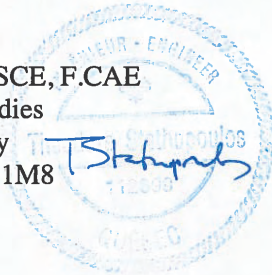


# ANNEXE 7. ÉTUDE DES CONDITIONS ENVIRONNEMENTALES ET DES VENTS (2012)

**WIND ENVIRONMENTAL CONDITIONS  
AROUND THE PROJECT  
“DOMAINE des FRANCISCAINS”**

by

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November 2012

At the request of Mr. André Bachand acting on behalf of Alliance / Prével, an assessment of the wind environmental conditions around the proposed project “DOMAINE des FRANCISCAINS” located on the south side of *Boulevard René Lévesque Ouest*, between Seymour and Hope streets in downtown Montreal has been carried out. The project consists of two 22-story towers, about 62 m high, which hardly exceeds the threshold of 60 meters applied by the *Ville de Montréal*, as far as the examination of wind environmental conditions at pedestrian level are concerned. The two towers are about 23 m apart and considering the particular building configuration of the proposed project and its surroundings, it was deemed appropriate to carry out initially, a wind impact analysis without a full experimental study on a model of the building and its surroundings in the wind tunnel.

The author of this report has discussed the proposed project with Mr. André Bachand, who has also provided the plans and explained the details of this project. Furthermore, the author of this report has considered the drawings of the project,

the surrounding areas and the topography; he has also visited the place to examine the environment of the new buildings in terms of surrounding buildings and their influence on the wind conditions around the location of the project. This report has been prepared in the English language to avoid translation difficulties of scientific and technical terms pertinent to the wind-engineering field, as established in the current literature.

The evaluation of likely wind conditions around any building configuration is not an easy task. A change in the geometry of the building of the project or, more frequently, in the arrangement of buildings in the neighborhood — for example, the construction of one or more new buildings in the area — may change the anticipated or current wind conditions drastically. In the present qualitative assessment, some general comments are made regarding likely wind conditions in the vicinity of the “DOMAINE des FRANCISCAINS” project on streets and public spaces at the pedestrian level by considering the wind climate of Montreal; the present conditions of the surroundings; and the proposed form, geometry and location of the planned building.

The approach recommended for this project is consistent with the provisions of the *Ville de Montréal* for buildings higher than 23 meters. Considering the height of the proposed building and its particular straightforward (mainly rectangular) configuration, it appears that a qualitative assessment should fully satisfy the requirements of the *Ville de Montréal*, as far as the wind impact of the proposed complex on the environment is concerned.

In general, buildings will only induce high wind speeds at lower levels if a significant part of them is exposed to direct wind flows. It is actually the direct exposure to wind rather than building height alone, which causes the problem. The basic wind environment of Montreal in terms of wind speeds and probabilities of exceedance from different directions is presented in Fig. 1. As clearly shown, westerly and southwesterly winds are dominant, while north and northeasterly winds may also be high. Note that these are upper level winds and significant changes may occur near the ground areas. In addition, differences exist between summer and winter wind data. Maximum summer winds are dominant from the west, while winter winds are certainly stronger and they blow primarily from southwest.

In accordance with the plans of the proposed project, the new buildings are mostly exposed to the strongest westerly / southwesterly winds. There is a small sheltering from the 3 to 4-storey high buildings south of René Lévesque Boulevard and the much taller Montréal children hospital. These buildings upstream along with many large trees in this upstream fetch, reduce the speed but also influence the turbulence of the oncoming wind. Particular attention should be paid to winds coming from south, southeast and east directions, which are not generally associated with strong winds; however, winds from these directions will be topographically enhanced considering the unique ground upstream topography, namely the well-known St. Jacques escarpment. In the first instance (winds mainly from west and southwest), the stagnation flow will occur on the west tower and the consequent downflow will impact on areas in the front (entrance) and the back of the project (towards the escarpment). The east tower will be fully emerged in the wake of the upwind tower, so wind speeds around it will be rather low with

enhanced fluctuations. Clearly, further to the landscaping and vegetation already planned for these areas, trees with dense broad foliage or other landscaping elements along René Lévesque (both sides) will be positive additions and would improve the wind climate at the pedestrian level. This will be also helpful for the case of the above-mentioned easterly winds, which will impinge on the easterly and southeasterly façades of the east tower and would generate corner stream flows on René Lévesque Boulevard.

Regarding strong north-northeasterly winds, the exposed height of the proposed buildings is significant, so the pressure differential along the building height will generate significant down-flow towards the sidewalks of René Lévesque and on the back of the project creating rather intense pedestrian-level wind conditions. Clearly the stagnation flow will now impact on the east tower, whereas the west tower will be immersed in its wake. Several tall buildings do exist at a larger distance and their impact on the wind regime around the proposed project will be effective in as far as the oncoming wind speed will be reduced and the turbulence intensity will be increased due to the roughness of upstream terrain. Pedestrian level wind conditions are expected to be fluctuating. Fortunately, the proposed new buildings have balconies and other façade elements, which are expected to mitigate the adverse wind conditions at the pedestrian level. It should be noted however, that northeasterly winds often bring large quantities of snow with them. In this case, snow would be expected to accumulate on the flat roofs of the proposed buildings, as well as on the roof of the connector section at the first floor of the two towers.



The architectural design of the proposed new project also includes a park / garden in between the two towers. This area is interrupted only by the one-storey high connector section, probably a gym, whose roof will be used only by residents as a terrace with a guardrail. This garden area and the terrace will be in the wake of either tower for the most critical wind directions, as already mentioned in this report. Mean wind speeds are expected to be rather low in these areas but the gustiness of the wind will be enhanced, restricting their use for at least some days of the year. For quasi-perpendicular to René Lévesque Boulevard wind directions, this area will become like a short tunnel with higher wind speeds than before. Depending on the final use of these areas, some intervention may be necessary in order to alleviate wind-induced nuances in the future. At any rate, such comments are relevant to the owners of the building rather than the *Ville de Montréal*.

It should be noted that all previous remarks made in this report have qualitative character and provide a general analysis of the anticipated wind conditions in the environment of the proposed new project “DOMAINE des FRANCISCAINS” for the main wind directions in Montreal assuming the present surroundings. As mentioned previously in this report, the construction of new buildings and development of other projects in the vicinity of the proposed project may change the wind regime drastically.

By considering the general project arrangement and features it appears that the likely wind conditions in the vicinity of the proposed project will be acceptable. Assuming the present surrounding configurations and general topography and based on fundamental wind engineering principles along with the

experience obtained from other projects, it is the author's expert opinion that the potential amplification of wind speeds and turbulence conditions around the project will not create dangerous or unacceptable pedestrian level winds in the area. **Winds will be high on certain days of the year but likely within the limits prescribed by the *Ville de Montréal***. Of course, quantification of any risk and probability of occurrence of particular wind conditions anywhere in the area cannot be made without a detailed experimental study carried out in a boundary layer wind tunnel simulating the natural wind conditions around this particular building. However, it appears that such a study may not be necessary for the “DOMAINE des FRANCISCAINS” project by considering its absolute and relative height, as well as its surrounding buildings and topography, unless the *Ville de Montréal* specifically requests it. Finally, the recommendations made in this report regarding the plantation of trees and bushes should be respected.

### Wind Climate of Montreal

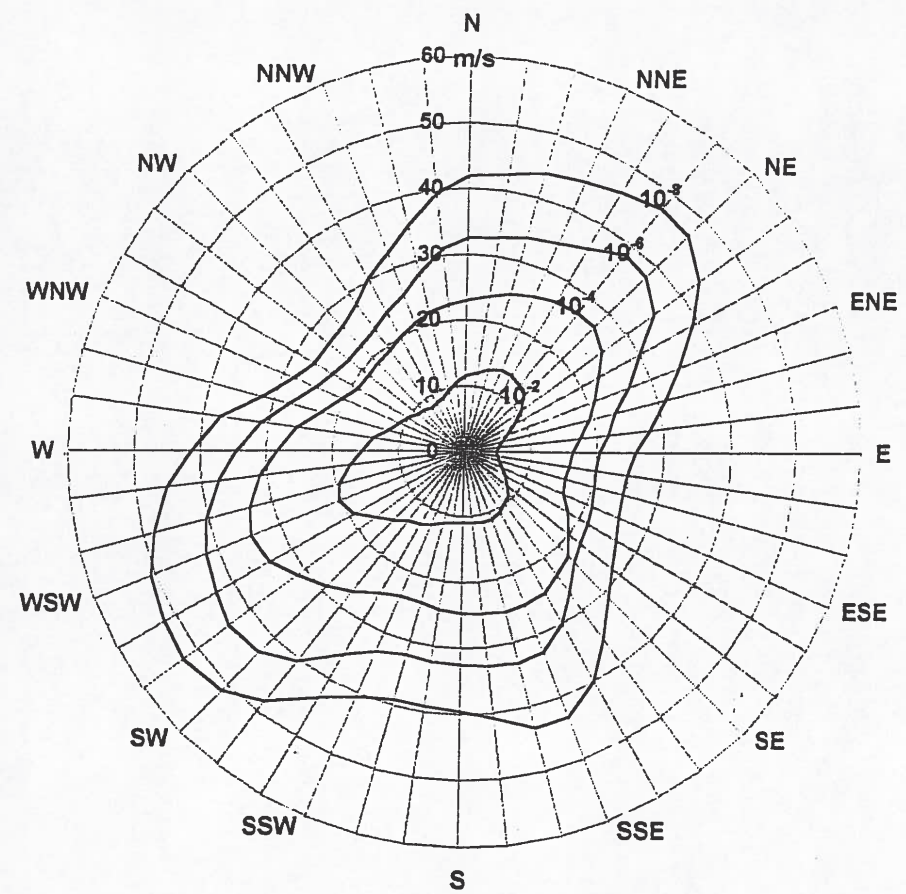


Figure 1