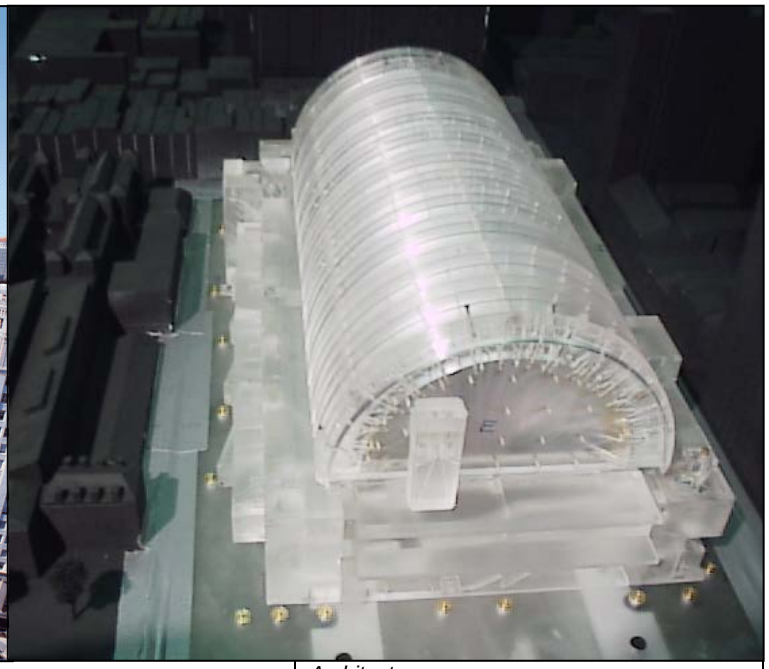
Philadelphia Regional Performing Arts Center, USA

Wind Engineering Study



Client	Structural Engineer	Architect
Dewhurst Macfarlane and Partners	Dewhurst Macfarlane and Partners	Rafael Viñoly Architects PC
Features	**Year Tested**	**Model Scale**
Flexible Cable and Glass End Walls	1999	1:200

The Project

The new Regional Performing Arts Center of Philadelphia comprises a large barrel vault which encloses the concert hall and recital theatre inside. This barrel vault, along with its end walls was intended to be as transparent as possible, which led to a unique design for the end walls. The two end walls are roughly 26m radius semicircles on a 20m high base, and are constructed by hanging vertical cables from a stiff arch just inside the edge of the roof, with tensioning masses attached at the bottom, and glazing between the cables. The resulting walls are quite flexible.

The Wind Tunnel Studies

The wind engineering studies included a study to determine the wind-induced structural loads and responses for the design of the end walls, local cladding pressure loads, wind speeds at pedestrian level and the behaviour of exhaust plumes from four exhaust locations.

The study of wind-induced cladding pressures was carried out for 695 measurement locations distributed over the roof and walls. The pressures measured on the end walls were integrated to determine cable loads and responses, including the resonant dynamic behaviour of the wall. Deflections of the wall were determined by including appropriate influence coefficients in the integration.

An aeroelastic test was also performed on the end walls to confirm the analytical predictions of the resonant response and to ensure that no unexpected aeroelastic responses of the walls would occur in full scale.

Wind speeds were measured at 24 locations around the site. The speeds at these locations were compared with criteria for pedestrian comfort and safety.

A flow visualization study was conducted to investigate the behaviour of exhaust plumes from four exhaust locations.

The Boundary Layer Wind Tunnel Laboratory

Western

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