

Course: CIVIL-468: Dynamics of Structures
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Assignment 4

Due: 22.12.2023

Goal: The goal of this project is to estimate the structural response of the footbridge outside the GC building with and without activated TMD due to a person jumping at midspan of the footbridge and due to a person walking across the bridge.

Task 1: Natural frequency

Estimate the natural frequency of the footbridge from the construction drawings. State any assumptions you are making.

Task 2: Response without tuned mass damper (TMD)

- Load case 1: Estimate the maximum acceleration for a person jumping on the footbridge with the forcing frequency = natural frequency (steady state response of harmonic excitation)
- Load case 2: Estimate the maximum acceleration at midspan of the footbridge if a person walks across the bridge.
- Why is the response due to Load case 2 smaller than for Load case 1?

Task 3: Response with TMD

- Assuming the properties of the TMD given below estimate the maximum acceleration again for Load case 1.

TMD: Mass $m=140$ kg (mass of the two TMDs together), frequency $\omega_d=2.44$ Hz, damping ratio $\zeta_d=12\%$



Figure 1: Photo of the TMDs on the footbridge in front of the GC building