

A2. Pipe Structural Design

A2-1 Introduction

Pipes shall be designed to withstand applied loads without risk of collapse or undue deformation.

Loads on pipes arise from the following:

Surface loading, e.g. traffic, including construction traffic

- Earth loads
- The weight of the pipe contents

These loads are resisted by the pipe barrel together with its bed and surround.

Pipes are classified into three structural categories, as shown in the table below:

Type	Material	Structural Properties of pipes made of various materials	Design Limiting Condition
Flexible	HDPE, uPVC, GRP	Pipe strength is largely provided by the bed and surround and the surrounding ground	Pipe deformation
Semi-rigid	Ductile iron	Pipe strength is provided by a combination of the bed, surround and surrounding ground and the pipe barrel	Pipe deformation, except for small sizes
Rigid	Concrete	Pipe strength is largely provided by the pipe barrel	Pipe collapse

Table A2-1 - Structural Properties of Pipes of Various Materials

The section that follows presents the calculations relating to the structural design of pipes, for the reference of the Consultant.

Where the applied loads on a pipe do not give the required structural factor of safety as required by the appropriate standard then an alternative pipe material and/or bed and surround detail shall be used.

The design of pipes shall take into account the loading from the passage of construction plants and other temporary conditions, as well as the final design loading.

In deep pipelines and where the system can surcharge, an internal pressure will arise in what are otherwise gravity pipes. The Consultant shall check that the internal pressure arising from a surcharge to ground level will not overstress the pipes.

The Consultant's attention is drawn to the considerable cost of constructing long lengths of large, deep pipelines. Under these circumstances the Consultant shall carry out