

11 APPENDIX THREE – PROCESS DESIGN



This appendix contains an article on how to size/design ponds. This article first appeared in the 'Water and Wastes in NZ' journal (issue 82) in September 1994. It is reproduced here with the kind permission of the Author and the New Zealand Water and Wastes Association.

WASTE STABILISATION POND ADVANCES – PART II

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Part I of the paper on waste stabilisation pond design which appeared in the July Journal, laid the foundations of effluent standards, based on helminths, and the superior pathogen removal which can be obtained by ponds, as against conventional sewage treatment. Part II presents the design parameters developed by Duncan Mara and Howard Pearson in their Waste Stabilisation Ponds, A Design Manual for Eastern Africa. The anaerobic and facultative pond designs are temperature dependent, which makes the parameters suitable for the New Zealand climate.

The temperature used in pond design is very important. It refers to the mean monthly air temperature during the coldest month. This provides a 2 – 3°C safety margin over the actual sewage temperature over the winter period.

Facultative and maturation ponds traditionally have been used in New Zealand, but to save space it is preferable to use an anaerobic pond first.

Anaerobic Ponds are typically 4 metres deep and the pH of the pond is maintained at close to 7.5 to maximise the bisulphide ions and minimise the smelly hydrogen sulphide. To achieve the lower pH, volumetric loadings, based on the mean minimum monthly temperature, are calculated from one of the equations below.

Temperature Celsius	Degrees	Volumetric g.BOD ₅ /m ³ .day	Loading	BOD Removal Percentage
< 10		100		40
10 – 20		20T to 100		2T + 20
> 20		300		60
T = Temperature in Degrees Celsius				

The anaerobic pond retention time is usually between 0.85 to 1.5 days. If the pond is to be used for settling grit and screenings, just as with the septic tank, greater than 1 day's retention would be recommended. De-sludging or de-gritting would then only be required about every two years.

Facultative Ponds can either be for secondary treatment, after a land saving anaerobic pond, or to receive untreated sewage directly. Ponds are typically 1.5 metres deep. Again, the use of a temperature related equation is used, but on this occasion, based on surface BOD₅ loadings: