

# HYDRO•RAIN®

*Built for Speed®*



## IRRIGATION & LIGHTING **PRODUCT CATALOG**



# WHY US

**Hydro-Rain®**  
Not “just another  
name” in the  
marketplace.

We understand that time is money, so our products are designed to save you time. Whether it is programming a controller, installing the system, or adjusting the system, our products go together faster and easier.

You have better things to do than doing a job twice. Every product we sell goes through rigorous testing before we put our name on it.

Have a problem with one of our products? We want to know about it. If any product fails within three years, we will replace it. And we'll probably ask to have that failed product back, so we can make it better.

The heart of Hydro-Rain values are integrity, fair dealing, and lasting relationships between manufacturer, distributor, and contractor. We want to build lasting relationships that benefit all parties.



QUALITY MANAGEMENT SYSTEM ISO 9001:2015

Hydro-Rain® products are manufactured in facilities complying with ISO 9001:2015 quality requirements for the following scope: Design, manufacturing and distribution of residential and commercial irrigation products. Factories hold Certificate No: TRC01241





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Dashboard & App

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# 3 YEAR

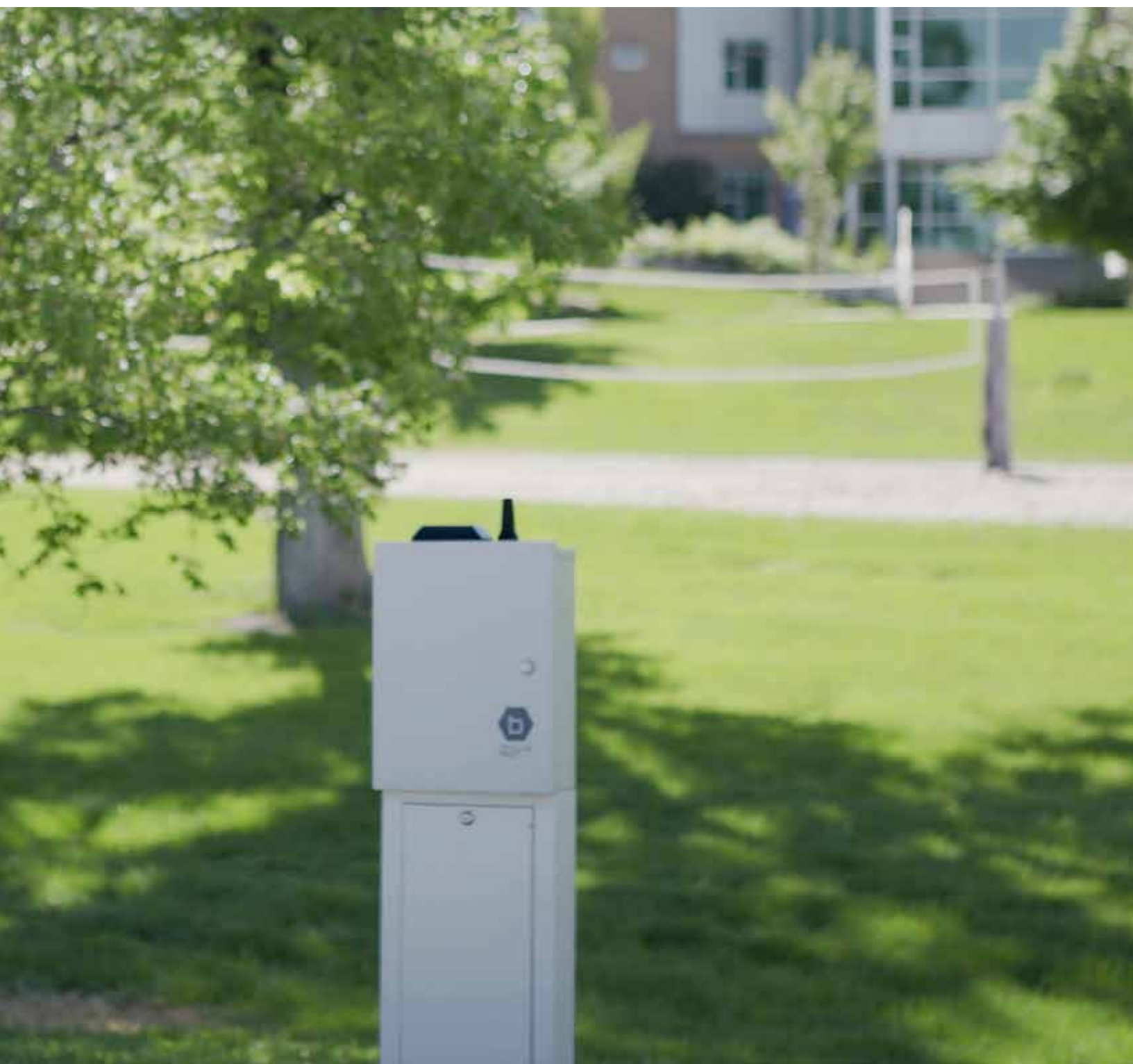
### Warranty

Hydro-Rain® warrants to its customers that its products will be free from defects in materials and workmanship for a period of three years from the date of purchase. We will replace, free of charge, the defective part or parts found to be defective under normal use and service for a period of up to three years after purchase (proof of purchase required). We reserve the right to inspect the defective part prior to replacement. Hydro-Rain® will not be responsible for consequential or incidental cost or damage caused by the product failure. Hydro-Rain® liability under this warranty is limited solely to the replacement or repair of defective parts. To exercise your warranty, return the unit to your dealer with a copy of the sales receipt.

Two year warranty extension available to Hydro-Rain® Contractor Advantage "Premier Level" contractors.

# CONNECTED DEVICES

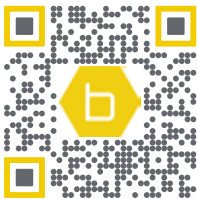
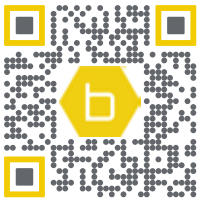




## B-HYVE PRO DASHBOARD AND APP

Simplify  
Irrigation System  
Management

b•hyve  
PRO



### Easy to Use

Access your customers' controllers from the app using your phone, tablet, computer, or at the controller itself.

### Save Water

WeatherSense™ technology accesses real-time local weather and soil data to ensure that lawns and gardens get exactly the water they need, when they need it. No more watering in the rain.

### Multi-Site Management

Allows you to monitor and control all your customers' controllers from anywhere in the world. Add an unlimited number of controllers to your account.

### Save Time

No more driving back and forth to customers' homes for simple programming adjustments; control it from wherever you are. Or simply set it to smart water and let Mother Nature determine the watering schedule.

### No Annual Fee

Get the control you want without any upfront costs or annual fees.

### Scalable Management

Manage tens, hundreds, or even thousands of controllers. Easily check how many timers are on-line, off-line, running a grow-in program, in rain delay, and so much more.

### Multi-User Support

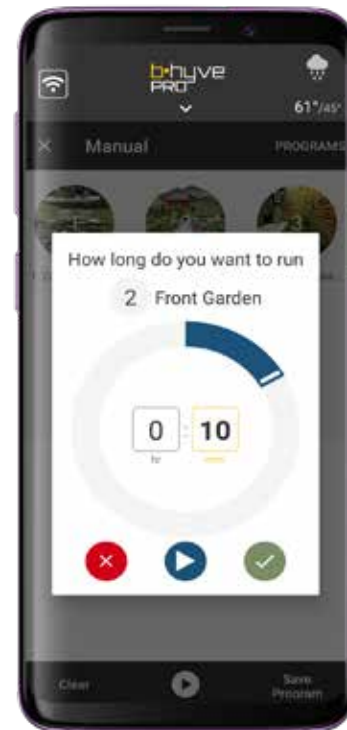
Set different permission levels to give contractors and property managers access to specific controllers. Then they can group and label the controllers based on their preferences (e.g., winterized, spring start-up).

### Reports

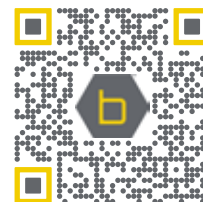
See when a controller watered or how much it rained.

### One Click Control

Control all of your customers' controllers with the click of a button, making it easy to turn them off for the winter and on in the spring.



Scan to Learn  
More About  
B-hyve



## HRT CUP

Make Auditing  
Easier and  
Faster Than  
Ever Before

### Features

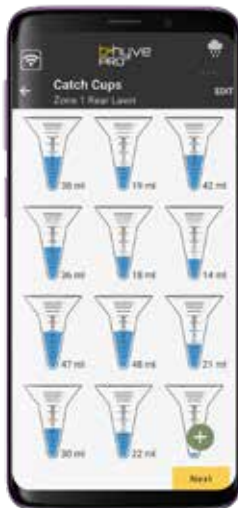
- Industry standard 16.25 square inch average throat area
- Measures sprinkler application in milliliters and centimeters
- Hydro-Rain®'s B-hyve™ Pro App gives readouts on the go. Works with all major mobile devices and tablets
- UV protected plastic cups and stakes make for long-lasting catch cups that will withstand the pressures of professional use
- Catch cups come in packs of twelve, and can easily be expanded to provide more accuracy
- Installed and gathered quickly so you can get on to the next job
- 7" stake securely holds the catch cup

### Contractor Advantages

- Helps identify issues with the irrigation system
- B-hyve™ Pro app does all the calculations in seconds
- Results are automatically imported into B-hyve™ software



connected  
devices



[irrigationaudit.hydrorain.com](http://irrigationaudit.hydrorain.com)



### How to Specify

|     | Model            |
|-----|------------------|
| HRT | Hydro-Rain Tools |
|     | Series           |
| CUP | 200 ML Cup       |

### SKU (Model)

- HRT-CUP (26251)

## HSC

Modular  
Controllerb-hyve  
PRO

## Features

- Independent programs: 4
- Start times per program: 4
- Maximum station run time: 4 hours (240 minutes)
- 3-year warranty, 5-year warranty for Premier Level Contractors
- Two integrated flow sensor inputs
- Two dedicated master valve or pump start terminals by zone
- 2.4 GHz Wi-Fi, 5 GHz Wi-Fi, Bluetooth, 900 MHz, or CAT-5 Ethernet connectivity
- Optional cellular connectivity available with a Hydro-Rain cellular module
- Non-volatile memory stores programming settings without battery
- 16-gauge powder coated metal wall mount enclosure
- Key-hole mounting for easy installation
- UL listed, NEMA-3R weather-resistant stainless steel
- Free and automatic firmware and software upgrades
- Includes USB charging port and shelf for resting a phone or tablet
- Simultaneously run two programs
- Support for up to 48 Station
- B-hyve Pro and B-hyve app compatible
- Built in Irrigation Audit feature guides you through audits quickly to identify D.U. and efficiency



## How to Specify

|         | Model                  |
|---------|------------------------|
| HSC     | High Station Count     |
| BHP     | B-hyve Pro             |
| Series  |                        |
| 1600    | 16 Station             |
| 800     | 8 Station              |
| Cell    | Cellular Communication |
| Options |                        |
| M       | Modular Base           |
| MD      | Module                 |

## SKU (Model)

- HSC-1600-M (04550)
- HSC-800-MD (04551)
- BHP-CELL-MD (04450)

## Physical Specifications

- 16" high x 11.5" wide x 5" deep
- 10 lbs

## Electrical Specifications

- Input Power:  
120/208/240 VAC +/- 10%, (60 Hz)
- Output Power:  
24 VAC (60 Hz)  
Station output (24 VAC): 0.56 A  
P/MV output (24 VAC): 0.32 A

## HSC

Two-Wire  
Controller

b•hyve  
PRO



### How to Specify

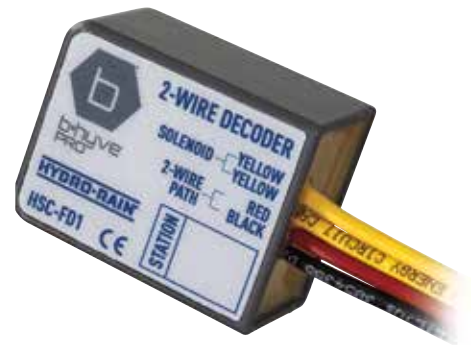
|      | Model                        |
|------|------------------------------|
| HSC  | High Station Count           |
| BHP  | B-hyve Pro                   |
|      | Series                       |
| 6300 | 63 Station                   |
| DP   | Decoder Programmer           |
| FD1  | Single Station Field Decoder |
| Cell | Cellular Communication       |
|      | Options                      |
| D    | Decoder                      |
| MD   | Module                       |

### Features

- Independent programs: 4
- Start times per program: 4
- Maximum station run time: 4 hours (240 minutes)
- 3-year warranty, 5-year warranty for Premier Level Contractors
- Two integrated flow meter inputs support Data Industrial®, CST, Netafim™, and other flow sensors with custom "K and offset" values
- Two dedicated master valve or pump start terminals by zone
- 2.4 GHz Wi-Fi, 5 GHz Wi-Fi, Bluetooth, 900 MHz, or CAT-5 Ethernet connectivity
- Optional cellular connectivity available with a Hydro-Rain cellular module
- Non-volatile memory stores programming settings without battery
- 16 gauge powder coated metal wall mount enclosure
- Standard CH751 keyed lock
- Key-hole mounting for easy installation
- UL listed, NEMA-3R weather-resistant stainless steel
- Free and automatic firmware and software upgrades
- Includes USB charging port and shelf for resting a phone or tablet
- Simultaneously run 2 programs
- Support for up to 63 field decoders
- Suggested wire size: 12 AWG
- 5300 foot range with one active valve
- B-hyve Pro and B-hyve app compatible
- Built in Irrigation Audit feature guides you through audits quickly to identify D.U. and efficiency
- AC technology means grounding is only required at Controller

### SKU (Model)

- HSC-6300-D (04554)
- HSC-DP (04553)
- HSC-FD1 (04555)
- BHP-CELL-MD (04450)



### Physical Specifications

- 16" high x 11.5" wide x 5" deep
- 10 lbs

### Electrical Specifications

- Input Power: 120/208/240 VAC +/- 10%, (60 Hz)
- Output Power: 24 VAC (60 Hz)  
Station output (24 VAC): 0.56 A  
P/MV output (24 VAC): 0.32 A  
Maximum output: 3.3 A

## HRC 400

Smart Wi-Fi  
Indoor/Outdoor  
Controller

b•hyve  
PRO™



### Features

- Available in 8 or 16 station
- Indoor and outdoor locking enclosure
- Bluetooth® and 2.4 GHz Wi-Fi enabled
- B-hyve Pro™ and B-hyve™ compatible
- Dedicated master valve/pump start terminal
- EPA WaterSense® certified
- Rain delay from 24 hours up to 32 days
- Advanced sensor ports
- 4 programs with 4 start times per program
- Programs stored in non-volatile memory
- Station timing from 1-240 minutes
- Up to 16 start times per day
- Programming schedule: days of week, watering intervals, and odd/even days
- Keyhole mounting for easy installation
- 3-year warranty, 5-year warranty for Premier Level Contractors
- Fully programmable at controller
- Built in Irrigation Audit feature guides you through audits quickly to identify D.U. and efficiency



### Specifications

- Transformer:  
Input 120VAC  
Output 24-26VAC 1A
- Max holding 24VAC 0.5A  
Max inrush 24VAC 2.25A
- Pump/master valve:  
Holding 24-26VAC 0.4A  
Inrush 24VAC 2.2A
- Water budgeting: adjusts 10% to 200% in 10% increments

### Approvals

- FCC, CSA

### How to Specify

|     | Model                |
|-----|----------------------|
| HRC | Controller           |
|     | Series               |
| 400 | Smart Indoor/Outdoor |
|     | Type                 |
| WF  | Wi-Fi                |
|     | Stations             |
| 8   | 8 Station            |
| 16  | 16 Station           |

### SKU (Model)

- HRC-400-WF-8 (04080)
- HRC-400-WF-16 (04082)

# HRC 410

Smart Wi-Fi  
Indoor Controller

b•hyve  
PRO



## Features

- Available in 8 station
- Indoor enclosure
- Bluetooth® and 2.4 GHz Wi-Fi enabled
- B-hyve Pro™ and B-hyve™ compatible
- Master valve capable
- EPA WaterSense® certified
- Rain delay from 24 hours up to 32 days
- Advanced sensor ports
- 4 programs with 4 start times per program
- Programs stored in non-volatile memory
- Station timing from 1-240 minutes
- Up to 16 start times per day
- Programming schedule: days of week, watering intervals, and odd/even days
- Single button for a sleek clean look
- 3-year warranty, 5-year warranty for Premier Level Contractors
- Built in Irrigation Audit feature guides you through audits quickly to identify D.U. and efficiency



connected  
devices

## How to Specify

|     | Model        |
|-----|--------------|
| HRC | Controller   |
|     | Series       |
| 410 | Smart Indoor |
|     | Type         |
| WF  | Wi-Fi        |
|     | Stations     |
| 8   | 8 Station    |

## SKU (Model)

- HRC-410-WF-8 (04060)

## Specifications

- Transformer:  
Input 120VAC  
Output 24-26VAC 0.75A
- Max holding 24VAC 0.5A  
Max inrush 24VAC 1.2A
- Water budgeting: adjusts 10% to 200% in 10% increments

## Approvals

- FCC, CSA



## CMS

Control and  
Monitoringb.hyve  
PRO

## Features

- Program with smart device
- Compatible with 6-AA batteries
- 3-year warranty, 5-year warranty for Premier Level Contractors
- Connects over Bluetooth® or 900 MHz
- Optional cellular connectivity available with a Hydro-Rain cellular module
- IP68 Rating with lid secured
- Control Unit body easily fits in 2 1/2" hole
- Non-volatile memory stores programming settings without battery
- Free and automatic firmware and software upgrades
- Controls 1 to 8 valves, or monitors flow using accessory modules
- Hydro-Rain latching solenoid is compatible with all Hydro-Rain HRZ, HRA, and HRJ valves
- Hydro-Rain latching solenoid is compatible with HRB, HRV, and HRP valves when used with an adapter
- Solenoid adapters available for most Rainbird®, Hunter®, Toro®, Irritrol®, K-Rain®, or Orbit® valves
- 100' maximum solenoid wire run from adapter module when using 18 AWG wire
- Works with the following Flow Meters:
  - » Data Industrial (Badger Meter) IR-220 Series (PVC models)
  - » Creative Sensor Technologies FSI-T Series
  - » Netafim Reed Switch Register-type Series
  - » Bermad 900 Series Reed Switch Register-type Series



## Physical Specifications

- 3.75" high x 4.5" wide x 4.5" deep
- 1 lbs

## Electrical Specifications

## Input Power:

- 6-AA Batteries

## Output Power:

Station Output: 9-14 VDC  
P/MV Output 9-14 VDC

## Range:

- Bluetooth: 100 feet
- 900 MHz: 5 miles
- Cellular: 10 miles



CMS-1VDC-MD

## How to Specify

|      | Model              |
|------|--------------------|
| CMS  | Controller         |
|      | Series             |
| CU   | Communication Unit |
| FM   | Flow Meter         |
| 1VDC | Single DC Solenoid |
| 4VDC | Quad DC Solenoid   |
| 25   | Length             |
| WM   | Wall Mount Type    |
| MD   | Bluetooth          |
| EXT  | Extension          |

## SKU (Model)

## Kits:

- CMS-4V-KIT (04401)
- CMS-FLO-KIT (04404)

## Components:

- CMS-CU (04400)
- CMS-FM-MD (04415)
- CMS-1VDC-MD (04430)
- CMS-4VDC-MD (04434)
- CMS-25-EXT (04425)
- CMS-WM (04460)
- BHP-CELL (04450)



### No Wires

The battery powered Irrigation Control and Monitoring system (CMS) is the most versatile smart irrigation device on the market today. Without the need for wires, it allows users to expand their irrigation systems or to reconnect valves where wires have been cut. And don't let its compact size fool you. The long range capabilities of this product accommodate almost any landscape.



### Smart Controls

With apps for both iOS and Android, you can access and control your device from anywhere – no more running back and forth to activate valves. It also uses WeatherSense™ technology and connects to a local weather feed to determine how much water is needed, based on the time of year.



### Smart Connectivity

The long range radios featured in this device allow for Wi-Fi, 900 MHz, Cellular, or Bluetooth® connectivity giving you a range of options, based on your needs. Using 900 MHz gives you the important capability to place the device at grade, without sacrificing functionality.



### Versatile

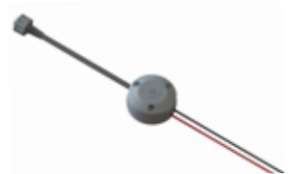
In addition to controlling your valves remotely with your smart phone, you can also control a master valve and monitor a flow meter to the device. By connecting a flow meter and master valve, you can shut down your irrigation system automatically or remotely if leaks are detected.



CLOUD BASED APP



CONTROL UNIT



MODULE



VALVE



## XD

Connected Hose  
Bib Controllerb•hyve  
PRO

## Features

- Program with smart device
- Compatible with 2 AA batteries
- 3-year warranty, 5-year warranty for Premier Level Contractors
- Programmable at the device, over Bluetooth, or over Wi-Fi with GEN 2 Hub
- Bluetooth 5 provides a maximum communication range of 800 feet
- IPX5 Rating with battery drawer secured
- Brass Hose Swivel
- Non-volatile memory stores programming settings without battery
- Free and automatic firmware and software upgrades
- Manual Rain Delay from 24 hours to 7 days
- Built in Irrigation Audit feature guides you through audits quickly to identify D.U. and Efficiency
- Bluetooth Mesh extends the range when each controller is within 100 feet of another controller or hub
- B-hyve Pro™ and B-hyve™ compatible
- EPA WaterSense Approved when connected to the B-hyve Cloud over Wi-Fi



## Specifications

- Power source: 2 AA batteries
- Recommended Bluetooth range: 100 feet
- Operating pressure: 10-100 psi
- Operating flow: 3-11 GPM
- Cycle run time from 1-240 minutes
- Up to 4 start times per day
- Programming schedule:  
At device: 1 hr, 3 hr, 6 hr, 12 hr, 1 day, 7 day  
On app: days of week, watering intervals, odd/even days, Smart watering

## Approvals

- UL, CSA, CE, FCC, IC

## SKU (Model)

- 24511 - Single Port
- 24632 - Dual Port
- 24634 - Quad Port
- 21027 - GEN 2 Hub



# HRC 480

Smart Hose  
Bib Controller

b•hyve  
PRO



## Features

- Program with smart device
- Compatible with 2 AA batteries
- 3-year warranty, 5-year warranty for Premier Level Contractors
- Programmable over Bluetooth®
- IP34 Rating with battery drawer secured
- Brass Hose Swivel
- Non-volatile memory stores programming settings without battery
- Free and automatic firmware and software upgrades
- Automatic Rain Delay from 24 hours to 32 days
- Built in Irrigation Audit feature guides you through audits quickly to identify D.U. and Efficiency
- Bluetooth Mesh extends the range when each controller is within 100 feet of another controller or hub
- Built in Flow Meter
- Hub converts BLE signal to 2.4 GHz Wi-Fi
- Rain Delay from 24 hours to 32 days
- B-hyve Pro™ and B-hyve™ compatible
- EPA WaterSense Approved when connected to the B-hyve Cloud over Wi-Fi



connected  
devices

## How to Specify

|     | Model                            |
|-----|----------------------------------|
| HRC | Controller                       |
|     | Series                           |
| 480 | Connect Battery-Powered Hose Bib |
|     | Type                             |
| WFH | Wi-Fi Hub included               |
| BT  | Bluetooth                        |
| 01  | Number of Outlets                |

## SKU (Model)

- HRC-480-WFH-1 (04139)
- HRC-480-BT-01 (04138)

## Specifications

- Power source: 2 AA batteries
- Operating pressure: 10-100 psi
- Operating flow: 2.5-9 GPM
- Cycle run time from 1-360 minutes
- Up to 4 start times per day
- Programming schedule: days of week, watering intervals, odd/even days

## Approvals

- UL, CSA, CE, FCC, IC

## BHP FFS

Flood and  
Freeze Detection

b•hyve  
PRO



### Features

- Small size fits almost anywhere
- Audible Alarm and phone notifications when a flood or freeze event is detected
- Sensor locations are automatically saved to your B-hyve Account
- Easily replaceable battery
- Low battery and disconnect alerts audible and sent to your phone
- Can be configured to automatically turn off irrigation
- User defined temperature alarms
- B-hyve Pro™ and B-hyve™ compatible
- Connect up to 10 sensors per hub



### How to Specify

|     | Model                 |
|-----|-----------------------|
| BHP | B-hyve Pro            |
|     | Series                |
| FFS | Flood Freeze Sensor   |
|     | Type                  |
| 1WH | Sensor with GEN 2 Hub |

### SKU (Model)

- BHP-FFS (04133)
- BHP-FFS-1WH (04134)

### Specifications

- Power Source: 1 CR2032 battery
- Bluetooth range: ±150 feet
- Temperature Sensor Range: 14 - 122 degrees Fahrenheit



# BHP CELL

Connect  
without limits



### Features

- Module switches between 2G, 3G, 4G based on signal strength to ensure connection
- Base module accepts SIM cards so you can use your own cellular plan
- Three years of service included to help you get started
- Internal Antenna for use in plastic enclosures automatically connects to the HSC external antenna



connected  
devices

### How to Specify

|      | Model                           |
|------|---------------------------------|
| BHP  | B-hyve Pro                      |
|      | Series                          |
| CELL | Celluar<br>Communication<br>Kit |

### SKU (Model)

- BHP-CELL

### Specifications

- Compatible with: CMS, HSC
- SIM Card included: Verizon, AT&T, Telnet (international)
- Communication standards: 2G, 3G, 4G
- Communication range: up to 10 miles from cellular antenna



# CONTROLLERS *AND* ACCESSORIES





## AC-POWERED



|                             | HSC                          | HRC 400 | HRC 410 | HRC100 C    |
|-----------------------------|------------------------------|---------|---------|-------------|
| <b>Application</b>          |                              |         |         |             |
| Residential                 | ●                            | ●       | ●       | ●           |
| Light Commercial            | ●                            | ●       |         | ●           |
| <b>Type of Controller</b>   |                              |         |         |             |
| Smart / Web Access          | ●                            | ●       | ●       |             |
| Traditional                 |                              | ●       |         | ●           |
| Modular                     | ●                            |         |         |             |
| Two-Wire                    | ●                            |         |         |             |
| <b>Features</b>             |                              |         |         |             |
| Stations                    | 16-48 Modular<br>63 Two-Wire | 8, 16   | 8       | 4, 6, 9, 12 |
| Programs                    | 4                            | 4       | 4       | 3           |
| *Run Time/Stn Min           | 1-240                        | 1-240   | 1-240   | 1-240       |
| Cycle Start Times/Program   | 4                            | 4       | 4       | 4           |
| Surge Protection            | ●                            | ●       |         | ●           |
| Master Valve/Pump Start     | 2                            | 1       |         | 1           |
| Cycle and Soak              | ●                            | ●       | ●       |             |
| Concurrent Programs         | ●                            |         |         |             |
| Circuit Breaker             | ●                            | ●       |         | ●           |
| Water Budgeting             | ●                            | ●       | ●       | ●           |
| 24 VAC Out                  | ●                            | ●       | ●       | ●           |
| Transformer                 | 3 Amp                        | 1 Amp   | ¾ Amp   | ¾ Amp       |
| WaterSense Certified        | ●                            | ●       | ●       |             |
| Wi-Fi Enabled               | ●                            | ●       | ●       |             |
| Bluetooth Ready             | ●                            | ●       | ●       |             |
| Mobile App                  | ●                            | ●       | ●       |             |
| Multi-Site Management       | ●                            | ●       | ●       |             |
| <b>Enclosure</b>            |                              |         |         |             |
| Outdoor Rated               | ●                            | ●       |         | ●           |
| Pigtail Included            | ●                            | ●       |         | ●           |
| Enclosure Material          | Powder Coated<br>Metal       | ABS     | ABS     | ABS         |
| UL/CTL/CSA                  | ●                            | ●       | ●       | ●           |
| <b>Programming Schedule</b> |                              |         |         |             |
| 7 Days of Week              | ●                            | ●       | ●       | ●           |
| Odd/Even Cycle              | ●                            | ●       | ●       | ●           |
| 1-31 Variable Cycle         | ●                            | ●       | ●       | ●           |
| Rain Delay                  | ●                            | ●       | ●       | ●           |
| 365 Day Calendar            | ●                            | ●       | ●       | ●           |
| Event Day Off               | ●                            | ●       | ●       |             |
| Smart Watering by Station   | ●                            | ●       | ●       |             |
| Manual Mode                 | ●                            | ●       | ●       | ●           |
| <b>Hardware/Accessories</b> |                              |         |         |             |
| Rain/Freeze Sensor Ready    | ●                            | ●       | ●       | ●           |
| Flow Meter                  | 2                            |         |         |             |

## HRC 400

Smart Wi-Fi  
Indoor/Outdoor  
Controller

b•hyve  
PRO



### Features

- Available in 8 or 16 station
- Indoor and outdoor locking enclosure
- Bluetooth® and 2.4 GHz Wi-Fi enabled
- B-hyve Pro™ and B-hyve™ compatible
- Dedicated master valve/pump start terminal
- EPA WaterSense® certified
- Rain delay from 24 hours up to 32 days
- Advanced sensor ports
- 4 programs with 4 start times per program
- Programs stored in non-volatile memory
- Station timing from 1-240 minutes
- Up to 16 start times per day
- Programming schedule: days of week, watering intervals, and odd/even days
- Keyhole mounting for easy installation
- 3-year warranty, 5-year warranty for Premier Level Contractors
- Fully programmable at controller
- Built in Irrigation Audit feature guides you through audits quickly to identify D.U. and efficiency



controllers

### How to Specify

|     | Model                |
|-----|----------------------|
| HRC | Controller           |
|     | Series               |
| 400 | Smart Indoor/Outdoor |
|     | Type                 |
| WF  | Wi-Fi                |
|     | Stations             |
| 8   | 8 Station            |
| 16  | 16 Station           |

### SKU (Model)

- HRC-400-WF-8 (04080)
- HRC-400-WF-16 (04082)

### Specifications

- Transformer:  
Input 120VAC  
Output 24-26VAC 1A
- Max holding 24VAC 0.5A  
Max inrush 24VAC 2.25A
- Pump/master valve:  
Holding 24-26VAC 0.4A  
Inrush 24VAC 2.2A
- Water budgeting: adjusts 10% to 200% in 10% increments

### Approvals

- FCC, CSA

## HSC

Two-Wire  
Controller

b•hyve  
PRO™



### How to Specify

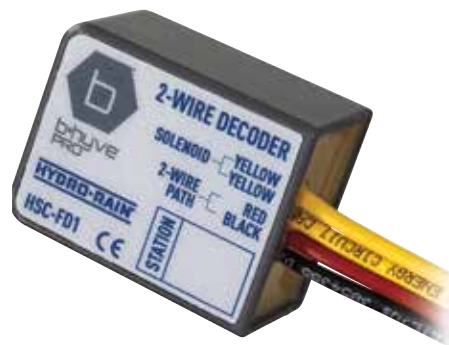
|      | Model                        |
|------|------------------------------|
| HSC  | High Station Count           |
| BHP  | B-hyve Pro                   |
|      | Series                       |
| 6300 | 63 Station                   |
| DP   | Decoder Programmer           |
| FD1  | Single Station Field Decoder |
| Cell | Cellular Communication       |
|      | Options                      |
| D    | Decoder                      |
| MD   | Module                       |

### Features

- Independent programs: 4
- Start times per program: 4
- Maximum station run time: 4 hours (240 minutes)
- 3-year warranty, 5-year warranty for Premier Level Contractors
- Two integrated flow meter inputs support Data Industrial®, CST, Netafim™, and other flow sensors with custom "K and offset" values
- Two dedicated master valve or pump start terminals by zone
- 2.4 GHz Wi-Fi, 5 GHz Wi-Fi, Bluetooth, 900 MHz, or CAT-5 Ethernet connectivity
- Optional cellular connectivity available with a Hydro-Rain cellular module
- Non-volatile memory stores programming settings without battery
- 16 gauge powder coated metal wall mount enclosure
- Standard CH751 keyed lock
- Key-hole mounting for easy installation
- UL listed, NEMA-3R weather-resistant stainless steel
- Free and automatic firmware and software upgrades
- Includes USB charging port and shelf for resting a phone or tablet
- Simultaneously run 2 programs
- Support for up to 63 field decoders
- Suggested wire size: 12 AWG
- 5300 foot range with one active valve
- B-hyve Pro and B-hyve app compatible
- Built in Irrigation Audit feature guides you through audits quickly to identify D.U. and efficiency
- AC technology means grounding is only required at Controller

### SKU (Model)

- HSC-6300-D (04554)
- HSC-DP (04553)
- HSC-FD1 (04555)
- BHP-CELL-MD (04450)



### Physical Specifications

- 16" high x 11.5" wide x 5" deep
- 10 lbs

### Electrical Specifications

- Input Power: 120/208/240 VAC +/- 10%, (60 Hz)
- Output Power: 24 VAC (60 Hz)  
Station output (24 VAC): 0.56 A  
P/MV output (24 VAC): 0.32 A  
Maximum output: 3.3 A

# HSC

Modular  
Controller

b•hyve  
PRO



## Features

- Independent programs: 4
- Start times per program: 4
- Maximum station run time: 4 hours (240 minutes)
- 3-year warranty, 5-year warranty for Premier Level Contractors
- Two integrated flow sensor inputs
- Two dedicated master valve or pump start terminals by zone
- 2.4 GHz Wi-Fi, 5 GHz Wi-Fi, Bluetooth, 900 MHz, or CAT-5 Ethernet connectivity
- Optional cellular connectivity available with a Hydro-Rain cellular module
- Non-volatile memory stores programming settings without battery
- 16-gauge powder coated metal wall mount enclosure
- Key-hole mounting for easy installation
- UL listed, NEMA-3R weather-resistant stainless steel
- Free and automatic firmware and software upgrades
- Includes USB charging port and shelf for resting a phone or tablet
- Simultaneously run two programs
- Support for up to 48 Station
- B-hyve Pro and B-hyve app compatible
- Built in Irrigation Audit feature guides you through audits quickly to identify D.U. and efficiency



## How to Specify

|         | Model                  |
|---------|------------------------|
| HSC     | High Station Count     |
| BHP     | B-hyve Pro             |
| Series  |                        |
| 1600    | 16 Station             |
| 800     | 8 Station              |
| Cell    | Cellular Communication |
| Options |                        |
| M       | Modular Base           |
| MD      | Module                 |

## SKU (Model)

- HSC-1600-M (04550)
- HSC-800-MD (04551)
- BHP-CELL-MD (04450)

## Physical Specifications

- 16" high x 11.5" wide x 5" deep
- 10 lbs

## Electrical Specifications

- Input Power: 120/208/240 VAC +/- 10%, (60 Hz)
- Output Power: 24 VAC (60 Hz)  
Station output (24 VAC): 0.56 A  
P/MV output (24 VAC): 0.32 A

## HRC 410

Smart Wi-Fi  
Indoor Controller

b•hyve  
PRO



## Features

- Available in 8 station
- Indoor enclosure
- Bluetooth® and 2.4 GHz Wi-Fi enabled
- B-hyve Pro™ and B-hyve™ compatible
- Master valve capable
- EPA WaterSense® certified
- Rain delay from 24 hours up to 32 days
- Advanced sensor ports
- 4 programs with 4 start times per program
- Programs stored in non-volatile memory
- Station timing from 1-240 minutes
- Up to 16 start times per day
- Programming schedule: days of week, watering intervals, and odd/even days
- Single button for a sleek clean look
- 3-year warranty, 5-year warranty for Premier Level Contractors
- Built in Irrigation Audit feature guides you through audits quickly to identify D.U. and efficiency



## How to Specify

|     | Model        |
|-----|--------------|
| HRC | Controller   |
|     | Series       |
| 410 | Smart Indoor |
|     | Type         |
| WF  | Wi-Fi        |
|     | Stations     |
| 8   | 8 Station    |

## SKU (Model)

- HRC-410-WF-8 (04060)

## Specifications

- Transformer:  
Input 120VAC  
Output 24-26VAC 0.75A
- Max holding 24VAC 0.5A  
Max inrush 24VAC 1.2A
- Water budgeting: adjusts 10% to 200% in 10% increments

## Approvals

- FCC, CSA



# HRC 100

Basic  
Indoor/Outdoor  
Controller

## Features

- Available in 4, 6, 9, or 12 stations
- Outdoor locking enclosure
- Simple to use easy-set-logic programming
- Dedicated master valve/pump start terminal
- Rain delay from 24 hours up to 32 days
- Rain/freeze sensor input
- Wireless rain/freeze sensor input
- 3 programs include the ability for interval, days of the week, and odd/even watering
- 4 start times available per program
- Short protection detects wiring faults and skips the station to prevent damage
- Battery backup stores programs and time in case of power outage
- Water Budgeting allows for adjustments to the program without modifying the program
- 3-year warranty, 5-year warranty for Premier Level Contractors



controllers

## How to Specify

|     | Model      |
|-----|------------|
| HRC | Controller |
|     | Series     |
| 100 | Basic      |
|     | Type       |
| C   | Gen 3      |
|     | Stations   |
| 4   | 4 Station  |
| 6   | 6 Station  |
| 9   | 9 Station  |
| 12  | 12 Station |

## SKU (Model)

- HRC-100-C-04 (04054)
- HRC-100-C-06 (04056)
- HRC-100-C-09 (04059)
- HRC-100-C-12 (04052)

## Specifications

- Transformer:  
Input 120VAC or 220/230VAC  
Output 24-26VAC 0.6A
- Station output: 24-26VAC 0.25A
- Pump/master valve output:  
Max holding 24VAC 0.4A  
Max inrush 24VAC 0.6A
- Station timing from 1-240 minutes
- Up to 12 start times per day
- Programming schedule: days of week, watering intervals, and odd/even days
- Water budgeting: adjusts 10% to 200% in 10% increments.

## Approvals

- FCC, CSA, CE

# BATTERY-POWERED CONTROLLERS





Hydro-rain provides a wide array of products that can be used separately or as part of a larger system helping you to work smarter and faster.

## PLATFORM

### TRADITIONAL

Built for Speed timers that do not connect while still providing irrigation in power-restricted areas.



#### HRC 980

STATIONS: 1  
PROGRAMS: 2



#### HRC 990

STATIONS: 1, 2, 3, 4 + Rain Sensor  
PROGRAMS: 4

### HYBRID

The best of both worlds providing automatic irrigation in hard-to-reach areas while allowing for remote access.



#### XD

STATIONS: 1, 2, 4 + Rain Sensor  
PROGRAMS: 1 in traditional,  
4 + Smart in app

### B-HYVE PRO

Bluetooth, Wi-Fi, LoRa, and cellular battery-powered controllers that provide the capability of an AC powered controller from the control of your smartphone or desktop



#### HRC-480

STATIONS: 1  
PROGRAMS: 4 + Smart



#### CMS

STATIONS: Modular maximum of 8  
PROGRAMS: 4 + Smart



# BATTERY-POWERED



|                             | CMS                             | XD                              | HRC 480            | HRC 990             | HRC 980        |
|-----------------------------|---------------------------------|---------------------------------|--------------------|---------------------|----------------|
| <b>Application</b>          |                                 |                                 |                    |                     |                |
| Residential                 | ●                               | ●                               | ●                  | ●                   | ●              |
| Commercial                  | ●                               |                                 |                    | ●                   |                |
| <b>Type of Controller</b>   |                                 |                                 |                    |                     |                |
| Smart / Web Access          | ●                               | ●                               | Requires Hub       |                     |                |
| Traditional                 |                                 | ●                               |                    | ●                   | ●              |
| <b>Features</b>             |                                 |                                 |                    |                     |                |
| Stations                    | 1-8                             | 1, 2, 4                         | 1                  | 1-4                 | 1              |
| Programs                    | 4 + Smart                       | 1 at device<br>4 + Smart in app | 4 + Smart          | 2                   | 1              |
| *Run Time/Stn Min           | 1-240                           | 1-240                           | 1-240              | 1-240               | 1-240          |
| Cycle Start Times/Program   | 4                               | Requires Hub                    | 4                  | 4                   | 2              |
| Cycle and Soak              | ●                               | Requires Hub                    | ●                  |                     |                |
| Water Budgeting             | ●                               | Requires Hub                    | ●                  | ●                   |                |
| Sensor Inputs               | Flow Meter                      |                                 | Built InFlow Meter | Rain, Soil Moisture |                |
| Batteries                   | 6-AA Batteries                  | 2-AA Batteries                  | 2-AA Batteries     | 3-AA Batteries      | 2-AA Batteries |
| WaterSense Certified        | ●                               | ●                               | ●                  |                     |                |
| Bluetooth                   | ●                               | ●                               | ●                  |                     |                |
| Mobile App                  | ●                               | ●                               | ●                  |                     |                |
| Multi-Site Management       | ●                               | Requires Hub                    | Requires Hub       |                     |                |
| <b>Enclosure</b>            |                                 |                                 |                    |                     |                |
| Outdoor Rated               | ●                               | ●                               | ●                  | ●                   | ●              |
| IP Rating                   | IP68                            | IPX5                            | 34                 | 68                  | 35             |
| UL/FCC/CSA                  | ●                               | ●                               | ●                  |                     |                |
| <b>Programming Schedule</b> |                                 |                                 |                    |                     |                |
| 7 Days of Week              | ●                               | Requires Hub                    | ●                  | ●                   | ●              |
| Odd/Even Cycle              | ●                               | Requires Hub                    | ●                  | ●                   |                |
| 1-31 Variable Cycle         | ●                               | 1-7 at device<br>1-31 in app    | ●                  | ●                   | ●              |
| Rain Delay                  | Requires Hub or Cellular module | 1-7 at device<br>1-31 in app    | ●                  | ●                   | ●              |
| 365 Day Calendar            | ●                               | Requires Hub                    | ●                  | ●                   |                |
| Event Day Off               | ●                               | Requires Hub                    | ●                  |                     |                |
| Smart Watering Mode         | Requires Hub or Cellular module | Requires Hub                    | Requires Hub       |                     |                |
| Manual Mode                 | ●                               | ●                               | ●                  | ●                   | ●              |
| <b>Hardware/Accessories</b> |                                 |                                 |                    |                     |                |
| Moisture Sensor Ready       |                                 |                                 |                    | ●                   |                |
| Rain/Freeze Sensor Ready    |                                 |                                 |                    | ●                   |                |
| Flow Meter                  | Requires Flow Meter Module      |                                 | ●                  |                     |                |
| Compatible Hubs             | GEN 2 Hub                       | GEN 2 Hub                       | GEN 1 Hub          |                     |                |

## CMS

Control and  
Monitoringb.hyve  
PRO

## Features

- Program with smart device
- Compatible with 6-AA batteries
- 3-year warranty, 5-year warranty for Premier Level Contractors
- Connects over Bluetooth® or 900 MHz
- Optional cellular connectivity available with a Hydro-Rain cellular module
- IP68 Rating with lid secured
- Control Unit body easily fits in 2 1/2" hole
- Non-volatile memory stores programming settings without battery
- Free and automatic firmware and software upgrades
- Controls 1 to 8 valves, or monitors flow using accessory modules
- Hydro-Rain latching solenoid is compatible with all Hydro-Rain HRZ, HRA, and HRJ valves
- Hydro-Rain latching solenoid is compatible with HRB, HRV, and HRP valves when used with an adapter
- Solenoid adapters available for most Rainbird®, Hunter®, Toro®, Irritrol®, K-Rain®, or Orbit® valves
- 100' maximum solenoid wire run from adapter module when using 18 AWG wire
- Works with the following Flow Meters:
  - » Data Industrial (Badger Meter) IR-220 Series (PVC models)
  - » Creative Sensor Technologies FSI-T Series
  - » Netafim Reed Switch Register-type Series
  - » Bermad 900 Series Reed Switch Register-type Series



## Physical Specifications

- 3.75" high x 4.5" wide x 4.5" deep
- 1 lbs

## Electrical Specifications

## Input Power:

- 6-AA Batteries

## Output Power:

Station Output: 9-14 VDC  
P/MV Output 9-14 VDC

## Range:

- Bluetooth: 100 feet
- 900 MHz: 5 miles
- Cellular: 10 miles



CMS-1VDC-MD

## How to Specify

|      | Model              |
|------|--------------------|
| CMS  | Controller         |
|      | Series             |
| CU   | Communication Unit |
| FM   | Flow Meter         |
| 1VDC | Single DC Solenoid |
| 4VDC | Quad DC Solenoid   |
| 25   | Length             |
| WM   | Wall Mount Type    |
| MD   | Bluetooth          |
| EXT  | Extension          |

## SKU (Model)

## Kits:

- CMS-4V-KIT (04401)
- CMS-FLO-KIT (04404)

## Components:

- CMS-CU (04400)
- CMS-FM-MD (04415)
- CMS-1VDC-MD (04430)
- CMS-4VDC-MD (04434)
- CMS-25-EXT (04425)
- CMS-WM (04460)
- BHP-CELL (04450)



## No Wires

The battery powered Irrigation Control and Monitoring system (CMS) is the most versatile smart irrigation device on the market today. Without the need for wires, it allows users to expand their irrigation systems or to reconnect valves where wires have been cut. And don't let its compact size fool you. The long range capabilities of this product accommodate almost any landscape.



## Smart Controls

With apps for both iOS and Android, you can access and control your device from anywhere – no more running back and forth to activate valves. It also uses WeatherSense™ technology and connects to a local weather feed to determine how much water is needed, based on the time of year.



## Smart Connectivity

The long range radios featured in this device allow for Wi-Fi, 900 MHz, Cellular, or Bluetooth® connectivity giving you a range of options, based on your needs. Using 900 MHz gives you the important capability to place the device at grade, without sacrificing functionality.



## Versatile

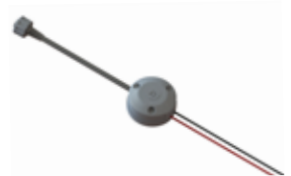
In addition to controlling your valves remotely with your smart phone, you can also control a master valve and monitor a flow meter to the device. By connecting a flow meter and master valve, you can shut down your irrigation system automatically or remotely if leaks are detected.



CLOUD BASED APP



CONTROL UNIT



MODULE



VALVE



## XD

Connected Hose  
Bib Controllerb•hyve  
PRO

## Features

- Program with smart device
- Compatible with 2 AA batteries
- 3-year warranty, 5-year warranty for Premier Level Contractors
- Programmable at the device, over Bluetooth, or over Wi-Fi with GEN 2 Hub
- Bluetooth 5 provides a maximum communication range of 800 feet
- IPX5 Rating with battery drawer secured
- Brass Hose Swivel
- Non-volatile memory stores programming settings without battery
- Free and automatic firmware and software upgrades
- Manual Rain Delay from 24 hours to 7 days
- Built in Irrigation Audit feature guides you through audits quickly to identify D.U. and Efficiency
- Bluetooth Mesh extends the range when each controller is within 100 feet of another controller or hub
- B-hyve Pro™ and B-hyve™ compatible
- EPA WaterSense Approved when connected to the B-hyve Cloud over Wi-Fi



## Specifications

- Power source: 2 AA batteries
- Recommended Bluetooth range: 100 feet
- Operating pressure: 10-100 psi
- Operating flow: 3-11 GPM
- Cycle run time from 1-240 minutes
- Up to 4 start times per day
- Programming schedule:  
At device: 1 hr, 3 hr, 6 hr, 12 hr, 1 day, 7 day  
On app: days of week, watering intervals, odd/even days, Smart watering

## Approvals

- UL, CSA, CE, FCC, IC

## SKU (Model)

- 24511 - Single Port
- 24632 - Dual Port
- 24634 - Quad Port
- 21027 - GEN 2 Hub



# HRC 480

Smart Hose  
Bib Controller



## Features

- Program with smart device
- Compatible with 2 AA batteries
- 3-year warranty, 5-year warranty for Premier Level Contractors
- Programmable over Bluetooth®
- IP34 Rating with battery drawer secured
- Brass Hose Swivel
- Non-volatile memory stores programming settings without battery
- Free and automatic firmware and software upgrades
- Automatic Rain Delay from 24 hours to 32 days
- Built in Irrigation Audit feature guides you through audits quickly to identify D.U. and Efficiency
- Bluetooth Mesh extends the range when each controller is within 100 feet of another controller or hub
- Built in Flow Meter
- Hub converts BLE signal to 2.4 GHz Wi-Fi
- Rain Delay from 24 hours to 32 days
- B-hyve Pro™ and B-hyve™ compatible
- EPA WaterSense Approved when connected to the B-hyve Cloud over Wi-Fi



## How to Specify

|     | Model                            |
|-----|----------------------------------|
| HRC | Controller                       |
|     | Series                           |
| 480 | Connect Battery-Powered Hose Bib |
|     | Type                             |
| WFH | Wi-Fi Hub included               |
| BT  | Bluetooth                        |
| 01  | Number of Outlets                |

## SKU (Model)

- HRC-480-WFH-1 (04139)
- HRC-480-BT-01 (04138)

## Specifications

- Power source: 2 AA batteries
- Operating pressure: 10-100 psi
- Operating flow: 2.5-9 GPM
- Cycle run time from 1-360 minutes
- Up to 4 start times per day
- Programming schedule: days of week, watering intervals, odd/even days

## Approvals

- UL, CSA, CE, FCC, IC

## HRC 990

Battery-  
Powered  
Controller

### Features

- Controls up to 4 latching solenoids
- Includes 1 latching solenoid
- Water resistant (IP68 rated)
- Battery-powered
- 2 programs with 4 start times per program
- Manual start and advance buttons
- Rain delay from 24 to 72 hours
- Rain/freeze sensor port

### Specifications

- Operates DC latching solenoids only
- 4 solenoid ports
- 2 module ports
- Power source:  
3 AA batteries (included) or  
3 AA rechargeable batteries with solar panel
- Station timing from 1-240 minutes
- Up to 6 start times per day
- Programming schedule: days of week,  
watering intervals, and odd/even days
- Water budgeting: adjusts 10% to  
200% in 10% increments.

### Approvals

- UL, FCC, CE

### Solenoid Specifications

- Operating Voltage: 13 VDC
- Operating Voltage Range: 9-14 VDC
- Pulse Width: 22ms
- Coil Resistance: 11.7  $\Omega \pm 5\%$

HRC-990-01



HRC-990-SD-MD



HRC-990-UN-SEN



HRC-990-HT-AD-PF



HRC-990-PB-AD



HRC-990-UN-AD



HRC-990-DV-AD-PF



### How to Specify

|     | Model                      |
|-----|----------------------------|
| HRC | Controller                 |
|     | Series                     |
| 990 | Battery-Powered Controller |
|     | Type                       |
| 01  | Included Solenoids         |
| SD  | Solenoid                   |
| UN  | Universal                  |
|     | Class                      |
| MD  | Module                     |
| SEN | Sensor                     |
| AD  | Solenoid Adapter           |

### SKU (Model)

- HRC-990-01 (04020)
- HRC-990-SD-MD (04010)
- HRC-990-UN-SEN (04002)
- HRC-990-UN-AD (04024)
- HRC-990-PB-AD (04022)
- HRC-990-DV-AD-PF (04023L)
- HRC-990-HT-AD-PF (04019)

HRC 980

Hose Bib  
Controller

Features

- Battery-powered
- Outdoor enclosure (IP35 rated)
- Intuitive rotary dial is quick and easy to program
- Manual water from 1-360 minutes
- Rain delay from 24-72 hours
- 1 station with 4 start times
- Programs stored in non-volatile memory
- Brass hose swivel



controllers

How to Specify

|       | Model                       |
|-------|-----------------------------|
| HRC   | Controller                  |
|       | Series                      |
| 980   | Battery-Powered<br>Hose Bib |
|       | Type                        |
| MULTI | Multiple<br>Start Times     |
|       | Options                     |
| 01    | 1 Outlet                    |

SKU (Model)

- HRC-980-MULTI-01  
(04035)

Specifications

- Power source: 2 AA batteries
- Operating pressure: 10-100 psi
- Operating flow: 2.5-8 GPM
- Cycle run time from 1-360 minutes
- Up to 4 start times per day
- Programming schedule: days of week or watering intervals

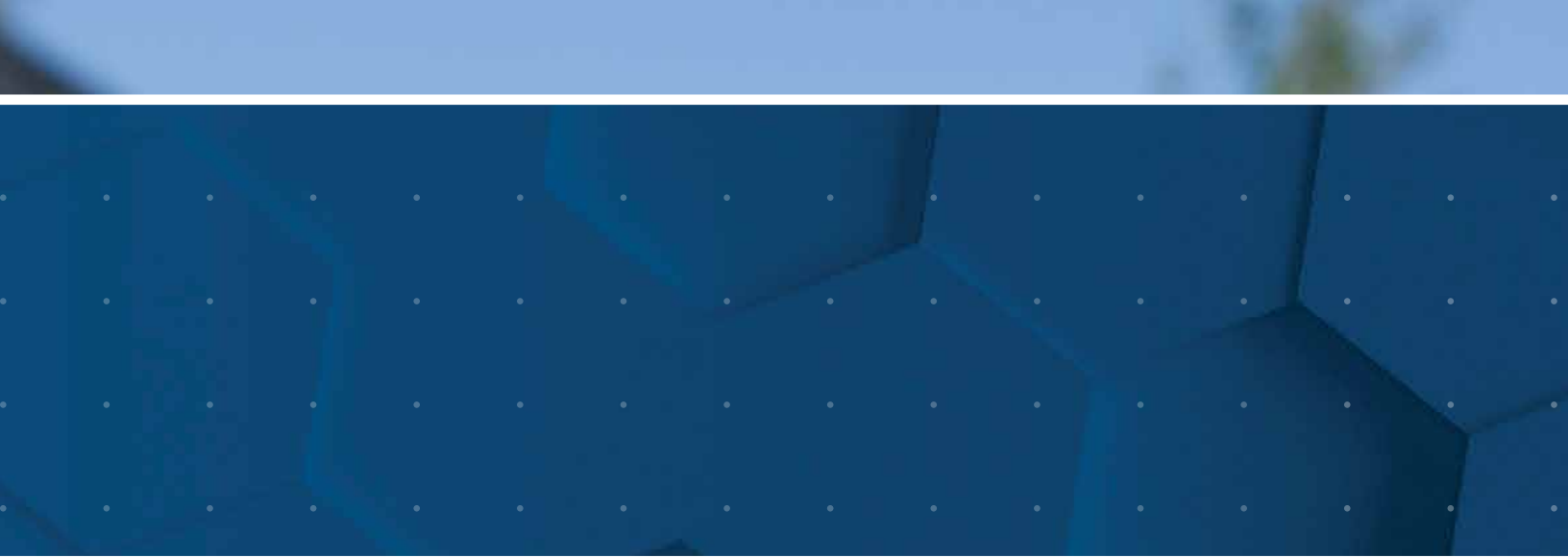
Approvals

- UL, CSA, CE



# CONTROLLER ACCESSORIES





## HRC 100

### Rain/Freeze Sensors

#### Features

- Rain gutter mounting bracket is equipped with a tool-free bolt system that is quick and intuitive to install
- Adjustable moisture activation
- Uses industry-standard hygroscopic discs
- HRC-100-RS-RF Freeze sensor activates at 37°F or 3°C
- Universal 2-wire system for use with most brands
- Normal open & normal close 3A@24VAC
- HRC-100-RS-RF manual override deactivates the wireless sensors during irrigation system maintenance

#### Specifications

- Rain sensitivity: adjustable nominal  $\frac{1}{8}$ "-1"
- Freeze sensitivity: 37°F  $\pm$  1°F
- Operating temperature: 14°F to 140°F
- Housing material: UV-resistant engineered polymer

#### RF Receiver

##### Specific Specifications

- Receiver power: 22-28VAC
- Transmitter power: 2 CR2032 3V cell

#### RF Receiver Dimensions

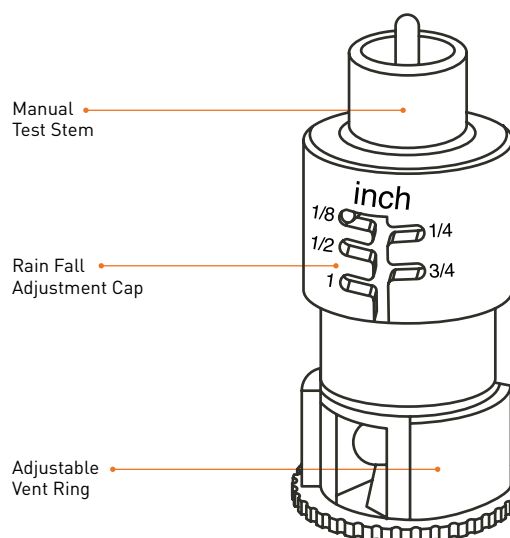
- Height: 3.75" (9.5 cm)
- Length: 1.1" (2.7 cm)

#### RF Transmitter Dimensions

- Height: 4" (10.1 cm)
- Length: 3.15" (8.0 cm)



#### Product Detail



#### How to Specify

|     | Model              |
|-----|--------------------|
| HRC | Controller         |
| 100 | Basic Sensor       |
| RS  | Rain/Freeze Sensor |
| RF  | Wireless           |
| HW  | Hard Wire          |

#### SKU (Model)

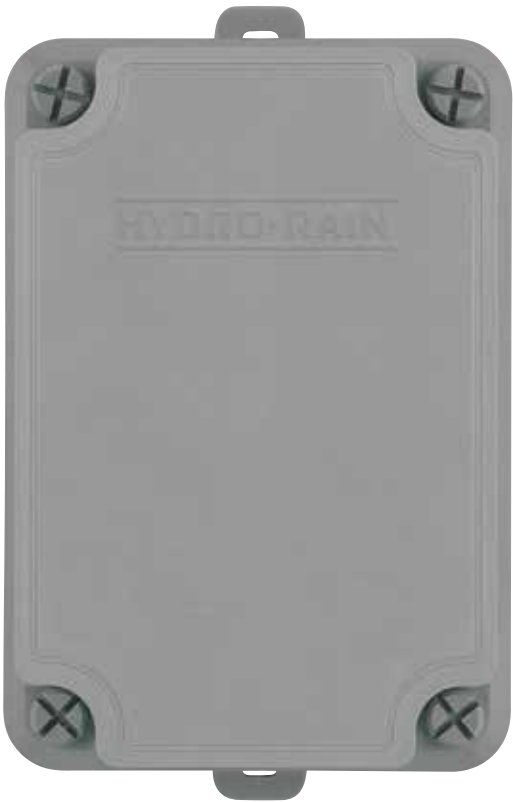
- HRC-100-RS-RF (04008)
- HRC-100-RS-HW (04007)

HRC PSR

Pump Start  
Relay

Features

- Works with 1 HP 110VAC or 2 HP 220VAC pumps
- Works with 24VAC sprinkler controllers
- Automatically activates pump when the controller activates a valve
- Locking, weather-resistant case
- Covered wiring compartment for extra protection
- Simple, trouble-free design
- Wide-range AC-activated coil that handles 100-120VAC or 200-240VAC at either 50 or 60 Hz
- Conforms to UL, CSA, TUV and meets IEC950
- For use with all Hydro-Rain Controllers



controllers

How to Specify

|     | Model            |
|-----|------------------|
| HRC | Controller       |
|     | Type             |
| PSR | Pump Start Relay |

SKU (Model)

- HRC-PSR (07009)

Specifications

- 24VAC 50/60Hz
- Inrush: 79mA
- Sealed: 71mA
- Resistance ( $\pm 10\%$ ) 303  $\Omega$
- Contractor rating (single phase)
- Double pole, single throw
- Inductive: 15 AMP
- Resistive: 25 AMP
- Input:
  - 110VAC–up to 1 HP
  - 220VAC–up to 2 HP



# IRRIGATION VALVES







|                                      | HRP | HRJ | HRV | HRB | HRA | HRZ |
|--------------------------------------|-----|-----|-----|-----|-----|-----|
| <b>Size</b>                          |     |     |     |     |     |     |
| 1", 1½", & 2"                        |     |     |     | •   |     |     |
| ¾", 1"                               |     |     | •   |     | •   |     |
| 1" only                              | •   | •   |     |     |     | •   |
| <b>Inlet</b>                         |     |     |     |     |     |     |
| FPT                                  |     | •   | •   | •   | •   |     |
| MPT                                  |     |     |     |     |     | •   |
| PVC Socket                           |     |     | •   |     |     |     |
| Push-fit                             | •   |     |     |     |     |     |
| Bottom Inlet                         |     |     |     |     | •   |     |
| <b>Rating/Flow</b>                   |     |     |     |     |     |     |
| 20 to 200 psi Rated                  |     |     |     | •   |     |     |
| 15 to 150 psi Rated                  | •   | •   | •   |     | •   | •   |
| .25 to 200 GPM                       |     |     |     | •   |     |     |
| .2 to 40 GPM                         | •   | •   | •   | •   | •   |     |
| .1 to 5 GPM                          |     |     |     |     |     | •   |
| <b>Features</b>                      |     |     |     |     |     |     |
| Manual Internal Bleed                | •   | •   | •   | •   | •   | •   |
| Manual External Bleed                |     | •   |     | •   |     | •   |
| 30 psi Regulator and Filter Included |     |     |     |     |     | •   |
| Anti-Siphon Feature                  |     |     |     |     | •   |     |
| Dirty Water Screen                   |     |     |     | •   |     | •   |
| PVC Body                             | •   | •   | •   |     | •   |     |
| Glass Filled Nylon Body              |     |     |     | •   |     |     |
| Stainless Steel Studs Molded In      | •   |     |     | •   |     |     |
| Accepts Latching Solenoid            | •   | •   | •   | •   | •   | •   |
| Filtered Pilot Hole                  |     |     | •   | •   |     |     |
| Balanced Pressure Diaphragm          | •   |     | •   |     | •   |     |
| 24VAC 50/60 Hz                       | •   | •   | •   | •   | •   | •   |
| Threaded Bonnet                      |     | •   |     |     |     | •   |
| One Piece Solenoid/Plunger           | •   |     |     | •   |     |     |
| Slow Closing                         | •   | •   |     | •   | •   | •   |
| Low Flow Capability                  | •   | •   | •   | •   | •   | •   |
| Normally Closed Forward Flow         |     | •   |     | •   | •   | •   |



# HRJ 100

Entry Level

## Features

- Internal bleed solenoid makes at-the-valve operation easy and spray-free
- Jar top bonnet provides trouble-free servicing without the use of tools
- Manual external bleed enables fast seasonal startup and shutdown
- Glass-filled nylon bonnet for extra strength
- Self-cleaning solenoid filter with pilot-flow 90-mesh (200 micron) screen
- Forward-flow design
- Accepts DC latching solenoids for use with HRC battery-operated controllers

## Specifications

- Pressure: 25-150 psi (1.72-10.34 bar)
- Flow: 15-30 GPM (56-113.6 l/min)
- Water temperature: up to 110°F (43°C)
- Ambient temperature: up to 125°F (51°C)

## Solenoid Specifications

- 24VAC 50/60 Hz (Cycles/Sec) solenoid
- Inrush current: .30A (7.2VAC) at 60 Hz
- Holding current: .19A (4.6VAC) at 60 Hz
- Coil resistance: 32 Ω

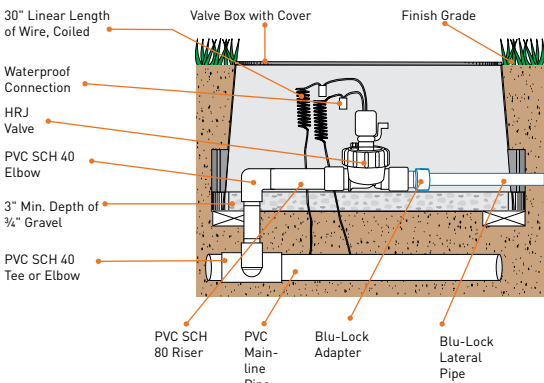


valves

## HRJ 100 Pressure Loss

| FLOW<br>GPM | PSI  | FLOW<br>LPM | BAR  |
|-------------|------|-------------|------|
| 0.25        | 5    | 1           | 0.35 |
| 2           | 4.6  | 8           | 0.32 |
| 5           | 3.5  | 20          | 0.24 |
| 10          | 4    | 40          | 0.30 |
| 15          | 2.97 | 60          | 0.21 |
| 20          | 3.26 | 80          | 0.23 |
| 30          | 6.2  | 100         | 0.30 |

## Installation Specification Detail



## How to Specify

|     | Model              |
|-----|--------------------|
| HRJ | Jar Top            |
|     | Size               |
| 100 | 1"                 |
|     | Options            |
| FF  | Female Pipe Thread |

## SKU (Model)

- HRJ-100-FF (02001)

## HRP SERIES

Revolutionary  
Push-fit  
Technology



### Features

- Push-fit design for a glue-less or clamp-free fast and clean installation
- Internal bleed solenoid makes at the valve operation easy and spray-free
- Captive solenoid plunger prevents accidental loss during servicing
- Captive bonnet screws provide trouble-free servicing with a flat, Phillips, or hex driver
- A balanced flow design keeps equal pressure on both sides of the diaphragm while the valve is off, increasing the valve's life
- Snap-fit diaphragm spring holds the spring on the bonnet
- Glass-filled polypropylene lid for extra strength
- Self-cleaning solenoid filter with pilot-flow 90-mesh (200 micron) screen
- The balanced flow design reduces the chance of a flooding event due to a diaphragm failure
- Accepts DC latching solenoids for use with HRC battery-operated controllers

### Specifications

- Pressure: 15-150 psi
- Flow: 0.2-40 GPM
- Water temperature: up to 110°F (43°C)
- Ambient temperature: up to 125°F (51°C)
- 24VAC 50/60 (Cycle) Solenoid
- Inrush current: .30 A at 60 Hz
- Holding current: .23 A at 60 Hz
- Coil resistance: 61 Ω

### Dimensions

- Height: 4.7" (11.93 cm)
- Length: 6.1" (15.49 cm)
- Width: 2.5" (6.35 cm)



HRP-100-PF-BL



HRP-100-PF-FCBL

**Blu-Lock®**



HRP-100-PF-PVC



HRP-100-PF-FCPVC

**PVC-Lock®**

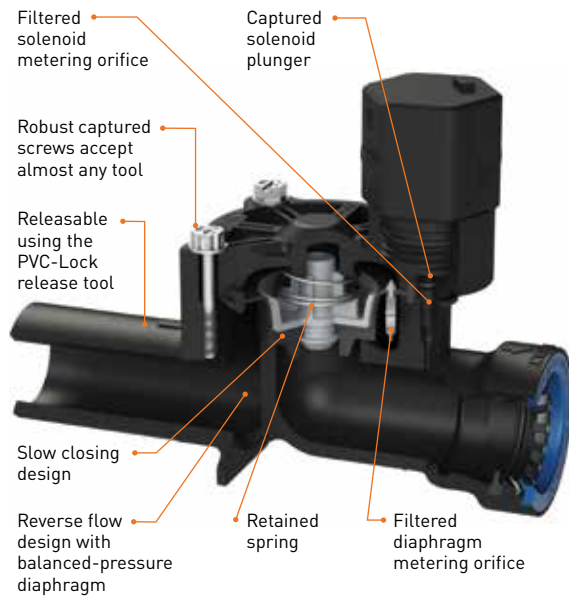
### How to Specify

|     | Model        |
|-----|--------------|
| HRP | Push-fit     |
|     | Size         |
| 100 | 1"           |
|     | Type         |
| PF  | Push-fit     |
| BL  | Blu-Lock     |
| PVC | PVC-Lock     |
| FC  | Flow Control |

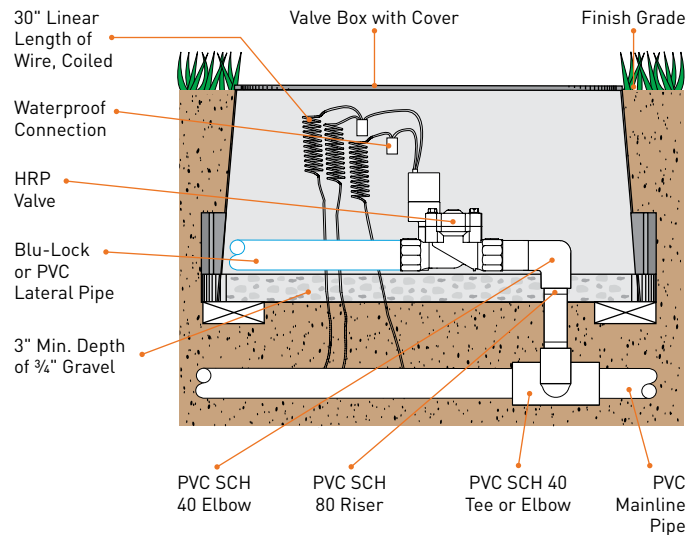
### SKU (Model)

- HRP-100-PF-BL (02030)
- HRP-100-PF-PVC (02031)
- HRP-100-PF-FCBL (02130)
- HRP-100-PF-FCPVC (02131)

### HRP Cutaway



### Installation Specification Detail



### HRP 100 Pressure Loss

| FLOW GPM | PSI  |
|----------|------|
| 5        | 3.81 |
| 10       | 4    |
| 15       | 4.37 |
| 20       | 4.82 |
| 25       | 5.42 |
| 30       | 6.21 |
| 35       | 7.23 |
| 40       | 8.11 |
| 45       | 8.75 |

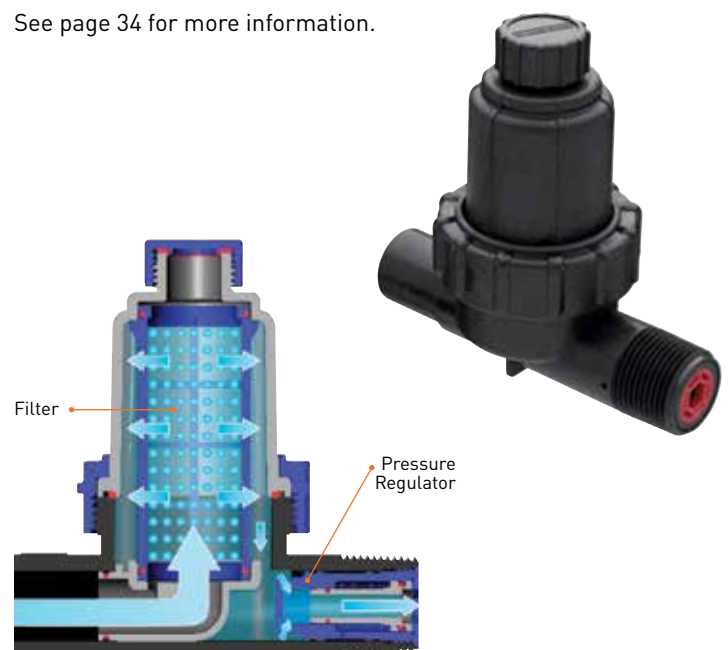


### HRZ 100 2-in-1

The 2-in-1 push-fit pressure-regulated drip filter is designed to be used with the HRP 100, creating a complete push-fit solution for drip applications.

- 200 mesh filter
- Jar top with flush port cap for easy serviceability
- Integrated 30 psi pressure regulator

See page 34 for more information.



## HRB SERIES

The industry's fastest, best built commercial valve.

### Features

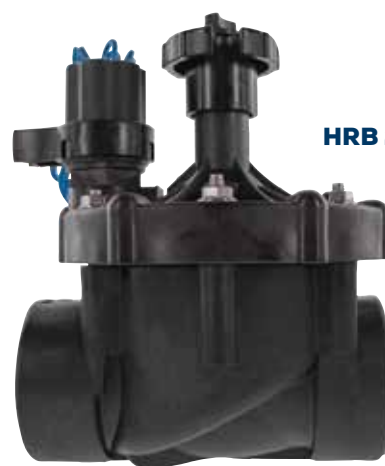
- Fiber-reinforced body delivers superior strength under extreme conditions
- Solid brass and stainless steel components ensure corrosion resistance
- Slow-closing reinforced diaphragm protects against water hammer
- Pilot hole filter screen reduces risk of clogging
- Stainless steel studs prevent possible damage due to over tightening and corrosion
- Manual internal bleed enables convenient, water efficient manual operation
- Manual external bleed enables fast seasonal startup and shutdown
- Low and high flow satisfies a wide range of flow conditions and application requirements
- Flow control stem provides ability to adjust flow over a wide range
- One-piece solenoid design secures plunger in solenoid body
- Normally closed, forward flow design
- Accepts DC latching solenoids for use with HRC battery-operated controllers



**HRB 100**



**HRB 150**



**HRB 200**



### How to Specify

| Model        |                    |
|--------------|--------------------|
| HRB          | Commercial         |
| Size         |                    |
| 100          | 1"                 |
| 150          | 1 1/2"             |
| 200          | 2"                 |
| Inlet/Outlet |                    |
| FF           | Female Pipe Thread |
| Options      |                    |
| FC           | Flow Control       |

### SKU (Model)

- HRB-100-FF-FC (05100)
- HRB-150-FF-FC (05101)
- HRB-200-FF-FC (05102)

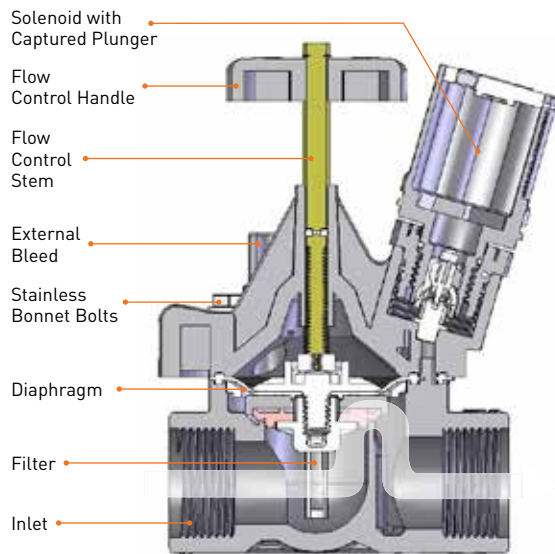
### Specifications

- Pressure: 20-200 psi (1.38-13.80 bar)
- Flow: 0.25-200 GPM (0.06-45.40 m<sup>3</sup>/h; 0.32-12.60 l/s)
- Water temperature: up to 105°F (66°C)
- Ambient temperature: up to 150°F (66°C)

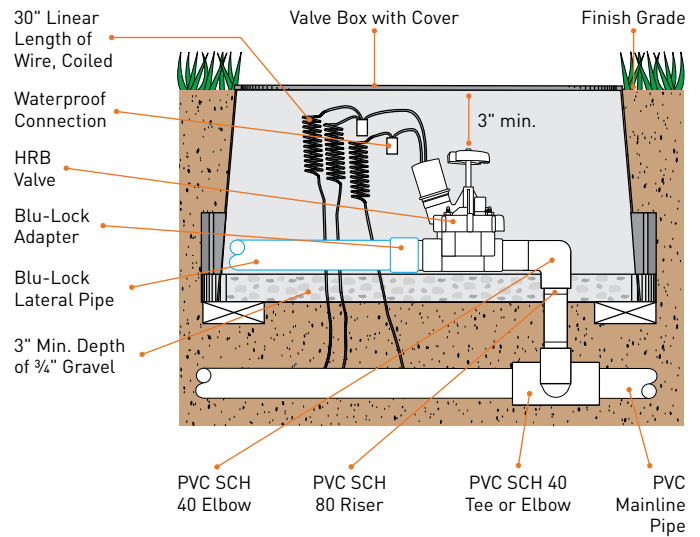
### Electrical Specifications

- 24VAC 50/60 (Cycle/Sec) solenoid
- Inrush current: .30A (7.2VAC) at 60 Hz
- Holding current: .19A (4.6VAC) at 60 Hz
- Coil resistance: 22 Ω

## HRB Cutaway



## Installation Specification Detail



## HRB Series Pressure Loss

## Metric

| FLOW<br>GPM | HRB 100 | HRB 150 | HRB 200 | FLOW<br>M <sup>3</sup> /H | FLOW<br>L/S | HRB 100 | HRB 150 | HRB 200 |
|-------------|---------|---------|---------|---------------------------|-------------|---------|---------|---------|
| 0.25        | 0.8     | –       | –       | 0.6                       | 0.02        | 0.05    | –       | –       |
| 0.5         | 1.0     | –       | –       | 1                         | 0.28        | 0.11    | –       | –       |
| 1           | 1.3     | –       | –       | 2                         | 0.56        | 0.12    | –       | –       |
| 5           | 1.7     | –       | –       | 3                         | 0.83        | 0.15    | –       | –       |
| 10          | 1.8     | –       | –       | 4                         | 1.11        | 0.18    | –       | –       |
| 20          | 2.9     | 3.9     | –       | 5                         | 1.39        | 0.24    | 0.27    | –       |
| 30          | 5.6     | 3.6     | –       | 6                         | 1.67        | 0.32    | 0.26    | –       |
| 40          | 10      | 3.5     | –       | 7                         | 1.93        | 0.41    | 0.25    | –       |
| 50          | 15.6    | 3.6     | 4.8     | 8                         | 2.22        | 0.54    | 0.25    | –       |
| 75          | –       | 5.4     | 4.5     | 9                         | 2.50        | 0.68    | 0.24    | –       |
| 100         | –       | 9.6     | 5.2     | 10                        | 2.78        | 0.84    | 0.24    | –       |
| 125         | –       | 14.6    | 8.2     | 12                        | 3.33        | –       | 0.26    | 0.33    |
| 150         | –       | 21.2    | 11.8    | 14                        | 3.89        | –       | 0.29    | 0.32    |
| 175         | –       | –       | 15.5    | 16                        | 4.44        | –       | 0.34    | 0.31    |
| 200         | –       | –       | 19.5    | 22                        | 6.11        | –       | 0.62    | 0.34    |
|             |         |         |         | 28                        | 7.78        | –       | 0.97    | 0.55    |
|             |         |         |         | 43                        | 9.45        | –       | 1.46    | 0.83    |
|             |         |         |         | 40                        | 11.11       | –       | –       | 1.09    |
|             |         |         |         | 45                        | 12.50       | –       | –       | 1.32    |

## NOTES:

1. Hydro-Rain recommends flow rates in the supply line not to exceed 7.5 ft/sec (2.29m/s) in order to reduce the effects of water hammer.
2. For flows below 5 GPM Hydro-Rain recommends the use of upstream filtration to prevent debris from collecting below the diaphragm.
3. For flows below 10 GPM (2.27 m<sup>3</sup>/h; 0.63 l/s) Hydro-Rain recommends the flow control stem be turned down two full turns from the fully open position.

## HRV SERIES

Tried and True

### Features

- Internal bleed solenoid makes at-the-valve operation easy and spray-free
- Bonnet screws provide trouble-free servicing without the use of tools
- A balanced flow design keeps equal pressure on both sides of the diaphragm while the valve is off, increasing the valve's life
- Glass-filled polypropylene bonnet for extra strength
- Self-cleaning solenoid filter with pilot-flow 90-mesh (200 micron) screen
- The balanced flow design reduces the chance of a flooding event due to a diaphragm failure
- Accepts DC latching solenoids for use with HRC battery-operated controllers



### Specifications

- Pressure: 15-150 psi
- 1" flow: 5-40 GPM (18-151 L/min)
- Water temperature: up to 110°F (43°C)
- Ambient temperature: up to 137°F (58.3°C)

### Solenoid Specifications

- 24VAC 50/60 (Cycle/Sec) solenoid
- Inrush current: .30A (7.2VAC) at 60 Hz
- Holding current: .19A (4.6VAC) at 60 Hz
- Coil resistance: 32 Ω



**HRV-100-R-FF-FC**



**HRV-100-R-FF**

### How to Specify

|       | Model                           |
|-------|---------------------------------|
| HRV   | Residential / Commercial Valves |
|       | Size                            |
| 100-R | Reverse Flow                    |
|       | Options                         |
| FF    | Female Pipe Thread              |
| SS    | PVC Slip                        |
| FC    | Flow Control                    |

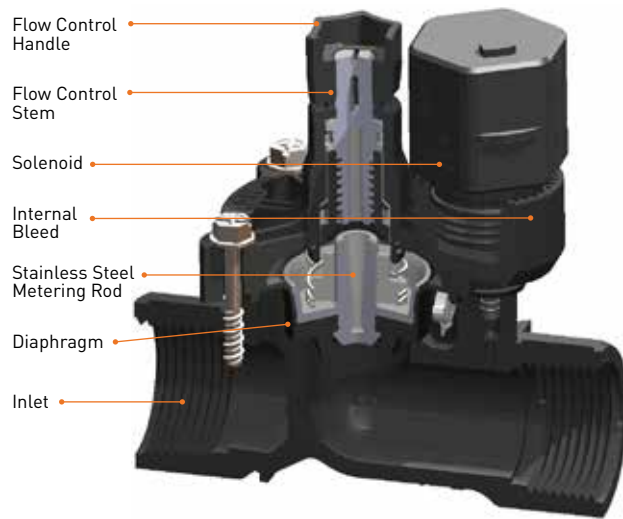
### SKU (Model)

- HRV-100-R-FF (02040)
- HRV-100-R-SS (02041)
- HRV-100-R-FF-FC (02140)
- HRV-100-R-SS-FC (02141)
- HRV-100-FF-FC (03125)
- HRV-100-SS-FC (03126)

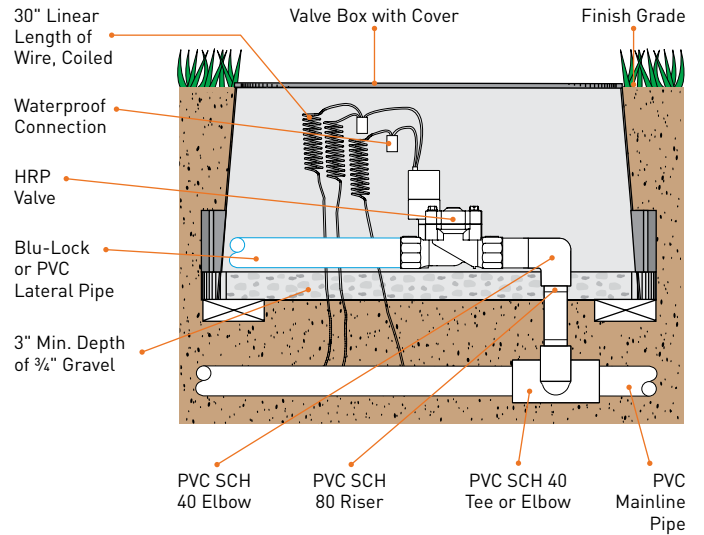
### HRV 100 Pressure Loss

| FLOW<br>GPM | PSI  |
|-------------|------|
| 5           | 1.21 |
| 10          | 1.23 |
| 15          | 1.88 |
| 20          | 2.94 |
| 25          | 4.86 |
| 30          | 9    |

## HRV Cutaway



## Installation Specification Detail



## HRA SERIES

Reliable, Tough,  
and Easy to Use

### Features

- Internal bleed solenoid makes at-the-valve operation easy and spray-free
- Bonnet screws provide trouble-free servicing with a Phillips driver
- Buna-N valve seat delivers positive closure and eliminates weeping
- Atmospheric vacuum breaker—prevents back flow into water source (meets applicable ASSE, CSA and IAPMO standards)
- Glass-filled polypropylene lid design for extra strength and heat resistance
- Forward-flow design
- Accepts DC latching solenoids for use with HRC battery-operated controllers

### Specifications

- Flow: 1-30 GPM (1-115 LPM)
- Pressure range: 10-150 psi (0.7-10 bar)
- Water temperature: up to 110°F (43°C)
- Ambient temperature: up to 137°F (58.3°C)

### Solenoid Specifications

- 24VAC 50/60 (Cycle/Sec) solenoid
- Inrush current: .30A (7.2VAC) at 60 Hz
- Holding current: .19A (4.6VAC) at 60 Hz
- Coil resistance: 32 Ω



**HRA-075**



**HRA-100**

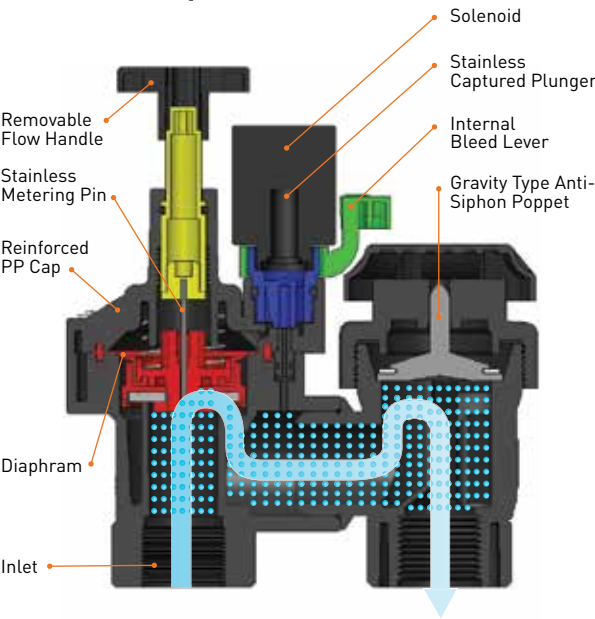
### How to Specify

|     | Model              |
|-----|--------------------|
| HRA | Anti-Siphon        |
|     | Size               |
| 075 | ¾"                 |
| 100 | 1"                 |
|     | Options            |
| FF  | Female Pipe Thread |
| FC  | Flow Control       |

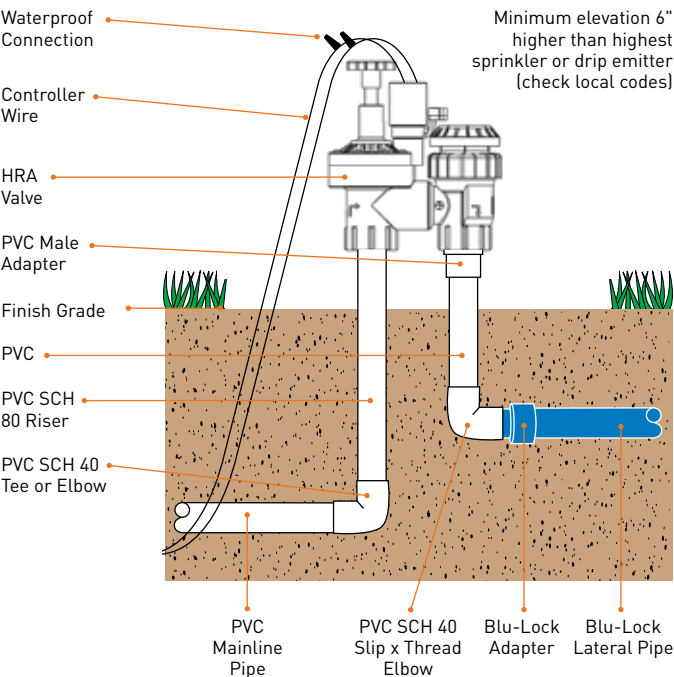
### SKU (Model)

- HRA-075-FF-FC (02013)
- HRA-100-FF-FC (02014)

HRA Cutaway



Installation Specification Detail



HRA Series Pressure Loss

| FLOW<br>GPM | HRA<br>075 | HRA<br>100 |
|-------------|------------|------------|
| 5           | 5          | 4          |
| 10          | 6          | 5          |
| 15          | 6          | 5          |
| 20          | 8          | 7          |
| 25          | —          | 10         |



# HRZ SERIES

Drip Zone Control

- Features**
- Ultra low flow allows operation at lowest possible flows to boost water savings
  - Lowest overall footprint reduces control zone kit and valve box waste
  - Made from 100% recyclable materials and PVC free
  - Stainless steel metering pin ensures optimal diaphragm performance
  - Manual external bleed allows for fast seasonal startup and shutdown
  - Stainless steel 200 mesh filter provides large surface area for low maintenance
  - Filter/regulators have a NPT flush port

- Specifications**
- Flow: 0.2-5.0 GPM (0.76-18.9 l/min)
  - Flow: 12-300 GPH (45-1,136 l/hour)
  - Inlet pressure: 25-150 psi (1.72-10.34 bar)
  - Regulated pressure: 30 psi (2.1 bar)
  - Filtration: 200 mesh filter

- Solenoid Specifications (VFR only)**
- 24VAC 50/60 Hz (Cycles/Sec) solenoid
  - Inrush current: .30A (7.2VAC) at 60 Hz
  - Holding current: .19A (4.6VAC) at 60 Hz
  - Coil resistance: 32 Ω



HRZ-100-VFR



HRZ-075-FR



HRZ-100-FR



HRZ-100-BL



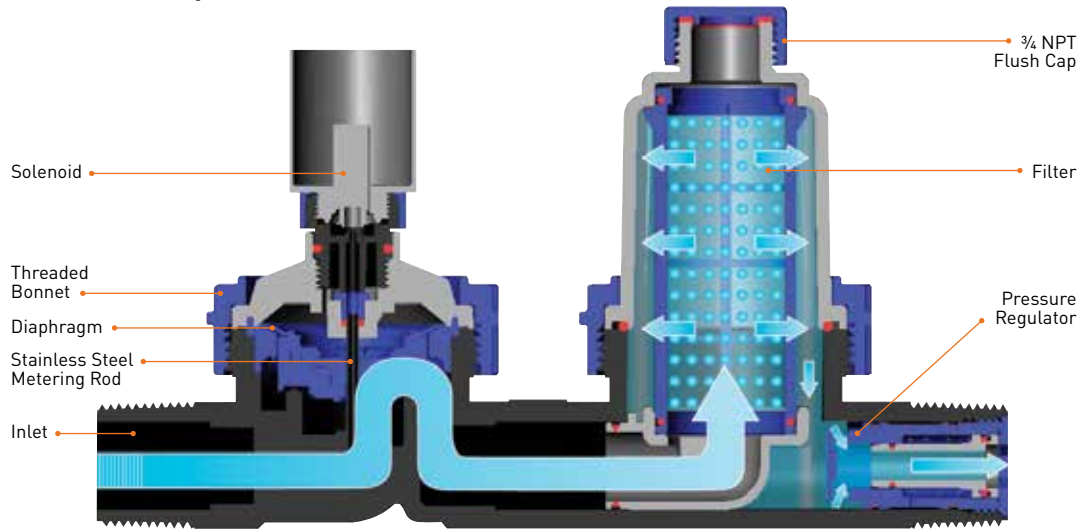
HRZ-100-PVC



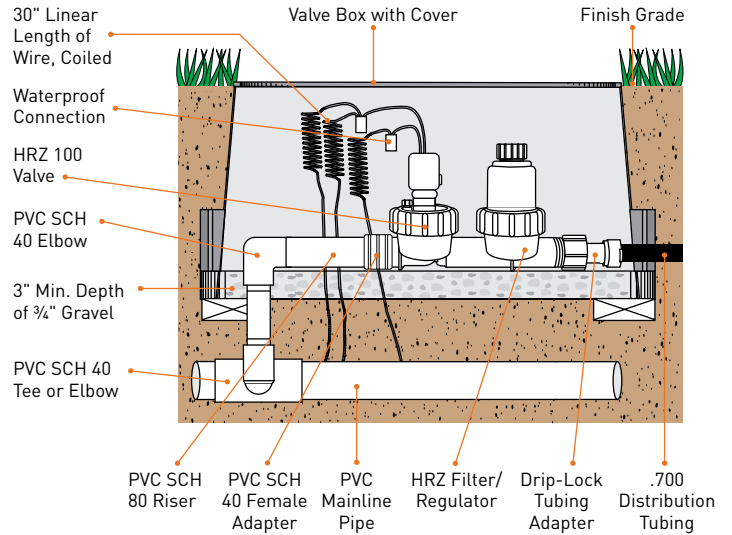
| How to Specify |     |
|----------------|-----|
| Model          | HRZ |
| Inlet Size     | 075 |
| Type           | FR  |
| Options        | 30  |

- SKU (Model)**
- HRZ-100-VFR-30 (02110)
  - HRZ-075-FR-30 (02115)
  - HRZ-100-FR-30 (02116)
  - HRZ-100-BL-30 (02117)
  - HRZ-100-PVC-30 (02118)
- Optional 1/2" Drip-Lock® adapter included

## HRZ Cutaway



## Installation Specification Detail



## HRZ 100 Pressure Loss

| FLOW GPM | PSI  | FLOW LPM | BAR |
|----------|------|----------|-----|
| 0.2      | 31.3 | 0.8      | 2.1 |
| 1.0      | 32.1 | 3.8      | 2.2 |
| 2.0      | 35.3 | 7.6      | 2.4 |
| 3.0      | 40.2 | 11.3     | 2.8 |
| 4.0      | 46.0 | 15.1     | 3.2 |
| 5.0      | 52.3 | 18.9     | 3.6 |

# VALVE ACCESSORIES





## AC SOLENOIDS

Control the Flow

### Features

- Various thread sizes to fit most brands
- Constructed with glass-filled nylon
- 12" of lead wire

### Specifications

- 24VAC 50/60 (Cycle/Sec)

### HRB-XXX-SD-RP Specifications

- Inrush current: 0.30 A @ 24VAC
- Holding current: 0.17A @ 24VAC
- Coil resistance: 21  $\Omega$

### HRJ-SD2-RP Specifications

- Inrush current: 0.36A @ 24VAC
- Holding current: 0.23A @ 24VAC
- Coil resistance: 56  $\Omega$

### HRP-SD-RP Specifications

- Inrush current: 0.35A @ 24VAC
- Holding current: 0.21A @ 24VAC
- Coil resistance: 59  $\Omega$

### HRJ-XXX-SD-RP Specifications

- Inrush current: 0.32A @ 24VAC
- Holding Current: 0.18A @ 24VAC
- Coil Resistance: 32  $\Omega$

HRB-XXX-SD-RP



HRJ-SD2-RP



HRP-SD-RP



HRJ-XXX-SD-RP



### How to Specify

|     | Model                   |
|-----|-------------------------|
| HRV | Professional Valve      |
| HRB | Commercial Valve        |
| HRJ | Jar Top Valve           |
| HRP | Push-fit Valve          |
|     | Series                  |
| XXX | Placeholder             |
| SD  | Solenoid                |
| SD2 | 2nd Generation Solenoid |
|     | Type                    |
| RP  | Replacement             |

### SKU (Model)

- HRB-XXX-SD-RP (05103)
- HRJ-SD2-RP (03084)
- HRP-SD-RP (02034)
- HRJ-XXX-SD-RP (02004)

# DC LATCHING SOLENOID & ADAPTERS

Control any valve

The HRC-990-SD-MD 13 VDC Latching Solenoid is used to convert automatic sprinkler valves so they can be operated with the HRC 900 Battery-Powered Sprinkler Controller.

### Features

- Solenoid is potted with Epoxy in a Heavy Duty housing for extended life in harsh conditions.
- Solenoid is compatible with Hydro-Rain, Irritrol, Toro, Orbit, Richdel, Hardie, and Weathermatic Valves (must reuse Weathermatic O-ring)
- HRC-990-PB-AD provides compatibility with Hydro-Rain HRB valves, Rain Bird PEB, PGA, EFB-CP, BPE/BPES & GB valves
- HRC-990-DV-AD-PF provides compatibility with Hydro-Rain HRP valves, Rain Bird 75-DAS, 100-DAS, 075-ASVF, 100-ASVF, all DV, DVF, and all JTV valves.
- HRC-990-HT-AD-PF provides compatibility with Hunter plastic valves

### Specifications

- Voltage Range: 9 to 14 Volts DC
- Operating current: 1.5A @ 13VDC
- Coil resistance: 11 Ω



HRC-990-SD-MD



HRC-990-UN-AD



HRC-990-PB-AD



HRC-990-DV-AD-PF

### How to Specify

| Model       |                            |
|-------------|----------------------------|
| HRC-990     | Battery-Powered Controller |
| Accessory   |                            |
| SD or 13VDC | Solenoid                   |
| PB          | PEB Solenoid               |
| DV          | DV Solenoid                |
| HT          | PGV Solenoid               |
| UN          | Universal                  |
| Type        |                            |
| AD          | Adapter                    |
| PF          | Push Fit                   |

### SKU (Model)

- HRC-990-SD-MD (04010)
- HRC-990-PB-AD (04022)
- HRC-990-DV-AD-PF (04023L)
- HRC-990-HT-AD-PF (04019)
- HRC-990-UN-AD (04024)
- HRC-13VDC (04010A)

## HRW SERIES

### Speed Seal™ Waterproof Wire Connectors



#### Features

- Metal helical insert twists wires together
- Silicone sealant creates a waterproof connection
- Wires are securely locked into place when twisted in a clockwise direction
- Ergonomic grip increases rapid turn capability and provides comfort and low hand stress
- High density and corrosion resistant material provide extended use and reliability
- Maximum voltage: 600VAC maximum building wire (1000VAC max. signs or luminaries)
- For irrigation systems and landscape lighting applications
- Heavy-duty gusseted pouch bags are resealable
- Extra-wide base provide stability when standing up



#### Specifications

- Max. voltage: 600VAC max. building wire (1000VAC max. signs or luminaries)
- Wire type: copper/copper
- Temperature rating: 105°C (221°F)
- Silicone sealant: -45°F- 400°F

#### How to Specify

| Model    |                               |
|----------|-------------------------------|
| HRW      | Wirenut                       |
| Quantity |                               |
| 61135    | 25 per Bag<br>1000 per Case   |
| 61146    | 150 per Pouch<br>900 per Case |
| 10222    | 20 per Bag<br>200 per Case    |
| 10241    | 100 per Pouch<br>600 per Case |
| 20111    | 15 per Bag<br>150 per Case    |
| 20136    | 50 per Pouch<br>300 per Case  |
| Color    |                               |
| PK       | Orange                        |
| BL       | Blue                          |
| TN       | Tan                           |

#### SKU (Model)

- HRW-61135-PK (03127)
- HRW-61146-PK (03130)
- HRW-10222-BL (03128)
- HRW-10241-BL (03131)
- HRW-20111-TN (03129)
- HRW-20136-TN (03132)

## VALVE BOX AND BASE

Strong and  
Durable

### Valve Box Features

- Pre-molded 3" pipe slots
- 3/8"-16 UNC nut is insert molded into box body
- "T" top lid provides extra strength
- Snap-latch keeps lid in place
- Skid-resistant lid
- Made from 100% recycled material (black boxes only)

### Dimensions

- 20.5" x 15.5" x 12.25"



**VB-STND-12-BG**



**VB-BASE**

### Base Features

- Formed with high strength, high density polyethylene material
- Includes covers for 3" pipe slots
- 6 pre-molded slots for 1.5" OD pipe
- Fits NDS® 14" x 19" box (113)
- Fits Carson®/Oldcastle® (1419)

### Dimensions

- 22.75" x 16.75" x 3.75"



### How to Specify

|      | Model                     |
|------|---------------------------|
| VB   | Valve Box                 |
| BASE | Base                      |
| STND | 15" x 20"                 |
| 12   | 12" Height                |
| BG   | Black Base with Green Lid |

### SKU (Model)

- VB-STND-12-BG (03306)
- VB-BASE (03230)

PVC-LOCK® MANIFOLD TEES

For PVC Pipe

Features

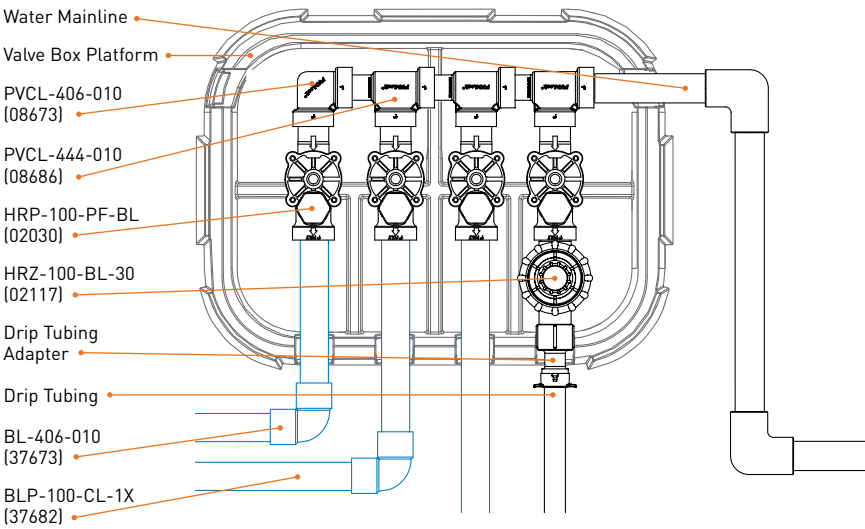
- Patent-pending design is 100% tool and glue free
- PVC-Lock® fittings cut installation time in half or more
- Patent-pending retaining system with stainless steel teeth grip pipe tightly for a strong, leak-proof connection
- PVC-Lock® fittings can swivel 360° around the pipe for easy sprinkler head orientation and adjustment
- For use with all brands and classes of Schedule 40 and 80 PVC pipe
- Removable and reusable using the PVC-Lock® removal tool
- Pressure rated for use on either side of the irrigation valve

Specifications

- Burst pressure: 600 psi (41.4 bar)
- Working pressure: 0-150 psi (10.5 bar) at 68°F (20°C)
- Certifications: IAPMO IGC 300-2013



Installation Specification Detail



| MANIFOLD TEES        | Part Number  | Nom. Size | Description  | SKU   |
|----------------------|--------------|-----------|--------------|-------|
| Push x Spigot x MPT  | PVCL-476-010 | 1"        | 1" x 1" x 1" | 08685 |
| Push x Spigot x Push | PVCL-444-010 | 1"        | 1" x 1" x 1" | 08686 |
| Push x Spigot x FPT  | PVCL-477-101 | 1"        | 1" x 1" x 1" | 08688 |

# HRM 100

## Union Manifold System

### Features

- No cutting, priming, gluing, or waiting
- Takes the estimation out of the installation process
- Built to high industry specifications (ISO 228, ASTM2466)
- Blu-Lock® adapters allow you to go straight out of valves to headers and laterals with environmentally friendly Blu-Lock® pipe
- Oversized O-ring allows more torque and compression to satisfy a wider variety of angles
- Large sealing surface area at critical connections to ensure no leaks
- Maximum pressure of 350 psi @ ambient temperature of 120°F
- 1" I.D. and ultra-smooth core maximizes flow and minimizes friction loss



### Specifications

- Max working pressure: 200 psi @ 73°F
- Burst pressure: exceeds >600 psi @ 73°F

### How to Specify

|     | Model                        |
|-----|------------------------------|
| HRM | Hydro-Rain Manifold System   |
|     | Size                         |
| 100 | 1"                           |
|     |                              |
| 01  | 1 Port                       |
| 02  | 2 Port                       |
| 03  | 3 Port                       |
| UM  | Union Swivel by MPT          |
| UF  | Union Swivel by FPT          |
| US  | Union Swivel by Slip         |
| UU  | Union Swivel by Union Swivel |
| UX  | Union Swivel                 |
| UB  | Union Swivel by Blu-Lock     |
| TS  | Thread Adapter               |
|     | Type                         |
| BD  | Body                         |
| BA  | Buttress Thread Adapter      |
| 1X  | 1"                           |
| CP  | Coupling                     |
| CA  | Cap                          |
| 04  | 4th Generation               |
| 75  | ¾"                           |

### SKU (Model)

- HRM-100-01-BD (03100)
- HRM-100-02-BD (03108)
- HRM-100-03-BD (03101)
- HRM-100-UM-BA (03105)
- HRM-100-UF-BA (03107)
- HRM-100-US-1X (03109)
- HRM-100-UU-CP (03110)
- HRM-100-UX-CA (03102)
- HRM-100-UM-04 (03104)
- HRM-100-UB-1X (03133)
- HRM-100-UB-75 (03134)
- HRM-100-TS-1X (03111)



HRM-100-02-BD

HRM-100-03-BD



HRM-100-01-BD

HRM-100-UM-BA

HRM-100-UF-BA



HRM-100-US-1X

HRM-100-UU-CP

HRM-100-UX-CA



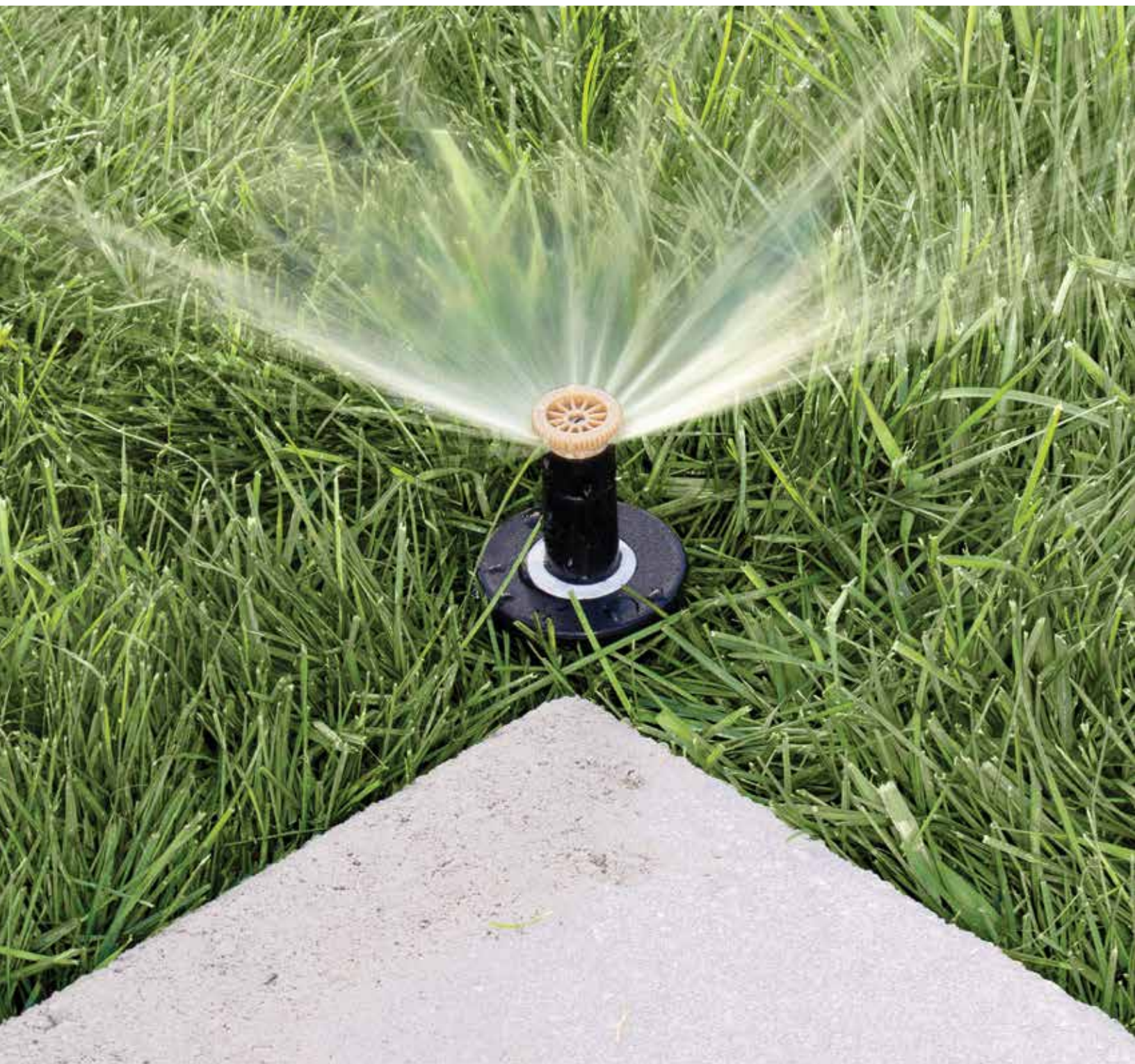
HRM-100-UM-04

HRM-100-UB-1X

HRM-100-UB-75

HRM-100-TS-1X

# SPRINKLERS



# HRS 150

Slim Head



## Features

- Pre-installed "quick rip" flush cap makes nozzle installation trouble-free. Just pull the tab, rip it off the stem, and install the filter and nozzle
- Pressure activated wiper seal minimizes flow-by and resists abrasion from debris
- Compatible with female thread nozzles
- Heavy-duty material stands up to the elements and delivers years of dependable performance
- Heat-treated, stainless steel retractor spring provides years of precision operation
- Two-piece stem ratchet makes nozzle and body alignment effortless
- Duty cycle, life, environmental, and field beta tests ensure quality and dependability
- Compatible with Hydro-Rain®, Hunter®, Irritrol®, K-Rain®, Orbit®, Rain Bird®, RainPro®, and Weathermatic® nozzles



sprinklers

## How to Specify

|     | Model        |
|-----|--------------|
| HRS | Spray Head   |
| 150 | Slim Profile |
| 04  | Height       |
|     | 4"           |

## SKU (Model)

- HRS-150-04 (03030)

## Dimensions

- HRS-150-04 (03030 6¼" (15.8 cm) body height; 4" pop-up height (10.1 cm)
- Exposed surface diameter: 1½" (3.8 cm)

## Specifications

- Pressure: 15-70 psi (1.0-6.2 bar)
- Spacing: 3-20' (0.9-6.1 meters)



## HRS 200

Rugged and  
Durable



### Features

- Five sealing surfaces in wiper seal defend against leaks on the stem and cap
- Over-molded wiper seal with a core of ridged plastic, stands up to corrosives
- Threaded to fit all major manufacturers' female threaded nozzles.
- Improved stem design deflects debris into spray head pockets
- WaterSense® Certified adjustable pressure regulating models increase nozzle efficiency while conserving water.
- Patent pending pressure reducer adjusts from 30 psi for spray nozzles to 40 psi for rotary nozzles with the turn of a screwdriver
- Hydro-Seal™ check valve eliminates low head drainage and speeds initial pop-up
- Spray head pockets are designed to catch debris preventing wear and tear



### How to Specify

|     | Model                                |
|-----|--------------------------------------|
| HRS | Spray Head                           |
| 200 | Commercial                           |
| SA  | Shrub Adapter                        |
| 02  | 2"                                   |
| 03  | 3"                                   |
| 04  | 4"                                   |
| 06  | 6"                                   |
| 12  | 12"                                  |
|     | Options                              |
| NP  | Non-Potable                          |
| BL  | ½" Blu-Lock Elbow                    |
| PR  | Pressure Regulating with Check Valve |

### SKU (Model)

- HRS-200-03 (03006) - 3" Spray Head
- HRS-200-04 (03016) - 4" Spray Head
- HRS-200-06 (03017) - 6" Spray Head
- HRS-200-12 (03018) - 12" Spray Head
- HRS-200-04-BL (03020) - 4" Spray Head with Blu-lock Elbow
- HRS-200-02-PR (03023) - 2" Adjustable Pressure Regulated Spray Head with Hydro-Seal
- HRS-200-03-PR (03007) - 3" Adjustable Pressure Regulated Spray Head with Hydro-Seal
- HRS-200-04-PR (03019) - 4" Adjustable Pressure Regulated Spray Head with Hydro-Seal
- HRS-200-06-PR (03021) - 6" Adjustable Pressure Regulated Spray Head with Hydro-Seal
- HRS-200-12-PR (03022) - 12" Adjustable Pressure Regulated Spray Head with Hydro-Seal

### Dimensions

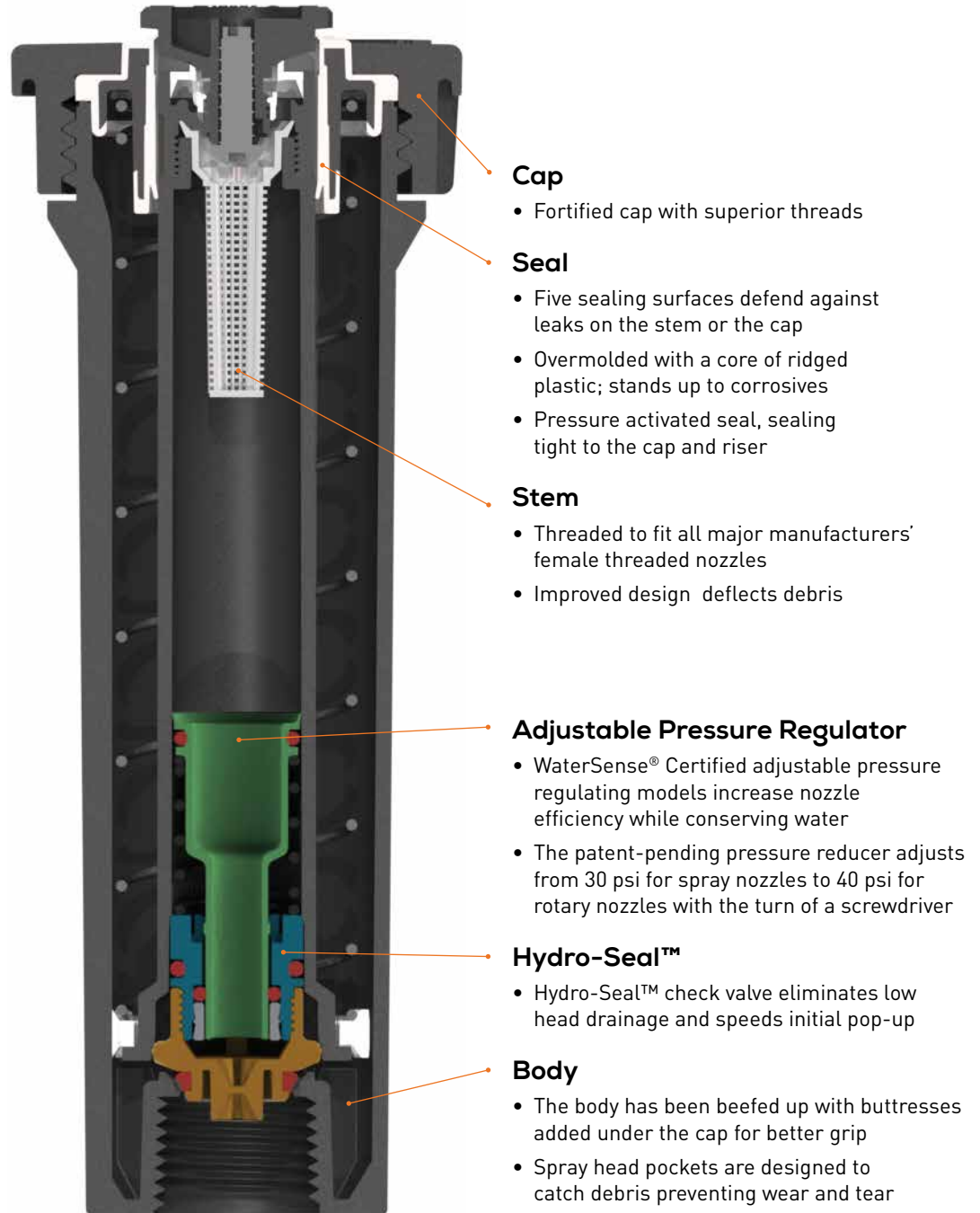
- 2" Spray Heads: 4" body height (10.16 cm); 2" (5.08 cm) pop-up height
- 3" Spray Heads: 5" body height (12.7 cm); 3" (7.62 cm) pop-up height
- 4" Spray Heads: 6" (15.2 cm) body height; 4" pop-up height (10.2 cm)
- 6" Spray Heads: 9 ⅜" (23.8 cm) body height; 6" pop-up height (15.2 cm)
- 12" Spray Heads: 16" (40.6 cm) body height; 12" pop-up height (30.5 cm)
- Cap diameter: 2 ." (5.7 cm)

### Specifications

- Spacing: 3 to 19 feet
- Pressure: 15 to 100 psi
- Flow-by: between 0 and 12 psi 0.1 gpm, above 12 psi 0 gpm
- Hydro-Seal Check Valve: up-to 10' of elevation

# HRS 200

Rugged and  
Durable



see the video



## Specifications

- Pressure: 15-70 psi (1.0-6.2 bar)
- Spacing: 3-20' (0.9-6.1 meters)

# SHRUB HEAD

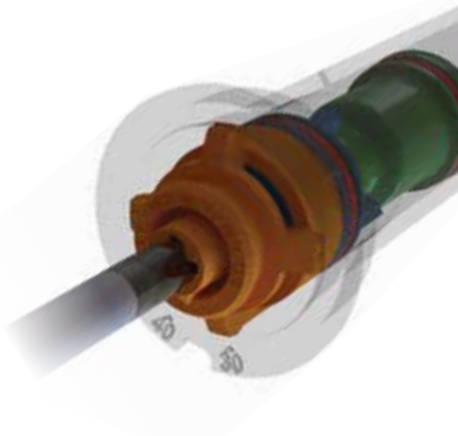
Rugged and Durable



- Features**
- Threaded to fit all major manufacturers' female threaded nozzles.
  - WaterSense® Certified adjustable pressure regulating models increase nozzle efficiency while conserving water.
  - Patent pending pressure reducer adjusts from 30 psi for spray nozzles to 40 psi for rotary nozzles with the turn of a screwdriver

- Dimensions**
- HRN 100 Shrub Adapter: 1 1/4" body height
  - HRS 200 Shrub Adapter: 4" body height

- Specifications**
- Spacing: 3 to 19 feet
  - Pressure: 15 to 100 psi
  - Flow-by: 0 gpm



HRS-200-SA-PR

| How to Specify |                             |
|----------------|-----------------------------|
| Model          |                             |
| HRS            | Spray Head                  |
| HRN            | Spray Nozzle                |
| Series         |                             |
| 200            | Commercial                  |
| 200            | Residential                 |
| Height         |                             |
| SA             | Shrub Adapter               |
| Options        |                             |
| PL             | Plastic                     |
| PR             | Pressure                    |
|                | Regulating with Check Valve |

- SKU (Model)**
- HRN-100-SA-PL (94525) - Shrub Adapter
  - HRS-200-SA-PR (54550) - Adjustable Pressure Regulated Shrub Adapter with Hydro-Seal Check Valve



HRN-100-SA-PL

## NON POTABLE

Reclaimed  
Water Ready



### Features

- Purple cap (Pantone color No. 512) for fast identification of recycled/reclaimed/Non-potable water
- Five sealing surfaces in wiper seal defend against leaks on the stem and cap
- Over-molded wiper seal with a core of ridged plastic, stands up to chemicals and corrosives
- Threaded to fit all major manufacturers' female threaded nozzles.
- Improved stem design deflects debris into spray head pockets
- WaterSense® Certified adjustable pressure regulating models increase nozzle efficiency while conserving water.
- Patent pending pressure reducer adjusts from 30 psi for spray nozzles to 40 psi for rotary nozzles with the turn of a screwdriver
- Hydro-Seal™ check valve eliminates low head drainage and speeds initial pop-up
- Spray head pockets are designed to catch debris preventing wear and tear



sprinklers

### How to Specify

|     | Model                                |
|-----|--------------------------------------|
| HRS | Spray Head                           |
| 200 | Commercial                           |
|     | Height                               |
| 04  | 4"                                   |
| 06  | 6"                                   |
| 12  | 12"                                  |
|     | Options                              |
| NP  | Non-Potable                          |
| PR  | Pressure Regulating with Check Valve |

### SKU (Model)

- HRS-200-04-NP (03044) - 4" Spray Head for Non-potable water
- HRS-200-06-NP (03045) - 6" Spray Head for Non-potable water
- HRS-200-12-NP (03046) - 12" Spray Head for Non-potable water
- HRS-200-04-NP-PR (03054) - 4" Spray Head for Non-potable water with Adjustable Pressure regulator and Hydro-Seal
- HRS-200-06-NP-PR (03055) - 6" Spray Head for Non-potable water with Adjustable Pressure regulator and Hydro-Seal
- HRS-200-12-NP-PR (03056) - 12" Spray Head for Non-potable water with Adjustable Pressure regulator and Hydro-Seal

### Dimensions

- 4" Spray Heads: 6" body height; 4" pop-up height
- 6" Spray Heads: 9 3/8" body height; 6" pop-up height
- 12" Spray Heads: 16" body height; 12" pop-up height
- Cap diameter: 2 1/4"

### Specifications

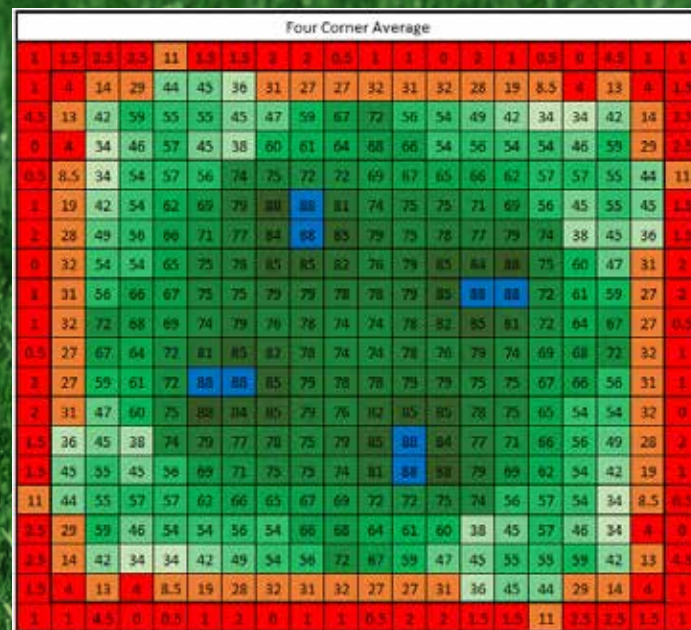
- Spacing: 3 to 19 feet
- Pressure: 15 to 100 psi
- Flow-by: between 0 and 12 psi 0.1 gpm, above 12 psi 0 gpm
- Hydro-Seal Check Valve: up-to 10' of elevation

## DISTRIBUTION UNIFORMITY

Distribution Uniformity is a measure of how uniformly water is being applied and if some areas are receiving more water than others. Simply put, is a measure of the irrigation system efficiency.

Hydro-Rain Nozzles are designed to have a match precipitation rate giving you the best Distribution Uniformity as shown in the four corner average diagram.

# HYDRO-RAIN®



## COMPETITOR A



## COMPETITOR B



# HRN 200

Outstanding  
Distribution  
Uniformity  
and Low  
Precipitation  
Rates

## Features

- Top is color-coded according to spray radius
- Thick, ridged edges around top of nozzle gives excellent grip no matter the conditions
- Adjustment slot allows use of a screwdriver to give fine arc adjustment during operation
- Matched precipitation on fixed and adjustable nozzles allow for outstanding distribution uniformity
- Strip nozzles have the most uniform precipitation rate vs. leading competitors

## How to Specify

|     | Model      |
|-----|------------|
| HRN | Nozzle     |
|     | Series     |
| 200 | Adjustable |
|     | Radius     |
| 04  | 4 Feet     |
| 08  | 8 Feet     |
| 10  | 10 Feet    |
| 12  | 12 Feet    |
| 15  | 15 Feet    |
| 18  | 18 Feet    |
|     | Pattern    |
| ADJ | Adjustable |

## SKU (Model)

- HRN-200-04-ADJ (04100)
- HRN-200-08-ADJ (04101)
- HRN-200-10-ADJ (04102)
- HRN-200-12-ADJ (04103)
- HRN-200-15-ADJ (04104)
- HRN-200-18-ADJ (04105)

## Adjustable Pattern Spray Nozzles



## Specifications

- Pressure range: 15-70 psi (1.03-4.83 bar)
- Optimized for 30 psi (2.1 bar)
- Filtration: 500 micron filter



| PATTERN                                                                                         | PRESSURE<br>PSI | RADIUS<br>FT | FLOW<br>GPM | PRECIP<br>IN/H ■ | PRECIP<br>IN/H ▲ | PRESSURE<br>BARS           | RADIUS<br>M | FLOW<br>M³/H | FLOW<br>L/S | PRECIP<br>MM/H ■ | PRECIP<br>MM/H ▲ |
|-------------------------------------------------------------------------------------------------|-----------------|--------------|-------------|------------------|------------------|----------------------------|-------------|--------------|-------------|------------------|------------------|
| HRN-200-04-ADJ (04100)                                                                          |                 |              |             |                  |                  | 4° Trajectory SI (Metric)  |             |              |             |                  |                  |
| 90° Arc<br>    | 20              | 4            | 0.61        | 14.75            | 17.03            | 1.4                        | 1.2         | 0.14         | 0.04        | 374.55           | 432.50           |
|                                                                                                 | 25              | 5            | 0.67        | 12.65            | 14.61            | 1.7                        | 1.4         | 0.15         | 0.04        | 321.30           | 371.02           |
|                                                                                                 | 30              | 5            | 0.73        | 11.22            | 12.95            | 2.1                        | 1.5         | 0.17         | 0.05        | 284.96           | 329.05           |
|                                                                                                 | 35              | 6            | 0.79        | 10.07            | 11.63            | 2.4                        | 1.7         | 0.18         | 0.05        | 255.72           | 295.29           |
|                                                                                                 | 40              | 6            | 0.84        | 8.97             | 10.36            | 2.8                        | 1.8         | 0.19         | 0.05        | 227.96           | 263.23           |
| 180° Arc<br>   | 20              | 4            | 1.23        | 14.75            | 17.03            | 1.4                        | 1.2         | 0.28         | 0.08        | 374.55           | 432.50           |
|                                                                                                 | 25              | 5            | 1.33        | 12.65            | 14.61            | 1.7                        | 1.4         | 0.30         | 0.08        | 321.30           | 371.02           |
|                                                                                                 | 30              | 5            | 1.46        | 11.22            | 12.95            | 2.1                        | 1.5         | 0.33         | 0.09        | 284.96           | 329.05           |
|                                                                                                 | 35              | 6            | 1.58        | 10.07            | 11.63            | 2.4                        | 1.7         | 0.36         | 0.10        | 255.72           | 295.29           |
|                                                                                                 | 40              | 6            | 1.68        | 8.97             | 10.36            | 2.8                        | 1.8         | 0.38         | 0.11        | 227.96           | 263.23           |
| 270° Arc<br>   | 20              | 4            | 1.84        | 14.75            | 17.03            | 1.4                        | 1.2         | 0.42         | 0.12        | 374.55           | 432.50           |
|                                                                                                 | 25              | 5            | 2.00        | 12.65            | 14.61            | 1.7                        | 1.4         | 0.45         | 0.13        | 321.30           | 371.02           |
|                                                                                                 | 30              | 5            | 2.18        | 11.22            | 12.95            | 2.1                        | 1.5         | 0.50         | 0.14        | 284.96           | 329.05           |
|                                                                                                 | 35              | 6            | 2.37        | 10.07            | 11.63            | 2.4                        | 1.7         | 0.54         | 0.15        | 255.72           | 295.29           |
|                                                                                                 | 40              | 6            | 2.52        | 8.97             | 10.36            | 2.8                        | 1.8         | 0.57         | 0.16        | 227.96           | 263.23           |
| 360° Arc<br>   | 20              | 4            | 2.45        | 14.75            | 17.03            | 1.4                        | 1.2         | 0.56         | 0.15        | 374.55           | 432.50           |
|                                                                                                 | 25              | 5            | 2.66        | 12.65            | 14.61            | 1.7                        | 1.4         | 0.60         | 0.17        | 321.30           | 371.02           |
|                                                                                                 | 30              | 5            | 2.91        | 11.22            | 12.95            | 2.1                        | 1.5         | 0.66         | 0.18        | 284.96           | 329.05           |
|                                                                                                 | 35              | 6            | 3.16        | 10.07            | 11.63            | 2.4                        | 1.7         | 0.72         | 0.20        | 255.72           | 295.29           |
|                                                                                                 | 40              | 6            | 3.36        | 8.97             | 10.36            | 2.8                        | 1.8         | 0.76         | 0.21        | 227.96           | 263.23           |
| HRN-200-08-ADJ (04101)                                                                          |                 |              |             |                  |                  | 10° Trajectory SI (Metric) |             |              |             |                  |                  |
| 90° Arc<br>    | 20              | 7            | 0.39        | 3.03             | 3.49             | 1.4                        | 2.1         | 0.09         | 0.02        | 76.87            | 88.77            |
|                                                                                                 | 25              | 8            | 0.42        | 2.77             | 3.20             | 1.7                        | 2.3         | 0.10         | 0.03        | 70.45            | 81.35            |
|                                                                                                 | 30              | 8            | 0.46        | 2.55             | 2.95             | 2.1                        | 2.5         | 0.10         | 0.03        | 64.86            | 74.90            |
|                                                                                                 | 35              | 9            | 0.50        | 2.37             | 2.73             | 2.4                        | 2.7         | 0.11         | 0.03        | 60.09            | 69.39            |
|                                                                                                 | 40              | 9            | 0.53        | 2.33             | 2.70             | 2.8                        | 2.8         | 0.12         | 0.03        | 59.29            | 68.46            |
| 180° Arc<br> | 20              | 7            | 0.77        | 3.03             | 3.49             | 1.4                        | 2.1         | 0.17         | 0.05        | 76.87            | 88.77            |
|                                                                                                 | 25              | 8            | 0.85        | 2.77             | 3.20             | 1.7                        | 2.3         | 0.19         | 0.05        | 70.45            | 81.35            |
|                                                                                                 | 30              | 8            | 0.92        | 2.55             | 2.95             | 2.1                        | 2.5         | 0.21         | 0.06        | 64.86            | 74.90            |
|                                                                                                 | 35              | 9            | 1.00        | 2.37             | 2.73             | 2.4                        | 2.7         | 0.23         | 0.06        | 60.09            | 69.39            |
|                                                                                                 | 40              | 9            | 1.06        | 2.33             | 2.70             | 2.8                        | 2.8         | 0.24         | 0.07        | 59.29            | 68.46            |
| 270° Arc<br> | 20              | 7            | 1.16        | 3.03             | 3.49             | 1.4                        | 2.1         | 0.26         | 0.07        | 76.87            | 88.77            |
|                                                                                                 | 25              | 8            | 1.27        | 2.77             | 3.20             | 1.7                        | 2.3         | 0.29         | 0.08        | 70.45            | 81.35            |
|                                                                                                 | 30              | 8            | 1.38        | 2.55             | 2.95             | 2.1                        | 2.5         | 0.31         | 0.09        | 64.86            | 74.90            |
|                                                                                                 | 35              | 9            | 1.49        | 2.37             | 2.73             | 2.4                        | 2.7         | 0.34         | 0.09        | 60.09            | 69.39            |
|                                                                                                 | 40              | 9            | 1.58        | 2.33             | 2.70             | 2.8                        | 2.8         | 0.36         | 0.10        | 59.29            | 68.46            |
| 360° Arc<br> | 20              | 7            | 1.54        | 3.03             | 3.49             | 1.4                        | 2.1         | 0.35         | 0.10        | 76.87            | 88.77            |
|                                                                                                 | 25              | 8            | 1.69        | 2.77             | 3.20             | 1.7                        | 2.3         | 0.38         | 0.11        | 70.45            | 81.35            |
|                                                                                                 | 30              | 8            | 1.84        | 2.55             | 2.95             | 2.1                        | 2.5         | 0.42         | 0.12        | 64.86            | 74.90            |
|                                                                                                 | 35              | 9            | 1.99        | 2.37             | 2.73             | 2.4                        | 2.7         | 0.45         | 0.13        | 60.09            | 69.39            |
|                                                                                                 | 40              | 9            | 2.11        | 2.33             | 2.70             | 2.8                        | 2.8         | 0.48         | 0.13        | 59.29            | 68.46            |



\*Adjusting the radius reduction screw/diffuser screw may be required to achieve catalog distance and flow

| PATTERN                                                                                         | PRESSURE<br>PSI | RADIUS<br>FT | FLOW<br>GPM | PRECIP<br>IN/H ■ | PRECIP<br>IN/H ▲ | PRESSURE<br>BARS | RADIUS<br>M | FLOW<br>M³/H | FLOW<br>L/S | PRECIP<br>MM/H ■ | PRECIP<br>MM/H ▲ |
|-------------------------------------------------------------------------------------------------|-----------------|--------------|-------------|------------------|------------------|------------------|-------------|--------------|-------------|------------------|------------------|
| HRN-200-10-ADJ (04102)                                                                          |                 |              |             |                  |                  | 18° Trajectory   |             |              |             |                  |                  |
| 90° Arc<br>    | 20              | 9            | 0.39        | 1.83             | 2.11             | 1.4              | 2.7         | 0.09         | 0.02        | 46.50            | 53.70            |
|                                                                                                 | 25              | 10           | 0.42        | 1.80             | 2.08             | 1.7              | 2.9         | 0.10         | 0.03        | 45.80            | 52.89            |
|                                                                                                 | 30              | 10           | 0.46        | 1.77             | 2.05             | 2.1              | 3.0         | 0.10         | 0.03        | 45.01            | 51.97            |
|                                                                                                 | 35              | 11           | 0.50        | 1.74             | 2.01             | 2.4              | 3.2         | 0.11         | 0.03        | 44.15            | 50.98            |
|                                                                                                 | 40              | 11           | 0.53        | 1.68             | 1.94             | 2.8              | 3.4         | 0.12         | 0.03        | 42.65            | 49.25            |
| 180° Arc<br>   | 20              | 9            | 0.77        | 1.83             | 2.11             | 1.4              | 2.7         | 0.17         | 0.05        | 46.50            | 53.70            |
|                                                                                                 | 25              | 10           | 0.85        | 1.80             | 2.08             | 1.7              | 2.9         | 0.19         | 0.05        | 45.80            | 52.89            |
|                                                                                                 | 30              | 10           | 0.92        | 1.77             | 2.05             | 2.1              | 3.0         | 0.21         | 0.06        | 45.01            | 51.97            |
|                                                                                                 | 35              | 11           | 1.00        | 1.74             | 2.01             | 2.4              | 3.2         | 0.23         | 0.06        | 44.15            | 50.98            |
|                                                                                                 | 40              | 11           | 1.06        | 1.68             | 1.94             | 2.8              | 3.4         | 0.24         | 0.07        | 42.65            | 49.25            |
| 270° Arc<br>   | 20              | 9            | 1.16        | 1.83             | 2.11             | 1.4              | 2.7         | 0.26         | 0.07        | 46.50            | 53.70            |
|                                                                                                 | 25              | 10           | 1.27        | 1.80             | 2.08             | 1.7              | 2.9         | 0.29         | 0.08        | 45.80            | 52.89            |
|                                                                                                 | 30              | 10           | 1.38        | 1.77             | 2.05             | 2.1              | 3.0         | 0.31         | 0.09        | 45.01            | 51.97            |
|                                                                                                 | 35              | 11           | 1.49        | 1.74             | 2.01             | 2.4              | 3.2         | 0.34         | 0.09        | 44.15            | 50.98            |
|                                                                                                 | 40              | 11           | 1.58        | 1.68             | 1.94             | 2.8              | 3.4         | 0.36         | 0.10        | 42.65            | 49.25            |
| 360° Arc<br>   | 20              | 9            | 1.54        | 1.83             | 2.11             | 1.4              | 2.7         | 0.35         | 0.10        | 46.50            | 53.70            |
|                                                                                                 | 25              | 10           | 1.69        | 1.80             | 2.08             | 1.7              | 2.9         | 0.38         | 0.11        | 45.80            | 52.89            |
|                                                                                                 | 30              | 10           | 1.84        | 1.77             | 2.05             | 2.1              | 3.0         | 0.42         | 0.12        | 45.01            | 51.97            |
|                                                                                                 | 35              | 11           | 1.99        | 1.74             | 2.01             | 2.4              | 3.2         | 0.45         | 0.13        | 44.15            | 50.98            |
|                                                                                                 | 40              | 11           | 2.11        | 1.68             | 1.94             | 2.8              | 3.4         | 0.48         | 0.13        | 42.65            | 49.25            |
| HRN-200-12-ADJ (04103)                                                                          |                 |              |             |                  |                  | 18° Trajectory   |             |              |             |                  |                  |
| 90° Arc<br>    | 20              | 12           | 0.51        | 1.48             | 1.71             | 1.4              | 3.5         | 0.12         | 0.03        | 37.55            | 43.36            |
|                                                                                                 | 25              | 12           | 0.55        | 1.46             | 1.68             | 1.7              | 3.7         | 0.12         | 0.03        | 37.03            | 42.76            |
|                                                                                                 | 30              | 13           | 0.58        | 1.43             | 1.65             | 2.1              | 3.8         | 0.13         | 0.04        | 36.40            | 42.03            |
|                                                                                                 | 35              | 13           | 0.62        | 1.41             | 1.63             | 2.4              | 4.0         | 0.14         | 0.04        | 35.82            | 41.36            |
|                                                                                                 | 40              | 14           | 0.65        | 1.37             | 1.58             | 2.8              | 4.1         | 0.15         | 0.04        | 34.86            | 40.26            |
| 180° Arc<br> | 20              | 12           | 1.02        | 1.48             | 1.71             | 1.4              | 3.5         | 0.23         | 0.06        | 37.55            | 43.36            |
|                                                                                                 | 25              | 12           | 1.09        | 1.46             | 1.68             | 1.7              | 3.7         | 0.25         | 0.07        | 37.03            | 42.76            |
|                                                                                                 | 30              | 13           | 1.16        | 1.43             | 1.65             | 2.1              | 3.8         | 0.26         | 0.07        | 36.40            | 42.03            |
|                                                                                                 | 35              | 13           | 1.24        | 1.41             | 1.63             | 2.4              | 4.0         | 0.28         | 0.08        | 35.82            | 41.36            |
|                                                                                                 | 40              | 14           | 1.30        | 1.37             | 1.58             | 2.8              | 4.1         | 0.29         | 0.08        | 34.86            | 40.26            |
| 270° Arc<br> | 20              | 12           | 1.52        | 1.48             | 1.71             | 1.4              | 3.5         | 0.35         | 0.10        | 37.55            | 43.36            |
|                                                                                                 | 25              | 12           | 1.64        | 1.46             | 1.68             | 1.7              | 3.7         | 0.37         | 0.10        | 37.03            | 42.76            |
|                                                                                                 | 30              | 13           | 1.74        | 1.43             | 1.65             | 2.1              | 3.8         | 0.40         | 0.11        | 36.40            | 42.03            |
|                                                                                                 | 35              | 13           | 1.86        | 1.41             | 1.63             | 2.4              | 4.0         | 0.42         | 0.12        | 35.82            | 41.36            |
|                                                                                                 | 40              | 14           | 1.95        | 1.37             | 1.58             | 2.8              | 4.1         | 0.44         | 0.12        | 34.86            | 40.26            |
| 360° Arc<br> | 20              | 12           | 2.03        | 1.48             | 1.71             | 1.4              | 3.5         | 0.46         | 0.13        | 37.55            | 43.36            |
|                                                                                                 | 25              | 12           | 2.18        | 1.46             | 1.68             | 1.7              | 3.7         | 0.50         | 0.14        | 37.03            | 42.76            |
|                                                                                                 | 30              | 13           | 2.33        | 1.43             | 1.65             | 2.1              | 3.8         | 0.53         | 0.15        | 36.40            | 42.03            |
|                                                                                                 | 35              | 13           | 2.48        | 1.41             | 1.63             | 2.4              | 4.0         | 0.56         | 0.16        | 35.82            | 41.36            |
|                                                                                                 | 40              | 14           | 2.60        | 1.37             | 1.58             | 2.8              | 4.1         | 0.59         | 0.16        | 34.86            | 40.26            |



\*Adjusting the radius reduction screw/diffuser screw may be required to achieve catalog distance and flow

| PATTERN                                                                                         | PRESSURE<br>PSI | RADIUS<br>FT | FLOW<br>GPM | PRECIP<br>IN/H ■ | PRECIP<br>IN/H ▲ | PRESSURE<br>BARS           | RADIUS<br>M | FLOW<br>M³/H | FLOW<br>L/S | PRECIP<br>MM/H ■ | PRECIP<br>MM/H ▲ |
|-------------------------------------------------------------------------------------------------|-----------------|--------------|-------------|------------------|------------------|----------------------------|-------------|--------------|-------------|------------------|------------------|
| HRN-200-15-ADJ (04104)                                                                          |                 |              |             |                  |                  | 26° Trajectory SI (Metric) |             |              |             |                  |                  |
| 90° Arc<br>    | 20              | 13           | 0.59        | 1.34             | 1.54             | 1.4                        | 4.0         | 0.13         | 0.04        | 33.94            | 39.19            |
|                                                                                                 | 25              | 14           | 0.65        | 1.27             | 1.46             | 1.7                        | 4.3         | 0.15         | 0.04        | 32.20            | 37.18            |
|                                                                                                 | 30              | 15           | 0.69        | 1.27             | 1.47             | 2.1                        | 4.4         | 0.16         | 0.04        | 32.25            | 37.25            |
|                                                                                                 | 35              | 15           | 0.74        | 1.27             | 1.47             | 2.4                        | 4.6         | 0.17         | 0.05        | 32.34            | 37.35            |
|                                                                                                 | 40              | 16           | 0.79        | 1.19             | 1.38             | 2.8                        | 4.9         | 0.18         | 0.05        | 30.29            | 34.98            |
| 180° Arc<br>   | 20              | 13           | 1.17        | 1.34             | 1.54             | 1.4                        | 4.0         | 0.27         | 0.07        | 33.94            | 39.19            |
|                                                                                                 | 25              | 14           | 1.29        | 1.27             | 1.46             | 1.7                        | 4.3         | 0.29         | 0.08        | 32.20            | 37.18            |
|                                                                                                 | 30              | 15           | 1.39        | 1.27             | 1.47             | 2.1                        | 4.4         | 0.31         | 0.09        | 32.25            | 37.25            |
|                                                                                                 | 35              | 15           | 1.49        | 1.27             | 1.47             | 2.4                        | 4.6         | 0.34         | 0.09        | 32.34            | 37.35            |
|                                                                                                 | 40              | 16           | 1.59        | 1.19             | 1.38             | 2.8                        | 4.9         | 0.36         | 0.10        | 30.29            | 34.98            |
| 270° Arc<br>   | 20              | 13           | 1.76        | 1.34             | 1.54             | 1.4                        | 4.0         | 0.40         | 0.11        | 33.94            | 39.19            |
|                                                                                                 | 25              | 14           | 1.94        | 1.27             | 1.46             | 1.7                        | 4.3         | 0.44         | 0.12        | 32.20            | 37.18            |
|                                                                                                 | 30              | 15           | 2.08        | 1.27             | 1.47             | 2.1                        | 4.4         | 0.47         | 0.13        | 32.25            | 37.25            |
|                                                                                                 | 35              | 15           | 2.23        | 1.27             | 1.47             | 2.4                        | 4.6         | 0.51         | 0.14        | 32.34            | 37.35            |
|                                                                                                 | 40              | 16           | 2.38        | 1.19             | 1.38             | 2.8                        | 4.9         | 0.54         | 0.15        | 30.29            | 34.98            |
| 360° Arc<br>   | 20              | 13           | 2.35        | 1.34             | 1.54             | 1.4                        | 4.0         | 0.53         | 0.15        | 33.94            | 39.19            |
|                                                                                                 | 25              | 14           | 2.58        | 1.27             | 1.46             | 1.7                        | 4.3         | 0.59         | 0.16        | 32.20            | 37.18            |
|                                                                                                 | 30              | 15           | 2.77        | 1.27             | 1.47             | 2.1                        | 4.4         | 0.63         | 0.17        | 32.25            | 37.25            |
|                                                                                                 | 35              | 15           | 2.98        | 1.27             | 1.47             | 2.4                        | 4.6         | 0.68         | 0.19        | 32.34            | 37.35            |
|                                                                                                 | 40              | 16           | 3.17        | 1.19             | 1.38             | 2.8                        | 4.9         | 0.72         | 0.20        | 30.29            | 34.98            |
| HRN-200-18-ADJ (04105)                                                                          |                 |              |             |                  |                  | 30° Trajectory SI (Metric) |             |              |             |                  |                  |
| 90° Arc<br>   | 20              | 15           | 0.68        | 1.16             | 1.34             | 1.4                        | 4.6         | 0.15         | 0.04        | 29.46            | 34.02            |
|                                                                                                 | 25              | 16           | 0.75        | 1.13             | 1.31             | 1.7                        | 4.9         | 0.17         | 0.05        | 28.78            | 33.24            |
|                                                                                                 | 30              | 17           | 0.83        | 1.11             | 1.28             | 2.1                        | 5.2         | 0.19         | 0.05        | 28.16            | 32.52            |
|                                                                                                 | 35              | 18           | 0.90        | 1.07             | 1.24             | 2.4                        | 5.5         | 0.20         | 0.06        | 27.22            | 31.43            |
|                                                                                                 | 40              | 19           | 0.96        | 1.02             | 1.18             | 2.8                        | 5.8         | 0.22         | 0.06        | 25.98            | 30.01            |
| 180° Arc<br> | 20              | 15           | 1.36        | 1.16             | 1.34             | 1.4                        | 4.6         | 0.31         | 0.09        | 29.46            | 34.02            |
|                                                                                                 | 25              | 16           | 1.51        | 1.13             | 1.31             | 1.7                        | 4.9         | 0.34         | 0.10        | 28.78            | 33.24            |
|                                                                                                 | 30              | 17           | 1.66        | 1.11             | 1.28             | 2.1                        | 5.2         | 0.38         | 0.10        | 28.16            | 32.52            |
|                                                                                                 | 35              | 18           | 1.80        | 1.07             | 1.24             | 2.4                        | 5.5         | 0.41         | 0.11        | 27.22            | 31.43            |
|                                                                                                 | 40              | 19           | 1.92        | 1.02             | 1.18             | 2.8                        | 5.8         | 0.44         | 0.12        | 25.98            | 30.01            |
| 270° Arc<br> | 20              | 15           | 2.03        | 1.16             | 1.34             | 1.4                        | 4.6         | 0.46         | 0.13        | 29.46            | 34.02            |
|                                                                                                 | 25              | 16           | 2.26        | 1.13             | 1.31             | 1.7                        | 4.9         | 0.51         | 0.14        | 28.78            | 33.24            |
|                                                                                                 | 30              | 17           | 2.50        | 1.11             | 1.28             | 2.1                        | 5.2         | 0.57         | 0.16        | 28.16            | 32.52            |
|                                                                                                 | 35              | 18           | 2.70        | 1.07             | 1.24             | 2.4                        | 5.5         | 0.61         | 0.17        | 27.22            | 31.43            |
|                                                                                                 | 40              | 19           | 2.88        | 1.02             | 1.18             | 2.8                        | 5.8         | 0.65         | 0.18        | 25.98            | 30.01            |
| 360° Arc<br> | 20              | 15           | 2.71        | 1.16             | 1.34             | 1.4                        | 4.6         | 0.62         | 0.17        | 29.46            | 34.02            |
|                                                                                                 | 25              | 16           | 3.01        | 1.13             | 1.31             | 1.7                        | 4.9         | 0.68         | 0.19        | 28.78            | 33.24            |
|                                                                                                 | 30              | 17           | 3.33        | 1.11             | 1.28             | 2.1                        | 5.2         | 0.76         | 0.21        | 28.16            | 32.52            |
|                                                                                                 | 35              | 18           | 3.61        | 1.07             | 1.24             | 2.4                        | 5.5         | 0.82         | 0.23        | 27.22            | 31.43            |
|                                                                                                 | 40              | 19           | 3.84        | 1.02             | 1.18             | 2.8                        | 5.8         | 0.87         | 0.24        | 25.98            | 30.01            |

\*Adjusting the radius reduction screw/diffuser screw may be required to achieve catalog distance and flow

# HRN 100

Outstanding  
Distribution  
Uniformity  
and Low  
Precipitation  
Rates

## Features

- Body is color-coded according to spray radius
- Thick, ridged edges around top of nozzle gives excellent grip no matter the conditions
- Adjustment slot allows use of a screwdriver to give fine arc adjustment during operation
- Matched precipitation on fixed and adjustable nozzles allow for outstanding distribution uniformity
- Strip nozzles have the most uniform precipitation rate vs. leading competitors

## Fixed Pattern Spray Nozzles



## Specifications

- Pressure range: 15-70 psi (1.03-4.83 bar)
- Optimized for 30 psi (2.1 bar)
- Filtration: 500 micron filter

## How to Specify

|     | Model        |
|-----|--------------|
| HRN | Nozzle       |
|     | Series       |
| 100 | Fixed        |
|     | Radius       |
| 04  | 4 Feet       |
| 08  | 8 Feet       |
| 10  | 10 Feet      |
| 12  | 12 Feet      |
| 15  | 15 Feet      |
| 18  | 18 Feet      |
|     | Pattern      |
| Q   | Quarter      |
| H   | Half         |
| F   | Full         |
| SST | Side Strip   |
| CST | Center Strip |
| EST | End Strip    |

## SKU (Model)

- HRN-100-08-Q (04203)
- HRN-100-08-H (04204)
- HRN-100-08-F (04205)
- HRN-100-10-Q (04206)
- HRN-100-10-H (04207)
- HRN-100-10-F (04208)
- HRN-100-12-Q (04209)
- HRN-100-12-H (04210)
- HRN-100-12-F (04211)
- HRN-100-15-Q (04212)
- HRN-100-15-H (04213)
- HRN-100-15-F (04214)
- HRN-100-15-SST (04215)
- HRN-100-15-CST (04216)
- HRN-100-15-EST (04217)

| PATTERN                                                                           | PRESSURE<br>PSI | W x L<br>FT | FLOW<br>GPM           |
|-----------------------------------------------------------------------------------|-----------------|-------------|-----------------------|
| <b>HRN-100-15-SST (04215)</b>                                                     |                 |             | <b>30° Trajectory</b> |
|  | 20              | 4 X 28      | 1.09                  |
|                                                                                   | 25              | 4 X 30      | 1.18                  |
|                                                                                   | 30              | 4 X 30      | 1.28                  |
|                                                                                   | 35              | 4 X 30      | 1.37                  |
|                                                                                   | 40              | 4 X 32      | 1.48                  |
| <b>HRN-100-15-CST (04216)</b>                                                     |                 |             | <b>30° Trajectory</b> |
|  | 20              | 4 X 28      | 1.09                  |
|                                                                                   | 25              | 4 X 30      | 1.18                  |
|                                                                                   | 30              | 4 X 30      | 1.28                  |
|                                                                                   | 35              | 4 X 30      | 1.37                  |
|                                                                                   | 40              | 4 X 32      | 1.48                  |
| <b>HRN-100-15-EST (04217)</b>                                                     |                 |             | <b>30° Trajectory</b> |
|  | 20              | 4 X 15      | 0.54                  |
|                                                                                   | 25              | 4 X 15      | 0.59                  |
|                                                                                   | 30              | 4 X 15      | 0.64                  |
|                                                                                   | 35              | 4 X 16      | 0.69                  |
|                                                                                   | 40              | 4 X 16      | 0.74                  |

| PATTERN                                                                             | PRESSURE<br>PSI | RADIUS<br>FT | FLOW<br>GPM           | PRECIP<br>IN/H ■ | PRECIP<br>IN/H ▲ | PRESSURE<br>BARS   | RADIUS<br>M | FLOW<br>M³/H | FLOW<br>L/S | PRECIP<br>MM/H ■ | PRECIP<br>MM/H ▲ |
|-------------------------------------------------------------------------------------|-----------------|--------------|-----------------------|------------------|------------------|--------------------|-------------|--------------|-------------|------------------|------------------|
| <b>HRN-100-08-Q (04203)</b>                                                         |                 |              | <b>10° Trajectory</b> |                  |                  | <b>SI (Metric)</b> |             |              |             |                  |                  |
|  | 20              | 7            | 0.29                  | 2.26             | 2.60             | 1.4                | 2.1         | 0.07         | 0.02        | 57.28            | 66.15            |
|                                                                                     | 25              | 8            | 0.32                  | 2.09             | 2.42             | 1.7                | 2.3         | 0.07         | 0.02        | 53.15            | 61.38            |
|                                                                                     | 30              | 8            | 0.35                  | 1.94             | 2.24             | 2.1                | 2.5         | 0.08         | 0.02        | 49.17            | 56.78            |
|                                                                                     | 35              | 9            | 0.37                  | 1.78             | 2.05             | 2.4                | 2.7         | 0.08         | 0.02        | 45.15            | 52.13            |
|                                                                                     | 40              | 9            | 0.40                  | 1.76             | 2.03             | 2.8                | 2.8         | 0.09         | 0.03        | 44.68            | 51.59            |
| <b>HRN-100-08-H (04204)</b>                                                         |                 |              | <b>10° Trajectory</b> |                  |                  | <b>SI (Metric)</b> |             |              |             |                  |                  |
|  | 20              | 7            | 0.57                  | 2.26             | 2.60             | 1.4                | 2.1         | 0.13         | 0.04        | 57.28            | 66.15            |
|                                                                                     | 25              | 8            | 0.64                  | 2.09             | 2.42             | 1.7                | 2.3         | 0.14         | 0.04        | 53.15            | 61.38            |
|                                                                                     | 30              | 8            | 0.70                  | 1.94             | 2.24             | 2.1                | 2.5         | 0.16         | 0.04        | 49.17            | 56.78            |
|                                                                                     | 35              | 9            | 0.75                  | 1.78             | 2.05             | 2.4                | 2.7         | 0.17         | 0.05        | 45.15            | 52.13            |
|                                                                                     | 40              | 9            | 0.80                  | 1.76             | 2.03             | 2.8                | 2.8         | 0.18         | 0.05        | 44.68            | 51.59            |
| <b>HRN-100-08-F (04205)</b>                                                         |                 |              | <b>10° Trajectory</b> |                  |                  | <b>SI (Metric)</b> |             |              |             |                  |                  |
|  | 20              | 7            | 1.15                  | 2.26             | 2.60             | 1.4                | 2.1         | 0.26         | 0.07        | 57.28            | 66.15            |
|                                                                                     | 25              | 8            | 1.28                  | 2.09             | 2.42             | 1.7                | 2.3         | 0.29         | 0.08        | 53.15            | 61.38            |
|                                                                                     | 30              | 8            | 1.40                  | 1.94             | 2.24             | 2.1                | 2.5         | 0.32         | 0.09        | 49.17            | 56.78            |
|                                                                                     | 35              | 9            | 1.50                  | 1.78             | 2.05             | 2.4                | 2.7         | 0.34         | 0.09        | 45.15            | 52.13            |
|                                                                                     | 40              | 9            | 1.59                  | 1.76             | 2.03             | 2.8                | 2.8         | 0.36         | 0.10        | 44.68            | 51.59            |
| <b>HRN-100-10-Q (04206)</b>                                                         |                 |              | <b>15° Trajectory</b> |                  |                  | <b>SI (Metric)</b> |             |              |             |                  |                  |
|  | 20              | 9            | 0.42                  | 2.00             | 2.31             | 1.4                | 2.7         | 0.10         | 0.03        | 50.73            | 58.58            |
|                                                                                     | 25              | 10           | 0.47                  | 2.00             | 2.31             | 1.7                | 2.9         | 0.11         | 0.03        | 50.82            | 58.68            |
|                                                                                     | 30              | 10           | 0.52                  | 1.99             | 2.30             | 2.1                | 3.0         | 0.12         | 0.03        | 50.63            | 58.47            |
|                                                                                     | 35              | 11           | 0.56                  | 1.95             | 2.25             | 2.4                | 3.2         | 0.13         | 0.04        | 49.59            | 57.26            |
|                                                                                     | 40              | 11           | 0.60                  | 1.91             | 2.21             | 2.8                | 3.4         | 0.14         | 0.04        | 48.52            | 56.02            |
| <b>HRN-100-10-H (04207)</b>                                                         |                 |              | <b>15° Trajectory</b> |                  |                  | <b>SI (Metric)</b> |             |              |             |                  |                  |
|  | 20              | 9            | 0.84                  | 2.00             | 2.31             | 1.4                | 2.7         | 0.19         | 0.05        | 50.73            | 58.58            |
|                                                                                     | 25              | 10           | 0.94                  | 2.00             | 2.31             | 1.7                | 2.9         | 0.21         | 0.06        | 50.82            | 58.68            |
|                                                                                     | 30              | 10           | 1.04                  | 1.99             | 2.30             | 2.1                | 3.0         | 0.24         | 0.07        | 50.63            | 58.47            |
|                                                                                     | 35              | 11           | 1.12                  | 1.95             | 2.25             | 2.4                | 3.2         | 0.25         | 0.07        | 49.59            | 57.26            |
|                                                                                     | 40              | 11           | 1.20                  | 1.91             | 2.21             | 2.8                | 3.4         | 0.27         | 0.08        | 48.52            | 56.02            |

| PATTERN                                                                                         | PRESSURE<br>PSI | RADIUS<br>FT | FLOW<br>GPM | PRECIP<br>IN/H ■ | PRECIP<br>IN/H ▲ | PRESSURE<br>BARS      | RADIUS<br>M | FLOW<br>M³/H | FLOW<br>L/S | PRECIP<br>MM/H ■ | PRECIP<br>MM/H ▲ |
|-------------------------------------------------------------------------------------------------|-----------------|--------------|-------------|------------------|------------------|-----------------------|-------------|--------------|-------------|------------------|------------------|
| <b>HRN-100-10-F (04208)</b>                                                                     |                 |              |             |                  |                  | <b>15° Trajectory</b> |             |              |             |                  |                  |
| 360° Arc<br>   | 20              | 9            | 1.68        | 2.00             | 2.31             | 1.4                   | 2.7         | 0.38         | 0.11        | 50.73            | 58.58            |
|                                                                                                 | 25              | 10           | 1.88        | 2.00             | 2.31             | 1.7                   | 2.9         | 0.43         | 0.12        | 50.82            | 58.68            |
|                                                                                                 | 30              | 10           | 2.07        | 1.99             | 2.30             | 2.1                   | 3.0         | 0.47         | 0.13        | 50.63            | 58.47            |
|                                                                                                 | 35              | 11           | 2.24        | 1.95             | 2.25             | 2.4                   | 3.2         | 0.51         | 0.14        | 49.59            | 57.26            |
|                                                                                                 | 40              | 11           | 2.40        | 1.91             | 2.21             | 2.8                   | 3.4         | 0.55         | 0.15        | 48.52            | 56.02            |
| <b>HRN-100-12-Q (04209)</b>                                                                     |                 |              |             |                  |                  | <b>20° Trajectory</b> |             |              |             |                  |                  |
| 90° Arc<br>    | 20              | 12           | 0.61        | 1.76             | 2.03             | 1.4                   | 3.5         | 0.14         | 0.04        | 44.76            | 51.68            |
|                                                                                                 | 25              | 12           | 0.68        | 1.81             | 2.09             | 1.7                   | 3.7         | 0.15         | 0.04        | 45.95            | 53.06            |
|                                                                                                 | 30              | 13           | 0.74        | 1.83             | 2.11             | 2.1                   | 3.8         | 0.17         | 0.05        | 46.38            | 53.55            |
|                                                                                                 | 35              | 13           | 0.80        | 1.83             | 2.11             | 2.4                   | 4.0         | 0.18         | 0.05        | 46.39            | 53.57            |
|                                                                                                 | 40              | 14           | 0.86        | 1.81             | 2.09             | 2.8                   | 4.1         | 0.19         | 0.05        | 45.90            | 53.00            |
| <b>HRN-100-12-H (04210)</b>                                                                     |                 |              |             |                  |                  | <b>20° Trajectory</b> |             |              |             |                  |                  |
| 180° Arc<br>   | 20              | 12           | 1.21        | 1.76             | 2.03             | 1.4                   | 3.5         | 0.27         | 0.08        | 44.76            | 51.68            |
|                                                                                                 | 25              | 12           | 1.35        | 1.81             | 2.09             | 1.7                   | 3.7         | 0.31         | 0.09        | 45.95            | 53.06            |
|                                                                                                 | 30              | 13           | 1.48        | 1.83             | 2.11             | 2.1                   | 3.8         | 0.34         | 0.09        | 46.38            | 53.55            |
|                                                                                                 | 35              | 13           | 1.60        | 1.83             | 2.11             | 2.4                   | 4.0         | 0.36         | 0.10        | 46.39            | 53.57            |
|                                                                                                 | 40              | 14           | 1.71        | 1.81             | 2.09             | 2.8                   | 4.1         | 0.39         | 0.11        | 45.90            | 53.00            |
| <b>HRN-100-12-F (04211)</b>                                                                     |                 |              |             |                  |                  | <b>20° Trajectory</b> |             |              |             |                  |                  |
| 360° Arc<br>   | 20              | 12           | 2.42        | 1.76             | 2.03             | 1.4                   | 3.5         | 0.55         | 0.15        | 44.76            | 51.68            |
|                                                                                                 | 25              | 12           | 2.71        | 1.81             | 2.09             | 1.7                   | 3.7         | 0.61         | 0.17        | 45.95            | 53.06            |
|                                                                                                 | 30              | 13           | 2.96        | 1.83             | 2.11             | 2.1                   | 3.8         | 0.67         | 0.19        | 46.38            | 53.55            |
|                                                                                                 | 35              | 13           | 3.21        | 1.83             | 2.11             | 2.4                   | 4.0         | 0.73         | 0.20        | 46.39            | 53.57            |
|                                                                                                 | 40              | 14           | 3.42        | 1.81             | 2.09             | 2.8                   | 4.1         | 0.78         | 0.22        | 45.90            | 53.00            |
| <b>HRN-100-15-Q (04212)</b>                                                                     |                 |              |             |                  |                  | <b>28° Trajectory</b> |             |              |             |                  |                  |
| 90° Arc<br>  | 20              | 14           | 0.76        | 1.61             | 1.86             | 1.4                   | 4.1         | 0.17         | 0.05        | 40.87            | 47.19            |
|                                                                                                 | 25              | 14           | 0.85        | 1.67             | 1.93             | 1.7                   | 4.3         | 0.19         | 0.05        | 42.52            | 49.10            |
|                                                                                                 | 30              | 15           | 0.96        | 1.75             | 2.02             | 2.1                   | 4.4         | 0.22         | 0.06        | 44.50            | 51.39            |
|                                                                                                 | 35              | 15           | 1.03        | 1.77             | 2.04             | 2.4                   | 4.6         | 0.23         | 0.07        | 44.93            | 51.88            |
|                                                                                                 | 40              | 16           | 1.11        | 1.77             | 2.05             | 2.8                   | 4.7         | 0.25         | 0.07        | 45.00            | 51.96            |
| <b>HRN-100-15-H (04213)</b>                                                                     |                 |              |             |                  |                  | <b>28° Trajectory</b> |             |              |             |                  |                  |
| 180° Arc<br> | 20              | 14           | 1.52        | 1.61             | 1.86             | 1.4                   | 4.1         | 0.35         | 0.10        | 40.87            | 47.19            |
|                                                                                                 | 25              | 14           | 1.70        | 1.67             | 1.93             | 1.7                   | 4.3         | 0.39         | 0.11        | 42.52            | 49.10            |
|                                                                                                 | 30              | 15           | 1.91        | 1.75             | 2.02             | 2.1                   | 4.4         | 0.43         | 0.12        | 44.50            | 51.39            |
|                                                                                                 | 35              | 15           | 2.07        | 1.77             | 2.04             | 2.4                   | 4.6         | 0.47         | 0.13        | 44.93            | 51.88            |
|                                                                                                 | 40              | 16           | 2.21        | 1.77             | 2.05             | 2.8                   | 4.7         | 0.50         | 0.14        | 45.00            | 51.96            |
| <b>HRN-100-15-F (04214)</b>                                                                     |                 |              |             |                  |                  | <b>28° Trajectory</b> |             |              |             |                  |                  |
| 360° Arc<br> | 20              | 14           | 3.05        | 1.61             | 1.86             | 1.4                   | 4.1         | 0.69         | 0.19        | 40.87            | 47.19            |
|                                                                                                 | 25              | 14           | 3.41        | 1.67             | 1.93             | 1.7                   | 4.3         | 0.77         | 0.21        | 42.52            | 49.10            |
|                                                                                                 | 30              | 15           | 3.83        | 1.75             | 2.02             | 2.1                   | 4.4         | 0.87         | 0.24        | 44.50            | 51.39            |
|                                                                                                 | 35              | 15           | 4.13        | 1.77             | 2.04             | 2.4                   | 4.6         | 0.94         | 0.26        | 44.93            | 51.88            |
|                                                                                                 | 40              | 16           | 4.42        | 1.77             | 2.05             | 2.8                   | 4.7         | 1.00         | 0.28        | 45.00            | 51.96            |

\*Adjusting the radius reduction screw/diffuser screw may be required to achieve catalog distance and flow

## HRX 075

Industry-  
Leading  
Distribution  
Uniformity

### Features

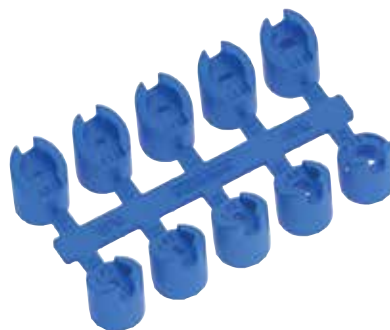
- Uniform coverage with matched precipitation across nozzles #1 through #4 and low angle nozzles
- Easy-to-match precipitation nozzle system. Use nozzle #1 for 90°, #2 for 180°, #3 for 270°, and #4 for 360°
- Rubber cover keeps the dirt out of adjustment components
- Lubricated gear assembly provides years of reliable use
- Precision reversing mechanism enables smooth non-delayed forward and reverse rotation
- Adjustment key changes arc from 40-360°
- Radius can be adjusted from 100-50%

### Dimensions

- Overall height: 7 3/8" (19 cm)
- Exposed surface diameter: 1 3/4" (4 cm)
- Pop-up height: 4" (10 cm)

### Specifications

- Precipitation rate: 0.10-1.03 inches per hour
- Radius: 22'-52'
- Operating pressure: 30-70 psi
- Flow rate: 0.3-9.6 GPM
- Inlet: 3/4" FPT
- Nozzle outlet trajectory: 25 degree standard or 13 degrees low angle
- Nozzle installed: Number 2



### How to Specify

|     | Model                     |
|-----|---------------------------|
| HRX | Rotor                     |
|     | Inlet                     |
| 075 | 3/4" FPT                  |
|     | Pattern                   |
| ADJ | Adjustable                |
|     | Options                   |
| NP  | Non-potable/<br>Reclaimed |

### SKU (Model)

- HRX-075-ADJ (01010)
- HRX-075-ADJ-NP (01014)

| NOZZLE       | PRESSURE<br>PSI | RADIUS<br>FT | FLOW<br>GPM | PRECIP<br>IN/H ■ | PRECIP<br>IN/H ▲ |
|--------------|-----------------|--------------|-------------|------------------|------------------|
| <b>1</b>     | 25              | 28           | 0.7         | 0.18             | 0.20             |
|              | 35              | 30           | 0.9         | 0.18             | 0.21             |
|              | 45              | 31           | 1.0         | 0.20             | 0.23             |
|              | 55              | 31           | 1.1         | 0.22             | 0.26             |
|              | 65              | 31           | 1.3         | 0.26             | 0.30             |
| <b>2</b>     | 25              | 31           | 1.4         | 0.28             | 0.32             |
|              | 35              | 34           | 1.7         | 0.29             | 0.34             |
|              | 45              | 35           | 2.0         | 0.32             | 0.37             |
|              | 55              | 36           | 2.3         | 0.35             | 0.41             |
|              | 65              | 37           | 2.5         | 0.36             | 0.42             |
| <b>3</b>     | 25              | 31           | 2.1         | 0.43             | 0.49             |
|              | 35              | 35           | 2.6         | 0.41             | 0.48             |
|              | 45              | 38           | 3.0         | 0.41             | 0.47             |
|              | 55              | 39           | 3.3         | 0.41             | 0.48             |
|              | 65              | 40           | 3.6         | 0.43             | 0.49             |
| <b>4</b>     | 25              | 33           | 2.8         | 0.50             | 0.57             |
|              | 35              | 38           | 3.4         | 0.46             | 0.53             |
|              | 45              | 40           | 4.0         | 0.49             | 0.56             |
|              | 55              | 42           | 4.5         | 0.50             | 0.58             |
|              | 65              | 43           | 5.0         | 0.51             | 0.59             |
| <b>8</b>     | 25              | 36           | 6.0         | 0.89             | 1.03             |
|              | 35              | 45           | 7.1         | 0.68             | 0.79             |
|              | 45              | 50           | 8.0         | 0.63             | 0.73             |
|              | 55              | 51           | 8.8         | 0.66             | 0.76             |
|              | 65              | 52           | 9.6         | 0.68             | 0.79             |
| <b>L 0.5</b> | 25              | 24           | 0.3         | 0.10             | 0.12             |
|              | 35              | 26           | 0.4         | 0.11             | 0.13             |
|              | 45              | 28           | 0.5         | 0.12             | 0.14             |
|              | 55              | 29           | 0.6         | 0.14             | 0.16             |
|              | 65              | 31           | 0.7         | 0.14             | 0.16             |
| <b>L 1</b>   | 25              | 23           | 0.7         | 0.26             | 0.30             |
|              | 35              | 26           | 0.9         | 0.25             | 0.29             |
|              | 45              | 29           | 1.0         | 0.23             | 0.26             |
|              | 55              | 31           | 1.2         | 0.25             | 0.29             |
|              | 65              | 32           | 1.4         | 0.27             | 0.31             |
| <b>L 1.5</b> | 25              | 23           | 1.2         | 0.44             | 0.50             |
|              | 35              | 27           | 1.3         | 0.35             | 0.40             |
|              | 45              | 29           | 1.5         | 0.34             | 0.40             |
|              | 55              | 31           | 1.7         | 0.35             | 0.40             |
|              | 65              | 32           | 1.9         | 0.36             | 0.42             |
| <b>L 2</b>   | 25              | 23           | 1.6         | 0.58             | 0.67             |
|              | 35              | 27           | 1.8         | 0.49             | 0.57             |
|              | 45              | 29           | 2.0         | 0.45             | 0.52             |
|              | 55              | 32           | 2.2         | 0.43             | 0.49             |
|              | 65              | 33           | 2.4         | 0.42             | 0.49             |
| <b>L 3</b>   | 25              | 30           | 2.6         | 0.57             | 0.65             |
|              | 35              | 36           | 2.8         | 0.42             | 0.48             |
|              | 45              | 40           | 3.0         | 0.37             | 0.43             |
|              | 55              | 41           | 3.3         | 0.37             | 0.43             |
|              | 65              | 42           | 3.5         | 0.38             | 0.44             |

\*All precipitation rates were calculated using 180° operation. The precipitation rate for 360° of operation would be half of the value in the table. 8.0 nozzle is designed for single-head field and pasture applications

\*For optimal matched precipitation use the suggested nozzle when the indicated pattern is set.

|                                                                                     | PATTERN     | Suggested Nozzle | Suggested L Nozzle |
|-------------------------------------------------------------------------------------|-------------|------------------|--------------------|
|  | <b>90°</b>  | 1                | L 0.5              |
|  | <b>180°</b> | 2                | L 1                |
|  | <b>270°</b> | 3                | L 1.5              |
|  | <b>360°</b> | 4                | L 2                |



sprinklers



# MICRO-IRRIGATION *AND* FITTINGS





# Drip Irrigation

Use HRM fittings with Blu-Lock for 1-inch applications

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Use BL-435-102 and BL-401-101-DL for ¾-inch applications

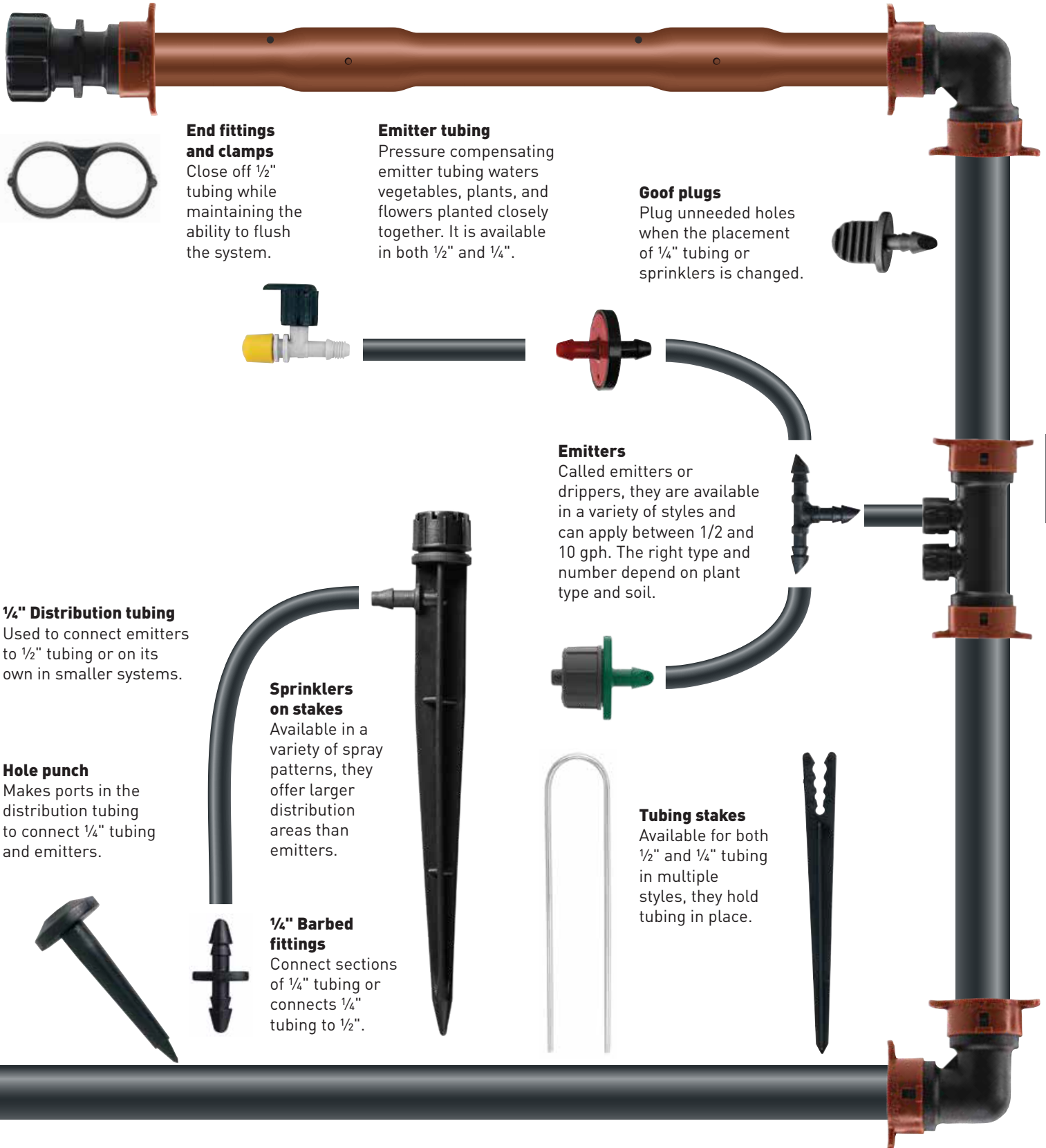
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Use the included 1 inch by ½ inch adapter for ½ inch applications

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**End fittings and clamps**

Close off 1/2" tubing while maintaining the ability to flush the system.

**Emitter tubing**

Pressure compensating emitter tubing waters vegetables, plants, and flowers planted closely together. It is available in both 1/2" and 1/4".

**Goof plugs**

Plug unneeded holes when the placement of 1/4" tubing or sprinklers is changed.

**Emitters**

Called emitters or drippers, they are available in a variety of styles and can apply between 1/2 and 10 gph. The right type and number depend on plant type and soil.

**1/4" Distribution tubing**

Used to connect emitters to 1/2" tubing or on its own in smaller systems.

**Sprinklers on stakes**

Available in a variety of spray patterns, they offer larger distribution areas than emitters.

**Hole punch**

Makes ports in the distribution tubing to connect 1/4" tubing and emitters.

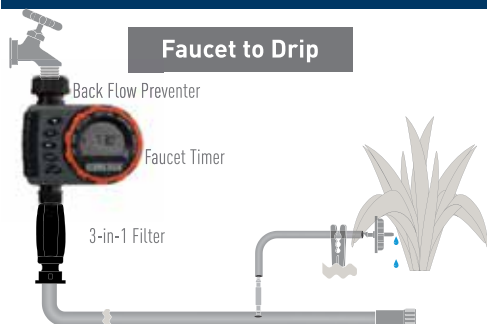
**1/4" Barbed fittings**

Connect sections of 1/4" tubing or connects 1/4" tubing to 1/2".

**Tubing stakes**

Available for both 1/2" and 1/4" tubing in multiple styles, they hold tubing in place.

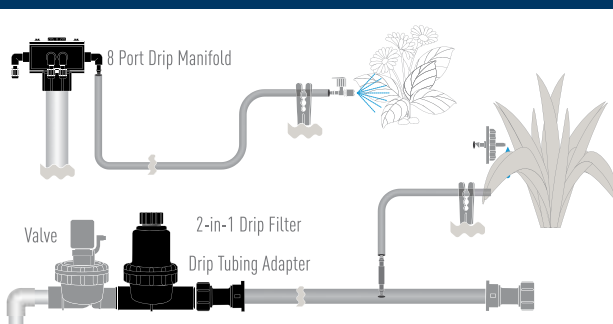
## Connect To Water Source



**Faucet to Drip**

**Riser to Drip**

**Valve to Drip**



HRC-980-MULTI-01  
(04035)

### HRC-980-Multi-01

Provides automatic irrigation control for drip systems connected to a hose tap.



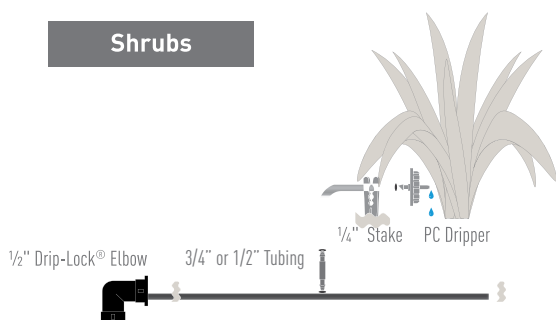
HRZ-100-VFR-30  
(02110)

### HRZ Filter/Regulators

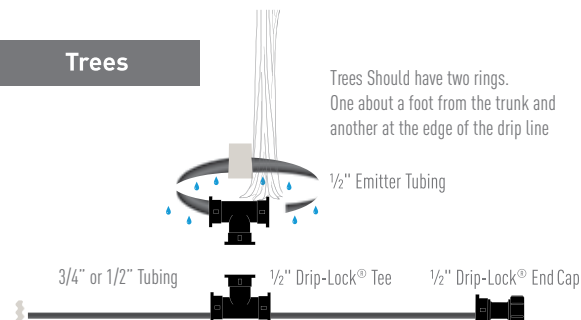
Easily connects to an irrigation valve for large scale drip projects.

## Connect Distribution Tubing and Fittings

**Shrubs**



**Trees**



### Blu-Lock Fittings

Use 1" or 3/4" HDPE pipe and fittings to move the water close to where you need it.



### Blu-Lock Transition Fittings

Use transition fittings when coming out of the valve or reducing to 1/2" drip line.



### Drip-Lock Fittings

1/2" Drip-lock fittings work with most brands of tubing faster than traditional insert fittings.



### Drip-Lock Manifold Tee

Install on 1/2" lines as needed to add emitters.



### HRZ Manifolds

Add to irrigation risers for use with multiple emitters from one riser.

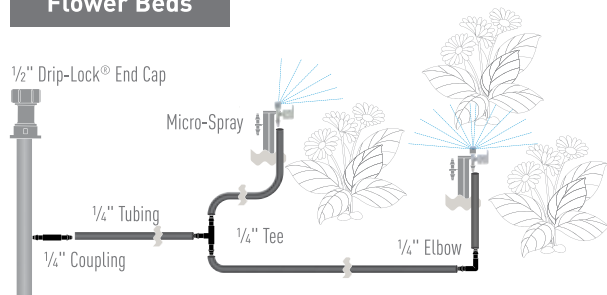


### Blu-Lock and DLT Pipe

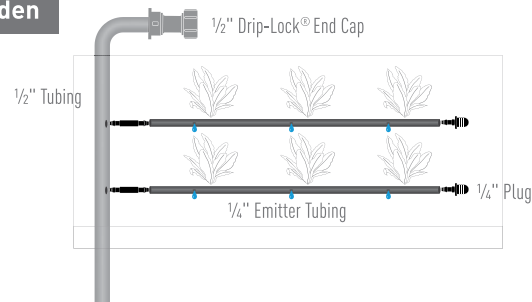
Distribute the water from the valve to the emitter lines.

## Connect Emitter Lines and Fittings

### Flower Beds



### Vegetable Garden



### Drip-Lock Manifold Tee

Install on 1/2" lines as needed to add 1/2" emitter lines.



### Double Barb 1/4" Fittings

The double barb holds tight in distribution lines.

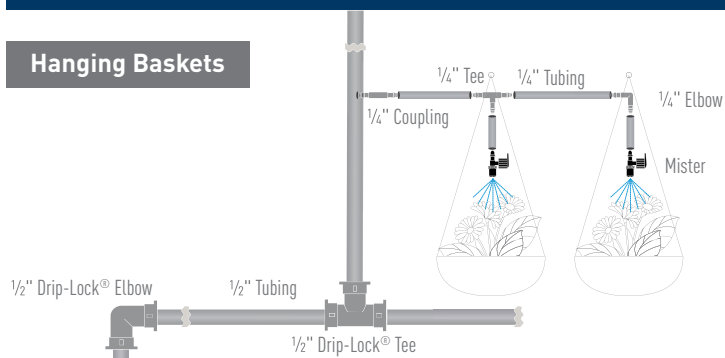


### 1/4" DLT Tubing

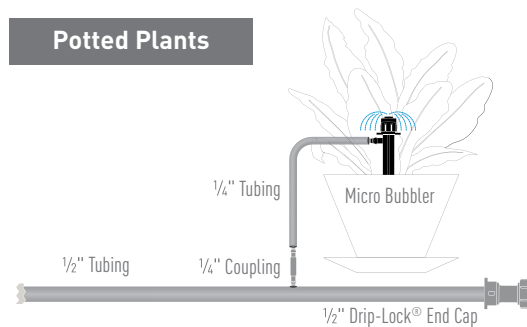
Moves the water to the plant from the larger distribution lines.

## Connect Sprinklers and Emitters

### Hanging Baskets



### Potted Plants



### Sprinklers/Drippers

Choose the right type of watering for any drip application



Spray

For watering delicate flowers and garden areas



Dripper

For spot watering trees and shrubs



Multi-Stream/  
Micro-Bubbler

For gently watering potted plants and flower beds

### Sprinkler Types



Micro-SprayM

Sprays 1-15 ft.  
Use in flower beds and gardens.  
Available in Strip, 90, 180 and 360 degree patterns.



Mister

Fine Mist  
Perfect for watering delicate flowers, hanging baskets, and flower pots.



Multi-Stream

Sprays 1 to 6 ft.  
Ideal for watering flowers, potted plants and shrubs.



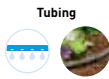
Micro-Bubbler

Sprays 1 to 6 ft.  
Use for watering shrubs and potted plants.



Dripper

.5 to 4 GPH  
Optimal for spot watering trees and shrubs.



Tubing

1 GPH  
Ideal for trees, gardens, and densely planted areas



HRZ SERIES

Manifolds

Features

- Flow control on adjustable manifolds
- ¼" barbed ports with threaded caps
- Easy to remove filter-prevents clogged nozzles
- Connects to ½" MPT
- Ports rotate up to 270°
- UV resistant

Specifications

- Operating pressure: 0-50 psi (0-3.4 bar)
- Flow: .01-20 GPH at 50 psi
- Minimum filtration: 12 mesh (707 microns)



HRZ-AFM-4



HRZ-AFM-8



HRZ-FFSA-1



HRZ-FFRA-1



HRZ-FFM-2M



HRZ-FFM-2



HRZ-FFM-4

| MANIFOLDS       |  | SKU        | Ports | Description        | MODEL |
|-----------------|--|------------|-------|--------------------|-------|
| Adjustable Flow |  | HRZ-AFM-4  | 4     | ½" FPT             | 07005 |
|                 |  | HRZ-AFM-8  | 8     | ½" FPT             | 07000 |
| Full Flow       |  | HRZ-FFSA-1 | 1     | Shrub Head Adapter | 07050 |
|                 |  | HRZ-FFRA-1 | 1     | ½" FPT             | 07056 |
|                 |  | HRZ-FFM-2M | 2     | ½" MPT             | 07035 |
|                 |  | HRZ-FFM-2  | 2     | ½" FPT             | 07030 |
|                 |  | HRZ-FFM-4  | 4     | ½" FPT             | 07025 |
|                 |  |            |       |                    |       |

## DLT SERIES

### Pipe and Tubing

### Features

- Designed for vineyards, orchards, row crops, and landscape
- Use with Drip-Lock® or barbed fittings
- Commercial grade
- UV resistant

### Specifications

- Operating pressure: 0-50 psi (0-3.4 bar)
- 1/2" tubing material: polyethylene
- 1/4" tubing material: vinyl



**DLT-250-50**  
**DLT-250-100**



**DLT-660-100**  
**DLT-700-100**  
**DLT-700-500**



**DLT-10-12-100**



**DLT-250S-100**

micro

## PIPE & TUBING

|               | SKU           | Size | Description | MODEL |
|---------------|---------------|------|-------------|-------|
| Distribution  | DLT-250-50    | 1/4" | 1/4" x 50'  | 07300 |
|               | DLT-250-100   | 1/4" | 1/4" x 100' | 07301 |
|               | DLT-660-100   | 1/2" | .660 x 100' | 07336 |
|               | DLT-700-100   | 1/2" | .700 x 100' | 07346 |
|               | DLT-700-500   | 1/2" | .700 x 500' | 07347 |
| 1 GPH Emitter | DLT-10-12-100 | 1/2" | .700 x 100' | 07376 |
| Soaker        | DLT-250S-100  | 1/4" | 1/4" x 100' | 07331 |

## HRZ SERIES

### Emitters and Sprays

#### Features

- Self-piercing barb on pressure compensating emitters
- Color coded by flow
- UV and chemical resistant
- Insect baffle to deter insect entry
- Removable cap for inspection and cleaning
- Designed for vineyards, orchards, row crops, and landscape

#### Specifications

- Operating pressure: 5-25 psi (0.34-1.7 bar)
- Flow rate: .5-2 GPH

**HRZ-BUB360-STK****HRZ-MS360-STK****HRZ-PCD-05****HRZ-PCD-10****HRZ-PCD-20**

## SPRAYS & EMITTERS

|          | SKU            | Description                      | MODEL |
|----------|----------------|----------------------------------|-------|
| Sprays   | HRZ-BUB360-STK | Micro-Bubbler on 6" Stake        | 07110 |
|          | HRZ-MS360-STK  | Multi-Stream Emitter on 6" Stake | 07105 |
| Emitters | HRZ-PCD-05     | PC Emitter – ½ GPH               | 07214 |
|          | HRZ-PCD-10     | PC Emitter – 1 GPH               | 07225 |
|          | HRZ-PCD-20     | PC Emitter – 2 GPH               | 07226 |

# HRZ SERIES

## Accessories

## Features

- UV resistant materials
- No clamps required
- Industry exclusive double barb

## Specifications

- Maximum pressure: 50 psi (3.4 bar)
- Material: UV-resistant nylon and/or aluminum



**HRZ-CS-7-6**



**HRZ-LS-7  
HRZ-LS-18**



**HRZ-PCN-7  
HRZ-PCN-18**



**HRZ-FIG-8**



**1401-002**



**1406-002**



**1429-002**



**1VLV-002**

| ACCESSORIES          |  | SKU        | Size | Description          | MODEL |
|----------------------|--|------------|------|----------------------|-------|
| Stakes               |  | HRZ-CS-7-6 | 1/4" | Clip Stake           | 05721 |
|                      |  | HRZ-LS-7   | 1/4" | Loop Stake           | 05730 |
|                      |  | HRZ-LS-18  | 1/2" | Loop Stake           | 05731 |
| Clamps               |  | HRZ-PCN-7  | 1/4" | Pipe Clamp w/Nail    | 05715 |
|                      |  | HRZ-PCN-18 | 1/2" | Pipe Clamp w/Nail    | 05716 |
| Double Barb Fittings |  | 1401-002   | 1/4" | Tee                  | 07401 |
|                      |  | 1406-002   | 1/4" | Elbow                | 07400 |
|                      |  | 1429-002   | 1/4" | Coupling             | 07402 |
|                      |  | 1VLV-002   | 1/4" | Shut-off Valve       | 07404 |
| Fittings             |  | HRZ-FIG-8  | 1/2" | Figure 8 End Fitting | 05443 |

micro

# PUSH FITTINGS





# DLM 050

Drip-Lock® Dual Branch Tees

- Features**
- All 1/2" fittings are releasable and reusable with the Drip-Lock® release collar
  - Patented design is 100% tool and chemical free
  - Low insertion force makes installation quick and easy
  - 1/2" Drip-Lock® works with tubing from 16 mm to .710"
  - 1/4" Drip-Lock® works with tubing from 0.245" to 0.250"
  - Total compatibility of fittings, pipe, manifolds, valves, saddles, and heads
  - Drip-Lock® technology ensures lower friction loss for better water efficiency
  - Built-tough fittings made from UV-resistant ABS, stainless steel, and EPDM seals
  - Every fitting comes with 2 plugs

- Specifications**
- Compatibility range: 16mm (about .630") to .710" (18 mm) outside diameter
  - Burst pressure exceeds 100 psi (6.9 bar)
  - Operating pressure: 0-50 psi (0-3.4 bar)



DL-401-072



DL-444-072

see the video



| DRIP DUAL BRANCH FITTINGS | SKU        | Nom Size | Description               | MODEL |
|---------------------------|------------|----------|---------------------------|-------|
| Dual Branch Reducing Tee  | DL-401-072 | 1/2"     | 1/2" x 1/2" x 1/4" x 1/4" | 07046 |
| Dual Branch Manifold Tee  | DL-444-072 | 1/2"     | 1/2" x 1/2" x 1/4" x 1/4" | 07047 |

## DRIP-LOCK®

For ½"  
Micro-Irrigation  
Pipe



### Features

- All ½" fittings are releasable and reusable with the Drip-Lock® release collar
- Patented design requires no glue or tools for installation
- Low insertion force makes installation quick and easy
- ½" Drip-Lock® works with most ½" tubing
- Drip-Lock® technology ensures lower friction loss for better water efficiency
- Built tough fittings made from UV-resistant ABS, stainless steel and EPDM seals

### Specifications

- Compatibility range: 16mm (about .630") to .710" (18 mm) outside diameter
- Burst pressure exceeds 100 psi (6.9 bar)
- Operating pressure: 0-50 psi (0-3.4 bar)



**DL-401-005**



**DL-406-005**



**DL-429-005**



**DL-VLV-005**



**DL-436-101**



**DL-436-005**



**DL-FHT-101**



**DL-447-005**

| FITTINGS       |                    | SKU        | Nom Size | Description  | MODEL |
|----------------|--------------------|------------|----------|--------------|-------|
| Tee            | Push x Push x Push | DL-401-005 | ½"       | ½" x ½" x ½" | 07492 |
| Elbow          | Push x Push        | DL-406-005 | ½"       | ½" x ½"      | 07490 |
| Coupling       | Push x Push        | DL-429-005 | ½"       | ½" x ½"      | 07491 |
| Adapter        | Push x MPT         | DL-436-101 | ½"       | ½" x ¾"      | 07493 |
|                |                    | DL-436-005 | ½"       | ½" x ½"      | 07494 |
|                | Push x FHT         | DL-FHT-101 | ½"       | ½" x ⅝"      | 07495 |
| Shut-off Valve | Shut-off Valve     | DL-VLV-005 | ½"       | ½" x ½"      | 07497 |
| End Cap        | End Cap            | DL-447-005 | ½"       | ½" x MHT     | 07498 |

BLU-LOCK® x DRIP-LOCK®

For ½" Micro Irrigation Pipe

- Blu-Lock® Features**
- Low insertion force makes installation fast
  - Works with all HDPE pipe ASTM D2239 listed SDR 15 100 psi and SDR 19 80 psi pipe
  - Fittings are releasable and reusable with the Blu-Lock® release tool
  - Patented design is 100% tool and chemical free
  - Blu-Lock® technology will ensure lower friction loss for better water efficiency
  - Built-tough fittings made from UV-resistant ABS, stainless steel, and EPDM seals are designed and tested to ensure toughness
  - For use on the downstream side of the station valves; not rated for mainline use

- Specifications**
- Blu-Lock® ¾" (1.9 cm) Lateral Pipe Fittings:
- Working pressure: 10-100 psi (0.69-6.9 bar)
- Blu-Lock® 1" (2.5 cm) Lateral Pipe Fittings:
- Working pressure: 10-100 psi (0.69-6.9 bar)

- Drip-Lock® Features**
- Fittings are releasable and reusable with the Drip-Lock® release collar
  - Patented design requires no glue or tools for installation
  - Low insertion force makes installation quick and easy
  - ½" Drip-Lock® works with tubing from 16 mm to 18mm
  - Drip-Lock® technology ensures lower friction loss for better water efficiency
  - Built-tough fittings made from UV-resistant ABS, stainless steel, and EPDM seals

- Specifications**
- Compatibility range: 16mm (about .630") to .710" (about 18 mm) outside diameter
  - Burst pressure exceeds 100 psi (6.9 bar)
  - Operating pressure: 0-50 psi (0-3.4 bar)



BL-401-101-DL



BL-402-101-DL

| TEES               | SKU           | Nom. Size | Description  | MODEL |
|--------------------|---------------|-----------|--------------|-------|
| Push x Push x Push | BL-401-130-DL | 1"        | 1" x 1" x ½" | 37360 |
|                    | BL-401-101-DL | ¾"        | ¾" x ¾" x ½" | 37361 |

# BLU-LOCK®

For HDPE Pipe

## Features

- Low insertion force makes installation fast
- Works with all HDPE pipe ASTM D2239 listed SDR 15 100 psi and SDR 19 80 psi pipe
- All ½", ¾", and 1" fittings are releasable and reusable with the Blu-Lock® release tool or collar
- Patented design is 100% tool and chemical free
- Coil and straight length pipe options provide unrivaled flexibility
- Blu-Lock® is environmentally friendly and recyclable HDPE pipe that provides a superior alternative to PVC
- Blu-Lock® technology will ensure lower friction loss for better water efficiency
- Builttough fittings made from UV-resistant ABS, stainless steel, and EPDM seals are designed and tested to ensure toughness
- For use on the downstream side of the station valves; not rated for mainline use



## Specifications

### Blu-Lock® ½" (1.3 cm) Swing Pipe Fittings:

- Burst pressure: exceeds 220 psi (15.2 bar)
- Working pressure: 10-80 psi (0.69-5.5 bar)

### Blu-Lock® ¾" (1.9 cm) Lateral Pipe Fittings:

- Burst pressure: exceeds 250 psi (17.2 bar)
- Working pressure: 10-125 psi (0.69-8.6 bar)

### Blu-Lock® 1" (2.5 cm) Lateral Pipe Fittings:

- Burst pressure: exceeds 350 psi (24.1 bar)
- Working pressure: 10-150 psi (0.69-10.3 bar)

## PSI vs. Flow Rate

| PSI | 1" GPM | ¾" GPM |
|-----|--------|--------|
| 40  | 11     | 8      |
| 50  | 13     | 9      |
| 60  | 14     | 10     |
| 70  | 16     | 11     |

## 1" (2.5 cm) Pipe Pressure Loss\*

| FLOW GPM | VELOCITY FPS | PRESSURE LOSS PSI |
|----------|--------------|-------------------|
| 1        |              |                   |
| 2        |              |                   |
| 3        |              |                   |
| 4        | 1.48         | 0.46              |
| 5        | 1.86         | 0.76              |
| 6        | 2.23         | 1.06              |
| 7        | 2.60         | 1.37              |
| 8        | 2.97         | 1.80              |
| 9        | 3.34         | 2.23              |
| 10       | 3.71         | 2.76              |
| 11       | 4.08         | 3.07              |
| 12       | 4.45         | 3.85              |
| 13       | 4.83         | 4.45              |
| 14       | 5.2          | 5.10              |
| 15       | 5.57         | 5.76              |
| 20       | 7.42         | 9.90              |
| 25       | 9.98         | 14.90             |

\*Measured in 100' lengths

## ¾" (1.9 cm) Pipe Pressure Loss\*

| FLOW GPM | VELOCITY FPS | PRESSURE LOSS PSI |
|----------|--------------|-------------------|
| 1        | 0.60         | 0.15              |
| 2        | 1.20         | 0.48              |
| 3        | 1.80         | 1.00              |
| 4        | 2.41         | 1.64              |
| 5        | 3.01         | 2.46              |
| 6        | 3.61         | 3.45              |
| 7        | 4.21         | 4.59              |
| 8        | 4.81         | 5.85              |
| 9        | 5.41         | 7.29              |
| 10       | 6.02         | 8.85              |
| 11       | 6.62         | 10.60             |
| 12       | 7.22         | 12.40             |
| 13       | 7.82         | 14.40             |
| 14       | 8.42         | 16.50             |
| 15       | 9.02         | 18.70             |

\*Measured in 100' lengths

## TEES



Push x Push x Push

| SKU         | Nom Size | Description        | MODEL |
|-------------|----------|--------------------|-------|
| BL-401-010  | 1"       | 1" x 1" x 1"       | 37670 |
| BL-401-131  | 1"       | 1" x 1" x 3/4"     | 37683 |
| BL-401-130  | 1"       | 1" x 1" x 1/2"     | 37672 |
| BL-401-007  | 3/4"     | 3/4" x 3/4" x 3/4" | 37370 |
| BL-401-101  | 3/4"     | 3/4" x 3/4" x 1/2" | 37373 |
| BL-401-005  | 1/2"     | 1/2" x 1/2" x 1/2" | 37977 |
| BL-401-102  | 1"       | 3/4" x 3/4" x 1"   | 37684 |
| BL-401-075  | 1"       | 1/2" x 1/2" x 1"   | 37687 |
| BL-401-074  | 3/4"     | 1/2" x 1/2" x 3/4" | 37387 |
| BL-402-130  | 1"       | 1" x 1" x 1/2"     | 37671 |
| BL-402-101  | 3/4"     | 3/4" x 3/4" x 1/2" | 37372 |
| BL-1401-130 | 1"       | 1" x 1" x 1/2"     | 37904 |
| BL-1401-101 | 3/4"     | 3/4" x 3/4" x 1/2" | 37903 |



Bullhead



Push x Push x FPT



Barb x Barb x Push

## ELBOWS



Push x Push

| SKU        | Nom Size | Description   | MODEL |
|------------|----------|---------------|-------|
| BL-406-010 | 1"       | 1" x 1"       | 37673 |
| BL-406-007 | 3/4"     | 3/4" x 3/4"   | 37374 |
| BL-406-005 | 1/2"     | 1/2" x 1/2"   | 37987 |
| BL-407-130 | 1"       | 1" x 1/2"     | 37675 |
| BL-407-101 | 3/4"     | 3/4" x 1/2"   | 37375 |
| BL-407-005 | 1/2"     | 1/2" x 1/2"   | 37972 |
| BL-407-074 | 1/2"     | 1/2" x 3/4"   | 37973 |
| BL-410-005 | 1/2"     | 1/2" x 1/2"   | 37970 |
| BL-410-007 | 1/2"     | 1/2" x 3/4"   | 37971 |
| BL-409-005 | 1/2"     | 1/2" x Street | 37979 |



Push x FPT



Push x MPT



Push x Street

## SWING ASSEMBLIES



Street x Street

| SKU           | Nom Size | Description       | MODEL |
|---------------|----------|-------------------|-------|
| BLJ-050-SS-6X | 1/2"     | 6" Swing Assembly | 37604 |

## SWING JOINTS



Push x MPT

BLJ-410-005

Nom  
Size

1/2"

Description

1/2" x 1/2"

MODEL

37985

BLJ-410-101

1/2"

1/2" x 3/4"

37986

## COUPLINGS



Push x Push

BL-429-010

Nom  
Size

1"

Description

1" x 1"

MODEL

37676

BL-429-131

1"

1" x 3/4"

37677

BL-429-130

1"

1" x 1/2"

37685

BL-429-007

3/4"

3/4" x 3/4"

37376

BL-429-101

3/4"

3/4" x 1/2"

37377

BL-429-005

1/2"

1/2" x 1/2"

37976

## ADAPTERS



Push x MPT

BL-436-010

Nom  
Size

1"

Description

1" x 1"

MODEL

37678

BL-436-131

3/4"

3/4" x 1"

37383

BL-436-007

3/4"

3/4" x 3/4"

37378

Push x FPT

BLA-075-BF-75

3/4"

3/4" x 3/4"

37379

BL-435-102

3/4"

1" x 3/4"

37355



Push x Push

BL-474-010

1"

1" x 1"

08682

BL-474-007

3/4"

3/4" x 3/4"

08683

SPG x Push

BL-438-131

3/4"

1" x 3/4"

37384



Push x MPT

BL-436-101

1/2"

1/2" x 3/4"

37975

BL-436-005

1/2"

1/2" x 1/2"

37974



Barb x Push

BL-1474-130

1"

1" x 1/2"

37902

BL-1474-101

3/4"

3/4" x 1/2"

37901

BL-FPA-050

1/2"

1/2" x 1/2"

37900



Push x Buttress

HRM-100-UB-1x

1"

1" x 1"

03133

HRM-075-UB-1x

3/4"

3/4" x 3/4"

03134

## END CAPS



Push

| SKU        | Nom Size | Description | MODEL |
|------------|----------|-------------|-------|
| BL-447-010 | 1"       | 1"          | 37680 |
| BL-447-007 | ¾"       | ¾"          | 37380 |

## TOOLS/ACCESSORIES



Release

Auto Drain Valve

Poly Pipe Cutter

| SKU           | Nom Size | Description        | MODEL |
|---------------|----------|--------------------|-------|
| BL-RTL-100    | 1"       | 1"                 | 37908 |
| BL-RTL-075    | ¾"       | ¾"                 | 37909 |
| BLD-050-BX-50 | ½"       | ½" Blu-Lock Spigot | 02602 |
| BLB-CUT-25-1x | 1"       | 1"                 | 26113 |

## 100 PSI SIDR 15 PIPE



Straight



Coil



Coil-Reclaimed

| SKU           | Nom Size | Description | MODEL |
|---------------|----------|-------------|-------|
| BLP-100-SL-20 | 1"       | 1" x 20'    | 37681 |
| BLP-075-SL-20 | ¾"       | ¾" x 20'    | 37381 |
| BLP-100-CL-1x | 1"       | 1" x 100'   | 37682 |
| BLP-100-CL-3x | 1"       | 1" x 300'   | 37692 |
| BLP-075-CL-1x | ¾"       | ¾" x 100'   | 37382 |
| BLP-075-CL-3x | ¾"       | ¾" x 300'   | 37388 |
| BLP-100-CR-1x | 1"       | 1" x 100'   | 37698 |
| BLP-100-CR-1x | ¾"       | ¾" x 100'   | 37396 |

## SWING PIPE



Coil

| SKU           | Nom Size | Description | MODEL |
|---------------|----------|-------------|-------|
| BLP-050-CL-1x | ½"       | ½" x 100'   | 37980 |

## BLS NITRO SADDLES™

The Fastest  
Irrigation Saddle

### Features

- Installs in less than 5 seconds
- Push lock design; no tools required
- Designed for a chemical-free, glue-free, tool-free installation
- Swiss-engineered Schenkel clamp provides a fast, one-hand installation
- Ergonomic grip is comfortable and fast under any condition
- High-impact ABS guarantees durability
- Best in class flow with up to 14 GPM at 40 psi
- Compatible with ASTM D2239 listed SIDR 19 80 psi

### Specifications

- Flow: up to 14 GPM (53 LPM) at 40 psi (2.75 bar)
- Operating pressure: 120 psi (8.2 bar) max
- Burst pressure: 220 psi (15.17 bar)

### Dimensions

- Saddle height: 3" (7.6 cm)
- Saddle width: 2" (5.0 cm)
- Tap height: 3" (7.6 cm)
- Tap width: 2.5" (6.3 cm)
- Installed height: 3" (7.6 cm)



BLS-125-BD-LT



BLS-100-BD-LT



BLS-075-BD-LT



BLS-TAP-FP-75



BLS-TAP-FP-50



BLS-TAP-BL-50



BLS-TAP-SB-50

## SADDLE BODY



Body

| SKU           | Nom. Size | MODEL |
|---------------|-----------|-------|
| BLS-125-BD-LT | 1 1/4"    | 02911 |
| BLS-100-BD-LT | 1"        | 02917 |
| BLS-075-BD-LT | 3/4"      | 02916 |

## SADDLE TEES



FPT Tap

| SKU           | Nom. Size | MODEL |
|---------------|-----------|-------|
| BLS-TAP-FP-75 | 3/4"      | 02920 |
| BLS-TAP-FP-50 | 1/2"      | 02919 |
| BLS-TAP-BL-50 | 1/2"      | 02918 |
| BLS-TAP-SB-50 | 1/2"      | 02019 |

BL Swing Pipe Tap

SB Adapter Tap

## PVC-LOCK®

For PVC Pipe



### Features

- Patent-pending design is 100% tool and glue free
- PVC-Lock® fittings cut installation time in half or more
- Patent-pending retaining system with stainless steel teeth grip pipe tightly for a strong, leak-proof connection
- PVC-Lock® fittings can swivel 360° around the pipe for easy sprinkler head orientation and adjustment
- For use with all brands and classes of Schedule 40 and 80 PVC pipe
- Removable and reusable using the PVC-Lock® removal tool
- Pressure rated for use on either side of the irrigation valve

### Specifications

- Burst pressure: 600 psi (41.4 bar)
- Working pressure: 0-150 psi (10.5 bar) at 68°F (20°C)
- Certifications: IAPMO IGC 300-2013



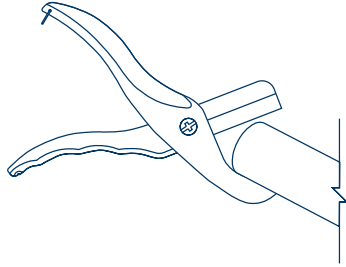
### How Does PVC-Lock® Work?



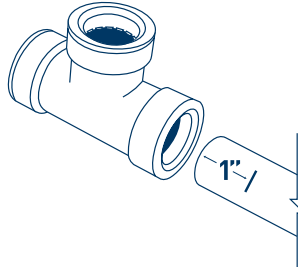
When PVC pipe is inserted to the pipe stop, the O-ring seals around the pipe and the stainless steel ring "locks" the pipe in place.

The fitting with a fully inserted pipe creates a permanent, leak-free connection.

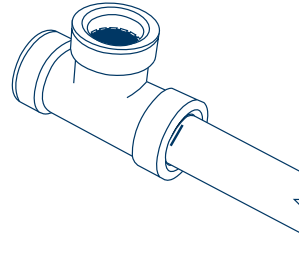
## Simple Installation



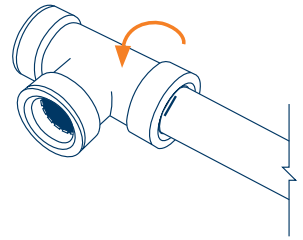
Cut pipe using a poly pipe cutter (make sure ends are clean and straight).



Mark the pipe 1" from the end with a marker. Ensure that pipe and fitting are free of dirt and debris.



While twisting slightly, push the pipe completely into the fitting up to the mark you made on the pipe.



All Blu-Lock fittings swivel 360° allowing for easy directional adjustment.



## TEES



Push x Push x Push

PVCL-401-010

1"

1" x 1" x 1"

08672

PVCL-401-007

3/4"

3/4" x 3/4" x 3/4"

07752

PVCL-401-005

1/2"

1/2" x 1/2" x 1/2"

06503

Bullhead

PVCL-401-102

1"

3/4" x 3/4" x 1"

08684



Push x Push x FPT

PVCL-402-130

1"

1" x 1" x 1/2"

08671

PVCL-402-101

3/4"

3/4" x 3/4" x 1/2"

07772

PVCL-402-005

1/2"

1/2" x 1/2" x 1/2"

06544

## MANIFOLD TEES



Push x Spigot x MIPT

PVCL-476-010

1"

1" x 1" x 1"

08685

Push x Spigot x Push

PVCL-444-010

1"

1" x 1" x 1"

08686

Push x Spigot x FPT

PVCL-477-101

1"

1" x 1" x 1"

08688

## ELBOWS



Push x Push

PVCL-406-010

1"

1" x 1"

08673

PVCL-406-007

3/4"

3/4" x 3/4"

07774

PVCL-406-005

1/2"

1/2" x 1/2"

06516



Push x FPT

PVCL-407-130

1"

1" x 1/2"

08675

PVCL-407-010

1"

1" x 1"

08681

PVCL-407-101

3/4"

3/4" x 1/2"

07775

PVCL-407-005

1/2"

1/2" x 1/2"

06547



Push x MPT

PVCL-410-010

1"

1" x 1"

08679

PVCL-410-005

1/2"

1/2" x 1/2"

06548

## COUPLINGS



Push x Push

PVCL-429-015

2"

2" x 2"

08660

PVCL-429-020

1 1/2"

1 1/2" x 1 1/2"

08620

PVCL-429-010

1"

1" x 1"

08676

PVCL-429-131

1"

1" x 3/4"

08677

PVCL-429-007

3/4"

3/4" x 3/4"

07776

PVCL-429-101

3/4"

3/4" x 1/2"

06619

PVCL-429-005

1/2"

1/2" x 1/2"

06542

## SLIDE REPAIR COUPLINGS



Push x Spigot

| SKU          | Nom Size | Description | MODEL |
|--------------|----------|-------------|-------|
| PVCL-SFX-015 | 2"       | 2" x 2"     | 08648 |
| PVCL-SFX-020 | 1½"      | 1½" x 1½"   | 08647 |
| PVCL-SFX-100 | 1"       | 1" x 1"     | 08646 |
| PVCL-SFX-075 | ¾"       | ¾" x ¾"     | 07884 |
| PVCL-SFX-050 | ½"       | ½" x ½"     | 06556 |

## FLEXIBLE COUPLINGS



Push x Push

| SKU          | Nom Size | Description | MODEL |
|--------------|----------|-------------|-------|
| PVCL-FPC-100 | 1"       | 1" x 1"     | 08002 |
| PVCL-FPC-075 | ¾"       | ¾" x ¾"     | 07002 |
| PVCL-FPC-050 | ½"       | ½" x ½"     | 06002 |

## ADAPTERS



Push x MPT

Push x Spigot

Insert x Spigot

| SKU          | Nom Size | Description | MODEL |
|--------------|----------|-------------|-------|
| PVCL-436-010 | 1"       | 1" x 1"     | 08678 |
| PVCL-436-007 | ¾"       | ¾" x ¾"     | 07778 |
| PVCL-437-131 | 1"       | ¾" x 1"     | 08690 |
| 1460-010     | 1"       | 1" x 1"     | 37905 |

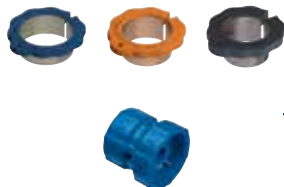
## END CAPS



Push

| SKU          | Nom Size | Description | MODEL |
|--------------|----------|-------------|-------|
| PVCL-447-010 | 1"       | 1"          | 08680 |
| PVCL-447-007 | ¾"       | ¾"          | 07780 |
| PVCL-447-005 | ½"       | ½"          | 06546 |

## TOOLS



Release

Bevel

| SKU           | Nom Size | Description | MODEL |
|---------------|----------|-------------|-------|
| PVCL-RTL-100  | 1"       | 1"          | 08195 |
| PVCL-RTL-075  | ¾"       | ¾"          | 07015 |
| PVCL-RTL-050  | ½"       | ½"          | 06016 |
| PVCL-BVL-251  |          | 1½" x 2"    | 02023 |
| PVCL-BVL-T00L |          | ¾" x 1"     | 02022 |

## KITS



| SKU          | Nom Size | Description      | MODEL |
|--------------|----------|------------------|-------|
| PVCL-SRK-015 | 1"-1½"   | Slide Repair Kit | 08637 |
| PVCL-SRK-020 | 2"       | Slide Repair Kit | 08638 |

# LIGHTING



## HRL 100 SERIES

Independent Stations  
Allows Better Management of Landscape Lighting

### Transformer Features

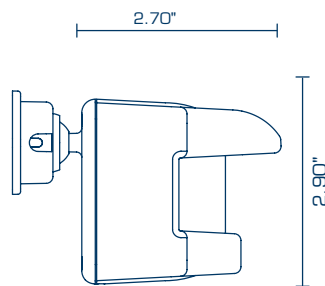
- Optimized for LED landscape lights
- Digital display
- 3 fully programmable stations
- 2 start times per station
- 60W built-in electronic transformer 12V AC/DC
- Photocell with 10' cable
- Motion sensor capable
- Indoor/outdoor mount

### Transformer Specifications

- 18 watts per station

### Motion Sensor Specifications

- Designed for the HRL-100 landscape lighting controllers
- DC pulse
- Passive infrared sensor
- 120° field of view
- 40' range



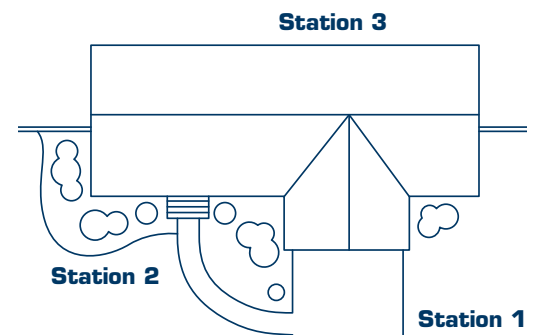
Lighting

### How to Specify

|     | Model                     |
|-----|---------------------------|
| HRL | Hydro-Rain Lighting       |
|     | Series                    |
| 100 | Basic                     |
|     | Type                      |
| 60W | Transformer Size in Watts |
| MS  | Motion Sensor             |

### SKU (Model)

- HRL-100-60W (06700)
- HRL-100-MS (06730)



## HRL SPOT LIGHTING

Directional  
Lighting

### Features

- PWM dimming
- Warm light output
- 3 high efficiency LED lights
- Aluminum housing
- Weather resistant
- Directional lighting

### Specifications

- Material: aluminum
- Finish: black or textured bronze
- Light source: USA 12V LED & driver
- Power usage: 3 watts
- Operation range: 7V-15V AC or DC
- Lumens: 210
- 8" mounting stake included
- Wire lead: #18-2 @ 30"
- Expected life: 50,000 hrs



**HRL-BRS2-LED-3W**



**HRL-BKS2-LED-3W**



**HRL-BKS1-LED-3W**



**HRL-BRS1-LED-3W**

### Color Temperature



### How to Specify

| Model       |                     |
|-------------|---------------------|
| HRL         | Hydro-Rain Lighting |
| Series      |                     |
| BK          | Black               |
| BR          | Bronze              |
| 1           | Traditional         |
| 2           | Bullet              |
| Bulb Type   |                     |
| LED         | LED Lighting        |
| Power Usage |                     |
| 3W          | Power Input         |

### SKU (Model)

- HRL-BKS1-LED-3W (86721)
- HRL-BRS1-LED-3W (86723)
- HRL-BRS2-LED-3W (86722)
- HRL-BKS2-LED-3W (86724)

# HRL PATH LIGHTING

## Area Lighting

### Features

- PWM dimming
- Warm light output
- 3 high efficiency LED lights
- Aluminum housing
- Weather resistant
- Classic design for path or area lighting

### Specifications

- Material: aluminum
- Finish: black or textured bronze
- Light source: USA 12V LED & driver
- Power usage: 3 watts
- Operation range: 7V-15V AC or DC
- Lumens: 210
- 8" mounting stake included
- Wire lead: #18-2 @ 30"
- Expected life: 50,000 hrs



HRL-BKP1-LED-3W



HRL-BRP1-LED-3W

## Color Temperature



### How to Specify

| Model       |                     |
|-------------|---------------------|
| HRL         | Hydro-Rain Lighting |
| Series      |                     |
| BK          | Black               |
| BR          | Bronze              |
| Bulb Type   |                     |
| LED         | LED Lighting        |
| Power Usage |                     |
| 3W          | Power Input         |

### SKU (Model)

- HRL-BKP1-LED-3W (86701)
- HRL-BRP1-LED-3W (86703)
- HRL-BRP2-LED-3W (86702)



HRL-BRP2-LED-3W

## CONTRACTOR ADVANTAGE REWARDS

Travel, Events,  
Merchandise,  
Gift Cards,  
Distributor  
Credit

### Built for Speed

Time is money.  
Faster installs mean lower labor costs—  
and more money in your pocket. With Hydro-  
Rain patented Blu-Lock® piping system and  
professional irrigation products, there's  
no glue, no twisting, no pounding, no  
headache—just 80% faster installation.

Installation speed:  
It's the Hydro-Rain® advantage.

### Built for Rewards

To help you enjoy the time you save, you can  
now earn points towards merchandise, travel,  
and account credit every time you purchase any  
Hydro-Rain® product including Blu-Lock® pipe  
and fittings, valves, controllers, valve boxes,  
manifolds, sprinklers, nozzles, etc. As a Hydro-  
Rain® contractor, you'll earn up to 5 points  
for every dollar you spend. You work hard.  
Rewards points are our way of saying "thanks!"

### Built for You

The Contractor Advantage program is  
designed for top landscaping and irrigation  
professionals. As a participating contractor,  
you'll receive training, resources, and special  
benefits to help you grow your business.

**It pays to install Hydro-Rain®.  
Join the Hydro-Rain Contractor  
Advantage™ Program today!**

To learn more or sign up, go to:  
[www.hydorain.com](http://www.hydorain.com) and click on  
"CONTRACTOR," or ask your authorized  
Hydro-Rain® distributor for details.

Get your  
Rewards!



#### RESTRICTIONS

- Product must be purchased at authorized distributors to earn points.
- Points earned from pre-tax invoice price, not from delivery charges.
- Points expire 24 months after they post to the website.
- Must have an account # at an authorized distributor to enter the website.
- Points will become inactive if distribution houses notify Hydro-Rain® of delinquent accounts.
- Minimum purchase of at least \$50 before web account is created.

**High Payout**

- Up to 5 points per dollar spent

**Easy Enrollment**

- Automatic for contractors already using Hydro-Rain® products
- Automatic for new customers when: Hydro-Rain® products are purchased on an account at an authorized distributor. For a list of distributors, click on "Where to Buy" at [www.hydrorain.com](http://www.hydrorain.com)

**Simple Process**

- No invoices to mail or fax in
- No product mixes to balance
- No additional fees to redeem merchandise (not even shipping and handling)
- Check point totals at any time online
- No need for a 1099

**Up-to-Date Information**

- Log into the website at any time to check your points totals
- Points are updated at least once a month (within 30-40 days of purchase)
- No additional lag time for processing paper invoices
- Points can be used as soon as they post to your account on the website

**Great Customer Service**

- Redeem points online
- All reward redemptions include shipping tracking numbers

**Scan to  
Learn More!**

# REFERENCE



## COMMON CONVERSIONS

| To Convert | From                       | To                         | Multiply By | To Convert | From               | To                 | Multiply By |
|------------|----------------------------|----------------------------|-------------|------------|--------------------|--------------------|-------------|
| Area       | acres                      | foot <sup>2</sup>          | 43560       | Length     | foot               | inch               | 12          |
|            | acres                      | meter <sup>2</sup>         | 4046.8      |            | inch               | centimeter         | 2.54        |
|            | meter <sup>2</sup>         | foot <sup>2</sup>          | 10.764      |            | foot               | meter              | 0.30481     |
|            | foot <sup>2</sup>          | inch <sup>2</sup>          | 144         |            | kilometer          | miles              | 0.6214      |
|            | inch <sup>2</sup>          | centimeter <sup>2</sup>    | 6.452       |            | miles              | foot               | 5280        |
| Power      | hecters                    | meter <sup>2</sup>         | 10000       | Pressure   | miles              | meter              | 1609.34     |
|            | hecters                    | acres                      | 2.471       |            | millimeter         | inch               | 0.03937     |
|            | kilowatts                  | horsepower                 | 1.341       |            | Psi                | kilopascals        | 6.89476     |
| Flow       | foot <sup>3</sup> /minute  | meter <sup>3</sup> /second | 0.0004719   |            | Psi                | bar                | 0.068948    |
|            | foot <sup>3</sup> /second  | meter <sup>3</sup> /second | 0.02832     | Velocity   | bar                | kilopascals        | 100         |
|            | yards <sup>3</sup> /minute | meter <sup>3</sup> /second | 0.01274     |            | Psi                | feet of head       | 2.31        |
|            | gallon/minute              | meter <sup>3</sup> /hour   | 0.22716     |            | feet/second        | meter/second       | 0.3048      |
|            | gallon/minute              | liter/minute               | 3.7854      | Volume     | feet <sup>3</sup>  | gallon             | 7.481       |
|            | gallon/minute              | liter/second               | 0.06309     |            | feet <sup>3</sup>  | liter              | 28.32       |
|            | meter <sup>3</sup> /hour   | liter/minute               | 16.645      |            | meter <sup>3</sup> | feet <sup>3</sup>  | 35.31       |
|            | meter <sup>3</sup> /hour   | liter/second               | 0.2774      |            | meter <sup>3</sup> | yard <sup>3</sup>  | 1.3087      |
|            | liter/minute               | liter/second               | 60          |            | yard <sup>3</sup>  | feet <sup>3</sup>  | 27          |
|            |                            |                            |             |            | yard <sup>3</sup>  | gallon             | 202         |
|            |                            |                            |             |            | acres/feet         | foot <sup>3</sup>  | 43560       |
|            |                            |                            |             |            | gallon             | meter <sup>3</sup> | 0.003785    |
|            |                            |                            |             |            | gallon             | liter              | 3.785       |
|            |                            |                            |             |            | imperial gallon    | gallon             | 1.833       |

## COMMON FORMULAS

## Precipitation Rates

|                                             |              |                                                                                                                            |              |                                                                                                                                     |
|---------------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------|
| Equilateral Triangular Spacing              | PR = (in/hr) | $\frac{(\text{gpm of } 360) \times 96.25}{(\text{Head Spacing})^2 \times .866}$                                            | PR = (mm/hr) | $\frac{\text{m}^3/\text{hr of } 360 \times 1000}{(\text{Head Spacing})^2 \times .866}$                                              |
| Square/Rectangular Spacing                  | PR = (in/hr) | $\frac{(\text{gpm of } 360) \times 96.25}{\text{Head Spacing} \times \text{Row Spacing}}$                                  | PR = (mm/hr) | $\frac{\text{m}^3/\text{hr of } 360 \times 1000}{\text{Head Spacing} \times \text{Row Spacing}}$                                    |
| Square/Rectangular Spacing for Specific Arc | PR = (in/hr) | $\frac{34650 \times \text{gpm (for any arc)}}{\text{Degrees of Arc} \times \text{Head Spacing} \times \text{Row Spacing}}$ | PR = (mm/hr) | $\frac{\text{m}^3/\text{hr (for any arc)} \times 1000}{\text{Degrees of Arc} \times \text{Head Spacing} \times \text{Row Spacing}}$ |

## Horsepower

$$\text{HP} = \frac{\text{gpm} \times \text{ft of Head}}{3,960 \times \text{Pump Efficiency (expressed as a decimal)}}$$

$$\text{HP} = \frac{\text{lpm} \times \text{Meters of Head}}{3,433 \times \text{Pump Efficiency (expressed as a decimal)}}$$

## Station Run Time

$$\text{SRT} = (\text{min/wk}) \frac{\text{Total Weekly Req'd (in/wk)} \times 60 (\text{min/hr})}{\text{Precipitation Rate (in/hr)}}$$

$$\text{SRT} = (\text{min/wk}) \frac{\text{Total Weekly Req'd (mm/wk)} \times 60 (\text{min/hr})}{\text{Precipitation Rate (mm/hr)}}$$

## Pipe Velocity

$$V = (\text{ft/sec}) \frac{0.4085 \times \text{Flow (gpm)}}{(\text{Inside Pipe Diameter in Inches})^2}$$

$$V = (\text{m/sec}) \frac{1273.24 \times \text{Flow (l/sec)}}{(\text{Inside Pipe Diameter in Millimeters})^2}$$

## Slope

$$S = \frac{\text{Rise (Measure of Length)}}{\text{Run (Measure of Length)}}$$

**WATER METER PRESSURE LOSS CHART: Typical Pressure Loss (psi)**

| Flow (gpm)                       | 5/8"          | 3/4"            | 1"              | 1½"           | 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          | 2.0             | 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                              |
| <b>75% of max meter capacity</b> | <b>15 gpm</b> | <b>22.5 gpm</b> | <b>37.5 gpm</b> | <b>75 gpm</b> | <b>120 gpm</b> | <b>225 gpm</b> | <b>375 gpm</b> | <b>75% of max meter capacity</b> |

**POLYETHYLENE PLASTIC PIPE ID CONTROLLED**

PE 3408 ASTM D2239 C=140 • psi loss per 100 ft of pipe

| Nominal Size<br>Avg ID<br>flow (gpm) | 1/2"<br>0.622   |             | 3/4"<br>0.824   |             | 1"<br>1.049     |             | 1 1/4"<br>1.380 |             | 1 1/2"<br>1.610 |             | 2"<br>2.067     |             | 2 1/2"<br>2.469 |             | 3"<br>3.068     |             | 4"<br>4.026     |             |
|--------------------------------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|
|                                      | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>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        |

\*Note: Shaded areas represent 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 ft of pipe

| Nominal Size | 1/2"            |             | 3/4"            |             | 1"              |             | 1 1/4"          |             | 1 1/2"          |             | 2"              |             | 2 1/2"          |             | 3"              |             | 4"              |             |
|--------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|
| Avg ID       | 0.696           |             | 0.910           |             | 1.175           |             | 1.512           |             | 1.734           |             | 2.173           |             | 2.635           |             | 3.21            |             | 4.134           |             |
| Pipe OD      | 0.840           |             | 1.050           |             | 1.315           |             | 1.660           |             | 1.900           |             | 2.375           |             | 2.875           |             | 3.500           |             | 4.500           |             |
| Avg Wall     | 0.072           |             | 0.070           |             | 0.070           |             | 0.074           |             | 0.083           |             | 0.101           |             | 0.120           |             | 0.145           |             | 0.183           |             |
| Min Wall     | 0.062           |             | 0.060           |             | 0.060           |             | 0.064           |             | 0.073           |             | 0.091           |             | 0.110           |             | 0.135           |             | 0.173           |             |
| flow (gpm)   | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>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        | 3.58            | 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 85           |                 |             |                 |             |                 |             |                 |             | 11.53           | 10.94       | 7.34            | 3.65        | 4.99            | 1.43        | 3.37            | 0.55        | 2.03            | 0.16        |
| 90           |                 |             |                 |             |                 |             |                 |             | 12.21           | 12.16       | 7.78            | 4.06        | 5.29            | 1.59        | 3.56            | 0.61        | 2.15            | 0.18        |
| 95           |                 |             |                 |             |                 |             |                 |             | 12.89           | 13.45       | 8.21            | 4.48        | 5.58            | 1.76        | 3.76            | 0.67        | 2.27            | 0.20        |
| 100          |                 |             |                 |             |                 |             |                 |             | 13.57           | 14.79       | 8.64            | 4.93        | 5.88            | 1.93        | 3.96            | 0.74        | 2.39            | 0.22        |
| 110          |                 |             |                 |             |                 |             |                 |             | 14.93           | 17.64       | 9.50            | 5.88        | 6.46            | 2.30        | 4.36            | 0.88        | 2.63            | 0.26        |
| 120          |                 |             |                 |             |                 |             |                 |             |                 |             | 10.37           | 6.91        | 7.05            | 2.71        | 4.75            | 1.04        | 2.86            | 0.30        |
| 130          |                 |             |                 |             |                 |             |                 |             |                 |             | 11.23           | 8.02        | 7.64            | 3.14        | 5.15            | 1.20        | 3.10            | 0.35        |
| 140          |                 |             |                 |             |                 |             |                 |             |                 |             | 12.10           | 9.20        | 8.23            | 3.60        | 5.54            | 1.38        | 3.34            | 0.40        |
| 150          |                 |             |                 |             |                 |             |                 |             |                 |             | 12.96           | 10.45       | 8.81            | 4.09        | 5.94            | 1.57        | 3.58            | 0.46        |
| 160          |                 |             |                 |             |                 |             |                 |             |                 |             | 13.82           | 11.77       | 9.40            | 4.61        | 6.34            | 1.76        | 3.82            | 0.52        |
| 170          |                 |             |                 |             |                 |             |                 |             |                 |             | 14.69           | 13.17       | 9.99            | 5.16        | 6.73            | 1.97        | 4.06            | 0.58        |
| 180          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 10.58           | 5.73        | 7.13            | 2.19        | 4.30            | 0.64        |
| 190          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 11.16           | 6.34        | 7.52            | 2.42        | 4.54            | 0.71        |
| 200          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 11.75           | 6.97        | 7.92            | 2.67        | 4.77            | 0.78        |
| 220          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 12.93           | 8.31        | 8.71            | 3.18        | 5.25            | 0.93        |
| 240          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 14.10           | 9.77        | 9.50            | 3.74        | 5.73            | 1.09        |
| 260          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 10.29           | 4.33        | 6.21            | 1.27        |
| 280          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 11.09           | 4.97        | 6.68            | 1.45        |
| 300          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 11.88           | 5.65        | 7.16            | 1.65        |
| 320          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 12.67           | 6.37        | 7.64            | 1.86        |
| 340          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 13.46           | 7.12        | 8.12            | 2.08        |
| 360          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 14.25           | 7.92        | 8.59            | 2.31        |
| 380          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 9.07            | 2.56        |
| 400          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 9.55            | 2.81        |
| 420          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 10.03           | 3.08        |
| 440          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 10.50           | 3.35        |
| 460          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 10.98           | 3.64        |
| 480          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 11.46           | 3.94        |
| 500          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 11.94           | 4.25        |

\*Note: Shaded areas represent velocities over 5 fps. Use with caution where water hammer is a concern.

## CLASS 200 PVC IPS PLASTIC PIPE

ASTM D2241 (1120, 1220) SDR 21 C=150 • psi loss per 100 ft of pipe

| Nominal Size | Class 315: ½"   |             | ¾"              |             | 1"              |             | 1½"             |             | 2"              |             | 2½"             |             | 3"              |             | 4"              |             | 6"              |             |
|--------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|
| Avg ID       | 0.696           |             | 0.910           |             | 1.169           |             | 1.482           |             | 1.700           |             | 2.129           |             | 2.581           |             | 3.146           |             | 4.046           |             |
| Pipe OD      | 0.840           |             | 1.050           |             | 1.315           |             | 1.660           |             | 1.900           |             | 2.375           |             | 2.875           |             | 3.500           |             | 4.500           |             |
| Avg Wall     | 0.072           |             | 0.070           |             | 0.073           |             | 0.089           |             | 0.100           |             | 0.123           |             | 0.147           |             | 0.177           |             | 0.227           |             |
| Min Wall     | 0.062           |             | 0.060           |             | 0.063           |             | 0.079           |             | 0.090           |             | 0.113           |             | 0.137           |             | 0.167           |             | 0.214           |             |
| flow (gpm)   | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>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            | 0.100       | 0.80            | 0.03        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 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        |
| 85           |                 |             |                 |             |                 |             |                 |             | 12.00           | 12.05       | 7.65            | 4.03        | 5.21            | 1.58        | 3.50            | 0.60        | 2.12            | 0.18        |
| 90           |                 |             |                 |             |                 |             |                 |             | 12.71           | 13.40       | 8.10            | 4.48        | 5.51            | 1.76        | 3.71            | 0.67        | 2.24            | 0.20        |
| 95           |                 |             |                 |             |                 |             |                 |             | 13.41           | 14.81       | 8.55            | 4.95        | 5.82            | 1.94        | 3.92            | 0.74        | 2.37            | 0.22        |
| 100          |                 |             |                 |             |                 |             |                 |             | 14.12           | 16.28       | 9.00            | 5.45        | 6.12            | 2.13        | 4.12            | 0.81        | 2.49            | 0.24        |
| 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        |

\*Note: Shaded areas represent velocities over 5 fps. Use with caution where water hammer is a concern.

**CLASS 315 PVC IPS PLASTIC PIPE**

ASTM D2241 (1120, 1220) SDR 13.5 C=150 • psi loss per 100 ft 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 (gpm)   | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>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        |

\*Note: Shaded areas represent velocities over 5 fps. Use with caution where water hammer is a concern.

**SCHEDULE 40 PVC IPS PLASTIC PIPE**

ASTM D1785 (1120, 1220) SDR 21 C=150 • psi loss per 100 ft of pipe

| Nominal Size | 1/2"            |             | 3/4"            |             | 1"              |             | 1 1/4"          |             | 1 1/2"          |             | 2"              |             | 2 1/2"          |             | 3"              |             | 4"              |             | 5"              |             |
|--------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|
| 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 (gpm)   | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>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           | 2.90        | 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        | 4.87            | 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            | 0.12        | 0.13            | 0.04        |
| 120          |                 |             |                 |             |                 |             |                 |             | 11.68           | 9.24        | 8.19            | 3.89        | 5.29            | 1.34        | 3.06            | 0.36        | 1.35            | 0.13        | 0.15            | 0.05        |
| 130          |                 |             |                 |             |                 |             |                 |             | 12.66           | 10.72       | 8.87            | 4.52        | 5.73            | 1.56        | 3.32            | 0.41        | 1.46            | 0.14        | 0.16            | 0.06        |
| 140          |                 |             |                 |             |                 |             |                 |             | 13.63           | 12.30       | 9.55            | 5.18        | 6.17            | 1.79        | 3.57            | 0.47        | 1.57            | 0.15        | 0.17            | 0.06        |
| 150          |                 |             |                 |             |                 |             |                 |             | 14.61           | 13.97       | 10.24           | 5.89        | 6.61            | 2.03        | 3.83            | 0.54        | 1.68            | 0.16        | 0.18            | 0.07        |
| 160          |                 |             |                 |             |                 |             |                 |             | 15.58           | 15.75       | 10.92           | 6.63        | 7.05            | 2.29        | 4.08            | 0.61        | 1.79            | 0.17        | 0.19            | 0.08        |
| 170          |                 |             |                 |             |                 |             |                 |             |                 |             | 11.60           | 7.42        | 7.50            | 2.56        | 4.34            | 0.68        | 1.91            | 0.19        | 0.20            | 0.09        |
| 180          |                 |             |                 |             |                 |             |                 |             |                 |             | 12.28           | 8.25        | 7.94            | 2.85        | 4.59            | 0.75        | 2.02            | 0.20        | 0.21            | 0.10        |
| 190          |                 |             |                 |             |                 |             |                 |             |                 |             | 12.97           | 9.12        | 8.38            | 3.15        | 4.85            | 0.83        | 2.13            | 0.21        | 0.22            | 0.11        |
| 200          |                 |             |                 |             |                 |             |                 |             |                 |             | 13.65           | 10.03       | 8.82            | 3.46        | 5.11            | 0.92        | 2.24            | 0.22        | 0.23            | 0.12        |
| 220          |                 |             |                 |             |                 |             |                 |             |                 |             | 15.01           | 11.96       | 9.70            | 4.13        | 5.62            | 1.09        | 2.47            | 0.24        | 0.25            | 0.15        |
| 240          |                 |             |                 |             |                 |             |                 |             |                 |             | 16.38           | 14.06       | 10.58           | 4.85        | 6.13            | 1.28        | 2.69            | 0.26        | 0.26            | 0.17        |
| 260          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 11.46           | 5.63        | 6.64            | 1.49        | 2.92            | 0.27        | 0.27            | 0.20        |
| 280          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 12.35           | 6.46        | 7.15            | 1.71        | 3.14            | 0.28        | 0.28            | 0.23        |
| 300          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 13.23           | 7.34        | 7.66            | 1.94        | 3.37            | 0.29        | 0.29            | 0.26        |
| 320          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 14.11           | 8.27        | 8.17            | 2.19        | 3.59            | 0.30        | 0.30            | 0.30        |
| 340          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 14.99           | 9.25        | 8.68            | 2.45        | 3.81            | 0.31        | 0.31            | 0.33        |
| 360          |                 |             |                 |             |                 |             |                 |             |                 |             |                 |             | 15.87           | 10.29       | 9.19            | 2.72        | 4.04            | 0.32        | 0.32            | 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        |                 |             |

\*Note: Shaded areas represent velocities over 5 fps. Use with caution where water hammer is a concern.

**SCHEDULE 40 STEEL**

ASTM B53 C=100 • psi loss per 100 ft of pipe

| Nominal Size<br>Pipe ID<br>Pipe OD<br>Avg Wall | 1/2"            |             | 3/4"            |             | 1"              |             | 1 1/4"          |             | 1 1/2"          |             | 2"              |             | 2 1/2"          |             | 3"              |             | 4"              |             |
|------------------------------------------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|-----------------|-------------|
|                                                | 0.622           |             | 0.824           |             | 1.049           |             | 1.38            |             | 1.610           |             | 2.067           |             | 2.469           |             | 3.068           |             | 4.026           |             |
|                                                | 0.842           |             | 1.050           |             | 1.315           |             | 1.660           |             | 1.900           |             | 2.375           |             | 2.875           |             | 3.500           |             | 4.500           |             |
|                                                | 0.110           |             | 0.113           |             | 0.133           |             | 0.140           |             | 0.145           |             | 0.154           |             | 0.203           |             | 0.216           |             | 0.237           |             |
| flow (gpm)                                     | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>loss | velocity<br>fps | psi<br>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       |

\*Note: Shaded areas represent velocities over 7 fps. Use with caution where water hammer is a concern.

## TYPE K COPPER TUBING

ASTM B88 C=140 • psi loss per 100 ft of pipe

| Nominal Size<br>Pipe ID<br>Pipe OD<br>Avg Wall | 1/2"                    |             | 5/8"                    |             | 3/4"                    |             | 1"                      |             | 1 1/4"                  |             | 1 1/2"                  |             | 2"                      |             | 2 1/2"                  |             | 3"                      |             |
|------------------------------------------------|-------------------------|-------------|-------------------------|-------------|-------------------------|-------------|-------------------------|-------------|-------------------------|-------------|-------------------------|-------------|-------------------------|-------------|-------------------------|-------------|-------------------------|-------------|
|                                                | 0.527<br>0.625<br>0.049 |             | 0.652<br>0.750<br>0.049 |             | 0.745<br>0.875<br>0.065 |             | 0.995<br>1.125<br>0.065 |             | 1.245<br>1.375<br>0.065 |             | 1.481<br>1.625<br>0.072 |             | 1.959<br>2.125<br>0.083 |             | 2.435<br>2.625<br>0.095 |             | 2.907<br>3.125<br>0.109 |             |
| flow (gpm)                                     | velocity<br>fps         | psi<br>loss | velocity<br>fps         | psi<br>loss | velocity<br>fps         | psi<br>loss | velocity<br>fps         | psi<br>loss | velocity<br>fps         | psi<br>loss | velocity<br>fps         | psi<br>loss | velocity<br>fps         | psi<br>loss | velocity<br>fps         | psi<br>loss | velocity<br>fps         | psi<br>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                                            |                         |             |                         |             |                         |             |                         |             |                         |             |                         |             |                         |             |                         |             |                         |             |

\*Note: Shaded areas represent 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 ft of pipe

| Nominal Size<br>Pipe ID<br>Pipe OD<br>Avg Wall | 1/2"                    |             | 5/8"                    |             | 3/4"                    |             | 1"                      |             | 1 1/4"                  |             | 1 1/2"                  |             | 2"                      |             | 2 1/2"                  |             | 3"                      |             |
|------------------------------------------------|-------------------------|-------------|-------------------------|-------------|-------------------------|-------------|-------------------------|-------------|-------------------------|-------------|-------------------------|-------------|-------------------------|-------------|-------------------------|-------------|-------------------------|-------------|
|                                                | 0.545<br>0.625<br>0.040 |             | 0.666<br>0.750<br>0.042 |             | 0.785<br>0.875<br>0.045 |             | 1.025<br>1.125<br>0.050 |             | 1.265<br>1.375<br>0.055 |             | 1.505<br>1.625<br>0.060 |             | 1.985<br>2.125<br>0.070 |             | 2.465<br>2.625<br>0.080 |             | 2.945<br>3.125<br>0.090 |             |
| flow (gpm)                                     | velocity<br>fps         | psi<br>loss | velocity<br>fps         | psi<br>loss | velocity<br>fps         | psi<br>loss | velocity<br>fps         | psi<br>loss | velocity<br>fps         | psi<br>loss | velocity<br>fps         | psi<br>loss | velocity<br>fps         | psi<br>loss | velocity<br>fps         | psi<br>loss | velocity<br>fps         | psi<br>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                                            |                         |             |                         |             |                         |             |                         |             |                         |             |                         |             |                         |             |                         |             |                         |             |

\*Note: Shaded areas represent velocities over 7 fps. Use with caution where water hammer is a concern.

## FRICION LOSS FORMULAS

### Hazen-Williams Equation

$$H_f = [0.2083] [100/C]^{1.852} [Q^{1.852}/D^{4.866}]$$

The result is multiplied by .433 to give psi loss for 100 feet of pipe

The velocity values were derived using the following:

$$V = [0.408 \times Q_{gpm}] / d^2$$

The average inside diameter of OD controlled pipe was based upon subtracting two times the minimum wall thickness plus one-half of the wall thickness tolerance from the outside diameter.

\*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 temperature of 73.4°F

## APPROXIMATE PRESSURE LOSSES FOR PIPE FITTINGS

To use this chart, multiply the approximate "equivalent feet of pipe" value by the proper pipe pressure loss per 100 ft. rating, then divide by 100. The result is the fitting loss in psi. **Notes:** It is recommended that this chart be used only when the manufacturers recommended pressure loss values are not available.

| Steel Fitting Type                 | ½"   | ¾"  | 1"   | 1¼"  | 1½"  | 2"   | 2½"  | 3"   | 4"   | 6"   | 8"   |
|------------------------------------|------|-----|------|------|------|------|------|------|------|------|------|
| Coupling                           | 0.6  | 0.8 | 1    | 1.2  | 1.5  | 2    | 2.5  | 3    | 4    | 6    | 8    |
| Run of St. Tee                     | 1    | 1   | 1.5  | 2    | 2    | 2.5  | 3    | 4    | 5    | 7    | 10   |
| Tee, Side Outlet                   | 3    | 4.5 | 5    | 7    | 9    | 11   | 13   | 16   | 20   | 31   | 42   |
| Tee, Run Reduced ½"                | 1.5  | 2.5 | 3    | 4    | 5    | 6    | 7    | 8    | 12   | 16   | 20   |
| Elbow, 90°                         | 1.5  | 2.5 | 3    | 4    | 5    | 6    | 7    | 8    | 12   | 16   | 20   |
| Elbow, 45°                         | 0.75 | 1   | 1.3  | 1.7  | 2    | 2.5  | 3    | 3.5  | 5    | 7.5  | 10   |
| Corporation Stop                   | 9    | 9   | 9    | 9    | 9    | 9    |      |      |      |      |      |
| Curb Stop                          | 6    | 6   | 7    | 7    | 8    | 8    |      |      |      |      |      |
| 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 |

## ESTIMATING PIPE SIZE

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

| Nominal Pipe Size | Approximate String Length in Inches |            |          |
|-------------------|-------------------------------------|------------|----------|
|                   | Copper Pipe                         | Galvanized | PVC Pipe |
| ½"                | 2"                                  | 2 ⅝"       | 2 ⅝"     |
| ⅝"                | 2 ⅜"                                |            |          |
| ¾"                | 2 ¾"                                | 3 ⅝"       | 3 ⅝"     |
| 1"                | 3 ½"                                | 4 ⅞"       | 4 ⅞"     |
| 1 ¼"              | 4 ⅝"                                | 5 ⅜"       | 5 ⅜"     |
| 1 ½"              | 5 ⅞"                                | 6"         | 6"       |
| 2"                | 6 ¾"                                | 7 ⅞"       | 7 ⅞"     |

## VALVE WIRE SIZING\*

Maximum one-way distance (ft) between controller and valve (standard 24 VAC solenoid)†

| Wire Size | Maximum Run Length |      |      |      |      |       |       |
|-----------|--------------------|------|------|------|------|-------|-------|
|           | 18                 | 16   | 14   | 12   | 10   | 8     | 6     |
| 18        | 1020               | 1260 | 1470 | 1640 | 1770 | 1860  | 1930  |
| 16        | 1260               | 1630 | 2000 | 2330 | 2610 | 2810  | 2960  |
| 14        | 1470               | 2000 | 2590 | 3180 | 3710 | 4150  | 4480  |
| 12        | 1640               | 2330 | 3180 | 4120 | 5050 | 5900  | 6590  |
| 10        | 1770               | 2610 | 3710 | 5050 | 6540 | 8030  | 9380  |
| 8         | 1860               | 2810 | 4150 | 5900 | 8030 | 10400 | 12770 |
| 6         | 1930               | 2960 | 4480 | 6590 | 9380 | 12770 | 16540 |

†Solenoid Model: 24 VAC, Pressure: 150 psi, Voltage Drop: 4V, Min. Op. Voltage: 20V, Amperage (peak): 0.3A

\*This assumes control wire and ground wire are the same size.

## DRIP FORMULAS

### Number of Emitters per Plant

$$\text{Emitters per Plant} = \frac{\text{Canopy Area (sq ft)} \times 0.75}{\text{Wetted Area per Emitter (sq ft)}}$$

| Soil Type  | Wetted Area   |              |
|------------|---------------|--------------|
|            | Diameter (ft) | Area (sq ft) |
| Sand       | 2-3           | 3-7          |
| Sandy-Loam | 3-4.5         | 7-16         |
| Loam       | 3-5           | 7-20         |
| Clay-Loam  | 4-6           | 13-28        |
| Clay       | 5-7           | 20-38        |

### Flow per Zone

$$\text{Flow per Zone} = \frac{\text{Total Number of Drippers} \times \text{Dripper Flow Rate (gph)}}{\text{GPM}}$$

### Precipitation Rate Formula for Multiple Rows

$$\text{Precipitation Rate (in per hr)} = \frac{231.1 \times \text{Emitter Flow (gph)}}{\text{Lateral Spacing (in)} \times \text{Emitter Spacing (in)}}$$

| Emitter Flow | Emitter Spacing | Spacing Between Drip Laterals |       |       |       |       |       |
|--------------|-----------------|-------------------------------|-------|-------|-------|-------|-------|
|              |                 | 6 in                          | 12 in | 18 in | 24 in | 30 in | 36 in |
| 0.53 gph     | 12 in           | 1.62                          | 0.81  | 0.54  | 0.40  | 0.32  | 0.27  |
| 0.53 gph     | 18 in           | 1.08                          | 0.54  | 0.36  | 0.27  | 0.22  | 0.18  |
| 0.53 gph     | 24 in           | 0.81                          | 0.40  | 0.27  | 0.20  | 0.16  | 0.13  |
| 1.02 gph     | 12 in           | 3.11                          | 1.56  | 1.04  | 0.78  | 0.62  | 0.52  |
| 1.02 gph     | 18 in           | 2.07                          | 1.04  | 0.69  | 0.52  | 0.41  | 0.35  |
| 1.02 gph     | 24 in           | 1.56                          | 0.78  | 0.52  | 0.39  | 0.31  | 0.26  |

Note: this formula applies to evenly spaced drip irrigation laterals and emitters

\*Lateral Spacing—the distance between rows of emitter tubing

\*Emitter Spacing—the distance between emitters in tubing

### Precipitation Rate Formula for a Single Row.

$$\text{Precipitation Rate (in per hr)} = \frac{231.1 \times \text{Emitter Flow (gph)}}{\text{Width of Area (in)} \times \text{Emitter Spacing (in)}}$$

| Emitter Flow | Emitter Spacing | Width of Contained Landscape |      |      |      |      |
|--------------|-----------------|------------------------------|------|------|------|------|
|              |                 | 1 ft                         | 2 ft | 3 ft | 4 ft | 5 ft |
| 0.53 gph     | 12 in           | 0.81                         | 0.40 | 0.27 | 0.20 | 0.16 |
| 0.53 gph     | 18 in           | 0.54                         | 0.27 | 0.18 | 0.13 | 0.11 |
| 0.53 gph     | 24 in           | 0.40                         | 0.20 | 0.13 | 0.10 | 0.08 |
| 1.02 gph     | 12 in           | 1.56                         | 0.78 | 0.52 | 0.39 | 0.31 |
| 1.02 gph     | 18 in           | 1.04                         | 0.52 | 0.35 | 0.26 | 0.21 |
| 1.02 gph     | 24 in           | 0.78                         | 0.39 | 0.26 | 0.19 | 0.16 |



Lined area for notes.

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**HYDRO-RAIN®**

North Salt Lake, UT 84054

Telephone: 888-493-7672

Fax: 801-203-1179



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