

Below-Grade Expansion Joints: Challenges and Best Practices

Marisa L. TURNER

Senior Staff II

Simpson Gumpertz & Heger

San Francisco, CA, USA

mlturner@sqh.com

Marisa is a building envelope consultant with 12 years of experience in the industry.



Rose F. MCCLURE

Senior Staff II

Simpson Gumpertz & Heger

Chicago, IL, USA

rvmcclure@sqh.com

Rose is a structural engineering consultant with 10 years of experience in the industry.



1 Abstract

Many of our cities are running out of usable construction space for large buildings. New buildings are reaching new heights and new depths, often extending several stories below-grade. This presents challenges for waterproofing, particularly when building foundations extend below the groundwater table. With climate change and sea-level rise, many geographic areas will increasingly need to consider groundwater.

Building code requirements, especially in seismic regions, often require engineers to design movement joints or separation joints in below-grade structures. But foundation waterproofing materials are designed to seal around a building, not a void or an excavation. Structural joints are more susceptible to leakage, and higher volumes of leakage, than areas with solid backup.

We review design considerations for movement joints and present two case studies: a parking structure with structural separation joints between exterior shotcrete shear walls; and a hospital campus relying on below-grade expansion joints between buildings with differing foundation systems. In both, the presence of below-grade joints necessitates more complicated detailing and installation.

Experience shows us the best practice is to waterproof the building, not the void. Performance is best when the below-grade structural walls provide a solid, continuous substrate. Where movement joints cannot be avoided, we recommend designing structural elements to also meet the needs of the waterproofing system.

Keywords: Foundation waterproofing; expansion joints; movement joints; below-grade waterproofing.

2 Introduction

As cities become more densely populated, building structures are reaching new heights and new depths. New buildings routinely extend several stories below grade, and into saturated soils below the groundwater table [1].

A dedicated below-grade waterproofing system is important to prevent water ingress into a building's

basement levels. Monolithic concrete, on its own, will greatly slow the passage of water. However, when foundation structures require movement joints, it takes special considerations to meet both structural and waterproofing performance goals.

3 Reasons for Movement Joints

Structural joints are designed and built into foundation elements for different reasons. Expansion joints, also referred to as movement or