Scaled Distance Blasting Vibration Calculation
$PPV = K(SD)^{-b}$

Online documentation   Parameter Variations   Additional Notes   Tips   Reference   Disclaimer   Calculate

To use: Type in your desired values for each parameter. All are required. Standard parameter values are shown column titles in *bold italic*. It is recommended that you use the standard values unless you have specific need to change them. Additional parameter combinations may be entered in gray cells, but variations in parameters will only be calculated for first data row. You can separately choose metric or U.S. units for each data row calculation. Sheet will recalculate automatically as you change values. The variations area, below the data entry area, shows the results of varying one parameter in the first data row, leaving the others constant. Cells in which you should not input or change information are locked. Values in U.S. units appear in *blue* ; those in metric units appear in *green* . Results or parameters which exceed U.S. OSM limits will appear in *bold italic* . See the Reference section for these limits. PPV results should be applied with at least a 2x safety factor, to take into account limitations of the calculation approach and accuracy. When blasting vibration monitoring is done, the measured PPV 's should be the determinant of charge weights, not these calculated estimates.

Parameters						Messages	Calculation Results				
Desired input units (1 - U.S., 2 - Metric)	Charge Weight per delay (lb. or kg.)	Charge weight scaling: square root (0.5); cube root (0.33)	Distance from charge (ft or m)	Attenuation exponent b (typically 1.6; range from about 0.6 to 2.5)	Confinement factor (K) (Metric units - typical 1140, range 500-5000); U.S. units - typical 150, range 20-600)		Peak particle velocity, PPV (in/sec or mm/sec)	Scaled distance (SD, Ds) (ft/(lb^0.5 or m/(kg^0.5)	Maximum charge weight allowed w/o monitoring (per U.S. OSM SD limits) (lb or kg)	Maximum charge weight allowed w/ monitoring (per U.S. OSM PPV limits) (lb or kg)	Minimum vibration safe distance (based on U.S. OSM PPV limits w/ monitoring) (ft. or m)
1	2.5	0.5	660	1.8	160		0.00	417.4	144.0	1549.1	#NUM!
1	2	0.5	660	1.8	160		0.00	466.7	144.0	1549.1	#NUM!
1	0.5	0.5	660	1.8	160		0.00	933.4	144.0	1549.1	#NUM!

Parameter Variations (leaving all others constant) for first data row only
Chosen values repeated in first row below, variations follow

Vary charge weight (lbs)	Calculated PPV (in/sec)	Vary distance (ft)	Calculated PPV (in/sec)	Vary exponent b	Calculated PPV (in/sec)	Vary K factor (ft/(lb^0.5)	Calculated PPV (in/sec)	Vary charge wt. scaling	Calculated PPV (in/sec)
2.5	0.000	660	0.000	1.8	0.000	160	0.000	0.5	0.000
5	0.006	50	0.319	0.6	4.283	20	0.000	0.5	0.003
10	0.011	100	0.092	0.7	2.343	50	0.001	0.33	0.002
20	0.020	150	0.044	0.8	1.281	100	0.002		
50	0.048	200	0.026	0.9	0.701	150	0.003		
100	0.085	250	0.018	1	0.383	200	0.004		
150	0.122	300	0.013	1.1	0.210	250	0.005		
200	0.158	350	0.010	1.2	0.115	300	0.006		
250	0.194	400	0.008	1.3	0.063	350	0.007		
300	0.228	450	0.006	1.4	0.034	400	0.008		
350	0.262	500	0.005	1.5	0.019	450	0.009		
400	0.296	550	0.004	1.6	0.010	500	0.010		
450	0.329	600	0.004	1.7	0.006	550	0.011		
500	0.361	650	0.003	1.8	0.003	600	0.012		
550	0.394	700	0.003	1.9	0.002	650	0.012		
600	0.426	750	0.002	2	0.001	700	0.013		

Additional Notes

Although scaled distance calculations are most commonly used for blasting vibration, they have also been shown to be valuable in construction vibrations from equipment. You can use the calculator in those settings as well, if you have the source energy parmeters (equivalent to the charge weights) and the corresponding K values.

Safe distances are not calculated here because blasting limits are frequency-dependent. Scaled distances less than the U.S. OSM limits are considered "unsafe" from a vibration standpoint. They are flagged in *bold italic* when they occur. Blasting vibration PPV's in excess of the U.S. OSM limits for monitored blasts are similarly highlighted. The limits are for single blasts; those for multiple blasts should be somewhat lower, as multiple blasts increase the damage probability. PPV results should be applied with at least a 2x safety factor, to take into account limitations of the calculation approach and accuracy.

Tips:

If you plan to use the same parameter values for multiple or all calculations, select the parameter cell(s) that have the value you want and use the drag handle at the lower right of the cell to drag the same value down the column. Choose "Fill without formatting" from the drop down fill menu. This trick is particularly useful for those parameters (units, charge weight scaling, b exponent and K factor) which often remain at the default values shown in the first row. Remember that you must use a K factor of the correct unit type for your chosen units. To clear data, you can use the drag handle to select the data you want to delete, then press the Delete key. It is recommended that you NOT delete parameters in the first data row, although you can

Reference

U.S. Blasting Limits
USBM RI8507 Mid-frequency suggested

	Max PPV (in/sec)	Max PPV (mm/sec)
Homes with plaster walls	0.50	12.7
Homes without plaster walls	0.75	19.1
OSM Mid-frequency limit	0.75	19.1

U.S. OSM Blasting Regulations (0.5 charge weight scaling factor required)

Distance (D) from the blasting site, in feet	Distance (D) from the blasting site, in meters	Allowable PPV (V max, in/sec) with monitoring	Allowable PPV (V max, mm/sec) with monitoring	Scaled-distance factor to be applied without seismic monitoring (Ds), ft./lb	Scaled-distance factor to be applied without seismic monitoring (Ds), m/kg
0 to 300	0 to 91.44	1.25	31.8	50	22.6
301 to 5,000	91.74 to 1524	1.00	25.4	55	24.9
5,001 and beyond	1524.3 and beyond	0.75	19.1	65	29.4

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