

# Popular Building Science?

D  
AN  
IELS

Dr. Ted Kesik, P.Eng.  
Professor of Building Science

U  
OF  
T

January 2019

When I have been asked why I chose the name Popular Building Science for the website, I tell people I can answer but they must be patient because it is a long story. To those who are willing to endure my diatribe, I begin by explaining that building science is a very broad field that intersects with applied science, engineering, architecture and the health sciences. At its core, building science seeks to help deliver buildings that are resilient, efficient, sustainable and promote occupant well-being. But it also looks at how to rehabilitate the existing buildings that are underperforming so that they can reduce their carbon footprints, thus protecting our natural world while providing healthier indoor environments and extending the useful service life of buildings. And building science is also interested in the bigger picture that involves not just a single building, but entire communities and urban regions in terms of their metabolism. In the 21<sup>st</sup> century, building science concerns itself with a spectrum that ranges from nanotechnology to entire cities and regions.

But it is not popular. By that I mean, “*intended for or suited to the taste, understanding, or means of the general public rather than specialists or intellectuals.*” As someone who has been teaching building science to architects for over 30 years, and despite the increasing criticality of building science to the success of high-performance buildings, it is only the rare student that takes an avid interest in the building science perspective to inform their design thinking. For someone who entered the construction industry in 1974 as a technician, I have found that professional practitioners have been poorly trained in building science and tend to be more reactive than proactive in its application to building design. Building owners seldom appreciate that most of the problems they experience with their buildings are completely avoidable through preventive measures that have been well known by the building science community for nearly half a century. And when it comes to the general public, people do not understand even the most basic aspects of the buildings they inhabit - countless television programs about the unwitting victims of inferior renovations attest to how little the average person knows about building science, even though they may be highly educated and affluent.<sup>1</sup>

---

<sup>1</sup> People know more about electronic and digital technology because manufacturers have educated the buying public about all of the terminology that deals with the performative qualities of their products – otherwise they would not have a basis upon which to persuade consumers to upgrade their devices every two to three years. The building industry, and especially developers, prefer consumers with the least possible knowledge about building science. Almost all of the meaningful metrics and indicators needed to convey building performance remain absent in marketing and governments are moving at glacial speeds to legislate reporting and public accessibility to vital data about buildings.

How do we make building science popular? That is the question I have been pondering for quite a while as an educator, researcher and professional practitioner. And I have come to realize that the answer is related to the great divide between architecture and engineering, with both silos disinterested in educating the general public about healthful buildings. If this same attitude was shared by health professionals, people would still be smoking in buildings and viewing tobacco advertising at sporting events that extolled the glamour of cigarettes. Fortunately, the health professionals battled ignorance about bad influences on human health, such as smoking, poor diet and lack of exercise, by educating the public and influencing politicians to nudge popular behaviour through warning and nutrition labels, the banning of certain kinds of advertising combined with the broadcasting of advertising that promotes healthy choices and lifestyles. Why have building professionals been so lagging in their advocacy for better building science literacy and the mandatory labelling of building performance?

Architecture and engineering design of buildings in Canada, and most parts of North America, is a race to the bottom when it comes to design fees. Professional design fees have been steadily creeping downwards while the costs of building skyrocket. Nobody seems to see the connection between poorly designed buildings, and in particular poorly prepared drawings and specifications, and rising construction costs. Constructors have to manage the risk of incorrect, incomplete and incoherent contract documents by raising their prices to cover the costs associated with delays while awaiting the resolution of unresolved design details, conflicting specifications, etc. Invariably there are also unforeseen extras and claims that exacerbate the inflation rate for construction. As someone who entered the construction industry in 1974, I can attest to there being far too many white hard hats on the site compared to the number of persons actually being productive. Moreover, nothing has changed substantively for the past half century in terms of construction technology innovation, and the buildings we are constructing are not of better quality than their predecessors.

All of these failings stem from absurdly deflated design fees. Traditional buildings constructed after World War II in Canada that featured no air conditioning, fire alarms, insulation and air/vapour barriers, etc., enjoyed higher design fees than today's buildings that are being asked to meet high energy and environmental performance standards. What the average person fails to understand is that it is the DNA of a building, which is almost entirely decided when it is conceived, that will determine its life cycle performance. Nurture throughout construction and during occupation can maintain a building and help it achieve its maximum performance potential, but its upper performance limit is decided by its DNA. Biology tells us that we must pay at least as much attention to nature as nurture, but this has been lost to the present generation of developers, institutions and agencies that regularly beat down design fees and then complain their buildings suck, even though they boast all kinds of ratings and certifications.<sup>2</sup>

---

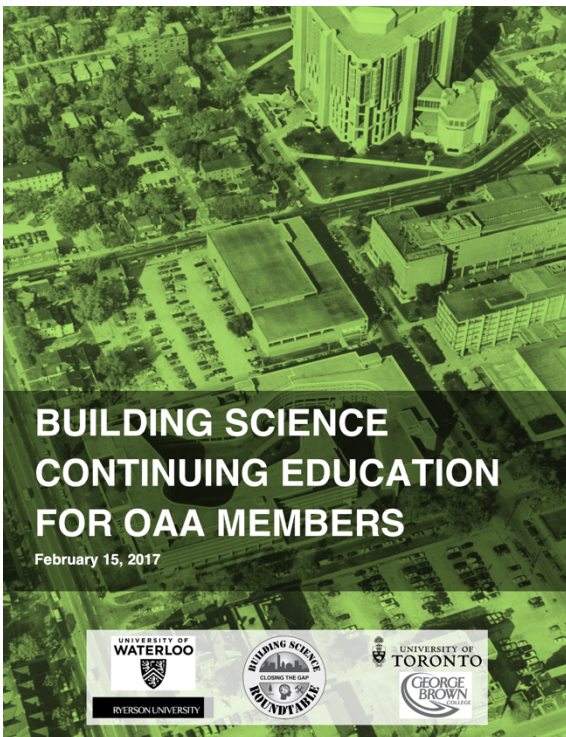
<sup>2</sup> For decades, the Center for the Built Environment at the University of California, Berkeley has reported the results of post-occupancy evaluations, specifically indoor environmental surveys involving the occupants. On a scale of -3 (completely dissatisfied) to +3 (completely satisfied) reported scores almost entirely reside in the range of -1 to +1, suggesting that the vast majority of buildings exhibit mediocre indoor environmental performance. This has not changed with the introduction of LEED ratings, and it has been stated, "Therefore, it can be concluded that there is not a significant influence of LEED certification on occupant satisfaction with indoor environmental quality, although the analysis of mean votes of satisfaction reveals that occupants of LEED buildings tend to be slightly more satisfied with air quality, and slightly more dissatisfied with amount of light."

Altomonte, S. and S. Schiavon, 2013. Occupant satisfaction in LEED and non-LEED certified buildings. *Building and Environment*, Volume 68, pp: 66-76.

Access to light and air continue to challenge contemporary architecture, in particular our multi-unit residential buildings. The dominant mid-rise and high-rise typologies feature deep narrow units with single aspect facades that provide insufficient daylight and inadequate natural ventilation. Ontario has become infamous for permitting bedrooms without windows in residential suites and architects have remained complicit, not challenging this step backwards by greedy developers gaming the building code system. Thermal comfort in condos near their highly glazed facades is also questionable with many occupants observing that during the coldest and hottest days of the year, the perimeter adjacent the glazing is often uninhabitable by virtue of extreme discomfort. But in Ontario there is always an architect that will do the unconscionable while the profession turns a blind eye. A progressive OAA would have amended its code of ethics to preclude such malpractices.

### **OAA and the Architecture of Denial**

The recently released Claims Experience Workbook, a joint publication funded by the Ontario Association of Architects (OAA) and ProDemnity Insurance Company indicates that a large proportion of claims for water damage are associated with a lack of building science knowledge on the part of the architect and/or a failure to select an appropriately qualified building science consultant.<sup>3</sup> Clearly, a proactive profession would seek to address the current technical knowledge deficit through continuing education while lobbying professional accreditation authorities to increase the building science content in architecture programs.



*While there is no doubt that the quality of workmanship and care in construction is woefully lacking in contemporary buildings, it is also obvious that so many design details fail to consider the realities of the construction industry and site conditions in the Ontario climate. This awareness is lacking among many OAA members employed in practices across Ontario who are recent graduates of architecture programs and have spent virtually all of their time in front of computers operating drawing software. The present situation can only be expected to get worse unless proactive continuing education becomes part of the OAA's culture. A serious reality check is long overdue.*

A report prepared by Ontario's Building Science Roundtable in 2017, following a request by the Ontario Association of Architects (OAA) and ProDemnity Insurance Company, provided a framework for the architecture profession to institute basic, mandatory building science continuing education.

---

<sup>3</sup> *Claims Experience Workbook*, Prepared by The Research in Architecture Studio for the OAA/Pro-Demnity Joint Working Group, October, 2017. <http://prodemnity.com/wp-content/uploads/Claims-Experience-Workbook.pdf>

Yet it is interesting to note that after being provided with a practical roadmap for advancing building science continuing education among its members at an annual cost of less than \$50 per member, the OAA decided to ignore the expert advice of Ontario's academic building science community. This ignored report warned that, "***Building science continuing education is now recognized as being lifelong learning needed to help all building professionals maintain currency and competency in building design.***" Further, there does not appear to be any interest by the OAA to advocate for a mandatory building enclosure design and field review as has been mandated in British Columbia following the "Leaky Condo Crisis" of the 1980s and 90s. As a result, it is likely that Ontario will bequeath future generations with a crumbling building stock liability rather than a laudable legacy.

Denial is no antidote for our mediocre quality of contemporary buildings that have questionable indoor environmental quality, marginal durability, high carbon footprints and poor flexibility and adaptability. And so Popular Building Science remains a tongue-in-cheek oxymoron here in Ontario for the subject matter is anything but popular and also sadly lacking among those who professionally should know better. But it does not have to be that way and I hope this web site is a step in the right direction - it beats burying one's head in the sand and refusing to acknowledge that our badly performing building stock is simply unsustainable.

A handwritten signature in blue ink, appearing to read "Ted Kesik". The signature is stylized with a large, looping initial "T" and "K".

Professor Ted Kesik, Ph.D., P.Eng.  
ted.kesik@daniels.utoronto.ca