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

Static & Residual Pressure – Calculating Available Mains Water Supply

Rule of thumb method:

<u>Pressure drop less than 10%</u>

Three times the original flow is available

<u>Pressure drop less than 15%</u>

Twice the original flow is available

<u>Pressure drop less than 25%</u>

The available flow is equal to the original

<u>Pressure drop more than 25%</u>

The available flow is less than the original

Relay Pumping

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

Base Pump

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

Booster Pump 1

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

Booster Pump 2

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

Fire Ground Pump

Relay Pumping

Decreases by 100 kPa Controlled manner until at idle

Fire Ground Pump

Decreases by 100 kPa Controlled manner until at idle

Booster Pump 2

Decreases by 100 kPa Controlled manner until at idle

Booster Pump 1

Decreases by 100 kPa Controlled manner until at idle

Base Pump

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

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

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

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

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

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 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

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

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

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 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
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

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

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

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

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

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'.

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.

Class A foam users guide (wildfire)

Foam Type	Recommended Nozzles	Mix Ratio %	Characteristics	Application
Non aspirated Solution	Conventional nozzle: jet, spray or fog	0.1% to 0.2%	Milky fluid	Deep penetration of fuels including: porous bark, windrows, mulch, grasses, forest ground litter, ground fires, hay, fence posts, general blacking out/mop-up.
Wet	Low expansion nozzles	0.1% to 0.3%	Watery foam	Rapid drainage penetrates and foam cover seals in moisture for protection of bark, isolation of tree stands elevated and surface fuels, grasses, forest ground litter and fence lines. Short-term control lines, flora, fauna and historical sites, and general blacking out/mop-up.
Fluid	Low and medium expansion nozzles	0.3% to 0.5%	Fluid shaving cream	Slow drainage needs time to penetrate. Foam cover seals in moisture for protection of bark, isolation of tree stands elevated and surface fuels, grasses, forest ground litter, fence lines, and structures. Short term control lines, flora, fauna and historical sites, and general blacking out/mop-up.
Dry	Low and medium expansion nozzles	0.5% to 1.0%	Shaving cream	Asset protection i.e. structures, machinery, coating hay stacks, flora, fauna and historical sites. **Caution: has limited wetting ability insulating is the main use. Not for use in mop-up.**

A simple rule for application, WHEN IN DOUBT WETTER IS BETTER!

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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	7 lengths