Possible relationships

Experimentally determined DAmp

Measure profile or record vehicle acceleration over bridge

Record operational bridge acceleration

Analyze vehicle over measured profile to obtain vehicle acceleration

DAF\_V = (max vehicle acceleration (filtered)+1)\*vehicle\_weight

Note: if acceleration of vehicle is recorded, the results will only pertain to that vehicle (i.e. one cannot say the resulting determined amplification factor can be used for any other vehicles/traffic)

Total LL Response = (Dead\_load or 1st mode @ 1G)\*max\_bridge\_accel(%g filtered)\*α+Static\_LL\_response\*DAF\_V

Or… the total live load response is a function of a portion of the dead load to account for body forces from vibration plus the response from the vehicle load that is amplified due to its acceleration.

Analytically Determined DAmp

1. Analyze vehicle acceleration due to profile (Future work: develop vehicle acceleration standards based on real profiles)
2. Response from (max vehicle acceleration+1)\*vehicle\_weight/vehicle\_weight = 1 + max\_vehicle\_accel = amplification factor due to vehicle acceleration (DAF\_V)
3. Assuming the structure behaves linearly, we can also say: bridge response from dynamic contact force = bridge response from static vehicle \* (1 + max\_vehicle\_accel)
4. Hypothesis: this portion of amplification is relatively independent of bridge structure (i.e. profile controls)
5. Perform natural frequency analysis and Dead Load Analysis and modal parameter identification of vehicle acceleration
6. Additional component of amplification due to motion of bridge can be calculated by apportioning bridge response from dead-load. That portion would be a function of the level of plausible excitation of the bridge’s first couple modes which is dependent on the structure and the traffic.
7. A possible function for this portion may include the following parameters:
   * Max %g vehicle acceleration (stop filter > X mode) or
   * some parameter related to the PSD (i.e. how much of the traffic excitation is in a specific frequency range)
   * Dead-load deflection (stand-in for stiffness)
   * First natural frequency