# THE COST OF TRANSPARENCY: ACOUSTIC, FINANCIAL AND SUSTAINABILITY CONSIDERATIONS FOR GLAZED OFFICE PARTITIONS

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## 1 Introduction

Based on Toronto and Montreal office fit-outs with glazed storefronts, this paper considers the cost of transparency for social, financial and environmental outcomes. Although glazing has benefits for natural light and inclusivity, the acoustic performance, financial cost and sustainability considerations may compete and even conflict. Balancing these costs is important, if challenging, in the context of UN Sustainable Development Goals for infrastructure, cities, responsible production and climate action.

The office has an inescapable relationship with glazing, from the earliest glass curtainwall, Oriel Chambers (Liverpool, 1864) to the modernist towers of the 1950s. Some modernist offices also featured internal glazed partitions (Figure 1). Buildings like Lever House (1952) and the Seagram Building (1958) began an era of tall glass structures that is still with us and was made possible by innovations in façade engineering, building ventilation systems, and float glass manufacturing.

The history of the office is also one of social change, from ideas of Taylorist efficiency to 1960s collaborative landscapes (*Bürolandschaften*) that demoted the private office but led to ranks of cubicles [1]. The latest social change emerged from the Covid-19 pandemic. Of Canadian workers in professional services in 2024, 60-72% come into the office some or all the time, with 21-27% working hybrid [2]. However, a 2023 Gensler survey found that workers would prefer to spend more time in the office: 63% rather than the 48% currently spent. Focus time was the top reason for coming in, with socializing coming second [3]. The ability to focus presupposes an environment with the right conditions, including acoustic, for paying sustained attention to a task.

## 2 Sound Isolation & Speech Privacy

Retrofit recommendations at an existing multi-floor Toronto office were driven by concerns with speech privacy between private offices as well as between offices and open office areas. The tower is characterized by perimeter offices with glazed storefronts and large open office areas. In addition to a poorly performing partition-to-mullion condition in perimeter offices, measured data show poor sound isolation between rooms with glazed storefronts and open office areas. The storefront system uses single-glazed 12 mm tempered glass, with light aluminium framing to underside of ceiling, with some jamb joints having seals only.

**Figure 1:** Connecticut General Headquarters, 1957 (Architects: Skidmore, Owings & Merrill, reproduced from [1])

The Speech Privacy Class (SPC) metric combines partition sound isolation with the receiving space background level to indicate likely performance. An SPC of 70 is recommended to achieve minimal speech privacy; 85 or higher is needed for confidential conversations [4]. Table 1 shows results for two representative rooms. Figure 2 shows the custom system, with examples of typical gaps that reduce acoustic performance.

**Table 1:** Sound Isolation and Speech Privacy Class, Toronto office

| Src Rm / Partition / Rec Rm | ASTC | SPC* |
|---|---|---|
| Conference / glazed partition, double sliding doors / Corridor | 18 | 47 |
| Conference / fixed glazed partition / Corridor nr reception | 24 | 55 |
| Meeting room / glazed partition, single sliding door / Open area | 26 | 59 |

** Approximate SPC rating*

These results indicate a low level of speech privacy and correlate with subjective experience. Staff have reported distracting conversations and discussions being audible outside rooms. This issue becomes more significant as working patterns have changed since Covid-19, with possible implications for productivity and time spent in the office.

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**Figure 2:** Custom glazed storefront system with typical seals

## 3 Financial Costs

The custom glazing at the Toronto office tower was partly driven by cost considerations. A proprietary system used on one floor was estimated to cost 25% to 40% more than the custom system. From a recent project in Montreal, glazed systems from two well-known manufacturers were quoted at $328/m for a double-glazed 12/12 mm laminated system with STC45 rating; and at $378/m for a double-glazed 10/12 mm tempered system with STC43 rating (both systems for 2.6 m height). Multiplied across several office floors, the cost of such systems can substantial, particularly if office space is not fully occupied across the working week. Proprietary systems can offer better sound isolation, but cost is typically an important driver for the client and may determine the storefront system selected.

## 4 Embodied Carbon Costs

The acoustician's role often ends with a specification that meets the acoustic criteria and project budget. By thinking more broadly, we can also contribute to efforts to reduce embodied carbon through informed materials selection. Glass is an energy-intensive material to produce. Per unit area, 6mm glass can require seven times the embodied carbon of one layer of 5/8" type X gypsum. Arup studied the Global Warming Potential (GWP) of four typical storefront systems and found that glazing is the greatest contributor to carbon emissions among all the storefront materials (Figure 3). Using these GWP values, the carbon cost of the glazing in the Toronto storefronts can be estimated at 56,800 kg $CO_2$eq, equivalent to driving the Trans-Canada Highway from St John's to Victoria 33 times in a gasoline-powered car.

Reducing the carbon cost is theoretically possible by reusing or recycling the glass at end-of-life. In practice, such closed-loop recycling is challenging because laminated and fritted glass is limited to downcycling into low-value aggregate, and most demolished storefronts still go to landfill [5]. There is also potential to reduce embodied carbon by specifying glass that is not perfectly transparent, but there is not yet enough market demand to make such glass commercially viable.

## 5 Conclusion : Balancing Costs

The aesthetics of perfectly transparent glass arose with modernism, made possible by innovations in float glass manufacture. This aesthetic underpins current architectural practice. However, the costs of glazing – reduced acoustic performance, high project cost and significant embodied carbon – require rethinking how we design with glass. First, early involvement in space planning is beneficial, allowing a collaborative solution that may require less glazing to achieve the

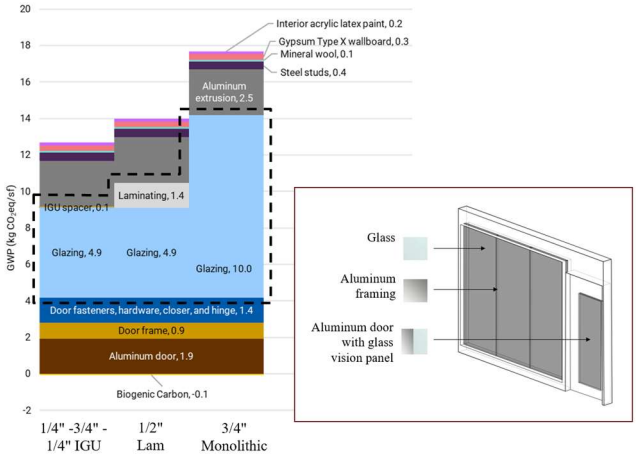


**Figure 3:** GWP for typical aluminum storefront with three glazing buildups with ~STC38 rating

design outcomes, including acoustic performance. Second, acousticians could work with architects and designers to create a new glass aesthetic that better relates a partition's transparency to its function, providing varying degrees of transparency depending on the need for visual connection or privacy. The answer about how to balance the multiple costs of transparency depends on the project, but asking questions is a good place to start.

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