UPTOWN STRAWHOUSE

Reimagining housing construction in the climate change era

The City of Minneapolis recognizes that climate change is a problem and has a bold carbon reduction goal of 80% greenhouse gas (GHG) reduction from a 2006 baseline by 2050. As the built environment contributes 73% to the city's GHG emissions, we need to begin considering alternative approaches to buildings that involve low operational and embodied carbon.

As energy professionals committed to doing our part to mitigate and reduce the effects of climate change, we are undertaking a scientifically based approach to building a low carbon building. Being built with our own funds, we invite our project to be used as a test case and model for innovative approaches to low carbon building in the future.

PROJECT GOALS

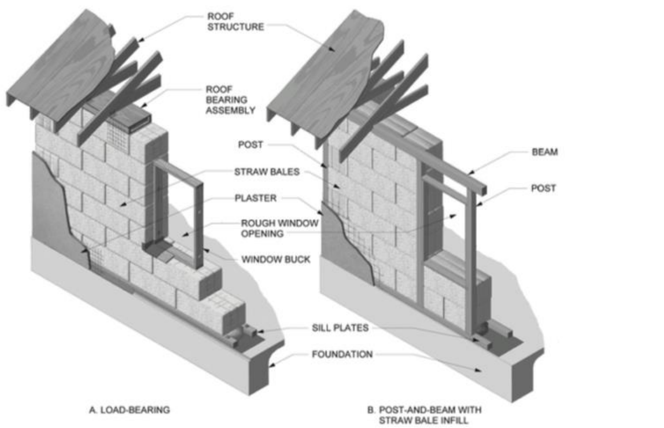
- Small footprint
- Infill development
- Walk-bike-transit friendly
- Natural materials
- Passive house
- Net zero energy

STRAWBALE BENEFITS

- Low embodied energy and carbon
- By-product reuse
- High thermal mass
- High fire resistance
- Sound attenuation

Why straw?

Conventional wall assembly materials involve foams, wraps, plastics, resins, and generally carbon-intensive and non-natural materials. Building with straw bales as part of either a load bearing structure or as functionally wall insulation is a climate-friendlier alternative. The non-load bearing technique we plan to use can be found in the International Residential Code, Appendix M. Examples of straw bale buildings in cold climates abound; one in North Branch, MN constructed in 1996 was successfully sold about 20 years later, demonstrating the long-term viability and low-risk of this construction when designed and built properly.



But wait…hasn't this gone poorly in the past?

As with any construction, proper attention must be paid to moisture control or risk mold and/or decay. Straw with moisture levels consistently under 20% will not decompose.

A subsidized project from 1998 in South Minneapolis unfortunately failed to mitigate moisture appropriately. In that project, bales were installed after sitting in the rain. Straw was incorporated into the foundation, which risked ground moisture infiltration. Improper roof insulation caused condensation when warm interior air reached the cold metal roof and shed into the walls. Prefab stucco siding panels had been inadequately testing for moisture control. These among other issues caused this project to fail and the building was demolished after a few years.

Our team has studied what went wrong in this case and as well as best practices employed by successful projects and have carefully planned to mitigate moisture using the best management strategies listed to the right.

Photo credits: Precipitate Architecture (front), www.finehomebuilding.com/2018/10/10/houses-design-case-straw-bale-houses (back left) www.buildinggreen.com/primer/how-water-moves-through-buildings (back right)

MOISTURE MITIGATION STRATEGIES

Figure: Pathways in which water can infiltrate buildings

1. Bulk water: large eaves and windows flush with wall exterior reduce exposure and windowsill ponding

2. Capillary action: bales sit atop a 26" pony wall, reducing exposure to ground-level moisture incl. snow

3. Air-transported moisture: 3-layer plaster application lessons air leaks

4. Vapor diffusion: bales are strategically covered in plaster, which allow vapor to escape if the bales do get wet

Internal moisture content: testing of bales during construction ensures MC <20%

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