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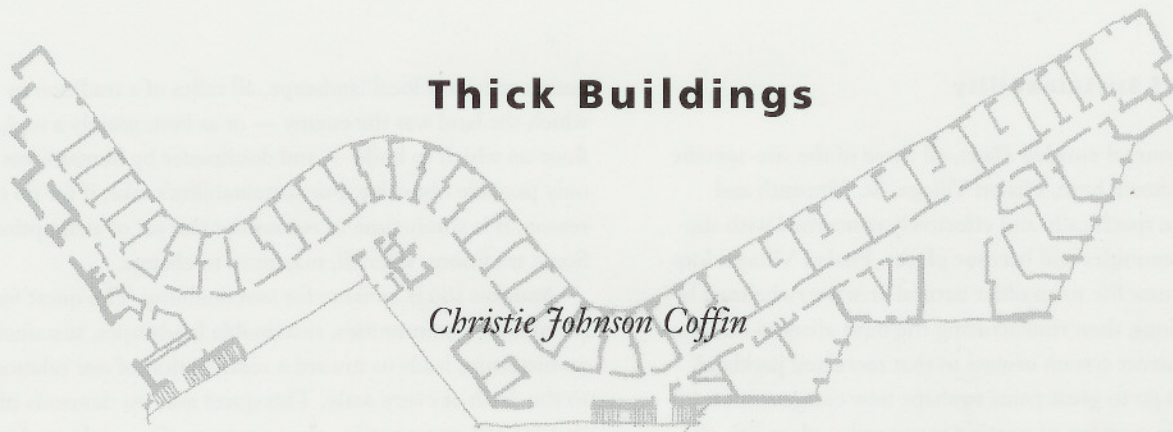
Author

Coffin, Christie Johnson

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Thick Buildings

Christie Johnson Coffin

The idea of tracts of windowless indoor space has troubled me for years. I often ask people why they assume that windows are a luxury and not a necessity in a workplace. The most heartbreaking answer came from a professor at a major university, who told me that architects had taught him to live without windows.

As an architect, I direct large hospital and laboratory projects. A portion of my effort has been devoted to rethinking the design to accommodate the inhabitants and let light in. At a hospital design meeting I proudly presented a plan that managed to daylight a basement for the medical records department, thus providing natural light at the records clerks' work desks. A nurse administrator asked me, "Why would you want them to have windows?"

I have always been interested in daylight. As an architect I argue for narrow buildings with access to natural light, fresh air and view; yet large, contemporary buildings are often planned with the assumption that windows are a luxury. I outline here some questions raised by the construction of large, window-poor buildings, which I will call thick buildings.

Given a choice, almost all of us would select offices with operable windows for our own use. Yet since the development of mechanical heating, ventilating and cooling systems earlier in the twentieth century, we have been content to design buildings that ignore people's heliotropic tendencies.

Thick buildings, it is claimed, provide improved flexibility, economy and communication. Flexibility is gained, it is said, by creating large featureless plains of space that can be portioned out in small allotments as needed.

Limiting the quantity of building surface in contact with the weather may reduce construction costs, conserve energy and cut maintenance expenses. There are fewer windows to wash or clothe with sun control devices.

Thick buildings may also result from an overemphasis on the importance of internal proximity within modern organizations. In the last 20 or 30 years, design programs have grown from simple space lists to full function-

al specifications, including relationships among departments and spaces. Compactness increases the number of people within hailing distance of any person's desk. If space continues unimpeded for hundreds of feet, many differently shaped departments can be tessellated on the same floor plane.

In the U.S., we leave the question of thick or thin to building owners and their advisors to solve. U.S. codes require operable windows for habitable rooms within residences. This often excludes kitchens and bathrooms and permits daylighting through adjacent spaces for dining or sitting areas. Within hospitals and other residential institutions windows are required only in bedrooms. In recent decades, intensive care bedrooms have been included in this requirement. Labor and delivery rooms, examination and treatment rooms, and surgical recovery rooms are permitted to be windowless, despite research indicating more rapid recovery in rooms with windows.¹

Major U.S. codes, such as the Uniform Building Code (International Conference of Building Officials), and the BOCA National Code (Building Officials and Codes Administrators International, Inc.), commonly permit either windows or artificial illumination and ventilation for all non-residential uses. Windowless schools were popular briefly in the 1960s, especially with



(Opposite page) Baker House. Design by Alvar Aalto. (Christie Johnson Coffin)

(Left and below) An inventively thin building in Amsterdam: Nederlandsche Middenstandsbank. Ton Alberts and Max von Huut, designers. (Photo: Rocky Mountain Institute; drawing: Christie Johnson Coffin)

authoritarian teachers. Even now there is no daylighting requirement for U.S. schools or workplaces. Daylighting is seen as an amenity, but not required for public health and safety.

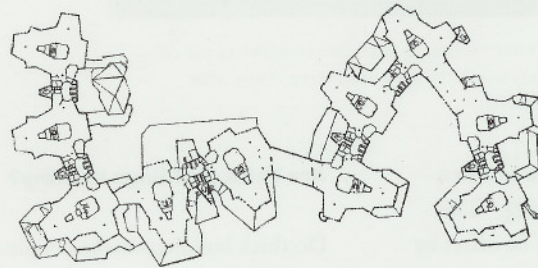
Europeans have taken a stronger stance on workplace windows. In Germany, windows are expected near workstations. In Finland, where at midwinter the few daylight hours occur entirely during the work day, daylighting is a legal requirement in workplaces. The Netherlands also requires windows in workplaces. Indeed, a further Dutch requirement prevents the use of mechanical air conditioning in new structures unless required by machinery or processes. In the Netherlands, bad building design is not a justification for air conditioning.

With this in mind, should we reconsider U.S. practices and standards?

Are Thick Buildings Economical?

Building economics is a crucial determinant of building form. While thick buildings may be less expensive in the first instance, the economics of bulk is often a limited calculation that does not account for the full range of costs, short-term and long-term, monetary and human, that building forms affect.

Mechanical engineers often speak of the energy economies possible in thick buildings. One referred to a



building with four sides of floor-to-ceiling glass walls. In this case, half-silvered, black-tinted glass reduced the heat gain and extra artificial illumination was added to make up for the loss of daylight. The reported energy conservation effort was heroic, the engineer justly proud. He enjoyed the challenge of producing complex systems to solve the problems posed by the thick form and the large quantities of unprotected glazing.

Yet, when asked, this same engineer speculated that, except in extreme climates like Siberia and Zanzibar, high-perimeter, daylighted buildings may require less energy to run. Daylighting can save electrical costs. Artificial lighting may account for one third of the energy used in a workplace, not to mention increased air conditioning energy needed to remove the heat generated by lights, both winter and summer. In daylighted buildings, external sun control

devices and landscaping can mitigate unwanted heat gain from windows.

Simpler heating, ventilating and cooling systems may mitigate the costs added by increased building perimeter. Systems worth considering to save first costs and energy include four-pipe radiators with thermostats, operable windows and ceiling fans. Many passive heating and cooling approaches may be practical only for thin buildings, for example, trombe walls and night sky cooling. Individuals with access to operable windows and thermostats report comfort in a wider temperature range, thereby effecting further energy savings. In some cases, mechanical cooling may be eliminated altogether.

Preliminary computer modeling of energy use versus building mass by Bob Rundquist, developer of BEEM software, uses weather tapes for Minneapolis, Miami and New York. Early results indicate only a minor increment of added energy cost as building shape



San Francisco's Victorian rowhouse, a quintessential type of thin building, has demonstrated its adaptability over the years. (Christie Johnson Coffin)

varies from a massive square to a slender shape with full daylighting.² This modest cost differential can be offset by a number of features that have a more pronounced effect in thin buildings: solar orientation, exterior sunshading, natural ventilation, passive solar heating and cooling, wider comfort range. Indeed, rental values increase for space with windows. Costs may not play as large a part as suspected.

Sustainable architecture advocates point to examples like the 1987 Amsterdam headquarters of the Nederlandse Middenstandsbank (NMB), designed by Ton Alberts and Max von Huut. This narrow, many winged, six-to-nine-story building houses 2,400 employees in 528,000 square feet. A podium accommodates parking and meeting rooms. No desk is further than 23 feet from a window. Energy use is one fifth that of a nearby contemporary bank building. Extra construction costs estimated at \$700,000 have resulted in annual energy savings estimated at \$2.5 million.³

Are Thick Buildings Healthy?

Do thick buildings make people sick? As Hal Levin and Kevin Teichman point out, indoor air quality "has become a major concern, because people spend up to 90 per cent of their time indoors, where pollutant levels frequently exceed those outdoors."⁴ Some threats to health, like Legionnaire's disease, developed with artificial ventilation. Other potential threats include secondhand smoke and the use of building products that emit everything from offensive odor to irritants, systemic toxins, carcinogens, and teratogens.

Indoor air pollution can result in a significant increase in sick leave and reduction in productivity. Costs to building owners have included monetary settlements to affected building users, as well as renovation. The most serious cases, such as the Terrasses de la Chaudiere near Ottawa, have been thick, sealed buildings with reduced air changes. In a British study on building sickness the five healthiest buildings had operable windows and a high proportion of one- or two-person office space.⁵

Indoor air quality is rarely a serious question in narrow buildings with smaller spaces and operable windows.

People who work in thick buildings often report that they endure rather than enjoy the arrangement; they describe feelings of isolation and oppression. Again the economic and social benefits of the new NMB Bank building are worth citing. Absenteeism is down. Workers' blood pressures have gone down. The employees have achieved remarkable productivity since moving in. The results exceed the expected Hawthorne effect, the short-term improvement often encountered in work groups who receive even random attention and changes in their workplace. NMB is perceived to be progressive and has experienced a major growth in business. How important was building configuration in the health and economic changes at NMB?⁶

Are Thick Buildings Recyclable?

American economic practice is to view buildings as short-term investments to be depreciated and sold, a practice that results from tax policies, not from regarding buildings as embodiments of materials and energy and as objects of use. Far from designing for significant long term savings, we have come to treat buildings and their interior architecture as disposable. A strong expectation is that commercial buildings will be gutted and remodelled several times over their economic lives.

The dynamics might change if there were more incentive to motivate better use of building resources. Germany has enacted "cradle-to-grave legislation" on manufactured products like television sets and refrigerators; manufacturers are required to recycle or otherwise safely dispose of obsolete equipment. A true test of sustainability in architecture

would emerge if buildings were covered by similar legislation.

As these codes and standards change future generations may not seek out thick buildings to sustain their needs. I haven't found any study that tracks the rate of renovation and reuse as a function of building massing, but I expect that thick buildings and the energy embodied in them may not be as easily recycled as extensively daylighted buildings.

I often see windowed buildings such as the Massachusetts Institute of Technology's main building complex reused with a minimum of adaptation. Freeman and Bosworth's complex has survived 78 years of use with minimal renovations. On either side of the main corridor are rooms with operable windows and, perhaps, a view to the river. Many rooms are generously sized; offices that can house whole seminars or serve as incubator spaces for new programs. Newer MIT buildings, thick ones, have been extensively renovated.⁷

What will we make of the thick office buildings lying vacant in many urban centers? What new uses can we find for surplus, often thick, urban hospitals? This is not an idle question in California, where it is estimated that we have twice as many hospitals as we need, and more and more medical care is provided outside of hospitals.

One of my fantasies is the wholesale recycling of an urban hospital. The process would start, as it has with many successful warehouse and factory conversions, by creating enormous holes in the structure for multilevel courtyards and gardens. The complex could mix commercial, residential and civic uses or could house a new community college complete with realistic training facilities for fields such as health care, warehousing, office and computer work, and maintenance of complex building sys-

tems. It would be expensive, but could be part of a process that brings health, life and greater safety into urban precincts dominated by secured health care building complexes..

Perhaps we can learn from the survivors, such as the temporary structures found at most universities. At the University of California, Berkeley, several clapboard buildings, narrow boxes with a gabled roofs, have long refused to die. All rooms were equally simple boxes with tall double-hung, operable windows. They were economically built during World War II for temporary use. Over the years, with minimum remodeling, they housed many departments, agencies and programs; often serving as incubator space for new programs, such as women's studies or peer counseling. Lack of preciousness made reuse inexpensive. The rules were few. The inhabitants enjoyed the availability of space, a garden setting, windows that opened, and doors that locked. They served many well by their adaptability.

Victorian townhouses, purposely built for extended Victorian families

with servants, have demonstrated an uncanny ability to be reused with relatively little effort. With minimal changes they have been transformed to accommodate straightened Edwardian families with boarders and day servants, clusters of flats and bed sitters, stylishly unconventional graphic designers, conservative legal offices, a bookstore/coffee house, or even a small hotel. Many of these changes occur graciously through reinterpretation with little more than a coat of paint. Decorative features, moldings and good finishes encourage maintaining the integrity of the original construction. Generously sized, well-proportioned, daylighted spaces with privacy are remarkably versatile.

Who Benefits from Large, Compact Configurations?

What effect do thick, internalized structures have on our communities and our social structure? While building form alone does not determine organizational behavior, it can mediate, enable or obstruct it.

Kantoorgebouw Centraal Beheer, a Dutch insurance company building, includes features like skylights to bring sunlight into its interior. Herman Hertzberger, designer. (Christie Johnson Coffin)



Inhabitants of thick, inward-looking buildings are isolated and often secured from the surrounding community. A large complex organization, such as a hospital, corporate offices or university department, can achieve partial self-sufficiency within a single building.

Hospital architects will feel at home with arguments for thick buildings designed to improve internal communication. Functional specifications for hospitals commonly require everything to be near everything else to reduce response time in an emergency and to cut staffing costs. Yet, in recent years, with thicker and thicker hospitals, both staffing costs and response time have tended to increase. When I fell ill in Tanzania, a small clinic with few resources provided me with initial examination, blood drawing, lab test, consultation, prescription and dispensing of appropriate pharmaceuticals all within an hour.

Maze-like hospital megastructures are stressful to patients, visitors and staff. How critical is this stress? Is it naive to think that daylighted buildings interlaced with courtyards, gardens and views into the community would better serve the needs of health?

Also, narrow buildings may enhance connections that help make communities function. Working in a slender building, one has a view of other people — people not in the same company, institution or profession, people who constitute a diverse social and cultural milieu. The presence of more windows, doors and thus eyes on the street may deter crime and encourage increased, safe use of open spaces and streets. These relationships are as important as the intra-organizational connections thought to be fostered by thick buildings.

The notion that narrow, daylighted buildings reduce absenteeism and reinforce overall worker self-esteem and productivity is not far fetched, but it is difficult to establish. Objective measures of productivity are unavailable for most pursuits. There is little in the research to strongly support or dispute this idea.⁸ Scarcity of windows may support gender and race bias, through the use of windows as a status symbol. Executives in their rooms with views ringing a windowless central pool of clerks is a familiar representation of the spatial caste system.⁹ The social price of thick buildings must be questioned.

Thin Buildings that Work

An employer wishes to house a work group of hundreds of employees. This employer wants the building to be both reasonable in terms of normal market prices for space and sustainable in the long run. She is concerned about her employees and wishes to sustain their long term health, productivity and contribution to the company and the community, while sustaining long-term energy savings of all sorts (initial in terms of the energy embodied in the building, and ongoing in terms of heating, cooling, lighting, maintenance, and remodeling). Would her company be best served by a thick building or a daylighted building?

In thinking through an answer consider carefully the following: Most employees given the choice will choose daylighted space, and not only for the increased prestige. Natural ventilation and daylighting will continue to be virtually free and other sources of energy will likely become more expensive. (A building width four times the window header height would allow daylighting throughout.) Most indoor air quality problems have been experienced in



Offices, lobbies and stairways inside the NMB building all have access to natural light. (Rocky Mountain Institute)



thick buildings. Many employers during the current recession have been faced with large increments of window-poor space that are difficult to sub-lease as an organization shrinks.

Consider carefully before carting that narrow, old building off to landfill and replacing it with a new, thick one. It may be that for the moment all we can back up with hard data is that the windows at worst won't hurt and that thick buildings might. I am on the side of doing building users no harm.

Notes

1. Roger S. Ulrich, "View Through a Window May Influence Recovery from Surgery," *Science* 224 (27 April 1984): 420-421.
2. Christie Coffin and Bob Rundquist are working on an article that advances a simple model showing how energy use varies as massing varies.
3. William Browning, "NMB Bank Headquarters: The Impressive Performance of a Green Building," *Urban Land* (June 1992): 23-25.
4. Hal Levin and Kevin Teichman, "Indoor Air Quality — for Architects," *Progressive Architecture* (March, 1991).
5. S. Wilson and A. Hedge, *The Office Environment Survey: A Study of Building Sickness* (London: Building Use Studies Ltd., 1987).
6. Karl H. Maret, "Working with Light," *In Context* (Spring, 1993).
7. Fred Hapgood, *Up the Infinite Corridor* (New York: Addison-Wesley, 1993).
8. J. C. Vischer, "The Effects of Daylighting on Occupant Behavior in Buildings, New Directions for Research," in E. Bales and R. McCluney (eds.) *1986 International Daylighting Conference, Proceedings II* (ASHRAE, 1989).
9. Leslie Kanes Weisman, *Discrimination by Design* (Chicago: University of Illinois Press: 1992).



The Bateson Building, in Sacramento, is a thin building that surrounds an atrium. (Christie Johnson Coffin)