



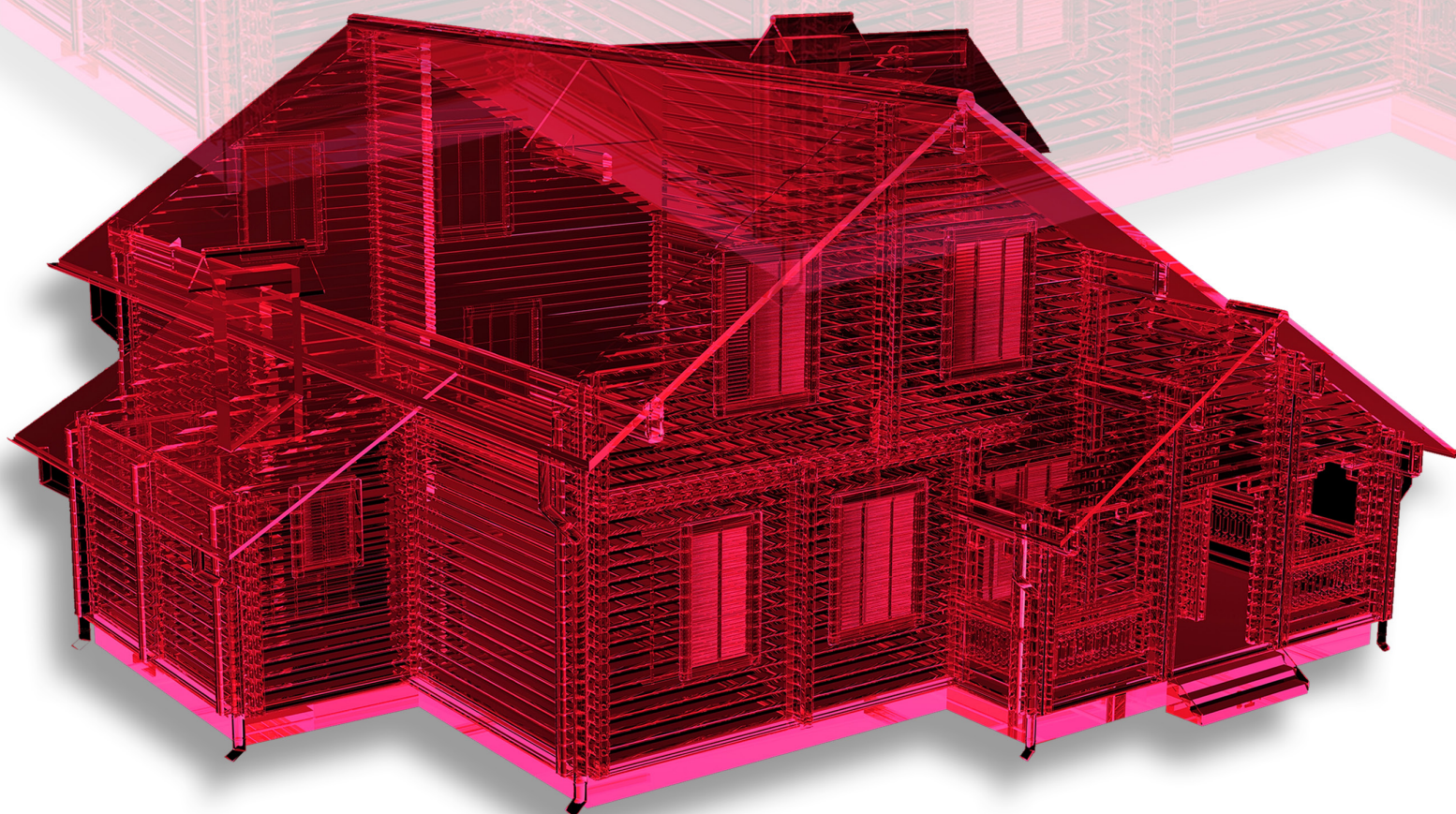
**MASONRY
WORKS**
Council Of Ontario

**BRICK
BLOCK
STONE**

APRIL 2021

MASONRY'S THERMAL MASS

A Peek Behind Masonry's Thermal Capacitance & Thermal Energy



All levels of government are grappling with methods of addressing climate change. Canada's commitment to the Paris Agreement means collectively we must all do our part to keep global warming to below 2 degrees of pre-industrial levels. This ambitious initiative is important as there is a limited time to slow down climate change before its impacts become permanent. One of the largest contributors to climate change globally is the building sector. In fact, the construction, operation and decommissioning of buildings accounts for about 40% of global GHG emissions. Therefore, addressing the performance of buildings can play a significant role in reducing global GHG's and in turn helping to achieve the goals of the Paris Agreement.

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The Push for Net Zero

In Ontario, there is a push to have all buildings constructed by 2030 to reach net-zero performance. The term net-zero is being used more frequently in the design community as its clients both in the public and private sector demand better performance from buildings. The term net-zero defined simply is; a building which creates as much energy as it uses in a year. This definition can also be expanded to include net-zero carbon wherein a building sequesters as much carbon (or GHGs) as it produces. In order for this to occur a number of building systems must be considered, utilized and/or improved upon. This is especially true when it comes to building material and building envelope performance. An important contributing factor to ensure that a building's mechanical system can operate more efficiently is how effectively the building structure and envelope can help regulate temperature. This is where the concept of thermal mass comes into play.



Masonry's Thermal Mass

Thermal mass is the ability of a building to absorb, store and release heat. Masonry materials (brick, block, stone) inherently possess superior thermal mass properties and therefore can be utilized to increase the efficiency of a building, contributing to net-zero rating and subsequently reducing GHG's produced by the building. A recent thermal study completed at the National Brick Research Center at Clemson University indicates that the thermal mass of a brick allowed it to take anywhere from 28-23 hours longer than other materials such as vinyl to reach equilibrium with the exterior temperature.



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| Wall | Time to Reach Equilibrium [hr] |
|--------------|--------------------------------|
| Stud | 6.2 |
| HardiePlank | 11.3 |
| Vinyl Siding | 7.7 |
| Brick | 34.2 |

Source: Thermal Comparison – Hot Box, National Brick Research Center Clemson University

This means that concrete block walls can help contribute to a process known as Load Shifting, wherein the thermal mass of the wall can regulate the temperature of the building for long enough periods of time so that heat and cooling can occur during off peak hours. This is significant for two reasons; one, it saves the building owner/operator significant money on heating and cooling costs, secondly, it allows for the HVAC system to draw from the grid during off peak hours, in Ontario during off peak hours the grid is mainly powered by nuclear and hydro-electricity, which is virtually carbon free, meaning that the heating and cooling of that building is occurring with next to no GHG emissions. This is a huge advantage provided by concrete block.

As researchers continue to pour R&D resources into finding solutions for buildings to meet better performance standards, they tend to overlook the advantages of some of the materials that already exist. Masonry materials have contributed to creating some of the world's longest standing structures. This durability coupled with superior thermal mass properties makes masonry materials an ideal building envelope solution for home owners, building owners and operators and governments of all levels in addressing climate change and achieving net-zero targets.