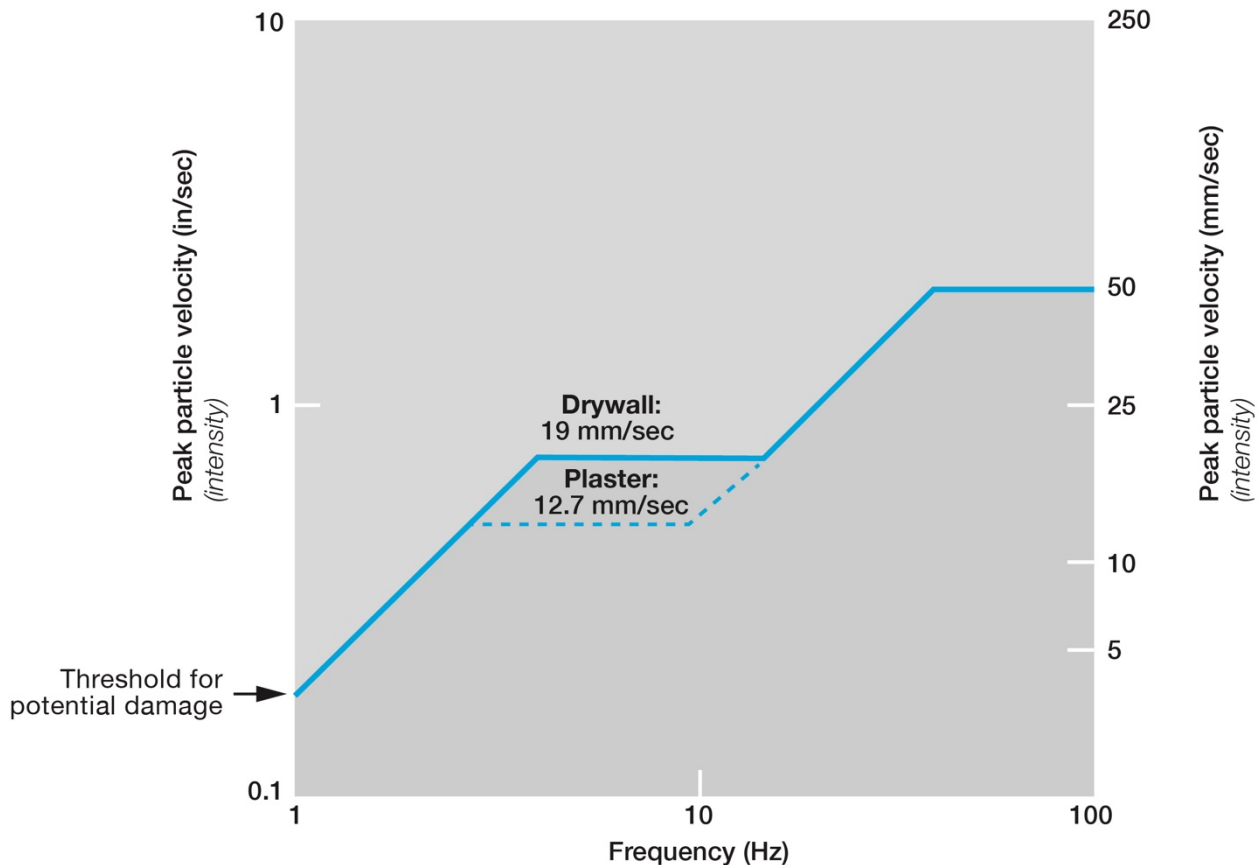


## Understanding the Z-Curve

The Z-Curve line establishes a limit above which damage becomes possible, but it is crucial to note that damage does not automatically occur once this limit is breached. Damage would not actually occur in the average residence until ground vibrations reached significantly higher intensities than those outlined by the USBM Z-Curve. If the Z-Curve criteria is exceeded, the probability of damage is merely introduced and will incrementally increase with higher and higher vibration amplitudes.

**USBM Z-CURVE (USBM RI 8507)**  
Threshold damage vibration criteria



Vibrations are occurring around us every day and are highly subjective. Each individual's perception and tolerance will influence the degree to which vibrations are a nuisance or objectionable. Humans and animals are far more sensitive to vibrations than a two-storey timber framed house, bridge or other structures.

### Permanent Monitoring Units

West Calgary Ring Road			92 Cougarstone Manor SW, Calgary, AB		9555 2 Avenue SW, Calgary, AB		97 Cougar Ridge Close SW, Calgary, AB		130 Cougarstone Close SW, Calgary, AB		128 Cougarstone Manor SW, Calgary, AB		152 Cougarstone Common SW, Calgary, AB		135 Cougarstone Common SW, Calgary, AB	
Blast Date:	Blast no.	Blast time:	PPV	AOP	PPV	AOP	PPV	AOP	PPV	AOP	PPV	AOP	PPV	AOP	PPV	AOP
3-Nov-20	WCRR-187	16:22	1.14mm/s	123.4dB(L)	1.52mm/s	121.9dB(L)	2.92mm/s	119.4dB(L)	0.25mm/s	136.1dB(L)	0.76mm/s	138.4dB(L)	0.64mm/s	120.1dB(L)	0.38mm/s	122.7dB(L)
6-Nov-20	WCRR-188	16:11	1.27mm/s	118.1dB(L)	1.27mm/s	119.3dB(L)	3.68mm/s	120.8dB(L)	0.38mm/s	108.8dB(L)	1.02mm/s	112.6dB(L)	1.52mm/s	112.0dB(L)	0.76mm/s	108.8dB(L)
20-Nov-20	WCRR-189	16:05	1.52mm/s	117.2dB(L)	1.52mm/s	115.2dB(L)	2.79mm/s	118.7dB(L)	0.38mm/s	112.7dB(L)	0.64mm/s	112.3dB(L)	0.51mm/s	116.9dB(L)	0.38mm/s	108.4dB(L)
21-Nov-20	WCRR-190	16:09	1.65mm/s	118.1dB(L)	1.14mm/s	121.9dB(L)	3.30mm/s	114.8dB(L)	Communication with monitor interrupted		0.76mm/s	123.4dB(L)	0.64mm/s	114.8dB(L)	0.38mm/s	114.0dB(L)

Please note: None of the controlled blasts in November generated ground vibrations of a sufficient frequency to produce a seismograph report.