footbridge 2008

Viscous dampers: An effective way to suppress pedestrian-induced motions

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To eliminate the feedback between pedestrians and the footbridge, the potential solutions are :

- stiffening the bridge
- active control
- supplemental passive damping

Damper design features :

- dampers can continuously cycle at an average frequency of 0,8 Hz
- dampers can respond to tiny deflections as low as 0,025 mm
- dampers response can have low hysteretic content to avoid pedestrians sensing the classical “stick-slip” motion
- several distinct design of dampers can be required: different output forces, deflections, equations and envelope dimensions
- dampers are maintenance-free for the entire life cycle (endurance life in excess of 10^9 cycles)

Customer controlled parameters

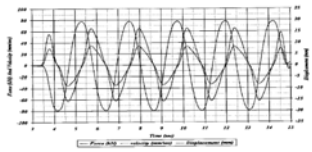
$F = C \cdot V^{\alpha}$

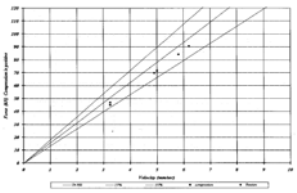
Dampers are adjusted to meet specified parameters

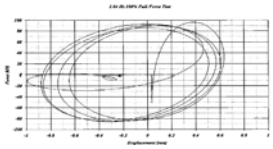
Maximum rated force
Damping constant
Damping exponent
Operating temperature
Max damper envelope
Mounting configuration

For footbridges, linear dampers are preferred.

Tests performed on dampers







Implementation of fluid dampers

Dampers are essentially a bolt-in item

Tests performed on footbridges

Tests prove that the damped bridges perform superbly:

- peak measured acceleration are reduced from 0,25g undamped to 0,006g
- dampers reduce the dynamic response by at least 40 to 1 for all modes
- no resonance is noted at any mode
- no observable biodynamic feedback occurs