

# 5 on one hose

## 1 Introduction

Since quite some time, the Belgian Fire Service mainly staffs its engines with 6 firefighters. Ten years ago, the same standard was used in France and The Netherlands. For many Belgian firefighters, it was a strange thought to have less people in the engine. Since the Fire Department Amalgamation in 2015, people are much more used to terms such as AP4 and AP6. An AP6 is an engine that has 6 firefighters on board, while an AP4 only carries 4 firefighters. Under certain conditions, the Belgian law allows an engine to be dispatched to a fire with 4 firefighters on board.

So what makes the big difference between an AP6 and an AP4? Both trucks have a driver-pump operator and a company officer with at least the grade of sergeant (US rank would be lieutenant) on board. This means a AP6 has two duo's of firefighters on board, while a AP4 only has one duo.

So what can we do with those two duo's? And where is the big advantage with two duo's in comparison with one duo?

## 2 Provide water supply at every fire?

An engine with six firefighters in board can execute two tactics at the same time. In the past, this was very rigid. The tasks for both teams were fixed. They were even named after it. They spoke about an "attack team" and a "water team". They acquired these names because one team had to attack the fire while the other teams had to search for water supply. This last team went, accompanied by a standpipe and hydrant key, looking for a hydrant to supply the engine. As soon as a functional hydrant was found, the standpipe was put in place and a supply hose was put in place. Once the water supply had been realized, this team was available again to execute a new tactic.



**Image 1** A firefighter mounts a standpipe. (Picture: Pierre-Henri Demeyere)

Past years showed out that:

- Fire evolves a lot faster than before, to about 10 times faster.
- There is a lot more smoke production than before and time pressure to save people increases.
- Firefighters are much more educated in the use of the nozzle than before and use much less water as a result.

This information allows to understand that there is a better way to fight fires than to handle every fire with an attack team and a water team. Due to this change in philosophy, water



supply for the engine is not always placed by the crew of that vehicle. There are of course other possibilities:

- A water tender supplies the engine. Its crew can additionally hook to a fire hydrant.
- The water supply is put in place by the crew of a later arriving vehicle.
- The driver of the second arriving engine pumps the 2 500 liters of water from his vehicle to the tank of the first vehicle, causing to have 5 000 liters of water to its disposal without finding a fire hydrant.

It is the company officer of the first arriving engine who decides whether the engine must be supplied with additional water or not.

Most fires do not require 2 500 liters of water to be put under control. In that case, the second duo can start a search & rescue right away instead of looking for water supply first. This choice results in possible victims to be saved faster. Specifically, the second duo starts their search a lot sooner. The time which was used before to put a supply hose in place is now time won for the rescue task. By making this choice consistently – every time the fire behavior allows – eventually more victims will be saved.

### **3 How much distance can you cover with two persons?**

The fire service keeps learning. About 10 years ago, every engine was equipped with rolled low pressure hoses. This made it very hard to lay a low pressure line in a building. As a result, high pressure lines were used very often. One of its major advantages is the ability to advance while the hose is under pressure. This was not possible with a rolled low pressure hose. Because of this, firefighting was often done with a dangerously low flow rate.

Luckily, starting from 2008 the bundle hoses (e.g. The Cleveland hoselay) were introduced in Belgium. These got into service bit by bit. Anno 2020, bundle hoses have become standard equipment and are frequently used at fires. The use of high pressure hoses has luckily reduced because of them. Now it is possible to advance with a pressurised low pressure hose. A disadvantage of a 45 mm hose in comparison to a high pressure hose is its weight. This makes it less mobile. As a result, attention rose for hose management. In the USA, high pressure systems already disappeared in the seventies. Low pressure is used at about all times. An interior attack with a 64 mm hose is no exception there. So there was a lot to learn about working with a heavy hose in a smooth manner. In the article "*Hose Handling*" we went deeper on this topic.

A more recent approach is the use of hoses with a diameter of 38 mm. The flow rate coming out of a 45 mm hose is not limited by the diameter of the hose, but by the nozzle on it. In other words, it is not necessary to have a hose with a diameter of 45 mm if the nominal flow rate of the nozzle is 400 to 500 liters per minute. Or to put it another way: *We drag those heavy hoses along while absolutely not necessary.*

More and more fire departments are recognizing that a 38 mm hose allows to use the same flow rate while the firefighters carry 30% less weight. A disadvantage of the 38 mm hoses are the greater friction losses. In most cases, the fire is less than 40 meters from the



location of the threeway-manifold. The larger friction losses are then compensated by giving one to two bars more pressure at the pump. Due to the greater friction losses, it is important to limit the number of hose lengths to 3. With a 38 mm hose that is longer than 60 meters, the pressure losses are too high.

A 38 mm hose also bends easier than a 45 mm hose. This can only be solved with good hose management skills.

Training on hose management and working with 38 mm hoses are two factors that ensure that the attack crew can work faster and more smoothly. They can do more with less effort. Still, there is a limitation to what a duo can do. On a long stretch or a stretch where a number of corners have to be passed, the duo quickly reaches the limits of what is physically possible. After all, advancing while keeping low with a hose is hard work. If the second nozzle man has to return to a corner because the hose is stuck there, it takes time and energy.

A possible solution to this problem is for the company officer to help advance the hose. He usually has the thermal imaging camera with him so he can also help searching for victims while helping the hose to advance. However, this method also has a major disadvantage. The company officer is now part of the attack team and is therefore no longer available to command his second duo. He can partly overcome this by giving good orders in advance. However, if something goes wrong, he no longer knows where his two other firefighters are.

#### **4 New method: With 5 on one hose**

A tactic being used more and more is called "4 on one hose" or "5 on one hose". It comes down to the full crew of the engine being used on the same tactic. The purpose of it consist of getting water on the fire as soon as possible. The SOP "Deployment of hoses", which was published in March 2018 by the KCCE (Belgian centre of expertise for the fire service), already shortly mentioned this possibility.

##### **4.1 Description of the method**

The nozzle man goes first. His role is to find the way to the fire. It also ensures that the smoke gasses are cooled down. In the past, his colleague would have followed him directly. Typically there was physical contact between the two. However, this leads to the second man having to drag the entire hose. Hose management techniques teach you to position the second man four meters behind the nozzle man. In this way, the nozzle man "pulls" the four meters of hose with him. The second man is then responsible for the next piece of hose.

The distance of four meters can be interpreted loosely. The team must take into account the conditions on scene. If the nozzle man turns around corner, the second man can move up to that corner and sit there for a while to pass along the hose. That way he bypasses the friction. Everything runs smoother.





**Image 2** Exercise Five on one hose at Nevele Fire Station, Zone Centrum, Belgium. (Picture: Wouter Bingé)

If the entire crew of the engine is deployed on the same hose, the hose management system is expanded. The nozzle man advances first and then someone comes along every four meters to help to move the hose forward. In this way, the crew is spread over 20 meters of hose. Again, the four meter distances are just rules of thumb.

Most fires are less than 20 meters away from the entrance. However, if the fire is further away, the distances between the different crew members will have to be longer. It is best to keep in mind that the nozzle man is usually closest to the danger. That is why it is best for the second man to stay close to him or her. The distance between the nozzle man and the second man is then best at a maximum of four meters. The three other team members can then be spread over the remaining length of hose.

Here, it is important as well that the team adapts to the environment in which it finds itself. If the hose goes around a corner or through a doorway, it can be very useful to leave a crew member there to take away the friction between the hose and the corner.

#### 4.2 Position of the company officer

The company officer can deploy the attack hose together with the team, but it is also possible to let the four crew members independently deploy the attack hose while the company officer explores further and makes his or her picture of the situation more complete (= better situational awareness). Finally, the company officer can also stay outside to take the chief officer's role until he has arrived at the intervention site.

The number of thermal imaging cameras in the engine will play a role in this. If there is only one thermal imaging camera, and the company wants to keep it with him, it is best to position him behind the nozzle man. This allows the thermal imaging camera to be used to assist the nozzle man in the search for the fire. Once the fire has been found, the company officer will take the last meters between his original position and the position of the nozzle man. The thermal imaging camera can be very useful for attacking the fire and for post-extinguishing in an environment with very limited visibility.

#### 4.3 Anti-ventilation

In the classic way of working with a two-person attack team, it is almost impossible to apply anti-ventilation if a smoke stopper is not present. After all, the second man has to stay close to the nozzle man. By deploying the entire crew on the same hose, someone can be left at the door to play door man when no smoke stopper is available.

The role of the door man is to keep the door as shut as possible and pass the hose at the same time. By making the door opening as small as possible, only a limited amount of air can enter. If the doorway is the only opening, the fire will usually remain small. A second important effect is limiting the outflow of smoke. The place for the doorman is preferably well considered. In an apartment building, the apartment door is the best option. In an office building, it can be the entrance door to the floor.



**Image 3** The Door man.  
(Picture: Ed Hartin)

The person at the door will listen carefully while sitting there. The ideal position for this is on the inside of the door. It is possible that the team inside calls for an extra firefighter inside. However, it is also possible that they come out because they are retreating. In both cases it is important that their message is received.

The person will sit at the doorway until the next person on hose arrives. Then this person will sit at the door and take over the door man function. An extra person can then enter.

A smoke stopper is a better way to limit the inflow of air and the outflow of smoke. Because five people are available, it is easier to bring a smoke stopper than in a team of two. It is best for the engine's second duo to take these with them, as the first duo will be busy with the hose bundle (= Cleveland hoselay). Usually, the smoke stopper will be placed at the first door through which smoke flows out (or where smoke is expected to flow out). Once the smoke stopper is in place, the only thing that needs to be considered is the point of friction that the side of the doorway can be. If the hose runs straight through the doorway, there will be little to no friction. However, if the hose goes to the right or left as soon as it has passed the door, there will be (a lot of) friction with the door jamb.

#### 4.4 What after the attack started?

The team of five will move quickly and smoothly with the hose. Once the nozzle man gets to a point where he or she can attack the fire, the hose won't advance that much anymore. Two situations can then arise:

- The company officer stays with the nozzle man
- The company officer leaves the attack crew (two firefighters) to attack the fire and will handle other matters himself (directing the second crew, reconnaissance, coordinating with chief officer,...)

At that point it is important that the nozzle man has a thermal imaging camera to evaluate the effect of his attack and to adjust if necessary. Either the company officer will sit with the nozzle man or he will hand over his camera to the second person of the team (in Belgium this is usually the number two). If several thermal imaging cameras are available, this person will already have a camera.

At moment the nozzle man gets into position, the second person will be a few meters away on the hose. That person is supposed to advance that distance and form a loop of hose





behind the nozzle man. In this way, a classic attack team is created again at the point of attack. In addition, they have four meters of hose at their disposal to progress smoothly while the rest of the attack hose remains in place.

The two other team members have nothing left to do at that point. They can be used for another task. Often that will be search & rescue (primary search).

## 5 Advantages

What is the advantage of deploying as five on one hose? Fire is much faster than before. Five on one hose allows faster deployment than before. With this the faster fire behaviour is partly compensated.

The work of the company officer also becomes much clearer. In the first phase of the deployment, the fire has not yet been located. This means that there is a considerable risk. The commander does not know where the fire is, how big it is, how easily it can spread, ... If the search & rescue team starts searching independently (especially if this is done without water), it will be more difficult for him to keep an overview. In the 5 on one hose-system, the entire crew is behind the nozzle. The nozzle should still provide some form of protection. At the same time, the company officer knows approximately where everyone is.

This way of working is especially useful for larger buildings where a longer distance has to be covered, such as a parking garage, an industrial building, a hotel, a large apartment building, ... In an ordinary single-family home, it will be possible to easily deploy the attack hose with two firefighters.

While progressing, the last two team members (in Belgium: the numbers three and four) can already search for victims on their way to the fire. Along the way the hose travels, they can look left and right to see if they see a victim. They can also familiarize themselves with the situation inside: How is the geometry? Where are doors? Which kind of room could be where? This will help them later during the search & rescue. Because they experience the advance, they also form an image of the fire: how much smoke is there? How warm is it? Their search will become slightly more efficient due to these elements, which increases the victims' chances of survival. In case one of them also has a thermal imaging camera, it can also be used to search for victims during the advance. If the commander is the only one who has a camera, he will also have to pay attention to scanning for victims during the advance.

If suddenly a victim is found, enough personnel is immediately on site to evacuate this victim. Often the evacuation will be carried out by the two team members sitting in the back. Depending on the location of the victim, the nozzle man, the second person in front and the company officer will pass on the victim to the people at the back who will become the search & rescue team at that time. They will bring the victim out and the remaining three firefighters will now have to complete the remain of the advance towards the fire.

A final advantage of five on one hose is that the overweight of a 45 mm hose compared to a 38 mm hose can be compensated a bit. It is therefore an ideal tactic to use if no 38 mm hose is available or if an exceptional choice is made to set up a 70 mm hose.



## 6 Combination with other techniques

This tactic can be combined with the various techniques used in a classic two-person deployment. *Bringing a loop* is a technique that is very useful for bringing in a few meters of hose. The second nozzle man pulls along a loop behind him. In this way he not only moves the entire hose behind him, but there is a three to four meter section of hose that is located directly behind the second nozzle man. The moment the nozzle man reaches a place from which he can attack the fire, the advance stops. The big advantage of a loop is that the hose does not go out in a straight line. On the contrary: there is a reserve of three to four meters ready that allows for a little progress to start extinguishing immediately after the fire has been put down. The disadvantage of this method is that the loop sometimes falters against furniture. The smaller the spaces, the more likely this will happen.

If 5 on one hose is combined with a loop, the loop is best made when the nozzle man arrives at the point of attack. Up to that point, the hose lies in one straight line. This prevents the loop from jamming against furniture, etc. As soon as the nozzle man arrives at the point of attack, the company officer moves the camera towards him. The other three members of the team advance a little further with the hose so that a loop is created just behind the nozzle man. The number two then stays with the nozzle man while the second duo (numbers three and four) switch to the search & rescue tactic.

Five on one hose is a method that has been introduced in all zones in the province of Antwerp. Karel Van Heetvelde, Steve De Blauwe and Ronny Cornelis have developed a complete methodology to make good progress with four or five. They use different orders to make the team work well together:

- Hose: the team progresses the hose
- Move: Number four moves forward to the position of number three, number three to number two and so on
- Door: The nozzle man arrives at a door
- Stop: The company officer asks to wait a bit
- Retreat: The team falls back

These orders forge the four/five team members into one whole. A squad that masters this method becomes very efficient at deploying a hose. A progress that used to be a difficult challenge with two people, suddenly becomes a piece of cake.





**Image 4** Correct placement of the leg over the hose. (Drawing: Bart Noyens)

Another technique that is also gaining popularity is using a leg to bring the hose forward instead of using your arms. The way to do this is to place the back lower leg over the hose (see image 4). The hose then passes, as it were, between the two legs.

When advancing, the lower leg is pushed forward. Because the foot hooks behind the hose, the hose is pulled forward. Leg muscles are much larger and stronger than arm muscles. By using this method one takes advantage of the strong leg muscles to move the hose with relative ease. This method can be especially useful for lighter firefighters or firefighters who have less strength in their arms and/or upper body.

Aaron Fields from the Seattle Fire Department has propagated this method in the US under the banner "The Nozzle Forward". They mainly use this method to advance 64 mm hoses as this is their primary tool of attack.

This technique does have a disadvantage compared to the traditional method. If the nozzle man applies it, the hose (and therefore the nozzle) will come between his or her legs. As a result, there is less control over the direction of the nozzle. In the traditional method, the hose is clamped in the armpit of the nozzle man. This allows him or her to control the hose by moving his or her body. This makes it possible to apply the extinguishing water very accurately and thus leads to a higher efficiency. Normally the nozzle man will only have to move a limited amount of hose. This should work using the traditional method.

This is a good technique when two firefighters are advancing with a 45 mm hose. Especially the rear person has to move a large weight of hose. Then this technique can help. However, if progress is made with four/five on one hose, then the disadvantages probably do not outweigh the advantages. After all, each person on the hose only has to move a short piece of hose.

## 7 Afterthought

During my career, I have experienced the following developments within the fire service:

- Nozzle Techniques
- Door entry procedure with nozzle
- Thermal Imaging Cameras
- Bundle hoses (= Cleveland hoselay)
- Hose management
- Piercing nozzles
- Quitting to supply the engine with water every time
- Smoke stopper



- Forcible Entry
- 38 mm hoses

The order in which these innovations are introduced is not the same everywhere. Not every organization is equally advanced in implementing these matters. Five on one hose as a tactic is another innovation that can make our work better, more efficient. Let's embrace them all to become better firefighters that put out fires faster and save people faster. After all, that is what it is all about...

## 8 Sources

- [1] *Kerber S (2012) Analysis of Changing Residential Fire Dynamics and Its Implications on Firefighter Operational Timeframes, Fire Technology, 48, 865–891*
- [2] *Lambert K (2017) Beschouwingen over hogedruk, De BrandweerM/V, januari 2017*
- [3] *Lambert K (2014) Hanteren van een slang, De BrandweerM/V, november 2014*
- [4] *KCCE (2018) Aflegsysteem van lijnen*
- [5] *Brandweerzone Rand (2020) Lesbrieff: Vorderen door middel van de Kastro-methode, december 2020*
- [6] *De Blauwe S & Lambert K (2019) Slangenmanagement, De BrandweerM/V, januari 2019*
- [7] *Van Heetvelde K, De Blauwe S, Cornelis R, persoonlijke communicatie, 2016-2021*

Karel Lambert

