



BETTER BUILDINGS

Exterior Wall Rehabilitation and Performance Improvements

Overview



Possible safety and liability issues concerned the managers of the condominium in Nepean, a suburb of Ottawa. Douglas Hardie Architect and Keller Engineer Associates were hired to analyze the problems, propose solutions and prepare drawings and documents for a construction contract.

The consultants recommended:

- completely removing and replacing the brick veneer and curtain walls
- repairing the structural masonry wall
- installing a new air and vapour barrier
- installing new insulation
- replacing windows
- enclosing the open balconies for more protection against water penetrating the walls and to create additional usable space.

The contractor, Brikon Masonry, did the work between May and December, 1990. Carleton Condominium Corporation No. 1, the building owner, borrowed to pay for the work. Each owner paid a special proportional assessment to repay the loan.

Today, the building exterior is safe and more attractive. The apartments are more spacious and comfortable. The resale value of the apartments is expected to improve.

THE BUILDING

The condominium is an 11-storey, 120-unit, 1,800 m² (19,375 sq. ft.) building. The Hambro System structure is load-bearing concrete block walls and open-web steel joists with concrete floor slabs. Shelf plates and angles on every second floor support the exterior, clay brick veneer walls. The original windows were wood frame. Curtain walls clad the staircases and elevator lobby.

PROBLEMS AND CAUSES

Moisture between the brick veneer and the block wall, caused the brick to deteriorate. In turn, the moisture corroded the ties securing the brick veneer to the block wall and the shelf plates and angles supporting the brick. The mortar joints in the brick veneer showed major cracks. Water entered the wall through the cracks. The air-vapour barrier did not perform well and after water entered the wall, the UFFI (Urea Formaldehyde Foam Insulation) absorbed and held the water inside the wall. Residents complained of cold, drafty apartments. The excessive moisture in the wall decayed window frames and caused leaks.

IMPROVEMENTS



Douglas Hardie Architect and Keller Engineer Associates developed a plan which could be completed quickly at a realistic price.

Special care was taken to respect the rainscreen principle for the new exterior. Simply put, a drained cavity, or air space, separates the exterior cladding from the backup wall. Any moisture that gets into the cavity drains outside through weep holes at the bottom of the wall. To minimize the moisture getting through, the backup wall must be an airtight barrier. This ensures a pressure balance between the outside and the cavity, which prevents the wind from 'pushing' rain into the cavity.

Exterior work included:

- removing the brick veneer, ties, shelf plates and angles, and the existing curtain wall
- repairing the back-up block wall
- removing all UFFI
- installing a new, rubberized membrane air barrier over the block wall
- installing new, semi-rigid fiberglass insulation
- installing new ties, supports and brick veneer
- enclosing balconies with prefinished insulated metal panels, vinyl-clad wood windows and using steel studs and gypsum board as infill sections
- replacing curtain walls and installing new, vinyl-clad, wood windows

A CHALLENGING PROCESS

The work was tendered and the owners and contractor signed a standard construction contract (CCDC-2. Stipulated Price Contract) with the successful bidder. The performance bond was 50 per cent of the contract price. Work started on April 30, 1990 and was substantially completed on Nov. 28, 1990. Deficiency repairs continued until June, 1993.

The project had to meet both technical and operational challenges.



Scheduling to complete the work in one summer was a challenge. The contractor used a movable scaffold system. Two platforms each spanning one side of the building, with a stair tower at one end for access. The platforms were raised to the top of the building. Demolition proceeded from the top down. Installation of new material moved from the bottom up.

The architects and engineers designed the exterior to perform well for a long time. To make sure that the contractors followed the many specified details, the work was carefully inspected early in the morning or late in the evening to keep work on schedule.

The impact on the residents, who lived in the building during construction, was also a challenge. Safety, particularly during demolition, was a primary concern. The owners closed parking at the front of the building for a few months. Residents could not use their balconies during most of the summer. To reduce the noise impact, demolition and construction work was done between 7:30 a.m. and 5:30 p.m.

Workers needed access to apartments to install balcony enclosures and windows, for other work and for deficiency repairs. The deficiency repairs corrected air leaks from windows during the first winter and water leakage through balcony windows. The contractor finished the deficiency repairs by the summer of 1993.



COSTS

The total cost of construction was \$2,106,598, plus GST. Other costs included professional and municipal fees.

Mobilization and site cleanup \$308 a suite
Scaffolding \$ 28 / m²
Demolition \$ 36 / m²
UFFI removal \$ 38 / m²
New windows \$270 / m²
Air barrier \$ 43 / m²
Insulation \$ 41 / m²

New brick masonry veneer \$240 / m²

RESULTS

The new wall system meets and is expected to continue meeting the performance standards. Occupants are more comfortable. The new windows eliminate the drafts, leaks and excessive heat loss and operate more smoothly. Residents use the enclosed balconies all year and have more space in their apartments a significant improvement. The building is more attractive. Although no assessment has been made of changes in sales or marketability, the managers expect the new exterior and more spacious apartments will appeal to prospective buyers.

LESSONS LEARNED

Elements making the project a success were:

- thorough technical analysis before taking action
- applying current rainscreen design, using well-understood techniques and materials for an effective, economically feasible solution
- giving careful attention to access, scaffolding, and scheduling of trades and consultants
- carefully inspecting each section of the new wall
- closely co-ordinating the efforts of the owner, project manager, consultants and contractor.

CONTACTS

Owner Carleton Condominium Corporation No. 1

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Consultants Keller Engineer Associates
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