Water for firefighting in five South African towns

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ABSTRACT

Alternative methods of firefighting and new firefighting technologies could reduce the reliance on potable water supplied via the water distribution system (WDS) for firefighting. Water required for firefighting in 5 towns in proximity to Stellenbosch, South Africa, was evaluated. The key objective of this research project was to investigate the extent to which the WDS was used for fighting fires. The fire flow requirements, specified in South African guidelines, as well as some international standards, were also reviewed. Information from fire departments in 3 municipal areas was analysed to determine the fire type category, the method for extinguishing the fire, and the water requirement to extinguish the fire. Only 8.6% of all fires were extinguished using water from the WDS by connecting firefighting equipment to a fire hydrant at the time of the fire. Most fires were extinguished by means of water ejected from a pre-filled tanker vehicle disconnected from the WDS at the time of fighting the fire. In most cases water was drawn from the WDS at a predetermined location and time, and then transported by tanker vehicle to the demand point upon receiving an emergency call. This research underlines the need for a hitherto unpublished and more realistic firefighting code for South Africa as it pertains to the WDS.

Keywords: fire flow, water distribution system

LIST OF ABBREVIATIONS AND ACRONYMS

F_F	-	Fire flow volume as per fire record
F_T	-	Initial total tanker volume (firefighting vehicle)
F_N	-	Fire flow volume required from pipe network
WDS	-	Water distribution system

INTRODUCTION

Background

South Africa is currently faced with infrastructure challenges to meet the current demands for service delivery and in particular the provision of water and sanitation. Even though supplying water for potable needs is the main function of a water distribution system (WDS), water is also reserved (as per current standards) to fight fires. To realise the significance of providing water for this purpose, one only needs to consider the damaging effects of a fire.

Numerous methods could be used to extinguish fires. The traditional approach, assumed to be standard practice, involves the provision of water for firefighting via the WDS, as stipulated in South African design guidelines (CSIR, 2003). It is, therefore, important to design a WDS which would ensure that the required flow of water for fighting fires would be readily available for extinguishing fires during an emergency.

Apart from the financial implications of providing the required infrastructure capacity for fire flow in the WDS, provision of water for firefighting via the WDS has other disadvantages. Reserving system capacity for infrequent fire flow may have an adverse impact on the quality of the water. Fire flow provision necessitates larger pipes and larger reservoirs than would be required in the absence thereof. The increased system capacity remains unutilised during all normal periods of use and the subsequent increased time that water is stagnant in the system would lead to loss of disinfectant and resulting bacterial growth. The larger pipes may also lead to relatively low flow velocities and subsequent deposition of sediments.

Fire progression and the role of water

Davies (2000) illustrated the progression of fires in buildings by identifying 5 phases: ignition; smouldering; flame growth; fully developed stage and eventual decay, as depicted in Fig. 1. It is obvious that a fire could be extinguished more effectively by tackling it at the correct time. The least productive time to start the fire-extinguishing process would be in the fully developed phase. A fire could be extinguished by eliminating any one of the four components needed to sustain a fire. This could be done by removing the fuel, removing the oxidiser, inhibiting the chain reaction or reducing the temperature. The effectiveness of extinguishing fires is thus a function of the firefighting agents and numerous other factors, such as the stage at which it is tackled and thus the response time, the efficiency of the fire fighter, the fire department, the available equipment and the method used to extinguish the fire. The question arises as to the role of water and the WDS in the process.

Water has long been the most commonly used fire-extinguishing agent. The physical properties of water make it ideal for extinguishing most types of fire. Water absorbs heat as it evaporates and also displaces oxygen. It is clear that water is needed for firefighting, but the source of such water is clearly unimportant.

Motivation

There is a clear need to research the sensibility and scope of fire provision via the WDS. This paper is considered a contribution in this regard. It is important to ensure that the level of fire flow

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