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PRELIMINARY ASSESSMENT OF WATER MAINS

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ABSTRACT: The Canadian Water and Wastewater Association (CWWA), in a study to assess the status of municipal water distribution system, reported that \$12.5 billion would have to be invested over 15-year (1997 - 2012) period to replace the existing deteriorated water mains and construct new mains to cope with the projected population growth. Consequently, Canadian municipalities face a great challenge of managing these replacement and new installation projects efficiently. One of these challenges is how to assess the condition rating of buried water mains. This is because water mains are typically underground, operated under pressure, and usually inaccessible. Condition rating is a mandatory process to establish and employ management strategies for an asset. To assess the condition of water mains, current research considers physical, environmental, and operational factors and their effect on different types of water mains. A condition rating scale and its associated rehabilitation actions are proposed. It is divided into 6 categories, numerically ranging (0-10) and linguistically from “Critical” to “Excellent”.

Condition rating models are developed to assess and set up rehabilitation priority for water mains using the integration of two techniques; (i) artificial neural network (ANN) and (ii) analytical hierarchy process (AHP). The developed model allows considering more factors in order to increase the accuracy and efficiency of the developed model. Based on the developed AHP/ANN model, deterioration curves are generated for Cast Iron (CI) and Ductile Iron (DI) water mains.

Finally, an automated, web-based condition rating tool (CR-Predictor) is developed to assess condition rating. A case example has been worked out to demonstrate the usage and capabilities of the developed system.

The developed tool and models are relevant to researchers and practitioners (municipal engineers, consultants, and contractors) in order to prioritize pipe inspection and rehabilitation planning for existing water mains.