

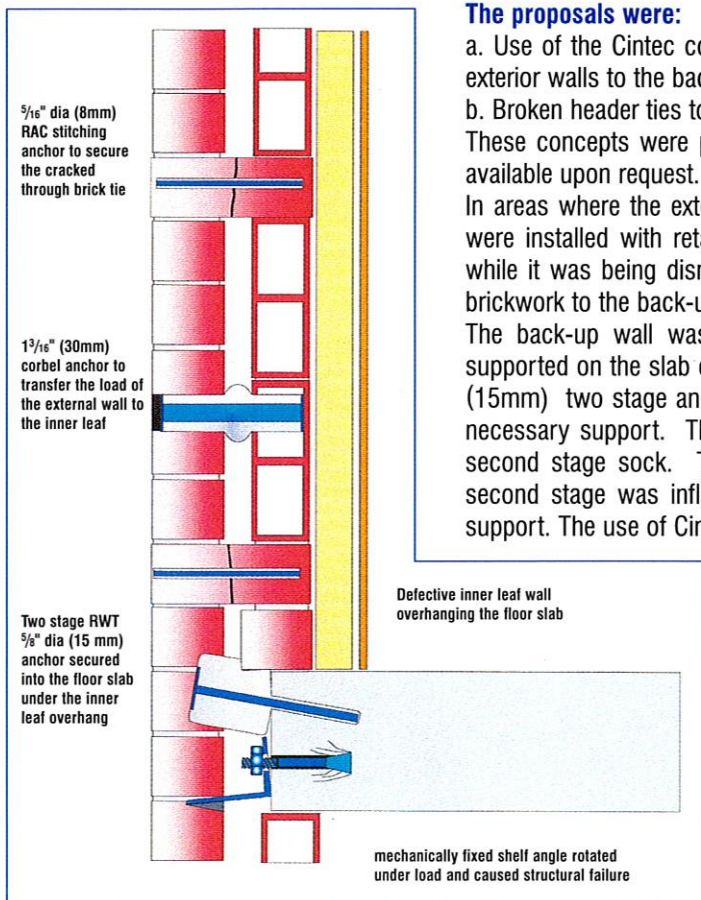
77 Howard Street, Toronto, Ontario, Canada

## Exterior wall restoration

This 24-storey apartment block's exterior wall consists of two wythes tied together by courses of header bricks. The exterior wythe is a glazed clay brick and is supported by a painted steel shelf angle connected at each floor into the floor slab. The inner wythe consisted of a 4" (100mm) hollow concrete block back-up wall. Deterioration is due to vertical loads imposed by shortening of the structural frame. Lack of soft joints below the shelf angles to accommodate movement has resulted in;

1. Bowing of walls.
2. Crushing of over stressed units.
3. Shear failure of the header courses.
4. Rotation of shelf angles

Corrosion deterioration has also occurred in the shelf angles and connecting bolts. Due to occupation of the dwellings, complete replacement of the walls was impractical. Thus Halsall Associates in conjunction with Cintec Canada participated in the development of a stabilization strategy.



## The proposals were:

- a. Use of the Cintec corbel anchor to transfer vertical loads from the exterior walls to the back-up walls.
- b. Broken header ties to be restored using Cintec stitching anchors. These concepts were proven with full laboratory load tests. Results available upon request.

In areas where the exterior walls were beyond repair, Cintec anchors were installed with retaining plates to prevent collapse of the panel, while it was being dismantled. The anchor was used to tie the new brickwork to the back-up wall.

The back-up wall was found, during construction, to be not fully supported on the slab edge at some locations. A special RWT, 5/8" dia (15mm) two stage anchor was designed and supplied to provide the necessary support. This special two-stage anchor had an oversized second stage sock. This was secured into the floor slab, and the second stage was inflated under the inner leaf overhang to provide support. The use of Cintec anchors thus provided stabilization and

repair on this project, without disturbance or relocation of the tenants.

## Conclusions of the Test Report:

The test assembly failed by crushing of the concrete block interior (back-up) wythe at the corbel anchors. The observed failure load of 10.3 Kn (2295 lb) exceeded the design (service) load of 2.85 Kn (636 lb) by a factor of 3.6.

## Engineers

Halsall Associates, Toronto, Ontario, Canada

## Contractors

Maxim Group General Contractors, Concord, Ontario, Canada