

Experimental study into the use of positive pressure ventilation in staircases during fire service interventions

Karel Lambert¹

Supervisors: Bart Merci, Tarek Beji

Abstract – This article discusses experiments to determine ideal positioning of positive pressure ventilators by the fire service on the fire ground.

Keywords – fire ventilation, positive pressure ventilation, PPV

I. Introduction

The use of positive pressure ventilation (PPV) is widespread within the fire service. In Belgium fire services tend to position one PPV fan in front of the main entrance. In North America fire services use practices where two fans are placed in series, parallel or in V-shape. Experiments have been done to test which is the ideal place to position one PPV fan. Other experiments had to determine which fan combination (series, parallel or V-shape) generated the biggest flow.

II. Used buildings

Four different buildings were used to do the experiments. Amongst them was one low-rise and one high-rise building. The bulk of the experiments were done in the two remaining, mid-rise buildings.

III. Experiments

Nine days of testing took place. For every experiment one or more PPV fans were positioned in front of the main entrance of the building. The generated air speed was measured with an anemometer in the staircase. The place of the measurements was the doorway giving access to the floor.

In a doorway 15 points were determined to do the measurement. The mean value of the 15 points was used to draw conclusions.

Factors influencing the result of the measurements were the wind and the position of the person doing the measurements.

The goal of the experiments is guidance for positioning

fans on the fire ground. Fans will never be placed exactly on the right spot on the fire ground. Therefore the uncertainty on the data is considered acceptable.

Experiments regarding one PPV fan included the optimal distance and the inclination of the ventilator. Experiments regarding multiple fans included two fans in series, two fans in parallel, two fans in a V-shape, three fans in V-shape and a combination of two fans in a V-shape and one fan at the bottom of the staircase.

Several types of V-shape were examined.

IV. Conclusion

If the goal of the operation is the removal of smoke in room after the fire is extinguished, then a good position for the PPV fan is a distance of 1,6 m from the entrance. The fan should not be tilted.

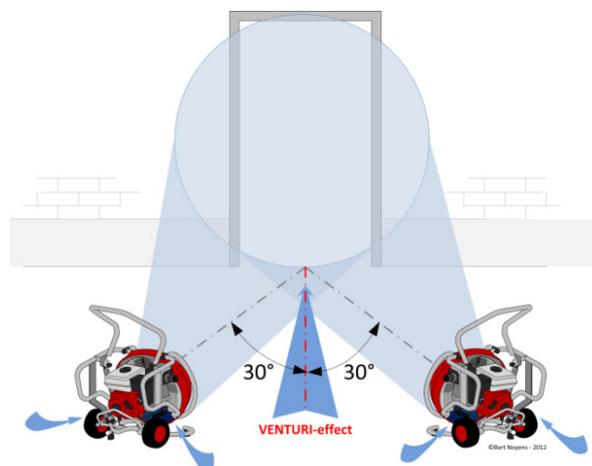


Figure 1: Two PPV-fans in a V-shape with an angle of 30° (credit: Bart Noyens)

When two fans are used, the ideal configuration is in a V-shape. Both fans should not be tilted. The distance between the axis of the fan and the middle of the door opening should be 1,6 m. The angle between the axis of the fan and the axis of the door should be 30° to achieve the best possible result.

¹K. Lambert is with the Brussels Fire Department.
Email: karel.lambert@skynet.be