

GLARE AND REFLECTIONS



Quantifying buildings' interaction with the sun to ensure efficiency, comfort and safety

Reflections from buildings have been blamed for blinding pilots, “melting” cars and even burning people. No design firm wants their next building to be known as a “death ray” or to create a safety hazard for vehicles or aircraft. However, reflections can also create other, less dramatic but equally consequential headaches.



systems or other reflective building elements confident that you will not create issues for others or experience problems within your own buildings.

Glare and reflections can cause automated daylight controls to function poorly, create unforeseen visual nuisances and even increase cooling loads in neighboring buildings. When considering a project in context, it's important think about not just how reflections from your building can affect your neighbors, but also how they can affect you. This step is particularly critical for multi-tower developments, where inter-tower effects can be significant and severe.

Our Service

We help you understand when, and how often direct and reflected sunlight can impact a space, either within or outside your project. With this information, you can move ahead with highly glazed façades, photovoltaic

Our custom tool for simulating the sun, called Eclipse, gives fast and accurate estimates of glare impacts and risk potential. Testing shows that Eclipse provides high-quality engineering analysis faster than other comparable tools, and we continually benchmark it against real-world data. Eclipse results are accurate to the minute and include not only time and place but also, crucially, intensity. We can also pair these estimates with other services, such as specialized field measurements of existing glare impacts to provide additional context for our findings. Where mitigation is needed, we equip you with easy-to-use data that will help you envision, justify and correctly implement the appropriate changes to your building.

We are one of the most skilled and experienced firms working on quantifying and mitigating the impacts of glare. We've worked on dozens of projects around the world, from simple nuisance glare to potential “death-rays.” Our specialists have helped define criteria for reflected light and heat in the urban context, advised city planning teams on establishing glare criteria and regularly educate on the topic. We also have experience in forensically analyzing existing glare issues. This kind of analysis may include both onsite measurements and simulations to identify sources and mitigation solutions.

RWDI is a valuable partner to clients seeking to...

Explore Innovations

- Design complex façade shapes while avoiding reflectivity issues
- Use high-performance glazing effectively
- Create iconic buildings by harnessing reflections to safely provide light or energy

Create Opportunities

- Build high-value tower developments by avoiding nuisance glare and heat gains
- Design high-reflectivity façades beyond local codes by demonstrating low impact
- Choose optimized façade-mounted shading for effective glare control, inside and out, at least cost

Meet Challenges

- Address complaints and concerns with facts and data
- Forensically analyze existing problems
- Mitigate problems with confidence that solutions will be effective

Fulfill Expectations

- Document compliance with municipal regulations
- Protect aircraft and airport staff from glare coming from solar panels and buildings
- Create masterplans that anticipate glare issues



In evaluating glare, and in the full range of our solar services, we may work closely with equally experienced colleagues throughout the firm to consider thermal loads, internal airflow, wind loading, snow and ice buildup and aeroacoustics. This collaboration ensures that glare solutions are considered holistically and do not cause unanticipated problems elsewhere in the project.

How we work

RWDI has been a pioneer in determining acceptable reflection criteria for both thermal and visual comfort as well as human safety. Our in-house ray-tracing tool Eclipse calculates solar reflection intensities, frequencies and durations which when combined with our criteria, allows us to quantify the need for mitigation and provide guidance on the form that mitigation could take. Our onsite physical testing capabilities allow us to verify both the modeling results and the effectiveness of mitigation.

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Eclipse provides accurate minute-by-minute simulation of reflections. It allows for even the smallest details of the reflecting buildings to be included and provides easy-to-understand graphical results describing the glare potential for a project. Our simulation approach has been published in peer-reviewed scientific journals and conferences, and has been used successfully across every continent save Antarctica.



Our techniques are robust and scalable. We can investigate the impact of a single building in isolation or the cumulative effect of multiple buildings within a development or neighborhood. The latter capability is key to ensuring all units in a multi-tower development have good access to daylight and are not overexposed to nuisance glare or heat gains. And we can do all of this at time scales as short as a minute and—by leveraging any available ambient solar data to investigate long term impacts—as long as decades.



Our reflection results can be paired with other analyses in various ways. For example, we may compute energy potential for solar energy systems, quantify shadows or use computational fluid dynamics (CFD) to check how reflections impact thermal comfort and internal heat gains. Our custom tools also allow us to easily extend a reflection analysis to also look at a range of additional solar effects. Thus, we can provide a holistic understanding of how a new or existing building interacts with the sun and its neighbors.

With this deep understanding of how a design will interact with the sun, the design team can quickly and accurately quantify impacts and assess the need for and effectiveness of mitigation measures.

Holistic Analysis

- Reflected sunlight
- Direct sunlight
- Human thermal comfort
- Heat loads
- Interior daylighting
- Solar energy viability
- Shadowing

Applications at All Scales

- Individual photovoltaic (PV) cells
- Building lobbies
- Stadia
- Urban centers