

Vibrations related to the operation of the Réseau express métropolitain

The Réseau express métropolitain (REM) is the largest public transit project launched in Québec in the last 50 years. This automated light rail system will cover 67 km along a dedicated corridor. The project was optimized to the maximum during its design phase and 85% of the REM will run on existing rail or road corridors.

Vibrations during the operating phase

Vibration propagation varies according to three main factors:

- Source (speed of the light rail vehicles, type of rail, etc.)
- Trajectory (soil type, rock depth, etc.)
- Receiving buildings (their construction type, their foundations, etc.)

In 2016, CDPQ Infra commissioned a preliminary study on the vibration environment expected to exist during REM operations. Preliminary results indicated that the operating vibration limits would be respected along the entire route, once mitigation measures were put in place in some areas.

A complete vibration assessment

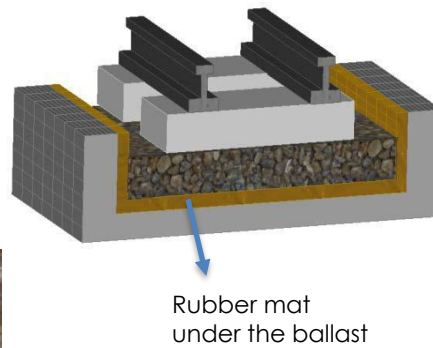
A new detailed modelling of the vibrations expected to occur during REM operations is currently being done using complete and up-to-date data from the NouvLR limited partnership (the consortium selected to build the tracks) and from the Groupe des Partenaires pour la Mobilité des Montréalais (GPMM, the consortium that will supply the rolling stock).

The modelling will be based chiefly on these factors: the pass-by frequency of REM train cars; the speed of the REM; the type of rolling stock chosen; the type of rails and brackets; and the specific configuration of the rails. This modelling will be carried out in accordance with the directives of the Québec regulatory authorities and in compliance with the Federal Transit Administration (FTA) guidelines presented below.

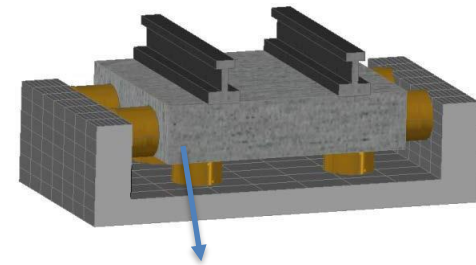
If detailed modelling indicates that some areas are likely to be affected beyond the established criteria, mitigation measures will be implemented by NouvLR during the design and construction of the REM. These measures will include installing stiffer supports for the rails (high resilience fasteners), using a rubber mat under the rail foundation, or insulating the concrete slab to which the rail is attached with several layers of rubber. The specific context of each area will determine the measures to be taken.



High-resilience fasteners



Rubber mat
under the ballast



Fixing of the rail on a
concrete slab placed
on rubber insulators

Thresholds to be respected

During operation, the REM must comply with FTA vibration thresholds. These thresholds were established to ensure the integrity of the structures and to minimize the impact on the surrounding environment.

The vibration thresholds presented are vibration velocities, expressed in the logarithmic unit VdB (decibels of vibration). A logarithmic velocity unit is used to express the ratio between two values of the same nature/unit (in this case mm/s). To obtain the vibration thresholds shown, a reference vibration velocity (VdB ref) is required. This reference vibration velocity represents the “zero” or “starting point” (0 VdB) of the logarithmic unit.

Type of building	Vibration threshold For more than 70 vibration events per day	
	mm/second	VdB
Category 1 – High sensitivity	0.045	65
Category 2 – Residential	0.101	72
Category 3 – Institutional	0.143	75
Recording studio	0.045	65
Auditorium and theatre hall	0.101	72

Vibration thresholds in operation (FTA) (VdB ref. 25.4×10^{-6} mm/s)*

*** U.S. FTA reference 1×10^{-6} in./sec. converted to metric system**

Monitoring during operations

During the operating phase, a monitoring program will be implemented to ensure that the vibrations produced correspond to those predicted by the detailed modelling. This monitoring program will include periodic control measures and regular inspection of infrastructure and equipment. If monitoring results indicate vibration values above the prescribed vibration thresholds, corrective measures will be implemented.

To contact us and stay informed about the construction

- For complete information on upcoming work, visit **rem.info/en**
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