

LIGHTWANDS - BULLRING DEVELOPMENT, BIRMINGHAM, 2003

The LightWands are an architectural sculpture consisting of 3 flexible masts 33, 28 and 23m tall which form an entrance feature for the New Bullring Development in Birmingham. Ten 1.5m long stainless steel leaves are mounted on individual bearings at 1m intervals toward the top of each mast. These leaves are free to rotate under the action of wind and are angled to help generate more movement of the masts in low wind speeds. At rest the leaves fall back in their equilibrium positions to form a spiral and when the wind blows they rotate downwind and help generate more mast deflection under low wind speeds. The 33m mast will deflect up to 5.8 meters under extreme wind loading.

Gurit drew on their experience with the engineering of the Ron Arad free-standing

mast sculpture in Canary Wharf to calculate the required laminate specification to achieve the client's deflection criteria. Due to the large deflections of the mast and the relationship between the deflections of the mast and the applied loadings, a non linear structural analysis of the mast was required.

Gurit used in house laminate analysis and mast design programs with non linear capabilities to optimise the laminates. To verify the spreadsheet analysis and check on local wall buckling a non linear finite element model of the largest mast was analysed using the MSC Patran/Nastran suite of programs.

Gurit also used MSC PATRAN/NASTRAN to carry out finite element analysis in order to check and improve the design of the stainless steel leaves.



Gurit's structural engineering and technical services teams worked closely with the builder, AMS Structures (based on the Isle of Wight), to define the construction method for the composite tubes. Gurit also carried out testing in their analytical laboratories on samples of the masts and test panels to verify laminate quality, cure cycles and laminate properties.

The masts laminates consist of unidirectional and biaxial E-glass reinforcements laminated with Gurit epoxy resin, and were manufactured in two parts in a common female mould. A two part polyurethane paint finish was used to finish the masts. The masts have 3 metre pinnacles mounted at the tip, which were laminated using SP115 clear resin and RE210 cloth to provide a translucent finish to achieve the required tip lighting effect.

