

Construction vibration

1. Introduction

This Appendix provides supporting information for the assessment of demolition and construction activity generated vibration. It covers the following:

- Hydraulic breaking;
- Driven Piling;
- Augering (albeit this is not currently proposed for the Proposed Scheme); and
- Compaction plant.

Guidance vibration levels and propagation estimations are provided for reference and to permit the prediction of expected vibration levels at difference distances.

2. Hydraulic breaking

Reference data is difficult to obtain for this activity. For this assessment, the reference data of WissJF (Construction vibrations: state-of-the-art, 1981) has been consulted and the guideline values of Table 1 below applied.

Table 1: Guideline values for concrete breaking

Reference Plant Item	Minimum Distance for < 10.0 mms ⁻¹	Minimum Distance for < 3.0 mms ⁻¹	Minimum Distance for < 1.0 mms ⁻¹	Minimum Distance for < 0.3 mms ⁻¹
Jack Hammer*	2 m	4 m	7 m	11 m
Pavement Breaker*	9 m	20 m	40 m	100 m

Note * a Pavement Breaker has been assumed to be equivalent to an excavator mounted hydraulic breaker / pecker with a Jack Hammer being a hand-held item of plant.

3. Driven piling

BS5228-2 provides a reference for driven tubular steel piling as Table entry C1.3 with the corresponding data:

- 12.32 to 13.91 mms⁻¹ PPV at a distance of 5.0 m;
- 8.45 to 8.76 mms⁻¹ PPV at a distance of 10.0 m; and
- 4.32 to 5.40 mms⁻¹ PPV at a distance of 20.0 m.

Based on the upper range value as a worst case and the assumption of a linear rate of drop with doubling of distance indicates a 1.79 mms⁻¹ reduction per doubling of distance away from the driven tubular steel piling location. This indicates the following approximate forward predicted values:

- At 40.0 m, PPV is expected to be up to approximately 3.61 mms⁻¹;
- At 80.0 m, PPV is expected to be up to approximately 1.82 mms⁻¹; and
- At 160.0 m, PPV is expected to be up to approximately 0.03 mms⁻¹.

Therefore, it is reasonable to expect the distances provided in Table 2 would be applicable.

Table 2: Guideline values for driven tubular steel piling

Reference Plant Item	Minimum Distance for < 10.0 mms ⁻¹	Minimum Distance for < 3.0 mms ⁻¹	Minimum Distance for < 1.0 mms ⁻¹	Minimum Distance for < 0.3 mms ⁻¹
Tubular Steel	7	55	120	160

4. Augering

BS5228-2 provides a reference for augering as Table entry D.6.103 with the corresponding data:

- 0.38 mms^{-1} PPV at a distance of 10.0 m;
- 0.30 mms^{-1} PPV at a distance of 20.0 m; and
- 0.03 mms^{-1} PPV at a distance of 30.0 m.

Therefore, it is reasonable to expect the distances provided in Table 3 would be applicable.

Table 3: Guideline values for augering

Reference Plant Item	Minimum Distance for < 10.0 mms^{-1}	Minimum Distance for < 3.0 mms^{-1}	Minimum Distance for < 1.0 mms^{-1}	Minimum Distance for < 0.3 mms^{-1}
Auger Rig	-	1 m*	5 m*	21 m
Note * indicates an assumed distance based on extrapolation.				

5. Compaction plant

Historic data for vibratory compaction plant is provided in Table 4 below obtained from the Transport Research Laboratory Report 429 Groundborne vibration caused by mechanised construction works (TRL).

Table 4: Guideline values for vibratory compaction

Reference Plant Item	Minimum Distance for < 10.0 mms^{-1}	Minimum Distance for < 3.0 mms^{-1}	Minimum Distance for < 1.0 mms^{-1}	Minimum Distance for < 0.3 mms^{-1}
Vibratory Roller	-	15 m	40 m	140 m*
Note * indicates an assumed distance based on extrapolation.				