

INDIRECT Frost-Tec Systems Mix Ratio Calculations

MUST ONLY BE INSTALLED IN BROADY'S SOLAPOWER CLOSED CIRCUIT OR HEAT EXCHANGE SYSTEMS.

Frost-Tec Dose Rate

- For Protection to -8°C add at a rate of 20%.
- For Protection to -15°C add at a rate of 30%.
- For Protection to -24°C add at a rate of 40%.

System Water Volume Calculation for correct ratio mix of Frost-Tec

The following equation is a simple method of determining the volume of water in a length of pipe so as to mix the correct ratio of Frost-Tec for Frost Protection.

General requirements are 1 litre Frost-Tec for each Solar Collector.

Calculation for water volume	Example – 15mm pipe x 10m long
1. Measure the inside pipe diameter (I/D) in cm	13mm = 1.3cm
2. Half this figure	$1.3 / 2 = 0.65$
3. Multiply by itself (square root)	$0.65 \times 0.65 = 0.4225$
4. Multiply by 3.1416 (pi)	$0.4225 \times 3.1416 = 1.327$
5. Multiply by the length of pipe (cm)	$1.327 \times 1000\text{cm}$
6. Result is in mm	$= 1327\text{mm}$
7. Divide by 1000 for conversion to litres	or 1.327 litres

Working Example: Broady's Indirect Pump Circulated System – 2 collectors connected to Hot Water Cylinder located at ground level.

- 2 x Solar Collectors (each contains 2 litres of water)
- Hot water cylinder has a 6m indirect coil (19.4mm I/D)
- 8m flow and return pipes (13mm I/D) to Solar Collectors.
- Freeze protection required -15°C (ratio: 30% Frost-Tec / 70% Water).

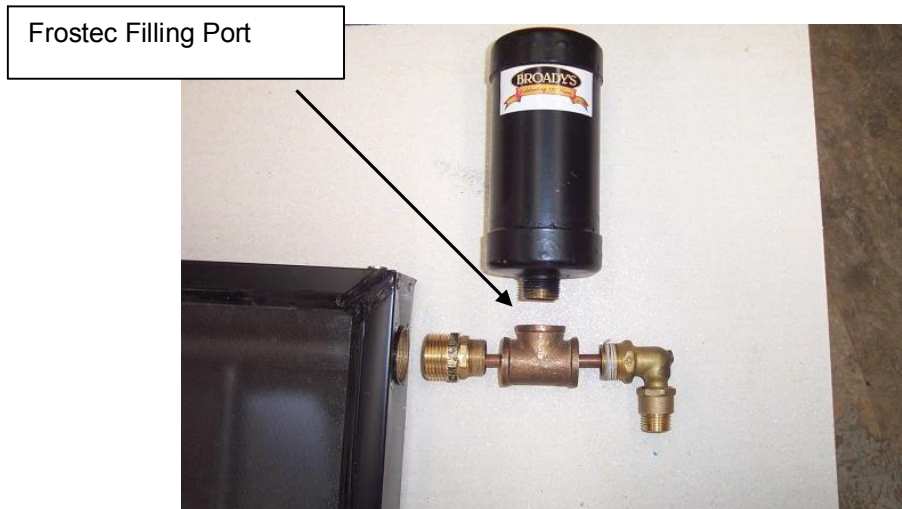
HWC Indirect Coil	Flow and Return Pipes	Solar Panels
1.94cm	1.3cm	2 litres ea x 2 Panels = 4 litres
$1.94 / 2 = 0.97$	$1.3 / 2 = 0.65$	
$0.97 \times 0.97 = 0.941$	$0.65 \times 0.65 = 0.4225$	
$0.941 \times 3.1416 = 2.956$	$0.4225 \times 3.1416 = 1.327$	
$2.956 \times 600\text{cm} = 1,774 \text{ mm}$	$1.327 \times 800\text{cm} = 1,062\text{mm}$	
$1,774 / 1000 = \mathbf{1.77 \text{ litres}}$	$1,062 / 1000 = \mathbf{1.062 \text{ litres}}$	

Total Volume $1.77 + 1.06 + 4.00 = \mathbf{6.83 \text{ litres}}$

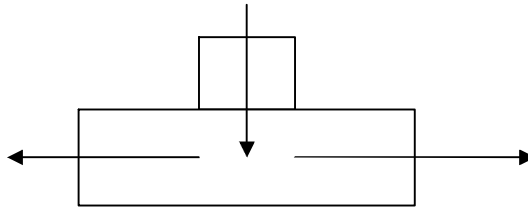
Mix Ratio

Frost-Tec	$6.83 \text{ Lt} \times 30\% = 2.05 \text{ litres of Frost-Tec}$
Water	$6.83 \text{ Lt} \times 70\% = 4.78 \text{ litres of Water}$

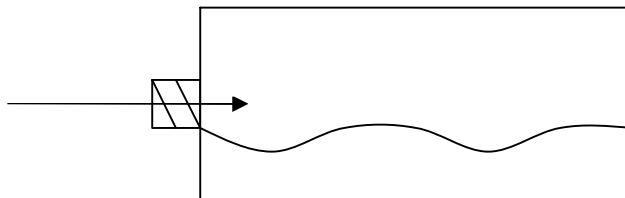
Correct filling of Indirect System with Frostec



Step 1. Completely fill system with correct ratio of Frostec and water through the filling port 20mm Tee.



Step 2. While on its side fill the expansion vessel with water up to the opening level.



Step 3. Quickly screw expansion vessel into filling port Tee.

