

CCLRT Final Vibration Report

Executive Summary

This Executive Summary presents the results of testing at vibration-sensitive facilities and the anticipated impacts that may result from light rail transit (LRT) operations on the Central Corridor Light Rail (CCLRT) project. Possible mitigation strategies to address the impacts are also identified. The investigations included critical facilities identified by project staff and key stakeholders. In addition, vibration analyses were made at four locations on the Hiawatha Light Rail Transit (HLRT) line to measure the vibration force generated by the existing light rail vehicles.

Summary of Results

The following table summarizes of the locations along the Central Corridor where tests were performed, the resulting assessment of impact and potential mitigation strategies to address the impact.

| Table 1: Summary of Vibration Mitigation | | | |
|---|--------------------------|------------|---|
| Location | Exceeds FTA Impact Level | Length, ft | Mitigation Options/Strategies |
| U of M, Washington Ave Kolthoff Hall, Hasselmo Hall, NMR, Amundson Hall, Weaver Densford Hall | Yes | 1800 | Resilient direct fixation fasteners |
| KSTP Studio | Yes | | Resilient direct fixation fasteners, additional analysis of mitigation requirements |
| 1951 University | Yes | | Relocate recording studio or construct a vibration isolated room |
| MDH/MDA Labs | No | -- | No mitigation required |
| Church of St. Louis King of France | Yes | 700 ft | Floating slab or design equivalent such as Tire Derived Aggregate |
| Central Presbyterian Church | | | |
| Minnesota Public Radio | | | |
| Fitzgerald Theater | | | |
| McNally Smith Recording Studios | | | |

Force Density Tests: Force density testing consists of dropping a heavy weight on the ground and measuring the force into the ground and the response at several distances from the impact. The goal of the test is to create vibration pulses that travel from the source to the receiver using the same path that will be taken by the transit system vibration. The force density tests on the Hiawatha LRT embedded track show that the vibration from buses exceeds the LRV vibration at frequencies below 30 Hz and that there is potential for a substantial amount of vibration from LRT operations at frequencies greater than 60 Hz.

Description of Recommended Vibration Mitigation Measures

Resilient direct fixation track fasteners: Direct fixation track fasteners are used to attach rails directly to a concrete slab. To use resilient fasteners with embedded track, the track would be constructed on top of a concrete slab and then concrete panels would be placed between and next to the rails.

Tire Derived Aggregate (shredded tires): This approach consists of building the track on top of a layer of tire derived aggregate to isolate the vibrations. Tire Derived Aggregate is a construction material recycled from discarded tires. This approach for mitigating LRT vibration has been successfully used by light rail systems in Denver and San Jose.

Floating slab track: A “floating slab” consists of a concrete slab supported by rubber-like material or steel-coil springs. The track is attached directly to the concrete slab using direct fixation fasteners and the springs are supported by a concrete foundation. Floating slabs are very effective at reducing vibration levels.