Technical Update 1

Dynamic watertightness tests for curtain walling

The Centre for Window and Cladding Technology's 'Standard and guide to good practice for curtain walling' (1996) calls for a dynamic water test for all walls for which the static water test pressure is 600 Pa or greater. This relates to facades with a calculated wind pressure in excess of 1600 Pa. Specifiers may however call for the test to be applied to facades that are to be erected on less exposed sites.

The CWCT test requires either:

- A wind generating device to create a jet of width at least half the greater dimension of the test panel or 4m which ever is smaller;

or

- A smaller wind generator that is moved in successive tests to cover the whole area of the specimen.

In practice tests conducted in the UK use an aero- engine to generate the required jet of air. The generator speed is adjusted so that the deflection of the sample is the same as for the static water test at 600 Pa, or 0.25 design wind pressure. It is permissible to provide a chamber pressure equal to 25% of this pressure in order to achieve the required deflections.

Research by Taywood Engineering Ltd, the Building Research Establishment, Permasteelisa, IFT Rosenheim and PF Consultants has sought to develop a dynamic test that can be run using a smaller wind generator. This will be published during October 1999 as prEN 13050, 'European standard on a dynamic watertightness test for curtain walling'. The designation prEN means that this is a pre-standard and not a full EN standard. It will remain a prEN for three years whilst experience is gained of its use. At the end of three years CEN/TC33/WG6 will vote either to adopt prEN 13050 as a full standard, maintain it as a prEN or to modify it in the light of experience.

During the three-year life of prEN 13050 there are two published methods for the dynamic testing of curtain walls. Specifications requiring compliance with CWCT 'Standard and guide to good practice for curtain walling' or 'Standard and guide to good practice for walls with ventilated rainscreens' will require the CWCT test using the aero engine or equivalent.

However specialist contractors and clients/specifiers may wish to gain experience of prEN 13050. CWCT encourages the use of prEN 13050 alongside the CWCT test method so that the UK can compare the two methods and make an informed response when our UK delegates vote in CEN/TC33/WG6. To avoid confusion, when both dynamic test regimes are to be used on the same specimen the following points should be noted:

- Where a client calls for both the CWCT and CEN tests it should be established in advance of the testing which test is being used to assess the performance of the wall and which test is being run only for informative purposes, to prove the test method;

- Where a CEN test is included in a sequence of testing it may influence the other tests in the sequence. For this reason it should be run after all the other water penetration tests.

- Where a CEN test is included in the standard CWCT test sequence it has to come before the 'wind resistance - safety' test as it is not a requirement that the wall be resistant to water penetration following that test.

Water may leak into the specimen only during the CEN test or only during the CWCT tests. When water leakage is discovered at the time of dismantling it will not be possible to know which of the tests caused the leakage. Where possible arrangements should be made to thoroughly inspect for leakage prior to commencement of the CEN test.

prEN 13050 will be based on the test apparatus and methodology set out in Appendix A. It will be available in October 1999 from BSI.

CWCT has a number of reservations about the test:

- The wind generator is moved vertically midway between adjacent mullions to drive water across the wall. However, a joint between two projecting mullions may be protected from this transverse flow. It would then be appropriate to move the wind generator along the joint.

- A similar consideration applies where a joint is recessed. For instance in a pre-cast or panellised wall.

- It is not clear whether a flow of 2.0 l/min/m^2 is sufficient to fully wet the surface, nor whether this is significant to this test.

- The test has been developed by testing a limited arrangement of wall types. It is not clear that it is a valid test for all forms of drained and ventilated wall.

APPENDIX A

TEST APPARATUS AND METHODOLOGY

A1 Test apparatus

A1.1 A pressure chamber with an opening into which the test specimen can be fitted.

A1.2 A means for rapidly applying controlled air pressures in the pressure chamber, and thereby to the specimen.

The apparatus should be able to apply continuous regular air pressure pulses at a frequency of 0.2 Hz with the minimum test pressure equal to one third of the maximum test pressure.

A1.3 A means of accurately measuring and recording applied test pressures.

A1.4 A water spraying system that delivers clean water at 2 l/m^2 min. so that a constant and continuous film can be applied to the outside surface of the test specimen.

A1.5 A mobile wind generator for applying a controlled turbulent airflow to all points on the outside surface of the specimen. The turbulent airflow should be generated by a variable speed axial fan fixed to a 600 mm diameter rigid duct which directs the airflow around a 90^o parallel bend onto the outside surface of the specimen. The bend in the duct should have a smaller radius of 300 mm and the straight length after the bend should be 300 mm. The fan should be capable of generating an airflow with the following features, measured 20 mm from the end of the duct and within 300 mm of the central horizontal axis.

1. A minimum velocity of not less than 30 m/s along the central horizontal axis.
2. A minimum velocity of not less than 20 m/s over 75 % of the measurement area.
3. A minimum velocity of not less than 8 m/s at any point within the measurement area.

The axis of the airflow from the duct should be horizontal and normal to the outside surface of the test specimen with the end of the duct 650 mm, ±50 mm, from the specimen.

The wind generator should be mounted on a device that provides controlled movement in any direction in a plane parallel to the outside surface of the specimen.

A2 Test method

Before applying air pressure in the pressure chamber spray the test specimen with water at a rate of 2 l/m^2 min. for 15 minutes to ensure that the specimen is thoroughly wetted.

After this spraying apply continuous regular air pressure pulses at a frequency of 0.2 Hz with the maximum test pressure equal to 0.375 (or exceptional 0.40) of the design wind pressure for the facade and the minimum test pressure equal to 0.33 of the maximum test pressure.

Position the wind generator with the central horizontal axis of the duct midway between the outer two mullions nearest one edge of the specimen, and 0.3 m above the bottom of the specimen. If each mullion is less than 0.3 m or more than 0.9 m from the central axis .

of the duct, test each mullion separately with the wind generator positioned to satisfy this requirement

Start the fan and adjust the speed to produce an airflow with a velocity of 30 m/s when measured 20 mm from the end of the duct along the central horizontal axis.

Move the wind generator upwards at 2.5 m/min, until the central horizontal axis from the duct is 0.3 m from the top of the specimen. Return the wind generator as rapidly as possible to the starting position near the bottom of the specimen. Make a second upward pass with the wind generator as before and return it to the starting position. Traverse the wind generator across the specimen so that the central horizontal axis of the duct is between the next pair of mullions and make two upward passes with the wind generator as before. Repeat this process until the whole of the specimen has been covered.

Constantly inspect the inside surfaces of the specimen for water leaks during the test and record the times and locations of any that occur.