ABSTRACT

In South Africa, as is mostly the norm globally, national legislation recommends that potable water distribution systems (WDSs) maintain the capacity, both in flow and pressure head, to provide specified quantities for fire-fighting purposes. As a result, a limiting requirement and thus dominant constraint in the design of WDSs, is the provision for fire-flow. It is therefore pertinent that fire-fighting requirements are defined as accurately as possible. Fire-flow is defined as: 'the rate of flow of water required by the fire-fighting service for the extinguishing of fires'. Contrary to this, there is a view that the demand by emergency services for water supplies were historically based on instinct and strongly characterised by what was available rather than a technical analysis of what was needed (Davis, 2000). Furthermore, the typical implementation approach to designing WDSs has remained largely unchanged for 60 years. Despite this, the condition of WDS infrastructure, development of fire-fighting technologies and techniques, and the growth in fire safety awareness have dramatically evolved. It is therefore logical that the provision and requirements for fire-flows be amended to more appropriate levels. This study therefore investigates the question: Are the current South African standards and design guidelines pertaining to fire-flow provision appropriate for modern fire-fighting techniques and do they ensure the most efficient balance between providing sufficient fire protection and promoting sustainable water use? To answer this question, the study: (1) reviewed design guidelines and standards locally and internationally; (2) conducted interviews on key role players within the City of Johannesburg's fire department, including active and experienced fire-fighters, trainers, and heads of various directives; and (3) captured and analysed information contained within 10 years of billable (incidents that the fire department can charge the property owner for their services rendered) fire incident reports representing 3859 fire events within the City of Johannesburg. The review of literature revealed a lack of uniformity in design requirements for fire-fighting. This suggests that a large element of uncertainty exists on the topic of water provision for

fire-fighting. This is further emphasized by the fact that nowhere in any of South Africa's national guidelines are theoretical or empirical methods referenced or identified to be the source of the fire-flow values quoted. This problem is further compounded by the fact that water provision is never guaranteed by water services provider nor can they be held liable for failure to meet any recommendations in the guidelines. The review of South African metropolitan, district and local by-laws also identified that different expectations are held regarding the role and provision of water for firefighting. As regards the interviews conducted, the dominant opinion expressed is that the biggest infringements to firefighting in the City of Johannesburg are the frequent occurrences of fire hydrant related problems and the shortage of first response pumping appliances. From the fire incident reports, this study reports that 75% of fire incidents required less than 6.6 kl of fire-flow volume - this is less than the capacity (6.9 kl) of a conventional pumping tanker. This means that 75% of fire incidents in the City of Johannesburg can be managed without the use of municipal fire hydrants if a suitable first response appliance is dispatched. Furthermore, the data shows that 99.9% of all fire incidents within the city demand an average fire flow rate less than 1200 L/min, which is the minimum hydrant flow rate for the lowest fire risk category in SANS 10090. Likewise, 98% of all fire incidents required an average fire flow rate less than 350 L/min, which is the minimum hydrant flow rate for the lowest fire risk category in the South African '*Guidelines for Human Settlement Planning and Design'* manual.

.