

**GUIDELINE FOR PIPE MATERIAL SELECTION OF
WATER TRANSMISSION NETWORKS IN
SRI LANKAN CONTEXT**

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“This dissertation was submitted to the Department of Civil Engineering of the University of Moratuwa in partial fulfilment of the requirements for the Master of Science in Construction Project Management”

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DECLARATION

I hereby declare that this report does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any university to the best of my knowledge and believe it does not contain any material previously published, written or orally communicated by another person or myself except where due reference is made in the text.

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ABSTRACT

Selection of appropriate pipe material is one of the most challenging tasks in water supply projects, since it contributes substantially to the overall cost of a project. Any water supply scheme mainly consists of a transmission pipe network and a distribution pipe network whereas, the transmission pipe network becomes more vital as it conveys high flow rates, and most of the time the transmission lines are to be designed as pumping lines. Numerous numbers of factors such as initial cost, velocity and head losses, ease of construction, durability, water hammer effects, flexibility and toughness, resistance to chemicals and energy and operating and maintenance cost have to be considered at the design stage of a transmission network. In this research study, an effort has been made to apply the method of Multiple Attribute Decision Making (MADM) to evaluate the most critical parameter in selecting of water transmission pipelines in Sri Lankan context. Consequently, Analytic Hierarchical Process (AHP) methods were used to select the best material, based on the most critical parameter obtained from MADM method. Five alternative materials: Ductile Iron (DI), High-Density Polyethylene PN-16 (HDPE), HDPE PN-10, Glass Reinforced Polymer (GRP) and Mild Steel (MS) were used for analysis and five assessment attributes: velocity, material supply and laying cost, friction losses, energy cost and water hammer effects have been incorporated in the analysis. Additionally, the actual data of an existing water supply network was used for the study. The most suitable material for water transmission is DI with compared to other materials considered for the study. Finally, manual calculations using MS Excel was used to justify the AHP methodology. Based on the findings, a guideline was developed and this guideline provides material supply and laying is the most critical parameter in the selection of most suitable pipe material for the transmission network of a water supply system in Sri Lankan context.

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LIST OF ABBRIVIATIONS

AHP	Analytic Hierarchy Process
ASA	Acrylonitrile styrene acrylate and
CI	Cast Iron
DI	Ductile Iron
DN	Nominal Diameter
GRP	Glass Reinforced Plastic
GRPE	Glass Reinforced Polymer
HDPE	High Density Poly Ethylene
LCA	Life Cycle Assessment
LKR	Lanka Rupees
MADM	Multiple Attribute Decision Making
MCDM	Multiple Criteria Decision Making
NPV	Nest Present Valve
PBT	Polybutylene Terephthalate
PCTA	Poly Cyclohexylenedimethylene Tere/Isophthalate Copolyester
PCTG	Poly Cyclohexylenedimethylene Terephthalate Glycol Copolymer
PET	Polyethylene Terephthalate
PE-UHMW	Polyethelene Ultra High Molecular Weight
PN	Nominal Pressure
PVC	Polyvinyl Chloride
TOPSIS	Technique for Order Preference by Similarity to Ideal Solution
UV	Ultra Violet
WTP	Water Treatment Plant