The dynamic buffer zone system

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Objekttyp: **Article**

Zeitschrift: **IABSE reports = Rapports AIPC = IVBH Berichte**

Band (Jahr): **77 (1998)**

PDF erstellt am: **28.06.2024**

Persistenter Link: https://doi.org/10.5169/seals-58259

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The Dynamic Buffer Zone System

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Summary

The main intent of preserving the building envelope of vintage buildings is not to alter the environmental conditions previously experienced by the wall assembly. The technology known as the Dynamic Buffer Zone (DBZ) introduces a layer of warm, dry, pressurized air into the existing wall. The DBZ provides a high degree of containment by controlling the air pressure differentials that cause the moisture flow. The dry, pressurized air also offers opportunities for energy management when it is extended to or through the glazing, and/or combined with the building envelope ventilation air. The introduction of the DBZ between the environmental separator and the interior finish is potentially a reliable way to compensate for minor defects in the building envelope during and after construction.

Introduction

The renovation of buildings with traditional load-bearing masonry walls usually involves window and mechanical upgrades intended to pressurize and humidify the interior space.
This strategy inevitably generates environmental loads not experienced by the original enclosure. There is growing evidence to suggest that sustained air pressurization is damaging to vintage building envelopes even when mechanical pressurization is low. The risks of poor performance and damage to the building envelope are high if air leakage and vapour diffusion are not adequately controlled. One proven restoration approach introduces a layer of dry pressurized air into the existing wall assembly. This technology provides a high level of containment by controlling the air pressure differentials that cause moisture flows. The dry pressurized air layer, known as the Dynamic Buffer zone, also offers energy management opportunities when it is extended to the glazing and/or combined with the building ventilation air.

Dynamic Buffer Zone System

YBSS is uniquely experienced in the development, testing and implementation of the Dynamic Buffer Zone (DBZ) wall system in several historical buildings in Canada. These buildings include the Canada Life Building and Rogers Cantell Office Campus in Toronto, and the East Memorial Building, a major historical government edifice in Ottawa. The challenge presented

by these buildings was to develop and design a system that would protect the aged, but preserved, external cladding and at the same time allow for high humidity levels within the interior spaces. The initial proposal of the Architect and Mechanical Engineer was to insulate the inside face of the external walls. However, YBSS determined that although this proposal increased the interior building temperature it decreased the outside wall temperature, thus causing interstitial condensation within the wall as a result of moisture movements. The freezing of the condensate would inevitable result in cracking, spalling and its eventual destruction of the historic wall cladding . Any solution to this problem had to maintain the external appearance of the building.
YBSS proposed the Dynamic Buffer Zone solution. Extensive research and testing led to solution that utilized the "Dynamic Buffer Zone" (DBZ) principle. The DBZ is essentially a controlled environment around the perimeter that prevents the moisture, heat and exterior pollutants from migrating through the wall.

CONCLUSION

The main purpose of the Dynamic Buffer Zone is to ensure comfortable interior environmental conditions in a building that is undergoing a major interior retrofit in order to extend its service life. The DBZ approach was initially reserved for moisture sensitive buildings, however, there are many other benefits that can be derived from this technology. For example, the control of air movement within the interior enclosure cavities can recuperate energy losses from the building, or dissipate solar gain before it becomes a problem that the mechanical system must address. The conditioning of the wall or window cavities would reduce the need for processing the large volumes of air that are required to generate comfort. The system also ensures an effective wall renovation without modifying the architecture of the original building facade. This air management system has benefits that go beyond operating cost. A technology that controls all aspects of energy and moisture transfer within the building envelope will ultimately produce capital cost savings and an occupant comfort level that is otherwise unachievable through the conventional upgrades. This simple, yet durable, building envelope presents a fundamental component of an exceptional building design.

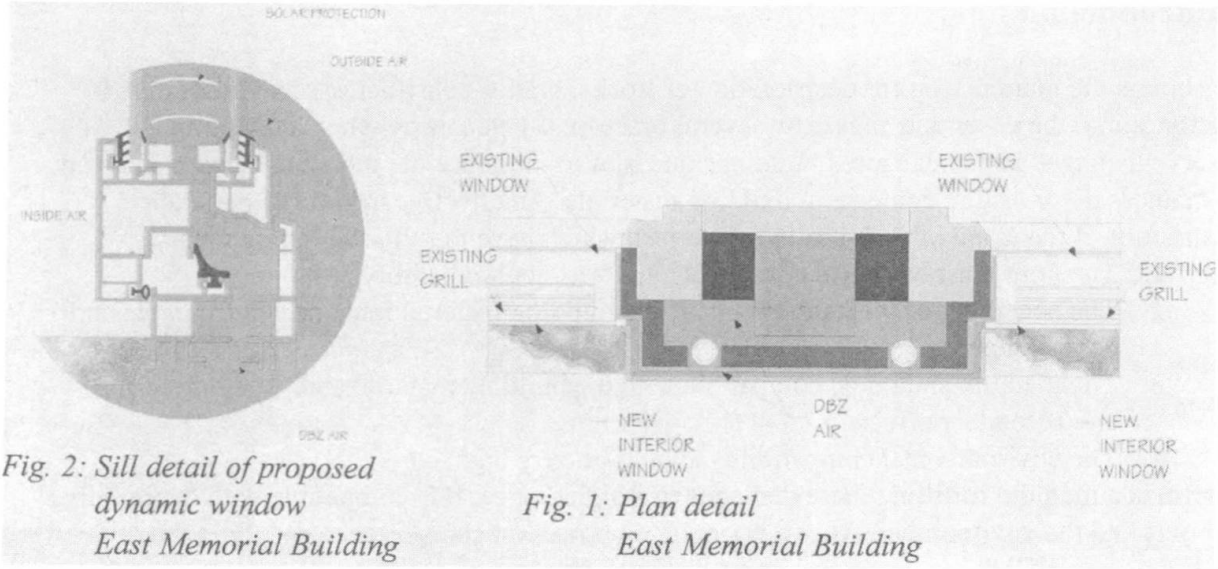

Fig. 2: Sill detail of proposed dynamic window East Memorial Building

Fig. 1: Plan detail East Memorial Building