

EVALUATION OF RESIDENTIAL WATER DEMAND CROSS-CORRELATION IN THE CITY OF TRIPOLI

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Abstract: Water supply systems represent an essential component of the infrastructure in urban populations worldwide. Water distribution systems are designed by sizing system components so that they meet current and future demands to be provided at minimum required levels of water pressure and quality. The cost of establishing newly-designed water supply systems is largely dedicated to the supply and placement of pipelines. The sizing of pipelines is highly dependent on the amount of water demands allocated to distribution nodes of the system under consideration. The current demand allocation practices normally imply that there is perfect spatial correlation among the aggregated demands, which is not essentially the case in practice. This assumption indicates that most users follow a single diurnal pattern, which means that such users react simultaneously and in exactly the same way during normal and peak demand conditions. However, the way users react in real-world systems highly depends on many factors that differ from one user to another such as social habits and financial constraints. Recent studies anticipated that low levels of spatial demand correlation can result in significant savings of the capital cost of water supply systems. In this paper, an investigation on the actual demand spatial correlation is carried out using field measurements of diurnal demand patterns for different users in a residential area located in the city of Tripoli. Results showed that users react independently and the correlation is far away from the perfect case.