**Static & Residual Pressure – Calculating Available Mains Water Supply**

**Rule of thumb method:**

**Pressure drop less than 10%**

Three times the original flow is available

**Pressure drop less than 15%**

Twice the original flow is available

**Pressure drop less than 25%**

The available flow is equal to the original

**Pressure drop more than 25%**

The available flow is less than the original

**Static & Residual Pressure – Calculating Available Mains Water Supply**

**STATIC PRESSURE**

Pressure reading on compound gauge when supply hoses are connected to mains water supply and before delivery hose lines are charged.

**RESIDUAL PRESSURE**

Pressure reading on compound gauge while water is flowing to delivery hose line

**Relay Pumping**

** Fire** **Ground Pump  Booster Pump 2**

** Booster Pump 1**

** Base Pumpound Pump**

**Relay Pumping**

** Base Pump  Booster Pump 1**

** Booster Pump 2**

** Fire Ground Pump**

Decreases by 100 kPa Controlled manner until at idle

1. Deliver at 500 kPa
2. Increases by 100 kPa
3. Increases until desired flow achieved

Decreases by 100 kPa Controlled manner until at idle

1. Deliver at 500 kPa
2. Increases by 100 kPa
3. Maintain inlet gauge

Decreases by 100 kPa Controlled manner until at idle

1. Deliver at 500 kPa
2. Increases by 100 kPa
3. Maintain inlet gauge

Decreases by 100 kPa Controlled manner until at idle

1. Deliver at 500 kPa
2. Increases by 100 kPa
3. Maintain inlet gauge

**Typical Buildings and Required Tactical Flow Rates**

**Garage 8mt x 10mt = 80mt2**

Contents Only 50% involved

40 x 4 =160LPM

Structure & Contents 50% involved 40 x 6 = 240LPM

Contents Only 100% involved

80 x 4 = 320LPM

Structure & Contents 100% involved 80 x 6 = 480LPM

**House (single storey)**

15mt x 20mt = 300mt2

Contents Only 50% involved

150 x 4 =600LPM

Structure & Contents 50% involved

150 x 6 =900LPM

Contents Only 100% involved

300 x 4 =1200LPM

Structure & Contents 100% involved

300 x 6=1800LPM

**School Wing (3 x classrooms) 40mt x 25mt = 1000mt2**

Contents Only 50% involved 500 x 4=2000LPM

Structure & Contents 50% involved 500x6=3000LPM

Contents Only 100%involved 1000x4=4000LPM

Structure & Contents 100%involved 1000x6=6000LPM

**Tactical Flow**

The rule works on square meters of fire involvement i.e. 25% of a building on fire with a measurement of 10m x 20m

(10 x 20=200m²).

**25% of 200m² is 50m² of fire**.

If the fire involves contents only then multiply area involved x 4 to obtain the litres of water per minute required.

**50m² x 4=200 LPM**

If the fire involves both the structure and the contents then multiply x 6.

**50m² x 6=300 LPM**

**Unifire V7**

|  |  |  |
| --- | --- | --- |
| **Optimum Nozzle Pressure** | **LPM - Jet** | **LPM - Fog** |
| **200 kPa** | **55LPM** | **155LPM** |
| **600 kPa** | **100LPM** | **270LPM** |
| **1000 kPa** | **130LPM** | **290LPM** |

**Unifire V10**

|  |  |  |
| --- | --- | --- |
| **Optimum Nozzle Pressure** | **LPM - Jet** | **LPM - Fog** |
| **200 kPa** | **95LPM** | **180LPM** |
| **600 kPa** | **165LPM** | **315LPM** |
| **1000 kPa** | **210LPM** | **365LPM** |

**Unifire V12**

|  |  |  |
| --- | --- | --- |
| **Optimum Nozzle Pressure** | **LPM - Jet** | **LPM - Fog** |
| **200 kPa** | **135LPM** | **185LPM** |
| **600 kPa** | **233LPM** | **325LPM** |
| **1000 kPa** | **300LPM** | **400LPM** |

**Unifire V18**

|  |  |  |
| --- | --- | --- |
| **Optimum Nozzle Pressure** | **LPM - Jet** | **LPM - Fog** |
| **200 kPa** | **225LPM** | **265LPM** |
| **600 kPa** | **400LPM** | **465LPM** |
| **1000 kPa** | **510LPM** | **605LPM** |

**Small Town**

|  |  |
| --- | --- |
| **Optimum Nozzle Pressure** | **Litres Per Minute** |
| **350 kPa** | **6mm Tip 150LPM** |
| **350 kPa** | **12mm Tip 200LPM** |

**AWG Shut-off**

|  |  |  |
| --- | --- | --- |
| **Optimum Nozzle Pressure** | **Jet - Litres Per Minute** | **Spray – Litres Per Minute** |
| **500 kPa** | **6mm Tip 86LPM** | **6mm Tip 86LPM** |
| **500 kPa** | **12mm Tip 180LPM** | **12mm Tip 180LPM** |

**Quell TB15**

|  |  |  |
| --- | --- | --- |
| **Optimum Nozzle Pressure** | **Spray Pattern** | **Litres Per Minute** |
| **700 kPa** | **Straight Jet** | **80LPM** |
| **700 kPa** | **Half Fog** | **100LPM** |
| **700 kPa** | **Full Fog** | **230LPM** |

**Angus SL150**

|  |  |  |
| --- | --- | --- |
| **Optimum Nozzle Pressure** | **Spray Pattern** | **Litres Per Minute** |
| **700 kPa** | **Straight Jet** | **150LPM** |
| **700 kPa** | **Half Fog** | **300LPM** |
| **700 kPa** | **Full Fog** | **350LPM** |

**TFT D75DP (pistol grip) & ½” Smooth Bore Tip (Break-apart)**

|  |  |
| --- | --- |
| **Optimum Nozzle Pressure** | **Litres Per Minute** |
| **500 kPa** | **250LPM** |

**TFT D75DP (pistol grip) & DQ 60 Tip (Break-apart)**

|  |  |
| --- | --- |
| **Optimum Nozzle Pressure** | **Litres Per Minute** |
| **500 kPa** | **20, 40, 100, 150 & 235lpm** |

**64mm Service Branch**

|  |  |  |
| --- | --- | --- |
| **Nozzle Size** | **Optimum Nozzle Pressure** | **Litres Per Minute** |
| **20mm** | **500 kPa** | **600LPM** |
| **25mm** | **700 kPa** | **1100LPM** |
| **30mm** | **800 kPa** | **1700LPM** |
| **32mm** | **800 kPa** | **1900LPM** |

**Luxford Tip**

|  |  |  |
| --- | --- | --- |
| **Spray Pattern** | **Optimum Nozzle Pressure** | **Litres Per Minute** |
| **Jet** | **700 kPa** | **450LPM** |
| **Fog** | **800 kPa** | **1000LPM** |

**Protek 361**

|  |  |
| --- | --- |
| **Optimum Nozzle Pressure** | **Jet - Litres Per Minute** |
| **700 kPa** | **Variable –50LPM, 100LPM,150LPM, 230LPM,** |

**Protek 366**

|  |  |
| --- | --- |
| **Optimum Nozzle Pressure** | **Jet - Litres Per Minute** |
| **700 kPa** | **Variable –115, 230LPM, 360LPM, 475LPM,** |

**G-Force**

|  |  |
| --- | --- |
| **Optimum Nozzle Pressure** | **Jet - Litres Per Minute** |
| **500 kPa** | **Variable –110LPM, 230LPM,360LPM, 470LPM, 570LPM** |

**Protek 368**

|  |  |
| --- | --- |
| **Optimum Nozzle Pressure** | **Jet - Litres Per Minute** |
| **700 kPa** | **Variable–360LPM, 475LPM,550LPM,750LPM, 950LPM** |

**TFT THUNDERFOG FTS200LF**

|  |  |
| --- | --- |
| **Optimum Nozzle Pressure** | **Litres Per Minute** |
| **500 kPa** | **470, 570, 750lpm** |

**Pump Delivery Pressures – 38mm and 65mm Handlines 500kPa Nozzles**

**TFT G-Force @ 500 kPa Branch Pressure**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **LPM** | **30M** | **60M** | **90M** | **120M** | **150M** | **180M** |
| **110** | **550** | **550** | **550** | **600** | **600** | **600** |
| **230** | **600** | **650** | **700** | **750** | **800** | **900** |
| **360** | **650** | **800** | **1000** | **1100** |  |  |
| **470** | **750** | **1000** | **1250** |  |  |  |
| **570** | **900** | **1250** |  |  |  |  |

**65mm Handlines**

**TFT Thunderfog @ 500 kPa Branch Pressure**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **LPM** | **30M** | **60M** | **90M** | **120M** | **150M** | **180M** |
| **470** | **550** | **550** | **600** | **600** | **650** | **650** |
| **570** | **550** | **600** | **600** | **650** | **650** | **700** |
| **750** | **550** | **600** | **650** | **700** | **750** | **800** |

**Foam Operations - Class B**

**Pumpers**

**Angus 450 Foam Branch @ 700 kPa**

**1050kPa at the inline inductor**

**60 metres of 65mm hose after the inductor (preferred)**

**Round the Pump Proportioner requires 700 kPa at the branch**

**3% - 13.5 LPM - 200 litres empty in 14 minutes**

**6% - 27 LPM - 200 litres empty in 7 minutes**

**Z Zero Inlet**

**M Set Metering Valve**

**I Open Inductor**

**F Open Foam Supply**

**Live Hose Reels**

**Unifire V12 Fog Nozzle @ 700 kPa Branch Pressure**

**Straight Jet Fog**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **LPM** | **20M** |  | **LPM** | **20M** |
| **200** | **900** | **300** | **1150** |

**Live Hose Reel – Akron 1720 Turbojet**

|  |  |
| --- | --- |
| **LPM** | **60M** |
| **50** | **750** |
| **100** | **900** |
| **150** | **1100** |
| **230** | **1650** |

**Live Hose Reel - Angus SL 150**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **(Jet) LPM** | **20M** |  | **(Fog) LPM** | **20M** |
| **150** | **800** | **350** | **1300** |

**Foam Branch Operations - Class A**

**Angus Foamlite B65 Foam Branch @ 700 kPa**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **LPM** | **30M** | **60M** | **90M** | **120M** | **150M** | **180M** |
| **85** | **750** | **750** | **750** | **750** | **750** | **750** |

**Angus Phoenix R200 Lo-Ex Branch @ 700 kPa**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **LPM** | **30M** | **60M** | **90M** | **120M** | **150M** | **180M** |
| **205** | **750** | **800** | **850** | **900** | **950** | **1000** |

**Angus Phoenix R200 Med-Ex Branch @ 500 kPa**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **LPM** | **30M** | **60M** | **90M** | **120M** | **150M** | **180M** |
| **150** | **550** | **550** | **600** | **600** | **650** | **650** |

**Foam Branch Operations - Class B**

**Medium Tanker**

1. **Fit G-Force Nozzle with Low-Ex foam attachment.**
2. **Set Quenchmaster Foam System set to 1%**
3. **Set pump delivery pressure using chart above**

**Foam Branch Operations - Class B**

**3.4C Tanker**

**Angus 225 Foam Branch @ 700 kPa**

**1050kPa at the inline inductor**

**60 metres of 65mm hose after the inductor (preferred)**

**3% - 6.75 LPM - 200 litres empty in 29 minutes**

**6% - 3.5 LPM - 200 litres empty in 14 minutes**

**Elkhart Monitor riser for Class B Foam**

**Set monitor to 360 LPM and pressure to 1400 kPa**

**Foam Operations - Class B**

**Calculating critical application rate**

**6.5 Litres (foam solution)/ minute/ square metre**

For example:

* Fire size is 400 sq. mtrs (20 x 20)
* 400 x 6.5 = **2600 lts** of foam solution per minute. (To be delivered on the fire and maintained for ten minutes after fire extinguishment)
* Total amount of concentrate required multiply the quantity of solution required per minute by 10 (minutes)
* 2600 x 10 = **26,000 ltrs** of foam solution required

**To calculate the amount of foam concentrate required**

3% of 26,000 = 780 ltrs of concentrate

6% of 26,000 = 1560 ltrs of concentrate

**Foam Branch Operations - Class B**

**3.4D Tanker**

**FB5X Branch MK1 - 225 LPM @ 700 kPa**

**FB5X Branch MK2 - 225 LPM @ 550 kPa**

**3% - 6.75 LPM 200 litres empty in 29 minutes**

**6% - 13.5 LPM 200 litres empty in 14 minutes**

**Foam Operations - Class B**

**Calculating critical application rate**

**Number of foam branches required**

Divide foam solution by flow rate of the branch

**For example :**

Angus F450 = 450 LPM

2600 divided by 450 = 6 branches

Angus F225 or FB5X = 225 LPM

2600 divided by 225 = 12 branches

**Duty Point – 1800 LPM**

|  |  |  |
| --- | --- | --- |
| **3.0 metre** | **Duty point (100%)** | **1800 LPM** |
| **4.5 metre** | **1/7 capacity loss (85%)** | **1530 LPM** |
| **6.0 metre** | **1/3 capacity loss (66%)** | **1188 LPM** |
| **7.0 metre** | **1/2 capacity loss (50%)** | **900 LPM** |
| **7.5 metre** | **2/3 capacity loss (33%)** | **594 LPM** |

**Duty Point – 1200 LPM**

|  |  |  |
| --- | --- | --- |
| **3.0 metre** | **Duty point (100%)** | **1200 LPM** |
| **4.5 metre** | **1/7 capacity loss (85%)** | **1020 LPM** |
| **6.0 metre** | **1/3 capacity loss (66%)** | **792 LPM** |
| **7.0 metre** | **1/2 capacity loss (50%)** | **600 LPM** |
| **7.5 metre** | **2/3 capacity loss (33%)** | **396 LPM** |

**Duty Point – 900 LPM**

|  |  |  |
| --- | --- | --- |
| **3.0 metre** | **Duty point (100%)** | **900 LPM** |
| **4.5 metre** | **1/7 capacity loss (85%)** | **765 LPM** |
| **6.0 metre** | **1/3 capacity loss (66%)** | **594 LPM** |
| **7.0 metre** | **1/2 capacity loss (50%)** | **450 LPM** |
| **7.5 metre** | **2/3 capacity loss (33%)** | **300 LPM** |

**Duty Point – 450 LPM**

|  |  |  |
| --- | --- | --- |
| **3.0 metre** | **Duty point (100%)** | **450 LPM** |
| **4.5 metre** | **1/7 capacity loss (85%)** | **383 LPM** |
| **6.0 metre** | **1/3 capacity loss (66%)** | **297 LPM** |
| **7.0 metre** | **1/2 capacity loss (50%)** | **225 LPM** |
| **7.5 metre** | **2/3 capacity loss (33%)** | **149 LPM** |

**Suction Inlet Guide**

**75mm inlet 900 LPM**

**100mm inlet 2000 LPM**

**125mm inlet 3000 or 4000 LPM**

**Duty Point – 4000 LPM**

|  |  |  |
| --- | --- | --- |
| **3.0 metre** | **Duty point (100%)** | **4000 LPM** |
| **4.5 metre** | **1/7 capacity loss (85%)** | **3400 LPM** |
| **6.0 metre** | **1/3 capacity loss (66%)** | **2640 LPM** |
| **7.0 metre** | **1/2 capacity loss (50%)** | **2000 LPM** |
| **7.5 metre** | **2/3 capacity loss (33%)** | **1320 LPM** |

**Duty Point – 3000 LPM**

|  |  |  |
| --- | --- | --- |
| **3.0 metre** | **Duty point (100%)** | **3000 LPM** |
| **4.5 metre** | **1/7 capacity loss (85%)** | **2550 LPM** |
| **6.0 metre** | **1/3 capacity loss (66%)** | **1980 LPM** |
| **7.0 metre** | **1/2 capacity loss (50%)** | **1500 LPM** |
| **7.5 metre** | **2/3 capacity loss (33%)** | **990 LPM** |

**Duty Point – 2000 LPM**

|  |  |  |
| --- | --- | --- |
| **3.0 metre** | **Duty point (100%)** | **2000 LPM** |
| **4.5 metre** | **1/7 capacity loss (85%)** | **1700 LPM** |
| **6.0 metre** | **1/3 capacity loss (66%)** | **1320 LPM** |
| **7.0 metre** | **1/2 capacity loss (50%)** | **1000 LPM** |
| **7.5 metre** | **2/3 capacity loss (33%)** | **660 LPM** |

**Relay Pumping –Shut down**

* Commencing at the incident or fire ground pump, reduce the output of the pump relay in a controlled manner, under the direction of the Water Sector Commander, until all appliances have returned to idle and close all deliveries.
* Disengage/close down pumps.
* Close hydrant or lose prime if draughting from a static supply.
* Release residual pressure from system.
* Make up equipment.

****

**Relay Pumping - Establishing**

* Establish a Water Sector Commander
* Determine the distance between pumps using either the 7 Bar or 10 Bar chart.
* Each pump should have two spare lengths of hose in case one bursts.
* Lay hose and position pumps.
* Ensure that each booster pump has a spare delivery valve/bleed valve to release air from the system.
* Advise the base pump operator to deliver water at 500 kPa.
* Set the pump pressure of each pump to 500kPa once air is expelled and water is flowing from the open unused delivery valve.
* Increase the pressure in the base pump once all the pumps in the relay have water.
* Adjust the output pressure of each successive pump until the desired flow rate is achieved. This is to be done in a controlled manner, for example increases of 100kPa, controlled by the Water Sector Commander
* Maintain a pump inlet pressure of at least 100kPa.
* Arrange communications between all pumps.
* Consider forming a ‘Water Sector’.

**Pump Delivery Pressures - 38mm and 65mm Handlines 700kPa Nozzles**

**Protek Model 361 @ 700 kPa Branch Pressure**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **LPM** | **30M** | **60M** | **90M** | **120M** | **150M** | **180M** |
| **50** | **700** | **700** | **750** | **750** | **750** | **750** |
| **100** | **750** | **750** | **750** | **750** | **750** | **800** |
| **150** | **750** | **750** | **800** | **800** | **850** | **850** |
| **230** | **800** | **850** | **900** | **950** | **1000** | **1100** |

**Protek Model 366 @ 700 kPa Branch Pressure**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **LPM** | **30M** | **60M** | **90M** | **120M** | **150M** | **180M** |
| **115** | **750** | **750** | **750** | **800** | **800** | **800** |
| **230** | **800** | **850** | **900** | **950** | **1000** | **1100** |
| **360** | **850** | **1000** | **1200** | **1300** |  |  |
| **475** | **950** | **1200** |  |  |  |  |

**Protek Model 368 @ 700 kPa Branch Pressure**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **LPM** | **30M** | **60M** | **90M** | **120M** | **150M** | **180M** |
| **360** | **750** | **750** | **750** | **750** | **800** | **800** |
| **475** | **750** | **750** | **800** | **800** | **800** | **850** |
| **550** | **750** | **800** | **800** | **850** | **850** | **900** |
| **750** | **800** | **800** | **900** | **950** | **1000** | **1050** |
| **950** | **800** | **900** | **1000** | **1050** | **1150** | **1200** |

**Number of hose lengths between pump (10 Bar pump)**

Aerial Pumper, Heavy Pumper, Medium Pumper, Light Pumper, some Bigfills

|  |  |  |  |
| --- | --- | --- | --- |
| **Flow Rate** | **Single 65mm hose** | **Twin 65mm hose** | **Single 100mm hose** |
| **1000 LPM** | **9 lengths (270m)** | **37 lengths (1125m)** | **112 lengths (3360m)** |
| **2000 LPM** | **2 lengths (60m)** | **9 lengths (270m)** | **28 lengths (840m)** |
| **3000 LPM** | **N/A** | **4 lengths (120m)** | **12 lengths (360m)** |
| **4000 LPM** | **N/A** | **2 lengths (60 metres)** | **7 lengths (210m)** |
| **5000 LPM** | **N/A** | **1 length (30 metres)** | **4 lengths (120m)** |

**Number of hose lengths between pumps (7 Bar pump)**

Pumpers pre-2005, Pumper Tankers, Tankers, Bigfills

|  |  |  |  |
| --- | --- | --- | --- |
| **Flow Rate** | **Single 65mm hose** | **Twin 65mm hose** | **Single 100mm hose** |
| **500 LPM** | **25 lengths (750m)** | **100 lengths (3000m)** | **448 lengths (13400m)** |
| **1000 LPM** | **6 lengths (180m)** | **25 lengths (750m)** | **112 lengths (3360m)** |
| **2000 LPM** | **1 length (30m)** | **6 lengths (180m)** | **28 lengths (840m)** |
| **3000 LPM** | **N/A** | **2 lengths (60m)** | **12 lengths (360m)** |
| **4000 LPM** | **N/A** | **1 length (30m)** | **7 lengths (210m)** |