Design Considerations for Curtain Wall Parapets in Cold Climates

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ABSTRACT

Aluminum and glass curtain walls have gained enormous popularity across Canada and the United States as an engineered system used as the vertical envelope for a variety of low-rise and high-rise building types, particularly in the institutional and commercial sector. This paper shall focus on design considerations for curtain wall parapets in cold climates. Symptoms of water leakage problems caused by condensation behind curtain wall parapet assemblies is a recurring issue which often entails costly remedial repair measures. Despite the recurring problems encountered on several buildings, there are still very few guidelines available to assist designers with proper detailing considerations.

INTRODUCTION

Water infiltration problems due to condensation behind curtain wall parapet assemblies in cold climates is a recurring issue which often entails costly remedial repair measures. High parapets are particularly problematic given the difficulty in providing adequate air and heat circulation behind the curtain wall for both stick built and unitized curtain wall systems. Condensation and frost build-up that form on the back side of the curtain wall components during cold exterior winter conditions eventually thaw during warmer conditions, resulting in water dripping to the interior of the building and damaging the interior finishes. Left unattended, mold growth becomes a growing concern as well as potential long-term corrosion of the anchors at the top of the curtain wall.

CONCERNS RELATED TO CURTAIN WALL PARAPETS IN COLD CLIMATES

It is common practice on metal and glass curtain wall buildings to continuously run the curtain wall upwards past the roof line to the top of the parapet level (Figure 1). The curtain wall at the top of the building is typically supported by a concrete or steel parapet structure and installed at approximately 25 to 50 mm in front of the edge of the floor slabs. Given that the exterior face of the parapet structure is usually in line with the exterior floor slab edge, the cavity between the back of the curtain wall and the parapet structure will be the same as the distance in front of the slab edge (between 25 to 50 mm). This cavity usually communicates with the interior ambient space and the air within the cavity will contain the same amount of moisture as the conditioned air in the interior of the building. However, given the limited width and more importantly the height of the cavity, natural heat flow is often insufficient to warm the back of the curtain wall during cold winter conditions. Condensation and frost formation occur when the surface temperatures of the curtain wall components which are in contact with the parapet air cavity are below the dew point temperature.

RECOMMENDATIONS FOR CURTAIN WALL PARAPETS IN COLD CLIMATES

A practical alternative to continuously running the curtain wall upwards past the roof line is to stop and seal the curtain wall below the parapet level (Figure 2). In order to achieve the architectural look of a continuous curtain wall, the parapet level is “clad” with a small curtain wall section. The section of curtain wall cladding at the parapet level can be designed to...
match the rest of the curtain wall and the spandrel area can be comprised of glass, metal or any other material typically used in curtain walls.

In this application, it is essential to ensure the continuity of the air barrier and thermal barrier at the top of the curtain wall termination, which shall be extended behind the curtain wall parapet cladding and tie into the roof assembly system. Once this has been completed, the curtain wall parapet cladding is installed. The parapet cladding is vented and drained to the exterior, much like in a conventional rain screen wall construction.

This alternative approach to curtain wall parapet construction eliminates the cavity behind the back of a typical curtain wall parapet which usually communicates with the interior ambient space, resulting in condensation and frost formation during cold winter conditions. When incorporated in the design phase, this approach is efficient, cost effective and easy to undertake.

**Figure 1** Conventional curtain wall parapet assembly.

**Figure 2** Alternative curtain wall parapet assembly.