





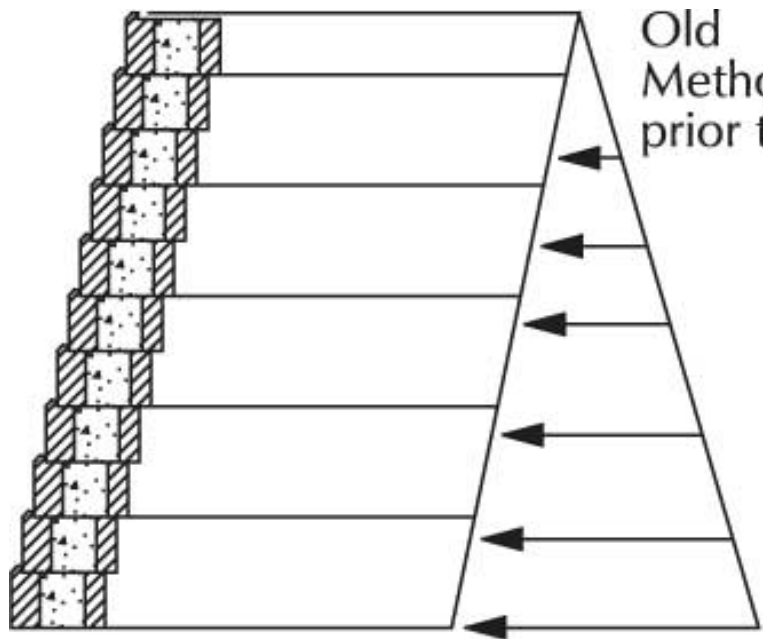
SUMMARY

Attached you will find calculations done by a structural engineer indicating that the steel reinforcement, in the long walls of the screen treatment structure constructed as part of the Arboretum Pond 3 reconstruction, is insufficient.

The screen treatment structure was designed by one of our senior engineers at that time. While this engineer was/is a gifted modeling/hydraulic engineer, it appears that the structural design calculations were done incorrectly.

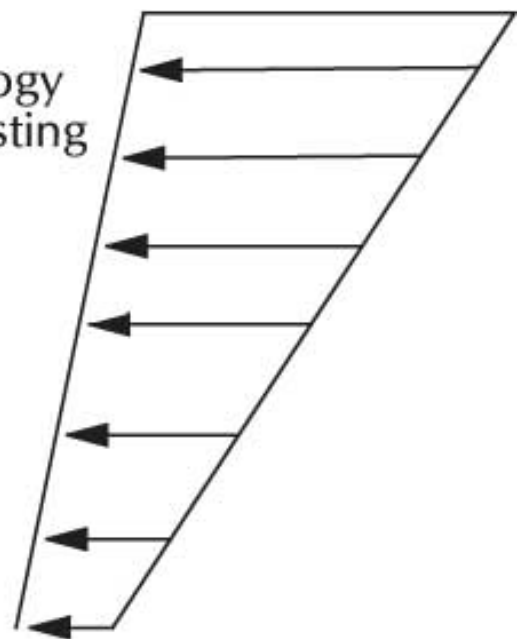
No design calculations could be found in the file for review purposes but based on the physical evidence and the calculations done by our consultant and given the knowledge base of the designer it is my opinion that several issues occurred resulting in this failure.

- 1) The designer was not a structural engineer. Most of our sewer structures are relatively small and the calculations associated with them are relatively simple. This allows a relatively routine design to be used that is in fact included in our standard specifications. This design fell well outside the design parameters for those standards.
- 2) The design and reinforcement were modified by the design engineer but it would appear that the overburden load (from our vactors driving close to the wall to remove sediment) was ignored – see load sketch below.
- 3) The insufficient tensile reinforcement of the concrete combined with fact that roof was not included (as is the case with most of our structures) to pin the walls in place resulted in failure (defined as excessive deflection) when the walls were stressed with load from vactors during maintenance operations.



Static active pressure distribution

Old Methodology prior to testing



Dynamic active pressure distribution