

PGAS AND RESPONSE SPECTRUM PARAMETERS FOR WAIMAKARIRI STORAGE PONDS

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Table 1: NZS1170.5 Deep Soil Spectral Parameters and PGAs

	Z=0.34				
Annual Exceedance Probability (AEP)	R-factor for spectrum	PGA(g) for spectra	R-factor for PGA	Unweighted PGA(g)	PGA(g) for liquefaction assessment with $(M/7.5)^{2.5}$ weighting
1/150	0.67	0.31	0.8	0.43	0.24
1/2500	1.8	0.77	2.0	0.85	0.55
1/10,000	2.4	1.06	2.9	1.11	0.81

Use NZS1170.5 Deep Soil spectral shape factors with $Z=0.34$ and R-factors given above for spectral periods $T \geq 0.1s$.

$$SA(T) = PGA + (SA(0.1s) - PGA) * (T/0.1) \text{ for } 0s \leq T \leq 0.1s$$

where PGA is as listed above and $SA(0.1s)$ is obtained using the NZS1170.5 spectral shape factors.

The recommended spectra approximately envelope the hazard spectra calculated from the McVerry and Bradley ground-motion models for the estimated time-varying point-by-point seismicity rates for the Christchurch region averaged over the next 50 years, plus the fault model contributions (see Figure below).

Unweighted PGAs are listed in the second-to-last column, and PGAs calculated using magnitude-weighting factors of $(M/7.5)^{2.5}$ are listed in the final column for use in liquefaction assessment.

The R-factor for the 1/150 AEP motions are larger than the NZS1170 value of 0.6. This is in line with Christchurch results for AEPs larger than 1/500.

The value $R=1.8$ for an AEP of 1/2500 is the same as that in NZS1170.

The R-factor of 2.4 for the 1/10,000 AEP, which is lower than the minimum AEP of 1/2500 included in NZS1170, was obtained by matching the spectrum to the hazard results, as shown in Figure 1.

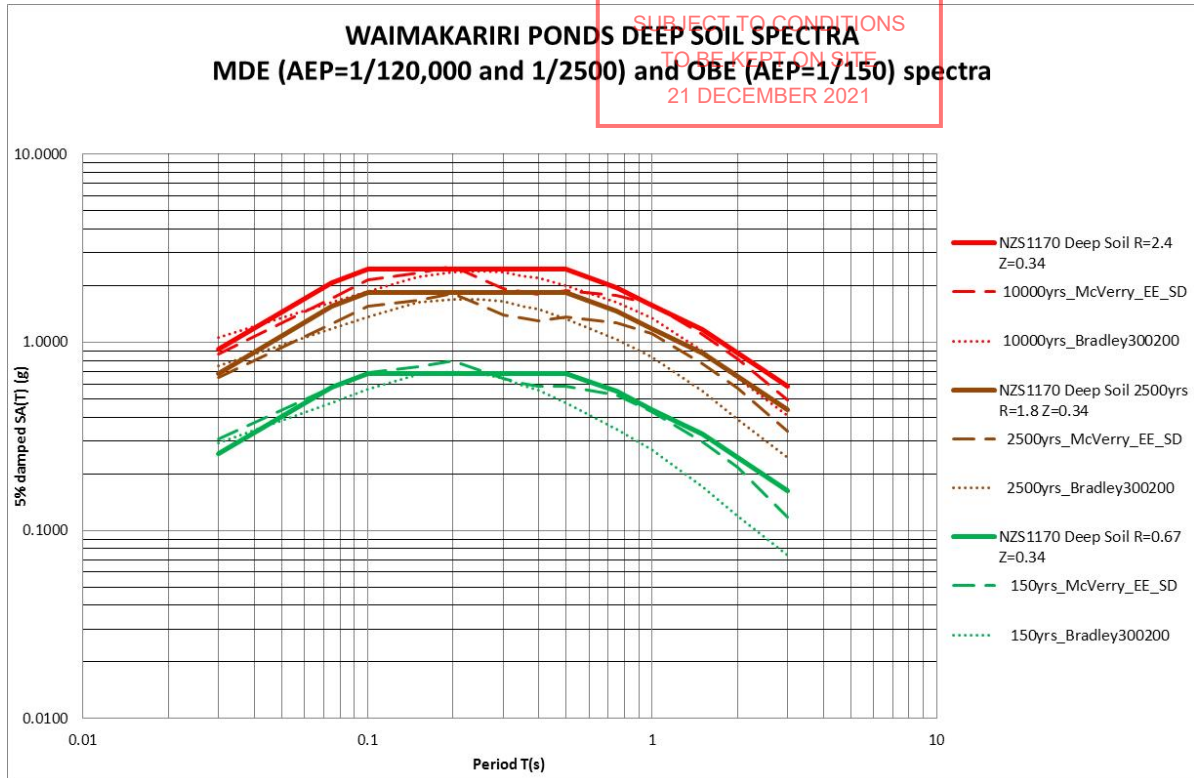


Figure 1: NZS1170 Deep Soil spectra (solid curves) with $Z=0.34$ and $R=2.4$, 1.8 and 0.67 recommended to represent MDE spectra for High PIC structures (annual exceedance probability $AEP=1/10,000$) and Medium PIC structures ($AEP=1/2500$) and Operating Basis Earthquake ($AEP=1/150$) motions and the hazard spectra calculated using the McVerry (dashed curves) and Bradley (dotted curves) ground-motion models that they approximately envelope for periods of $0.1s$ and greater. The recommended spectra use a linear interpolation from the p_{ga} values (corresponding to $0s$ period, but plotted at $0.03s$) to the join the NZS1170 spectra shown at $0.1s$ period.