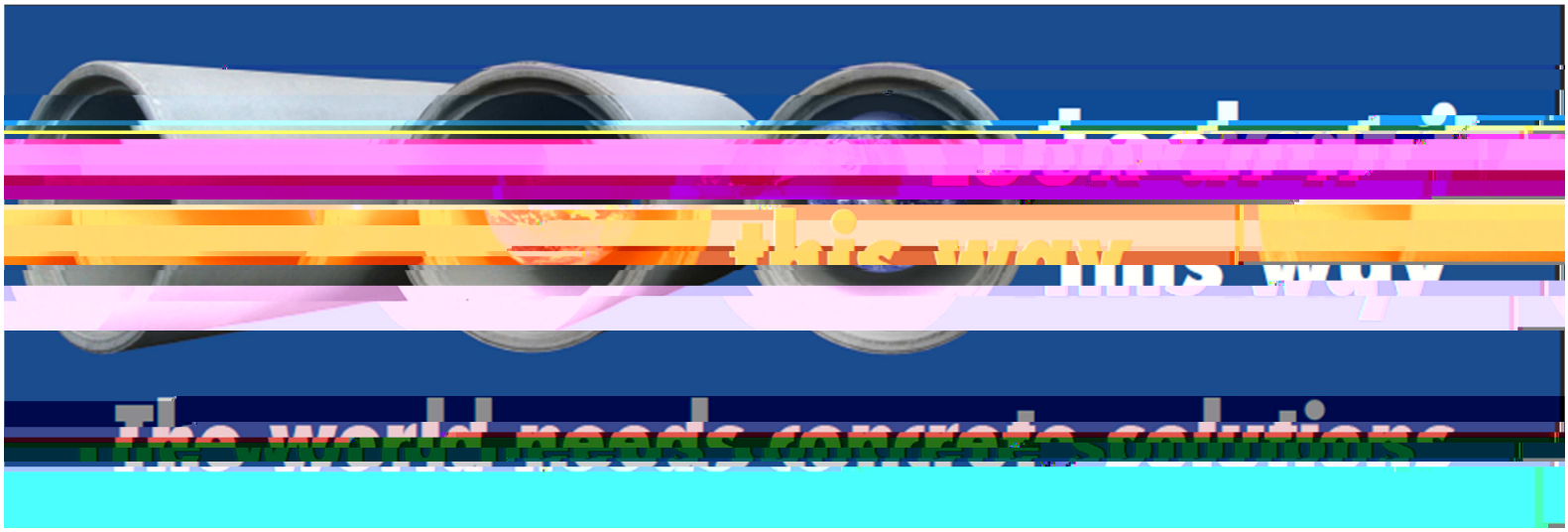


Manning’s Roughness Coefficient

Should Designers Accept Laboratory Test Results from Suppliers?

Since it's conception in 1890, Manning's equation is still the most widely used and accepted formula for calculating the hydraulic capacity of gravity flow sewer systems; most major North American municipalities reference their accepted Manning's 'n' coefficient to avoid any subjectivity. Manning's 'n' is an empirical roughness coefficient used in the Manning Formula for evaluating the hydraulic capacity of gravity-flow conduits. Manning's 'n' is used to calculate a required pipe diameter and slope needed to obtain a desired flow capacity:

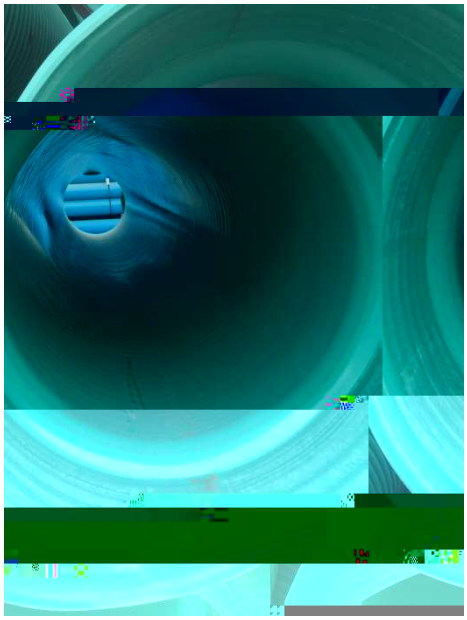
Where:

- Q = flow rate (—)
- n = Manning's roughness coefficient
- A = area of conduit ( )
- R = Hydraulic Radius, expressed as the area/wetted perimeter (m)
- S = slope of conduit

Because the coefficient is in the denominator of the equation, a higher roughness coefficient means a rougher pipe surface and hence a lower flow rate.

From a designers perspective, it can be tempting to accept a lower roughness coefficient to achieve a desired hydraulic capacity:

- The designer could be limited by a fixed slope or a spacial constraint where the maximum diameter of the conduit is restricted by existing buried infrastructure.
- It adds a significant cost to up-size a pipe diameter. Pipe smaller than 750mm ID typically differ by 75mm and pipe larger differ by 150mm; this includes added costs associated with excavating a larger trench to accommodate the pipe and more imported aggregates needed for backfilling as well.



Even ribbed PVC, which claims to have a smooth ID, will experience corrugation growth. Will it have the same hydraulic capacity as other smooth-walled pipe?

Determining the correct roughness coefficient to use is subjective by nature because it is based on empirical testing. Countless laboratory tests have been done over many decades on various pipe materials and configurations which provide a

Additional Hydraulic Advantages of Concrete Pipe:

- Concrete pipe internal diameters are commonly larger than plastic pipe. Most concrete pipe manufacturers in Canada use “soft metric” forms, meaning they are designed in inches and then converted to metric; for example, a 900mm pipe is actually 36 inches (914mm).
- Plastic pipe will defect under load, like it’s designed to, up to 7.5% (most widely