Tony Edwards watched cladding systems gain the seal of approval for an upmarket London residential scheme, as he explains

**Testing time in China**

With the tallest block of the Lincoln Plaza residential scheme, under construction in London’s Canary Wharf area, reaching 32 storeys, the ability of the cladding systems to withstand the elements was crucial. The Galliard Homes development comprises six blocks, offering 546 apartments, while the first 12 floors of one block will be occupied by a Hilton Group hotel. Regional Building Control (RBC) is the approved inspector for both sections of the building, which covered the cladding systems.

The aluminium panels were manufactured at the Shenyang Yuanda Aluminium Industry Engineering Company in north-east China and the tests were carried out by the Shenyang Kezheng Construction Engineering Testing Company, an accredited independent testing laboratory. As a member of the RBC building control team, I was also invited to witness the tests in September 2013.

Although wind and weather resistance was the main focus for the test, the cladding systems have been designed to fully comply with other aspects of the Building Regulations, regarding insulation and fire spread.

On large buildings such as Lincoln Plaza, although the cladding system is essentially the same there are several different configurations; some panels are flat, while others are designed to incorporate windows and doors, corners, balconies and slopes. The balconies are manufactured by the same company in Shenyang.

Subject to satisfactory testing in China, all of the components were to be shipped to the UK to be assembled on site.

All the types of cladding system to be used on the building were tested, and each sequence was seen as independent.

Before testing began the external face of the cladding specimen was thoroughly washed using a mild additive-free detergent and then rinsed.

Tests were carried out to relevant BS EN codes, in particular BS EN 12211: 2000 Windows and doors. Resistance to wind load. Test method and Centre for Windows and Cladding Technology (CWCT) Standard for systemised building envelopes Part 3: Air, water and wind resistance. Other CWCT tests include air permeability, water tightness and strength.

**Wind tests**

Wind tests are carried out under both positive and negative pressure, the definitions being:

- **Positive pressure**: the pressure on the external face is greater than that on the internal face.
- **Negative pressure**: the pressure on the internal face is greater than that on the external face.

The service wind load for 100% of the sample composed of typical facade elements could typically be expected to be 1,300Pa for positive wind pressure and 1,600Pa for negative wind pressure.

For both positive and negative applications of the peak test pressure there must be no permanent damage to framing members, glass, glazing panels or anchors. Framing members must not distort, panels must remain securely held in place, as must glazing beads, structural silicone assemblies, decorative capping pieces and gaskets.
Pressure is applied to the test specimen by the wind generator, which is carefully calibrated and located at the correct distance away. In general terms, a wind speed of 30m/s equates to a test pressure of 551Pa. The negative internal pressure of 50Pa is added so that a total of 600Pa is achieved. This can be applied from the control room.

The test pressure is typically increased in three to four equal increments and held for 15 ± 5s. After the application of each increase in pressure the displacement of framing members was measured and recorded. Openable components of the cladding system such as windows were then opened and closed five times to record any change in the ease of opening.

**Air permeability**
This is a test method for determining the air leakage characteristics of the test specimen under specified air pressure differences at ambient conditions. The air permeability is the ratio of the airflow per unit of specimen area and is given in m³/h.

**Water tightness**
Water tightness is estimated by spraying one homogeneous and constant water flow as one continuous film on the external surface of the test specimen with increasing positive test pressure over a finite time period. The water temperature has to be between +4°C and + 30°C and must be clean tap water. Test pressures are increased to 600Pa and typically the water flow rate is 3.4l/m².

In order to generate storm conditions, the water tightness test was also carried out using the mobile wind generator (aero engine) with power rating of 250kW and a 380V AC power supply. The rotor diameter was 2.2m and it had speed regulation with a frequency converter giving a maximum wind speed of 35m/s.

It was possible to witness the test by being shut in the chamber at the rear of the cladding/window sample being tested and from personal experience I can confirm there was no water leakage. The hose test was used to determine the resistance to water penetration of those joints of the cladding envelope designed to remain permanently closed and watertight.

**Impact tests**
Both soft body and hard body impact tests were carried out. The soft body impact test was used on glazed areas including glazed doors and balustrading. This is either a 50kg double tyre impactor or a 50kg bag filled with glass spheres, suspended from a chord 3m long. The hard body impact test is a 1kg steel ball 62.5mm diameter, suspended from a chord 3m long and is designed to simulate external impacts such as cradle impact. The impact tests must not cause component breakage, punching/holing failure, displacement of any components or indentation.

After the tests the cladding components were dismantled and inspected for both damage and water ingress, photographed and recorded in accordance with the relevant standard for the section.

All tests achieved the relevant test criteria. Only one had to be rerun but this was because there had been a failure to properly seal the chamber/cladding assembly and was not through a faulty test specimen.

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