

TR17 115

23. Vibration due to vehicles in Giblin Street, Hobart.

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Giblin Street in Lenah Valley, Hobart, is the only access to the large dolerite quarry operated on Knocklofty by Hobart Quarries Pty Ltd. While the Department of Mines was examining the possible vibration damage to houses at the Doyle Avenue junction due to quarry blasting it was decided to investigate the vibration effects of passing traffic. Giblin Street at this point has a grade of about 1 in 50. Loaded heavy vehicles pass downslope. Traffic slows across the junction and there is a significant increase in noise level and vibration of empty vehicles as they accelerate upslope from a near standing start.

Houses on the southern side of Giblin Street are founded on 1-5 m of fill which occupies a small headwater stream overlying dolerite.

EQUIPMENT

A Bison enhancement seismograph with visual wave display was used for the tests. The enhancement property of the equipment was not utilised since only amplitudes of the waveform across a reasonable interval, up to 0.5 s was required. A standard high response, low impedance geophone was used which had been cross-calibrated with other geophones, thus the amplitude of the display signal could be related to ground motion. The geophone was placed about 15 m from the road centre. Using this equipment it is also possible to determine vibration frequencies and modulation effects.

RESULTS

Frequencies of vibration varied between 20 and 100 Hz with maximum amplitudes noted in the range 30-50 Hz. The high frequency vibrations never contributed more than 15% of the total amplitude.

Downhill traffic Maximum displacement ± 0.0025 mm (trucks)

Uphill traffic Maximum displacement ± 0.0075 mm (trucks)
 ± 0.005 mm (cars)

However velocity is a more realistic damage criterion since it introduces the critical effect of frequency. Velocity can be calculated from:

$$v = Aw = A2\pi/T \text{ where}$$

A = amplitude in cm

T = period of wave motion in secs

hence the maximum velocity determined in the conditions noted here is

$$v_{\max} = \frac{0.0075}{10} \times \frac{2\pi}{20} \times 1000 \text{ cm/s}$$

This expression utilises a wave period of 20 ms. The most commonly determined high amplitude period was about 30-35 ms but use of this value would reduce the estimate of maximum velocity. Therefore $v_{\max} = 0.235$ cm/s.

This value is about one tenth of the generally regarded critical level and one quarter of the safe level used in Tasmania.

It is therefore concluded that no significant ground vibrations are caused by traffic in Giblin Street.