The Engineering Conflict: Thermal Performance vs. Mobile Connectivity

The Irish construction sector has undergone a radical transformation in recent years, driven by the Near Zero Energy Building (NZEB) standards. We have moved away from traditional cavity blocks to highly sophisticated, airtight building envelopes. While this is a triumph for energy conservation, it has created a significant challenge for telecommunications. In the industry, we refer to this as "building fabric attenuation." Essentially, the materials specified to keep heat inside are exceptionally effective at blocking Radio Frequency (RF) signals from entering. Smartsat connect is frequently engaged to engineer solutions where standard mobile coverage fails due to these construction methods.

To understand the mechanics of the problem, we must look at the specific materials used. The standard external wall in a modern development typically features high-density PIR (polyisocyanurate) insulation boards faced with composite aluminium foil. Aluminium is a highly conductive metal. When a building is wrapped in this material, it creates a conductive shield. RF signals, particularly the higher frequency bands used for 4G and 5G data (1800MHz and 2100MHz), are reflected by this surface.

The attenuation is further compounded by the glazing specifications. Modern triple-glazed units are heavy, but the glass itself is not the primary blocker. The issue lies with the Low-E (Low Emissivity) metal oxide coatings applied to the panes to reflect long-wave infrared radiation. These coatings can attenuate mobile signals by up to 30dB. In signal terms, a 3dB drop represents a halving of power. A 30dB drop is catastrophic, essentially eliminating any usable signal before it penetrates the glass.

Homeowners often attempt to mitigate this with consumer-grade mesh Wi-Fi systems to support Wi-Fi calling. However, this is a Voice over IP (VoIP) solution, not a cellular one. It is dependent on the stability of the fibre connection and introduces latency and packet loss issues, particularly when the network is under load from streaming or gaming. For a reliable, business-grade voice and data connection, the RF path must be physically restored.

The professional hardware solution involves the deployment of a ComReg-compliant **mobile phone signal booster** system. The installation follows a strict protocol. First, a site survey is conducted using a spectrum analyser to identify the serving cell tower and measure

the "donor" signal quality (Signal-to-Noise Ratio). A high-gain directional antenna is then mounted externally to capture this signal.

A low-loss coaxial cable (typically LMR-400 grade) is run from the external antenna into the building's communications hub. This cable feeds a digital repeater unit, which filters and amplifies the signal. Crucially, the repeater must be calibrated to provide enough gain to overcome the wall attenuation without causing oscillation (feedback) with the external network. Internal service antennas are then distributed to recreate the mobile cell within the thermal envelope. This approach effectively "pipes" the mobile network through the obstruction, ensuring consistent VoLTE performance and data throughput independent of the building's insulation.

Conclusion Signal loss in A-rated homes is a predictable outcome of building physics. It requires a hardware intervention that addresses the specific attenuation properties of modern materials. By implementing a dedicated repeater system, we can ensure that the building's digital infrastructure matches its thermal performance.

Call to Action For a technical assessment of your property's signal attenuation, contact the engineering team at Smartsat connect. https://www.smartsatconnect.ie/