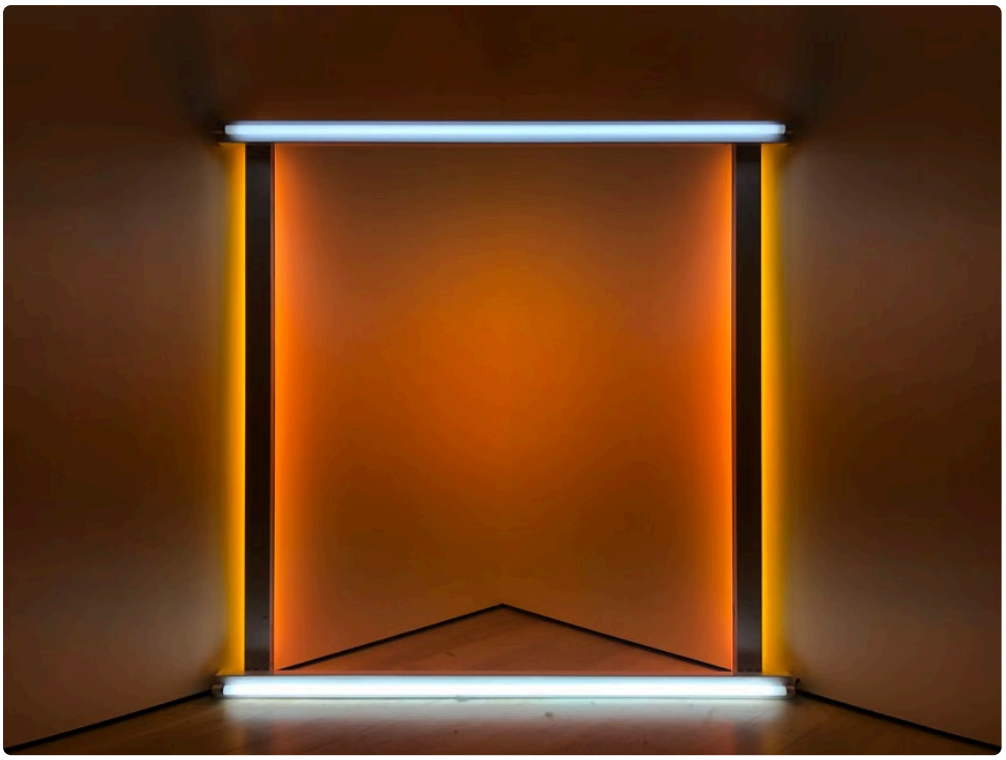
Designing buildings for the distinct challenges presented by Edinburgh's winter daylight requires balancing a multitude of factors — from managing low sun angles and short winter days to ensuring airtightness without sacrificing ventilation and indoor air quality. With 12 years of experience working on tenements and pre-war housing upgrades, I've learned it's these subtle balancing acts that can make or break comfort and health during our long, dark winters.

Understanding Edinburgh's Winter Daylight Context

At a latitude of approximately 56 degrees north, Edinburgh experiences quite short winter days, where daylight can last only around 6 hours during the darkest period. This has significant implications for designing suitable daylighting strategies:



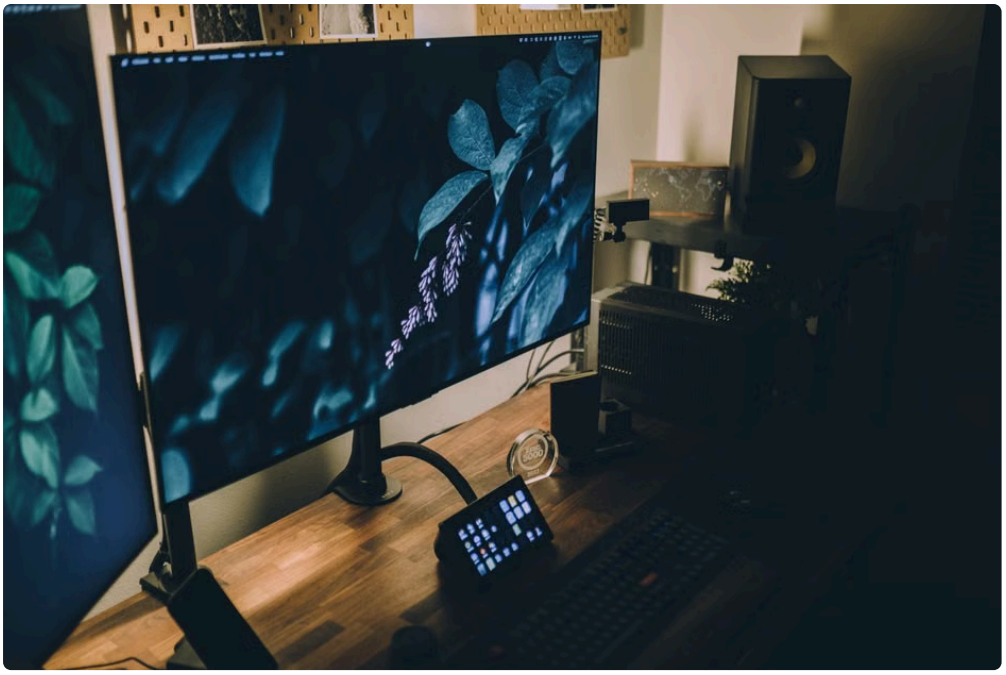
- **Diffuse North Light Planning:** As direct midday sunlight is often weak or absent, especially in winter, relying on diffuse north light becomes essential for steady, glare-free illumination.
- **Low Sun Angles:** When the sun is visible, it strikes at a low angle, meaning that overhangs, window reveals, and shading devices must be carefully designed to capture beneficial solar gain without unwanted glare or heat loss.
- **Short Winter Days:** The limited daylight calls for maximizing daylight penetration into main rooms to reduce artificial lighting loads, which is not only expensive but impacts wellbeing negatively.

Magnific, a local Edinburgh company specialising in natural lighting solutions, offers some excellent examples of well-considered window designs and light-optimising features suitable for these conditions (image credit: Magnific).

Daylight and Ventilation: Why Both Matter

While daylight is crucial for human health and comfort during dark winters, ventilation and indoor air quality are even more regulated and consequential. UK Government-approved guidance, such as Approved Document F, sets

minimum requirements to protect occupants from stale air, excess moisture, and pollutants.



Ventilation and Indoor Air Quality: The Most Regulated Health Factor

Ventilation prevents the buildup of indoor pollutants, including carbon dioxide (CO2), which is often used as a proxy measure of how well a space is ventilated. In retrofit projects especially, managing airtightness without losing essential ventilation is a careful balance.

- **CO2 as a Proxy for Ventilation Adequacy:** Using cheap indoor air monitors to track CO2 levels can provide real-time feedback, allowing occupants and retrofit coordinators to assess whether ventilation is adequate.
- **Approved Document F vs Scottish Building Standards:** While the principles align closely—both emphasise fresh air supply rates and moisture control—the numerical ventilation rates differ slightly between the UK Government regulations (gov.uk – Approved Document F page) and Scotland's own Building Standards.
- **Airtightness vs Accidental Ventilation:** Improving airtightness in older buildings is key for energy efficiency and thermal comfort but must not come at the cost of unplanned, uncontrolled ventilation gaps, which often lead to moisture ingress.

Moisture, Condensation, and Mould: Symptoms of Ventilation Gaps

In Edinburgh's cold and damp winters, I've seen many retrofit projects where improved insulation was thrown in without addressing ventilation, leading to problematic moisture build-up. This results in condensation and mould, not only degrading the building fabric but harming occupant health.

Symptom Cause Remedy Surface condensation on windows Cold surfaces and high indoor moisture levels from activities like cooking and showering Improve ventilation rates—extractor fans, trickle vents; consider double/ triple glazing with low U-values Mould growth in corners or behind furniture Inadequate air circulation and persistent moisture accumulation Address ventilation gaps, avoid blocking vents, and increase background air exchange Damp patches inside wall cavities Air leaks driving moist air into insulation cavities and condensing on colder surfaces Airseal properly during retrofit; use vapour control layers; continuous ventilation strategy

Practical Steps for Daylight and Ventilation Design in Edinburgh Winters

Having coordinated numerous retrofit projects, I always begin by asking: "Which way do the main rooms face?" because orientation profoundly affects daylight availability and solar gain potential.

1. **Maximise South and East-Facing Windows:** These orientations capture the best winter sun. Consider window designs that allow low-angle sun to penetrate deep into rooms, such as taller windows or sidelights.
2. **Use Diffuse North Light Intelligently:** For north-facing rooms, optimise window area and use light shelves or reflective internal surfaces to bounce in more diffuse light.

   how to design for daylight
3. **Balance Airtightness with Mechanical Ventilation:** Upgrade airtightness to reduce heat loss but control ventilation through well-designed extract fans or MVHR (Mechanical Ventilation with Heat Recovery) systems—avoid relying on accidental ventilation gaps.
4. **Monitor Indoor Air Quality Post-Occupancy:** Simple, cheap indoor air monitors that track CO2 allow forensic analysis to catch ventilation problems early.
5. **Consider Occupant Behaviour and Education:** For example, Releaf's THC oil education page highlights how indoor air pollutants can impact health, making occupant awareness critical to maintaining good air quality.

Defining 'Adequate Ventilation' for Edinburgh's Winter Homes

I will often stop a meeting to clarify what 'adequate ventilation' actually means, because it's a fundamental yet misunderstood concept. In essence, it means:

- Maintaining indoor CO2 levels below 1000 ppm as a general target for comfort and cognitive function.
- Ensuring fresh air supply rates meet or exceed the prescribed rates from Approved Document F or Scottish Building Standards—in units of litres per second per person or per square metre.
- Preventing excessive moisture buildup to avoid condensation, mould, and damage to the building fabric.
- Balancing ventilation with winter thermal comfort to avoid cold drafts or excessive heat loss.

Good ventilation design also means recognising that air quality affects occupant wellbeing directly. However, I'm wary of overly enthusiastic claims that a building "treats" illnesses purely through design. Buildings can support health by maintaining good air quality and daylight but are not cures in themselves.

Conclusion: Embrace the Complexities of Winter Daylight and Air Quality at Edinburgh Latitude

Designing for Edinburgh's winter daylight is an exercise in balancing solar geometry, airtightness, ventilation, and occupant needs. Working with companies like Magnific who understand natural lighting intricacies, following UK Government guidance, and leveraging practical tools like CO2 monitors all contribute to better performance.

Above all, retrofit projects must avoid the trap of improving insulation without addressing ventilation—because moisture and mould problems are not just building defects; they are signals that indoor environmental health is compromised. With careful daylight planning, thoughtful ventilation design, and rigorous post-occupancy evaluation, winter living in Edinburgh's pre-war and tenement housing stock can be warm, bright, and healthy.