

HOSEREEL BRANCHES AND FRICITIONAL LOSS 30/09/2005

After attending our watch BAR (20/09/05) and to follow on from my report dated 06/09/05 reference foam equip hand controlled branches and frictional loss in hose lines, I feel I must raise the following points.

During the course we used the TFT Ultimatic FO7 hosereel branch, we currently have one of these branches on the run on 190, our second hosereel branch and the two of 191's branches are of the Delta H500-25F type. When the branch first arrived on station we tried to find out the technical specifications of the new branch but could find none available and the current SIS tech 1/026 has no mention of this new branch.

We asked about the branch on the course and although there are no technical specifications for the branch available we were informed that the TFT branch performed best in a number of trials when compared to various other branches.

During an attack exercise in the hot cans we used the TFT branch with a pump pressure of between 20-22 bars. I know it is considered by experts that high pressure hose reels with a bore of 19mm and a flow rate of 110 l/min are more than capable of dealing with most compartment fires, but this may not always be the case. I am also aware that there are a number of reports (produced in Sweden) that show if hosereels are the primary attack hose that they should be of 25mm bore.

As the fuel loading in the hot cans does not compare realistically with the fuel loadings in a real bedroom or living room etc. (this is not a criticism of the training exercise) should we not be armed with better attack equipment and have 25mm bore HP hose lines as a minimum and/or better LP attack hose lines and branches. The World Series pump now in the service has the capability to deliver higher volumes of water through the high pressure side of the pump than previous pumps in the service. So increased high pressure flow rates and 25mm bore tubing would seem to provide the perfect combination for primary attack/defence lines, with all the manual handling advantages, but must be backed up with a secondary 51mm hose line with a suitable branch. I do not believe our 45mm hose fitted with a Delta H500-65f branch would provide an adequate primary, secondary or covering hose line when dealing with compartment fires in attack or defensive modes (see report 6/9/05 ref frictional loss/flow rates)

When choosing HP attack hose the following should be borne in mind. For a flow rate of 100 l/min through 19mm hosereel tubing with 60 metres laid out straight and on the ground there will be a pressure loss of **10.9 bars** (this will increase to approximately **17.4 bars** with most of the

hosereel still on the drum). So for example if the hose from one side of the appliance were required to be coupled to the other side and only one length from this side were removed from the drum, (four lengths laid out flat and straight and two remaining on the drum) it can be seen that the pump operator would need to take these factors into account, so as to give the attack hose the correct pressure/flow rates.

I cannot recall nor do I believe that frictional loss through hosereel tubing has been considered in the past, and in fact in the past losses through hosereel tubing due to frictional loss would not have had a major impact on fire fighting operations. But with these new modern techniques frictional loss/flow rates become a major factor in the operational success of these techniques.

Another concern is that the World Series pump is designed to use high pressures and has built in anti-surge valves on the hosereels to protect the pump when pulsing. (See appendix 1)

The GM pump may not have the same level of protection. Tech 1/026 states “when using HP hosereels the pressure should not exceed 26bar as damage may occur to the pump casing or collecting head”.

As the World Series pump has the design advantage of generating higher pressures (the maximum normal operating pressure is 40 bars) this could give a higher velocity stream/fog stream and greater penetration, also better performance and attack capabilities and may also have a positive affect on the water droplets and spray performance.

Although we have no SIS on the new branches their performance appears to be far superior to that of the delta branches currently in service in HFRS and during some high pressure tests that we carried out on station the delta branches became difficult to operate in rapid pulsing mode, despite having a Hydro-dynamically assisted slide valve. But the new TFT branch operated as easily under high pressure rapid pulsing as it did under lower pressures. Could we also not consider this type of branch or one of a higher specification combined with 51mm hose for low pressure attack lines? Should all appliances not have the branches on both sides?

I understand that in December 2004 the ODPM produced a report into flow rates and modern branches in use when tackling fire in high rise building and general fire fighting techniques. It stated that fire and rescue services should consider the use of 51mm hose instead of 45mm hose (larger hose was found to have manual handling issues).

There is also a training need to educate the pump operator in providing the correct flow rates/pressures and calculating frictional loss through the different types of hose carried on all appliances.

I believe that our BAI's have a greater understanding of the affects that attack lines and branches have when dealing with compartment fires, and may be able to shed more light on this subject.

I also believe that a more comprehensive training package combining pump operating and tackling compartment fires is required to raise fire fighters standards to levels achieved by our service BAI's.

FF Martin Arrowsmith
Blue Watch WGC

APPENDIX 1

ANTI SURGE VALVES FITTED TO GODIVA WORLD SERIES PUMPS

The purpose of these valves is to prevent pressure surges in the high pressure hoses from being transmitted back into the pump.

If the high pressure nozzles may be used in the manner that causes pulsing of the water (i.e. in a potential flashover situation) it is **highly** recommended that anti-surge valves be fitted.

If the high pressure nozzles may be used in a manner that causes pulsing of the water and non return valves are fitted into a suction collecting head

(as in Hertfordshire) it is **absolutely essential** that anti surge valves be fitted.

Pulsing of the high pressure nozzles can cause standing pressure shockwaves to travel back down the high pressure hoses and into the pump. If anti-surge valves are not fitted, unhindered these waves will continue to travel backwards through the pump until dissipated down the suction line. However, if a collecting head is fitted incorporating non return valves and the pump were being fed from a pressure fed supply. The pressure waves will have no where to go and could cause rupture of the weakest component, often the collecting head. If the pump is stand alone the high pressures transmitted back through the pump will dissipate through the supply pipe back into the appliance water tank.

Pulsing of the high pressure discharge can cause pressure spikes, which will be considerably higher than the nominal pressure. It is therefore essential that high pressure hose fitting are able to stand these high pressure spikes without blowing off.

It is theoretically possible that the timing of the pulse could hit a natural frequency of reflected shock waves, which may result in a significant magnification of the pressure pulse.

The anti-surge valves prevent the high pressure shock waves from travelling back into the pump. However, the anti-surge valves are deliberately designed to slowly leak (in reverse flow mode) there by allowing a gradually dissipation of pressure into the pump.

Although the fitting of anti-surge valves will provide some protection for pump components they will not prevent high pressure hose fittings from blowing off if there pressure capacity is exceeded. Only hose reel tubing with a minimum working pressure rating of 55bars should be used with the World Series pump. The fitting of the coupling to the tubing must be swaged and not speed ring.