2 PE3408 ASTM D2239 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 3" | | 4" | | 6" | | 8" | | 10" | | 12" | | 14" | | 16" | | 18" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 2.440 | | 3.136 | | 4.589 | | 6.013 | | 7.494 | | 8.890 | | 9.760 | | 11.156 | | 12.550 | |
| Pipe O.D. | 3.500 | | 4.500 | | 6.625 | | 8.625 | | 10.750 | | 12.750 | | 14.000 | | 16.000 | | 18.000 | |
| Avg. Wall | 0.530 | | 0.682 | | 1.018 | | 1.306 | | 1.628 | | 1.930 | | 2.120 | | 2.422 | | 2.725 | |
| Min Wall | 0.500 | | 0.643 | | 0.946 | | 1.232 | | 1.536 | | 1.821 | | 2.000 | | 2.286 | | 2.571 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 50 | 3.43 | 0.78 | 2.07 | 0.23 | 0.97 | 0.04 | 0.56 | 0.01 | 0.36 | 0.00 | 0.26 | 0.00 | 0.21 | 0.00 | 0.16 | 0.00 | 0.13 | 0.00 |
| 60 | 4.11 | 1.09 | 2.49 | 0.32 | 1.16 | 0.05 | 0.68 | 0.01 | 0.44 | 0.00 | 0.31 | 0.00 | 0.26 | 0.00 | 0.20 | 0.00 | 0.16 | 0.00 |
| 70 | 4.80 | 1.45 | 2.90 | 0.43 | 1.36 | 0.07 | 0.79 | 0.02 | 0.51 | 0.01 | 0.36 | 0.00 | 0.30 | 0.00 | 0.23 | 0.00 | 0.18 | 0.00 |
| 80 | 5.48 | 1.86 | 3.32 | 0.55 | 1.55 | 0.09 | 0.90 | 0.02 | 0.58 | 0.01 | 0.41 | 0.00 | 0.34 | 0.00 | 0.26 | 0.00 | 0.21 | 0.00 |
| 90 | 6.17 | 2.31 | 3.73 | 0.68 | 1.74 | 0.11 | 1.02 | 0.03 | 0.65 | 0.01 | 0.46 | 0.00 | 0.39 | 0.00 | 0.30 | 0.00 | 0.23 | 0.00 |
| 100 | 6.85 | 2.81 | 4.15 | 0.83 | 1.94 | 0.13 | 1.13 | 0.03 | 0.73 | 0.01 | 0.52 | 0.01 | 0.43 | 0.00 | 0.33 | 0.00 | 0.26 | 0.00 |
| 120 | 8.22 | 3.93 | 4.98 | 1.16 | 2.32 | 0.18 | 1.35 | 0.05 | 0.87 | 0.02 | 0.62 | 0.01 | 0.51 | 0.00 | 0.39 | 0.00 | 0.31 | 0.00 |
| 140 | 9.59 | 5.23 | 5.81 | 1.54 | 2.71 | 0.24 | 1.58 | 0.06 | 1.02 | 0.02 | 0.72 | 0.01 | 0.60 | 0.01 | 0.46 | 0.00 | 0.36 | 0.00 |
| 160 | 10.96 | 6.70 | 6.64 | 1.98 | 3.10 | 0.31 | 1.81 | 0.08 | 1.16 | 0.03 | 0.83 | 0.01 | 0.69 | 0.01 | 0.52 | 0.00 | 0.41 | 0.00 |
| 180 | | | 7.47 | 2.46 | 3.49 | 0.39 | 2.03 | 0.10 | 1.31 | 0.04 | 0.93 | 0.02 | 0.77 | 0.01 | 0.59 | 0.01 | 0.47 | 0.00 |
| 200 | | | 8.30 | 2.99 | 3.87 | 0.47 | 2.26 | 0.13 | 1.45 | 0.04 | 1.03 | 0.02 | 0.86 | 0.01 | 0.66 | 0.01 | 0.52 | 0.00 |
| 220 | | | 9.13 | 3.56 | 4.26 | 0.56 | 2.48 | 0.15 | 1.60 | 0.05 | 1.14 | 0.02 | 0.94 | 0.01 | 0.72 | 0.01 | 0.57 | 0.00 |
| 240 | | | 9.96 | 4.19 | 4.65 | 0.66 | 2.71 | 0.18 | 1.74 | 0.06 | 1.24 | 0.03 | 1.03 | 0.02 | 0.79 | 0.01 | 0.62 | 0.00 |
| 260 | | | 10.79 | 4.86 | 5.04 | 0.76 | 2.93 | 0.20 | 1.89 | 0.07 | 1.34 | 0.03 | 1.11 | 0.02 | 0.85 | 0.01 | 0.67 | 0.01 |
| 280 | | | 11.62 | 5.57 | 5.42 | 0.87 | 3.16 | 0.23 | 2.03 | 0.08 | 1.45 | 0.03 | 1.20 | 0.02 | 0.92 | 0.01 | 0.73 | 0.01 |
| 300 | | | | | 5.81 | 0.99 | 3.39 | 0.27 | 2.18 | 0.09 | 1.55 | 0.04 | 1.28 | 0.03 | 0.98 | 0.01 | 0.78 | 0.01 |
| 320 | | | | | 6.20 | 1.12 | 3.61 | 0.30 | 2.32 | 0.10 | 1.65 | 0.04 | 1.37 | 0.03 | 1.05 | 0.01 | 0.83 | 0.01 |
| 340 | | | | | 6.59 | 1.25 | 3.84 | 0.34 | 2.47 | 0.12 | 1.76 | 0.05 | 1.46 | 0.03 | 1.11 | 0.02 | 0.88 | 0.01 |
| 360 | | | | | 6.97 | 1.39 | 4.06 | 0.37 | 2.62 | 0.13 | 1.86 | 0.06 | 1.54 | 0.04 | 1.18 | 0.02 | 0.93 | 0.01 |
| 380 | | | | | 7.36 | 1.54 | 4.29 | 0.41 | 2.76 | 0.14 | 1.96 | 0.06 | 1.63 | 0.04 | 1.25 | 0.02 | 0.98 | 0.01 |
| 400 | | | | | 7.75 | 1.69 | 4.51 | 0.45 | 2.91 | 0.16 | 2.06 | 0.07 | 1.71 | 0.04 | 1.31 | 0.02 | 1.04 | 0.01 |
| 450 | | | | | 8.72 | 2.10 | 5.08 | 0.56 | 3.27 | 0.19 | 2.32 | 0.08 | 1.93 | 0.05 | 1.48 | 0.03 | 1.17 | 0.02 |
| 500 | | | | | 9.69 | 2.56 | 5.64 | 0.69 | 3.63 | 0.24 | 2.58 | 0.10 | 2.14 | 0.06 | 1.64 | 0.03 | 1.30 | 0.02 |
| 550 | | | | | 10.66 | 3.05 | 6.21 | 0.82 | 4.00 | 0.28 | 2.84 | 0.12 | 2.36 | 0.08 | 1.80 | 0.04 | 1.42 | 0.02 |
| 600 | | | | | 11.62 | 3.58 | 6.77 | 0.96 | 4.36 | 0.33 | 3.10 | 0.14 | 2.57 | 0.09 | 1.97 | 0.05 | 1.55 | 0.03 |
| 650 | | | | | | | 7.33 | 1.12 | 4.72 | 0.38 | 3.36 | 0.17 | 2.78 | 0.11 | 2.13 | 0.06 | 1.68 | 0.03 |
| 700 | | | | | | | 7.90 | 1.28 | 5.09 | 0.44 | 3.61 | 0.19 | 3.00 | 0.12 | 2.29 | 0.06 | 1.81 | 0.04 |
| 750 | | | | | | | 8.46 | 1.45 | 5.45 | 0.50 | 3.87 | 0.22 | 3.21 | 0.14 | 2.46 | 0.07 | 1.94 | 0.04 |
| 800 | | | | | | | 9.03 | 1.64 | 5.81 | 0.56 | 4.13 | 0.24 | 3.43 | 0.16 | 2.62 | 0.08 | 2.07 | 0.05 |
| 850 | | | | | | | 9.59 | 1.83 | 6.18 | 0.63 | 4.39 | 0.27 | 3.64 | 0.17 | 2.79 | 0.09 | 2.20 | 0.05 |
| 900 | | | | | | | 10.16 | 2.04 | 6.54 | 0.70 | 4.65 | 0.30 | 3.85 | 0.19 | 2.95 | 0.10 | 2.33 | 0.06 |
| 950 | | | | | | | 10.72 | 2.25 | 6.90 | 0.77 | 4.90 | 0.34 | 4.07 | 0.21 | 3.11 | 0.11 | 2.46 | 0.06 |
| 1000 | | | | | | | 11.28 | 2.48 | 7.26 | 0.85 | 5.16 | 0.37 | 4.28 | 0.23 | 3.28 | 0.12 | 2.59 | 0.07 |
| 1050 | | | | | | | 11.85 | 2.71 | 7.63 | 0.93 | 5.42 | 0.40 | 4.50 | 0.26 | 3.44 | 0.13 | 2.72 | 0.08 |
| 1100 | | | | | | | | | 7.99 | 1.01 | 5.68 | 0.44 | 4.71 | 0.28 | 3.61 | 0.15 | 2.85 | 0.08 |
| 1150 | | | | | | | | | 8.35 | 1.10 | 5.94 | 0.48 | 4.93 | 0.30 | 3.77 | 0.16 | 2.98 | 0.09 |
| 1200 | | | | | | | | | 8.72 | 1.19 | 6.19 | 0.52 | 5.14 | 0.33 | 3.93 | 0.17 | 3.11 | 0.10 |
| 1250 | | | | | | | | | 9.08 | 1.28 | 6.45 | 0.56 | 5.35 | 0.35 | 4.10 | 0.19 | 3.24 | 0.10 |
| 1300 | | | | | | | | | 9.44 | 1.38 | 6.71 | 0.60 | 5.57 | 0.38 | 4.26 | 0.20 | 3.37 | 0.11 |
| 1350 | | | | | | | | | 9.81 | 1.48 | 6.97 | 0.64 | 5.78 | 0.41 | 4.43 | 0.21 | 3.50 | 0.12 |
| 1400 | | | | | | | | | 10.17 | 1.58 | 7.23 | 0.69 | 6.00 | 0.44 | 4.59 | 0.23 | 3.63 | 0.13 |
| 1450 | | | | | | | | | 10.53 | 1.69 | 7.49 | 0.74 | 6.21 | 0.47 | 4.75 | 0.24 | 3.76 | 0.14 |
| 1500 | | | | | | | | | 10.90 | 1.80 | 7.74 | 0.78 | 6.42 | 0.50 | 4.92 | 0.26 | 3.89 | 0.15 |
| 1550 | | | | | | | | | 11.26 | 1.91 | 8.00 | 0.83 | 6.64 | 0.53 | 5.08 | 0.28 | 4.02 | 0.16 |
| 1600 | | | | | | | | | 11.62 | 2.03 | 8.26 | 0.88 | 6.85 | 0.56 | 5.25 | 0.29 | 4.14 | 0.16 |
| 1650 | | | | | | | | | | | 8.52 | 0.93 | 7.07 | 0.59 | 5.41 | 0.31 | 4.27 | 0.17 |
| 1700 | | | | | | | | | | | 8.78 | 0.99 | 7.28 | 0.63 | 5.57 | 0.33 | 4.40 | 0.18 |
| 1750 | | | | | | | | | | | 9.03 | 1.04 | 7.50 | 0.66 | 5.74 | 0.35 | 4.53 | 0.19 |
| 1800 | | | | | | | | | | | 9.29 | 1.10 | 7.71 | 0.70 | 5.90 | 0.36 | 4.66 | 0.21 |
| 1900 | | | | | | | | | | | 9.81 | 1.21 | 8.14 | 0.77 | 6.23 | 0.40 | 4.92 | 0.23 |
| 2000 | | | | | | | | | | | 10.32 | 1.33 | 8.57 | 0.85 | 6.56 | 0.44 | 5.18 | 0.25 |
| 2100 | | | | | | | | | | | 10.84 | 1.46 | 8.99 | 0.93 | 6.88 | 0.48 | 5.44 | 0.27 |
| 2200 | | | | | | | | | | | 11.36 | 1.59 | 9.42 | 1.01 | 7.21 | 0.53 | 5.70 | 0.30 |
| 2300 | | | | | | | | | | | 11.87 | 1.73 | 9.85 | 1.10 | 7.54 | 0.57 | 5.96 | 0.32 |
| 2400 | | | | | | | | | | | | | 10.28 | 1.19 | 7.87 | 0.62 | 6.22 | 0.35 |
| 2500 | | | | | | | | | | | | | 10.71 | 1.28 | 8.20 | 0.67 | 6.48 | 0.38 |
| 2600 | | | | | | | | | | | | | 11.14 | 1.38 | 8.52 | 0.72 | 6.74 | 0.41 |
| 2700 | | | | | | | | | | | | | 11.56 | 1.48 | 8.85 | 0.77 | 6.99 | 0.43 |
| 2800 | | | | | | | | | | | | | 11.99 | 1.58 | 9.18 | 0.82 | 7.25 | 0.46 |
| 2900 | | | | | | | | | | | | | | | 9.51 | 0.88 | 7.51 | 0.50 |
| 3000 | | | | | | | | | | | | | | | 9.83 | 0.94 | 7.77 | 0.53 |
| 3300 | | | | | | | | | | | | | | | 10.82 | 1.12 | 8.55 | 0.63 |
| 3600 | | | | | | | | | | | | | | | 11.80 | 1.31 | 9.33 | 0.74 |
| 3900 | | | | | | | | | | | | | | | | | 10.10 | 0.86 |
| 4000 | | | | | | | | | | | | | | | | | 10.36 | 0.90 |

**The shaded area represents velocities over 5 fps. Use with caution.**

# HDPE DR 9 200 PSI (IPS SIZE, OD CONTROLLED)

**ANSI/ASAE S376.2 PE3408 ASTM D2239 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 3" | | 4" | | 6" | | 8" | | 10" | | 12" | | 14" | | 16" | | 18" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 2.674 | | 3.440 | | 5.065 | | 6.593 | | 8.218 | | 9.746 | | 10.700 | | 12.230 | | 13.760 | |
| Pipe O.D. | 3.500 | | 4.500 | | 6.625 | | 8.625 | | 10.750 | | 12.750 | | 14.000 | | 16.000 | | 18.000 | |
| Avg. Wall | 0.413 | | 0.530 | | 0.780 | | 1.016 | | 1.266 | | 1.502 | | 1.650 | | 1.885 | | 2.120 | |
| Min Wall | 0.389 | | 0.500 | | 0.736 | | 0.958 | | 1.194 | | 1.417 | | 1.556 | | 1.778 | | 2.000 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 50 | 2.85 | 0.50 | 1.72 | 0.15 | 0.80 | 0.02 | | | | | | | | | | | | |
| 60 | 3.42 | 0.70 | 2.07 | 0.20 | 0.95 | 0.03 | | | | | | | | | | | | |
| 70 | 3.99 | 0.93 | 2.41 | 0.27 | 1.11 | 0.04 | | | | | | | | | | | | |
| 80 | 4.56 | 1.19 | 2.76 | 0.35 | 1.27 | 0.05 | | | | | | | | | | | | |
| 90 | 5.14 | 1.48 | 3.10 | 0.43 | 1.43 | 0.07 | | | | | | | | | | | | |
| 100 | 5.71 | 1.80 | 3.45 | 0.53 | 1.59 | 0.08 | 0.94 | 0.02 | | | | | | | | | | |
| 120 | 6.85 | 2.52 | 4.14 | 0.74 | 1.91 | 0.11 | 1.13 | 0.03 | | | | | | | | | | |
| 140 | 7.99 | 3.35 | 4.83 | 0.98 | 2.23 | 0.15 | 1.31 | 0.04 | | | | | | | | | | |
| 160 | 9.13 | 4.29 | 5.52 | 1.26 | 2.54 | 0.19 | 1.50 | 0.05 | 0.97 | 0.02 | | | | | | | | |
| 180 | | | 6.21 | 1.57 | 2.86 | 0.24 | 1.69 | 0.07 | 1.09 | 0.02 | | | | | | | | |
| 200 | | | 6.90 | 1.90 | 3.18 | 0.29 | 1.88 | 0.08 | 1.21 | 0.03 | | | | | | | | |
| 220 | | | 7.59 | 2.27 | 3.50 | 0.35 | 2.06 | 0.10 | 1.33 | 0.03 | | | | | | | | |
| 240 | | | 8.27 | 2.67 | 3.82 | 0.41 | 2.25 | 0.11 | 1.45 | 0.04 | 1.03 | 0.02 | | | | | | |
| 260 | | | 8.96 | 3.10 | 4.13 | 0.47 | 2.44 | 0.13 | 1.57 | 0.04 | 1.12 | 0.02 | | | | | | |
| 280 | | | 9.65 | 3.55 | 4.45 | 0.54 | 2.63 | 0.15 | 1.69 | 0.05 | 1.20 | 0.02 | | | | | | |
| 300 | | | | | 4.77 | 0.61 | 2.82 | 0.17 | 1.81 | 0.06 | 1.29 | 0.03 | 1.07 | 0.02 | | | | |
| 320 | | | | | 5.09 | 0.69 | 3.00 | 0.19 | 1.93 | 0.07 | 1.37 | 0.03 | 1.14 | 0.02 | | | | |
| 340 | | | | | 5.41 | 0.77 | 3.19 | 0.21 | 2.05 | 0.07 | 1.46 | 0.03 | 1.21 | 0.02 | | | | |
| 360 | | | | | 5.73 | 0.86 | 3.38 | 0.24 | 2.17 | 0.08 | 1.55 | 0.04 | 1.28 | 0.02 | | | | |
| 380 | | | | | 6.04 | 0.95 | 3.57 | 0.26 | 2.30 | 0.09 | 1.63 | 0.04 | 1.35 | 0.02 | | | | |
| 400 | | | | | 6.36 | 1.05 | 3.75 | 0.29 | 2.42 | 0.10 | 1.72 | 0.04 | 1.43 | 0.03 | | | | |
| 450 | | | | | 7.16 | 1.30 | 4.22 | 0.36 | 2.72 | 0.12 | 1.93 | 0.05 | 1.60 | 0.03 | 1.23 | 0.02 | | |
| 500 | | | | | 7.95 | 1.58 | 4.69 | 0.44 | 3.02 | 0.15 | 2.15 | 0.07 | 1.78 | 0.04 | 1.36 | 0.02 | | |
| 550 | | | | | 8.75 | 1.89 | 5.16 | 0.52 | 3.32 | 0.18 | 2.36 | 0.08 | 1.96 | 0.05 | 1.50 | 0.03 | | |
| 600 | | | | | 9.54 | 2.22 | 5.63 | 0.61 | 3.62 | 0.21 | 2.58 | 0.09 | 2.14 | 0.06 | 1.64 | 0.03 | 1.29 | 0.02 |
| 650 | | | | | | | 6.10 | 0.71 | 3.93 | 0.24 | 2.79 | 0.11 | 2.32 | 0.07 | 1.77 | 0.04 | 1.40 | 0.02 |
| 700 | | | | | | | 6.57 | 0.82 | 4.23 | 0.28 | 3.01 | 0.12 | 2.49 | 0.08 | 1.91 | 0.04 | 1.51 | 0.02 |
| 750 | | | | | | | 7.04 | 0.93 | 4.53 | 0.32 | 3.22 | 0.14 | 2.67 | 0.09 | 2.05 | 0.05 | 1.62 | 0.03 |
| 800 | | | | | | | 7.51 | 1.05 | 4.83 | 0.36 | 3.44 | 0.16 | 2.85 | 0.10 | 2.18 | 0.05 | 1.72 | 0.03 |
| 850 | | | | | | | 7.98 | 1.17 | 5.14 | 0.40 | 3.65 | 0.17 | 3.03 | 0.11 | 2.32 | 0.06 | 1.83 | 0.03 |
| 900 | | | | | | | 8.45 | 1.30 | 5.44 | 0.45 | 3.87 | 0.19 | 3.21 | 0.12 | 2.45 | 0.06 | 1.94 | 0.04 |
| 950 | | | | | | | 8.92 | 1.44 | 5.74 | 0.49 | 4.08 | 0.21 | 3.39 | 0.14 | 2.59 | 0.07 | 2.05 | 0.04 |
| 1000 | | | | | | | 9.39 | 1.58 | 6.04 | 0.54 | 4.30 | 0.24 | 3.56 | 0.15 | 2.73 | 0.08 | 2.15 | 0.04 |
| 1050 | | | | | | | 9.86 | 1.73 | 6.34 | 0.59 | 4.51 | 0.26 | 3.74 | 0.16 | 2.86 | 0.09 | 2.26 | 0.05 |
| 1100 | | | | | | | | | 6.65 | 0.65 | 4.72 | 0.28 | 3.92 | 0.18 | 3.00 | 0.09 | 2.37 | 0.05 |
| 1150 | | | | | | | | | 6.95 | 0.70 | 4.94 | 0.31 | 4.10 | 0.19 | 3.14 | 0.10 | 2.48 | 0.06 |
| 1200 | | | | | | | | | 7.25 | 0.76 | 5.15 | 0.33 | 4.28 | 0.21 | 3.27 | 0.11 | 2.59 | 0.06 |
| 1250 | | | | | | | | | 7.55 | 0.82 | 5.37 | 0.36 | 4.45 | 0.23 | 3.41 | 0.12 | 2.69 | 0.07 |
| 1300 | | | | | | | | | 7.85 | 0.88 | 5.58 | 0.38 | 4.63 | 0.24 | 3.55 | 0.13 | 2.80 | 0.07 |
| 1350 | | | | | | | | | 8.16 | 0.94 | 5.80 | 0.41 | 4.81 | 0.26 | 3.68 | 0.14 | 2.91 | 0.08 |
| 1400 | | | | | | | | | 8.46 | 1.01 | 6.01 | 0.44 | 4.99 | 0.28 | 3.82 | 0.15 | 3.02 | 0.08 |
| 1450 | | | | | | | | | 8.76 | 1.08 | 6.23 | 0.47 | 5.17 | 0.30 | 3.96 | 0.16 | 3.12 | 0.09 |
| 1500 | | | | | | | | | 9.06 | 1.15 | 6.44 | 0.50 | 5.35 | 0.32 | 4.09 | 0.17 | 3.23 | 0.09 |
| 1550 | | | | | | | | | 9.36 | 1.22 | 6.66 | 0.53 | 5.52 | 0.34 | 4.23 | 0.18 | 3.34 | 0.10 |
| 1600 | | | | | | | | | 9.67 | 1.29 | 6.87 | 0.56 | 5.70 | 0.36 | 4.36 | 0.19 | 3.45 | 0.11 |
| 1650 | | | | | | | | | 9.97 | 1.37 | 7.09 | 0.60 | 5.88 | 0.38 | 4.50 | 0.20 | 3.56 | 0.11 |
| 1700 | | | | | | | | | | | 7.30 | 0.63 | 6.06 | 0.40 | 4.64 | 0.21 | 3.66 | 0.12 |
| 1750 | | | | | | | | | | | 7.52 | 0.67 | 6.24 | 0.42 | 4.77 | 0.22 | 3.77 | 0.12 |
| 1800 | | | | | | | | | | | 7.73 | 0.70 | 6.41 | 0.45 | 4.91 | 0.23 | 3.88 | 0.13 |
| 1900 | | | | | | | | | | | 8.16 | 0.78 | 6.77 | 0.49 | 5.18 | 0.26 | 4.09 | 0.14 |
| 2000 | | | | | | | | | | | 8.59 | 0.85 | 7.13 | 0.54 | 5.46 | 0.28 | 4.31 | 0.16 |
| 2100 | | | | | | | | | | | 9.02 | 0.93 | 7.48 | 0.59 | 5.73 | 0.31 | 4.53 | 0.17 |
| 2200 | | | | | | | | | | | 9.45 | 1.02 | 7.84 | 0.65 | 6.00 | 0.34 | 4.74 | 0.19 |
| 2300 | | | | | | | | | | | 9.88 | 1.10 | 8.20 | 0.70 | 6.27 | 0.37 | 4.96 | 0.21 |
| 2400 | | | | | | | | | | | | | 8.55 | 0.76 | 6.55 | 0.40 | 5.17 | 0.22 |
| 2500 | | | | | | | | | | | | | 8.91 | 0.82 | 6.82 | 0.43 | 5.39 | 0.24 |
| 2600 | | | | | | | | | | | | | 9.27 | 0.88 | 7.09 | 0.46 | 5.60 | 0.26 |
| 2700 | | | | | | | | | | | | | 9.62 | 0.94 | 7.36 | 0.49 | 5.82 | 0.28 |
| 2800 | | | | | | | | | | | | | 9.98 | 1.01 | 7.64 | 0.53 | 6.03 | 0.30 |
| 2900 | | | | | | | | | | | | | | | 7.91 | 0.56 | 6.25 | 0.32 |
| 3000 | | | | | | | | | | | | | | | 8.18 | 0.60 | 6.46 | 0.34 |
| 3300 | | | | | | | | | | | | | | | 9.00 | 0.71 | 7.11 | 0.40 |
| 3600 | | | | | | | | | | | | | | | 9.82 | 0.84 | 7.76 | 0.47 |
| 3900 | | | | | | | | | | | | | | | | | 8.40 | 0.55 |
| 4000 | | | | | | | | | | | | | | | | | 8.62 | 0.57 |

**The shaded area represents velocities over 5 fps. Use with caution.**

# HDPE DR 11 160 PSI (IPS SIZE, OD CONTROLLED)

**ANSI/ASAE S376.2 PE3408, ASTM D2239 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 3" | | 4" | | 6" | | 8" | | 10" | | 12" | | 14" | | 16" | | 18" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 2.826 | | 3.632 | | 5.349 | | 6.963 | | 8.678 | | 10.292 | | 11.300 | | 12.914 | | 14.532 | |
| Pipe O.D. | 3.500 | | 4.500 | | 6.625 | | 8.625 | | 10.750 | | 12.750 | | 14.000 | | 16.000 | | 18.000 | |
| Avg. Wall | 0.337 | | 0.434 | | 0.638 | | 0.831 | | 1.036 | | 1.229 | | 1.350 | | 1.543 | | 1.734 | |
| Min Wall | 0.318 | | 0.409 | | 0.602 | | 0.784 | | 0.977 | | 1.159 | | 1.273 | | 1.455 | | 1.636 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 50 | 2.55 | 0.38 | 1.55 | 0.11 | 0.71 | 0.02 | | | | | | | | | | | | |
| 60 | 3.07 | 0.53 | 1.86 | 0.16 | 0.86 | 0.02 | | | | | | | | | | | | |
| 70 | 3.58 | 0.71 | 2.17 | 0.21 | 1.00 | 0.03 | | | | | | | | | | | | |
| 80 | 4.09 | 0.91 | 2.47 | 0.27 | 1.14 | 0.04 | | | | | | | | | | | | |
| 90 | 4.60 | 1.13 | 2.78 | 0.33 | 1.28 | 0.05 | | | | | | | | | | | | |
| 100 | 5.11 | 1.37 | 3.09 | 0.40 | 1.43 | 0.06 | 0.84 | 0.02 | | | | | | | | | | |
| 120 | 6.13 | 1.92 | 3.71 | 0.57 | 1.71 | 0.09 | 1.01 | 0.02 | | | | | | | | | | |
| 140 | 7.15 | 2.56 | 4.33 | 0.76 | 2.00 | 0.11 | 1.18 | 0.03 | | | | | | | | | | |
| 160 | 8.17 | 3.28 | 4.95 | 0.97 | 2.28 | 0.15 | 1.35 | 0.04 | | | | | | | | | | |
| 180 | 9.20 | 4.08 | 5.57 | 1.20 | 2.57 | 0.18 | 1.51 | 0.05 | | | | | | | | | | |
| 200 | 10.22 | 4.96 | 6.19 | 1.46 | 2.85 | 0.22 | 1.68 | 0.06 | 1.08 | 0.02 | 0.77 | 0.01 | | | | | | |
| 220 | 11.24 | 5.91 | 6.80 | 1.74 | 3.14 | 0.27 | 1.85 | 0.07 | 1.19 | 0.03 | 0.85 | 0.01 | | | | | | |
| 240 | 12.26 | 6.95 | 7.42 | 2.05 | 3.42 | 0.31 | 2.02 | 0.09 | 1.30 | 0.03 | 0.92 | 0.01 | | | | | | |
| 260 | | | 8.04 | 2.38 | 3.71 | 0.36 | 2.19 | 0.10 | 1.41 | 0.03 | 1.00 | 0.01 | | | | | | |
| 280 | | | 8.66 | 2.73 | 3.99 | 0.41 | 2.36 | 0.11 | 1.52 | 0.04 | 1.08 | 0.02 | | | | | | |
| 300 | | | 9.28 | 3.10 | 4.28 | 0.47 | 2.52 | 0.13 | 1.63 | 0.04 | 1.16 | 0.02 | | | | | | |
| 320 | | | 9.90 | 3.49 | 4.56 | 0.53 | 2.69 | 0.15 | 1.73 | 0.05 | 1.23 | 0.02 | | | | | | |
| 340 | | | 10.52 | 3.91 | 4.85 | 0.59 | 2.86 | 0.16 | 1.84 | 0.06 | 1.31 | 0.02 | 1.09 | 0.02 | | | | |
| 360 | | | 11.13 | 4.34 | 5.13 | 0.66 | 3.03 | 0.18 | 1.95 | 0.06 | 1.39 | 0.03 | 1.15 | 0.02 | | | | |
| 380 | | | | | 5.42 | 0.73 | 3.20 | 0.20 | 2.06 | 0.07 | 1.46 | 0.03 | 1.21 | 0.02 | | | | |
| 400 | | | | | 5.70 | 0.80 | 3.37 | 0.22 | 2.17 | 0.08 | 1.54 | 0.03 | 1.28 | 0.02 | | | | |
| 450 | | | | | 6.42 | 1.00 | 3.79 | 0.28 | 2.44 | 0.09 | 1.73 | 0.04 | 1.44 | 0.03 | | | | |
| 500 | | | | | 7.13 | 1.21 | 4.21 | 0.34 | 2.71 | 0.12 | 1.93 | 0.05 | 1.60 | 0.03 | 1.22 | 0.02 | | |
| 550 | | | | | 7.84 | 1.45 | 4.63 | 0.40 | 2.98 | 0.14 | 2.12 | 0.06 | 1.76 | 0.04 | 1.35 | 0.02 | | |
| 600 | | | | | 8.56 | 1.70 | 5.05 | 0.47 | 3.25 | 0.16 | 2.31 | 0.07 | 1.92 | 0.04 | 1.47 | 0.02 | | |
| 650 | | | | | 9.27 | 1.97 | 5.47 | 0.55 | 3.52 | 0.19 | 2.50 | 0.08 | 2.08 | 0.05 | 1.59 | 0.03 | | |
| 700 | | | | | 9.98 | 2.26 | 5.89 | 0.63 | 3.79 | 0.21 | 2.70 | 0.09 | 2.24 | 0.06 | 1.71 | 0.03 | 1.35 | 0.02 |
| 750 | | | | | 10.69 | 2.57 | 6.31 | 0.71 | 4.06 | 0.24 | 2.89 | 0.11 | 2.40 | 0.07 | 1.83 | 0.04 | 1.45 | 0.02 |
| 800 | | | | | | | 6.73 | 0.80 | 4.33 | 0.27 | 3.08 | 0.12 | 2.56 | 0.08 | 1.96 | 0.04 | 1.55 | 0.02 |
| 850 | | | | | | | 7.15 | 0.90 | 4.61 | 0.31 | 3.27 | 0.13 | 2.72 | 0.09 | 2.08 | 0.04 | 1.64 | 0.03 |
| 900 | | | | | | | 7.57 | 1.00 | 4.88 | 0.34 | 3.47 | 0.15 | 2.88 | 0.09 | 2.20 | 0.05 | 1.74 | 0.03 |
| 950 | | | | | | | 7.99 | 1.10 | 5.15 | 0.38 | 3.66 | 0.16 | 3.04 | 0.10 | 2.32 | 0.05 | 1.84 | 0.03 |
| 1000 | | | | | | | 8.42 | 1.21 | 5.42 | 0.42 | 3.85 | 0.18 | 3.20 | 0.12 | 2.45 | 0.06 | 1.93 | 0.03 |
| 1050 | | | | | | | 8.84 | 1.33 | 5.69 | 0.45 | 4.04 | 0.20 | 3.36 | 0.13 | 2.57 | 0.07 | 2.03 | 0.04 |
| 1100 | | | | | | | 9.26 | 1.45 | 5.96 | 0.50 | 4.24 | 0.22 | 3.51 | 0.14 | 2.69 | 0.07 | 2.13 | 0.04 |
| 1150 | | | | | | | 9.68 | 1.57 | 6.23 | 0.54 | 4.43 | 0.23 | 3.67 | 0.15 | 2.81 | 0.08 | 2.22 | 0.04 |
| 1200 | | | | | | | 10.10 | 1.70 | 6.50 | 0.58 | 4.62 | 0.25 | 3.83 | 0.16 | 2.94 | 0.08 | 2.32 | 0.05 |
| 1250 | | | | | | | 10.52 | 1.83 | 6.77 | 0.63 | 4.81 | 0.27 | 3.99 | 0.17 | 3.06 | 0.09 | 2.42 | 0.05 |
| 1300 | | | | | | | | | 7.04 | 0.68 | 5.01 | 0.29 | 4.15 | 0.19 | 3.18 | 0.10 | 2.51 | 0.05 |
| 1350 | | | | | | | | | 7.31 | 0.72 | 5.20 | 0.32 | 4.31 | 0.20 | 3.30 | 0.10 | 2.61 | 0.06 |
| 1400 | | | | | | | | | 7.58 | 0.78 | 5.39 | 0.34 | 4.47 | 0.21 | 3.43 | 0.11 | 2.70 | 0.06 |
| 1450 | | | | | | | | | 7.86 | 0.83 | 5.59 | 0.36 | 4.63 | 0.23 | 3.55 | 0.12 | 2.80 | 0.07 |
| 1500 | | | | | | | | | 8.13 | 0.88 | 5.78 | 0.38 | 4.79 | 0.24 | 3.67 | 0.13 | 2.90 | 0.07 |
| 1550 | | | | | | | | | 8.40 | 0.94 | 5.97 | 0.41 | 4.95 | 0.26 | 3.79 | 0.14 | 2.99 | 0.08 |
| 1600 | | | | | | | | | 8.67 | 0.99 | 6.16 | 0.43 | 5.11 | 0.27 | 3.91 | 0.14 | 3.09 | 0.08 |
| 1650 | | | | | | | | | 8.94 | 1.05 | 6.36 | 0.46 | 5.27 | 0.29 | 4.04 | 0.15 | 3.19 | 0.09 |
| 1700 | | | | | | | | | 9.21 | 1.11 | 6.55 | 0.48 | 5.43 | 0.31 | 4.16 | 0.16 | 3.28 | 0.09 |
| 1750 | | | | | | | | | 9.48 | 1.17 | 6.74 | 0.51 | 5.59 | 0.32 | 4.28 | 0.17 | 3.38 | 0.10 |
| 1800 | | | | | | | | | 9.75 | 1.23 | 6.93 | 0.54 | 5.75 | 0.34 | 4.40 | 0.18 | 3.48 | 0.10 |
| 1900 | | | | | | | | | 10.29 | 1.36 | 7.32 | 0.59 | 6.07 | 0.38 | 4.65 | 0.20 | 3.67 | 0.11 |
| 2000 | | | | | | | | | | | 7.70 | 0.65 | 6.39 | 0.42 | 4.89 | 0.22 | 3.86 | 0.12 |
| 2100 | | | | | | | | | | | 8.09 | 0.72 | 6.71 | 0.45 | 5.14 | 0.24 | 4.06 | 0.13 |
| 2200 | | | | | | | | | | | 8.47 | 0.78 | 7.03 | 0.50 | 5.38 | 0.26 | 4.25 | 0.15 |
| 2300 | | | | | | | | | | | 8.86 | 0.85 | 7.35 | 0.54 | 5.63 | 0.28 | 4.44 | 0.16 |
| 2400 | | | | | | | | | | | | | 7.67 | 0.58 | 5.87 | 0.30 | 4.64 | 0.17 |
| 2500 | | | | | | | | | | | | | 7.99 | 0.63 | 6.12 | 0.33 | 4.83 | 0.18 |
| 2600 | | | | | | | | | | | | | 8.31 | 0.68 | 6.36 | 0.35 | 5.02 | 0.20 |
| 2700 | | | | | | | | | | | | | 8.63 | 0.72 | 6.61 | 0.38 | 5.22 | 0.21 |
| 2800 | | | | | | | | | | | | | 8.95 | 0.77 | 6.85 | 0.40 | 5.41 | 0.23 |
| 2900 | | | | | | | | | | | | | | | 7.09 | 0.43 | 5.60 | 0.24 |
| 3000 | | | | | | | | | | | | | | | 7.34 | 0.46 | 5.80 | 0.26 |
| 3300 | | | | | | | | | | | | | | | 8.07 | 0.55 | 6.38 | 0.31 |
| 3600 | | | | | | | | | | | | | | | 8.81 | 0.64 | 6.96 | 0.36 |
| 3900 | | | | | | | | | | | | | | | | | 7.53 | 0.42 |
| 4000 | | | | | | | | | | | | | | | | | 7.73 | 0.44 |

**The shaded area represents velocities over 5 fps. Use with caution.**

# HDPE DR 13.5 128 PSI (IPS SIZE, OD CONTROLLED)

**ANSI/ASAE S376.2 PE3408, ASTM D2239 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 3" | | 4" | | 6" | | 8" | | 10" | | 12" | | 14" | | 16" | | 18" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 2.950 | | 3.794 | | 5.583 | | 7.269 | | 9.062 | | 10.748 | | 11.802 | | 13.488 | | 15.174 | |
| Pipe O.D. | 3.500 | | 4.500 | | 6.625 | | 8.625 | | 10.750 | | 12.750 | | 14.000 | | 16.000 | | 18.000 | |
| Avg. Wall | 0.275 | | 0.353 | | 0.521 | | 0.678 | | 0.844 | | 1.001 | | 1.099 | | 1.256 | | 1.413 | |
| Min Wall | 0.259 | | 0.333 | | 0.491 | | 0.639 | | 0.796 | | 0.944 | | 1.037 | | 1.185 | | 1.333 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 50 | 2.34 | 0.31 | 1.42 | 0.09 | 0.65 | 0.01 | | | | | | | | | | | | |
| 60 | 2.81 | 0.43 | 1.70 | 0.13 | 0.79 | 0.02 | | | | | | | | | | | | |
| 70 | 3.28 | 0.58 | 1.98 | 0.17 | 0.92 | 0.03 | | | | | | | | | | | | |
| 80 | 3.75 | 0.74 | 2.27 | 0.22 | 1.05 | 0.03 | | | | | | | | | | | | |
| 90 | 4.22 | 0.92 | 2.55 | 0.27 | 1.18 | 0.04 | | | | | | | | | | | | |
| 100 | 4.69 | 1.11 | 2.83 | 0.33 | 1.31 | 0.05 | 0.77 | 0.01 | | | | | | | | | | |
| 120 | 5.63 | 1.56 | 3.40 | 0.46 | 1.57 | 0.07 | 0.93 | 0.02 | | | | | | | | | | |
| 140 | 6.56 | 2.08 | 3.97 | 0.61 | 1.83 | 0.09 | 1.08 | 0.03 | | | | | | | | | | |
| 160 | 7.50 | 2.66 | 4.54 | 0.78 | 2.09 | 0.12 | 1.24 | 0.03 | | | | | | | | | | |
| 180 | 8.44 | 3.31 | 5.10 | 0.97 | 2.36 | 0.15 | 1.39 | 0.04 | | | | | | | | | | |
| 200 | | | 5.67 | 1.18 | 2.62 | 0.18 | 1.54 | 0.05 | 0.99 | 0.02 | 0.71 | 0.01 | | | | | | |
| 220 | | | 6.24 | 1.41 | 2.88 | 0.22 | 1.70 | 0.06 | 1.09 | 0.02 | 0.78 | 0.01 | | | | | | |
| 240 | | | 6.80 | 1.66 | 3.14 | 0.25 | 1.85 | 0.07 | 1.19 | 0.02 | 0.85 | 0.01 | | | | | | |
| 260 | | | 7.37 | 1.92 | 3.40 | 0.29 | 2.01 | 0.08 | 1.29 | 0.03 | 0.92 | 0.01 | | | | | | |
| 280 | | | 7.94 | 2.20 | 3.67 | 0.34 | 2.16 | 0.09 | 1.39 | 0.03 | 0.99 | 0.01 | | | | | | |
| 300 | | | | | 3.93 | 0.38 | 2.32 | 0.11 | 1.49 | 0.04 | 1.06 | 0.02 | | | | | | |
| 320 | | | | | 4.19 | 0.43 | 2.47 | 0.12 | 1.59 | 0.04 | 1.13 | 0.02 | | | | | | |
| 340 | | | | | 4.45 | 0.48 | 2.63 | 0.13 | 1.69 | 0.05 | 1.20 | 0.02 | 1.00 | 0.01 | | | | |
| 360 | | | | | 4.71 | 0.54 | 2.78 | 0.15 | 1.79 | 0.05 | 1.27 | 0.02 | 1.05 | 0.01 | | | | |
| 380 | | | | | 4.97 | 0.59 | 2.93 | 0.16 | 1.89 | 0.06 | 1.34 | 0.02 | 1.11 | 0.02 | | | | |
| 400 | | | | | 5.24 | 0.65 | 3.09 | 0.18 | 1.99 | 0.06 | 1.41 | 0.03 | 1.17 | 0.02 | | | | |
| 450 | | | | | 5.89 | 0.81 | 3.47 | 0.22 | 2.24 | 0.08 | 1.59 | 0.03 | 1.32 | 0.02 | | | | |
| 500 | | | | | 6.54 | 0.98 | 3.86 | 0.27 | 2.48 | 0.09 | 1.77 | 0.04 | 1.46 | 0.03 | 1.12 | 0.01 | | |
| 550 | | | | | 7.20 | 1.17 | 4.25 | 0.33 | 2.73 | 0.11 | 1.94 | 0.05 | 1.61 | 0.03 | 1.23 | 0.02 | | |
| 600 | | | | | 7.85 | 1.38 | 4.63 | 0.38 | 2.98 | 0.13 | 2.12 | 0.06 | 1.76 | 0.04 | 1.35 | 0.02 | | |
| 650 | | | | | 8.51 | 1.60 | 5.02 | 0.44 | 3.23 | 0.15 | 2.30 | 0.07 | 1.90 | 0.04 | 1.46 | 0.02 | | |
| 700 | | | | | | | 5.41 | 0.51 | 3.48 | 0.17 | 2.47 | 0.08 | 2.05 | 0.05 | 1.57 | 0.03 | 1.24 | 0.01 |
| 750 | | | | | | | 5.79 | 0.58 | 3.73 | 0.20 | 2.65 | 0.09 | 2.20 | 0.05 | 1.68 | 0.03 | 1.33 | 0.02 |
| 800 | | | | | | | 6.18 | 0.65 | 3.97 | 0.22 | 2.83 | 0.10 | 2.34 | 0.06 | 1.79 | 0.03 | 1.42 | 0.02 |
| 850 | | | | | | | 6.56 | 0.73 | 4.22 | 0.25 | 3.00 | 0.11 | 2.49 | 0.07 | 1.91 | 0.04 | 1.51 | 0.02 |
| 900 | | | | | | | 6.95 | 0.81 | 4.47 | 0.28 | 3.18 | 0.12 | 2.64 | 0.08 | 2.02 | 0.04 | 1.59 | 0.02 |
| 950 | | | | | | | 7.34 | 0.90 | 4.72 | 0.31 | 3.36 | 0.13 | 2.78 | 0.08 | 2.13 | 0.04 | 1.68 | 0.02 |
| 1000 | | | | | | | 7.72 | 0.98 | 4.97 | 0.34 | 3.53 | 0.15 | 2.93 | 0.09 | 2.24 | 0.05 | 1.77 | 0.03 |
| 1050 | | | | | | | 8.11 | 1.08 | 5.22 | 0.37 | 3.71 | 0.16 | 3.08 | 0.10 | 2.35 | 0.05 | 1.86 | 0.03 |
| 1100 | | | | | | | | | 5.47 | 0.40 | 3.89 | 0.18 | 3.22 | 0.11 | 2.47 | 0.06 | 1.95 | 0.03 |
| 1150 | | | | | | | | | 5.71 | 0.44 | 4.06 | 0.19 | 3.37 | 0.12 | 2.58 | 0.06 | 2.04 | 0.04 |
| 1200 | | | | | | | | | 5.96 | 0.47 | 4.24 | 0.21 | 3.52 | 0.13 | 2.69 | 0.07 | 2.13 | 0.04 |
| 1250 | | | | | | | | | 6.21 | 0.51 | 4.41 | 0.22 | 3.66 | 0.14 | 2.80 | 0.07 | 2.21 | 0.04 |
| 1300 | | | | | | | | | 6.46 | 0.55 | 4.59 | 0.24 | 3.81 | 0.15 | 2.92 | 0.08 | 2.30 | 0.04 |
| 1350 | | | | | | | | | 6.71 | 0.59 | 4.77 | 0.26 | 3.95 | 0.16 | 3.03 | 0.08 | 2.39 | 0.05 |
| 1400 | | | | | | | | | 6.96 | 0.63 | 4.94 | 0.27 | 4.10 | 0.17 | 3.14 | 0.09 | 2.48 | 0.05 |
| 1450 | | | | | | | | | 7.20 | 0.67 | 5.12 | 0.29 | 4.25 | 0.19 | 3.25 | 0.10 | 2.57 | 0.05 |
| 1500 | | | | | | | | | 7.45 | 0.71 | 5.30 | 0.31 | 4.39 | 0.20 | 3.36 | 0.10 | 2.66 | 0.06 |
| 1550 | | | | | | | | | 7.70 | 0.76 | 5.47 | 0.33 | 4.54 | 0.21 | 3.48 | 0.11 | 2.75 | 0.06 |
| 1600 | | | | | | | | | 7.95 | 0.80 | 5.65 | 0.35 | 4.69 | 0.22 | 3.59 | 0.12 | 2.84 | 0.07 |
| 1650 | | | | | | | | | 8.20 | 0.85 | 5.83 | 0.37 | 4.83 | 0.24 | 3.70 | 0.12 | 2.92 | 0.07 |
| 1700 | | | | | | | | | | | 6.00 | 0.39 | 4.98 | 0.25 | 3.81 | 0.13 | 3.01 | 0.07 |
| 1750 | | | | | | | | | | | 6.18 | 0.41 | 5.13 | 0.26 | 3.92 | 0.14 | 3.10 | 0.08 |
| 1800 | | | | | | | | | | | 6.36 | 0.44 | 5.27 | 0.28 | 4.04 | 0.14 | 3.19 | 0.08 |
| 1900 | | | | | | | | | | | 6.71 | 0.48 | 5.57 | 0.31 | 4.26 | 0.16 | 3.37 | 0.09 |
| 2000 | | | | | | | | | | | 7.06 | 0.53 | 5.86 | 0.34 | 4.49 | 0.18 | 3.54 | 0.10 |
| 2100 | | | | | | | | | | | 7.42 | 0.58 | 6.15 | 0.37 | 4.71 | 0.19 | 3.72 | 0.11 |
| 2200 | | | | | | | | | | | 7.77 | 0.63 | 6.44 | 0.40 | 4.93 | 0.21 | 3.90 | 0.12 |
| 2300 | | | | | | | | | | | 8.12 | 0.69 | 6.74 | 0.44 | 5.16 | 0.23 | 4.08 | 0.13 |
| 2400 | | | | | | | | | | | | | 7.03 | 0.47 | 5.38 | 0.25 | 4.25 | 0.14 |
| 2500 | | | | | | | | | | | | | 7.32 | 0.51 | 5.61 | 0.27 | 4.43 | 0.15 |
| 2600 | | | | | | | | | | | | | 7.62 | 0.55 | 5.83 | 0.29 | 4.61 | 0.16 |
| 2700 | | | | | | | | | | | | | 7.91 | 0.59 | 6.06 | 0.31 | 4.78 | 0.17 |
| 2800 | | | | | | | | | | | | | 8.20 | 0.63 | 6.28 | 0.33 | 4.96 | 0.18 |
| 2900 | | | | | | | | | | | | | | | 6.50 | 0.35 | 5.14 | 0.20 |
| 3000 | | | | | | | | | | | | | | | 6.73 | 0.37 | 5.32 | 0.21 |
| 3300 | | | | | | | | | | | | | | | 7.40 | 0.44 | 5.85 | 0.25 |
| 3600 | | | | | | | | | | | | | | | 8.07 | 0.52 | 6.38 | 0.29 |
| 3900 | | | | | | | | | | | | | | | | | 6.91 | 0.34 |
| 4000 | | | | | | | | | | | | | | | | | 7.09 | 0.36 |

**The shaded area represents velocities over 5 fps. Use with caution.**

# C900 DR 25 CLASS 100 (C.I.O.D.)

**AWWA C900 ASTM D1784 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 4" | | 6" | | 8" | | 10" | | 12" | |
|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 4.392 | | 6.314 | | 8.282 | | 10.158 | | 12.080 | |
| Pipe OD | 4.800 | | 6.900 | | 9.050 | | 11.100 | | 13.200 | |
| Avg. Wall | 0.204 | | 0.293 | | 0.384 | | 0.471 | | 0.560 | |
| Min. Wall | 0.192 | | 0.276 | | 0.362 | | 0.444 | | 0.528 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 25 | 0.53 | 0.01 | 0.26 | 0.00 | 0.15 | 0.00 | 0.10 | 0.00 | 0.07 | 0.00 |
| 50 | 1.06 | 0.04 | 0.51 | 0.01 | 0.30 | 0.00 | 0.20 | 0.00 | 0.14 | 0.00 |
| 75 | 1.59 | 0.09 | 0.77 | 0.02 | 0.45 | 0.00 | 0.30 | 0.00 | 0.21 | 0.00 |
| 100 | 2.12 | 0.16 | 1.02 | 0.03 | 0.59 | 0.01 | 0.40 | 0.00 | 0.28 | 0.00 |
| 125 | 2.64 | 0.24 | 1.28 | 0.04 | 0.74 | 0.01 | 0.49 | 0.00 | 0.35 | 0.00 |
| 150 | 3.17 | 0.34 | 1.54 | 0.06 | 0.89 | 0.02 | 0.59 | 0.01 | 0.42 | 0.00 |
| 175 | 3.70 | 0.45 | 1.79 | 0.08 | 1.04 | 0.02 | 0.69 | 0.01 | 0.49 | 0.00 |
| 200 | 4.23 | 0.58 | 2.05 | 0.10 | 1.19 | 0.03 | 0.79 | 0.01 | 0.56 | 0.00 |
| 225 | 4.76 | 0.72 | 2.30 | 0.12 | 1.34 | 0.03 | 0.89 | 0.01 | 0.63 | 0.01 |
| 250 | 5.29 | 0.88 | 2.56 | 0.15 | 1.49 | 0.04 | 0.99 | 0.01 | 0.70 | 0.01 |
| 275 | 5.82 | 1.05 | 2.81 | 0.18 | 1.64 | 0.05 | 1.09 | 0.02 | 0.77 | 0.01 |
| 300 | 6.35 | 1.23 | 3.07 | 0.21 | 1.78 | 0.06 | 1.19 | 0.02 | 0.84 | 0.01 |
| 325 | 6.87 | 1.43 | 3.33 | 0.24 | 1.93 | 0.07 | 1.29 | 0.02 | 0.91 | 0.01 |
| 350 | 7.40 | 1.63 | 3.58 | 0.28 | 2.08 | 0.07 | 1.38 | 0.03 | 0.98 | 0.01 |
| 375 | | | 3.84 | 0.32 | 2.23 | 0.08 | 1.48 | 0.03 | 1.05 | 0.01 |
| 400 | | | 4.09 | 0.36 | 2.38 | 0.10 | 1.58 | 0.04 | 1.12 | 0.02 |
| 450 | | | 4.61 | 0.45 | 2.68 | 0.12 | 1.78 | 0.04 | 1.26 | 0.02 |
| 500 | | | 5.12 | 0.54 | 2.97 | 0.14 | 1.98 | 0.05 | 1.40 | 0.02 |
| 550 | | | 5.63 | 0.65 | 3.27 | 0.17 | 2.17 | 0.06 | 1.54 | 0.03 |
| 600 | | | 6.14 | 0.76 | 3.57 | 0.20 | 2.37 | 0.08 | 1.68 | 0.03 |
| 700 | | | 7.16 | 1.01 | 4.16 | 0.27 | 2.77 | 0.10 | 1.96 | 0.04 |
| 800 | | | 8.19 | 1.29 | 4.76 | 0.35 | 3.16 | 0.13 | 2.24 | 0.05 |
| 900 | | | 9.21 | 1.61 | 5.35 | 0.43 | 3.56 | 0.16 | 2.52 | 0.07 |
| 1000 | | | 10.23 | 1.95 | 5.95 | 0.52 | 3.95 | 0.19 | 2.80 | 0.08 |
| 1100 | | | | | 6.54 | 0.62 | 4.35 | 0.23 | 3.08 | 0.10 |
| 1200 | | | | | 7.14 | 0.73 | 4.74 | 0.27 | 3.36 | 0.12 |
| 1300 | | | | | 7.73 | 0.85 | 5.14 | 0.31 | 3.63 | 0.14 |
| 1400 | | | | | 8.33 | 0.97 | 5.54 | 0.36 | 3.91 | 0.16 |
| 1500 | | | | | 8.92 | 1.11 | 5.93 | 0.41 | 4.19 | 0.18 |
| 1600 | | | | | 9.52 | 1.25 | 6.33 | 0.46 | 4.47 | 0.20 |
| 1700 | | | | | | | 6.72 | 0.52 | 4.75 | 0.22 |
| 1800 | | | | | | | 7.12 | 0.57 | 5.03 | 0.25 |
| 1900 | | | | | | | 7.51 | 0.63 | 5.31 | 0.27 |
| 2000 | | | | | | | 7.91 | 0.70 | 5.59 | 0.30 |
| 2100 | | | | | | | 8.30 | 0.76 | 5.87 | 0.33 |
| 2200 | | | | | | | 8.70 | 0.83 | 6.15 | 0.36 |
| 2300 | | | | | | | | | 6.43 | 0.39 |
| 2400 | | | | | | | | | 6.71 | 0.42 |
| 2500 | | | | | | | | | 6.99 | 0.45 |
| 2600 | | | | | | | | | 7.27 | 0.49 |
| 2700 | | | | | | | | | 7.55 | 0.52 |
| 2800 | | | | | | | | | 7.83 | 0.56 |
| 2900 | | | | | | | | | 8.11 | 0.60 |
| 3000 | | | | | | | | | 8.39 | 0.64 |
| 3100 | | | | | | | | | 8.67 | 0.68 |
| 3200 | | | | | | | | | | |
| 3300 | | | | | | | | | | |
| 3400 | | | | | | | | | | |
| 3500 | | | | | | | | | | |
| 3600 | | | | | | | | | | |
| 3800 | | | | | | | | | | |
| 3900 | | | | | | | | | | |
| 4000 | | | | | | | | | | |
| 4200 | | | | | | | | | | |
| 4400 | | | | | | | | | | |
| 4600 | | | | | | | | | | |
| 4800 | | | | | | | | | | |
| 5000 | | | | | | | | | | |
| 5500 | | | | | | | | | | |
| 6000 | | | | | | | | | | |
| 6500 | | | | | | | | | | |
| 7000 | | | | | | | | | | |
| 7500 | | | | | | | | | | |
| 8000 | | | | | | | | | | |
| 8500 | | | | | | | | | | |

**The shaded area represents velocities over 5 fps. Use with caution.**

# C900 DR 18 CLASS 150 (C.I.O.D.)

**AWWA C900 ASTM D1784 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 4" | | 6" | | 8" | | 10" | | 12" | |
|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 4.234 | | 6.088 | | 7.984 | | 9.792 | | 11.646 | |
| Pipe OD | 4.800 | | 6.900 | | 9.050 | | 11.100 | | 13.200 | |
| Avg. Wall | 0.283 | | 0.406 | | 0.533 | | 0.654 | | 0.777 | |
| Min. Wall | 0.267 | | 0.383 | | 0.503 | | 0.617 | | 0.733 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 25 | 0.57 | 0.01 | 0.28 | 0.00 | 0.16 | 0.00 | 0.11 | 0.00 | 0.08 | 0.00 |
| 50 | 1.14 | 0.05 | 0.55 | 0.01 | 0.32 | 0.00 | 0.21 | 0.00 | 0.15 | 0.00 |
| 75 | 1.71 | 0.11 | 0.83 | 0.02 | 0.48 | 0.01 | 0.32 | 0.00 | 0.23 | 0.00 |
| 100 | 2.28 | 0.19 | 1.10 | 0.03 | 0.64 | 0.01 | 0.43 | 0.00 | 0.30 | 0.00 |
| 125 | 2.84 | 0.29 | 1.38 | 0.05 | 0.80 | 0.01 | 0.53 | 0.00 | 0.38 | 0.00 |
| 150 | 3.41 | 0.41 | 1.65 | 0.07 | 0.96 | 0.02 | 0.64 | 0.01 | 0.45 | 0.00 |
| 175 | 3.98 | 0.54 | 1.93 | 0.09 | 1.12 | 0.02 | 0.74 | 0.01 | 0.53 | 0.00 |
| 200 | 4.55 | 0.69 | 2.20 | 0.12 | 1.28 | 0.03 | 0.85 | 0.01 | 0.60 | 0.01 |
| 225 | 5.12 | 0.86 | 2.48 | 0.15 | 1.44 | 0.04 | 0.96 | 0.01 | 0.68 | 0.01 |
| 250 | 5.69 | 1.05 | 2.75 | 0.18 | 1.60 | 0.05 | 1.06 | 0.02 | 0.75 | 0.01 |
| 275 | 6.26 | 1.25 | 3.03 | 0.21 | 1.76 | 0.06 | 1.17 | 0.02 | 0.83 | 0.01 |
| 300 | 6.83 | 1.47 | 3.30 | 0.25 | 1.92 | 0.07 | 1.28 | 0.02 | 0.90 | 0.01 |
| 325 | 7.40 | 1.70 | 3.58 | 0.29 | 2.08 | 0.08 | 1.38 | 0.03 | 0.98 | 0.01 |
| 350 | 7.97 | 1.95 | 3.85 | 0.33 | 2.24 | 0.09 | 1.49 | 0.03 | 1.05 | 0.01 |
| 375 | 8.53 | 2.22 | 4.13 | 0.38 | 2.40 | 0.10 | 1.60 | 0.04 | 1.13 | 0.02 |
| 400 | 9.10 | 2.50 | 4.40 | 0.43 | 2.56 | 0.11 | 1.70 | 0.04 | 1.20 | 0.02 |
| 450 | | | 4.95 | 0.53 | 2.88 | 0.14 | 1.91 | 0.05 | 1.35 | 0.02 |
| 500 | | | 5.50 | 0.65 | 3.20 | 0.17 | 2.13 | 0.06 | 1.50 | 0.03 |
| 550 | | | 6.05 | 0.77 | 3.52 | 0.21 | 2.34 | 0.08 | 1.65 | 0.03 |
| 600 | | | 6.60 | 0.91 | 3.84 | 0.24 | 2.55 | 0.09 | 1.80 | 0.04 |
| 700 | | | 7.71 | 1.20 | 4.48 | 0.32 | 2.98 | 0.12 | 2.11 | 0.05 |
| 800 | | | 8.81 | 1.54 | 5.12 | 0.41 | 3.40 | 0.15 | 2.41 | 0.07 |
| 900 | | | 9.91 | 1.92 | 5.76 | 0.51 | 3.83 | 0.19 | 2.71 | 0.08 |
| 1000 | | | | | 6.40 | 0.62 | 4.26 | 0.23 | 3.01 | 0.10 |
| 1100 | | | | | 7.04 | 0.74 | 4.68 | 0.28 | 3.31 | 0.12 |
| 1200 | | | | | 7.68 | 0.87 | 5.11 | 0.32 | 3.61 | 0.14 |
| 1300 | | | | | 8.32 | 1.01 | 5.53 | 0.38 | 3.91 | 0.16 |
| 1400 | | | | | 8.96 | 1.16 | 5.96 | 0.43 | 4.21 | 0.19 |
| 1500 | | | | | 9.60 | 1.32 | 6.38 | 0.49 | 4.51 | 0.21 |
| 1600 | | | | | 10.24 | 1.49 | 6.81 | 0.55 | 4.81 | 0.24 |
| 1700 | | | | | | | 7.23 | 0.62 | 5.11 | 0.27 |
| 1800 | | | | | | | 7.66 | 0.69 | 5.41 | 0.29 |
| 1900 | | | | | | | 8.08 | 0.76 | 5.72 | 0.33 |
| 2000 | | | | | | | 8.51 | 0.83 | 6.02 | 0.36 |
| 2100 | | | | | | | 8.94 | 0.91 | 6.32 | 0.39 |
| 2200 | | | | | | | 9.36 | 0.99 | 6.62 | 0.43 |
| 2300 | | | | | | | | | 6.92 | 0.46 |
| 2400 | | | | | | | | | 7.22 | 0.50 |
| 2500 | | | | | | | | | 7.52 | 0.54 |
| 2600 | | | | | | | | | 7.82 | 0.58 |
| 2700 | | | | | | | | | 8.12 | 0.63 |
| 2800 | | | | | | | | | | |
| 2900 | | | | | | | | | | |
| 3000 | | | | | | | | | | |
| 3100 | | | | | | | | | | |
| 3200 | | | | | | | | | | |
| 3300 | | | | | | | | | | |
| 3400 | | | | | | | | | | |
| 3500 | | | | | | | | | | |
| 3600 | | | | | | | | | | |
| 3800 | | | | | | | | | | |
| 3900 | | | | | | | | | | |
| 4000 | | | | | | | | | | |
| 4200 | | | | | | | | | | |
| 4400 | | | | | | | | | | |
| 4600 | | | | | | | | | | |
| 4800 | | | | | | | | | | |
| 5000 | | | | | | | | | | |
| 5500 | | | | | | | | | | |
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| 6500 | | | | | | | | | | |
| 7000 | | | | | | | | | | |
| 7500 | | | | | | | | | | |
| 8000 | | | | | | | | | | |
| 8500 | | | | | | | | | | |

**The shaded area represents velocities over 5 fps. Use with caution.**

# C900 DR 14 CLASS 200 (C.I.O.D.)

**AWWA C900 ASTM D1784 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 4" | | 6" | | 8" | | 10" | | 12" | |
|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 4.072 | | 5.854 | | 7.680 | | 9.418 | | 11.200 | |
| Pipe OD | 4.800 | | 6.900 | | 9.050 | | 11.100 | | 13.200 | |
| Avg. Wall | 0.364 | | 0.523 | | 0.685 | | 0.841 | | 1.000 | |
| Min. Wall | 0.343 | | 0.493 | | 0.646 | | 0.793 | | 0.943 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 25 | 0.62 | 0.02 | 0.30 | 0.00 | 0.17 | 0.00 | 0.11 | 0.00 | 0.08 | 0.00 |
| 50 | 1.23 | 0.06 | 0.60 | 0.01 | 0.35 | 0.00 | 0.23 | 0.00 | 0.16 | 0.00 |
| 75 | 1.85 | 0.14 | 0.89 | 0.02 | 0.52 | 0.01 | 0.34 | 0.00 | 0.24 | 0.00 |
| 100 | 2.46 | 0.23 | 1.19 | 0.04 | 0.69 | 0.01 | 0.46 | 0.00 | 0.33 | 0.00 |
| 125 | 3.08 | 0.35 | 1.49 | 0.06 | 0.86 | 0.02 | 0.57 | 0.01 | 0.41 | 0.00 |
| 150 | 3.69 | 0.49 | 1.79 | 0.08 | 1.04 | 0.02 | 0.69 | 0.01 | 0.49 | 0.00 |
| 175 | 4.31 | 0.65 | 2.08 | 0.11 | 1.21 | 0.03 | 0.80 | 0.01 | 0.57 | 0.00 |
| 200 | 4.92 | 0.84 | 2.38 | 0.14 | 1.38 | 0.04 | 0.92 | 0.01 | 0.65 | 0.01 |
| 225 | 5.54 | 1.04 | 2.68 | 0.18 | 1.56 | 0.05 | 1.03 | 0.02 | 0.73 | 0.01 |
| 250 | 6.15 | 1.27 | 2.98 | 0.22 | 1.73 | 0.06 | 1.15 | 0.02 | 0.81 | 0.01 |
| 275 | 6.77 | 1.51 | 3.27 | 0.26 | 1.90 | 0.07 | 1.26 | 0.03 | 0.89 | 0.01 |
| 300 | 7.38 | 1.78 | 3.57 | 0.30 | 2.08 | 0.08 | 1.38 | 0.03 | 0.98 | 0.01 |
| 325 | 8.00 | 2.06 | 3.87 | 0.35 | 2.25 | 0.09 | 1.49 | 0.03 | 1.06 | 0.01 |
| 350 | 8.61 | 2.36 | 4.17 | 0.40 | 2.42 | 0.11 | 1.61 | 0.04 | 1.14 | 0.02 |
| 375 | 9.23 | 2.68 | 4.46 | 0.46 | 2.59 | 0.12 | 1.72 | 0.05 | 1.22 | 0.02 |
| 400 | | | 4.76 | 0.52 | 2.77 | 0.14 | 1.84 | 0.05 | 1.30 | 0.02 |
| 450 | | | 5.36 | 0.64 | 3.11 | 0.17 | 2.07 | 0.06 | 1.46 | 0.03 |
| 500 | | | 5.95 | 0.78 | 3.46 | 0.21 | 2.30 | 0.08 | 1.63 | 0.03 |
| 550 | | | 6.55 | 0.93 | 3.80 | 0.25 | 2.53 | 0.09 | 1.79 | 0.04 |
| 600 | | | 7.14 | 1.10 | 4.15 | 0.29 | 2.76 | 0.11 | 1.95 | 0.05 |
| 700 | | | 8.33 | 1.46 | 4.84 | 0.39 | 3.22 | 0.14 | 2.28 | 0.06 |
| 800 | | | 9.52 | 1.87 | 5.53 | 0.50 | 3.68 | 0.18 | 2.60 | 0.08 |
| 900 | | | 10.72 | 2.32 | 6.23 | 0.62 | 4.14 | 0.23 | 2.93 | 0.10 |
| 1000 | | | | | 6.92 | 0.75 | 4.60 | 0.28 | 3.25 | 0.12 |
| 1100 | | | | | 7.61 | 0.90 | 5.06 | 0.33 | 3.58 | 0.14 |
| 1200 | | | | | 8.30 | 1.06 | 5.52 | 0.39 | 3.90 | 0.17 |
| 1300 | | | | | 8.99 | 1.22 | 5.98 | 0.45 | 4.23 | 0.20 |
| 1400 | | | | | 9.68 | 1.40 | 6.44 | 0.52 | 4.55 | 0.22 |
| 1500 | | | | | 10.38 | 1.60 | 6.90 | 0.59 | 4.88 | 0.25 |
| 1600 | | | | | 11.07 | 1.80 | 7.36 | 0.67 | 5.20 | 0.29 |
| 1700 | | | | | | | 7.82 | 0.75 | 5.53 | 0.32 |
| 1800 | | | | | | | 8.28 | 0.83 | 5.85 | 0.36 |
| 1900 | | | | | | | 8.74 | 0.92 | 6.18 | 0.39 |
| 2000 | | | | | | | 9.20 | 1.01 | 6.51 | 0.43 |
| 2100 | | | | | | | 9.66 | 1.10 | 6.83 | 0.47 |
| 2200 | | | | | | | 10.12 | 1.20 | 7.16 | 0.52 |
| 2300 | | | | | | | | | 7.48 | 0.56 |
| 2400 | | | | | | | | | 7.81 | 0.61 |
| 2500 | | | | | | | | | 8.13 | 0.66 |
| 2600 | | | | | | | | | 8.46 | 0.70 |
| 2700 | | | | | | | | | 8.78 | 0.76 |
| 2800 | | | | | | | | | 9.11 | 0.81 |
| 2900 | | | | | | | | | 9.43 | 0.86 |
| 3000 | | | | | | | | | 9.76 | 0.92 |
| 3100 | | | | | | | | | 10.08 | 0.98 |
| 3200 | | | | | | | | | | |
| 3300 | | | | | | | | | | |
| 3400 | | | | | | | | | | |
| 3500 | | | | | | | | | | |
| 3600 | | | | | | | | | | |
| 3800 | | | | | | | | | | |
| 3900 | | | | | | | | | | |
| 4000 | | | | | | | | | | |
| 4200 | | | | | | | | | | |
| 4400 | | | | | | | | | | |
| 4600 | | | | | | | | | | |
| 4800 | | | | | | | | | | |
| 5000 | | | | | | | | | | |
| 5500 | | | | | | | | | | |
| 6000 | | | | | | | | | | |
| 6500 | | | | | | | | | | |
| 7000 | | | | | | | | | | |
| 7500 | | | | | | | | | | |
| 8000 | | | | | | | | | | |
| 8500 | | | | | | | | | | |

**The shaded area represents velocities over 5 fps. Use with caution.**

# C905 DR 25 165 PSI (C.I.O.D.)

**AWWA C905 ASTM D1784 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 14" | | 16" | | 18" | | 20" | | 24" | | 30" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 14.002 | | 15.924 | | 17.846 | | 19.768 | | 23.612 | | 29.286 | |
| Pipe OD | 15.300 | | 17.400 | | 19.500 | | 21.600 | | 25.800 | | 32.000 | |
| Avg. Wall | 0.649 | | 0.738 | | 0.827 | | 0.916 | | 1.094 | | 1.357 | |
| Min. Wall | 0.612 | | 0.696 | | 0.780 | | 0.864 | | 1.032 | | 1.280 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 400 | 0.83 | 0.01 | 0.64 | 0.00 | 0.51 | 0.00 | 0.42 | 0.00 | 0.29 | 0.00 | 0.19 | 0.00 |
| 450 | 0.94 | 0.01 | 0.72 | 0.00 | 0.58 | 0.00 | 0.47 | 0.00 | 0.33 | 0.00 | 0.21 | 0.00 |
| 500 | 1.04 | 0.01 | 0.80 | 0.01 | 0.64 | 0.00 | 0.52 | 0.00 | 0.37 | 0.00 | 0.24 | 0.00 |
| 550 | 1.14 | 0.01 | 0.88 | 0.01 | 0.70 | 0.00 | 0.57 | 0.00 | 0.40 | 0.00 | 0.26 | 0.00 |
| 600 | 1.25 | 0.02 | 0.97 | 0.01 | 0.77 | 0.00 | 0.63 | 0.00 | 0.44 | 0.00 | 0.29 | 0.00 |
| 650 | 1.35 | 0.02 | 1.05 | 0.01 | 0.83 | 0.01 | 0.68 | 0.00 | 0.48 | 0.00 | 0.31 | 0.00 |
| 700 | 1.46 | 0.02 | 1.13 | 0.01 | 0.90 | 0.01 | 0.73 | 0.00 | 0.51 | 0.00 | 0.33 | 0.00 |
| 750 | 1.56 | 0.02 | 1.21 | 0.01 | 0.96 | 0.01 | 0.78 | 0.00 | 0.55 | 0.00 | 0.36 | 0.00 |
| 800 | 1.66 | 0.03 | 1.29 | 0.01 | 1.02 | 0.01 | 0.84 | 0.01 | 0.59 | 0.00 | 0.38 | 0.00 |
| 850 | 1.77 | 0.03 | 1.37 | 0.02 | 1.09 | 0.01 | 0.89 | 0.01 | 0.62 | 0.00 | 0.40 | 0.00 |
| 900 | 1.87 | 0.03 | 1.45 | 0.02 | 1.15 | 0.01 | 0.94 | 0.01 | 0.66 | 0.00 | 0.43 | 0.00 |
| 950 | 1.98 | 0.04 | 1.53 | 0.02 | 1.22 | 0.01 | 0.99 | 0.01 | 0.70 | 0.00 | 0.45 | 0.00 |
| 1000 | 2.08 | 0.04 | 1.61 | 0.02 | 1.28 | 0.01 | 1.04 | 0.01 | 0.73 | 0.00 | 0.48 | 0.00 |
| 1100 | 2.29 | 0.05 | 1.77 | 0.03 | 1.41 | 0.01 | 1.15 | 0.01 | 0.80 | 0.00 | 0.52 | 0.00 |
| 1200 | 2.50 | 0.06 | 1.93 | 0.03 | 1.54 | 0.02 | 1.25 | 0.01 | 0.88 | 0.00 | 0.57 | 0.00 |
| 1300 | 2.71 | 0.07 | 2.09 | 0.04 | 1.67 | 0.02 | 1.36 | 0.01 | 0.95 | 0.01 | 0.62 | 0.00 |
| 1400 | 2.91 | 0.08 | 2.25 | 0.04 | 1.79 | 0.02 | 1.46 | 0.01 | 1.02 | 0.01 | 0.67 | 0.00 |
| 1500 | 3.12 | 0.09 | 2.41 | 0.05 | 1.92 | 0.03 | 1.57 | 0.02 | 1.10 | 0.01 | 0.71 | 0.00 |
| 1600 | 3.33 | 0.10 | 2.57 | 0.05 | 2.05 | 0.03 | 1.67 | 0.02 | 1.17 | 0.01 | 0.76 | 0.00 |
| 1700 | 3.54 | 0.11 | 2.74 | 0.06 | 2.18 | 0.03 | 1.77 | 0.02 | 1.24 | 0.01 | 0.81 | 0.00 |
| 1800 | 3.75 | 0.12 | 2.90 | 0.06 | 2.31 | 0.04 | 1.88 | 0.02 | 1.32 | 0.01 | 0.86 | 0.00 |
| 1900 | 3.95 | 0.13 | 3.06 | 0.07 | 2.43 | 0.04 | 1.98 | 0.02 | 1.39 | 0.01 | 0.90 | 0.00 |
| 2000 | 4.16 | 0.15 | 3.22 | 0.08 | 2.56 | 0.04 | 2.09 | 0.03 | 1.46 | 0.01 | 0.95 | 0.00 |
| 2100 | 4.37 | 0.16 | 3.38 | 0.09 | 2.69 | 0.05 | 2.19 | 0.03 | 1.54 | 0.01 | 1.00 | 0.00 |
| 2200 | 4.58 | 0.17 | 3.54 | 0.09 | 2.82 | 0.05 | 2.30 | 0.03 | 1.61 | 0.01 | 1.05 | 0.00 |
| 2300 | 4.79 | 0.19 | 3.70 | 0.10 | 2.95 | 0.06 | 2.40 | 0.04 | 1.68 | 0.01 | 1.09 | 0.01 |
| 2400 | 4.99 | 0.21 | 3.86 | 0.11 | 3.07 | 0.06 | 2.51 | 0.04 | 1.76 | 0.02 | 1.14 | 0.01 |
| 2500 | 5.20 | 0.22 | 4.02 | 0.12 | 3.20 | 0.07 | 2.61 | 0.04 | 1.83 | 0.02 | 1.19 | 0.01 |
| 2600 | 5.41 | 0.24 | 4.18 | 0.13 | 3.33 | 0.07 | 2.71 | 0.04 | 1.90 | 0.02 | 1.24 | 0.01 |
| 2700 | 5.62 | 0.26 | 4.34 | 0.14 | 3.46 | 0.08 | 2.82 | 0.05 | 1.98 | 0.02 | 1.28 | 0.01 |
| 2800 | 5.83 | 0.27 | 4.51 | 0.15 | 3.59 | 0.08 | 2.92 | 0.05 | 2.05 | 0.02 | 1.33 | 0.01 |
| 2900 | 6.04 | 0.29 | 4.67 | 0.16 | 3.72 | 0.09 | 3.03 | 0.05 | 2.12 | 0.02 | 1.38 | 0.01 |
| 3000 | 6.24 | 0.31 | 4.83 | 0.17 | 3.84 | 0.10 | 3.13 | 0.06 | 2.20 | 0.02 | 1.43 | 0.01 |
| 3100 | 6.45 | 0.33 | 4.99 | 0.18 | 3.97 | 0.10 | 3.24 | 0.06 | 2.27 | 0.03 | 1.47 | 0.01 |
| 3200 | 6.66 | 0.35 | 5.15 | 0.19 | 4.10 | 0.11 | 3.34 | 0.07 | 2.34 | 0.03 | 1.52 | 0.01 |
| 3300 | 6.87 | 0.37 | 5.31 | 0.20 | 4.23 | 0.11 | 3.45 | 0.07 | 2.41 | 0.03 | 1.57 | 0.01 |
| 3400 | 7.08 | 0.39 | 5.47 | 0.21 | 4.36 | 0.12 | 3.55 | 0.07 | 2.49 | 0.03 | 1.62 | 0.01 |
| 3500 | 7.28 | 0.41 | 5.63 | 0.22 | 4.48 | 0.13 | 3.65 | 0.08 | 2.56 | 0.03 | 1.66 | 0.01 |
| 3600 | 7.49 | 0.43 | 5.79 | 0.23 | 4.61 | 0.13 | 3.76 | 0.08 | 2.63 | 0.03 | 1.71 | 0.01 |
| 3700 | 7.70 | 0.46 | 5.95 | 0.24 | 4.74 | 0.14 | 3.86 | 0.09 | 2.71 | 0.04 | 1.76 | 0.01 |
| 3800 | | | 6.11 | 0.26 | 4.87 | 0.15 | 3.97 | 0.09 | 2.78 | 0.04 | 1.81 | 0.01 |
| 3900 | | | 6.28 | 0.27 | 5.00 | 0.15 | 4.07 | 0.09 | 2.85 | 0.04 | 1.86 | 0.01 |
| 4000 | | | 6.44 | 0.28 | 5.12 | 0.16 | 4.18 | 0.10 | 2.93 | 0.04 | 1.90 | 0.01 |
| 4200 | | | 6.76 | 0.31 | 5.38 | 0.18 | 4.39 | 0.11 | 3.07 | 0.05 | 2.00 | 0.02 |
| 4400 | | | 7.08 | 0.34 | 5.64 | 0.19 | 4.59 | 0.12 | 3.22 | 0.05 | 2.09 | 0.02 |
| 4600 | | | 7.40 | 0.37 | 5.89 | 0.21 | 4.80 | 0.13 | 3.37 | 0.05 | 2.19 | 0.02 |
| 4800 | | | 7.72 | 0.40 | 6.15 | 0.23 | 5.01 | 0.14 | 3.51 | 0.06 | 2.28 | 0.02 |
| 5000 | | | | | 6.41 | 0.25 | 5.22 | 0.15 | 3.66 | 0.06 | 2.38 | 0.02 |
| 5200 | | | | | 6.66 | 0.26 | 5.43 | 0.16 | 3.81 | 0.07 | 2.47 | 0.02 |
| 5400 | | | | | 6.92 | 0.28 | 5.64 | 0.17 | 3.95 | 0.07 | 2.57 | 0.03 |
| 5600 | | | | | 7.17 | 0.30 | 5.85 | 0.18 | 4.10 | 0.08 | 2.66 | 0.03 |
| 5800 | | | | | 7.43 | 0.32 | 6.06 | 0.20 | 4.24 | 0.08 | 2.76 | 0.03 |
| 6000 | | | | | 7.69 | 0.34 | 6.26 | 0.21 | 4.39 | 0.09 | 2.85 | 0.03 |
| 6200 | | | | | 7.94 | 0.37 | 6.47 | 0.22 | 4.54 | 0.09 | 2.95 | 0.03 |
| 6400 | | | | | | | 6.68 | 0.24 | 4.68 | 0.10 | 3.04 | 0.03 |
| 6600 | | | | | | | 6.89 | 0.25 | 4.83 | 0.10 | 3.14 | 0.04 |
| 6800 | | | | | | | 7.10 | 0.26 | 4.98 | 0.11 | 3.23 | 0.04 |
| 7000 | | | | | | | 7.31 | 0.28 | 5.12 | 0.12 | 3.33 | 0.04 |
| 7500 | | | | | | | 7.83 | 0.32 | 5.49 | 0.13 | 3.57 | 0.05 |
| 8000 | | | | | | | | | 5.85 | 0.15 | 3.81 | 0.05 |
| 8500 | | | | | | | | | 6.22 | 0.17 | 4.04 | 0.06 |
| 9000 | | | | | | | | | 6.59 | 0.19 | 4.28 | 0.07 |
| 9500 | | | | | | | | | 6.95 | 0.21 | 4.52 | 0.07 |
| 10000 | | | | | | | | | 7.32 | 0.23 | 4.76 | 0.08 |
| 10500 | | | | | | | | | 7.68 | 0.25 | 4.99 | 0.09 |

**The shaded area represents velocities over 5 fps. Use with caution where water hammer is a concern.**

# C905 DR 18 235 PSI (C.I.O.D.)

**AWWA C905 ASTM D1784 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 14" | | 16" | | 18" | | 20" | | 24" | | 30" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 13.50 | | 15.35 | | 17.20 | | 19.06 | | 22.76 | | 28.23 | |
| Pipe OD | 15.30 | | 17.40 | | 19.50 | | 21.60 | | 25.80 | | 32.00 | |
| Avg. Wall | 0.901 | | 1.025 | | 1.148 | | 1.272 | | 1.519 | | 1.885 | |
| Min. Wall | 0.850 | | 0.967 | | 1.083 | | 1.200 | | 1.433 | | 1.778 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 400 | 0.90 | 0.01 | 0.69 | 0.00 | 0.55 | 0.00 | 0.45 | 0.00 | 0.31 | 0.00 | 0.20 | 0.00 |
| 450 | 1.01 | 0.01 | 0.78 | 0.01 | 0.62 | 0.00 | 0.51 | 0.00 | 0.35 | 0.00 | 0.23 | 0.00 |
| 500 | 1.12 | 0.01 | 0.87 | 0.01 | 0.69 | 0.00 | 0.56 | 0.00 | 0.39 | 0.00 | 0.26 | 0.00 |
| 550 | 1.23 | 0.02 | 0.95 | 0.01 | 0.76 | 0.00 | 0.62 | 0.00 | 0.43 | 0.00 | 0.28 | 0.00 |
| 600 | 1.34 | 0.02 | 1.04 | 0.01 | 0.83 | 0.01 | 0.67 | 0.00 | 0.47 | 0.00 | 0.31 | 0.00 |
| 650 | 1.46 | 0.02 | 1.13 | 0.01 | 0.90 | 0.01 | 0.73 | 0.00 | 0.51 | 0.00 | 0.33 | 0.00 |
| 700 | 1.57 | 0.03 | 1.21 | 0.01 | 0.96 | 0.01 | 0.79 | 0.00 | 0.55 | 0.00 | 0.36 | 0.00 |
| 750 | 1.68 | 0.03 | 1.30 | 0.02 | 1.03 | 0.01 | 0.84 | 0.01 | 0.59 | 0.00 | 0.38 | 0.00 |
| 800 | 1.79 | 0.03 | 1.39 | 0.02 | 1.10 | 0.01 | 0.90 | 0.01 | 0.63 | 0.00 | 0.41 | 0.00 |
| 850 | 1.90 | 0.04 | 1.47 | 0.02 | 1.17 | 0.01 | 0.96 | 0.01 | 0.67 | 0.00 | 0.44 | 0.00 |
| 900 | 2.02 | 0.04 | 1.56 | 0.02 | 1.24 | 0.01 | 1.01 | 0.01 | 0.71 | 0.00 | 0.46 | 0.00 |
| 950 | 2.13 | 0.04 | 1.65 | 0.02 | 1.31 | 0.01 | 1.07 | 0.01 | 0.75 | 0.00 | 0.49 | 0.00 |
| 1000 | 2.24 | 0.05 | 1.73 | 0.03 | 1.38 | 0.01 | 1.12 | 0.01 | 0.79 | 0.00 | 0.51 | 0.00 |
| 1100 | 2.46 | 0.06 | 1.90 | 0.03 | 1.52 | 0.02 | 1.24 | 0.01 | 0.87 | 0.00 | 0.56 | 0.00 |
| 1200 | 2.69 | 0.07 | 2.08 | 0.04 | 1.65 | 0.02 | 1.35 | 0.01 | 0.94 | 0.01 | 0.61 | 0.00 |
| 1300 | 2.91 | 0.08 | 2.25 | 0.04 | 1.79 | 0.02 | 1.46 | 0.01 | 1.02 | 0.01 | 0.67 | 0.00 |
| 1400 | 3.14 | 0.09 | 2.42 | 0.05 | 1.93 | 0.03 | 1.57 | 0.02 | 1.10 | 0.01 | 0.72 | 0.00 |
| 1500 | 3.36 | 0.10 | 2.60 | 0.05 | 2.07 | 0.03 | 1.69 | 0.02 | 1.18 | 0.01 | 0.77 | 0.00 |
| 1600 | 3.58 | 0.12 | 2.77 | 0.06 | 2.21 | 0.04 | 1.80 | 0.02 | 1.26 | 0.01 | 0.82 | 0.00 |
| 1700 | 3.81 | 0.13 | 2.94 | 0.07 | 2.34 | 0.04 | 1.91 | 0.02 | 1.34 | 0.01 | 0.87 | 0.00 |
| 1800 | 4.03 | 0.14 | 3.12 | 0.08 | 2.48 | 0.04 | 2.02 | 0.03 | 1.42 | 0.01 | 0.92 | 0.00 |
| 1900 | 4.25 | 0.16 | 3.29 | 0.09 | 2.62 | 0.05 | 2.13 | 0.03 | 1.50 | 0.01 | 0.97 | 0.00 |
| 2000 | 4.48 | 0.17 | 3.46 | 0.09 | 2.76 | 0.05 | 2.25 | 0.03 | 1.57 | 0.01 | 1.02 | 0.00 |
| 2100 | 4.70 | 0.19 | 3.64 | 0.10 | 2.89 | 0.06 | 2.36 | 0.04 | 1.65 | 0.02 | 1.08 | 0.01 |
| 2200 | 4.93 | 0.21 | 3.81 | 0.11 | 3.03 | 0.06 | 2.47 | 0.04 | 1.73 | 0.02 | 1.13 | 0.01 |
| 2300 | 5.15 | 0.23 | 3.98 | 0.12 | 3.17 | 0.07 | 2.58 | 0.04 | 1.81 | 0.02 | 1.18 | 0.01 |
| 2400 | 5.37 | 0.25 | 4.16 | 0.13 | 3.31 | 0.08 | 2.70 | 0.05 | 1.89 | 0.02 | 1.23 | 0.01 |
| 2500 | 5.60 | 0.26 | 4.33 | 0.14 | 3.45 | 0.08 | 2.81 | 0.05 | 1.97 | 0.02 | 1.28 | 0.01 |
| 2600 | 5.82 | 0.28 | 4.50 | 0.15 | 3.58 | 0.09 | 2.92 | 0.05 | 2.05 | 0.02 | 1.33 | 0.01 |
| 2700 | 6.05 | 0.30 | 4.68 | 0.16 | 3.72 | 0.09 | 3.03 | 0.06 | 2.13 | 0.02 | 1.38 | 0.01 |
| 2800 | 6.27 | 0.33 | 4.85 | 0.17 | 3.86 | 0.10 | 3.15 | 0.06 | 2.20 | 0.03 | 1.43 | 0.01 |
| 2900 | 6.49 | 0.35 | 5.02 | 0.19 | 4.00 | 0.11 | 3.26 | 0.06 | 2.28 | 0.03 | 1.48 | 0.01 |
| 3000 | 6.72 | 0.37 | 5.19 | 0.20 | 4.14 | 0.11 | 3.37 | 0.07 | 2.36 | 0.03 | 1.54 | 0.01 |
| 3100 | 6.94 | 0.39 | 5.37 | 0.21 | 4.27 | 0.12 | 3.48 | 0.07 | 2.44 | 0.03 | 1.59 | 0.01 |
| 3200 | 7.17 | 0.42 | 5.54 | 0.22 | 4.41 | 0.13 | 3.60 | 0.08 | 2.52 | 0.03 | 1.64 | 0.01 |
| 3300 | | | 5.71 | 0.24 | 4.55 | 0.14 | 3.71 | 0.08 | 2.60 | 0.03 | 1.69 | 0.01 |
| 3400 | | | 5.89 | 0.25 | 4.69 | 0.14 | 3.82 | 0.09 | 2.68 | 0.04 | 1.74 | 0.01 |
| 3500 | | | 6.06 | 0.26 | 4.82 | 0.15 | 3.93 | 0.09 | 2.76 | 0.04 | 1.79 | 0.01 |
| 3600 | | | 6.23 | 0.28 | 4.96 | 0.16 | 4.04 | 0.10 | 2.83 | 0.04 | 1.84 | 0.01 |
| 3700 | | | 6.41 | 0.29 | 5.10 | 0.17 | 4.16 | 0.10 | 2.91 | 0.04 | 1.89 | 0.02 |
| 3800 | | | 6.58 | 0.31 | 5.24 | 0.18 | 4.27 | 0.11 | 2.99 | 0.05 | 1.95 | 0.02 |
| 3900 | | | 6.75 | 0.32 | 5.38 | 0.18 | 4.38 | 0.11 | 3.07 | 0.05 | 2.00 | 0.02 |
| 4000 | | | 6.93 | 0.34 | 5.51 | 0.19 | 4.49 | 0.12 | 3.15 | 0.05 | 2.05 | 0.02 |
| 4200 | | | 7.27 | 0.37 | 5.79 | 0.21 | 4.72 | 0.13 | 3.31 | 0.05 | 2.15 | 0.02 |
| 4400 | | | 7.62 | 0.40 | 6.07 | 0.23 | 4.94 | 0.14 | 3.46 | 0.06 | 2.25 | 0.02 |
| 4600 | | | | | 6.34 | 0.25 | 5.17 | 0.15 | 3.62 | 0.06 | 2.36 | 0.02 |
| 4800 | | | | | 6.62 | 0.27 | 5.39 | 0.17 | 3.78 | 0.07 | 2.46 | 0.02 |
| 5000 | | | | | 6.89 | 0.29 | 5.62 | 0.18 | 3.94 | 0.08 | 2.56 | 0.03 |
| 5200 | | | | | 7.17 | 0.32 | 5.84 | 0.19 | 4.09 | 0.08 | 2.66 | 0.03 |
| 5400 | | | | | 7.44 | 0.34 | 6.07 | 0.21 | 4.25 | 0.09 | 2.76 | 0.03 |
| 5600 | | | | | | | 6.29 | 0.22 | 4.41 | 0.09 | 2.87 | 0.03 |
| 5800 | | | | | | | 6.52 | 0.23 | 4.57 | 0.10 | 2.97 | 0.03 |
| 6000 | | | | | | | 6.74 | 0.25 | 4.72 | 0.11 | 3.07 | 0.04 |
| 6200 | | | | | | | 6.97 | 0.27 | 4.88 | 0.11 | 3.17 | 0.04 |
| 6400 | | | | | | | 7.19 | 0.28 | 5.04 | 0.12 | 3.28 | 0.04 |
| 6600 | | | | | | | 7.42 | 0.30 | 5.20 | 0.13 | 3.38 | 0.04 |
| 6800 | | | | | | | 7.64 | 0.31 | 5.35 | 0.13 | 3.48 | 0.05 |
| 7000 | | | | | | | 7.86 | 0.33 | 5.51 | 0.14 | 3.58 | 0.05 |
| 7500 | | | | | | | | | 5.91 | 0.16 | 3.84 | 0.06 |
| 8000 | | | | | | | | | 6.30 | 0.18 | 4.10 | 0.06 |
| 8500 | | | | | | | | | 6.69 | 0.20 | 4.35 | 0.07 |
| 9000 | | | | | | | | | 7.09 | 0.22 | 4.61 | 0.08 |
| 9500 | | | | | | | | | 7.48 | 0.25 | 4.86 | 0.09 |
| 10000 | | | | | | | | | | | 5.12 | 0.10 |
| 10500 | | | | | | | | | | | 5.38 | 0.10 |

**The shaded area represents velocities over 5 fps. Use with caution where water hammer is a concern.**

# PVC 63 IPS PLASTIC PIPE

**ANSI/ASAE S376.2 ASTM D1784 SDR 64 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 4" | | 6" | | 8" | | 10" | | 12" | |
|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 4.340 | | 6.397 | | 8.335 | | 10.394 | | 12.328 | |
| Pipe OD | 4.500 | | 6.625 | | 8.625 | | 10.750 | | 12.750 | |
| Avg. Wall | 0.080 | | 0.114 | | 0.145 | | 0.178 | | 0.211 | |
| Min. Wall | 0.070 | | 0.104 | | 0.135 | | 0.168 | | 0.199 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 10 | 0.22 | 0.00 | 0.10 | 0.00 | 0.06 | 0.00 | 0.04 | 0.00 | 0.03 | 0.00 |
| 20 | 0.43 | 0.01 | 0.20 | 0.00 | 0.12 | 0.00 | 0.08 | 0.00 | 0.05 | 0.00 |
| 30 | 0.65 | 0.02 | 0.30 | 0.00 | 0.18 | 0.00 | 0.11 | 0.00 | 0.08 | 0.00 |
| 40 | 0.87 | 0.03 | 0.40 | 0.00 | 0.23 | 0.00 | 0.15 | 0.00 | 0.11 | 0.00 |
| 50 | 1.08 | 0.05 | 0.50 | 0.01 | 0.29 | 0.00 | 0.19 | 0.00 | 0.13 | 0.00 |
| 60 | 1.30 | 0.07 | 0.60 | 0.01 | 0.35 | 0.00 | 0.23 | 0.00 | 0.16 | 0.00 |
| 70 | 1.52 | 0.09 | 0.70 | 0.01 | 0.41 | 0.00 | 0.26 | 0.00 | 0.19 | 0.00 |
| 80 | 1.73 | 0.11 | 0.80 | 0.02 | 0.47 | 0.00 | 0.30 | 0.00 | 0.21 | 0.00 |
| 90 | 1.95 | 0.14 | 0.90 | 0.02 | 0.53 | 0.01 | 0.34 | 0.00 | 0.24 | 0.00 |
| 100 | 2.17 | 0.17 | 1.00 | 0.03 | 0.59 | 0.01 | 0.38 | 0.00 | 0.27 | 0.00 |
| 120 | 2.60 | 0.24 | 1.20 | 0.04 | 0.70 | 0.01 | 0.45 | 0.00 | 0.32 | 0.00 |
| 140 | 3.03 | 0.32 | 1.40 | 0.05 | 0.82 | 0.01 | 0.53 | 0.00 | 0.38 | 0.00 |
| 160 | 3.47 | 0.41 | 1.60 | 0.06 | 0.94 | 0.02 | 0.60 | 0.01 | 0.43 | 0.00 |
| 180 | 3.90 | 0.51 | 1.79 | 0.08 | 1.06 | 0.02 | 0.68 | 0.01 | 0.48 | 0.00 |
| 200 | 4.33 | 0.61 | 1.99 | 0.09 | 1.17 | 0.03 | 0.76 | 0.01 | 0.54 | 0.00 |
| 225 | 4.87 | 0.76 | 2.24 | 0.12 | 1.32 | 0.03 | 0.85 | 0.01 | 0.60 | 0.00 |
| 250 | 5.42 | 0.93 | 2.49 | 0.14 | 1.47 | 0.04 | 0.94 | 0.01 | 0.67 | 0.01 |
| 275 | 5.96 | 1.11 | 2.74 | 0.17 | 1.62 | 0.05 | 1.04 | 0.02 | 0.74 | 0.01 |
| 300 | 6.50 | 1.30 | 2.99 | 0.20 | 1.76 | 0.05 | 1.13 | 0.02 | 0.81 | 0.01 |
| 325 | 7.04 | 1.51 | 3.24 | 0.23 | 1.91 | 0.06 | 1.23 | 0.02 | 0.87 | 0.01 |
| 350 | 7.58 | 1.73 | 3.49 | 0.26 | 2.06 | 0.07 | 1.32 | 0.02 | 0.94 | 0.01 |
| 375 | | | 3.74 | 0.30 | 2.20 | 0.08 | 1.42 | 0.03 | 1.01 | 0.01 |
| 400 | | | 3.99 | 0.34 | 2.35 | 0.09 | 1.51 | 0.03 | 1.07 | 0.01 |
| 425 | | | 4.24 | 0.38 | 2.50 | 0.10 | 1.61 | 0.04 | 1.14 | 0.02 |
| 450 | | | 4.49 | 0.42 | 2.64 | 0.12 | 1.70 | 0.04 | 1.21 | 0.02 |
| 475 | | | 4.74 | 0.46 | 2.79 | 0.13 | 1.79 | 0.04 | 1.28 | 0.02 |
| 500 | | | 4.99 | 0.51 | 2.94 | 0.14 | 1.89 | 0.05 | 1.34 | 0.02 |
| 550 | | | 5.48 | 0.61 | 3.23 | 0.17 | 2.08 | 0.06 | 1.48 | 0.02 |
| 600 | | | 5.98 | 0.71 | 3.52 | 0.20 | 2.27 | 0.07 | 1.61 | 0.03 |
| 650 | | | 6.48 | 0.83 | 3.82 | 0.23 | 2.45 | 0.08 | 1.74 | 0.03 |
| 700 | | | 6.98 | 0.95 | 4.11 | 0.26 | 2.64 | 0.09 | 1.88 | 0.04 |
| 750 | | | 7.48 | 1.08 | 4.40 | 0.30 | 2.83 | 0.10 | 2.01 | 0.04 |
| 800 | | | 7.98 | 1.21 | 4.70 | 0.33 | 3.02 | 0.11 | 2.15 | 0.05 |
| 850 | | | | | 4.99 | 0.37 | 3.21 | 0.13 | 2.28 | 0.06 |
| 900 | | | | | 5.29 | 0.42 | 3.40 | 0.14 | 2.42 | 0.06 |
| 950 | | | | | 5.58 | 0.46 | 3.59 | 0.16 | 2.55 | 0.07 |
| 1000 | | | | | 5.87 | 0.51 | 3.78 | 0.17 | 2.68 | 0.08 |
| 1050 | | | | | 6.17 | 0.55 | 3.97 | 0.19 | 2.82 | 0.08 |
| 1150 | | | | | 6.75 | 0.66 | 4.34 | 0.22 | 3.09 | 0.10 |
| 1200 | | | | | 7.05 | 0.71 | 4.53 | 0.24 | 3.22 | 0.11 |
| 1250 | | | | | | | 4.72 | 0.26 | 3.36 | 0.11 |
| 1300 | | | | | | | 4.91 | 0.28 | 3.49 | 0.12 |
| 1350 | | | | | | | 5.10 | 0.30 | 3.62 | 0.13 |
| 1400 | | | | | | | 5.29 | 0.32 | 3.76 | 0.14 |
| 1500 | | | | | | | 5.66 | 0.37 | 4.03 | 0.16 |
| 1550 | | | | | | | 5.85 | 0.39 | 4.16 | 0.17 |
| 1600 | | | | | | | 6.04 | 0.41 | 4.30 | 0.18 |
| 1650 | | | | | | | 6.23 | 0.44 | 4.43 | 0.19 |
| 1700 | | | | | | | 6.42 | 0.46 | 4.56 | 0.20 |
| 1750 | | | | | | | 6.61 | 0.49 | 4.70 | 0.21 |
| 1800 | | | | | | | | | 4.83 | 0.22 |
| 1850 | | | | | | | | | 4.97 | 0.24 |
| 1900 | | | | | | | | | 5.10 | 0.25 |
| 1950 | | | | | | | | | 5.23 | 0.26 |
| 2000 | | | | | | | | | 5.37 | 0.27 |
| 2100 | | | | | | | | | 5.64 | 0.30 |
| 2200 | | | | | | | | | 5.91 | 0.32 |
| 2300 | | | | | | | | | 6.17 | 0.35 |
| 2400 | | | | | | | | | 6.44 | 0.38 |
| 2500 | | | | | | | | | 6.71 | 0.41 |
| 2600 | | | | | | | | | | |
| 2700 | | | | | | | | | | |
| 2800 | | | | | | | | | | |
| 2900 | | | | | | | | | | |
| 3000 | | | | | | | | | | |

**The shaded area represents velocities over 5 fps. Use with caution.**

# PVC 100 IPS PLASTIC PIPE

**ANSI/ASAE S376.2 ASTM D1784 SDR 41 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 6" | | 8" | | 10" | | 12" | | 14" | | 16" | | 18" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 6.281 | | 8.179 | | 10.194 | | 12.090 | | 13.270 | | 15.164 | | 17.060 | |
| Pipe OD | 6.625 | | 8.625 | | 10.750 | | 12.750 | | 14.000 | | 16.000 | | 18.000 | |
| Avg. Wall | 0.172 | | 0.223 | | 0.278 | | 0.330 | | 0.365 | | 0.418 | | 0.470 | |
| Min. Wall | 0.162 | | 0.210 | | 0.262 | | 0.311 | | 0.341 | | 0.390 | | 0.439 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 20 | 0.21 | 0.00 | 0.12 | 0.00 | 0.08 | 0.00 | 0.06 | 0.00 | 0.05 | 0.00 | 0.04 | 0.00 | 0.03 | 0.00 |
| 40 | 0.41 | 0.01 | 0.24 | 0.00 | 0.16 | 0.00 | 0.11 | 0.00 | 0.09 | 0.00 | 0.07 | 0.00 | 0.06 | 0.00 |
| 60 | 0.62 | 0.01 | 0.37 | 0.00 | 0.24 | 0.00 | 0.17 | 0.00 | 0.14 | 0.00 | 0.11 | 0.00 | 0.08 | 0.00 |
| 80 | 0.83 | 0.02 | 0.49 | 0.01 | 0.31 | 0.00 | 0.22 | 0.00 | 0.19 | 0.00 | 0.14 | 0.00 | 0.11 | 0.00 |
| 100 | 1.03 | 0.03 | 0.61 | 0.01 | 0.39 | 0.00 | 0.28 | 0.00 | 0.23 | 0.00 | 0.18 | 0.00 | 0.14 | 0.00 |
| 150 | 1.55 | 0.06 | 0.91 | 0.02 | 0.59 | 0.01 | 0.42 | 0.00 | 0.35 | 0.00 | 0.27 | 0.00 | 0.21 | 0.00 |
| 200 | 2.07 | 0.10 | 1.22 | 0.03 | 0.79 | 0.01 | 0.56 | 0.00 | 0.46 | 0.00 | 0.35 | 0.00 | 0.28 | 0.00 |
| 250 | 2.59 | 0.15 | 1.52 | 0.04 | 0.98 | 0.01 | 0.70 | 0.01 | 0.58 | 0.00 | 0.44 | 0.00 | 0.35 | 0.00 |
| 300 | 3.10 | 0.22 | 1.83 | 0.06 | 1.18 | 0.02 | 0.84 | 0.01 | 0.70 | 0.01 | 0.53 | 0.00 | 0.42 | 0.00 |
| 350 | 3.62 | 0.29 | 2.13 | 0.08 | 1.37 | 0.03 | 0.98 | 0.01 | 0.81 | 0.01 | 0.62 | 0.00 | 0.49 | 0.00 |
| 400 | 4.14 | 0.37 | 2.44 | 0.10 | 1.57 | 0.03 | 1.12 | 0.02 | 0.93 | 0.01 | 0.71 | 0.01 | 0.56 | 0.00 |
| 450 | 4.65 | 0.46 | 2.74 | 0.13 | 1.77 | 0.04 | 1.26 | 0.02 | 1.04 | 0.01 | 0.80 | 0.01 | 0.63 | 0.00 |
| 500 | 5.17 | 0.56 | 3.05 | 0.15 | 1.96 | 0.05 | 1.40 | 0.02 | 1.16 | 0.01 | 0.89 | 0.01 | 0.70 | 0.00 |
| 550 | 5.69 | 0.66 | 3.35 | 0.18 | 2.16 | 0.06 | 1.54 | 0.03 | 1.27 | 0.02 | 0.98 | 0.01 | 0.77 | 0.01 |
| 600 | 6.21 | 0.78 | 3.66 | 0.22 | 2.36 | 0.07 | 1.67 | 0.03 | 1.39 | 0.02 | 1.06 | 0.01 | 0.84 | 0.01 |
| 650 | 6.72 | 0.90 | 3.96 | 0.25 | 2.55 | 0.09 | 1.81 | 0.04 | 1.51 | 0.02 | 1.15 | 0.01 | 0.91 | 0.01 |
| 700 | 7.24 | 1.04 | 4.27 | 0.29 | 2.75 | 0.10 | 1.95 | 0.04 | 1.62 | 0.03 | 1.24 | 0.01 | 0.98 | 0.01 |
| 750 | 7.76 | 1.18 | 4.57 | 0.33 | 2.94 | 0.11 | 2.09 | 0.05 | 1.74 | 0.03 | 1.33 | 0.02 | 1.05 | 0.01 |
| 800 | 8.27 | 1.33 | 4.88 | 0.37 | 3.14 | 0.13 | 2.23 | 0.05 | 1.85 | 0.03 | 1.42 | 0.02 | 1.12 | 0.01 |
| 850 | 8.79 | 1.48 | 5.18 | 0.41 | 3.34 | 0.14 | 2.37 | 0.06 | 1.97 | 0.04 | 1.51 | 0.02 | 1.19 | 0.01 |
| 900 | | | 5.49 | 0.46 | 3.53 | 0.16 | 2.51 | 0.07 | 2.09 | 0.04 | 1.60 | 0.02 | 1.26 | 0.01 |
| 950 | | | 5.79 | 0.50 | 3.73 | 0.17 | 2.65 | 0.08 | 2.20 | 0.05 | 1.69 | 0.03 | 1.33 | 0.01 |
| 1000 | | | 6.10 | 0.55 | 3.93 | 0.19 | 2.79 | 0.08 | 2.32 | 0.05 | 1.77 | 0.03 | 1.40 | 0.02 |
| 1050 | | | 6.40 | 0.61 | 4.12 | 0.21 | 2.93 | 0.09 | 2.43 | 0.06 | 1.86 | 0.03 | 1.47 | 0.02 |
| 1100 | | | 6.71 | 0.66 | 4.32 | 0.23 | 3.07 | 0.10 | 2.55 | 0.06 | 1.95 | 0.03 | 1.54 | 0.02 |
| 1150 | | | | | 4.52 | 0.25 | 3.21 | 0.11 | 2.66 | 0.07 | 2.04 | 0.04 | 1.61 | 0.02 |
| 1200 | | | | | 4.71 | 0.27 | 3.35 | 0.12 | 2.78 | 0.07 | 2.13 | 0.04 | 1.68 | 0.02 |
| 1250 | | | | | 4.91 | 0.29 | 3.49 | 0.13 | 2.90 | 0.08 | 2.22 | 0.04 | 1.75 | 0.02 |
| 1300 | | | | | 5.10 | 0.31 | 3.63 | 0.13 | 3.01 | 0.09 | 2.31 | 0.04 | 1.82 | 0.03 |
| 1350 | | | | | 5.30 | 0.33 | 3.77 | 0.14 | 3.13 | 0.09 | 2.40 | 0.05 | 1.89 | 0.03 |
| 1400 | | | | | 5.50 | 0.35 | 3.91 | 0.15 | 3.24 | 0.10 | 2.48 | 0.05 | 1.96 | 0.03 |
| 1450 | | | | | 5.69 | 0.38 | 4.05 | 0.16 | 3.36 | 0.10 | 2.57 | 0.05 | 2.03 | 0.03 |
| 1500 | | | | | 5.89 | 0.40 | 4.19 | 0.18 | 3.48 | 0.11 | 2.66 | 0.06 | 2.10 | 0.03 |
| 1600 | | | | | 6.28 | 0.45 | 4.47 | 0.20 | 3.71 | 0.13 | 2.84 | 0.07 | 2.24 | 0.04 |
| 1700 | | | | | 6.67 | 0.51 | 4.75 | 0.22 | 3.94 | 0.14 | 3.02 | 0.07 | 2.38 | 0.04 |
| 1800 | | | | | | | 5.02 | 0.25 | 4.17 | 0.16 | 3.19 | 0.08 | 2.52 | 0.05 |
| 1900 | | | | | | | 5.30 | 0.27 | 4.40 | 0.17 | 3.37 | 0.09 | 2.66 | 0.05 |
| 2000 | | | | | | | 5.58 | 0.30 | 4.63 | 0.19 | 3.55 | 0.10 | 2.80 | 0.06 |
| 2100 | | | | | | | 5.86 | 0.33 | 4.87 | 0.21 | 3.73 | 0.11 | 2.94 | 0.06 |
| 2200 | | | | | | | 6.14 | 0.36 | 5.10 | 0.23 | 3.90 | 0.12 | 3.08 | 0.07 |
| 2300 | | | | | | | 6.42 | 0.39 | 5.33 | 0.25 | 4.08 | 0.13 | 3.22 | 0.07 |
| 2400 | | | | | | | 6.70 | 0.42 | 5.56 | 0.27 | 4.26 | 0.14 | 3.36 | 0.08 |
| 2500 | | | | | | | 6.98 | 0.45 | 5.79 | 0.29 | 4.44 | 0.15 | 3.50 | 0.08 |
| 2600 | | | | | | | 7.26 | 0.49 | 6.02 | 0.31 | 4.61 | 0.16 | 3.64 | 0.09 |
| 2700 | | | | | | | 7.54 | 0.52 | 6.26 | 0.33 | 4.79 | 0.17 | 3.78 | 0.10 |
| 2800 | | | | | | | 7.82 | 0.56 | 6.49 | 0.35 | 4.97 | 0.19 | 3.93 | 0.10 |
| 2900 | | | | | | | 8.09 | 0.59 | 6.72 | 0.38 | 5.15 | 0.20 | 4.07 | 0.11 |
| 3000 | | | | | | | 8.37 | 0.63 | 6.95 | 0.40 | 5.32 | 0.21 | 4.21 | 0.12 |
| 3100 | | | | | | | 8.65 | 0.67 | 7.18 | 0.43 | 5.50 | 0.22 | 4.35 | 0.13 |
| 3200 | | | | | | | 8.93 | 0.71 | 7.41 | 0.45 | 5.68 | 0.24 | 4.49 | 0.13 |
| 3300 | | | | | | | | | 7.65 | 0.48 | 5.86 | 0.25 | 4.63 | 0.14 |
| 3400 | | | | | | | | | 7.88 | 0.51 | 6.03 | 0.27 | 4.77 | 0.15 |
| 3500 | | | | | | | | | 8.11 | 0.54 | 6.21 | 0.28 | 4.91 | 0.16 |
| 3600 | | | | | | | | | 8.34 | 0.56 | 6.39 | 0.29 | 5.05 | 0.17 |
| 3700 | | | | | | | | | 8.57 | 0.59 | 6.56 | 0.31 | 5.19 | 0.17 |
| 3800 | | | | | | | | | | | 6.74 | 0.33 | 5.33 | 0.18 |
| 3900 | | | | | | | | | | | 6.92 | 0.34 | 5.47 | 0.19 |
| 4000 | | | | | | | | | | | 7.10 | 0.36 | 5.61 | 0.20 |
| 4100 | | | | | | | | | | | 7.27 | 0.38 | 5.75 | 0.21 |
| 4200 | | | | | | | | | | | 7.45 | 0.39 | 5.89 | 0.22 |
| 4300 | | | | | | | | | | | | | 6.03 | 0.23 |
| 4400 | | | | | | | | | | | | | 6.17 | 0.24 |
| 4500 | | | | | | | | | | | | | 6.31 | 0.25 |
| 4600 | | | | | | | | | | | | | 6.45 | 0.26 |
| 4700 | | | | | | | | | | | | | 6.59 | 0.27 |

**The shaded area represents velocities over 5 fps. Use with caution.**

# PVC 125 IPS PLASTIC PIPE

**ANSI/ASAE S376.2 ASTM D1784 SDR 32.5 C=150**

**PSI Loss per 100' of Pipe**

| Nominal Size | 6" | | 8" | | 10" | | 12" | | 14" | | 16" | | 18" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 6.193 | | 8.063 | | 10.048 | | 11.918 | | 13.088 | | 14.956 | | 16.826 | |
| Pipe OD | 6.625 | | 8.625 | | 10.750 | | 12.750 | | 14.000 | | 16.000 | | 18.000 | |
| Avg. Wall | 0.216 | | 0.281 | | 0.351 | | 0.416 | | 0.456 | | 0.522 | | 0.587 | |
| Min. Wall | 0.204 | | 0.265 | | 0.331 | | 0.392 | | 0.430 | | 0.492 | | 0.554 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 20 | 0.21 | 0.00 | 0.13 | 0.00 | 0.08 | 0.00 | 0.06 | 0.00 | 0.05 | 0.00 | 0.04 | 0.00 | 0.03 | 0.00 |
| 40 | 0.43 | 0.01 | 0.25 | 0.00 | 0.16 | 0.00 | 0.11 | 0.00 | 0.10 | 0.00 | 0.07 | 0.00 | 0.06 | 0.00 |
| 60 | 0.64 | 0.01 | 0.38 | 0.00 | 0.24 | 0.00 | 0.17 | 0.00 | 0.14 | 0.00 | 0.11 | 0.00 | 0.09 | 0.00 |
| 80 | 0.85 | 0.02 | 0.50 | 0.01 | 0.32 | 0.00 | 0.23 | 0.00 | 0.19 | 0.00 | 0.15 | 0.00 | 0.12 | 0.00 |
| 100 | 1.06 | 0.03 | 0.63 | 0.01 | 0.40 | 0.00 | 0.29 | 0.00 | 0.24 | 0.00 | 0.18 | 0.00 | 0.14 | 0.00 |
| 150 | 1.60 | 0.06 | 0.94 | 0.02 | 0.61 | 0.01 | 0.43 | 0.00 | 0.36 | 0.00 | 0.27 | 0.00 | 0.22 | 0.00 |
| 200 | 2.13 | 0.11 | 1.26 | 0.03 | 0.81 | 0.01 | 0.57 | 0.00 | 0.48 | 0.00 | 0.36 | 0.00 | 0.29 | 0.00 |
| 250 | 2.66 | 0.16 | 1.57 | 0.05 | 1.01 | 0.02 | 0.72 | 0.01 | 0.60 | 0.00 | 0.46 | 0.00 | 0.36 | 0.00 |
| 300 | 3.19 | 0.23 | 1.88 | 0.06 | 1.21 | 0.02 | 0.86 | 0.01 | 0.71 | 0.01 | 0.55 | 0.00 | 0.43 | 0.00 |
| 350 | 3.72 | 0.31 | 2.20 | 0.09 | 1.41 | 0.03 | 1.01 | 0.01 | 0.83 | 0.01 | 0.64 | 0.00 | 0.50 | 0.00 |
| 400 | 4.26 | 0.39 | 2.51 | 0.11 | 1.62 | 0.04 | 1.15 | 0.02 | 0.95 | 0.01 | 0.73 | 0.01 | 0.58 | 0.00 |
| 450 | 4.79 | 0.49 | 2.82 | 0.14 | 1.82 | 0.05 | 1.29 | 0.02 | 1.07 | 0.01 | 0.82 | 0.01 | 0.65 | 0.00 |
| 500 | 5.32 | 0.59 | 3.14 | 0.16 | 2.02 | 0.06 | 1.44 | 0.02 | 1.19 | 0.02 | 0.91 | 0.01 | 0.72 | 0.00 |
| 550 | 5.85 | 0.71 | 3.45 | 0.20 | 2.22 | 0.07 | 1.58 | 0.03 | 1.31 | 0.02 | 1.00 | 0.01 | 0.79 | 0.01 |
| 600 | 6.38 | 0.83 | 3.77 | 0.23 | 2.42 | 0.08 | 1.72 | 0.03 | 1.43 | 0.02 | 1.09 | 0.01 | 0.86 | 0.01 |
| 650 | 6.91 | 0.97 | 4.08 | 0.27 | 2.63 | 0.09 | 1.87 | 0.04 | 1.55 | 0.03 | 1.19 | 0.01 | 0.94 | 0.01 |
| 700 | 7.45 | 1.11 | 4.39 | 0.31 | 2.83 | 0.11 | 2.01 | 0.05 | 1.67 | 0.03 | 1.28 | 0.02 | 1.01 | 0.01 |
| 750 | 7.98 | 1.26 | 4.71 | 0.35 | 3.03 | 0.12 | 2.15 | 0.05 | 1.79 | 0.03 | 1.37 | 0.02 | 1.08 | 0.01 |
| 800 | 8.51 | 1.42 | 5.02 | 0.39 | 3.23 | 0.13 | 2.30 | 0.06 | 1.91 | 0.04 | 1.46 | 0.02 | 1.15 | 0.01 |
| 850 | 9.04 | 1.59 | 5.33 | 0.44 | 3.43 | 0.15 | 2.44 | 0.07 | 2.02 | 0.04 | 1.55 | 0.02 | 1.22 | 0.01 |
| 900 | | | 5.65 | 0.49 | 3.64 | 0.17 | 2.59 | 0.07 | 2.14 | 0.05 | 1.64 | 0.02 | 1.30 | 0.01 |
| 950 | | | 5.96 | 0.54 | 3.84 | 0.19 | 2.73 | 0.08 | 2.26 | 0.05 | 1.73 | 0.03 | 1.37 | 0.02 |
| 1000 | | | 6.28 | 0.59 | 4.04 | 0.20 | 2.87 | 0.09 | 2.38 | 0.06 | 1.82 | 0.03 | 1.44 | 0.02 |
| 1050 | | | 6.59 | 0.65 | 4.24 | 0.22 | 3.02 | 0.10 | 2.50 | 0.06 | 1.92 | 0.03 | 1.51 | 0.02 |
| 1100 | | | 6.90 | 0.71 | 4.45 | 0.24 | 3.16 | 0.11 | 2.62 | 0.07 | 2.01 | 0.04 | 1.59 | 0.02 |
| 1150 | | | | | 4.65 | 0.26 | 3.30 | 0.11 | 2.74 | 0.07 | 2.10 | 0.04 | 1.66 | 0.02 |
| 1200 | | | | | 4.85 | 0.29 | 3.45 | 0.12 | 2.86 | 0.08 | 2.19 | 0.04 | 1.73 | 0.02 |
| 1250 | | | | | 5.05 | 0.31 | 3.59 | 0.13 | 2.98 | 0.09 | 2.28 | 0.04 | 1.80 | 0.03 |
| 1300 | | | | | 5.25 | 0.33 | 3.73 | 0.14 | 3.10 | 0.09 | 2.37 | 0.05 | 1.87 | 0.03 |
| 1350 | | | | | 5.46 | 0.36 | 3.88 | 0.15 | 3.22 | 0.10 | 2.46 | 0.05 | 1.95 | 0.03 |
| 1400 | | | | | 5.66 | 0.38 | 4.02 | 0.17 | 3.33 | 0.10 | 2.55 | 0.05 | 2.02 | 0.03 |
| 1450 | | | | | 5.86 | 0.41 | 4.17 | 0.18 | 3.45 | 0.11 | 2.64 | 0.06 | 2.09 | 0.03 |
| 1500 | | | | | 6.06 | 0.43 | 4.31 | 0.19 | 3.57 | 0.12 | 2.74 | 0.06 | 2.16 | 0.04 |
| 1600 | | | | | 6.47 | 0.49 | 4.60 | 0.21 | 3.81 | 0.13 | 2.92 | 0.07 | 2.31 | 0.04 |
| 1700 | | | | | 6.87 | 0.54 | 4.88 | 0.24 | 4.05 | 0.15 | 3.10 | 0.08 | 2.45 | 0.04 |
| 1800 | | | | | | | 5.17 | 0.26 | 4.29 | 0.17 | 3.28 | 0.09 | 2.59 | 0.05 |
| 1900 | | | | | | | 5.46 | 0.29 | 4.53 | 0.18 | 3.47 | 0.10 | 2.74 | 0.05 |
| 2000 | | | | | | | 5.74 | 0.32 | 4.76 | 0.20 | 3.65 | 0.11 | 2.88 | 0.06 |
| 2100 | | | | | | | 6.03 | 0.35 | 5.00 | 0.22 | 3.83 | 0.12 | 3.03 | 0.07 |
| 2200 | | | | | | | 6.32 | 0.38 | 5.24 | 0.24 | 4.01 | 0.13 | 3.17 | 0.07 |
| 2300 | | | | | | | 6.61 | 0.42 | 5.48 | 0.26 | 4.20 | 0.14 | 3.31 | 0.08 |
| 2400 | | | | | | | 6.89 | 0.45 | 5.72 | 0.28 | 4.38 | 0.15 | 3.46 | 0.08 |
| 2500 | | | | | | | 7.18 | 0.48 | 5.95 | 0.31 | 4.56 | 0.16 | 3.60 | 0.09 |
| 2600 | | | | | | | 7.47 | 0.52 | 6.19 | 0.33 | 4.74 | 0.17 | 3.75 | 0.10 |
| 2700 | | | | | | | 7.76 | 0.56 | 6.43 | 0.35 | 4.92 | 0.19 | 3.89 | 0.10 |
| 2800 | | | | | | | 8.04 | 0.60 | 6.67 | 0.38 | 5.11 | 0.20 | 4.04 | 0.11 |
| 2900 | | | | | | | 8.33 | 0.64 | 6.91 | 0.40 | 5.29 | 0.21 | 4.18 | 0.12 |
| 3000 | | | | | | | 8.62 | 0.68 | 7.15 | 0.43 | 5.47 | 0.22 | 4.32 | 0.13 |
| 3100 | | | | | | | 8.90 | 0.72 | 7.38 | 0.46 | 5.65 | 0.24 | 4.47 | 0.13 |
| 3200 | | | | | | | 9.19 | 0.77 | 7.62 | 0.49 | 5.84 | 0.25 | 4.61 | 0.14 |
| 3300 | | | | | | | | | 7.86 | 0.51 | 6.02 | 0.27 | 4.76 | 0.15 |
| 3400 | | | | | | | | | 8.10 | 0.54 | 6.20 | 0.28 | 4.90 | 0.16 |
| 3500 | | | | | | | | | 8.34 | 0.57 | 6.38 | 0.30 | 5.04 | 0.17 |
| 3600 | | | | | | | | | 8.57 | 0.60 | 6.57 | 0.32 | 5.19 | 0.18 |
| 3700 | | | | | | | | | 8.81 | 0.63 | 6.75 | 0.33 | 5.33 | 0.19 |
| 3800 | | | | | | | | | | | 6.93 | 0.35 | 5.48 | 0.20 |
| 3900 | | | | | | | | | | | 7.11 | 0.37 | 5.62 | 0.21 |
| 4000 | | | | | | | | | | | 7.30 | 0.38 | 5.76 | 0.22 |
| 4100 | | | | | | | | | | | 7.48 | 0.40 | 5.91 | 0.23 |
| 4200 | | | | | | | | | | | 7.66 | 0.42 | 6.05 | 0.24 |
| 4300 | | | | | | | | | | | | | 6.20 | 0.25 |
| 4400 | | | | | | | | | | | | | 6.34 | 0.26 |
| 4500 | | | | | | | | | | | | | 6.49 | 0.27 |
| 4600 | | | | | | | | | | | | | 6.63 | 0.28 |
| 4700 | | | | | | | | | | | | | 6.77 | 0.29 |

**The shaded area represents velocities over 5 fps. Use with caution.**

# 50' HEAD PLASTIC IRRIGATION PIPE (PIP)

**ANSI/ASAE S376.2 C=150 Water Temperature 73˚ F**

**PSI Loss per 100' of Pipe**

| Nominal Size | 4" | | 6" | | 8" | | 10" | | 12" | | 15" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 3.984 | | 5.980 | | 7.980 | | 9.980 | | 11.980 | | 14.980 | |
| Pipe OD | 4.134 | | 6.140 | | 8.160 | | 10.200 | | 12.240 | | 15.300 | |
| Avg.Wall | 0.075 | | 0.080 | | 0.090 | | 0.110 | | 0.130 | | 0.160 | |
| Min.Wall | 0.065 | | 0.070 | | 0.080 | | 0.100 | | 0.120 | | 0.150 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 25 | 0.64 | 0.02 | 0.29 | 0.00 | 0.16 | 0.00 | 0.10 | 0.00 | 0.07 | 0.00 | | |
| 50 | 1.29 | 0.07 | 0.57 | 0.01 | 0.32 | 0.00 | 0.20 | 0.00 | 0.14 | 0.00 | 0.09 | 0.00 |
| 75 | 1.93 | 0.15 | 0.86 | 0.02 | 0.48 | 0.01 | 0.31 | 0.00 | 0.21 | 0.00 | 0.14 | 0.00 |
| 100 | 2.57 | 0.26 | 1.14 | 0.04 | 0.64 | 0.01 | 0.41 | 0.00 | 0.28 | 0.00 | 0.18 | 0.00 |
| 125 | 3.21 | 0.39 | 1.43 | 0.05 | 0.80 | 0.01 | 0.51 | 0.00 | 0.36 | 0.00 | 0.23 | 0.00 |
| 150 | 3.86 | 0.55 | 1.71 | 0.08 | 0.96 | 0.02 | 0.61 | 0.01 | 0.43 | 0.00 | 0.27 | 0.00 |
| 175 | 4.50 | 0.73 | 2.00 | 0.10 | 1.12 | 0.02 | 0.72 | 0.01 | 0.50 | 0.00 | 0.32 | 0.00 |
| 200 | 5.14 | 0.93 | 2.28 | 0.13 | 1.28 | 0.03 | 0.82 | 0.01 | 0.57 | 0.00 | 0.36 | 0.00 |
| 225 | 5.78 | 1.16 | 2.57 | 0.16 | 1.44 | 0.04 | 0.92 | 0.01 | 0.64 | 0.01 | 0.41 | 0.00 |
| 250 | 6.43 | 1.41 | 2.85 | 0.20 | 1.60 | 0.05 | 1.02 | 0.02 | 0.71 | 0.01 | 0.45 | 0.00 |
| 275 | 7.07 | 1.68 | 3.14 | 0.23 | 1.76 | 0.06 | 1.13 | 0.02 | 0.78 | 0.01 | 0.50 | 0.00 |
| 300 | 7.71 | 1.97 | 3.42 | 0.27 | 1.92 | 0.07 | 1.23 | 0.02 | 0.85 | 0.01 | 0.55 | 0.00 |
| 325 | 8.35 | 2.29 | 3.71 | 0.32 | 2.08 | 0.08 | 1.33 | 0.03 | 0.92 | 0.01 | 0.59 | 0.00 |
| 350 | 9.00 | 2.63 | 3.99 | 0.36 | 2.24 | 0.09 | 1.43 | 0.03 | 0.99 | 0.01 | 0.64 | 0.00 |
| 375 | 9.64 | 2.99 | 4.28 | 0.41 | 2.40 | 0.10 | 1.54 | 0.03 | 1.07 | 0.01 | 0.68 | 0.00 |
| 400 | | | 4.56 | 0.47 | 2.56 | 0.11 | 1.64 | 0.04 | 1.14 | 0.02 | 0.73 | 0.01 |
| 425 | | | 4.85 | 0.52 | 2.72 | 0.13 | 1.74 | 0.04 | 1.21 | 0.02 | 0.77 | 0.01 |
| 450 | | | 5.13 | 0.58 | 2.88 | 0.14 | 1.84 | 0.05 | 1.28 | 0.02 | 0.82 | 0.01 |
| 475 | | | 5.42 | 0.64 | 3.04 | 0.16 | 1.95 | 0.05 | 1.35 | 0.02 | 0.86 | 0.01 |
| 500 | | | 5.70 | 0.70 | 3.20 | 0.17 | 2.05 | 0.06 | 1.42 | 0.02 | 0.91 | 0.01 |
| 550 | | | 6.28 | 0.84 | 3.52 | 0.21 | 2.25 | 0.07 | 1.56 | 0.03 | 1.00 | 0.01 |
| 600 | | | 6.85 | 0.99 | 3.84 | 0.24 | 2.46 | 0.08 | 1.71 | 0.03 | 1.09 | 0.01 |
| 650 | | | 7.42 | 1.15 | 4.16 | 0.28 | 2.66 | 0.09 | 1.85 | 0.04 | 1.18 | 0.01 |
| 700 | | | 7.99 | 1.31 | 4.48 | 0.32 | 2.87 | 0.11 | 1.99 | 0.04 | 1.27 | 0.02 |
| 750 | | | 8.56 | 1.49 | 4.81 | 0.37 | 3.07 | 0.12 | 2.13 | 0.05 | 1.36 | 0.02 |
| 800 | | | | | 5.13 | 0.41 | 3.28 | 0.14 | 2.27 | 0.06 | 1.45 | 0.02 |
| 850 | | | | | 5.45 | 0.46 | 3.48 | 0.16 | 2.42 | 0.06 | 1.55 | 0.02 |
| 900 | | | | | 5.77 | 0.51 | 3.69 | 0.17 | 2.56 | 0.07 | 1.64 | 0.02 |
| 950 | | | | | 6.09 | 0.57 | 3.89 | 0.19 | 2.70 | 0.08 | 1.73 | 0.03 |
| 1000 | | | | | 6.41 | 0.63 | 4.10 | 0.21 | 2.84 | 0.09 | 1.82 | 0.03 |
| 1100 | | | | | 7.05 | 0.75 | 4.51 | 0.25 | 3.13 | 0.10 | 2.00 | 0.03 |
| 1200 | | | | | 7.69 | 0.88 | 4.92 | 0.30 | 3.41 | 0.12 | 2.18 | 0.04 |
| 1300 | | | | | 8.33 | 1.02 | 5.33 | 0.34 | 3.70 | 0.14 | 2.36 | 0.05 |
| 1400 | | | | | 8.97 | 1.17 | 5.73 | 0.39 | 3.98 | 0.16 | 2.55 | 0.05 |
| 1500 | | | | | | | 6.14 | 0.45 | 4.26 | 0.18 | 2.73 | 0.06 |
| 1600 | | | | | | | 6.55 | 0.50 | 4.55 | 0.21 | 2.91 | 0.07 |
| 1700 | | | | | | | 6.96 | 0.56 | 4.83 | 0.23 | 3.09 | 0.08 |
| 1800 | | | | | | | 7.37 | 0.63 | 5.12 | 0.26 | 3.27 | 0.09 |
| 1900 | | | | | | | 7.78 | 0.69 | 5.40 | 0.28 | 3.45 | 0.10 |
| 2000 | | | | | | | 8.19 | 0.76 | 5.69 | 0.31 | 3.64 | 0.11 |
| 2100 | | | | | | | | | 5.97 | 0.34 | 3.82 | 0.12 |
| 2200 | | | | | | | | | 6.25 | 0.37 | 4.00 | 0.13 |
| 2300 | | | | | | | | | 6.54 | 0.40 | 4.18 | 0.14 |
| 2400 | | | | | | | | | 6.82 | 0.44 | 4.36 | 0.15 |
| 2500 | | | | | | | | | 7.11 | 0.47 | 4.55 | 0.16 |
| 2600 | | | | | | | | | 7.39 | 0.51 | 4.73 | 0.17 |
| 2700 | | | | | | | | | 7.68 | 0.54 | 4.91 | 0.18 |
| 2800 | | | | | | | | | 7.96 | 0.58 | 5.09 | 0.20 |
| 2900 | | | | | | | | | 8.24 | 0.62 | 5.27 | 0.21 |
| 3000 | | | | | | | | | 8.53 | 0.66 | 5.45 | 0.22 |
| 3200 | | | | | | | | | | | 5.82 | 0.25 |
| 3400 | | | | | | | | | | | 6.18 | 0.28 |
| 3600 | | | | | | | | | | | 6.55 | 0.31 |
| 3800 | | | | | | | | | | | 6.91 | 0.35 |
| 4000 | | | | | | | | | | | 7.27 | 0.38 |
| 4200 | | | | | | | | | | | 7.64 | 0.42 |
| 4400 | | | | | | | | | | | 8.00 | 0.45 |
| 4600 | | | | | | | | | | | 8.36 | 0.49 |
| 4800 | | | | | | | | | | | 8.73 | 0.53 |
| 5000 | | | | | | | | | | | 9.09 | 0.57 |
| 5200 | | | | | | | | | | | | |
| 5400 | | | | | | | | | | | | |
| 5600 | | | | | | | | | | | | |
| 5800 | | | | | | | | | | | | |
| 6000 | | | | | | | | | | | | |

**The shaded area represents velocities over 5 fps. Use with caution.**

# 100' HEAD PLASTIC IRRIGATION PIPE (PIP)

**ANSI/ASAE S376.2 C=150 Water Temperature 73˚ F**

**PSI Loss per 100' of Pipe**

| Nominal Size | 6" | | 8" | | 10" | | 12" | | 15" | | 18" | | 21" | | 24" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 5.980 | | 7.966 | | 9.962 | | 11.958 | | 14.952 | | 18.277 | | 21.547 | | 24.239 | |
| Pipe OD | 6.140 | | 8.160 | | 10.200 | | 12.240 | | 15.300 | | 18.701 | | 22.047 | | 24.803 | |
| Avg.Wall | 0.080 | | 0.097 | | 0.119 | | 0.141 | | 0.174 | | 0.212 | | 0.250 | | 0.282 | |
| Min.Wall | 0.070 | | 0.087 | | 0.109 | | 0.131 | | 0.016 | | 0.200 | | 0.236 | | 0.266 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 25 | 0.29 | 0.00 | 0.16 | 0.00 | 0.10 | 0.00 | 0.07 | 0.00 | 0.05 | 0.00 | | | | | | |
| 50 | 0.57 | 0.01 | 0.32 | 0.00 | 0.21 | 0.00 | 0.14 | 0.00 | 0.09 | 0.00 | 0.06 | 0.00 | | | | |
| 75 | 0.86 | 0.02 | 0.48 | 0.01 | 0.31 | 0.00 | 0.21 | 0.00 | 0.14 | 0.00 | 0.09 | 0.00 | | | | |
| 100 | 1.14 | 0.04 | 0.64 | 0.01 | 0.41 | 0.00 | 0.29 | 0.00 | 0.18 | 0.00 | 0.12 | 0.00 | 0.09 | 0.00 | 0.07 | 0.00 |
| 125 | 1.43 | 0.05 | 0.80 | 0.01 | 0.51 | 0.00 | 0.36 | 0.00 | 0.23 | 0.00 | 0.15 | 0.00 | 0.11 | 0.00 | 0.09 | 0.00 |
| 150 | 1.71 | 0.08 | 0.96 | 0.02 | 0.62 | 0.01 | 0.43 | 0.00 | 0.27 | 0.00 | 0.18 | 0.00 | 0.13 | 0.00 | 0.10 | 0.00 |
| 175 | 2.00 | 0.10 | 1.13 | 0.02 | 0.72 | 0.01 | 0.50 | 0.00 | 0.32 | 0.00 | 0.21 | 0.00 | 0.15 | 0.00 | 0.12 | 0.00 |
| 200 | 2.28 | 0.13 | 1.29 | 0.03 | 0.82 | 0.01 | 0.57 | 0.00 | 0.36 | 0.00 | 0.24 | 0.00 | 0.18 | 0.00 | 0.14 | 0.00 |
| 225 | 2.57 | 0.16 | 1.45 | 0.04 | 0.93 | 0.01 | 0.64 | 0.01 | 0.41 | 0.00 | 0.27 | 0.00 | 0.20 | 0.00 | 0.16 | 0.00 |
| 250 | 2.85 | 0.20 | 1.61 | 0.05 | 1.03 | 0.02 | 0.71 | 0.01 | 0.46 | 0.00 | 0.31 | 0.00 | 0.22 | 0.00 | 0.17 | 0.00 |
| 275 | 3.14 | 0.23 | 1.77 | 0.06 | 1.13 | 0.02 | 0.78 | 0.01 | 0.50 | 0.00 | 0.34 | 0.00 | 0.24 | 0.00 | 0.19 | 0.00 |
| 300 | 3.42 | 0.27 | 1.93 | 0.07 | 1.23 | 0.02 | 0.86 | 0.01 | 0.55 | 0.00 | 0.37 | 0.00 | 0.26 | 0.00 | 0.21 | 0.00 |
| 325 | 3.71 | 0.32 | 2.09 | 0.08 | 1.34 | 0.03 | 0.93 | 0.01 | 0.59 | 0.00 | 0.40 | 0.00 | 0.29 | 0.00 | 0.23 | 0.00 |
| 350 | 3.99 | 0.36 | 2.25 | 0.09 | 1.44 | 0.03 | 1.00 | 0.01 | 0.64 | 0.00 | 0.43 | 0.00 | 0.31 | 0.00 | 0.24 | 0.00 |
| 375 | 4.28 | 0.41 | 2.41 | 0.10 | 1.54 | 0.03 | 1.07 | 0.01 | 0.68 | 0.00 | 0.46 | 0.00 | 0.33 | 0.00 | 0.26 | 0.00 |
| 400 | 4.56 | 0.47 | 2.57 | 0.12 | 1.64 | 0.04 | 1.14 | 0.02 | 0.73 | 0.01 | 0.49 | 0.00 | 0.35 | 0.00 | 0.28 | 0.00 |
| 425 | 4.85 | 0.52 | 2.73 | 0.13 | 1.75 | 0.04 | 1.21 | 0.02 | 0.78 | 0.01 | 0.52 | 0.00 | 0.37 | 0.00 | 0.30 | 0.00 |
| 450 | 5.13 | 0.58 | 2.89 | 0.14 | 1.85 | 0.05 | 1.28 | 0.02 | 0.82 | 0.01 | 0.55 | 0.00 | 0.40 | 0.00 | 0.31 | 0.00 |
| 475 | 5.42 | 0.64 | 3.05 | 0.16 | 1.95 | 0.05 | 1.36 | 0.02 | 0.87 | 0.01 | 0.58 | 0.00 | 0.42 | 0.00 | 0.33 | 0.00 |
| 500 | 5.70 | 0.70 | 3.21 | 0.17 | 2.06 | 0.06 | 1.43 | 0.02 | 0.91 | 0.01 | 0.61 | 0.00 | 0.44 | 0.00 | 0.35 | 0.00 |
| 550 | 6.28 | 0.84 | 3.54 | 0.21 | 2.26 | 0.07 | 1.57 | 0.03 | 1.00 | 0.01 | 0.67 | 0.00 | 0.48 | 0.00 | 0.38 | 0.00 |
| 600 | 6.85 | 0.99 | 3.86 | 0.24 | 2.47 | 0.08 | 1.71 | 0.03 | 1.09 | 0.01 | 0.73 | 0.00 | 0.53 | 0.00 | 0.42 | 0.00 |
| 650 | 7.42 | 1.15 | 4.18 | 0.28 | 2.67 | 0.10 | 1.85 | 0.04 | 1.19 | 0.01 | 0.79 | 0.00 | 0.57 | 0.00 | 0.45 | 0.00 |
| 700 | 7.99 | 1.31 | 4.50 | 0.33 | 2.88 | 0.11 | 2.00 | 0.05 | 1.28 | 0.02 | 0.85 | 0.01 | 0.62 | 0.00 | 0.49 | 0.00 |
| 750 | 8.56 | 1.49 | 4.82 | 0.37 | 3.08 | 0.12 | 2.14 | 0.05 | 1.37 | 0.02 | 0.92 | 0.01 | 0.66 | 0.00 | 0.52 | 0.00 |
| 800 | | | 5.14 | 0.42 | 3.29 | 0.14 | 2.28 | 0.06 | 1.46 | 0.02 | 0.98 | 0.01 | 0.70 | 0.00 | 0.56 | 0.00 |
| 850 | | | 5.47 | 0.47 | 3.49 | 0.16 | 2.43 | 0.06 | 1.55 | 0.02 | 1.04 | 0.01 | 0.75 | 0.00 | 0.59 | 0.00 |
| 900 | | | 5.79 | 0.52 | 3.70 | 0.17 | 2.57 | 0.07 | 1.64 | 0.02 | 1.10 | 0.01 | 0.79 | 0.00 | 0.62 | 0.00 |
| 950 | | | 6.11 | 0.57 | 3.91 | 0.19 | 2.71 | 0.08 | 1.73 | 0.03 | 1.16 | 0.01 | 0.83 | 0.00 | 0.66 | 0.00 |
| 1000 | | | 6.43 | 0.63 | 4.11 | 0.21 | 2.85 | 0.09 | 1.82 | 0.03 | 1.22 | 0.01 | 0.88 | 0.00 | 0.69 | 0.00 |
| 1100 | | | 7.07 | 0.75 | 4.52 | 0.25 | 3.14 | 0.10 | 2.01 | 0.04 | 1.34 | 0.01 | 0.97 | 0.01 | 0.76 | 0.00 |
| 1200 | | | 7.72 | 0.88 | 4.93 | 0.30 | 3.42 | 0.12 | 2.19 | 0.04 | 1.47 | 0.02 | 1.05 | 0.01 | 0.83 | 0.00 |
| 1300 | | | 8.36 | 1.02 | 5.34 | 0.35 | 3.71 | 0.14 | 2.37 | 0.05 | 1.59 | 0.02 | 1.14 | 0.01 | 0.90 | 0.00 |
| 1400 | | | 9.00 | 1.18 | 5.76 | 0.40 | 3.99 | 0.16 | 2.55 | 0.05 | 1.71 | 0.02 | 1.23 | 0.01 | 0.97 | 0.01 |
| 1500 | | | | | 6.17 | 0.45 | 4.28 | 0.19 | 2.74 | 0.06 | 1.83 | 0.02 | 1.32 | 0.01 | 1.04 | 0.01 |
| 1600 | | | | | 6.58 | 0.51 | 4.57 | 0.21 | 2.92 | 0.07 | 1.95 | 0.03 | 1.41 | 0.01 | 1.11 | 0.01 |
| 1700 | | | | | 6.99 | 0.57 | 4.85 | 0.23 | 3.10 | 0.08 | 2.08 | 0.03 | 1.49 | 0.01 | 1.18 | 0.01 |
| 1800 | | | | | 7.40 | 0.63 | 5.14 | 0.26 | 3.28 | 0.09 | 2.20 | 0.03 | 1.58 | 0.01 | 1.25 | 0.01 |
| 1900 | | | | | 7.81 | 0.70 | 5.42 | 0.29 | 3.47 | 0.10 | 2.32 | 0.04 | 1.67 | 0.02 | 1.32 | 0.01 |
| 2000 | | | | | 8.22 | 0.77 | 5.71 | 0.32 | 3.65 | 0.11 | 2.44 | 0.04 | 1.76 | 0.02 | 1.39 | 0.01 |
| 2100 | | | | | | | 5.99 | 0.35 | 3.83 | 0.12 | 2.56 | 0.04 | 1.85 | 0.02 | 1.46 | 0.01 |
| 2200 | | | | | | | 6.28 | 0.38 | 4.01 | 0.13 | 2.69 | 0.05 | 1.93 | 0.02 | 1.53 | 0.01 |
| 2300 | | | | | | | 6.56 | 0.41 | 4.20 | 0.14 | 2.81 | 0.05 | 2.02 | 0.02 | 1.60 | 0.01 |
| 2400 | | | | | | | 6.85 | 0.44 | 4.38 | 0.15 | 2.93 | 0.06 | 2.11 | 0.03 | 1.67 | 0.01 |
| 2500 | | | | | | | 7.13 | 0.48 | 4.56 | 0.16 | 3.05 | 0.06 | 2.20 | 0.03 | 1.74 | 0.02 |
| 2600 | | | | | | | 7.42 | 0.51 | 4.74 | 0.17 | 3.18 | 0.07 | 2.28 | 0.03 | 1.81 | 0.02 |
| 2700 | | | | | | | 7.70 | 0.55 | 4.93 | 0.19 | 3.30 | 0.07 | 2.37 | 0.03 | 1.87 | 0.02 |
| 2800 | | | | | | | 7.99 | 0.59 | 5.11 | 0.20 | 3.42 | 0.07 | 2.46 | 0.03 | 1.94 | 0.02 |
| 2900 | | | | | | | 8.27 | 0.63 | 5.29 | 0.21 | 3.54 | 0.08 | 2.55 | 0.04 | 2.01 | 0.02 |
| 3000 | | | | | | | 8.56 | 0.67 | 5.47 | 0.23 | 3.66 | 0.08 | 2.64 | 0.04 | 2.08 | 0.02 |
| 3200 | | | | | | | | | 5.84 | 0.25 | 3.91 | 0.10 | 2.81 | 0.04 | 2.22 | 0.02 |
| 3400 | | | | | | | | | 6.20 | 0.28 | 4.15 | 0.11 | 2.99 | 0.05 | 2.36 | 0.03 |
| 3600 | | | | | | | | | 6.57 | 0.32 | 4.40 | 0.12 | 3.16 | 0.05 | 2.50 | 0.03 |
| 3800 | | | | | | | | | 6.93 | 0.35 | 4.64 | 0.13 | 3.34 | 0.06 | 2.64 | 0.03 |
| 4000 | | | | | | | | | 7.30 | 0.38 | 4.89 | 0.14 | 3.52 | 0.06 | 2.78 | 0.04 |
| 4200 | | | | | | | | | | | 5.13 | 0.16 | 3.69 | 0.07 | 2.92 | 0.04 |
| 4400 | | | | | | | | | | | 5.37 | 0.17 | 3.87 | 0.08 | 3.06 | 0.04 |
| 4600 | | | | | | | | | | | 5.62 | 0.19 | 4.04 | 0.08 | 3.19 | 0.05 |
| 4800 | | | | | | | | | | | 5.86 | 0.20 | 4.22 | 0.09 | 3.33 | 0.05 |
| 5000 | | | | | | | | | | | 6.11 | 0.22 | 4.39 | 0.10 | 3.47 | 0.06 |
| 5200 | | | | | | | | | | | | | 4.57 | 0.11 | 3.61 | 0.06 |
| 5400 | | | | | | | | | | | | | 4.75 | 0.11 | 3.75 | 0.06 |
| 5600 | | | | | | | | | | | | | 4.92 | 0.12 | 3.89 | 0.07 |
| 5800 | | | | | | | | | | | | | 5.10 | 0.13 | 4.03 | 0.07 |
| 6000 | | | | | | | | | | | | | 5.27 | 0.14 | 4.17 | 0.08 |

**The shaded area represents velocities over 5 fps. Use with caution.**

# SDR-81 50 PSI PLASTIC IRRIGATION PIPE (PIP)

**ANSI/ASAE S376.2 C=150 Water Temerature 73˚ F**

**PSI Loss per 100' of Pipe**

| Nominal Size | 6" | | 8" | | 10" | | 12" | | 15" | | 18" | | 21" | | 24" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 5.968 | | 7.938 | | 9.928 | | 11.918 | | 14.898 | | 18.211 | | 21.469 | | 24.153 | |
| Pipe OD | 6.140 | | 8.160 | | 10.200 | | 12.240 | | 15.300 | | 18.701 | | 22.047 | | 24.803 | |
| Avg.Wall | 0.086 | | 0.111 | | 0.136 | | 0.161 | | 0.201 | | 0.245 | | 0.289 | | 0.325 | |
| Min.Wall | 0.076 | | 0.101 | | 0.126 | | 0.151 | | 0.189 | | 0.231 | | 0.272 | | 0.306 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 25 | 0.29 | 0.00 | 0.16 | 0.00 | 0.10 | 0.00 | 0.07 | 0.00 | 0.05 | 0.00 | | | | | | |
| 50 | 0.57 | 0.01 | 0.32 | 0.00 | 0.21 | 0.00 | 0.14 | 0.00 | 0.09 | 0.00 | 0.06 | 0.00 | | | | |
| 75 | 0.86 | 0.02 | 0.49 | 0.01 | 0.31 | 0.00 | 0.22 | 0.00 | 0.14 | 0.00 | 0.09 | 0.00 | | | | |
| 100 | 1.15 | 0.04 | 0.65 | 0.01 | 0.41 | 0.00 | 0.29 | 0.00 | 0.18 | 0.00 | 0.12 | 0.00 | 0.09 | 0.00 | 0.07 | 0.00 |
| 125 | 1.43 | 0.05 | 0.81 | 0.01 | 0.52 | 0.00 | 0.36 | 0.00 | 0.23 | 0.00 | 0.15 | 0.00 | 0.11 | 0.00 | 0.09 | 0.00 |
| 150 | 1.72 | 0.08 | 0.97 | 0.02 | 0.62 | 0.01 | 0.43 | 0.00 | 0.28 | 0.00 | 0.18 | 0.00 | 0.13 | 0.00 | 0.10 | 0.00 |
| 175 | 2.00 | 0.10 | 1.13 | 0.03 | 0.72 | 0.01 | 0.50 | 0.00 | 0.32 | 0.00 | 0.22 | 0.00 | 0.15 | 0.00 | 0.12 | 0.00 |
| 200 | 2.29 | 0.13 | 1.29 | 0.03 | 0.83 | 0.01 | 0.57 | 0.00 | 0.37 | 0.00 | 0.25 | 0.00 | 0.18 | 0.00 | 0.14 | 0.00 |
| 225 | 2.58 | 0.16 | 1.46 | 0.04 | 0.93 | 0.01 | 0.65 | 0.01 | 0.41 | 0.00 | 0.28 | 0.00 | 0.20 | 0.00 | 0.16 | 0.00 |
| 250 | 2.86 | 0.20 | 1.62 | 0.05 | 1.03 | 0.02 | 0.72 | 0.01 | 0.46 | 0.00 | 0.31 | 0.00 | 0.22 | 0.00 | 0.17 | 0.00 |
| 275 | 3.15 | 0.24 | 1.78 | 0.06 | 1.14 | 0.02 | 0.79 | 0.01 | 0.51 | 0.00 | 0.34 | 0.00 | 0.24 | 0.00 | 0.19 | 0.00 |
| 300 | 3.44 | 0.28 | 1.94 | 0.07 | 1.24 | 0.02 | 0.86 | 0.01 | 0.55 | 0.00 | 0.37 | 0.00 | 0.27 | 0.00 | 0.21 | 0.00 |
| 325 | 3.72 | 0.32 | 2.10 | 0.08 | 1.35 | 0.03 | 0.93 | 0.01 | 0.60 | 0.00 | 0.40 | 0.00 | 0.29 | 0.00 | 0.23 | 0.00 |
| 350 | 4.01 | 0.37 | 2.27 | 0.09 | 1.45 | 0.03 | 1.01 | 0.01 | 0.64 | 0.00 | 0.43 | 0.00 | 0.31 | 0.00 | 0.24 | 0.00 |
| 375 | 4.30 | 0.42 | 2.43 | 0.10 | 1.55 | 0.04 | 1.08 | 0.01 | 0.69 | 0.00 | 0.46 | 0.00 | 0.33 | 0.00 | 0.26 | 0.00 |
| 400 | 4.58 | 0.47 | 2.59 | 0.12 | 1.66 | 0.04 | 1.15 | 0.02 | 0.74 | 0.01 | 0.49 | 0.00 | 0.35 | 0.00 | 0.28 | 0.00 |
| 425 | 4.87 | 0.53 | 2.75 | 0.13 | 1.76 | 0.04 | 1.22 | 0.02 | 0.78 | 0.01 | 0.52 | 0.00 | 0.38 | 0.00 | 0.30 | 0.00 |
| 450 | 5.15 | 0.59 | 2.91 | 0.15 | 1.86 | 0.05 | 1.29 | 0.02 | 0.83 | 0.01 | 0.55 | 0.00 | 0.40 | 0.00 | 0.31 | 0.00 |
| 475 | 5.44 | 0.65 | 3.08 | 0.16 | 1.97 | 0.05 | 1.36 | 0.02 | 0.87 | 0.01 | 0.58 | 0.00 | 0.42 | 0.00 | 0.33 | 0.00 |
| 500 | 5.73 | 0.71 | 3.24 | 0.18 | 2.07 | 0.06 | 1.44 | 0.02 | 0.92 | 0.01 | 0.62 | 0.00 | 0.44 | 0.00 | 0.35 | 0.00 |
| 550 | 6.30 | 0.85 | 3.56 | 0.21 | 2.28 | 0.07 | 1.58 | 0.03 | 1.01 | 0.01 | 0.68 | 0.00 | 0.49 | 0.00 | 0.38 | 0.00 |
| 600 | 6.87 | 1.00 | 3.88 | 0.25 | 2.48 | 0.08 | 1.72 | 0.03 | 1.10 | 0.01 | 0.74 | 0.00 | 0.53 | 0.00 | 0.42 | 0.00 |
| 650 | 7.45 | 1.16 | 4.21 | 0.29 | 2.69 | 0.10 | 1.87 | 0.04 | 1.19 | 0.01 | 0.80 | 0.01 | 0.58 | 0.00 | 0.45 | 0.00 |
| 700 | 8.02 | 1.33 | 4.53 | 0.33 | 2.90 | 0.11 | 2.01 | 0.05 | 1.29 | 0.02 | 0.86 | 0.01 | 0.62 | 0.00 | 0.49 | 0.00 |
| 750 | 8.59 | 1.51 | 4.86 | 0.38 | 3.10 | 0.13 | 2.15 | 0.05 | 1.38 | 0.02 | 0.92 | 0.01 | 0.66 | 0.00 | 0.52 | 0.00 |
| 800 | | | 5.18 | 0.42 | 3.31 | 0.14 | 2.30 | 0.06 | 1.47 | 0.02 | 0.98 | 0.01 | 0.71 | 0.00 | 0.56 | 0.00 |
| 850 | | | 5.50 | 0.47 | 3.52 | 0.16 | 2.44 | 0.07 | 1.56 | 0.02 | 1.05 | 0.01 | 0.75 | 0.00 | 0.59 | 0.00 |
| 900 | | | 5.83 | 0.53 | 3.73 | 0.18 | 2.59 | 0.07 | 1.65 | 0.02 | 1.11 | 0.01 | 0.80 | 0.00 | 0.63 | 0.00 |
| 950 | | | 6.15 | 0.58 | 3.93 | 0.20 | 2.73 | 0.08 | 1.75 | 0.03 | 1.17 | 0.01 | 0.84 | 0.00 | 0.66 | 0.00 |
| 1000 | | | 6.47 | 0.64 | 4.14 | 0.22 | 2.87 | 0.09 | 1.84 | 0.03 | 1.23 | 0.01 | 0.89 | 0.01 | 0.70 | 0.00 |
| 1100 | | | 7.12 | 0.77 | 4.55 | 0.26 | 3.16 | 0.11 | 2.02 | 0.04 | 1.35 | 0.01 | 0.97 | 0.01 | 0.77 | 0.00 |
| 1200 | | | 7.77 | 0.90 | 4.97 | 0.30 | 3.45 | 0.12 | 2.21 | 0.04 | 1.48 | 0.02 | 1.06 | 0.01 | 0.84 | 0.00 |
| 1300 | | | 8.42 | 1.04 | 5.38 | 0.35 | 3.73 | 0.14 | 2.39 | 0.05 | 1.60 | 0.02 | 1.15 | 0.01 | 0.91 | 0.00 |
| 1400 | | | 9.06 | 1.20 | 5.80 | 0.40 | 4.02 | 0.17 | 2.57 | 0.06 | 1.72 | 0.02 | 1.24 | 0.01 | 0.98 | 0.01 |
| 1500 | | | | | 6.21 | 0.46 | 4.31 | 0.19 | 2.76 | 0.06 | 1.85 | 0.02 | 1.33 | 0.01 | 1.05 | 0.01 |
| 1600 | | | | | 6.62 | 0.52 | 4.60 | 0.21 | 2.94 | 0.07 | 1.97 | 0.03 | 1.42 | 0.01 | 1.12 | 0.01 |
| 1700 | | | | | 7.04 | 0.58 | 4.88 | 0.24 | 3.13 | 0.08 | 2.09 | 0.03 | 1.50 | 0.01 | 1.19 | 0.01 |
| 1800 | | | | | 7.45 | 0.64 | 5.17 | 0.26 | 3.31 | 0.09 | 2.21 | 0.03 | 1.59 | 0.02 | 1.26 | 0.01 |
| 1900 | | | | | 7.86 | 0.71 | 5.46 | 0.29 | 3.49 | 0.10 | 2.34 | 0.04 | 1.68 | 0.02 | 1.33 | 0.01 |
| 2000 | | | | | 8.28 | 0.78 | 5.74 | 0.32 | 3.68 | 0.11 | 2.46 | 0.04 | 1.77 | 0.02 | 1.40 | 0.01 |
| 2100 | | | | | | | 6.03 | 0.35 | 3.86 | 0.12 | 2.58 | 0.04 | 1.86 | 0.02 | 1.47 | 0.01 |
| 2200 | | | | | | | 6.32 | 0.38 | 4.04 | 0.13 | 2.71 | 0.05 | 1.95 | 0.02 | 1.54 | 0.01 |
| 2300 | | | | | | | 6.61 | 0.42 | 4.23 | 0.14 | 2.83 | 0.05 | 2.04 | 0.02 | 1.61 | 0.01 |
| 2400 | | | | | | | 6.89 | 0.45 | 4.41 | 0.15 | 2.95 | 0.06 | 2.12 | 0.03 | 1.68 | 0.01 |
| 2500 | | | | | | | 7.18 | 0.48 | 4.60 | 0.16 | 3.08 | 0.06 | 2.21 | 0.03 | 1.75 | 0.02 |
| 2600 | | | | | | | 7.47 | 0.52 | 4.78 | 0.18 | 3.20 | 0.07 | 2.30 | 0.03 | 1.82 | 0.02 |
| 2700 | | | | | | | 7.76 | 0.56 | 4.96 | 0.19 | 3.32 | 0.07 | 2.39 | 0.03 | 1.89 | 0.02 |
| 2800 | | | | | | | 8.04 | 0.60 | 5.15 | 0.20 | 3.44 | 0.08 | 2.48 | 0.03 | 1.96 | 0.02 |
| 2900 | | | | | | | 8.33 | 0.64 | 5.33 | 0.22 | 3.57 | 0.08 | 2.57 | 0.04 | 2.03 | 0.02 |
| 3000 | | | | | | | 8.62 | 0.68 | 5.51 | 0.23 | 3.69 | 0.09 | 2.66 | 0.04 | 2.10 | 0.02 |
| 3200 | | | | | | | | | 5.88 | 0.26 | 3.94 | 0.10 | 2.83 | 0.04 | 2.24 | 0.02 |
| 3400 | | | | | | | | | 6.25 | 0.29 | 4.18 | 0.11 | 3.01 | 0.05 | 2.38 | 0.03 |
| 3600 | | | | | | | | | 6.62 | 0.32 | 4.43 | 0.12 | 3.19 | 0.05 | 2.52 | 0.03 |
| 3800 | | | | | | | | | 6.99 | 0.36 | 4.67 | 0.13 | 3.36 | 0.06 | 2.66 | 0.03 |
| 4000 | | | | | | | | | 7.35 | 0.39 | 4.92 | 0.15 | 3.54 | 0.07 | 2.80 | 0.04 |
| 4200 | | | | | | | | | | | 5.17 | 0.16 | 3.72 | 0.07 | 2.94 | 0.04 |
| 4400 | | | | | | | | | | | 5.41 | 0.18 | 3.89 | 0.08 | 3.08 | 0.04 |
| 4600 | | | | | | | | | | | 5.66 | 0.19 | 4.07 | 0.09 | 3.22 | 0.05 |
| 4800 | | | | | | | | | | | 5.91 | 0.21 | 4.25 | 0.09 | 3.36 | 0.05 |
| 5000 | | | | | | | | | | | 6.15 | 0.22 | 4.43 | 0.10 | 3.50 | 0.06 |
| 5200 | | | | | | | | | | | | | 4.60 | 0.11 | 3.64 | 0.06 |
| 5400 | | | | | | | | | | | | | 4.78 | 0.12 | 3.78 | 0.06 |
| 5600 | | | | | | | | | | | | | 4.96 | 0.12 | 3.92 | 0.07 |
| 5800 | | | | | | | | | | | | | 5.13 | 0.13 | 4.06 | 0.07 |
| 6000 | | | | | | | | | | | | | 5.31 | 0.14 | 4.20 | 0.08 |

The shaded area represents velocities over 5 fps. Use with caution.

# SDR-51 80 PSI PLASTIC IRRIGATION PIPE (PIP)

**ANSI/ASAE S376.2 C=150 Water Temerature 73˚ F**

**PSI Loss per 100' of Pipe**

| Nominal Size | 6" | | 8" | | 10" | | 12" | | 15" | | 18" | | 21" | | 24" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 5.880 | | 7.820 | | 9.776 | | 11.730 | | 14.658 | | 17.917 | | 21.123 | | 23.763 | |
| Pipe OD | 6.140 | | 8.160 | | 10.200 | | 12.240 | | 15.300 | | 18.701 | | 22.047 | | 24.803 | |
| Avg.Wall | 0.130 | | 0.170 | | 0.212 | | 0.255 | | 0.321 | | 0.392 | | 0.462 | | 0.520 | |
| Min.Wall | 0.120 | | 0.160 | | 0.200 | | 0.240 | | 0.300 | | 0.366 | | 0.432 | | 0.486 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 25 | 0.30 | 0.00 | 0.17 | 0.00 | 0.11 | 0.00 | 0.07 | 0.00 | 0.05 | 0.00 | | | | | | |
| 50 | 0.59 | 0.01 | 0.33 | 0.00 | 0.21 | 0.00 | 0.15 | 0.00 | 0.09 | 0.00 | 0.06 | 0.00 | | | | |
| 75 | 0.89 | 0.02 | 0.50 | 0.01 | 0.32 | 0.00 | 0.22 | 0.00 | 0.14 | 0.00 | 0.10 | 0.00 | | | | |
| 100 | 1.18 | 0.04 | 0.67 | 0.01 | 0.43 | 0.00 | 0.30 | 0.00 | 0.19 | 0.00 | 0.13 | 0.00 | 0.09 | 0.00 | 0.07 | 0.00 |
| 125 | 1.48 | 0.06 | 0.83 | 0.01 | 0.53 | 0.00 | 0.37 | 0.00 | 0.24 | 0.00 | 0.16 | 0.00 | 0.11 | 0.00 | 0.09 | 0.00 |
| 150 | 1.77 | 0.08 | 1.00 | 0.02 | 0.64 | 0.01 | 0.44 | 0.00 | 0.28 | 0.00 | 0.19 | 0.00 | 0.14 | 0.00 | 0.11 | 0.00 |
| 175 | 2.07 | 0.11 | 1.17 | 0.03 | 0.75 | 0.01 | 0.52 | 0.00 | 0.33 | 0.00 | 0.22 | 0.00 | 0.16 | 0.00 | 0.13 | 0.00 |
| 200 | 2.36 | 0.14 | 1.33 | 0.04 | 0.85 | 0.01 | 0.59 | 0.00 | 0.38 | 0.00 | 0.25 | 0.00 | 0.18 | 0.00 | 0.14 | 0.00 |
| 225 | 2.66 | 0.17 | 1.50 | 0.04 | 0.96 | 0.01 | 0.67 | 0.01 | 0.43 | 0.00 | 0.29 | 0.00 | 0.21 | 0.00 | 0.16 | 0.00 |
| 250 | 2.95 | 0.21 | 1.67 | 0.05 | 1.07 | 0.02 | 0.74 | 0.01 | 0.47 | 0.00 | 0.32 | 0.00 | 0.23 | 0.00 | 0.18 | 0.00 |
| 275 | 3.25 | 0.25 | 1.83 | 0.06 | 1.17 | 0.02 | 0.82 | 0.01 | 0.52 | 0.00 | 0.35 | 0.00 | 0.25 | 0.00 | 0.20 | 0.00 |
| 300 | 3.54 | 0.30 | 2.00 | 0.07 | 1.28 | 0.03 | 0.89 | 0.01 | 0.57 | 0.00 | 0.38 | 0.00 | 0.27 | 0.00 | 0.22 | 0.00 |
| 325 | 3.84 | 0.34 | 2.17 | 0.09 | 1.39 | 0.03 | 0.96 | 0.01 | 0.62 | 0.00 | 0.41 | 0.00 | 0.30 | 0.00 | 0.23 | 0.00 |
| 350 | 4.13 | 0.40 | 2.34 | 0.10 | 1.49 | 0.03 | 1.04 | 0.01 | 0.66 | 0.00 | 0.44 | 0.00 | 0.32 | 0.00 | 0.25 | 0.00 |
| 375 | 4.43 | 0.45 | 2.50 | 0.11 | 1.60 | 0.04 | 1.11 | 0.02 | 0.71 | 0.01 | 0.48 | 0.00 | 0.34 | 0.00 | 0.27 | 0.00 |
| 400 | 4.72 | 0.51 | 2.67 | 0.13 | 1.71 | 0.04 | 1.19 | 0.02 | 0.76 | 0.01 | 0.51 | 0.00 | 0.37 | 0.00 | 0.29 | 0.00 |
| 425 | 5.02 | 0.57 | 2.84 | 0.14 | 1.81 | 0.05 | 1.26 | 0.02 | 0.81 | 0.01 | 0.54 | 0.00 | 0.39 | 0.00 | 0.31 | 0.00 |
| 450 | 5.31 | 0.63 | 3.00 | 0.16 | 1.92 | 0.05 | 1.33 | 0.02 | 0.85 | 0.01 | 0.57 | 0.00 | 0.41 | 0.00 | 0.33 | 0.00 |
| 475 | 5.61 | 0.70 | 3.17 | 0.17 | 2.03 | 0.06 | 1.41 | 0.02 | 0.90 | 0.01 | 0.60 | 0.00 | 0.43 | 0.00 | 0.34 | 0.00 |
| 500 | 5.90 | 0.77 | 3.34 | 0.19 | 2.13 | 0.06 | 1.48 | 0.03 | 0.95 | 0.01 | 0.64 | 0.00 | 0.46 | 0.00 | 0.36 | 0.00 |
| 550 | 6.49 | 0.91 | 3.67 | 0.23 | 2.35 | 0.08 | 1.63 | 0.03 | 1.04 | 0.01 | 0.70 | 0.00 | 0.50 | 0.00 | 0.40 | 0.00 |
| 600 | 7.08 | 1.07 | 4.00 | 0.27 | 2.56 | 0.09 | 1.78 | 0.04 | 1.14 | 0.01 | 0.76 | 0.00 | 0.55 | 0.00 | 0.43 | 0.00 |
| 650 | 7.67 | 1.24 | 4.34 | 0.31 | 2.77 | 0.10 | 1.93 | 0.04 | 1.23 | 0.01 | 0.83 | 0.01 | 0.59 | 0.00 | 0.47 | 0.00 |
| 700 | 8.26 | 1.43 | 4.67 | 0.36 | 2.99 | 0.12 | 2.08 | 0.05 | 1.33 | 0.02 | 0.89 | 0.01 | 0.64 | 0.00 | 0.51 | 0.00 |
| 750 | 8.85 | 1.62 | 5.00 | 0.40 | 3.20 | 0.14 | 2.22 | 0.06 | 1.42 | 0.02 | 0.95 | 0.01 | 0.69 | 0.00 | 0.54 | 0.00 |
| 800 | | | 5.34 | 0.46 | 3.42 | 0.15 | 2.37 | 0.06 | 1.52 | 0.02 | 1.02 | 0.01 | 0.73 | 0.00 | 0.58 | 0.00 |
| 850 | | | 5.67 | 0.51 | 3.63 | 0.17 | 2.52 | 0.07 | 1.61 | 0.02 | 1.08 | 0.01 | 0.78 | 0.00 | 0.61 | 0.00 |
| 900 | | | 6.00 | 0.57 | 3.84 | 0.19 | 2.67 | 0.08 | 1.71 | 0.03 | 1.14 | 0.01 | 0.82 | 0.00 | 0.65 | 0.00 |
| 950 | | | 6.34 | 0.63 | 4.06 | 0.21 | 2.82 | 0.09 | 1.80 | 0.03 | 1.21 | 0.01 | 0.87 | 0.00 | 0.69 | 0.00 |
| 1000 | | | 6.67 | 0.69 | 4.27 | 0.23 | 2.97 | 0.10 | 1.90 | 0.03 | 1.27 | 0.01 | 0.91 | 0.01 | 0.72 | 0.00 |
| 1100 | | | 7.34 | 0.82 | 4.70 | 0.28 | 3.26 | 0.11 | 2.09 | 0.04 | 1.40 | 0.01 | 1.01 | 0.01 | 0.79 | 0.00 |
| 1200 | | | 8.01 | 0.97 | 5.12 | 0.33 | 3.56 | 0.13 | 2.28 | 0.05 | 1.53 | 0.02 | 1.10 | 0.01 | 0.87 | 0.00 |
| 1300 | | | 8.67 | 1.12 | 5.55 | 0.38 | 3.85 | 0.16 | 2.47 | 0.05 | 1.65 | 0.02 | 1.19 | 0.01 | 0.94 | 0.01 |
| 1400 | | | 9.34 | 1.29 | 5.98 | 0.43 | 4.15 | 0.18 | 2.66 | 0.06 | 1.78 | 0.02 | 1.28 | 0.01 | 1.01 | 0.01 |
| 1500 | | | | | 6.40 | 0.49 | 4.45 | 0.20 | 2.85 | 0.07 | 1.91 | 0.03 | 1.37 | 0.01 | 1.08 | 0.01 |
| 1600 | | | | | 6.83 | 0.56 | 4.74 | 0.23 | 3.04 | 0.08 | 2.03 | 0.03 | 1.46 | 0.01 | 1.16 | 0.01 |
| 1700 | | | | | 7.26 | 0.62 | 5.04 | 0.26 | 3.23 | 0.09 | 2.16 | 0.03 | 1.55 | 0.01 | 1.23 | 0.01 |
| 1800 | | | | | 7.68 | 0.69 | 5.34 | 0.28 | 3.42 | 0.10 | 2.29 | 0.04 | 1.65 | 0.02 | 1.30 | 0.01 |
| 1900 | | | | | 8.11 | 0.76 | 5.63 | 0.31 | 3.61 | 0.11 | 2.41 | 0.04 | 1.74 | 0.02 | 1.37 | 0.01 |
| 2000 | | | | | 8.54 | 0.84 | 5.93 | 0.35 | 3.80 | 0.12 | 2.54 | 0.04 | 1.83 | 0.02 | 1.45 | 0.01 |
| 2200 | | | | | | | 6.52 | 0.41 | 4.18 | 0.14 | 2.80 | 0.05 | 2.01 | 0.02 | 1.59 | 0.01 |
| 2400 | | | | | | | 7.12 | 0.49 | 4.56 | 0.16 | 3.05 | 0.06 | 2.19 | 0.03 | 1.73 | 0.02 |
| 2600 | | | | | | | 7.71 | 0.56 | 4.94 | 0.19 | 3.30 | 0.07 | 2.38 | 0.03 | 1.88 | 0.02 |
| 2800 | | | | | | | 8.30 | 0.65 | 5.32 | 0.22 | 3.56 | 0.08 | 2.56 | 0.04 | 2.02 | 0.02 |
| 3000 | | | | | | | 8.90 | 0.73 | 5.70 | 0.25 | 3.81 | 0.09 | 2.74 | 0.04 | 2.17 | 0.02 |
| 3200 | | | | | | | 9.49 | 0.83 | 6.08 | 0.28 | 4.07 | 0.11 | 2.93 | 0.05 | 2.31 | 0.03 |
| 3400 | | | | | | | 10.08 | 0.93 | 6.46 | 0.31 | 4.32 | 0.12 | 3.11 | 0.05 | 2.46 | 0.03 |
| 3600 | | | | | | | 10.67 | 1.03 | 6.84 | 0.35 | 4.58 | 0.13 | 3.29 | 0.06 | 2.60 | 0.03 |
| 3800 | | | | | | | 11.27 | 1.14 | 7.22 | 0.38 | 4.83 | 0.14 | 3.47 | 0.06 | 2.75 | 0.04 |
| 4000 | | | | | | | 11.86 | 1.25 | 7.60 | 0.42 | 5.08 | 0.16 | 3.66 | 0.07 | 2.89 | 0.04 |
| 4200 | | | | | | | | | 7.98 | 0.46 | 5.34 | 0.17 | 3.84 | 0.08 | 3.03 | 0.04 |
| 4400 | | | | | | | | | 8.36 | 0.50 | 5.59 | 0.19 | 4.02 | 0.09 | 3.18 | 0.05 |
| 4600 | | | | | | | | | 8.74 | 0.55 | 5.85 | 0.21 | 4.21 | 0.09 | 3.32 | 0.05 |
| 4800 | | | | | | | | | 9.11 | 0.59 | 6.10 | 0.22 | 4.39 | 0.10 | 3.47 | 0.06 |
| 5000 | | | | | | | | | 9.49 | 0.64 | 6.35 | 0.24 | 4.57 | 0.11 | 3.61 | 0.06 |
| 5200 | | | | | | | | | | | 6.61 | 0.26 | 4.76 | 0.12 | 3.76 | 0.07 |
| 5400 | | | | | | | | | | | 6.86 | 0.28 | 4.94 | 0.12 | 3.90 | 0.07 |
| 5600 | | | | | | | | | | | 7.12 | 0.30 | 5.12 | 0.13 | 4.05 | 0.08 |
| 5800 | | | | | | | | | | | 7.37 | 0.32 | 5.30 | 0.14 | 4.19 | 0.08 |
| 6000 | | | | | | | | | | | 7.63 | 0.34 | 5.49 | 0.15 | 4.34 | 0.09 |
| 6200 | | | | | | | | | | | | | 5.67 | 0.16 | 4.48 | 0.09 |
| 6400 | | | | | | | | | | | | | 5.85 | 0.17 | 4.62 | 0.10 |
| 6600 | | | | | | | | | | | | | 6.04 | 0.18 | 4.77 | 0.10 |
| 6800 | | | | | | | | | | | | | 6.22 | 0.19 | 4.91 | 0.11 |
| 7000 | | | | | | | | | | | | | 6.40 | 0.20 | 5.06 | 0.11 |

The shaded area represents velocities over 5 fps. Use with caution.

# SDR-41 100 PSI PLASTIC IRRIGATION PIPE (PIP)

**ANSI/ASAE S376.2 C=150 Water Temperature 73˚ F**

**PSI Loss per 100' of Pipe**

| Size | 6" | | 8" | | 10" | | 12" | | 15" | | 18" | | 21" | | 24" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 5.820 | | 7.738 | | 9.690 | | 11.606 | | 14.502 | | 17.725 | | 20.915 | | 23.507 | |
| Pipe OD | 6.140 | | 8.160 | | 10.200 | | 12.240 | | 15.300 | | 18.701 | | 22.047 | | 24.803 | |
| Avg.Wall | 0.160 | | 0.211 | | 0.255 | | 0.317 | | 0.399 | | 0.488 | | 0.566 | | 0.648 | |
| Min.Wall | 0.150 | | 0.199 | | 0.240 | | 0.299 | | 0.373 | | 0.456 | | 0.538 | | 0.605 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 25 | 0.30 | 0.00 | 0.17 | 0.00 | 0.11 | 0.00 | 0.08 | 0.00 | 0.05 | 0.00 | | | | | | |
| 50 | 0.60 | 0.01 | 0.34 | 0.00 | 0.22 | 0.00 | 0.15 | 0.00 | 0.10 | 0.00 | 0.06 | 0.00 | | | | |
| 75 | 0.90 | 0.02 | 0.51 | 0.01 | 0.33 | 0.00 | 0.23 | 0.00 | 0.15 | 0.00 | 0.10 | 0.00 | | | | |
| 100 | 1.20 | 0.04 | 0.68 | 0.01 | 0.43 | 0.00 | 0.30 | 0.00 | 0.19 | 0.00 | 0.13 | 0.00 | 0.09 | 0.00 | 0.07 | 0.00 |
| 125 | 1.51 | 0.06 | 0.85 | 0.02 | 0.54 | 0.01 | 0.38 | 0.00 | 0.24 | 0.00 | 0.16 | 0.00 | 0.12 | 0.00 | 0.09 | 0.00 |
| 150 | 1.81 | 0.09 | 1.02 | 0.02 | 0.65 | 0.01 | 0.45 | 0.00 | 0.29 | 0.00 | 0.19 | 0.00 | 0.14 | 0.00 | 0.11 | 0.00 |
| 175 | 2.11 | 0.12 | 1.19 | 0.03 | 0.76 | 0.01 | 0.53 | 0.00 | 0.34 | 0.00 | 0.23 | 0.00 | 0.16 | 0.00 | 0.13 | 0.00 |
| 200 | 2.41 | 0.15 | 1.36 | 0.04 | 0.87 | 0.01 | 0.61 | 0.01 | 0.39 | 0.00 | 0.26 | 0.00 | 0.19 | 0.00 | 0.15 | 0.00 |
| 225 | 2.71 | 0.18 | 1.53 | 0.05 | 0.98 | 0.02 | 0.68 | 0.01 | 0.44 | 0.00 | 0.29 | 0.00 | 0.21 | 0.00 | 0.17 | 0.00 |
| 250 | 3.01 | 0.22 | 1.70 | 0.06 | 1.09 | 0.02 | 0.76 | 0.01 | 0.49 | 0.00 | 0.32 | 0.00 | 0.23 | 0.00 | 0.18 | 0.00 |
| 275 | 3.31 | 0.27 | 1.87 | 0.07 | 1.19 | 0.02 | 0.83 | 0.01 | 0.53 | 0.00 | 0.36 | 0.00 | 0.26 | 0.00 | 0.20 | 0.00 |
| 300 | 3.61 | 0.31 | 2.04 | 0.08 | 1.30 | 0.03 | 0.91 | 0.01 | 0.58 | 0.00 | 0.39 | 0.00 | 0.28 | 0.00 | 0.22 | 0.00 |
| 325 | 3.91 | 0.36 | 2.21 | 0.09 | 1.41 | 0.03 | 0.98 | 0.01 | 0.63 | 0.00 | 0.42 | 0.00 | 0.30 | 0.00 | 0.24 | 0.00 |
| 350 | 4.22 | 0.42 | 2.38 | 0.10 | 1.52 | 0.03 | 1.06 | 0.01 | 0.68 | 0.00 | 0.45 | 0.00 | 0.33 | 0.00 | 0.26 | 0.00 |
| 375 | 4.52 | 0.47 | 2.56 | 0.12 | 1.63 | 0.04 | 1.14 | 0.02 | 0.73 | 0.01 | 0.49 | 0.00 | 0.35 | 0.00 | 0.28 | 0.00 |
| 400 | 4.82 | 0.53 | 2.73 | 0.13 | 1.74 | 0.04 | 1.21 | 0.02 | 0.78 | 0.01 | 0.52 | 0.00 | 0.37 | 0.00 | 0.30 | 0.00 |
| 425 | 5.12 | 0.60 | 2.90 | 0.15 | 1.85 | 0.05 | 1.29 | 0.02 | 0.82 | 0.01 | 0.55 | 0.00 | 0.40 | 0.00 | 0.31 | 0.00 |
| 450 | 5.42 | 0.66 | 3.07 | 0.17 | 1.96 | 0.06 | 1.36 | 0.02 | 0.87 | 0.01 | 0.58 | 0.00 | 0.42 | 0.00 | 0.33 | 0.00 |
| 475 | 5.72 | 0.73 | 3.24 | 0.18 | 2.06 | 0.06 | 1.44 | 0.03 | 0.92 | 0.01 | 0.62 | 0.00 | 0.44 | 0.00 | 0.35 | 0.00 |
| 500 | 6.02 | 0.80 | 3.41 | 0.20 | 2.17 | 0.07 | 1.51 | 0.03 | 0.97 | 0.01 | 0.65 | 0.00 | 0.47 | 0.00 | 0.37 | 0.00 |
| 550 | 6.62 | 0.96 | 3.75 | 0.24 | 2.39 | 0.08 | 1.67 | 0.03 | 1.07 | 0.01 | 0.71 | 0.00 | 0.51 | 0.00 | 0.41 | 0.00 |
| 600 | 7.23 | 1.13 | 4.09 | 0.28 | 2.61 | 0.09 | 1.82 | 0.04 | 1.16 | 0.01 | 0.78 | 0.00 | 0.56 | 0.00 | 0.44 | 0.00 |
| 650 | 7.83 | 1.31 | 4.43 | 0.33 | 2.82 | 0.11 | 1.97 | 0.05 | 1.26 | 0.02 | 0.84 | 0.01 | 0.61 | 0.00 | 0.48 | 0.00 |
| 700 | 8.43 | 1.50 | 4.77 | 0.38 | 3.04 | 0.13 | 2.12 | 0.05 | 1.36 | 0.02 | 0.91 | 0.01 | 0.65 | 0.00 | 0.52 | 0.00 |
| 750 | 9.03 | 1.70 | 5.11 | 0.43 | 3.26 | 0.14 | 2.27 | 0.06 | 1.46 | 0.02 | 0.97 | 0.01 | 0.70 | 0.00 | 0.55 | 0.00 |
| 800 | | | 5.45 | 0.48 | 3.48 | 0.16 | 2.42 | 0.07 | 1.55 | 0.02 | 1.04 | 0.01 | 0.75 | 0.00 | 0.59 | 0.00 |
| 850 | | | 5.79 | 0.54 | 3.69 | 0.18 | 2.57 | 0.07 | 1.65 | 0.03 | 1.10 | 0.01 | 0.79 | 0.00 | 0.63 | 0.00 |
| 900 | | | 6.13 | 0.60 | 3.91 | 0.20 | 2.73 | 0.08 | 1.75 | 0.03 | 1.17 | 0.01 | 0.84 | 0.00 | 0.66 | 0.00 |
| 950 | | | 6.47 | 0.66 | 4.13 | 0.22 | 2.88 | 0.09 | 1.84 | 0.03 | 1.23 | 0.01 | 0.89 | 0.01 | 0.70 | 0.00 |
| 1000 | | | 6.81 | 0.73 | 4.35 | 0.24 | 3.03 | 0.10 | 1.94 | 0.03 | 1.30 | 0.01 | 0.93 | 0.01 | 0.74 | 0.00 |
| 1100 | | | 7.50 | 0.87 | 4.78 | 0.29 | 3.33 | 0.12 | 2.13 | 0.04 | 1.43 | 0.02 | 1.03 | 0.01 | 0.81 | 0.00 |
| 1200 | | | 8.18 | 1.02 | 5.21 | 0.34 | 3.63 | 0.14 | 2.33 | 0.05 | 1.56 | 0.02 | 1.12 | 0.01 | 0.89 | 0.00 |
| 1300 | | | 8.86 | 1.18 | 5.65 | 0.40 | 3.94 | 0.16 | 2.52 | 0.06 | 1.69 | 0.02 | 1.21 | 0.01 | 0.96 | 0.01 |
| 1400 | | | 9.54 | 1.35 | 6.08 | 0.45 | 4.24 | 0.19 | 2.72 | 0.06 | 1.82 | 0.02 | 1.31 | 0.01 | 1.03 | 0.01 |
| 1500 | | | | | 6.52 | 0.51 | 4.54 | 0.21 | 2.91 | 0.07 | 1.95 | 0.03 | 1.40 | 0.01 | 1.11 | 0.01 |
| 1600 | | | | | 6.95 | 0.58 | 4.85 | 0.24 | 3.10 | 0.08 | 2.08 | 0.03 | 1.49 | 0.01 | 1.18 | 0.01 |
| 1700 | | | | | 7.39 | 0.65 | 5.15 | 0.27 | 3.30 | 0.09 | 2.21 | 0.03 | 1.59 | 0.02 | 1.26 | 0.01 |
| 1800 | | | | | 7.82 | 0.72 | 5.45 | 0.30 | 3.49 | 0.10 | 2.34 | 0.04 | 1.68 | 0.02 | 1.33 | 0.01 |
| 1900 | | | | | 8.26 | 0.80 | 5.76 | 0.33 | 3.69 | 0.11 | 2.47 | 0.04 | 1.77 | 0.02 | 1.40 | 0.01 |
| 2000 | | | | | 8.69 | 0.88 | 6.06 | 0.36 | 3.88 | 0.12 | 2.60 | 0.05 | 1.87 | 0.02 | 1.48 | 0.01 |
| 2200 | | | | | | | 6.66 | 0.43 | 4.27 | 0.15 | 2.86 | 0.06 | 2.05 | 0.02 | 1.62 | 0.01 |
| 2400 | | | | | | | 7.27 | 0.51 | 4.66 | 0.17 | 3.12 | 0.07 | 2.24 | 0.03 | 1.77 | 0.02 |
| 2600 | | | | | | | 7.88 | 0.59 | 5.04 | 0.20 | 3.38 | 0.08 | 2.43 | 0.03 | 1.92 | 0.02 |
| 2800 | | | | | | | 8.48 | 0.68 | 5.43 | 0.23 | 3.64 | 0.09 | 2.61 | 0.04 | 2.07 | 0.02 |
| 3000 | | | | | | | 9.09 | 0.77 | 5.82 | 0.26 | 3.90 | 0.10 | 2.80 | 0.04 | 2.22 | 0.02 |
| 3200 | | | | | | | 9.69 | 0.87 | 6.21 | 0.29 | 4.16 | 0.11 | 2.98 | 0.05 | 2.36 | 0.03 |
| 3400 | | | | | | | 10.30 | 0.97 | 6.60 | 0.33 | 4.42 | 0.12 | 3.17 | 0.06 | 2.51 | 0.03 |
| 3600 | | | | | | | 10.90 | 1.08 | 6.98 | 0.37 | 4.68 | 0.14 | 3.36 | 0.06 | 2.66 | 0.03 |
| 3800 | | | | | | | 11.51 | 1.20 | 7.37 | 0.40 | 4.93 | 0.15 | 3.54 | 0.07 | 2.81 | 0.04 |
| 4000 | | | | | | | 12.12 | 1.32 | 7.76 | 0.45 | 5.19 | 0.17 | 3.73 | 0.07 | 2.95 | 0.04 |
| 4200 | | | | | | | | | 8.15 | 0.49 | 5.45 | 0.18 | 3.92 | 0.08 | 3.10 | 0.05 |
| 4400 | | | | | | | | | 8.54 | 0.53 | 5.71 | 0.20 | 4.10 | 0.09 | 3.25 | 0.05 |
| 4600 | | | | | | | | | 8.92 | 0.58 | 5.97 | 0.22 | 4.29 | 0.10 | 3.40 | 0.05 |
| 4800 | | | | | | | | | 9.31 | 0.62 | 6.23 | 0.24 | 4.48 | 0.11 | 3.54 | 0.06 |
| 5000 | | | | | | | | | 9.70 | 0.67 | 6.49 | 0.25 | 4.66 | 0.11 | 3.69 | 0.06 |
| 5200 | | | | | | | | | | | 6.75 | 0.27 | 4.85 | 0.12 | 3.84 | 0.07 |
| 5400 | | | | | | | | | | | 7.01 | 0.29 | 5.04 | 0.13 | 3.99 | 0.07 |
| 5600 | | | | | | | | | | | 7.27 | 0.31 | 5.22 | 0.14 | 4.13 | 0.08 |
| 5800 | | | | | | | | | | | 7.53 | 0.33 | 5.41 | 0.15 | 4.28 | 0.08 |
| 6000 | | | | | | | | | | | 7.79 | 0.36 | 5.60 | 0.16 | 4.43 | 0.09 |
| 6200 | | | | | | | | | | | | | 5.78 | 0.17 | 4.58 | 0.10 |
| 6400 | | | | | | | | | | | | | 5.97 | 0.18 | 4.73 | 0.10 |
| 6600 | | | | | | | | | | | | | 6.16 | 0.19 | 4.87 | 0.11 |
| 6800 | | | | | | | | | | | | | 6.34 | 0.20 | 5.02 | 0.11 |
| 7000 | | | | | | | | | | | | | 6.53 | 0.21 | 5.17 | 0.12 |

**The shaded area represents velocities over 5 fps. Use with caution.**

# SDR-32.5 125 PSI PLASTIC IRRIGATION PIPE (PIP)

**ASAE S376.1 ASTM D2241 or SCS 430-DD C=150**

**PSI Loss per 100' of Pipe**

| Size | 6" | | 8" | | 10" | | 12" | | 15" | | 18" | | 21" | | 24" | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. ID | 5.740 | | 7.630 | | 9.530 | | 11.440 | | 14.300 | | 17.480 | | 20.610 | | 23.190 | |
| Pipe OD | 6.140 | | 8.160 | | 10.200 | | 12.240 | | 15.300 | | 18.701 | | 22.047 | | 24.803 | |
| Avg. Wall | 0.200 | | 0.265 | | 0.335 | | 0.400 | | 0.500 | | 0.611 | | 0.719 | | 0.807 | |
| Min.Wall | 0.189 | | 0.251 | | 0.314 | | 0.377 | | 0.471 | | 0.575 | | 0.678 | | 0.763 | |
| Flow | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI | Velocity | PSI |
| GPM | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS | FPS | LOSS |
| 25 | 0.31 | 0.00 | 0.18 | 0.00 | 0.11 | 0.00 | 0.08 | 0.00 | 0.05 | 0.00 | | | | | | |
| 50 | 0.62 | 0.01 | 0.35 | 0.00 | 0.22 | 0.00 | 0.16 | 0.00 | 0.10 | 0.00 | 0.07 | 0.00 | | | | |
| 75 | 0.93 | 0.03 | 0.53 | 0.01 | 0.34 | 0.00 | 0.23 | 0.00 | 0.15 | 0.00 | 0.10 | 0.00 | | | | |
| 100 | 1.24 | 0.04 | 0.70 | 0.01 | 0.45 | 0.00 | 0.31 | 0.00 | 0.20 | 0.00 | 0.13 | 0.00 | 0.10 | 0.00 | 0.08 | 0.00 |
| 125 | 1.55 | 0.07 | 0.88 | 0.02 | 0.56 | 0.01 | 0.39 | 0.00 | 0.25 | 0.00 | 0.17 | 0.00 | 0.12 | 0.00 | 0.09 | 0.00 |
| 150 | 1.86 | 0.09 | 1.05 | 0.02 | 0.67 | 0.01 | 0.47 | 0.00 | 0.30 | 0.00 | 0.20 | 0.00 | 0.14 | 0.00 | 0.11 | 0.00 |
| 175 | 2.17 | 0.12 | 1.23 | 0.03 | 0.79 | 0.01 | 0.55 | 0.00 | 0.35 | 0.00 | 0.23 | 0.00 | 0.17 | 0.00 | 0.13 | 0.00 |
| 200 | 2.48 | 0.16 | 1.40 | 0.04 | 0.90 | 0.01 | 0.62 | 0.01 | 0.40 | 0.00 | 0.27 | 0.00 | 0.19 | 0.00 | 0.15 | 0.00 |
| 225 | 2.79 | 0.20 | 1.58 | 0.05 | 1.01 | 0.02 | 0.70 | 0.01 | 0.45 | 0.00 | 0.30 | 0.00 | 0.22 | 0.00 | 0.17 | 0.00 |
| 250 | 3.10 | 0.24 | 1.75 | 0.06 | 1.12 | 0.02 | 0.78 | 0.01 | 0.50 | 0.00 | 0.33 | 0.00 | 0.24 | 0.00 | 0.19 | 0.00 |
| 275 | 3.41 | 0.28 | 1.93 | 0.07 | 1.24 | 0.02 | 0.86 | 0.01 | 0.55 | 0.00 | 0.37 | 0.00 | 0.26 | 0.00 | 0.21 | 0.00 |
| 300 | 3.71 | 0.33 | 2.10 | 0.08 | 1.35 | 0.03 | 0.94 | 0.01 | 0.60 | 0.00 | 0.40 | 0.00 | 0.29 | 0.00 | 0.23 | 0.00 |
| 325 | 4.02 | 0.39 | 2.28 | 0.10 | 1.46 | 0.03 | 1.01 | 0.01 | 0.65 | 0.00 | 0.43 | 0.00 | 0.31 | 0.00 | 0.25 | 0.00 |
| 350 | 4.33 | 0.44 | 2.45 | 0.11 | 1.57 | 0.04 | 1.09 | 0.02 | 0.70 | 0.01 | 0.47 | 0.00 | 0.34 | 0.00 | 0.27 | 0.00 |
| 375 | 4.64 | 0.51 | 2.63 | 0.13 | 1.68 | 0.04 | 1.17 | 0.02 | 0.75 | 0.01 | 0.50 | 0.00 | 0.36 | 0.00 | 0.28 | 0.00 |
| 400 | 4.95 | 0.57 | 2.80 | 0.14 | 1.80 | 0.05 | 1.25 | 0.02 | 0.80 | 0.01 | 0.53 | 0.00 | 0.38 | 0.00 | 0.30 | 0.00 |
| 425 | 5.26 | 0.64 | 2.98 | 0.16 | 1.91 | 0.05 | 1.32 | 0.02 | 0.85 | 0.01 | 0.57 | 0.00 | 0.41 | 0.00 | 0.32 | 0.00 |
| 450 | 5.57 | 0.71 | 3.15 | 0.18 | 2.02 | 0.06 | 1.40 | 0.02 | 0.90 | 0.01 | 0.60 | 0.00 | 0.43 | 0.00 | 0.34 | 0.00 |
| 475 | 5.88 | 0.78 | 3.33 | 0.20 | 2.13 | 0.07 | 1.48 | 0.03 | 0.95 | 0.01 | 0.63 | 0.00 | 0.46 | 0.00 | 0.36 | 0.00 |
| 500 | 6.19 | 0.86 | 3.50 | 0.22 | 2.25 | 0.07 | 1.56 | 0.03 | 1.00 | 0.01 | 0.67 | 0.00 | 0.48 | 0.00 | 0.38 | 0.00 |
| 550 | 6.81 | 1.03 | 3.85 | 0.26 | 2.47 | 0.09 | 1.71 | 0.04 | 1.10 | 0.01 | 0.73 | 0.00 | 0.53 | 0.00 | 0.42 | 0.00 |
| 600 | 7.43 | 1.21 | 4.20 | 0.30 | 2.70 | 0.10 | 1.87 | 0.04 | 1.20 | 0.01 | 0.80 | 0.01 | 0.58 | 0.00 | 0.46 | 0.00 |
| 650 | 8.05 | 1.40 | 4.56 | 0.35 | 2.92 | 0.12 | 2.03 | 0.05 | 1.30 | 0.02 | 0.87 | 0.01 | 0.62 | 0.00 | 0.49 | 0.00 |
| 700 | 8.67 | 1.60 | 4.91 | 0.40 | 3.14 | 0.14 | 2.18 | 0.06 | 1.40 | 0.02 | 0.93 | 0.01 | 0.67 | 0.00 | 0.53 | 0.00 |
| 750 | 9.29 | 1.82 | 5.26 | 0.46 | 3.37 | 0.15 | 2.34 | 0.06 | 1.50 | 0.02 | 1.00 | 0.01 | 0.72 | 0.00 | 0.57 | 0.00 |
| 800 | | | 5.61 | 0.51 | 3.59 | 0.17 | 2.49 | 0.07 | 1.60 | 0.02 | 1.07 | 0.01 | 0.77 | 0.00 | 0.61 | 0.00 |
| 850 | | | 5.96 | 0.58 | 3.82 | 0.20 | 2.65 | 0.08 | 1.70 | 0.03 | 1.14 | 0.01 | 0.82 | 0.00 | 0.64 | 0.00 |
| 900 | | | 6.31 | 0.64 | 4.04 | 0.22 | 2.81 | 0.09 | 1.80 | 0.03 | 1.20 | 0.01 | 0.86 | 0.01 | 0.68 | 0.00 |
| 950 | | | 6.66 | 0.71 | 4.27 | 0.24 | 2.96 | 0.10 | 1.90 | 0.03 | 1.27 | 0.01 | 0.91 | 0.01 | 0.72 | 0.00 |
| 1000 | | | 7.01 | 0.78 | 4.49 | 0.26 | 3.12 | 0.11 | 2.00 | 0.04 | 1.34 | 0.01 | 0.96 | 0.01 | 0.76 | 0.00 |
| 1100 | | | 7.71 | 0.93 | 4.94 | 0.31 | 3.43 | 0.13 | 2.19 | 0.04 | 1.47 | 0.02 | 1.06 | 0.01 | 0.83 | 0.00 |
| 1200 | | | 8.41 | 1.09 | 5.39 | 0.37 | 3.74 | 0.15 | 2.39 | 0.05 | 1.60 | 0.02 | 1.15 | 0.01 | 0.91 | 0.00 |
| 1300 | | | 9.11 | 1.26 | 5.84 | 0.43 | 4.05 | 0.18 | 2.59 | 0.06 | 1.74 | 0.02 | 1.25 | 0.01 | 0.99 | 0.01 |
| 1400 | | | 9.81 | 1.45 | 6.29 | 0.49 | 4.36 | 0.20 | 2.79 | 0.07 | 1.87 | 0.03 | 1.34 | 0.01 | 1.06 | 0.01 |
| 1500 | | | | | 6.74 | 0.56 | 4.68 | 0.23 | 2.99 | 0.08 | 2.00 | 0.03 | 1.44 | 0.01 | 1.14 | 0.01 |
| 1600 | | | | | 7.19 | 0.63 | 4.99 | 0.26 | 3.19 | 0.09 | 2.14 | 0.03 | 1.54 | 0.01 | 1.21 | 0.01 |
| 1700 | | | | | 7.64 | 0.70 | 5.30 | 0.29 | 3.39 | 0.10 | 2.27 | 0.04 | 1.63 | 0.02 | 1.29 | 0.01 |
| 1800 | | | | | 8.09 | 0.78 | 5.61 | 0.32 | 3.59 | 0.11 | 2.40 | 0.04 | 1.73 | 0.02 | 1.37 | 0.01 |
| 1900 | | | | | 8.54 | 0.87 | 5.92 | 0.36 | 3.79 | 0.12 | 2.54 | 0.05 | 1.82 | 0.02 | 1.44 | 0.01 |
| 2000 | | | | | 8.98 | 0.95 | 6.24 | 0.39 | 3.99 | 0.13 | 2.67 | 0.05 | 1.92 | 0.02 | 1.52 | 0.01 |
| 2200 | | | | | | | 6.86 | 0.47 | 4.39 | 0.16 | 2.94 | 0.06 | 2.11 | 0.03 | 1.67 | 0.01 |
| 2400 | | | | | | | 7.48 | 0.55 | 4.79 | 0.19 | 3.20 | 0.07 | 2.31 | 0.03 | 1.82 | 0.02 |
| 2600 | | | | | | | 8.11 | 0.64 | 5.19 | 0.21 | 3.47 | 0.08 | 2.50 | 0.04 | 1.97 | 0.02 |
| 2800 | | | | | | | 8.73 | 0.73 | 5.59 | 0.25 | 3.74 | 0.09 | 2.69 | 0.04 | 2.12 | 0.02 |
| 3000 | | | | | | | 9.35 | 0.83 | 5.99 | 0.28 | 4.01 | 0.11 | 2.88 | 0.05 | 2.28 | 0.03 |
| 3200 | | | | | | | 9.98 | 0.93 | 6.38 | 0.32 | 4.27 | 0.12 | 3.07 | 0.05 | 2.43 | 0.03 |
| 3400 | | | | | | | 10.60 | 1.04 | 6.78 | 0.35 | 4.54 | 0.13 | 3.27 | 0.06 | 2.58 | 0.03 |
| 3600 | | | | | | | 11.22 | 1.16 | 7.18 | 0.39 | 4.81 | 0.15 | 3.46 | 0.07 | 2.73 | 0.04 |
| 3800 | | | | | | | 11.85 | 1.28 | 7.58 | 0.43 | 5.07 | 0.16 | 3.65 | 0.07 | 2.88 | 0.04 |
| 4000 | | | | | | | 12.47 | 1.41 | 7.98 | 0.48 | 5.34 | 0.18 | 3.84 | 0.08 | 3.03 | 0.05 |
| 4200 | | | | | | | | | 8.38 | 0.52 | 5.61 | 0.20 | 4.03 | 0.09 | 3.19 | 0.05 |
| 4400 | | | | | | | | | 8.78 | 0.57 | 5.88 | 0.21 | 4.23 | 0.10 | 3.34 | 0.05 |
| 4600 | | | | | | | | | 9.18 | 0.62 | 6.14 | 0.23 | 4.42 | 0.10 | 3.49 | 0.06 |
| 4800 | | | | | | | | | 9.58 | 0.67 | 6.41 | 0.25 | 4.61 | 0.11 | 3.64 | 0.06 |
| 5000 | | | | | | | | | 9.98 | 0.72 | 6.68 | 0.27 | 4.80 | 0.12 | 3.79 | 0.07 |
| 5200 | | | | | | | | | | | 6.94 | 0.29 | 4.99 | 0.13 | 3.95 | 0.07 |
| 5400 | | | | | | | | | | | 7.21 | 0.31 | 5.19 | 0.14 | 4.10 | 0.08 |
| 5600 | | | | | | | | | | | 7.48 | 0.33 | 5.38 | 0.15 | 4.25 | 0.08 |
| 5800 | | | | | | | | | | | 7.74 | 0.36 | 5.57 | 0.16 | 4.40 | 0.09 |
| 6000 | | | | | | | | | | | 8.01 | 0.38 | 5.76 | 0.17 | 4.55 | 0.10 |
| 6200 | | | | | | | | | | | | | 5.96 | 0.18 | 4.70 | 0.10 |
| 6400 | | | | | | | | | | | | | 6.15 | 0.19 | 4.86 | 0.11 |
| 6600 | | | | | | | | | | | | | 6.34 | 0.20 | 5.01 | 0.11 |
| 6800 | | | | | | | | | | | | | 6.53 | 0.22 | 5.16 | 0.12 |
| 7000 | | | | | | | | | | | | | 6.72 | 0.23 | 5.31 | 0.13 |

**The shaded area represents velocities over 5 fps. Use with caution.**

# CLASS 150 ASBESTOS-CEMENT

**K = 0.32**

**Pressure Loss per 100' of Pipe (PSI)  Sizes 3"through 14"**

| Nominal Size | 3" | | 4" | | 6" | | 8" | | 10" | | 12" | | 14" | | Nominal Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe ID<br>Pipe O.D.<br>Wall Thick | 3.00<br>4.03<br>0.515 | | 3.95<br>5.15<br>0.600 | | 5.85<br>7.13<br>0.640 | | 7.85<br>9.45<br>0.800 | | 10.00<br>11.85<br>0.925 | | 12.00<br>14.12<br>0.106 | | 14.00<br>16.40<br>1.200 | | Pipe ID<br>Pipe O.D.<br>Wall Thick |
| Flow GPM | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Flow GPM |
| 2 | 0.09 | **0.00** | | | | | | | | | | | | | 2 |
| 4 | 0.18 | **0.01** | | | | | | | | | | | | | 4 |
| 6 | 0.27 | **0.01** | 0.16 | **0.00** | | | | | | | | | | | 6 |
| 8 | 0.36 | **0.02** | 0.21 | **0.01** | | | | | | | | | | | 8 |
| 10 | 0.45 | **0.03** | 0.26 | **0.01** | | | | | | | | | | | 10 |
| 15 | 0.68 | **0.07** | 0.39 | **0.02** | | | | | | | | | | | 15 |
| 20 | 0.91 | **0.12** | 0.52 | **0.03** | 0.24 | **0.00** | | | | | | | | | 20 |
| 25 | 1.13 | **0.19** | 0.65 | **0.05** | 0.30 | **0.01** | | | | | | | | | 25 |
| 30 | 1.36 | **0.26** | 0.78 | **0.07** | 0.36 | **0.01** | | | | | | | | | 30 |
| 35 | 1.59 | **0.35** | 0.92 | **0.09** | 0.42 | **0.01** | | | | | | | | | 35 |
| 40 | 1.81 | **0.46** | 1.05 | **0.12** | 0.48 | **0.02** | 0.26 | **0.00** | | | | | | | 40 |
| 50 | 2.27 | **0.70** | 1.31 | **0.18** | 0.60 | **0.03** | 0.33 | **0.01** | | | | | | | 50 |
| 60 | 2.72 | **0.98** | 1.57 | **0.26** | 0.72 | **0.04** | 0.40 | **0.01** | | | | | | | 60 |
| 70 | 3.17 | **1.32** | 1.83 | **0.34** | 0.83 | **0.05** | 0.46 | **0.01** | | | | | | | 70 |
| 80 | 3.63 | **1.70** | 2.09 | **0.44** | 0.95 | **0.06** | 0.53 | **0.01** | 0.33 | **0.00** | | | | | 80 |
| 90 | 4.08 | **2.13** | 2.35 | **0.55** | 1.07 | **0.08** | 0.60 | **0.02** | 0.37 | **0.01** | | | | | 90 |
| 100 | 4.53 | **2.60** | 2.61 | **0.67** | 1.19 | **0.10** | 0.66 | **0.02** | 0.41 | **0.01** | | | | | 100 |
| 110 | 4.99 | **3.11** | 2.88 | **0.81** | 1.31 | **0.12** | 0.73 | **0.03** | 0.45 | **0.01** | | | | | 110 |
| 120 | 5.44 | **3.67** | 3.14 | **0.95** | 1.43 | **0.14** | 0.79 | **0.03** | 0.49 | **0.01** | | | | | 120 |
| 130 | 5.89 | **4.28** | 3.40 | **1.11** | 1.55 | **0.16** | 0.86 | **0.04** | 0.53 | **0.01** | 0.37 | **0.00** | | | 130 |
| 140 | 6.35 | **4.92** | 3.66 | **1.28** | 1.67 | **0.19** | 0.93 | **0.04** | 0.57 | **0.01** | 0.40 | **0.01** | | | 140 |
| 160 | 7.25 | **6.35** | 4.18 | **1.65** | 1.91 | **0.24** | 1.06 | **0.06** | 0.65 | **0.02** | 0.45 | **0.01** | | | 160 |
| 180 | 8.16 | **7.94** | 4.71 | **2.06** | 2.15 | **0.30** | 1.19 | **0.07** | 0.73 | **0.19** | 0.51 | **0.01** | 0.37 | **0.00** | 180 |
| 200 | 9.07 | **9.70** | 5.23 | **2.52** | 2.38 | **0.37** | 1.32 | **0.09** | 0.82 | **0.03** | 0.57 | **0.01** | 0.42 | **0.01** | 200 |
| 220 | 9.97 | **11.62** | 5.75 | **3.02** | 2.62 | **0.44** | 1.46 | **0.10** | 0.90 | **0.03** | 0.62 | **0.01** | 0.46 | **0.01** | 220 |
| 240 | 10.88 | **13.71** | 6.28 | **3.56** | 2.86 | **0.52** | 1.59 | **0.12** | 0.98 | **0.04** | 0.68 | **0.02** | 0.50 | **0.01** | 240 |
| 260 | 11.79 | **15.96** | 6.80 | **4.15** | 3.10 | **0.61** | 1.72 | **0.14** | 1.06 | **0.04** | 0.74 | **0.02** | 0.54 | **0.01** | 260 |
| 280 | 12.69 | **18.37** | 7.32 | **4.77** | 3.34 | **0.70** | 1.85 | **0.16** | 1.14 | **0.05** | 0.79 | **0.02** | 0.58 | **0.01** | 280 |
| 300 | 13.60 | **20.95** | 7.84 | **5.44** | 3.58 | **0.79** | 1.99 | **0.19** | 1.22 | **0.06** | 0.85 | **0.02** | 0.62 | **0.01** | 300 |
| 350 | 15.87 | **28.08** | 9.15 | **7.29** | 4.17 | **1.06** | 2.32 | **0.25** | 1.43 | **0.08** | 0.99 | **0.03** | 0.73 | **0.01** | 350 |
| 400 | 18.13 | **36.18** | 10.46 | **9.40** | 4.77 | **1.37** | 2.65 | **0.32** | 1.63 | **0.10** | 1.13 | **0.04** | 0.83 | **0.02** | 400 |
| 450 | | | 11.77 | **11.76** | 5.36 | **1.72** | 2.98 | **0.41** | 1.84 | **0.12** | 1.28 | **0.05** | 0.94 | **0.02** | 450 |
| 500 | | | 13.07 | **14.36** | 5.96 | **2.10** | 3.31 | **0.50** | 2.04 | **0.15** | 1.42 | **0.06** | 1.04 | **0.03** | 500 |
| 550 | | | 14.38 | **17.21** | 6.56 | **2.51** | 3.64 | **0.59** | 2.24 | **0.18** | 1.56 | **0.07** | 1.14 | **0.03** | 550 |
| 600 | | | 15.69 | **20.31** | 7.15 | **2.96** | 3.97 | **0.70** | 2.45 | **0.21** | 1.70 | **0.09** | 1.25 | **0.04** | 600 |
| 650 | | | 17.00 | **23.64** | 7.75 | **3.45** | 4.30 | **0.82** | 2.65 | **0.25** | 1.84 | **0.10** | 1.35 | **0.05** | 650 |
| 700 | | | 18.30 | **27.22** | 8.35 | **3.97** | 4.63 | **0.94** | 2.86 | **0.29** | 1.98 | **0.12** | 1.46 | **0.06** | 700 |
| 750 | | | 19.61 | **31.03** | 8.94 | **4.53** | 4.97 | **1.07** | 3.06 | **0.33** | 2.13 | **0.13** | 1.56 | **0.06** | 750 |
| 800 | | | | | 9.54 | **5.12** | 5.30 | **1.21** | 3.26 | **0.37** | 2.27 | **0.15** | 1.67 | **0.07** | 800 |
| 900 | | | | | 10.73 | **6.40** | 5.96 | **1.52** | 3.67 | **0.46** | 2.55 | **0.19** | 1.87 | **0.09** | 900 |
| 1000 | | | | | 11.92 | **7.82** | 6.62 | **1.85** | 4.08 | **0.57** | 2.83 | **0.23** | 2.08 | **0.11** | 1000 |
| 1100 | | | | | 13.11 | **9.38** | 7.28 | **2.22** | 4.49 | **0.68** | 3.12 | **0.28** | 2.29 | **0.13** | 1100 |
| 1200 | | | | | 14.31 | **11.06** | 7.95 | **2.62** | 4.90 | **0.80** | 3.40 | **0.33** | 2.50 | **0.15** | 1200 |
| 1300 | | | | | 15.50 | **12.88** | 8.61 | **3.05** | 5.30 | **0.93** | 3.68 | **0.38** | 2.71 | **0.18** | 1300 |
| 1400 | | | | | 16.69 | **14.83** | 9.27 | **3.51** | 5.71 | **1.07** | 3.97 | **0.44** | 2.91 | **0.21** | 1400 |
| 1500 | | | | | 17.88 | **16.90** | 9.93 | **4.00** | 6.12 | **1.22** | 4.25 | **0.50** | 3.12 | **0.23** | 1500 |
| 1600 | | | | | 19.08 | **19.11** | 10.59 | **4.52** | 6.53 | **1.38** | 4.53 | **0.57** | 3.33 | **0.27** | 1600 |
| 1700 | | | | | | | 11.26 | **5.08** | 6.94 | **1.55** | 4.82 | **0.63** | 3.54 | **0.30** | 1700 |
| 1800 | | | | | | | 11.92 | **5.66** | 7.34 | **1.73** | 5.10 | **0.71** | 3.75 | **0.33** | 1800 |
| 1900 | | | | | | | 12.58 | **6.27** | 7.75 | **1.91** | 5.38 | **0.78** | 3.96 | **0.37** | 1900 |
| 2000 | | | | | | | 13.24 | **6.91** | 8.16 | **2.11** | 5.67 | **0.86** | 4.16 | **0.41** | 2000 |
| 2200 | | | | | | | 14.57 | **8.28** | 8.98 | **2.53** | 6.23 | **1.04** | 4.58 | **0.49** | 2200 |
| 2400 | | | | | | | 15.89 | **9.77** | 9.79 | **2.98** | 6.80 | **1.22** | 5.00 | **0.57** | 2400 |
| 2600 | | | | | | | 17.21 | **11.38** | 10.61 | **3.47** | 7.37 | **1.42** | 5.41 | **0.67** | 2600 |
| 2800 | | | | | | | 18.54 | **13.10** | 11.42 | **4.00** | 7.93 | **1.64** | 5.83 | **0.77** | 2800 |
| 3000 | | | | | | | 19.86 | **14.93** | 12.24 | **4.56** | 8.50 | **1.87** | 6.24 | **0.88** | 3000 |
| 3500 | | | | | | | | | 14.28 | **6.11** | 9.92 | **2.50** | 7.29 | **1.18** | 3500 |
| 4000 | | | | | | | | | 16.32 | **7.88** | 11.33 | **3.22** | 8.33 | **1.51** | 4000 |
| 4500 | | | | | | | | | 18.36 | **9.85** | 12.75 | **4.03** | 9.37 | **1.89** | 4500 |
| 5000 | | | | | | | | | | | 14.17 | **4.93** | 10.41 | **2.31** | 5000 |
| 5500 | | | | | | | | | | | 15.58 | **5.90** | 11.45 | **2.77** | 5500 |
| 6500 | | | | | | | | | | | 18.42 | **8.11** | 13.53 | **3.81** | 6500 |
| 7500 | | | | | | | | | | | | | 15.61 | **5.00** | 7500 |
| 8500 | | | | | | | | | | | | | 17.69 | **6.34** | 8500 |
| 9500 | | | | | | | | | | | | | 19.78 | **7.84** | 9500 |

**Friction losses calculated using the Scobey Formula.**

**The shaded area represents velocities over 5 fps. Use with caution where water hammer is a concern.**

# CLASS 150 ASBESTOS-CEMENT

**K = 0.32**

**Pressure Loss per 100' of Pipe (PSI)  Sizes 15" through 24"**

| Nominal Size | 15" | | 16" | | 18 | | 20" | | 21" | | 24" | | Nominal Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe ID<br>Pipe O.D.<br>Wall Thick | 15.00<br>17.91<br>1.455 | | 16.00<br>18.65<br>1.325 | | 18.00<br>21.21<br>1.605 | | 20.00<br>23.55<br>1.775 | | 21.00<br>24.94<br>1.990 | | 24.00<br>28.21<br>2.105 | | Pipe ID<br>Pipe O.D.<br>Wall Thick |
| Flow GPM | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Flow GPM |
| 200 | 0.36 | **0.00** | 0.32 | **0.00** | | | | | | | | | 200 |
| 300 | 0.54 | **0.01** | 0.48 | **0.01** | 0.38 | **0.00** | | | | | | | 300 |
| 400 | 0.73 | **0.01** | 0.64 | **0.01** | 0.50 | **0.01** | 0.41 | **0.00** | | | | | 400 |
| 500 | 0.91 | **0.02** | 0.80 | **0.02** | 0.63 | **0.01** | 0.51 | **0.01** | 0.46 | **0.00** | | | 500 |
| 600 | 1.09 | **0.03** | 0.96 | **0.02** | 0.76 | **0.01** | 0.61 | **0.01** | 0.56 | **0.01** | | | 600 |
| 700 | 1.27 | **0.04** | 1.12 | **0.03** | 0.88 | **0.02** | 0.71 | **0.01** | 0.65 | **0.01** | 0.50 | **0.00** | 700 |
| 800 | 1.45 | **0.05** | 1.28 | **0.04** | 1.01 | **0.02** | 0.82 | **0.01** | 0.74 | **0.01** | 0.57 | **0.01** | 800 |
| 900 | 1.63 | **0.06** | 1.43 | **0.05** | 1.13 | **0.03** | 0.92 | **0.02** | 0.83 | **0.01** | 0.64 | **0.01** | 900 |
| 1000 | 1.81 | **0.08** | 1.59 | **0.06** | 1.26 | **0.03** | 1.02 | **0.02** | 0.93 | **0.01** | 0.71 | **0.01** | 1000 |
| 1200 | 2.18 | **0.11** | 1.91 | **0.06** | 1.51 | **0.04** | 1.22 | **0.03** | 1.11 | **0.02** | 0.85 | **0.01** | 1200 |
| 1400 | 2.54 | **0.15** | 2.23 | **0.11** | 1.76 | **0.06** | 1.43 | **0.04** | 1.30 | **0.03** | 0.99 | **0.01** | 1400 |
| 1600 | 2.90 | **0.19** | 2.55 | **0.14** | 2.01 | **0.08** | 1.63 | **0.05** | 1.48 | **0.04** | 1.13 | **0.02** | 1600 |
| 1800 | 3.26 | **0.24** | 2.87 | **0.17** | 2.27 | **0.10** | 1.84 | **0.06** | 1.67 | **0.05** | 1.28 | **0.02** | 1800 |
| 2000 | 3.63 | **0.29** | 3.19 | **0.21** | 2.52 | **0.12** | 2.04 | **0.07** | 1.85 | **0.06** | 1.42 | **0.03** | 2000 |
| 2200 | 3.99 | **0.35** | 3.51 | **0.21** | 2.77 | **0.14** | 2.24 | **0.08** | 2.04 | **0.07** | 1.56 | **0.03** | 2200 |
| 2400 | 4.35 | **0.41** | 3.83 | **0.30** | 3.02 | **0.17** | 2.45 | **0.10** | 2.22 | **0.08** | 1.70 | **0.04** | 2400 |
| 2600 | 4.71 | **0.48** | 4.14 | **0.35** | 3.27 | **0.20** | 2.65 | **0.12** | 2.41 | **0.09** | 1.84 | **0.05** | 2600 |
| 2800 | 5.08 | **0.55** | 4.46 | **0.40** | 3.53 | **0.22** | 2.86 | **0.13** | 2.59 | **0.11** | 1.98 | **0.05** | 2800 |
| 3000 | 5.44 | **0.63** | 4.78 | **0.46** | 3.78 | **0.26** | 3.06 | **0.15** | 2.78 | **0.12** | 2.13 | **0.06** | 3000 |
| 3200 | 5.80 | **0.71** | 5.10 | **0.46** | 4.03 | **0.29** | 3.26 | **0.17** | 2.96 | **0.14** | 2.27 | **0.07** | 3200 |
| 3400 | 6.17 | **0.79** | 5.42 | **0.58** | 4.28 | **0.32** | 3.47 | **0.19** | 3.15 | **0.15** | 2.41 | **0.08** | 3400 |
| 3600 | 6.53 | **0.88** | 5.74 | **0.64** | 4.53 | **0.36** | 3.67 | **0.22** | 3.33 | **0.17** | 2.55 | **0.09** | 3600 |
| 3800 | 6.89 | **0.98** | 6.06 | **0.71** | 4.79 | **0.40** | 3.88 | **0.24** | 3.52 | **0.19** | 2.69 | **0.10** | 3800 |
| 4000 | 7.25 | **1.08** | 6.38 | **0.79** | 5.04 | **0.44** | 4.08 | **0.26** | 3.70 | **0.21** | 2.83 | **0.11** | 4000 |
| 4500 | 8.16 | **1.35** | 7.17 | **0.79** | 5.67 | **0.55** | 4.59 | **0.33** | 4.16 | **0.26** | 3.19 | **0.14** | 4500 |
| 5000 | 9.07 | **1.65** | 7.97 | **1.20** | 6.30 | **0.68** | 5.10 | **0.40** | 4.63 | **0.32** | 3.54 | **0.17** | 5000 |
| 5500 | 9.97 | **1.98** | 8.77 | **1.44** | 6.93 | **0.81** | 5.61 | **0.48** | 5.09 | **0.38** | 3.90 | **0.20** | 5500 |
| 6000 | 10.88 | **2.33** | 9.56 | **1.70** | 7.56 | **0.96** | 6.12 | **0.57** | 5.55 | **0.45** | 4.25 | **0.23** | 6000 |
| 6500 | 11.79 | **2.72** | 10.36 | **1.98** | 8.19 | **1.11** | 6.63 | **0.66** | 6.01 | **0.52** | 4.60 | **0.27** | 6500 |
| 7000 | 12.69 | **3.13** | 11.16 | **1.98** | 8.81 | **1.28** | 7.14 | **0.76** | 6.48 | **0.60** | 4.96 | **0.31** | 7000 |
| 7500 | 13.60 | **3.57** | 11.95 | **2.60** | 9.44 | **1.46** | 7.65 | **0.87** | 6.94 | **0.69** | 5.31 | **0.36** | 7500 |
| 8000 | 14.51 | **4.03** | 12.75 | **2.94** | 10.07 | **1.65** | 8.16 | **0.98** | 7.40 | **0.78** | 5.67 | **0.40** | 8000 |
| 8500 | 15.41 | **4.52** | 13.55 | **3.30** | 10.70 | **1.85** | 8.67 | **1.10** | 7.86 | **0.87** | 6.02 | **0.45** | 8500 |
| 9000 | 16.32 | **5.04** | 14.34 | **3.68** | 11.33 | **2.06** | 9.18 | **1.23** | 8.33 | **0.97** | 6.38 | **0.50** | 9000 |
| 9500 | 17.23 | **5.59** | 15.14 | **3.68** | 11.96 | **2.29** | 9.69 | **1.36** | 8.79 | **1.07** | 6.73 | **0.56** | 9500 |
| 10000 | 18.13 | **6.16** | 15.94 | **4.49** | 12.59 | **2.52** | 10.20 | **1.50** | 9.25 | **1.18** | 7.08 | **0.62** | 10000 |
| 10500 | 19.04 | **6.76** | 16.73 | **4.93** | 13.22 | **2.77** | 10.71 | **1.65** | 9.71 | **1.30** | 7.44 | **0.68** | 10500 |
| 11000 | 19.95 | **7.38** | 17.53 | **5.38** | 13.85 | **3.02** | 11.22 | **1.80** | 10.18 | **1.42** | 7.79 | **0.74** | 11000 |
| 11500 | | | 18.33 | **5.86** | 14.48 | **3.29** | 11.73 | **1.96** | 10.64 | **1.55** | 8.15 | **0.80** | 11500 |
| 12000 | | | 19.13 | **5.86** | 15.11 | **3.57** | 12.24 | **2.13** | 11.10 | **1.68** | 8.50 | **0.87** | 12000 |
| 12500 | | | 19.92 | **6.86** | 15.74 | **3.85** | 12.75 | **2.30** | 11.56 | **1.81** | 8.85 | **0.94** | 12500 |
| 13000 | | | | | 16.37 | **4.15** | 13.26 | **2.48** | 12.03 | **1.95** | 9.21 | **1.01** | 13000 |
| 13500 | | | | | 17.00 | **4.46** | 13.77 | **2.66** | 12.49 | **2.10** | 9.56 | **1.09** | 13500 |
| 14000 | | | | | 17.63 | **4.78** | 14.28 | **2.85** | 12.95 | **2.25** | 9.92 | **1.17** | 14000 |
| 14500 | | | | | 18.26 | **5.11** | 14.79 | **3.05** | 13.41 | **2.40** | 10.27 | **1.25** | 14500 |
| 15000 | | | | | 18.89 | **5.45** | 15.30 | **3.25** | 13.88 | **2.56** | 10.63 | **1.33** | 15000 |
| 15500 | | | | | 19.52 | **5.80** | 15.81 | **3.46** | 14.34 | **2.72** | 10.98 | **1.42** | 15500 |
| 16000 | | | | | | | 16.32 | **3.68** | 14.80 | **2.89** | 11.33 | **1.50** | 16000 |
| 16500 | | | | | | | 16.83 | **3.90** | 15.27 | **3.07** | 11.69 | **1.59** | 16500 |
| 17000 | | | | | | | 17.34 | **4.12** | 15.73 | **3.25** | 12.04 | **1.69** | 17000 |
| 17500 | | | | | | | 17.85 | **4.36** | 16.19 | **3.43** | 12.40 | **1.78** | 17500 |
| 18000 | | | | | | | 18.36 | **4.60** | 16.65 | **3.62** | 12.75 | **1.88** | 18000 |
| 18500 | | | | | | | 18.87 | **4.84** | 17.12 | **3.81** | 13.10 | **1.98** | 18500 |
| 19000 | | | | | | | 19.38 | **5.09** | 17.58 | **4.01** | 13.46 | **2.08** | 19000 |
| 19500 | | | | | | | 19.89 | **5.35** | 18.04 | **4.21** | 13.81 | **2.19** | 19500 |
| 20000 | | | | | | | | | 18.50 | **4.42** | 14.17 | **2.30** | 20000 |
| 21000 | | | | | | | | | 19.43 | **4.85** | 14.88 | **2.52** | 21000 |
| 22000 | | | | | | | | | | | 15.58 | **2.75** | 22000 |
| 23000 | | | | | | | | | | | 16.29 | **3.00** | 23000 |
| 24000 | | | | | | | | | | | 17.00 | **3.25** | 24000 |
| 25000 | | | | | | | | | | | 17.71 | **3.51** | 25000 |
| 26000 | | | | | | | | | | | 18.42 | **3.78** | 26000 |
| 27000 | | | | | | | | | | | 19.13 | **4.06** | 27000 |
| 28000 | | | | | | | | | | | 19.83 | **4.36** | 28000 |

**Friction losses calculated using the Scobey Formula.**

**The shaded area represents velocities over 5 fps. Use with caution where water hammer is a concern.**

# PORTABLE ALUMINUM PIPE WITH COUPLINGS

**K = 0.40**

**Pressure Loss per 100' of Pipe (PSI)  Sizes 3" through 10"**

| Nominal Size | 3" | | 4" | | 6" | | 7" | | 8" | | 10" | | Nominal Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe ID<br>Pipe O.D.<br>Wall Thick | 2.91<br>3.00<br>0.045 | | 3.91<br>4.00<br>0.045 | | 5.88<br>6.00<br>0.060 | | 6.87<br>7.00<br>0.065 | | 7.86<br>8.00<br>0.070 | | 9.82<br>10.00<br>0.090 | | Pipe ID<br>Pipe O.D.<br>Wall Thick |
| Flow GPM | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Velocity FPS | PSI Loss | Flow GPM |
| 5 | 0.24 | **0.01** | 0.13 | **0.00** | | | | | | | | | 5 |
| 10 | 0.48 | **0.04** | 0.27 | **0.01** | | | | | | | | | 10 |
| 15 | 0.72 | **0.08** | 0.40 | **0.02** | | | | | | | | | 15 |
| 20 | 0.96 | **0.14** | 0.53 | **0.03** | 0.24 | **0.00** | | | | | | | 20 |
| 25 | 1.20 | **0.22** | 0.67 | **0.03** | 0.29 | **0.01** | | | | | | | 25 |
| 30 | 1.44 | **0.30** | 0.80 | **0.07** | 0.35 | **0.01** | 0.26 | **0.00** | | | | | 30 |
| 35 | 1.68 | **0.41** | 0.94 | **0.10** | 0.41 | **0.01** | 0.30 | **0.01** | | | | | 35 |
| 40 | 1.92 | **0.53** | 1.07 | **0.13** | 0.47 | **0.02** | 0.35 | **0.01** | 0.26 | **0.00** | | | 40 |
| 45 | 2.16 | **0.66** | 1.20 | **0.16** | 0.53 | **0.02** | 0.39 | **0.01** | 0.30 | **0.01** | | | 45 |
| 50 | 2.40 | **0.80** | 1.34 | **0.16** | 0.59 | **0.03** | 0.43 | **0.01** | 0.33 | **0.01** | | | 50 |
| 60 | 2.88 | **1.13** | 1.60 | **0.27** | 0.71 | **0.04** | 0.52 | **0.02** | 0.40 | **0.01** | | | 60 |
| 70 | 3.36 | **1.52** | 1.87 | **0.36** | 0.82 | **0.05** | 0.60 | **0.02** | 0.46 | **0.01** | 0.30 | **0.00** | 70 |
| 80 | 3.84 | **1.96** | 2.14 | **0.47** | 0.94 | **0.06** | 0.69 | **0.03** | 0.53 | **0.02** | 0.34 | **0.01** | 80 |
| 90 | 4.32 | **2.45** | 2.41 | **0.58** | 1.06 | **0.08** | 0.78 | **0.04** | 0.59 | **0.02** | 0.38 | **0.01** | 90 |
| 100 | 4.80 | **3.00** | 2.67 | **0.58** | 1.18 | **0.10** | 0.86 | **0.04** | 0.66 | **0.02** | 0.42 | **0.01** | 100 |
| 110 | 5.29 | **3.59** | 2.94 | **0.85** | 1.30 | **0.11** | 0.95 | **0.05** | 0.73 | **0.03** | 0.47 | **0.01** | 110 |
| 120 | 5.77 | **4.24** | 3.21 | **1.01** | 1.41 | **0.14** | 1.04 | **0.06** | 0.79 | **0.03** | 0.51 | **0.01** | 120 |
| 130 | 6.25 | **4.93** | 3.48 | **1.17** | 1.53 | **0.16** | 1.12 | **0.07** | 0.86 | **0.04** | 0.55 | **0.01** | 130 |
| 140 | 6.73 | **5.68** | 3.74 | **1.35** | 1.65 | **0.18** | 1.21 | **0.08** | 0.93 | **0.04** | 0.59 | **0.01** | 140 |
| 150 | 7.21 | **6.47** | 4.01 | **1.35** | 1.77 | **0.21** | 1.30 | **0.10** | 0.99 | **0.05** | 0.63 | **0.02** | 150 |
| 160 | 7.69 | **7.32** | 4.28 | **1.74** | 1.89 | **0.23** | 1.38 | **0.11** | 1.06 | **0.06** | 0.68 | **0.02** | 160 |
| 170 | 8.17 | **8.21** | 4.55 | **1.95** | 2.00 | **0.26** | 1.47 | **0.12** | 1.12 | **0.06** | 0.72 | **0.02** | 170 |
| 180 | 8.65 | **9.15** | 4.81 | **2.18** | 2.12 | **0.29** | 1.56 | **0.14** | 1.19 | **0.07** | 0.76 | **0.02** | 180 |
| 190 | 9.13 | **10.14** | 5.08 | **2.41** | 2.24 | **0.32** | 1.64 | **0.15** | 1.26 | **0.08** | 0.80 | **0.03** | 190 |
| 200 | 9.61 | **11.18** | 5.35 | **2.41** | 2.36 | **0.36** | 1.73 | **0.17** | 1.32 | **0.09** | 0.85 | **0.03** | 200 |
| 225 | 10.81 | **13.98** | 6.02 | **3.33** | 2.65 | **0.45** | 1.94 | **0.21** | 1.49 | **0.11** | 0.95 | **0.04** | 225 |
| 250 | 12.01 | **17.08** | 6.69 | **4.07** | 2.95 | **0.55** | 2.16 | **0.26** | 1.65 | **0.13** | 1.06 | **0.04** | 250 |
| 275 | 13.21 | **20.48** | 7.35 | **4.87** | 3.24 | **0.65** | 2.38 | **0.31** | 1.82 | **0.16** | 1.16 | **0.05** | 275 |
| 300 | 14.41 | **24.16** | 8.02 | **5.75** | 3.54 | **0.77** | 2.59 | **0.36** | 1.98 | **0.19** | 1.27 | **0.06** | 300 |
| 325 | 15.62 | **28.12** | 8.69 | **5.75** | 3.83 | **0.90** | 2.81 | **0.42** | 2.15 | **0.22** | 1.38 | **0.07** | 325 |
| 350 | 16.82 | **32.38** | 9.36 | **7.70** | 4.12 | **1.03** | 3.02 | **0.48** | 2.31 | **0.25** | 1.48 | **0.08** | 350 |
| 375 | 18.02 | **36.91** | 10.03 | **8.78** | 4.42 | **1.18** | 3.24 | **0.55** | 2.48 | **0.29** | 1.59 | **0.10** | 375 |
| 400 | 19.22 | **41.73** | 10.70 | **9.93** | 4.71 | **1.33** | 3.46 | **0.62** | 2.64 | **0.32** | 1.69 | **0.11** | 400 |
| 425 | | | 11.37 | **11.14** | 5.01 | **1.50** | 3.67 | **0.70** | 2.81 | **0.36** | 1.80 | **0.12** | 425 |
| 450 | | | 12.03 | **11.14** | 5.30 | **1.67** | 3.89 | **0.78** | 2.97 | **0.40** | 1.90 | **0.14** | 450 |
| 475 | | | 12.70 | **13.76** | 5.60 | **1.85** | 4.10 | **0.86** | 3.14 | **0.45** | 2.01 | **0.15** | 475 |
| 500 | | | 13.37 | **15.17** | 5.89 | **2.04** | 4.32 | **0.95** | 3.31 | **0.49** | 2.12 | **0.17** | 500 |
| 550 | | | 14.71 | **18.18** | 6.48 | **2.44** | 4.75 | **1.14** | 3.64 | **0.59** | 2.33 | **0.20** | 550 |
| 600 | | | 16.05 | **21.45** | 7.07 | **2.88** | 5.18 | **1.35** | 3.97 | **0.70** | 2.54 | **0.23** | 600 |
| 650 | | | 17.38 | **21.45** | 7.66 | **3.35** | 5.62 | **1.57** | 4.30 | **0.81** | 2.75 | **0.27** | 650 |
| 700 | | | 18.72 | **28.75** | 8.25 | **3.86** | 6.05 | **1.81** | 4.63 | **0.94** | 2.96 | **0.31** | 700 |
| 750 | | | | | 8.84 | **4.40** | 6.48 | **2.06** | 4.96 | **1.07** | 3.17 | **0.36** | 750 |
| 800 | | | | | 9.43 | **4.98** | 6.91 | **2.33** | 5.29 | **1.21** | 3.39 | **0.41** | 800 |
| 850 | | | | | 10.02 | **5.58** | 7.34 | **2.61** | 5.62 | **1.35** | 3.60 | **0.45** | 850 |
| 900 | | | | | 10.61 | **6.23** | 7.78 | **2.91** | 5.95 | **1.51** | 3.81 | **0.51** | 900 |
| 1000 | | | | | 11.78 | **7.61** | 8.64 | **3.55** | 6.61 | **1.85** | 4.23 | **0.62** | 1000 |
| 1100 | | | | | 12.96 | **9.11** | 9.50 | **4.26** | 7.27 | **2.21** | 4.66 | **0.74** | 1100 |
| 1200 | | | | | 14.14 | **10.75** | 10.37 | **5.03** | 7.93 | **2.61** | 5.08 | **0.88** | 1200 |
| 1300 | | | | | 15.32 | **12.52** | 11.23 | **5.85** | 8.59 | **3.04** | 5.50 | **1.02** | 1300 |
| 1400 | | | | | 16.50 | **14.41** | 12.10 | **6.74** | 9.26 | **3.50** | 5.93 | **1.17** | 1400 |
| 1500 | | | | | 17.68 | **16.43** | 12.96 | **7.68** | 9.92 | **3.99** | 6.35 | **1.34** | 1500 |
| 1600 | | | | | 18.86 | **18.58** | 13.82 | **8.68** | 10.58 | **4.51** | 6.77 | **1.51** | 1600 |
| 1700 | | | | | | | 14.69 | **9.74** | 11.24 | **5.06** | 7.20 | **1.70** | 1700 |
| 1800 | | | | | | | 15.55 | **10.86** | 11.90 | **5.64** | 7.62 | **1.89** | 1800 |
| 1900 | | | | | | | 16.42 | **12.03** | 12.56 | **6.25** | 8.04 | **2.10** | 1900 |
| 2000 | | | | | | | 17.28 | **13.27** | 13.22 | **6.89** | 8.47 | **2.31** | 2000 |
| 2250 | | | | | | | 19.44 | **16.59** | 14.87 | **8.61** | 9.52 | **2.89** | 2250 |
| 2500 | | | | | | | | | 16.53 | **10.52** | 10.58 | **3.53** | 2500 |
| 2750 | | | | | | | | | 18.18 | **12.61** | 11.64 | **4.23** | 2750 |
| 3000 | | | | | | | | | 19.83 | **14.88** | 12.70 | **4.99** | 3000 |
| 3250 | | | | | | | | | | | 13.76 | **5.81** | 3250 |
| 3500 | | | | | | | | | | | 14.81 | **6.69** | 3500 |
| 3750 | | | | | | | | | | | 15.87 | **7.63** | 3750 |
| 4000 | | | | | | | | | | | 16.93 | **8.62** | 4000 |
| 4250 | | | | | | | | | | | 17.99 | **9.67** | 4250 |

**Friction losses calculated using the Scobey Formula.**

**The shaded area represents velocities over 5 fps. Use with caution where water hammer is a concern.**

# AUSTRALIAN STANDARD PVC PN 6 PLASTIC PIPE

**C = 150**

**Pressure Loss in Bar per 100 m  Sizes 100 mm through 375 mm**

| Nominal Size | 100 mm | | 150 mm | | 200 mm | | 225 mm | | 250 mm | | 300 mm | | 375 mm | | Nominal Size | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe ID<br>Pipe O.D.<br>Wall Thick | 107.8<br>114.3<br>3.25 | | 151.3<br>160.3<br>4.50 | | 213.8<br>225.3<br>5.25 | | 236.4<br>250.4<br>7.00 | | 266.2<br>280.4<br>7.10 | | 299.5<br>315.5<br>8.00 | | 380.3<br>400.5<br>10.10 | | Pipe ID<br>Pipe O.D.<br>Wall Thick | |
| Flow L/min | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Flow Cu. M/ Hr | Flow L/ sec |
| 100 | 0.18 | **0.00** | | | | | | | | | | | | | 6.0 | 1.67 |
| 125 | 0.23 | **0.01** | | | | | | | | | | | | | 7.5 | 2.08 |
| 150 | 0.27 | **0.01** | | | | | | | | | | | | | 9.0 | 2.50 |
| 175 | 0.32 | **0.01** | | | | | | | | | | | | | 10.5 | 2.92 |
| 200 | 0.36 | **0.01** | | | | | | | | | | | | | 12.0 | 3.33 |
| 225 | 0.41 | **0.02** | | | | | | | | | | | | | 13.5 | 3.75 |
| 250 | 0.46 | **0.02** | | | | | | | | | | | | | 15.0 | 4.17 |
| 275 | 0.50 | **0.02** | 0.25 | **0.00** | | | | | | | | | | | 16.5 | 4.58 |
| 300 | 0.55 | **0.03** | 0.28 | **0.01** | | | | | | | | | | | 18.0 | 5.00 |
| 325 | 0.59 | **0.03** | 0.30 | **0.01** | | | | | | | | | | | 19.5 | 5.42 |
| 350 | 0.64 | **0.04** | 0.32 | **0.01** | | | | | | | | | | | 21.0 | 5.83 |
| 375 | 0.68 | **0.04** | 0.35 | **0.01** | | | | | | | | | | | 22.5 | 6.25 |
| 400 | 0.73 | **0.05** | 0.37 | **0.01** | | | | | | | | | | | 24.0 | 6.67 |
| 475 | 0.87 | **0.07** | 0.44 | **0.01** | | | | | | | | | | | 28.5 | 7.92 |
| 500 | 0.91 | **0.07** | 0.46 | **0.01** | | | | | | | | | | | 30.0 | 8.33 |
| 550 | 1.00 | **0.09** | 0.51 | **0.02** | | | | | | | | | | | 33.0 | 9.17 |
| 600 | 1.09 | **0.10** | 0.56 | **0.02** | | | | | | | | | | | 36.0 | 10.0 |
| 650 | 1.19 | **0.12** | 0.60 | **0.02** | | | | | | | | | | | 39.0 | 10.8 |
| 700 | 1.28 | **0.13** | 0.65 | **0.03** | 0.32 | **0.00** | | | | | | | | | 42.0 | 11.7 |
| 750 | 1.37 | **0.15** | 0.69 | **0.03** | 0.35 | **0.01** | | | | | | | | | 45.0 | 12.5 |
| 800 | 1.46 | **0.17** | 0.74 | **0.03** | 0.37 | **0.01** | | | | | | | | | 48.0 | 13.3 |
| 900 | 1.64 | **0.21** | 0.83 | **0.04** | 0.42 | **0.01** | 0.34 | **0.00** | | | | | | | 54.0 | 15.0 |
| 1000 | 1.82 | **0.26** | 0.93 | **0.05** | 0.46 | **0.01** | 0.38 | **0.01** | | | | | | | 60.0 | 16.7 |
| 1100 | 2.01 | **0.31** | 1.02 | **0.06** | 0.51 | **0.01** | 0.41 | **0.01** | | | | | | | 66.0 | 18.3 |
| 1200 | 2.19 | **0.36** | 1.11 | **0.07** | 0.56 | **0.01** | 0.45 | **0.01** | 0.36 | **0.00** | | | | | 72.0 | 20.0 |
| 1300 | 2.37 | **0.42** | 1.20 | **0.08** | 0.60 | **0.02** | 0.49 | **0.01** | 0.39 | **0.01** | | | | | 78.0 | 21.7 |
| 1400 | 2.55 | **0.48** | 1.30 | **0.09** | 0.65 | **0.02** | 0.53 | **0.01** | 0.42 | **0.01** | | | | | 84.0 | 23.3 |
| 1500 | 2.74 | **0.55** | 1.39 | **0.11** | 0.70 | **0.02** | 0.56 | **0.01** | 0.45 | **0.01** | | | | | 90.0 | 25.0 |
| 1600 | 2.92 | **0.62** | 1.48 | **0.12** | 0.74 | **0.02** | 0.60 | **0.01** | 0.48 | **0.01** | 0.38 | **0.00** | | | 96.0 | 26.7 |
| 1800 | 3.28 | **0.77** | 1.67 | **0.15** | 0.83 | **0.03** | 0.68 | **0.02** | 0.54 | **0.01** | 0.43 | **0.01** | | | 108 | 30.0 |
| 2000 | 3.65 | **0.94** | 1.85 | **0.18** | 0.93 | **0.03** | 0.75 | **0.02** | 0.60 | **0.01** | 0.47 | **0.01** | | | 120 | 33.3 |
| 2200 | 4.01 | **1.12** | 2.04 | **0.21** | 1.02 | **0.04** | 0.83 | **0.02** | 0.66 | **0.01** | 0.52 | **0.01** | | | 132 | 36.7 |
| 2400 | 4.38 | **1.31** | 2.22 | **0.25** | 1.11 | **0.05** | 0.90 | **0.03** | 0.72 | **0.02** | 0.57 | **0.01** | | | 144 | 40.0 |
| 2600 | 4.74 | **1.52** | 2.41 | **0.29** | 1.21 | **0.05** | 0.98 | **0.03** | 0.78 | **0.02** | 0.61 | **0.01** | | | 156 | 43.3 |
| 2800 | 5.11 | **1.75** | 2.59 | **0.34** | 1.30 | **0.06** | 1.05 | **0.04** | 0.84 | **0.02** | 0.66 | **0.01** | | | 168 | 46.7 |
| 3000 | 5.47 | **1.98** | 2.78 | **0.38** | 1.39 | **0.07** | 1.13 | **0.04** | 0.90 | **0.02** | 0.71 | **0.01** | 0.44 | **0.00** | 180 | 50.0 |
| 3500 | | | 3.24 | **0.51** | 1.62 | **0.09** | 1.31 | **0.06** | 1.05 | **0.03** | 0.83 | **0.02** | 0.51 | **0.01** | 210 | 58.3 |
| 4000 | | | 3.70 | **0.65** | 1.85 | **0.12** | 1.50 | **0.07** | 1.20 | **0.04** | 0.95 | **0.02** | 0.59 | **0.01** | 240 | 66.7 |
| 4500 | | | 4.17 | **0.81** | 2.09 | **0.15** | 1.69 | **0.09** | 1.35 | **0.05** | 1.06 | **0.03** | 0.66 | **0.01** | 270 | 75.0 |
| 5000 | | | 4.63 | **0.98** | 2.32 | **0.18** | 1.88 | **0.11** | 1.50 | **0.06** | 1.18 | **0.04** | 0.73 | **0.01** | 300 | 83.3 |
| 5500 | | | 5.09 | **1.17** | 2.55 | **0.22** | 2.06 | **0.13** | 1.65 | **0.07** | 1.30 | **0.04** | 0.81 | **0.01** | 330 | 91.7 |
| 6000 | | | 5.56 | **1.38** | 2.78 | **0.26** | 2.25 | **0.15** | 1.79 | **0.09** | 1.42 | **0.05** | 0.88 | **0.02** | 360 | 100.0 |
| 6500 | | | | | 3.01 | **0.30** | 2.44 | **0.18** | 1.94 | **0.10** | 1.54 | **0.06** | 0.95 | **0.02** | 390 | 108.3 |
| 7000 | | | | | 3.25 | **0.34** | 2.63 | **0.20** | 2.09 | **0.12** | 1.65 | **0.07** | 1.03 | **0.02** | 420 | 116.7 |
| 7500 | | | | | 3.48 | **0.39** | 2.81 | **0.23** | 2.24 | **0.13** | 1.77 | **0.07** | 1.10 | **0.02** | 450 | 125.0 |
| 8000 | | | | | 3.71 | **0.44** | 3.00 | **0.26** | 2.39 | **0.15** | 1.89 | **0.08** | 1.17 | **0.03** | 480 | 133.3 |
| 8500 | | | | | 3.94 | **0.49** | 3.19 | **0.29** | 2.54 | **0.17** | 2.01 | **0.09** | 1.25 | **0.03** | 510 | 141.7 |
| 9000 | | | | | 4.17 | **0.54** | 3.38 | **0.32** | 2.69 | **0.19** | 2.13 | **0.11** | 1.32 | **0.03** | 540 | 150.0 |
| 9500 | | | | | 4.41 | **0.60** | 3.56 | **0.36** | 2.84 | **0.21** | 2.24 | **0.12** | 1.39 | **0.04** | 570 | 158.3 |
| 10000 | | | | | 4.64 | **0.66** | 3.75 | **0.39** | 2.99 | **0.23** | 2.36 | **0.13** | 1.47 | **0.04** | 600 | 166.7 |
| 11000 | | | | | 5.10 | **0.79** | 4.13 | **0.47** | 3.29 | **0.27** | 2.60 | **0.15** | 1.61 | **0.05** | 660 | 183.3 |
| 12000 | | | | | 5.56 | **0.92** | 4.50 | **0.55** | 3.59 | **0.32** | 2.84 | **0.18** | 1.76 | **0.06** | 720 | 200.0 |
| 13000 | | | | | | | 4.88 | **0.64** | 3.89 | **0.37** | 3.07 | **0.21** | 1.91 | **0.06** | 780 | 216.7 |
| 14000 | | | | | | | 5.25 | **0.73** | 4.19 | **0.42** | 3.31 | **0.24** | 2.05 | **0.07** | 840 | 233.3 |
| 15000 | | | | | | | 5.63 | **0.83** | 4.49 | **0.48** | 3.54 | **0.27** | 2.20 | **0.08** | 900 | 250.0 |
| 16000 | | | | | | | 6.00 | **0.94** | 4.79 | **0.54** | 3.78 | **0.31** | 2.34 | **0.10** | 960 | 266.7 |
| 17000 | | | | | | | | | 5.08 | **0.61** | 4.02 | **0.34** | 2.49 | **0.11** | 1020 | 283.3 |
| 18000 | | | | | | | | | 5.38 | **0.67** | 4.25 | **0.38** | 2.64 | **0.12** | 1080 | 300.0 |
| 19000 | | | | | | | | | 5.68 | **0.74** | 4.49 | **0.42** | 2.78 | **0.13** | 1140 | 316.7 |
| 20000 | | | | | | | | | 5.98 | **0.82** | 4.73 | **0.46** | 2.93 | **0.14** | 1200 | 333.3 |
| 22000 | | | | | | | | | | | 5.20 | **0.55** | 3.22 | **0.17** | 1320 | 366.7 |
| 24000 | | | | | | | | | | | 5.67 | **0.65** | 3.52 | **0.20** | 1440 | 400.0 |
| 26000 | | | | | | | | | | | | | 3.81 | **0.23** | 1560 | 433.3 |
| 28000 | | | | | | | | | | | | | 4.10 | **0.27** | 1680 | 466.7 |
| 30000 | | | | | | | | | | | | | 4.40 | **0.31** | 1800 | 500.0 |
| 32000 | | | | | | | | | | | | | 4.69 | **0.34** | 1920 | 533.3 |
| 34000 | | | | | | | | | | | | | 4.98 | **0.39** | 2040 | 566.7 |
| 36000 | | | | | | | | | | | | | 5.28 | **0.43** | 2160 | 600.0 |
| 38000 | | | | | | | | | | | | | 5.57 | **0.47** | 2280 | 633.3 |
| 40000 | | | | | | | | | | | | | 5.86 | **0.52** | 2400 | 666.7 |

**The shaded area represents velocities over 1.5 mps. Use with caution where water hammer is a concern.**

**Conversions:**
**Bar/100 M x 100 = kPa/100 M**
**Bar/100 M x 10.21 = Metres/100 M**
**Bar/100 M x 4.42 = PSI/100'**

# AUSTRALIAN STANDARD PVC PN 9 PLASTIC PIPE

**C = 150**

**Pressure Loss in Bar per 100 m  Sizes 25 mm through 80 mm**

| Nominal Size<br>Pipe ID<br>Pipe OD<br>Wall Thick | 25 mm<br>30.5<br>33.5<br>1.50 | | 32 mm<br>38.4<br>42.2<br>1.90 | | 40 mm<br>44.0<br>48.2<br>2.10 | | 50 mm<br>55.1<br>60.3<br>2.60 | | 80 mm<br>81.3<br>88.9<br>3.80 | | Nominal Size<br>Pipe ID<br>Pipe OD<br>Wall Thick | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow L/min | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Flow Cu. M/Hr | Flow L/sec |
| 4 | 0.09 | **0.00** | | | | | | | | | 0.24 | 0.07 |
| 5 | 0.11 | **0.01** | | | | | | | | | 0.30 | 0.08 |
| 6 | 0.14 | **0.01** | | | | | | | | | 0.36 | 0.10 |
| 7 | 0.16 | **0.01** | 0.10 | **0.00** | | | | | | | 0.42 | 0.12 |
| 8 | 0.18 | **0.02** | 0.11 | **0.01** | | | | | | | 0.48 | 0.13 |
| 9 | 0.21 | **0.02** | 0.13 | **0.01** | | | | | | | 0.54 | 0.15 |
| 10 | 0.23 | **0.02** | 0.14 | **0.01** | 0.11 | **0.00** | | | | | 0.60 | 0.17 |
| 12 | 0.27 | **0.03** | 0.17 | **0.01** | 0.13 | **0.01** | | | | | 0.72 | 0.20 |
| 14 | 0.32 | **0.04** | 0.20 | **0.01** | 0.15 | **0.01** | | | | | 0.84 | 0.23 |
| 15 | 0.34 | **0.05** | 0.21 | **0.02** | 0.16 | **0.01** | | | | | 0.90 | 0.25 |
| 16 | 0.36 | **0.06** | 0.23 | **0.02** | 0.17 | **0.01** | | | | | 0.96 | 0.27 |
| 18 | 0.41 | **0.07** | 0.26 | **0.02** | 0.20 | **0.01** | | | | | 1.08 | 0.30 |
| 20 | 0.46 | **0.09** | 0.29 | **0.03** | 0.22 | **0.01** | 0.14 | **0.00** | | | 1.20 | 0.33 |
| 22 | 0.50 | **0.10** | 0.31 | **0.03** | 0.24 | **0.02** | 0.15 | **0.01** | | | 1.32 | 0.37 |
| 24 | 0.55 | **0.12** | 0.34 | **0.04** | 0.26 | **0.02** | 0.17 | **0.01** | | | 1.44 | 0.40 |
| 26 | 0.59 | **0.14** | 0.37 | **0.05** | 0.28 | **0.02** | 0.18 | **0.01** | | | 1.56 | 0.43 |
| 28 | 0.64 | **0.16** | 0.40 | **0.05** | 0.31 | **0.03** | 0.19 | **0.01** | | | 1.68 | 0.47 |
| 30 | 0.68 | **0.18** | 0.43 | **0.06** | 0.33 | **0.03** | 0.21 | **0.01** | | | 1.80 | 0.50 |
| 32 | 0.73 | **0.21** | 0.46 | **0.07** | 0.35 | **0.03** | 0.22 | **0.01** | | | 1.92 | 0.53 |
| 34 | 0.77 | **0.23** | 0.49 | **0.07** | 0.37 | **0.04** | 0.24 | **0.01** | | | 2.04 | 0.57 |
| 36 | 0.82 | **0.26** | 0.51 | **0.08** | 0.39 | **0.04** | 0.25 | **0.01** | | | 2.16 | 0.60 |
| 38 | 0.87 | **0.28** | 0.54 | **0.09** | 0.41 | **0.05** | 0.26 | **0.02** | | | 2.28 | 0.63 |
| 40 | 0.91 | **0.31** | 0.57 | **0.10** | 0.44 | **0.05** | 0.28 | **0.02** | | | 2.40 | 0.67 |
| 42 | 0.96 | **0.34** | 0.60 | **0.11** | 0.46 | **0.06** | 0.29 | **0.02** | | | 2.52 | 0.70 |
| 44 | 1.00 | **0.37** | 0.63 | **0.12** | 0.48 | **0.06** | 0.31 | **0.02** | | | 2.64 | 0.73 |
| 46 | 1.05 | **0.40** | 0.66 | **0.13** | 0.50 | **0.07** | 0.32 | **0.02** | | | 2.76 | 0.77 |
| 48 | 1.09 | **0.44** | 0.69 | **0.14** | 0.52 | **0.07** | 0.33 | **0.02** | | | 2.88 | 0.80 |
| 50 | 1.14 | **0.47** | 0.71 | **0.15** | 0.54 | **0.08** | 0.35 | **0.03** | | | 3.00 | 0.83 |
| 55 | 1.25 | **0.56** | 0.79 | **0.18** | 0.60 | **0.09** | 0.38 | **0.03** | 0.18 | **0.00** | 3.30 | 0.92 |
| 60 | 1.37 | **0.66** | 0.86 | **0.21** | 0.65 | **0.11** | 0.42 | **0.04** | 0.19 | **0.01** | 3.60 | 1.00 |
| 65 | 1.48 | **0.76** | 0.93 | **0.25** | 0.71 | **0.13** | 0.45 | **0.04** | 0.21 | **0.01** | 3.90 | 1.08 |
| 70 | 1.59 | **0.88** | 1.00 | **0.28** | 0.76 | **0.15** | 0.49 | **0.05** | 0.22 | **0.01** | 4.20 | 1.17 |
| 75 | 1.71 | **1.00** | 1.07 | **0.32** | 0.82 | **0.17** | 0.52 | **0.06** | 0.24 | **0.01** | 4.50 | 1.25 |
| 80 | 1.82 | **1.12** | 1.14 | **0.36** | 0.87 | **0.19** | 0.56 | **0.06** | 0.26 | **0.01** | 4.80 | 1.33 |
| 85 | 1.94 | **1.26** | 1.22 | **0.40** | 0.93 | **0.21** | 0.59 | **0.07** | 0.27 | **0.01** | 5.10 | 1.42 |
| 90 | 2.05 | **1.40** | 1.29 | **0.45** | 0.98 | **0.23** | 0.63 | **0.08** | 0.29 | **0.01** | 5.40 | 1.50 |
| 95 | 2.16 | **1.54** | 1.36 | **0.50** | 1.04 | **0.26** | 0.66 | **0.09** | 0.30 | **0.01** | 5.70 | 1.58 |
| 100 | 2.28 | **1.70** | 1.43 | **0.55** | 1.09 | **0.28** | 0.70 | **0.09** | 0.32 | **0.01** | 6.00 | 1.67 |
| 110 | 2.51 | **2.03** | 1.57 | **0.65** | 1.20 | **0.34** | 0.77 | **0.11** | 0.35 | **0.02** | 6.60 | 1.83 |
| 120 | 2.73 | **2.38** | 1.72 | **0.77** | 1.31 | **0.40** | 0.83 | **0.13** | 0.38 | **0.02** | 7.20 | 2.00 |
| 130 | 2.96 | **2.76** | 1.86 | **0.89** | 1.42 | **0.46** | 0.90 | **0.15** | 0.42 | **0.02** | 7.80 | 2.17 |
| 140 | 3.19 | **3.17** | 2.00 | **1.02** | 1.53 | **0.53** | 0.97 | **0.18** | 0.45 | **0.03** | 8.40 | 2.33 |
| 150 | 3.42 | **3.60** | 2.14 | **1.16** | 1.63 | **0.60** | 1.04 | **0.20** | 0.48 | **0.03** | 9.00 | 2.50 |
| 175 | 3.99 | **4.79** | 2.50 | **1.54** | 1.91 | **0.80** | 1.22 | **0.27** | 0.56 | **0.04** | 10.5 | 2.92 |
| 200 | 4.56 | **6.13** | 2.86 | **1.97** | 2.18 | **1.02** | 1.39 | **0.34** | 0.64 | **0.05** | 12.0 | 3.33 |
| 225 | 5.13 | **7.62** | 3.22 | **2.45** | 2.45 | **1.27** | 1.57 | **0.43** | 0.72 | **0.06** | 13.5 | 3.75 |
| 250 | 5.70 | **9.27** | 3.57 | **2.98** | 2.72 | **1.54** | 1.74 | **0.52** | 0.80 | **0.08** | 15.0 | 4.17 |
| 275 | | | 3.93 | **3.56** | 3.00 | **1.84** | 1.91 | **0.62** | 0.88 | **0.09** | 16.5 | 4.58 |
| 300 | | | 4.29 | **4.18** | 3.27 | **2.16** | 2.09 | **0.72** | 0.96 | **0.11** | 18.0 | 5.00 |
| 325 | | | 4.65 | **4.85** | 3.54 | **2.50** | 2.26 | **0.84** | 1.04 | **0.13** | 19.5 | 5.42 |
| 350 | | | 5.00 | **5.56** | 3.81 | **2.87** | 2.43 | **0.96** | 1.12 | **0.15** | 21.0 | 5.83 |
| 375 | | | 5.36 | **6.32** | 4.09 | **3.26** | 2.61 | **1.09** | 1.20 | **0.17** | 22.5 | 6.25 |
| 400 | | | 5.72 | **7.12** | 4.36 | **3.68** | 2.78 | **1.23** | 1.28 | **0.19** | 24.0 | 6.67 |
| 450 | | | | | 4.90 | **4.58** | 3.13 | **1.53** | 1.44 | **0.23** | 27.0 | 7.50 |
| 500 | | | | | 5.45 | **5.56** | 3.48 | **1.87** | 1.60 | **0.28** | 30.0 | 8.33 |
| 550 | | | | | 5.99 | **6.64** | 3.83 | **2.23** | 1.76 | **0.34** | 33.0 | 9.17 |
| 600 | | | | | | | 4.17 | **2.61** | 1.92 | **0.40** | 36.0 | 10.0 |
| 650 | | | | | | | 4.52 | **3.03** | 2.08 | **0.46** | 39.0 | 10.8 |
| 700 | | | | | | | 4.87 | **3.48** | 2.24 | **0.53** | 42.0 | 11.7 |
| 750 | | | | | | | 5.22 | **3.95** | 2.41 | **0.60** | 45.0 | 12.5 |
| 800 | | | | | | | 5.56 | **4.45** | 2.57 | **0.68** | 48.0 | 13.3 |
| 900 | | | | | | | | | 2.89 | **0.84** | 54.0 | 15.0 |
| 1000 | | | | | | | | | 3.21 | **1.02** | 60.0 | 16.7 |
| 1100 | | | | | | | | | 3.53 | **1.22** | 66.0 | 18.3 |
| 1200 | | | | | | | | | 3.85 | **1.43** | 72.0 | 20.0 |
| 1300 | | | | | | | | | 4.17 | **1.66** | 78.0 | 21.7 |
| 1400 | | | | | | | | | 4.49 | **1.91** | 84.0 | 23.3 |
| 1500 | | | | | | | | | 4.81 | **2.17** | 90.0 | 25.0 |
| 1600 | | | | | | | | | 5.13 | **2.44** | 96.0 | 26.7 |
| 1700 | | | | | | | | | 5.45 | **2.73** | 102.0 | 28.3 |

**The shaded area represents velocities over 1.5 mps. Use with caution where water hammer is a concern.**

**Conversions:**
**Bar/100 M x 100 = kPa/100 M**
**Bar/100 M x 10.21 = Metres/100 M**
**Bar/100 M x 4.42 = PSI/100'**

# AUSTRALIAN STANDARD PVC PN 9 PLASTIC PIPE

**C = 150**

**Pressure Loss in Bar per 100 m  Sizes 100 mm through 375 mm**

| Nominal Size / Pipe ID / Pipe OD / Wall Thick | 100 mm 104.7 114.3 4.8 | | 150 mm 146.9 160.3 6.7 | | 200 mm 208.5 225.3 8.4 | | 225 mm 231.7 250.4 9.3 | | 250 mm 259.4 280.4 10.5 | | 300 mm 292.0 315.5 11.7 | | 375 mm 370.7 400.5 14.9 | | Nominal Size / Pipe ID / Pipe OD / Wall Thick | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow L/min | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Flow Cu. M/ Hr | Flow L/sec |
| 100 | 0.19 | **0.00** | | | | | | | | | | | | | 6.0 | 1.67 |
| 125 | 0.24 | **0.01** | | | | | | | | | | | | | 7.5 | 2.08 |
| 150 | 0.29 | **0.01** | | | | | | | | | | | | | 9.0 | 2.50 |
| 175 | 0.34 | **0.01** | | | | | | | | | | | | | 10.5 | 2.92 |
| 200 | 0.39 | **0.02** | | | | | | | | | | | | | 12.0 | 3.33 |
| 225 | 0.44 | **0.02** | | | | | | | | | | | | | 13.5 | 3.75 |
| 250 | 0.48 | **0.02** | 0.25 | **0.00** | | | | | | | | | | | 15.0 | 4.17 |
| 275 | 0.53 | **0.03** | 0.27 | **0.01** | | | | | | | | | | | 16.5 | 4.58 |
| 300 | 0.58 | **0.03** | 0.29 | **0.01** | | | | | | | | | | | 18.0 | 5.00 |
| 325 | 0.63 | **0.04** | 0.32 | **0.01** | | | | | | | | | | | 19.5 | 5.42 |
| 350 | 0.68 | **0.04** | 0.34 | **0.01** | | | | | | | | | | | 21.0 | 5.83 |
| 375 | 0.73 | **0.05** | 0.37 | **0.01** | | | | | | | | | | | 22.5 | 6.25 |
| 400 | 0.77 | **0.06** | 0.39 | **0.01** | | | | | | | | | | | 24.0 | 6.67 |
| 475 | 0.92 | **0.08** | 0.47 | **0.01** | | | | | | | | | | | 28.5 | 7.92 |
| 500 | 0.97 | **0.08** | 0.49 | **0.02** | | | | | | | | | | | 30.0 | 8.33 |
| 550 | 1.07 | **0.10** | 0.54 | **0.02** | | | | | | | | | | | 33.0 | 9.17 |
| 600 | 1.16 | **0.12** | 0.59 | **0.02** | | | | | | | | | | | 36.0 | 10.0 |
| 650 | 1.26 | **0.14** | 0.64 | **0.03** | 0.32 | **0.00** | | | | | | | | | 39.0 | 10.8 |
| 700 | 1.36 | **0.16** | 0.69 | **0.03** | 0.34 | **0.01** | | | | | | | | | 42.0 | 11.7 |
| 750 | 1.45 | **0.18** | 0.74 | **0.03** | 0.37 | **0.01** | | | | | | | | | 45.0 | 12.5 |
| 800 | 1.55 | **0.20** | 0.79 | **0.04** | 0.39 | **0.01** | | | | | | | | | 48.0 | 13.3 |
| 850 | 1.65 | **0.22** | 0.83 | **0.04** | 0.41 | **0.01** | 0.34 | **0.00** | | | | | | | 51.0 | 14.2 |
| 900 | 1.74 | **0.25** | 0.88 | **0.05** | 0.44 | **0.01** | 0.36 | **0.01** | | | | | | | 54.0 | 15.0 |
| 950 | 1.84 | **0.27** | 0.93 | **0.05** | 0.46 | **0.01** | 0.38 | **0.01** | | | | | | | 57.0 | 15.8 |
| 1000 | 1.94 | **0.30** | 0.98 | **0.06** | 0.49 | **0.01** | 0.39 | **0.01** | | | | | | | 60.0 | 16.7 |
| 1100 | 2.13 | **0.36** | 1.08 | **0.07** | 0.54 | **0.01** | 0.43 | **0.01** | 0.35 | **0.00** | | | | | 66.0 | 18.3 |
| 1200 | 2.32 | **0.42** | 1.18 | **0.08** | 0.59 | **0.01** | 0.47 | **0.01** | 0.38 | **0.01** | | | | | 72.0 | 20.0 |
| 1300 | 2.52 | **0.49** | 1.28 | **0.09** | 0.63 | **0.02** | 0.51 | **0.01** | 0.41 | **0.01** | | | | | 78.0 | 21.7 |
| 1400 | 2.71 | **0.56** | 1.38 | **0.11** | 0.68 | **0.02** | 0.55 | **0.01** | 0.44 | **0.01** | | | | | 84.0 | 23.3 |
| 1500 | 2.91 | **0.64** | 1.47 | **0.12** | 0.73 | **0.02** | 0.59 | **0.01** | 0.47 | **0.01** | | | | | 90.0 | 25.0 |
| 1600 | 3.10 | **0.72** | 1.57 | **0.14** | 0.78 | **0.02** | 0.63 | **0.01** | 0.50 | **0.01** | 0.40 | **0.00** | | | 96.0 | 26.7 |
| 1700 | 3.29 | **0.80** | 1.67 | **0.15** | 0.83 | **0.03** | 0.67 | **0.02** | 0.54 | **0.01** | 0.42 | **0.01** | | | 102 | 28.3 |
| 1800 | 3.49 | **0.89** | 1.77 | **0.17** | 0.88 | **0.03** | 0.71 | **0.02** | 0.57 | **0.01** | 0.45 | **0.01** | | | 108 | 30.0 |
| 1900 | 3.68 | **0.99** | 1.87 | **0.19** | 0.93 | **0.03** | 0.75 | **0.02** | 0.60 | **0.01** | 0.47 | **0.01** | | | 114 | 31.7 |
| 2000 | 3.87 | **1.08** | 1.96 | **0.21** | 0.98 | **0.04** | 0.79 | **0.02** | 0.63 | **0.01** | 0.50 | **0.01** | | | 120 | 33.3 |
| 2200 | 4.26 | **1.29** | 2.16 | **0.25** | 1.07 | **0.05** | 0.87 | **0.03** | 0.69 | **0.02** | 0.55 | **0.01** | | | 132 | 36.7 |
| 2400 | 4.65 | **1.52** | 2.36 | **0.29** | 1.17 | **0.05** | 0.95 | **0.03** | 0.76 | **0.02** | 0.60 | **0.01** | | | 144 | 40.0 |
| 2600 | 5.04 | **1.76** | 2.55 | **0.34** | 1.27 | **0.06** | 1.03 | **0.04** | 0.82 | **0.02** | 0.65 | **0.01** | | | 156 | 43.3 |
| 2800 | 5.42 | **2.02** | 2.75 | **0.39** | 1.37 | **0.07** | 1.11 | **0.04** | 0.88 | **0.02** | 0.70 | **0.01** | | | 168 | 46.7 |
| 3000 | 5.81 | **2.30** | 2.95 | **0.44** | 1.46 | **0.08** | 1.18 | **0.05** | 0.94 | **0.03** | 0.75 | **0.02** | 0.46 | **0.00** | 180 | 50.0 |
| 3200 | | | 3.14 | **0.50** | 1.56 | **0.09** | 1.26 | **0.05** | 1.01 | **0.03** | 0.80 | **0.02** | 0.49 | **0.01** | 192 | 53.3 |
| 3400 | | | 3.34 | **0.55** | 1.66 | **0.10** | 1.34 | **0.06** | 1.07 | **0.03** | 0.85 | **0.02** | 0.52 | **0.01** | 204 | 56.7 |
| 3600 | | | 3.54 | **0.62** | 1.76 | **0.11** | 1.42 | **0.07** | 1.13 | **0.04** | 0.89 | **0.02** | 0.56 | **0.01** | 216 | 60.0 |
| 3800 | | | 3.73 | **0.68** | 1.85 | **0.12** | 1.50 | **0.07** | 1.20 | **0.04** | 0.94 | **0.02** | 0.59 | **0.01** | 228 | 63.3 |
| 4000 | | | 3.93 | **0.75** | 1.95 | **0.14** | 1.58 | **0.08** | 1.26 | **0.05** | 0.99 | **0.03** | 0.62 | **0.01** | 240 | 66.7 |
| 4500 | | | 4.42 | **0.93** | 2.19 | **0.17** | 1.78 | **0.10** | 1.42 | **0.06** | 1.12 | **0.03** | 0.69 | **0.01** | 270 | 75.0 |
| 5000 | | | 4.91 | **1.13** | 2.44 | **0.21** | 1.97 | **0.12** | 1.57 | **0.07** | 1.24 | **0.04** | 0.77 | **0.01** | 300 | 83.3 |
| 5500 | | | 5.40 | **1.35** | 2.68 | **0.25** | 2.17 | **0.15** | 1.73 | **0.08** | 1.37 | **0.05** | 0.85 | **0.01** | 330 | 91.7 |
| 6000 | | | 5.89 | **1.59** | 2.93 | **0.29** | 2.37 | **0.17** | 1.89 | **0.10** | 1.49 | **0.06** | 0.93 | **0.02** | 360 | 100.0 |
| 6500 | | | | | 3.17 | **0.34** | 2.57 | **0.20** | 2.05 | **0.12** | 1.62 | **0.07** | 1.00 | **0.02** | 390 | 108.3 |
| 7000 | | | | | 3.41 | **0.38** | 2.76 | **0.23** | 2.20 | **0.13** | 1.74 | **0.07** | 1.08 | **0.02** | 420 | 116.7 |
| 8000 | | | | | 3.90 | **0.49** | 3.16 | **0.29** | 2.52 | **0.17** | 1.99 | **0.10** | 1.23 | **0.03** | 480 | 133.3 |
| 9000 | | | | | 4.39 | **0.61** | 3.55 | **0.37** | 2.83 | **0.21** | 2.24 | **0.12** | 1.39 | **0.04** | 540 | 150.0 |
| 10000 | | | | | 4.88 | **0.74** | 3.95 | **0.45** | 3.15 | **0.26** | 2.49 | **0.14** | 1.54 | **0.05** | 600 | 166.7 |
| 11000 | | | | | 5.36 | **0.89** | 4.34 | **0.53** | 3.46 | **0.31** | 2.73 | **0.17** | 1.70 | **0.05** | 660 | 183.3 |
| 12000 | | | | | 5.85 | **1.04** | 4.74 | **0.62** | 3.78 | **0.36** | 2.98 | **0.20** | 1.85 | **0.06** | 720 | 200.0 |
| 14000 | | | | | | | 5.53 | **0.83** | 4.41 | **0.48** | 3.48 | **0.27** | 2.16 | **0.08** | 840 | 233.3 |
| 16000 | | | | | | | | | 5.04 | **0.61** | 3.98 | **0.35** | 2.47 | **0.11** | 960 | 266.7 |
| 18000 | | | | | | | | | 5.67 | **0.76** | 4.47 | **0.43** | 2.78 | **0.13** | 1080 | 300.0 |
| 20000 | | | | | | | | | | | 4.97 | **0.52** | 3.08 | **0.16** | 1200 | 333.3 |
| 22000 | | | | | | | | | | | 5.47 | **0.62** | 3.39 | **0.19** | 1320 | 366.7 |
| 26000 | | | | | | | | | | | | | 4.01 | **0.27** | 1560 | 433.3 |
| 30000 | | | | | | | | | | | | | 4.63 | **0.35** | 1800 | 500.0 |
| 34000 | | | | | | | | | | | | | 5.24 | **0.44** | 2040 | 566.7 |
| 38000 | | | | | | | | | | | | | 5.86 | **0.54** | 2280 | 633.3 |

**The shaded area represents velocities over 1.5 mps. Use with caution where water hammer is a concern.**

**Conversions:**
**Bar/100 M x 100 = kPa/100 M**
**Bar/100 M x 10.21 = Metres/100 M**
**Bar/100 M x 4.42 = PSI/100'**

# AUSTRALIAN STANDARD PVC PN 12 PLASTIC PIPE

**C = 150**

**Pressure Loss in Bar per 100 m  Sizes 20 mm through 80 mm**

| Nominal Size | 20 mm | | 25 mm | | 32 mm | | 40 mm | | 50 mm | | 80 mm | | Nominal Size | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Pipe ID | 23.7 | | 29.7 | | 37.4 | | 42.8 | | 53.7 | | 79.1 | | Pipe ID | |
| Pipe O.D. | 26.7 | | 33.5 | | 42.2 | | 48.2 | | 60.3 | | 88.9 | | Pipe OD | |
| Wall Thick | 1.5 | | 1.9 | | 2.4 | | 2.7 | | 3.3 | | 4.9 | | Wall Thick | |
| Flow L/min | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Flow Cu. M/Hr | Flow L/sec |
| 1 | | | | | | | | | | | | | 0.06 | 0.02 |
| 2 | 0.08 | **0.00** | | | | | | | | | | | 0.12 | 0.03 |
| 3 | 0.11 | **0.01** | | | | | | | | | | | 0.18 | 0.05 |
| 4 | 0.15 | **0.01** | 0.10 | **0.00** | | | | | | | | | 0.24 | 0.07 |
| 5 | 0.19 | **0.02** | 0.12 | **0.01** | | | | | | | | | 0.30 | 0.08 |
| 6 | 0.23 | **0.03** | 0.14 | **0.01** | | | | | | | | | 0.36 | 0.10 |
| 7 | 0.26 | **0.04** | 0.17 | **0.01** | 0.11 | **0.00** | | | | | | | 0.42 | 0.12 |
| 8 | 0.30 | **0.05** | 0.19 | **0.02** | 0.12 | **0.01** | | | | | | | 0.48 | 0.13 |
| 9 | 0.34 | **0.07** | 0.21 | **0.02** | 0.14 | **0.01** | | | | | | | 0.54 | 0.15 |
| 10 | 0.38 | **0.08** | 0.24 | **0.03** | 0.15 | **0.01** | 0.12 | **0.00** | | | | | 0.60 | 0.17 |
| 12 | 0.45 | **0.11** | 0.29 | **0.04** | 0.18 | **0.01** | 0.14 | **0.01** | | | | | 0.72 | 0.20 |
| 14 | 0.53 | **0.15** | 0.33 | **0.05** | 0.21 | **0.02** | 0.16 | **0.01** | | | | | 0.84 | 0.23 |
| 16 | 0.60 | **0.19** | 0.38 | **0.06** | 0.24 | **0.02** | 0.19 | **0.01** | | | | | 0.96 | 0.27 |
| 18 | 0.68 | **0.24** | 0.43 | **0.08** | 0.27 | **0.03** | 0.21 | **0.01** | 0.13 | **0.00** | | | 1.08 | 0.30 |
| 20 | 0.75 | **0.29** | 0.48 | **0.10** | 0.30 | **0.03** | 0.23 | **0.02** | 0.15 | **0.01** | | | 1.20 | 0.33 |
| 22 | 0.83 | **0.35** | 0.53 | **0.12** | 0.33 | **0.04** | 0.25 | **0.02** | 0.16 | **0.01** | | | 1.32 | 0.37 |
| 24 | 0.91 | **0.41** | 0.57 | **0.14** | 0.36 | **0.04** | 0.28 | **0.02** | 0.18 | **0.01** | | | 1.44 | 0.40 |
| 26 | 0.98 | **0.48** | 0.62 | **0.16** | 0.39 | **0.05** | 0.30 | **0.03** | 0.19 | **0.01** | | | 1.56 | 0.43 |
| 28 | 1.06 | **0.55** | 0.67 | **0.18** | 0.42 | **0.06** | 0.32 | **0.03** | 0.21 | **0.01** | | | 1.68 | 0.47 |
| 30 | 1.13 | **0.62** | 0.72 | **0.20** | 0.45 | **0.07** | 0.35 | **0.04** | 0.22 | **0.01** | | | 1.80 | 0.50 |
| 32 | 1.21 | **0.70** | 0.76 | **0.23** | 0.48 | **0.08** | 0.37 | **0.04** | 0.24 | **0.01** | | | 1.92 | 0.53 |
| 34 | 1.28 | **0.79** | 0.81 | **0.26** | 0.51 | **0.08** | 0.39 | **0.04** | 0.25 | **0.01** | | | 2.04 | 0.57 |
| 36 | 1.36 | **0.87** | 0.86 | **0.29** | 0.54 | **0.09** | 0.42 | **0.05** | 0.26 | **0.02** | | | 2.16 | 0.60 |
| 38 | 1.43 | **0.97** | 0.91 | **0.32** | 0.57 | **0.10** | 0.44 | **0.05** | 0.28 | **0.02** | | | 2.28 | 0.63 |
| 40 | 1.51 | **1.06** | 0.95 | **0.35** | 0.60 | **0.11** | 0.46 | **0.06** | 0.29 | **0.02** | | | 2.40 | 0.67 |
| 42 | 1.58 | **1.16** | 1.00 | **0.38** | 0.63 | **0.12** | 0.49 | **0.07** | 0.31 | **0.02** | | | 2.52 | 0.70 |
| 44 | 1.66 | **1.27** | 1.05 | **0.42** | 0.66 | **0.14** | 0.51 | **0.07** | 0.32 | **0.02** | | | 2.64 | 0.73 |
| 46 | 1.74 | **1.38** | 1.10 | **0.45** | 0.69 | **0.15** | 0.53 | **0.08** | 0.34 | **0.03** | | | 2.76 | 0.77 |
| 48 | 1.81 | **1.49** | 1.15 | **0.49** | 0.72 | **0.16** | 0.56 | **0.08** | 0.35 | **0.03** | | | 2.88 | 0.80 |
| 50 | 1.89 | **1.61** | 1.19 | **0.53** | 0.75 | **0.17** | 0.58 | **0.09** | 0.37 | **0.03** | 0.17 | **0.00** | 3.00 | 0.83 |
| 55 | 2.08 | **1.92** | 1.31 | **0.63** | 0.83 | **0.21** | 0.64 | **0.11** | 0.40 | **0.04** | 0.19 | **0.01** | 3.30 | 0.92 |
| 60 | 2.26 | **2.25** | 1.43 | **0.74** | 0.90 | **0.24** | 0.69 | **0.13** | 0.44 | **0.02** | 0.20 | **0.01** | 3.60 | 1.00 |
| 65 | 2.45 | **2.61** | 1.55 | **0.86** | 0.98 | **0.28** | 0.75 | **0.15** | 0.48 | **0.05** | 0.22 | **0.01** | 3.90 | 1.08 |
| 70 | 2.64 | **2.99** | 1.67 | **0.98** | 1.06 | **0.32** | 0.81 | **0.17** | 0.51 | **0.06** | 0.24 | **0.01** | 4.20 | 1.17 |
| 75 | 2.83 | **3.40** | 1.79 | **1.12** | 1.13 | **0.36** | 0.87 | **0.19** | 0.55 | **0.06** | 0.25 | **0.01** | 4.50 | 1.25 |
| 80 | 3.02 | **3.83** | 1.91 | **1.26** | 1.21 | **0.41** | 0.93 | **0.22** | 0.59 | **0.07** | 0.27 | **0.01** | 4.80 | 1.33 |
| 85 | 3.21 | **4.29** | 2.03 | **1.41** | 1.28 | **0.46** | 0.98 | **0.24** | 0.62 | **0.08** | 0.29 | **0.01** | 5.10 | 1.42 |
| 90 | 3.40 | **4.77** | 2.15 | **1.56** | 1.36 | **0.51** | 1.04 | **0.27** | 0.66 | **0.09** | 0.31 | **0.01** | 5.40 | 1.50 |
| 95 | 3.58 | **5.27** | 2.27 | **1.73** | 1.43 | **0.57** | 1.10 | **0.30** | 0.70 | **0.10** | 0.32 | **0.02** | 5.70 | 1.58 |
| 100 | 3.77 | **5.79** | 2.39 | **1.90** | 1.51 | **0.62** | 1.16 | **0.33** | 0.74 | **0.11** | 0.34 | **0.02** | 6.00 | 1.67 |
| 110 | 4.15 | **6.91** | 2.63 | **2.27** | 1.66 | **0.74** | 1.27 | **0.39** | 0.81 | **0.13** | 0.37 | **0.02** | 6.60 | 1.83 |
| 120 | 4.53 | **8.12** | 2.86 | **2.66** | 1.81 | **0.87** | 1.39 | **0.46** | 0.88 | **0.15** | 0.41 | **0.02** | 7.20 | 2.00 |
| 130 | 4.91 | **9.42** | 3.10 | **3.09** | 1.96 | **1.01** | 1.50 | **0.53** | 0.96 | **0.18** | 0.44 | **0.03** | 7.80 | 2.17 |
| 140 | 5.28 | **10.81** | 3.34 | **3.55** | 2.11 | **1.16** | 1.62 | **0.61** | 1.03 | **0.20** | 0.48 | **0.03** | 8.40 | 2.33 |
| 150 | 5.66 | **12.28** | 3.58 | **4.03** | 2.26 | **1.32** | 1.74 | **0.69** | 1.10 | **0.23** | 0.51 | **0.04** | 9.00 | 2.50 |
| 175 | | | 4.18 | **5.36** | 2.64 | **1.75** | 2.02 | **0.92** | 1.29 | **0.31** | 0.59 | **0.05** | 10.5 | 2.92 |
| 200 | | | 4.77 | **6.86** | 3.01 | **2.24** | 2.31 | **1.18** | 1.47 | **0.39** | 0.68 | **0.06** | 12.0 | 3.33 |
| 225 | | | 5.37 | **8.54** | 3.39 | **2.79** | 2.60 | **1.47** | 1.65 | **0.49** | 0.76 | **0.07** | 13.5 | 3.75 |
| 250 | | | 5.97 | **10.38** | 3.77 | **3.39** | 2.89 | **1.78** | 1.84 | **0.59** | 0.85 | **0.09** | 15.0 | 4.17 |
| 275 | | | | | 4.14 | **4.05** | 3.18 | **2.13** | 2.02 | **0.70** | 0.93 | **0.11** | 16.5 | 4.58 |
| 300 | | | | | 4.52 | **4.75** | 3.47 | **2.50** | 2.21 | **0.83** | 1.02 | **0.13** | 18.0 | 5.00 |
| 325 | | | | | 4.90 | **5.51** | 3.76 | **2.90** | 2.39 | **0.96** | 1.10 | **0.15** | 19.5 | 5.42 |
| 350 | | | | | 5.28 | **6.32** | 4.05 | **3.32** | 2.57 | **1.10** | 1.19 | **0.17** | 21.0 | 5.83 |
| 375 | | | | | 5.65 | **7.19** | 4.34 | **3.78** | 2.76 | **1.25** | 1.27 | **0.19** | 22.5 | 6.25 |
| 400 | | | | | | | 4.63 | **4.26** | 2.94 | **1.41** | 1.36 | **0.22** | 24.0 | 6.67 |
| 450 | | | | | | | 5.21 | **5.29** | 3.31 | **1.75** | 1.53 | **0.27** | 27.0 | 7.50 |
| 500 | | | | | | | 5.79 | **6.43** | 3.68 | **2.13** | 1.70 | **0.33** | 30.0 | 8.33 |
| 550 | | | | | | | | | 4.04 | **2.54** | 1.87 | **0.39** | 33.0 | 9.17 |
| 600 | | | | | | | | | 4.41 | **2.99** | 2.04 | **0.46** | 36.0 | 10.0 |
| 650 | | | | | | | | | 4.78 | **3.47** | 2.21 | **0.53** | 39.0 | 10.8 |
| 700 | | | | | | | | | 5.15 | **3.98** | 2.38 | **0.61** | 42.0 | 11.7 |
| 750 | | | | | | | | | 5.51 | **4.52** | 2.55 | **0.69** | 45.0 | 12.5 |
| 800 | | | | | | | | | 5.88 | **5.09** | 2.72 | **0.78** | 48.0 | 13.3 |
| 900 | | | | | | | | | | | 3.06 | **0.97** | 54.0 | 15.0 |
| 1000 | | | | | | | | | | | 3.40 | **1.18** | 60.0 | 16.7 |
| 1100 | | | | | | | | | | | 3.74 | **1.40** | 66.0 | 18.3 |
| 1200 | | | | | | | | | | | 4.08 | **1.65** | 72.0 | 20.0 |
| 1300 | | | | | | | | | | | 4.42 | **1.91** | 78.0 | 21.7 |
| 1400 | | | | | | | | | | | 4.75 | **2.19** | 84.0 | 23.3 |
| 1600 | | | | | | | | | | | 5.43 | **2.81** | 96.0 | 26.7 |

**The shaded area represents velocities over 1.5 mps. Use with caution where water hammer is a concern.**

**Conversions:**
**Bar/100 M x 100 = kPa/100 M**
**Bar/100 M x 10.21 = Metres/100 M**
**Bar/100 M x 4.42 = PSI/100'**

# AUSTRALIAN STANDARD PVC PN 12 PLASTIC PIPE

**C = 150**

**Pressure Loss in Bar per 100 m  Sizes 100 mm through 375 mm**

| Nominal Size / Pipe ID / Pipe O.D. / Wall Thick | 100 mm 101.7 114.3 6.3 | | 150 mm 142.7 160.3 8.8 | | 200 mm 203.1 225.3 11.1 | | 225 mm 225.8 250.4 12.3 | | 250 mm 252.9 280.4 13.7 | | 300 mm 284.5 315.5 15.5 | | 375 mm 361.2 400.5 19.7 | | Nominal Size / Pipe ID / Pipe O.D. / Wall Thick | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow L/min | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Flow Cu. M/Hr | Flow L/sec |
| 100 | 0.20 | **0.00** | | | | | | | | | | | | | 6.0 | 1.67 |
| 125 | 0.26 | **0.01** | | | | | | | | | | | | | 7.5 | 2.08 |
| 150 | 0.31 | **0.01** | | | | | | | | | | | | | 9.0 | 2.50 |
| 175 | 0.36 | **0.01** | | | | | | | | | | | | | 10.5 | 2.92 |
| 200 | 0.41 | **0.02** | | | | | | | | | | | | | 12.0 | 3.33 |
| 225 | 0.46 | **0.02** | 0.23 | **0.00** | | | | | | | | | | | 13.5 | 3.75 |
| 250 | 0.51 | **0.03** | 0.26 | **0.01** | | | | | | | | | | | 15.0 | 4.17 |
| 275 | 0.56 | **0.03** | 0.29 | **0.01** | | | | | | | | | | | 16.5 | 4.58 |
| 300 | 0.61 | **0.04** | 0.31 | **0.01** | | | | | | | | | | | 18.0 | 5.00 |
| 325 | 0.67 | **0.04** | 0.34 | **0.01** | | | | | | | | | | | 19.5 | 5.42 |
| 350 | 0.72 | **0.05** | 0.36 | **0.01** | | | | | | | | | | | 21.0 | 5.83 |
| 375 | 0.77 | **0.06** | 0.39 | **0.01** | | | | | | | | | | | 22.5 | 6.25 |
| 400 | 0.82 | **0.06** | 0.42 | **0.01** | | | | | | | | | | | 24.0 | 6.67 |
| 475 | 0.97 | **0.09** | 0.49 | **0.02** | | | | | | | | | | | 28.5 | 7.92 |
| 500 | 1.02 | **0.10** | 0.52 | **0.02** | | | | | | | | | | | 30.0 | 8.33 |
| 550 | 1.13 | **0.11** | 0.57 | **0.02** | | | | | | | | | | | 33.0 | 9.17 |
| 600 | 1.23 | **0.13** | 0.62 | **0.03** | 0.31 | **0.00** | | | | | | | | | 36.0 | 10.0 |
| 650 | 1.33 | **0.16** | 0.68 | **0.03** | 0.33 | **0.01** | | | | | | | | | 39.0 | 10.8 |
| 700 | 1.43 | **0.18** | 0.73 | **0.03** | 0.36 | **0.01** | | | | | | | | | 42.0 | 11.7 |
| 750 | 1.54 | **0.20** | 0.78 | **0.04** | 0.39 | **0.01** | | | | | | | | | 45.0 | 12.5 |
| 800 | 1.64 | **0.23** | 0.83 | **0.04** | 0.41 | **0.01** | 0.33 | **0.00** | | | | | | | 48.0 | 13.3 |
| 900 | 1.84 | **0.28** | 0.94 | **0.05** | 0.46 | **0.01** | 0.37 | **0.01** | | | | | | | 54.0 | 15.0 |
| 1000 | 2.05 | **0.34** | 1.04 | **0.07** | 0.51 | **0.01** | 0.42 | **0.01** | | | | | | | 60.0 | 16.7 |
| 1100 | 2.25 | **0.41** | 1.14 | **0.08** | 0.57 | **0.01** | 0.46 | **0.01** | 0.36 | **0.00** | | | | | 66.0 | 18.3 |
| 1200 | 2.46 | **0.48** | 1.25 | **0.09** | 0.62 | **0.02** | 0.50 | **0.01** | 0.40 | **0.01** | | | | | 72.0 | 20.0 |
| 1400 | 2.87 | **0.64** | 1.46 | **0.12** | 0.72 | **0.02** | 0.58 | **0.01** | 0.46 | **0.01** | 0.37 | **0.00** | | | 84.0 | 23.3 |
| 1600 | 3.28 | **0.82** | 1.67 | **0.16** | 0.82 | **0.03** | 0.67 | **0.02** | 0.53 | **0.01** | 0.42 | **0.01** | | | 96.0 | 26.7 |
| 1800 | 3.69 | **1.02** | 1.87 | **0.20** | 0.92 | **0.04** | 0.75 | **0.02** | 0.60 | **0.01** | 0.47 | **0.01** | | | 108.0 | 30.0 |
| 2000 | 4.10 | **1.24** | 2.08 | **0.24** | 1.03 | **0.04** | 0.83 | **0.03** | 0.66 | **0.01** | 0.52 | **0.01** | | | 120.0 | 33.3 |
| 2200 | 4.51 | **1.48** | 2.29 | **0.29** | 1.13 | **0.05** | 0.91 | **0.03** | 0.73 | **0.02** | 0.58 | **0.01** | | | 132.0 | 36.7 |
| 2400 | 4.92 | **1.74** | 2.50 | **0.34** | 1.23 | **0.06** | 1.00 | **0.04** | 0.80 | **0.02** | 0.63 | **0.01** | | | 144.0 | 40.0 |
| 2600 | 5.33 | **2.02** | 2.71 | **0.39** | 1.34 | **0.07** | 1.08 | **0.04** | 0.86 | **0.02** | 0.68 | **0.01** | | | 156 | 43.3 |
| 2800 | 5.74 | **2.32** | 2.91 | **0.45** | 1.44 | **0.08** | 1.16 | **0.05** | 0.93 | **0.03** | 0.73 | **0.02** | 0.45 | **0.00** | 168 | 46.7 |
| 3000 | | | 3.12 | **0.51** | 1.54 | **0.09** | 1.25 | **0.05** | 0.99 | **0.03** | 0.79 | **0.02** | 0.49 | **0.01** | 180 | 50.0 |
| 3200 | | | 3.33 | **0.57** | 1.64 | **0.10** | 1.33 | **0.06** | 1.06 | **0.04** | 0.84 | **0.02** | 0.52 | **0.01** | 192 | 53.3 |
| 3500 | | | 3.64 | **0.67** | 1.80 | **0.12** | 1.45 | **0.07** | 1.16 | **0.04** | 0.92 | **0.02** | 0.57 | **0.01** | 210 | 58.3 |
| 4000 | | | 4.16 | **0.86** | 2.06 | **0.15** | 1.66 | **0.09** | 1.33 | **0.05** | 1.05 | **0.03** | 0.65 | **0.01** | 240 | 66.7 |
| 4500 | | | 4.68 | **1.07** | 2.31 | **0.19** | 1.87 | **0.12** | 1.49 | **0.07** | 1.18 | **0.04** | 0.73 | **0.01** | 270 | 75.0 |
| 5000 | | | 5.20 | **1.31** | 2.57 | **0.23** | 2.08 | **0.14** | 1.66 | **0.08** | 1.31 | **0.05** | 0.81 | **0.01** | 300 | 83.3 |
| 5500 | | | 5.72 | **1.56** | 2.83 | **0.28** | 2.29 | **0.17** | 1.82 | **0.10** | 1.44 | **0.05** | 0.89 | **0.02** | 330 | 91.7 |
| 6000 | | | | | 3.08 | **0.33** | 2.49 | **0.20** | 1.99 | **0.11** | 1.57 | **0.06** | 0.97 | **0.02** | 360 | 100.0 |
| 6500 | | | | | 3.34 | **0.38** | 2.70 | **0.23** | 2.15 | **0.13** | 1.70 | **0.07** | 1.06 | **0.02** | 390 | 108.3 |
| 7000 | | | | | 3.60 | **0.44** | 2.91 | **0.26** | 2.32 | **0.15** | 1.83 | **0.08** | 1.14 | **0.03** | 420 | 116.7 |
| 7500 | | | | | 3.85 | **0.50** | 3.12 | **0.30** | 2.49 | **0.17** | 1.96 | **0.10** | 1.22 | **0.03** | 450 | 125.0 |
| 8000 | | | | | 4.11 | **0.56** | 3.33 | **0.33** | 2.65 | **0.19** | 2.09 | **0.11** | 1.30 | **0.03** | 480 | 133.3 |
| 8500 | | | | | 4.37 | **0.63** | 3.53 | **0.37** | 2.82 | **0.22** | 2.23 | **0.12** | 1.38 | **0.04** | 510 | 141.7 |
| 9000 | | | | | 4.62 | **0.70** | 3.74 | **0.42** | 2.98 | **0.24** | 2.36 | **0.13** | 1.46 | **0.04** | 540 | 150.0 |
| 9500 | | | | | 4.88 | **0.77** | 3.95 | **0.46** | 3.15 | **0.26** | 2.49 | **0.15** | 1.54 | **0.05** | 570 | 158.3 |
| 10000 | | | | | 5.14 | **0.85** | 4.16 | **0.51** | 3.31 | **0.29** | 2.62 | **0.16** | 1.62 | **0.05** | 600 | 166.7 |
| 10500 | | | | | 5.40 | **0.93** | 4.36 | **0.55** | 3.48 | **0.32** | 2.75 | **0.18** | 1.71 | **0.06** | 630 | 175.0 |
| 11000 | | | | | 5.65 | **1.01** | 4.57 | **0.60** | 3.65 | **0.35** | 2.88 | **0.20** | 1.79 | **0.06** | 660 | 183.3 |
| 12000 | | | | | | | 4.99 | **0.71** | 3.98 | **0.41** | 3.14 | **0.23** | 1.95 | **0.07** | 720 | 200.0 |
| 13000 | | | | | | | 5.40 | **0.82** | 4.31 | **0.47** | 3.40 | **0.27** | 2.11 | **0.08** | 780 | 216.7 |
| 14000 | | | | | | | 5.82 | **0.94** | 4.64 | **0.54** | 3.67 | **0.31** | 2.27 | **0.10** | 840 | 233.3 |
| 15000 | | | | | | | | | 4.97 | **0.62** | 3.93 | **0.35** | 2.44 | **0.11** | 900 | 250.0 |
| 16000 | | | | | | | | | 5.30 | **0.69** | 4.19 | **0.39** | 2.60 | **0.12** | 960 | 266.7 |
| 17000 | | | | | | | | | 5.63 | **0.78** | 4.45 | **0.44** | 2.76 | **0.14** | 1020 | 283.3 |
| 18000 | | | | | | | | | 5.97 | **0.86** | 4.71 | **0.49** | 2.92 | **0.15** | 1080 | 300.0 |
| 19000 | | | | | | | | | | | 4.98 | **0.54** | 3.09 | **0.17** | 1140 | 316.7 |
| 20000 | | | | | | | | | | | 5.24 | **0.59** | 3.25 | **0.19** | 1200 | 333.3 |
| 21000 | | | | | | | | | | | 5.50 | **0.65** | 3.41 | **0.20** | 1260 | 350.0 |
| 22000 | | | | | | | | | | | 5.76 | **0.71** | 3.57 | **0.22** | 1320 | 366.7 |
| 24000 | | | | | | | | | | | | | 3.90 | **0.26** | 1440 | 400.0 |
| 26000 | | | | | | | | | | | | | 4.22 | **0.30** | 1560 | 433.3 |
| 28000 | | | | | | | | | | | | | 4.55 | **0.35** | 1680 | 466.7 |
| 30000 | | | | | | | | | | | | | 4.87 | **0.39** | 1800 | 500.0 |
| 32000 | | | | | | | | | | | | | 5.20 | **0.44** | 1920 | 533.3 |
| 34000 | | | | | | | | | | | | | 5.52 | **0.50** | 2040 | 566.7 |
| 36000 | | | | | | | | | | | | | 5.85 | **0.55** | 2160 | 600.0 |

**The shaded area represents velocities over 1.5 MPS. Use with caution where water hammer is a concern.**

**Conversions:**
**Bar/100 M x 100 = kPa/100 M**
**Bar/100 M x 10.21 = Metres/100 M**
**Bar/100 M x 4.42 = PSI/100'**

# AUSTRALIAN STANDARD PVC PN 15 PLASTIC PIPE

**C = 150**

**Pressure Loss in Bar per 100 m  Sizes 15 mm through 50 mm**

| Nominal Size<br>Pipe ID<br>Pipe O.D.<br>Wall Thick | 15 mm<br>18.3<br>21.3<br>1.5 | | 20 mm<br>22.9<br>26.7<br>1.9 | | 25 mm<br>28.9<br>33.5<br>2.3 | | 32 mm<br>36.4<br>42.2<br>2.9 | | 40 mm<br>41.6<br>48.2<br>3.3 | | 50 mm<br>52.1<br>60.3<br>4.1 | | Nominal Size<br>Pipe ID<br>Pipe O.D.<br>Wall Thick | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow L/min | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Flow Cu. M/ Hr | Flow L/sec |
| 1 | 0.06 | **0.00** | | | | | | | | | | | 0.06 | 0.02 |
| 2 | 0.13 | **0.01** | 0.08 | **0.00** | | | | | | | | | 0.12 | 0.03 |
| 3 | 0.19 | **0.03** | 0.12 | **0.01** | 0.08 | **0.00** | | | | | | | 0.18 | 0.05 |
| 4 | 0.25 | **0.05** | 0.16 | **0.02** | 0.10 | **0.01** | | | | | | | 0.24 | 0.07 |
| 5 | 0.32 | **0.08** | 0.20 | **0.03** | 0.13 | **0.01** | | | | | | | 0.30 | 0.08 |
| 6 | 0.38 | **0.11** | 0.24 | **0.04** | 0.15 | **0.01** | 0.10 | **0.00** | | | | | 0.36 | 0.10 |
| 7 | 0.44 | **0.15** | 0.28 | **0.05** | 0.18 | **0.02** | 0.11 | **0.01** | | | | | 0.42 | 0.12 |
| 8 | 0.51 | **0.19** | 0.32 | **0.06** | 0.20 | **0.02** | 0.13 | **0.01** | | | | | 0.48 | 0.13 |
| 9 | 0.57 | **0.24** | 0.36 | **0.08** | 0.23 | **0.03** | 0.14 | **0.01** | 0.11 | **0.00** | | | 0.54 | 0.15 |
| 10 | 0.63 | **0.29** | 0.40 | **0.09** | 0.25 | **0.03** | 0.16 | **0.01** | 0.12 | **0.01** | | | 0.60 | 0.17 |
| 12 | 0.76 | **0.40** | 0.48 | **0.13** | 0.30 | **0.04** | 0.19 | **0.01** | 0.15 | **0.01** | | | 0.72 | 0.20 |
| 14 | 0.89 | **0.53** | 0.56 | **0.18** | 0.35 | **0.06** | 0.22 | **0.02** | 0.17 | **0.01** | | | 0.84 | 0.23 |
| 16 | 1.01 | **0.68** | 0.64 | **0.23** | 0.40 | **0.07** | 0.26 | **0.02** | 0.20 | **0.01** | 0.12 | **0.00** | 0.96 | 0.27 |
| 18 | 1.14 | **0.85** | 0.72 | **0.28** | 0.45 | **0.09** | 0.29 | **0.03** | 0.22 | **0.02** | 0.14 | **0.01** | 1.08 | 0.30 |
| 20 | 1.27 | **1.04** | 0.80 | **0.34** | 0.50 | **0.11** | 0.32 | **0.04** | 0.24 | **0.02** | 0.16 | **0.01** | 1.20 | 0.33 |
| 22 | 1.39 | **1.23** | 0.88 | **0.41** | 0.55 | **0.13** | 0.35 | **0.04** | 0.27 | **0.02** | 0.17 | **0.01** | 1.32 | 0.37 |
| 24 | 1.52 | **1.45** | 0.96 | **0.48** | 0.60 | **0.15** | 0.38 | **0.05** | 0.29 | **0.03** | 0.19 | **0.01** | 1.44 | 0.40 |
| 26 | 1.65 | **1.68** | 1.04 | **0.55** | 0.66 | **0.18** | 0.42 | **0.06** | 0.32 | **0.03** | 0.20 | **0.01** | 1.56 | 0.43 |
| 28 | 1.77 | **1.93** | 1.12 | **0.63** | 0.71 | **0.21** | 0.45 | **0.07** | 0.34 | **0.04** | 0.22 | **0.01** | 1.68 | 0.47 |
| 30 | 1.90 | **2.19** | 1.20 | **0.72** | 0.76 | **0.23** | 0.48 | **0.08** | 0.37 | **0.04** | 0.23 | **0.01** | 1.80 | 0.50 |
| 32 | 2.03 | **2.47** | 1.28 | **0.81** | 0.81 | **0.26** | 0.51 | **0.09** | 0.39 | **0.05** | 0.25 | **0.02** | 1.92 | 0.53 |
| 34 | 2.15 | **2.77** | 1.36 | **0.91** | 0.86 | **0.29** | 0.54 | **0.10** | 0.42 | **0.05** | 0.26 | **0.02** | 2.04 | 0.57 |
| 36 | 2.28 | **3.07** | 1.44 | **1.01** | 0.91 | **0.33** | 0.58 | **0.11** | 0.44 | **0.06** | 0.28 | **0.02** | 2.16 | 0.60 |
| 38 | 2.41 | **3.40** | 1.52 | **1.12** | 0.96 | **0.36** | 0.61 | **0.12** | 0.47 | **0.06** | 0.30 | **0.02** | 2.28 | 0.63 |
| 40 | 2.53 | **3.74** | 1.60 | **1.23** | 1.01 | **0.40** | 0.64 | **0.13** | 0.49 | **0.07** | 0.31 | **0.02** | 2.40 | 0.67 |
| 42 | 2.66 | **4.09** | 1.68 | **1.34** | 1.06 | **0.44** | 0.67 | **0.14** | 0.51 | **0.08** | 0.33 | **0.02** | 2.52 | 0.70 |
| 44 | 2.78 | **4.46** | 1.76 | **1.47** | 1.11 | **0.47** | 0.70 | **0.16** | 0.54 | **0.08** | 0.34 | **0.03** | 2.64 | 0.73 |
| 46 | 2.91 | **4.84** | 1.84 | **1.59** | 1.16 | **0.52** | 0.74 | **0.17** | 0.56 | **0.09** | 0.36 | **0.03** | 2.76 | 0.77 |
| 48 | 3.04 | **5.24** | 1.92 | **1.72** | 1.21 | **0.56** | 0.77 | **0.18** | 0.59 | **0.10** | 0.37 | **0.03** | 2.88 | 0.80 |
| 50 | 3.16 | **5.65** | 2.00 | **1.86** | 1.26 | **0.60** | 0.80 | **0.20** | 0.61 | **0.10** | 0.39 | **0.03** | 3.00 | 0.83 |
| 55 | 3.48 | **6.74** | 2.20 | **2.22** | 1.39 | **0.72** | 0.88 | **0.24** | 0.67 | **0.12** | 0.43 | **0.04** | 3.30 | 0.92 |
| 60 | 3.80 | **7.92** | 2.40 | **2.60** | 1.51 | **0.84** | 0.96 | **0.28** | 0.73 | **0.15** | 0.47 | **0.05** | 3.60 | 1.00 |
| 65 | 4.11 | **9.18** | 2.60 | **3.02** | 1.64 | **0.98** | 1.04 | **0.32** | 0.80 | **0.17** | 0.51 | **0.06** | 3.90 | 1.08 |
| 70 | 4.43 | **10.53** | 2.80 | **3.46** | 1.76 | **1.12** | 1.12 | **0.37** | 0.86 | **0.19** | 0.54 | **0.06** | 4.20 | 1.17 |
| 75 | 4.75 | **11.97** | 3.01 | **3.94** | 1.89 | **1.27** | 1.20 | **0.42** | 0.92 | **0.22** | 0.58 | **0.07** | 4.50 | 1.25 |
| 80 | 5.06 | **13.49** | 3.21 | **4.44** | 2.02 | **1.44** | 1.28 | **0.48** | 0.98 | **0.25** | 0.62 | **0.08** | 4.80 | 1.33 |
| 85 | 5.38 | **15.09** | 3.41 | **4.96** | 2.14 | **1.61** | 1.36 | **0.53** | 1.04 | **0.28** | 0.66 | **0.09** | 5.10 | 1.42 |
| 90 | 5.70 | **16.78** | 3.61 | **5.52** | 2.27 | **1.79** | 1.44 | **0.59** | 1.10 | **0.31** | 0.70 | **0.10** | 5.40 | 1.50 |
| 95 | | | 3.81 | **6.10** | 2.39 | **1.97** | 1.52 | **0.65** | 1.16 | **0.34** | 0.74 | **0.11** | 5.70 | 1.58 |
| 100 | | | 4.01 | **6.70** | 2.52 | **2.17** | 1.60 | **0.72** | 1.22 | **0.38** | 0.78 | **0.12** | 6.00 | 1.67 |
| 110 | | | 4.41 | **8.00** | 2.77 | **2.59** | 1.76 | **0.86** | 1.35 | **0.45** | 0.86 | **0.15** | 6.60 | 1.83 |
| 120 | | | 4.81 | **9.40** | 3.02 | **3.04** | 1.92 | **1.01** | 1.47 | **0.53** | 0.93 | **0.17** | 7.20 | 2.00 |
| 130 | | | 5.21 | **10.90** | 3.28 | **3.53** | 2.08 | **1.17** | 1.59 | **0.61** | 1.01 | **0.20** | 7.80 | 2.17 |
| 140 | | | 5.61 | **12.50** | 3.53 | **4.05** | 2.24 | **1.34** | 1.71 | **0.70** | 1.09 | **0.23** | 8.40 | 2.33 |
| 150 | | | | | 3.78 | **4.60** | 2.40 | **1.52** | 1.84 | **0.79** | 1.17 | **0.26** | 9.00 | 2.50 |
| 175 | | | | | 4.41 | **6.12** | 2.80 | **2.02** | 2.14 | **1.06** | 1.36 | **0.35** | 10.5 | 2.92 |
| 200 | | | | | 5.04 | **7.84** | 3.20 | **2.59** | 2.45 | **1.35** | 1.56 | **0.45** | 12.0 | 3.33 |
| 225 | | | | | 5.67 | **9.74** | 3.60 | **3.22** | 2.76 | **1.68** | 1.75 | **0.56** | 13.5 | 3.75 |
| 250 | | | | | | | 4.00 | **3.92** | 3.06 | **2.05** | 1.94 | **0.68** | 15.0 | 4.17 |
| 275 | | | | | | | 4.40 | **4.68** | 3.37 | **2.44** | 2.14 | **0.81** | 16.5 | 4.58 |
| 300 | | | | | | | 4.80 | **5.49** | 3.67 | **2.87** | 2.33 | **0.95** | 18.0 | 5.00 |
| 325 | | | | | | | 5.20 | **6.37** | 3.98 | **3.33** | 2.53 | **1.10** | 19.5 | 5.42 |
| 350 | | | | | | | 5.60 | **7.31** | 4.29 | **3.82** | 2.72 | **1.26** | 21.0 | 5.83 |
| 375 | | | | | | | | | 4.59 | **4.34** | 2.92 | **1.44** | 22.5 | 6.25 |
| 400 | | | | | | | | | 4.90 | **4.89** | 3.11 | **1.62** | 24.0 | 6.67 |
| 450 | | | | | | | | | 5.51 | **6.08** | 3.50 | **2.01** | 27.0 | 7.50 |
| 500 | | | | | | | | | | | 3.89 | **2.45** | 30.0 | 8.33 |
| 550 | | | | | | | | | | | 4.28 | **2.92** | 33.0 | 9.17 |
| 600 | | | | | | | | | | | 4.67 | **3.43** | 36.0 | 10.0 |
| 650 | | | | | | | | | | | 5.06 | **3.98** | 39.0 | 10.8 |
| 700 | | | | | | | | | | | 5.45 | **4.57** | 42.0 | 11.7 |
| 750 | | | | | | | | | | | 5.83 | **5.19** | 45.0 | 12.5 |

**The shaded area represents velocities over 1.5 mps. Use with caution where water hammer is a concern.**

**Conversions:**
**Bar/100 M x 100 = kPa/100 M**
**Bar/100 M x 10.21 = Metres/100 M**
**Bar/100 M x 4.42 = PSI/100'**

# AUSTRALIAN STANDARD PVC PN 15 PLASTIC PIPE

**C = 150**

**Pressure Loss in Bar per 100 m  Slizes 80 mm through 300 mm**

| Nominal Size / Pipe ID / Pipe O.D. / Wall Thick | 80 mm 76.7 88.9 6.1 | | 100 mm 98.9 114.3 7.7 | | 150 mm 138.7 160.3 10.8 | | 200 mm 198.0 225.3 13.7 | | 250 mm 246.4 280.4 17.0 | | 300 mm 277.3 315.5 19.1 | | Nominal Size / Pipe ID / Pipe O.D. / Wall Thick | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Flow L/min | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Velocity MPS | Bar/ 100 M Loss | Flow Cu. M/Hr | Flow L/sec |
| 100 | 0.36 | **0.02** | 0.22 | **0.01** | | | | | | | | | 6.0 | 1.67 |
| 125 | 0.45 | **0.03** | 0.27 | **0.01** | | | | | | | | | 7.5 | 2.08 |
| 150 | 0.54 | **0.04** | 0.33 | **0.01** | | | | | | | | | 9.0 | 2.50 |
| 175 | 0.63 | **0.05** | 0.38 | **0.02** | | | | | | | | | 10.5 | 2.92 |
| 200 | 0.72 | **0.07** | 0.43 | **0.02** | | | | | | | | | 12.0 | 3.33 |
| 225 | 0.81 | **0.09** | 0.49 | **0.03** | 0.25 | **0.00** | | | | | | | 13.5 | 3.75 |
| 250 | 0.90 | **0.10** | 0.54 | **0.03** | 0.28 | **0.01** | | | | | | | 15.0 | 4.17 |
| 275 | 0.99 | **0.12** | 0.60 | **0.04** | 0.30 | **0.01** | | | | | | | 16.5 | 4.58 |
| 300 | 1.08 | **0.15** | 0.65 | **0.04** | 0.33 | **0.01** | | | | | | | 18.0 | 5.00 |
| 325 | 1.17 | **0.17** | 0.71 | **0.05** | 0.36 | **0.01** | | | | | | | 19.5 | 5.42 |
| 350 | 1.26 | **0.19** | 0.76 | **0.06** | 0.39 | **0.01** | | | | | | | 21.0 | 5.83 |
| 375 | 1.35 | **0.22** | 0.81 | **0.06** | 0.41 | **0.01** | | | | | | | 22.5 | 6.25 |
| 400 | 1.44 | **0.25** | 0.87 | **0.07** | 0.44 | **0.01** | | | | | | | 24.0 | 6.67 |
| 475 | 1.71 | **0.34** | 1.03 | **0.10** | 0.52 | **0.02** | | | | | | | 28.5 | 7.92 |
| 500 | 1.80 | **0.38** | 1.09 | **0.11** | 0.55 | **0.02** | | | | | | | 30.0 | 8.33 |
| 550 | 1.98 | **0.45** | 1.19 | **0.13** | 0.61 | **0.03** | 0.30 | **0.00** | | | | | 33.0 | 9.17 |
| 600 | 2.16 | **0.53** | 1.30 | **0.15** | 0.66 | **0.03** | 0.32 | **0.01** | | | | | 36.0 | 10.0 |
| 650 | 2.34 | **0.61** | 1.41 | **0.18** | 0.72 | **0.03** | 0.35 | **0.01** | | | | | 39.0 | 10.8 |
| 700 | 2.52 | **0.70** | 1.52 | **0.20** | 0.77 | **0.04** | 0.38 | **0.01** | | | | | 42.0 | 11.7 |
| 750 | 2.70 | **0.80** | 1.63 | **0.23** | 0.83 | **0.04** | 0.41 | **0.01** | | | | | 45.0 | 12.5 |
| 800 | 2.88 | **0.90** | 1.74 | **0.26** | 0.88 | **0.05** | 0.43 | **0.01** | | | | | 48.0 | 13.3 |
| 850 | 3.06 | **1.01** | 1.85 | **0.29** | 0.94 | **0.06** | 0.46 | **0.01** | | | | | 51.0 | 14.2 |
| 900 | 3.24 | **1.12** | 1.95 | **0.33** | 0.99 | **0.06** | 0.49 | **0.01** | | | | | 54.0 | 15.0 |
| 950 | 3.42 | **1.24** | 2.06 | **0.36** | 1.05 | **0.07** | 0.51 | **0.01** | | | | | 57.0 | 15.8 |
| 1000 | 3.60 | **1.36** | 2.17 | **0.40** | 1.10 | **0.08** | 0.54 | **0.01** | 0.35 | **0.00** | | | 60.0 | 16.7 |
| 1100 | 3.96 | **1.62** | 2.39 | **0.47** | 1.21 | **0.09** | 0.59 | **0.02** | 0.38 | **0.01** | | | 66.0 | 18.3 |
| 1200 | 4.32 | **1.90** | 2.61 | **0.56** | 1.32 | **0.11** | 0.65 | **0.02** | 0.42 | **0.01** | | | 72.0 | 20.0 |
| 1300 | 4.68 | **2.21** | 2.82 | **0.64** | 1.43 | **0.12** | 0.70 | **0.02** | 0.45 | **0.01** | | | 78.0 | 21.7 |
| 1400 | 5.04 | **2.53** | 3.04 | **0.74** | 1.54 | **0.14** | 0.76 | **0.03** | 0.49 | **0.01** | 0.39 | **0.00** | 84.0 | 23.3 |
| 1500 | 5.40 | **2.88** | 3.26 | **0.84** | 1.65 | **0.16** | 0.81 | **0.03** | 0.52 | **0.01** | 0.41 | **0.01** | 90.0 | 25.0 |
| 1600 | 5.76 | **3.24** | 3.47 | **0.95** | 1.76 | **0.18** | 0.87 | **0.03** | 0.56 | **0.01** | 0.44 | **0.01** | 96.0 | 26.7 |
| 1700 | | | 3.69 | **1.06** | 1.87 | **0.20** | 0.92 | **0.04** | 0.59 | **0.01** | 0.47 | **0.01** | 102 | 28.3 |
| 1800 | | | 3.91 | **1.18** | 1.98 | **0.23** | 0.97 | **0.04** | 0.63 | **0.01** | 0.50 | **0.01** | 108 | 30.0 |
| 1900 | | | 4.13 | **1.30** | 2.09 | **0.25** | 1.03 | **0.04** | 0.66 | **0.02** | 0.52 | **0.01** | 114 | 31.7 |
| 2000 | | | 4.34 | **1.43** | 2.20 | **0.27** | 1.08 | **0.05** | 0.70 | **0.02** | 0.55 | **0.01** | 120 | 33.3 |
| 2200 | | | 4.78 | **1.71** | 2.42 | **0.33** | 1.19 | **0.06** | 0.77 | **0.02** | 0.61 | **0.01** | 132 | 36.7 |
| 2400 | | | 5.21 | **2.01** | 2.64 | **0.38** | 1.30 | **0.07** | 0.84 | **0.02** | 0.66 | **0.01** | 144 | 40.0 |
| 2600 | | | 5.65 | **2.33** | 2.86 | **0.45** | 1.41 | **0.08** | 0.91 | **0.03** | 0.72 | **0.02** | 156 | 43.3 |
| 2800 | | | | | 3.08 | **0.51** | 1.51 | **0.09** | 0.98 | **0.03** | 0.77 | **0.02** | 168 | 46.7 |
| 3000 | | | | | 3.31 | **0.58** | 1.62 | **0.10** | 1.05 | **0.04** | 0.83 | **0.02** | 180 | 50.0 |
| 3200 | | | | | 3.53 | **0.66** | 1.73 | **0.12** | 1.12 | **0.04** | 0.88 | **0.02** | 192 | 53.3 |
| 3400 | | | | | 3.75 | **0.73** | 1.84 | **0.13** | 1.19 | **0.04** | 0.94 | **0.03** | 204 | 56.7 |
| 3600 | | | | | 3.97 | **0.82** | 1.95 | **0.14** | 1.26 | **0.05** | 0.99 | **0.03** | 216 | 60.0 |
| 3800 | | | | | 4.19 | **0.90** | 2.05 | **0.16** | 1.33 | **0.06** | 1.05 | **0.03** | 228 | 63.3 |
| 4000 | | | | | 4.41 | **0.99** | 2.16 | **0.18** | 1.40 | **0.06** | 1.10 | **0.03** | 240 | 66.7 |
| 4500 | | | | | 4.96 | **1.23** | 2.43 | **0.22** | 1.57 | **0.08** | 1.24 | **0.04** | 270 | 75.0 |
| 5000 | | | | | 5.51 | **1.50** | 2.70 | **0.27** | 1.75 | **0.09** | 1.38 | **0.05** | 300 | 83.3 |
| 5500 | | | | | | | 2.97 | **0.32** | 1.92 | **0.11** | 1.52 | **0.06** | 330 | 91.7 |
| 6000 | | | | | | | 3.24 | **0.37** | 2.09 | **0.13** | 1.65 | **0.07** | 360 | 100.0 |
| 6500 | | | | | | | 3.51 | **0.43** | 2.27 | **0.15** | 1.79 | **0.08** | 390 | 108.3 |
| 7000 | | | | | | | 3.78 | **0.49** | 2.44 | **0.17** | 1.93 | **0.10** | 420 | 116.7 |
| 7500 | | | | | | | 4.05 | **0.56** | 2.62 | **0.19** | 2.07 | **0.11** | 450 | 125.0 |
| 8000 | | | | | | | 4.33 | **0.63** | 2.79 | **0.22** | 2.21 | **0.12** | 480 | 133.3 |
| 8500 | | | | | | | 4.60 | **0.71** | 2.97 | **0.24** | 2.34 | **0.14** | 510 | 141.7 |
| 9000 | | | | | | | 4.87 | **0.79** | 3.14 | **0.27** | 2.48 | **0.15** | 540 | 150.0 |
| 9500 | | | | | | | 5.14 | **0.87** | 3.32 | **0.30** | 2.62 | **0.17** | 570 | 158.3 |
| 10000 | | | | | | | 5.41 | **0.96** | 3.49 | **0.33** | 2.76 | **0.19** | 600 | 166.7 |
| 10500 | | | | | | | 5.68 | **1.05** | 3.67 | **0.36** | 2.89 | **0.20** | 630 | 175.0 |
| 11000 | | | | | | | 5.95 | **1.14** | 3.84 | **0.39** | 3.03 | **0.22** | 660 | 183.3 |
| 11500 | | | | | | | | | 4.01 | **0.43** | 3.17 | **0.24** | 690 | 191.7 |
| 12000 | | | | | | | | | 4.19 | **0.46** | 3.31 | **0.26** | 720 | 200.0 |
| 13000 | | | | | | | | | 4.54 | **0.54** | 3.58 | **0.30** | 780 | 216.7 |
| 14000 | | | | | | | | | 4.89 | **0.62** | 3.86 | **0.35** | 840 | 233.3 |
| 15000 | | | | | | | | | 5.24 | **0.70** | 4.13 | **0.39** | 900 | 250.0 |
| 16000 | | | | | | | | | 5.59 | **0.79** | 4.41 | **0.44** | 960 | 266.7 |
| 17000 | | | | | | | | | 5.93 | **0.88** | 4.69 | **0.50** | 1020 | 283.3 |
| 18000 | | | | | | | | | | | 4.96 | **0.55** | 1080 | 300.0 |
| 19000 | | | | | | | | | | | 5.24 | **0.61** | 1140 | 316.7 |
| 20000 | | | | | | | | | | | 5.51 | **0.67** | 1200 | 333.3 |
| 21000 | | | | | | | | | | | 5.79 | **0.73** | 1260 | 350.0 |

**The shaded area represents velocities over 1.5 mps. Use with caution where water hammer is a concern.**

**Conversions:**
**Bar/100 M x 100 = kPa/100 M**
**Bar/100 M x 10.21 = Metres/100 M**
**Bar/100 M x 4.42 = PSI/100'**

# LOSS OF PRESSURE DUE TO FRICTION IN ORDINARY RUBBER HOSE

**Loss in Pounds per Sq. Inch (PSI) per 100' of Length Sizes ½" through 5"**

| Flow of Water in U.S. GPM | ½ | ⅝" | ¾" | 1" | 1¼" | 1½" | 2" | 2½" | 3" | 4" | 5" |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0.5 | 0.40 | | | | | | | | | | |
| 1.5 | 3.02 | 1.01 | 0.42 | | | | | | | | |
| 2.5 | 7.75 | 2.58 | 1.08 | | | | | | | | |
| 5 | 27.80 | 9.27 | 3.86 | 0.95 | 0.32 | 0.13 | | | | | |
| 10 | 99.50 | 33.20 | 13.80 | 3.38 | 1.14 | 0.47 | | | | | |
| 15 | | 71.00 | 29.60 | 7.25 | 2.45 | 1.01 | 0.25 | 0.08 | | | |
| 20 | | 121.00 | 50.30 | 12.40 | 4.15 | 1.71 | 0.42 | 0.14 | | | |
| 25 | | | 76.50 | 18.70 | 6.34 | 2.60 | 0.64 | 0.22 | | | |
| 30 | | | 108.00 | 26.50 | 8.96 | 3.68 | 0.90 | 0.30 | 0.13 | | |
| 35 | | | 142.00 | 34.80 | 11.80 | 4.83 | 1.18 | 0.40 | 0.17 | | |
| 40 | | | | 44.70 | 15.10 | 6.20 | 1.52 | 0.51 | 0.21 | | |
| 45 | | | | 55.00 | 18.60 | 7.65 | 1.87 | 0.63 | 0.26 | | |
| 50 | | | | 67.50 | 22.80 | 9.35 | 2.28 | 0.78 | 0.32 | | |
| 60 | | | | 94.30 | 31.80 | 13.10 | 3.19 | 1.08 | 0.45 | | |
| 70 | | | | 126.00 | 42.50 | 17.50 | 4.25 | 1.44 | 0.60 | | |
| 80 | | | | | 50.60 | 22.50 | 5.48 | 1.86 | 0.77 | | |
| 90 | | | | | 67.50 | 27.80 | 6.80 | 2.30 | 0.95 | 0.23 | |
| 100 | | | | | 81.50 | 33.50 | 8.19 | 2.78 | 1.15 | 0.28 | |
| 125 | | | | | 124.00 | 50.60 | 12.40 | 4.20 | 1.73 | 0.43 | |
| 150 | | | | | | 72.10 | 17.60 | 5.97 | 2.46 | 0.60 | 0.20 |
| 175 | | | | | | 94.50 | 23.10 | 7.83 | 3.23 | 0.79 | 0.27 |
| 200 | | | | | | 122.00 | 29.60 | 10.10 | 4.15 | 1.02 | 0.34 |
| 225 | | | | | | | 36.80 | 12.50 | 5.15 | 1.26 | 0.43 |
| 250 | | | | | | | 44.60 | 15.20 | 6.25 | 1.53 | 0.52 |
| 275 | | | | | | | 55.30 | 18.10 | 7.45 | 1.83 | 0.62 |
| 300 | | | | | | | 62.50 | 21.20 | 8.75 | 2.15 | 0.73 |

# ROUGHNESS COEFFICIENT C VALUES FOR HAZEN-WILLIAMS EQUATION

| Values of C Type Of Pipe | Range | New Pipe | Design C |
|---|---|---|---|
| PVC | 160–145 | 150 | 150 |
| Polyethylene | 150–130 | 140 | 140 |
| Asbestos-Cement | 160–140 | 150 | 140 |
| Cement-Lined Steel | 160–140 | 150 | 140 |
| Welded Steel | 150–80 | 140 | 100 |
| Riveted Steel | 140–90 | 110 | 100 |
| Concrete | 150–85 | 120 | 100 |
| Wrought or Cast Iron | 150–80 | 130 | 100 |
| Copper, Brass | 150–120 | 140 | 130 |
| Wood Stave | 145–110 | 120 | 110 |
| Vitrified Clay | | 110 | 100 |
| Corrugated Steel | | 60 | 60 |

Above values of C are for use with Hazen-Williams Equation, friction head losses in PSI per foot of pipe length for fresh water at 60˚F.

$$H_f = 0.00090194\left(\frac{100}{C}\right)^{1.852} \frac{Q^{1.852}}{d^{4.866}}$$

**Where:**

$H_f$ = Head loss due to friction in pounds per square inch (PSI)

C = Hazen-Williams coefficient for roughness of the inside of the pipe

Q = Flow in gallons per minute (GPM)

d = Inside diameter of pipe in inches

L = Length of pipe in feet

# REFERENCE TABLES FOR SELECTED DATA

**Head Losses Through Standard Foot Valves**

| | 1½" | 2" | 2½" | 3" | 4" | 6" | 8" | 10" | 12" |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Flow in GPM | | | | |
| **Head Loss in Feet** | | | | | | | | | |
| 1 | 39 | 66 | 96 | 152 | 268 | 632 | 1122 | 1805 | 2603 |
| 2 | 57 | 97 | 140 | 221 | 390 | 919 | 1632 | 2625 | 3786 |
| 3 | 71 | 120 | 175 | 275 | 486 | 1145 | 2032 | 3269 | 4713 |
| 4 | 83 | 141 | 204 | 322 | 568 | 1337 | 2374 | 3819 | 5507 |
| 5 | 94 | 159 | 230 | 363 | 641 | 1509 | 2678 | 4308 | 6213 |
| 6 | 104 | 175 | 254 | 401 | 707 | 1665 | 2956 | 4755 | 6836 |
| 7 | 113 | 190 | 276 | 435 | 769 | 1810 | 3212 | 5168 | 7452 |
| 8 | 121 | 205 | 297 | 468 | 826 | 1945 | 3453 | 5555 | 8010 |
| 9 | 129 | 218 | 317 | 499 | 880 | 2073 | 3680 | 5920 | 8636 |
| 10 | 137 | 231 | 335 | 528 | 932 | 2195 | 3896 | 6267 | 9037 |

# TABLE OF APPROXIMATE PRESSURE LOSSES FOR PIPE FITTINGS

**Listed in Equivalent Feet of Pipe**

| **Steel Fitting Type** | ½" | ¾" | 1" | 1¼" | 1½" | 2" | 2½" | 3" | 4" | 6" | 8" |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Coupling | 0.6 | 0.8 | 1.0 | 1.2 | 1.5 | 2.0 | 2.5 | 3.0 | 4.0 | 6.0 | 8.0 |
| Run of St. Tee | 1.0 | 1.0 | 1.5 | 2.0 | 2.0 | 2.5 | 3.0 | 4.0 | 5.0 | 7.0 | 10.0 |
| Tee, Side Outlet | 3.0 | 4.5 | 5.0 | 7.0 | 9.0 | 11.0 | 13.0 | 16.0 | 20.0 | 31.0 | 42.0 |
| Tee, Run Reduced ½" | 1.5 | 2.5 | 3.0 | 4.0 | 5.0 | 6.0 | 7.0 | 8.0 | 12.0 | 16.0 | 20.0 |
| Elbow, 90° | 1.5 | 2.5 | 3.0 | 4.0 | 5.0 | 6.0 | 7.0 | 8.0 | 12.0 | 16.0 | 20.0 |
| Elbow, 45° | 0.75 | 1.0 | 1.3 | 1.7 | 2.0 | 2.5 | 3.0 | 3.5 | 5.0 | 7.5 | 10.0 |
| Corporation Stop | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | 9.0 | | | | | |
| Curb Stop | 6.0 | 6.0 | 7.0 | 7.0 | 8.0 | 8.0 | | | | | |

| **Plastic IPS or Copper Fitting Type** | ½" | ¾" | 1" | 1¼" | 1½" | 2" | 2½" | 3" | 4" | 6" | 8" |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Coupling | 1.5 | 2.5 | 3.0 | 3.0 | 4.0 | 6.0 | 7.0 | 8.0 | 11.0 | 18.0 | 24.0 |
| Run of St. Tee | 2.5 | 3.0 | 4.0 | 5.0 | 6.0 | 8.0 | 9.0 | 11.0 | 15.0 | 21.0 | 28.0 |
| Tee, Side Outlet | 7.0 | 9.0 | 12.0 | 15.0 | 18.0 | 24.0 | 30.0 | 36.0 | 45.0 | 70.0 | 90.0 |
| Tee, Run Reduced ½" | 3.5 | 4.5 | 6.0 | 8.0 | 9.0 | 11.0 | 14.0 | 17.0 | 24.0 | 34.0 | 45.0 |
| Elbow, 90° | 3.5 | 4.5 | 6.0 | 8.0 | 9.0 | 11.0 | 14.0 | 17.0 | 24.0 | 34.0 | 45.0 |
| Elbow, 34° | 1.5 | 2.0 | 3.0 | 3.5 | 4.0 | 5.0 | 7.0 | 8.0 | 10.0 | 16.0 | 20.0 |

To use this chart, multiply the approximate equivalent feet of pipe value by the proper pipe pressure loss per 100' rating, then divide by 100. The result is the fitting loss in PSI.

Note: It is recommended that the above chart be used only when the manufacturer's recommended pressure loss values are not available.

# PRESSURE LOSS THROUGH SWING CHECK VALVES

**Pressure Loss (PSI)**

| Flow GPM | Valve Size ½" | ¾" | 1" | 1¼" | 1½" | 2" |
|---|---|---|---|---|---|---|
| 2 | 0.2 | | | | | |
| 3 | 0.5 | | | | | |
| 6 | 1.0 | 0.3 | | | | |
| 8 | 1.7 | 0.5 | | | | |
| 10 | 2.6 | 0.8 | 0.3 | | | |
| 12 | 3.6 | 1.1 | 0.5 | | | |
| 14 | 4.8 | 1.5 | 0.6 | | | |
| 16 | | 2.0 | 0.9 | | | |
| 18 | | 2.4 | 1.0 | | | |
| 20 | | 3.0 | 1.2 | 0.4 | | |
| 22 | | 3.5 | 1.4 | 0.5 | | |
| 24 | | 4.1 | 1.7 | 0.6 | | |
| 26 | | 4.8 | 2.0 | 0.7 | 0.4 | |
| 28 | | | 2.2 | 0.8 | 0.5 | |
| 30 | | | 2.5 | 0.9 | 0.5 | |
| 32 | | | 2.9 | 1.1 | 0.6 | |
| 34 | | | 3.2 | 1.2 | 0.6 | |
| 36 | | | 3.6 | 1.3 | 0.7 | |
| 38 | | | 3.9 | 1.5 | 0.8 | |
| 40 | | | 4.3 | 1.6 | 0.8 | 0.3 |
| 42 | | | 4.7 | 1.7 | 0.9 | 0.3 |
| 44 | | | | 1.9 | 1.0 | 0.4 |

| Flow GPM | Valve Size 1¼" | 1½" | 2" | 2½" | 3" | 4" |
|---|---|---|---|---|---|---|
| 46 | 2.1 | 1.1 | 0.4 | | | |
| 48 | 2.2 | 1.2 | 0.5 | | | |
| 50 | 2.4 | 1.3 | 0.5 | | | |
| 55 | 2.9 | 1.5 | 0.6 | | | |
| 60 | 3.4 | 1.8 | 0.7 | | | |
| 65 | 3.9 | 2.0 | 0.8 | | | |
| 70 | 4.5 | 2.4 | 0.9 | 0.4 | | |
| 75 | | 2.7 | 1.0 | 0.5 | | |
| 80 | | 3.0 | 1.2 | 0.6 | | |
| 90 | | 3.7 | 1.5 | 0.7 | | |
| 100 | | 4.6 | 1.8 | 0.9 | 0.4 | |
| 120 | | | 2.5 | 1.2 | 0.5 | |
| 140 | | | 3.3 | 1.6 | 0.7 | |
| 160 | | | 4.3 | 2.1 | 0.9 | 0.3 |
| 180 | | | 5.3 | 2.6 | 1.1 | 0.4 |
| 200 | | | 6.5 | 3.1 | 1.4 | 0.5 |
| 250 | | | | 4.7 | 2.1 | 0.7 |
| 300 | | | | 6.6 | 2.9 | 1.0 |
| 350 | | | | | 3.8 | 1.3 |
| 400 | | | | | 4.9 | 1.7 |
| 450 | | | | | | 2.1 |
| 500 | | | | | | 2.6 |

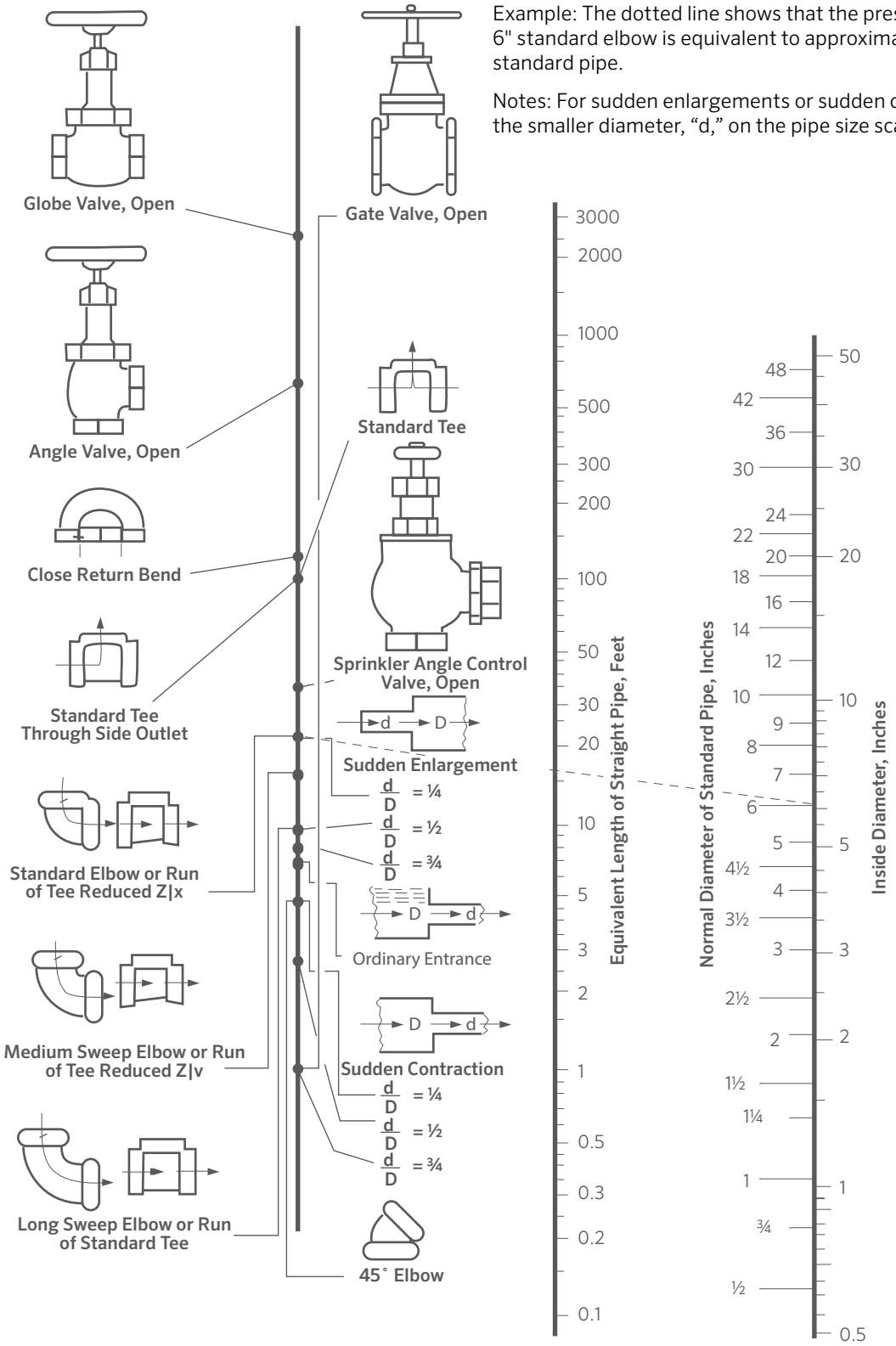
# PRESSURE LOSSES THROUGH COPPER AND BRONZE FITTINGS

**Equivalent Feet of Straight Tubing**

| Nominal Tube Size | Wrought Copper 90° Elbow | 45° Elbow | Tee Run | Tee Side Outlet | 90° Bend |
|---|---|---|---|---|---|
| ⅜ | 0.5 | 0.5 | 0.5 | 1 | 0.5 |
| ½ | 0.5 | 0.5 | 0.5 | 1 | 0.5 |
| ⅝ | 0.5 | 0.5 | 0.5 | 2 | 1 |
| ¾ | 1 | 0.5 | 0.5 | 2 | 1 |
| 1 | 1 | 1 | 0.5 | 3 | 2 |
| 1¼ | 2 | 1 | 0.5 | 4 | 2 |
| 1½ | 2 | 2 | 1 | 5 | 2 |
| 2 | 2 | 2 | 1 | 7 | 3 |
| 2½ | 2 | 3 | 2 | 9 | 4 |
| 3 | 3 | 4 | | | 5 |
| 3½ | 4 | | | | 7 |
| 4 | | | | | 8 |
| 5 | | | | | 10 |
| 6 | | | | | 13 |

| Cast Bronze 180° Bend | 90° Elbow | 45° Elbow | Tee Run | Tee Side Outlet | Compression Stop |
|---|---|---|---|---|---|
| ½ | 1 | 0.5 | 0.5 | 2 | 9 |
| 1 | 1 | 1 | 0.5 | 2 | 13 |
| 1 | 2 | 1 | 0.5 | 3 | 17 |
| 2 | 2 | 1 | 0.5 | 3 | 21 |
| 2 | 4 | 2 | 0.5 | 5 | 30 |
| 3 | 5 | 2 | 1 | 7 | |
| 4 | 8 | 3 | 1 | 9 | |
| 8 | 11 | 5 | 2 | 12 | |
| 16 | 14 | 8 | 2 | 16 | |
| 20 | 18 | 11 | 2 | 20 | |
| 24 | 24 | 14 | 2 | 31 | |
| 28 | 28 | 17 | 2 | 37 | |
| 37 | 41 | 22 | 2 | 48 | |
| 47 | 52 | 28 | 2 | 61 | |

# PRESSURE LOSSES IN VALVES AND FITTINGS




Example: The dotted line shows that the pressure loss in a 6" standard elbow is equivalent to approximately 16' of 6" standard pipe.

Notes: For sudden enlargements or sudden contractions, use the smaller diameter, “d,” on the pipe size scale.

# NOTES

Helping our customers succeed is what drives us. While our passion for innovation and engineering is built into everything we do, it is our commitment to exceptional support that we hope will keep you in the Hunter family of customers for years to come.

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