

Technical Update No 7



Buckling of curtain wall mullions

Flexural members are potentially subject to lateral torsional buckling. This arises due to lateral deflection of the compressive flange of a member subject to bending. This deflection can lead to buckling before the non-buckling design bending moment is reached.

Lateral torsional buckling may be prevented by restraining lateral movement of the compressive flange. In curtain walling, transoms will provide some restraint and resistance to buckling will depend on transom spacing, depth and method of connection. The detailing of the mullion/bracket connection will also affect the buckling performance. The glazing and infill panels may also provide some restraint but this is more difficult to quantify and should not be relied upon.

Lateral torsional buckling is not known to have caused failure of curtain walling either in service or under test conditions however the trend to larger sizes of glazing and more slender profiles increases the risk of failure of this type.

The CWCT Standard requires testing of curtain walls to demonstrate their ability to resist air leakage, water permeability and wind load. However, the stiffness and strength of mullions and transoms under test may be enhanced by non-structural components-glass, gaskets etc. This enhancement may not be realised in practice due to workmanship, tolerances and change of material properties over time. In the case of enhanced stiffness, these factors may lead to slightly larger deflections. In the case of enhanced strength a reduction in lateral restraint as a result of poor workmanship, tolerances or material variability could lead to complete structural failure.

All curtain wall-framing members should be selected or designed on the assumption that the glass provides no lateral restraint and on the basis of structural calculations or manufacturers design tables. The appropriate code for use in the United Kingdom is BS8118 Structural use of aluminium.

BS8118 includes provisions to prevent buckling occurring. BS 8118 states that lateral torsional buckling may be ignored where a beam is supported against lateral movement throughout its length. This may have been used by some curtain wall designers to justify ignoring lateral torsional buckling however the restraint provided by glazing units and infill panels may not be sufficient to justify this and should not be relied upon.

CWCT advice is that buckling failure should be considered in all curtain wall design. In some cases it will be possible to show by calculation that the proposed arrangement will have sufficient capacity to resist buckling failure. Where this is not the case the problem may be overcome by using a larger section mullion, reducing transom spacing, improving restraint at the brackets or reinforcing the mullion.

System companies or fabricators could assist this process by producing loading span curves for their profiles. Curves may be based on calculation or structural tests of the member without glazing.

CWCT is about to set up a group to produce more comprehensive guidance in the form of a design guide which will cover all aspects of structural performance.