



**Royal  
HaskoningDHV**  
*Enhancing Society Together*

**Section 14 Appendix 14.1  
Construction Vibration  
Calculations**

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## Appendix 14.1: Construction Vibration

**Client:** York Potash  
**Project:** York Potash Harbour  
**Date:** 10/04/2014

Calculation method for vibratory and dynamic compaction - for steady state and start-up/run down  
 In accordance with calculation listed in Table E.1 of BS5228-2:2009 +A1:2014

Limitations:

Single or Twin drums  
 Vibration Amplitude:  $0.4 < A < 1.72$  mm  
 Drum width  $0.75 < 2.2$  m  
 Distance to receptor  $2 < 110$  m  
 Potential Energy of raised tamper  $1 < 12$  MJ

**Data input:** (Based on Bomag DW213 Single Drum Vibratory Roller)

Required Certainty	66.6%
Number of Vibrating Drums	1
Amplitude (mm)	1.7
Drum Width (m)	2.13
Potential Energy of raised tamper (J)	n/a
Distance to Receptor (m)	set-back

**Vibratory Compaction:**

Set back distances:	Start-up	Steady
PPV > 0.3mm/s when distance (m) ☒	166.2	101.6
PPV > 1.0mm/s when distance (m) ☒	64.5	44.4
PPV > 10mm/s when distance (m) ☒	9.2	7.9
PPV > 15mm/s when distance (m) ☒	6.2	5.5

\*Results in red text are out of valid prediction range

**Client:** York Potash  
**Project:** York Potash Harbour  
**Date:** 10/04/2014

Calculation method for Vibratory and Percussive Piling for steady state and start-up/run down  
 In accordance with calculation listed in Table E.1 of BS5228-2:2009 +A1:2014

Limitations:

Pile toe depth =  $1 < 27$  m  
 Distance to receptor =  $1 < 111$  m  
 Hammer Energy, W =  $1.5 < 85$  kJ

**Data input:**

Required Certainty	66.6%
Ground Conditions	Stiff cohesive soils
Surface distance to receptor (m)	set-back
Hammer Energy (kJ)	85.0
Pile toe depth (m)	-
Slope distance, r (m)	N/A

**Vibratory Piling**

Set back distances:	Start-up	Steady	Combined
PPV > 0.3mm/s when distance (m) ☒	153.5	74.8	104.2
PPV > 1.0mm/s when distance (m) ☒	56.3	31.6	41.3
PPV > 10mm/s when distance (m) ☒	8.3	6.1	7.0
PPV > 15mm/s when distance (m) ☒	5.9	4.6	5.1

**Percussive Piling**

Set back distances:	
PPV > 0.3mm/s when slope distance (m) ☒	19.0
PPV > 1.0mm/s when slope distance (m) ☒	7.5
PPV > 10mm/s when slope distance (m) ☒	1.3
PPV > 15mm/s when slope distance (m) ☒	0.9

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## Appendix 14.1: Construction Vibration

**Client:** York Potash  
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**Date:** 10/04/2014

Calculation method for Vibratory and Percussive Piling for steady state and start-up/run down  
 In accordance with calculation listed in Table E.1 of BS5228-2:2009 +A1:2014

Limitations:

Pile toe depth = 1 < 27 m  
 Distance to receptor = 1 < 111 m  
 Hammer Energy, W = 1.5 < 85 kJ

**Data input:**

Required Certainty	66.6%
Ground Conditions	Piles driven to refusal
Surface distance to receptor (m)	set-back
Hammer Energy (kJ)	85.0
Pile toe depth (m)	-
Slope distance, <i>r</i> (m)	N/A

**Vibratory Piling**

Set back distances:	Start-up	Steady	Combined
PPV > 0.3mm/s when distance (m) ☒	153.5	74.8	104.2
PPV > 1.0mm/s when distance (m) ☒	56.3	31.6	41.3
PPV > 10mm/s when distance (m) ☒	8.3	6.1	7.0
PPV > 15mm/s when distance (m) ☒	5.9	4.6	5.1

**Percussive Piling**

Set back distances:	
PPV > 0.3mm/s when slope distance (m) ☒	48.1
PPV > 1.0mm/s when slope distance (m) ☒	19.0
PPV > 10mm/s when slope distance (m) ☒	3.2
PPV > 15mm/s when slope distance (m) ☒	2.4

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**Client:** York Potash  
**Project:** York Potash Harbour  
**Date:** 10/04/2014

Calculation method for Tunnelling Noise & Vibration  
 In accordance with calculation listed in Table E.1 of BS5228-2:2009 +A1:2014

Limitations:

Slope distance (*r*) 10 < 100 m

**Data input:**

Surface distance to receptor (m)	set-back
Tunnel head depth (m)	set-back
Slope distance, <i>r</i> (m)	N/A

**Groundborne Vibration:**

Set back distances:	
PPV > 0.3mm/s when distance (m) ☒	137.1
PPV > 1.0mm/s when distance (m) ☒	54.3
PPV > 10mm/s when distance (m) ☒	9.2
PPV > 15mm/s when distance (m) ☒	6.8

\*Results in red text are out of valid prediction range

**Client:** York Potash  
**Project:** York Potash Harbour  
**Date:** 10/04/2014

Calculation method for vibration from HGV movement on road  
 In accordance with calculation listed in Section 3.4.4 of TRRL Report RR246

**Data input:**

Soil Type	Alluvium
Height/Depth of surface defect (a) mm	50
HGV Speed (v) km/hr	30.0
Number of Defects	In path of multiple wheels
Distance to Receptor (m)	set-back

**HGV Vibration**

Set back distances:

PPV > 0.3mm/s when distance (m) ☒	276.6
PPV > 1.0mm/s when distance (m) ☒	60.3
PPV > 10mm/s when distance (m) ☒	3.3
PPV > 15mm/s when distance (m) ☒	2.0

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