

# Evaluation of minimum residual pressure as design criterion for South African water distribution systems

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## Abstract

The South African civil engineering fraternity has grown to accept 24 m as the design criterion for minimum residual pressure in water distribution systems. However, the theoretical peak demand in many systems has increased beyond the point where minimum residual pressure exceeds 24 m – at least according to hydraulic models. Additions of customers to existing supply systems have led to increased peak flows with time, often without infrastructure upgrades to internal reticulation. Increased flows imply reduced pressures. This is not necessarily a concern: peak flow conditions rarely occur in a supply system and also, customer complaints often act as a first sign of ‘low pressures’. No complaints imply ‘no low pressures’. The researchers analysed hydraulic models for 14 different towns in 5 municipal areas of South Africa, including 2 large metros, to identify the minimum residual pressures currently expected. The results include almost 55 000 model nodes and show that about 20% of the nodes in the distribution systems analysed have pressures of below 24 m, while pressures of below 14 m are not uncommon. Whether this relatively common occurrence of low pressures under modelled peak demand is found in practice is not known at this stage. A new guideline for minimum residual pressure based on previous criteria and results from this study is presented, noting that a physical lower limit of about 10 m water pressure is specified in home appliance specifications.

**Keywords:** water distribution system, residual pressure, peak flow, design standard