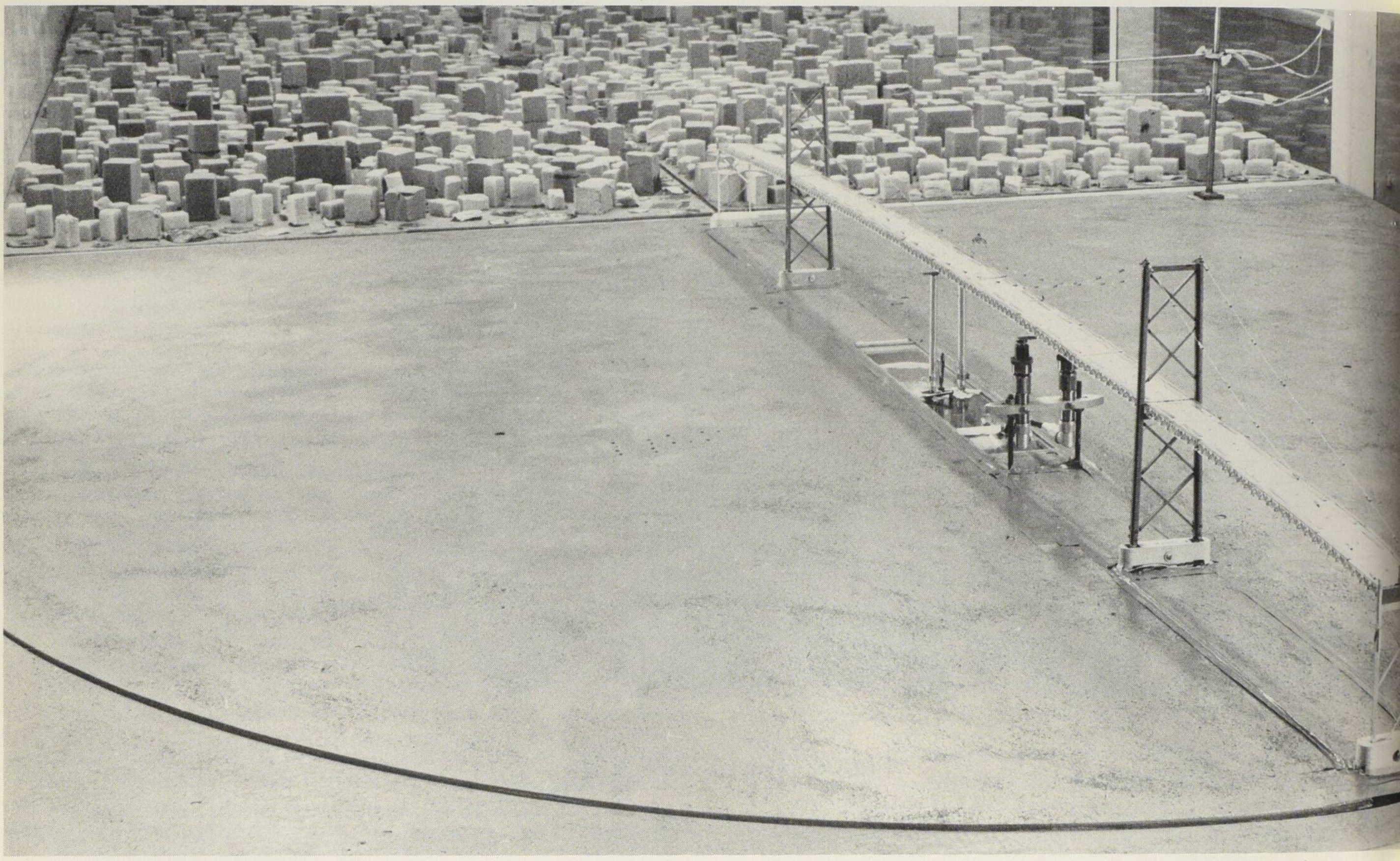
Boundary layer wind tunnel -
Blunting the teeth of the gale

A University of Western Ontario engineer gauges the effects of wind on constructions ranging from homes to bridges. New building standards are established with the potential for great savings in construction costs and time.



Ron Nelson Photography, London, Ont.

Revolutionary bridge building techniques were used during the construction of the Murray McKay Suspension Bridge at Halifax. Wind tunnel tests carried out by Dr. Davenport established the safety of the construction technique under a variety of prevailing wind conditions.

"He that observeth the wind shall not sow; and he that regardeth the clouds shall not reap," says the Preacher in Ecclesiastes. Dr. A.G. Davenport of the University of Western Ontario appears to have disproved this homily; he spends his days observing the wind, and the ideas sown from his observations are reaped by many. The description of his activity is rather more prosaic than "He that observeth the wind," and Dr. Davenport prefers "industrial aerodynamics" or "wind engineering" since his field of interest is in the effects of wind on various structures, for example, roofs, towers, tall buildings and suspension bridges, and in the environmental aspects of wind — the dispersal of air pollution, cooling effects in hot climates or the avoidance of winter discomfort in windy Canadian cities.

The wind is simply a gross movement of air and can arise from several different factors. Some winds extend for thousands of miles and have their origins on a global scale, such as differences in pressure across the earth, unequal heating effects of the sun at different latitudes and forces arising out of the earth's rotation. Wind may also occur at a particular location and may result from unequal cooling rates of water and land in coastal areas, the drainage of cold air into a valley during the evening, and other topographical features.

Wind has a changing face and what is manifest on a hot day as a cooling breeze in one location may, in another, produce havoc. In 1941, the Tacoma Narrows Bridge in Washington State broke apart in 64 km/h winds. In 1958, gusting winds caused $600,000 worth of damage to the Union Carbide Building in Toronto. It is therefore necessary for engineers and architects to understand and assess the varying effects which wind may have upon their construction. One result of Dr. Davenport's research has been the introduction of modifications into the National Building Code of Canada and the requirement that all buildings over 400 feet (120 m), and very slender buildings, be analyzed for dynamic response.

In order to determine the effects of wind upon a building, Dr. Davenport and his associates can proceed in several ways. In the case of an existing building, careful measurements are made of the stresses and deflections which take place in the building under actual wind conditions. In addition, the effects of wind upon the building may be simulated in the laboratory using a wind tunnel. The Boundary Layer Wind Tunnel at the University of Western Ontario was developed by Dr. Davenport in 1965 with the assistance of grants from the National Research Council. It is 100 feet long (30 m) and has a rectangular cross section eight feet (2.4 m) wide and seven feet (2.1 m) high, a