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Blindside Enclosure Walls in Zero Lot Line Conditions

In the dense core of many large urban areas, building sidewalls are often built adjoining or abutting the property line: this is usually described as a zero lot line. An alternative approach is to build a single wall that is shared by two buildings[1]. In the case of a new building constructed next to an existing building, the wall along the lot line that overlaps the existing building wall requires specific solutions to respond to the unique situation.

Blindside insulation refers to a situation where the exterior wall is so close to the adjacent building that the insulation on the exterior, and all the benefits this insulation location provides, cannot be installed from the exterior of the building using normal designs and techniques. The insulation must instead be placed first prior to building the enclosure support structure, and both must be installed from the interior of the building space.

Air Gaps Between Buildings

Many jurisdictions, and good structural engineering principles, require a minimum physical separation between new and existing buildings to allow for seismic movement, wind sway, and differential settlement. Hence, it is often not allowable to build exactly on the lot line, and an air gap of a minimum few inches (tens of millimeters) will be required.

The size of the air gap varies with building design and site characteristics as well as local regulation. However, a nominal gap size specification may take the form of "1 inch plus 1/300 of the height the two buildings overlap". In many cases a clear gap is simply specified, such as 2 to 4" (50 to 100 mm). For seismic purposes, low-density fibrous insulation layers do not transfer structural loads, and therefore should not be counted as "connecting" buildings, but building regulations can sometimes be written without the benefit of scientific reasoning and hence a significant air gap may be required despite the flexibility of many stone wool products.

Of course, a gap between two buildings of several inches will allow airflow, wind, rain, and snow penetration, and create a potential entry point for rodents and birds.

Although the quantities of rain and snow penetrating the gap may be very limited, these sources of moisture must be considered. In all cases, installing flexible blocks to the air gap at their vertical and horizontal perimeters is

highly recommended to prevent dirt, blown snow, and animal infestation. The top of the gap should, as is usually the case, be flashed to effectively eliminate rain water penetration.

Although sealing a gap is technically straightforward, the sealed joints need to allow for movement, which is both a practical and regulatory requirement, and they need to limit the connection to the adjoining building. This can be challenging as it requires cooperation from the owner of the adjacent building.

[1] According to the International Building Code (IBC), party walls are any wall located on a lot line between adjacent buildings, which is used or adapted for joint service between the two buildings.

Common blindside scenarios

The most common condition to be designed for is the vertical and horizontal sections of the new assembly as it abuts the existing building. Thus, as shown in Figure 1, there are three basic transitional conditions:

A. Where the new wall rises above the existing building (at the existing building parapet),

B. Where the new building wall ends at its parapet and the existing building is taller,

C. In plan section where the new building and existing building meet.

Although these are the most common parts that need to be designed, many variations may arise because of different situations, preferences, available skills, etc.

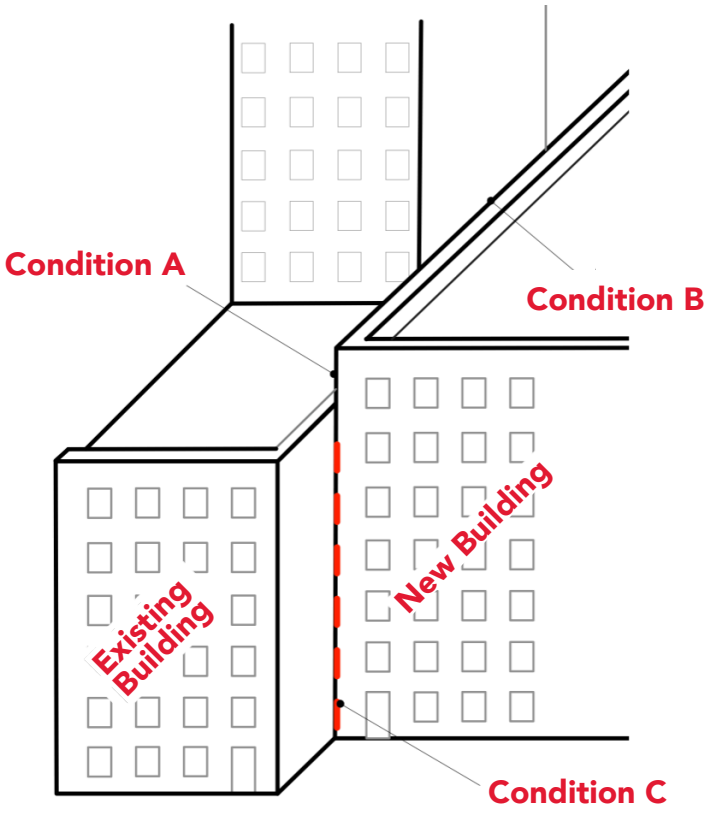


Figure 1: Multiple insulation scenarios in a zero lot-line situation between buildings

Insulating Blindside Walls

Zero lot line blindside insulated enclosures are a special case, because the process of construction severely limits access from the exterior, when it does not exclude it. Moreover, these walls must regularly meet stringent requirements such as fire-resistance ratings, sometimes in the range of 2 hours, and be airtight, water-resistant, and well thermally insulated.

From the perspective of providing good quality thermal control (without thermal bridges or air leaks) and durability (keeping structural components at room temperature), the best solution for all types of walls in all climate zones, is to locate all or most of the insulation on the exterior. Indeed, floor systems that penetrate and interrupt insulations layers are significant thermal bridges which can severely compromise the thermal performance. Hence, modern building codes increasingly require these thermal bridges be avoided or otherwise addressed, but to allow the use of continuous exterior insulation with these types of walls, different installation techniques are needed.

A very common type of zero lot line wall is constructed of concrete masonry units (CMU), on a frame of reinforced concrete or fire-protected steel, because of its excellent fire and sound resistance. Ideally, 2" to 4" (50 to 100 mm) of semi-rigid stone wool insulation boards (of approximately 4 lb/ft^3 (64 kg/m^3) density, such as ROCKWOOL Cavityrock®) would be installed on the exterior of the CMU and the supporting structural frame (if the CMU is not load bearing).

To accomplish this, it is necessary to attach the insulation on the exterior of the CMU from the interior. One method is to lay the block with joint reinforcement of the type designed for veneer cavity walls at 24" (610mm - 3 courses) intervals (Figure 2): the eyelet (shown on the right below) or the double wire (shown on the left) types are appropriate.

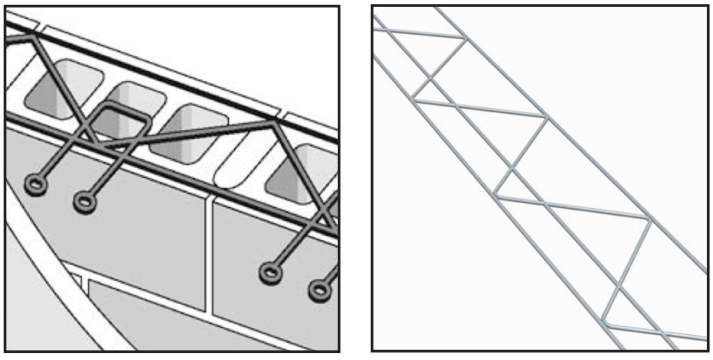


Figure 2: Examples of masonry joint reinforcement that can be used to hold exterior insulation

The eyelet or outer wire can extend past the exterior of the face by about 50 to 100% the thickness of the proposed insulation layer. Insulation board of 24" (610mm) width are then installed from the inside once one course of CMU is laid. Afterwards, when the third course is laid with the reinforcing wire, the lower insulation layer is pulled tight to the face of the CMU, and a 3-4" (76 to 102mm) long 16Ga. galvanized wire pushed through the eyelet half its length into the insulation layer (Figure 3). A minimum of two wire connectors, or one every 16" (406mm), whichever is greater, should be installed in each board. Then the process repeats: three courses of CMU installed, a board installed from the inside, pressed downward tightly so that it is impaled on the pins below.

In any type of enclosure wall, an air barrier layer is critical to limit the passage of smoke and odor transmission, as well as energy loss. In the zero lot line wall, the only practical solution with a CMU backup wall is to use a fully adhered, preferably fluid-applied, air barrier applied to the inside face of the CMU.

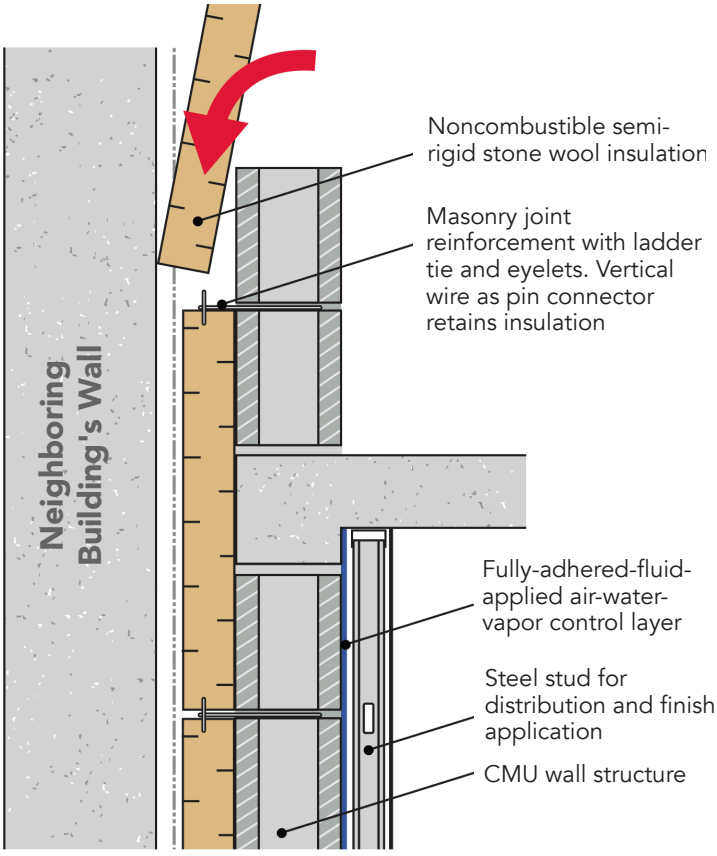


Figure 3: Installation technique for semi-rigid stone wool on the exterior of a zero lot line wall enclosure

To ensure continuity through the solid concrete slab (reinforced concrete is an air barrier, hollow core slabs must be grouted solid at the perimeter), the membrane should be lapped onto the concrete or sealed with an approved compatible mastic to complete the barrier.

Steel stud systems are commonly used for enclosures, but developing a zero lot line solution is much more complicated, because of the difficulty to provide continuity of the water and air control layers. A proposed example of an assembly is presented below showing some of the sealant details.

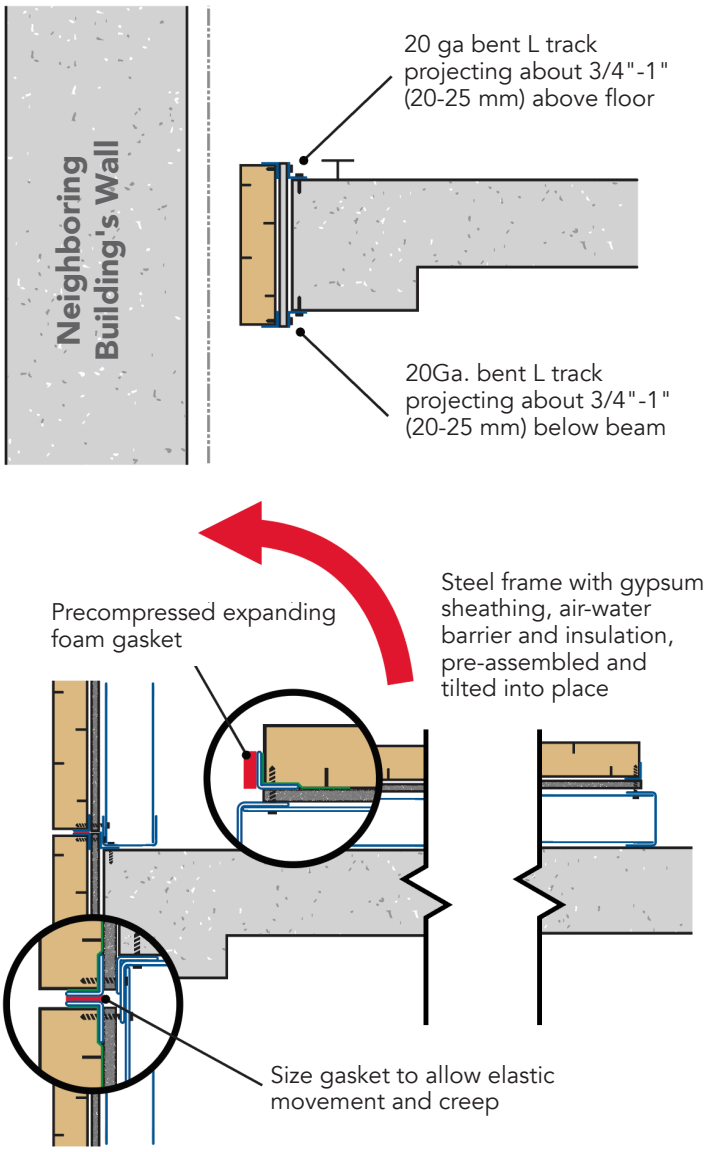


Figure 4: Details of a site-assembled zero lot line solution with a steel stud assembly

Prefabricated solutions have also been used to solve the zero lot line condition, but the challenge facing the use of prefabricated systems is having sufficient space to allow cranes to work within the available gap between the new and existing neighboring buildings.

One category of solution involves the prefabrication of enclosure wall panels that span from floor-to-floor and are installed from above. An example of such a system is single-wythe precast concrete. As is usual with this system, the panels are finished on the interior with ROCKWOOL insulation, steel stud framing and gypsum wall board. Firestopping is provided between floors. An important difference is that the joints must be sealed from the interior, and special care must be taken to design the system to allow access from the interior at the floor system: deep steel perimeter floor beams can make interior sealing particularly challenging.

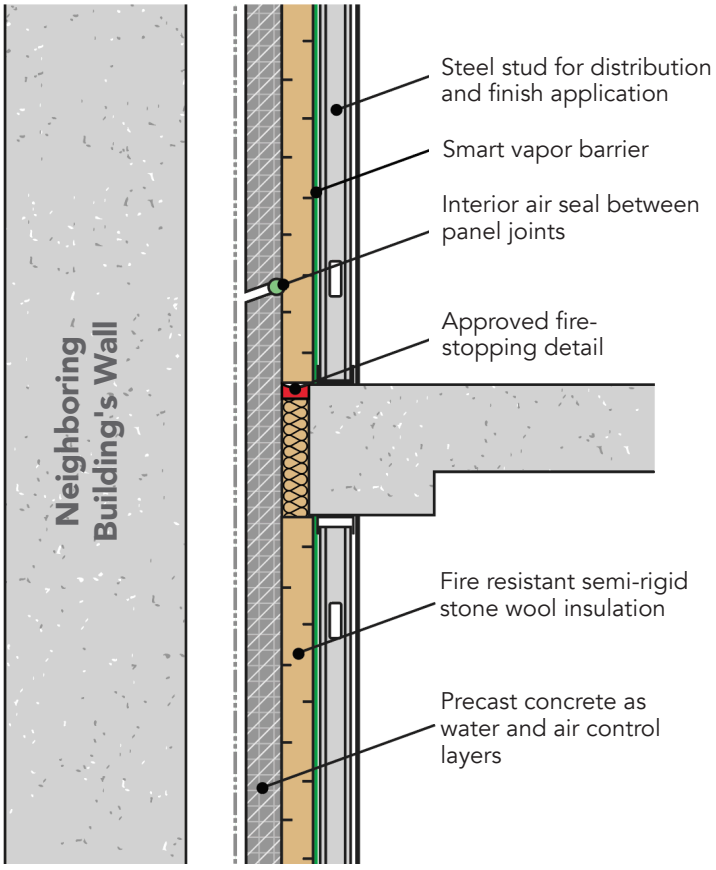


Figure 5: Pre-fabricated precast concrete panel used as a zero lot-line enclosure

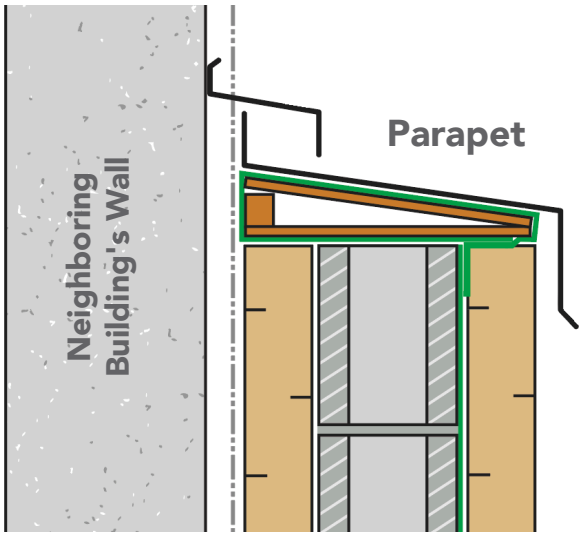
However, if sufficient room is available, precast concrete and Insulated Metal Panels (IMP) with noncombustible stone wool cores can perform well. These panelized systems will typically be air sealed at their joints from the interior, with proper shaping and gaskets used to manage rainwater at the exterior.

Perimeter Treatment

It is assumed that little (but not zero) water control is required in the drawings shown, as rainwater should be excluded from the wall by using a properly lapped parapet flashing and coping along the tops and sides of the gap. These perimeter details are also important to prevent the penetration of animals and wind-driven snow.

The precise detailing will usually depend on the available access to the existing building, both legal and practical. In all cases the transition details should allow for differential building settlement and movement.

Condition A



Condition B

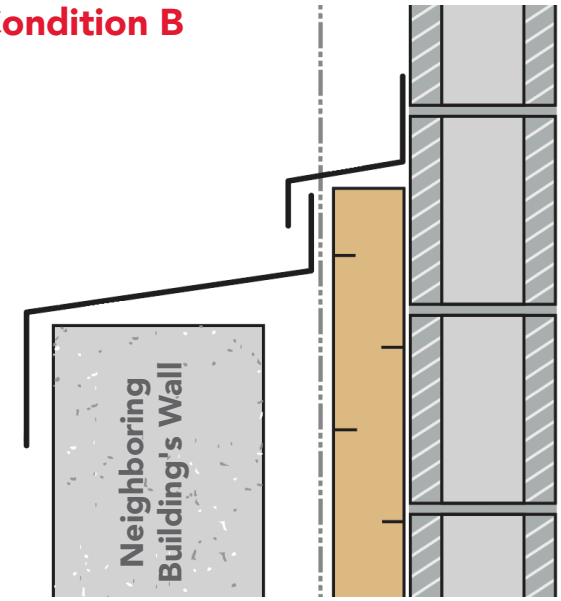


Figure 6: Rainwater control schematic examples (Condition A above and Condition B below) at a zero lot line condition between a new and existing building

Below Grade

The focus of this bulletin is above grade assemblies, but similar concepts apply below grade. In buildings with deep basements and complex waterproofing systems, insulation capable of constant water immersion will be needed. Shallow basements above the water table are best designed as drained enclosure systems. Stone wool insulation can be used as thermal insulation in these situations (Figure 7) when building next to existing construction. Both types of basement systems may use insulation inside of the structural wall in addition to continuous exterior insulation.

Figure 7: Stone wool insulation used at the transition from above-grade to below-grade enclosures

Summary

This bulletin has provided some background about the challenges of providing continuous insulation, as well as water and air control, in zero lot-line applications. The industry is rapidly developing assemblies and solutions to satisfy this emerging need, and it is hoped that the guidance provided here aids that outcome. As more solutions emerge, this bulletin will be updated and enriched.

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For more information about insulating movement joints with stone wool insulation, access **ROCKWOOL's Technical Bulletin** at rockwool.com.

To get in touch with the ROCKWOOL Technical Services team, visit **rockwool.com/north-america/contact/** or call at 1-877-823-9790

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