BEG Building Engineering Group

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University of Waterloo

July 14, 2025

State of Minnestoa
IRC
Technical Advisory Group

Re: Support of Minnesota's adoption of IRC Appendix BJ: Strawbale Construction

I write to express my support for the state of MN adopting Adoption of the 2024 IRC Appendix BJ Strawbale Construction, as amended by the proposal in front of your group.

I am a registered Professional Engineer in the Province of Ontario Canada, and Professor of Building Science for both the Civil/Architectural Engineering and Architecture programs at the University of Waterloo. As a practising engineer and as a researcher I have developed an expertise in the moisture performance of buildings, and worked on buildings as diverse as high-rise and supertall towers, US Federal courthouses, national museums, and housing on numerous continents.

As a researcher I have been involved in studying the material properties and system behavior of plastered strawbale walls since around 2002 (although I had interest in the system earlier). Beginning in that year I installed temperature, humidity, and moisture content sensors in several industrial and commercial buildings and monitored these for several years. This was important as it allowed us to understand and predict the performance of plastered strawbale walls as a function of outdoor climate, building exposure, and indoor conditions. With funding from the Canada Mortgage and Housing Corporation (CMHC) and the State of California, I undertook a wide range of material propery testing, including lime plaster, earth plaster, ans cement plaster coatings over strawbale. Wheat and oat strawbales were also characterized. This research stream culminated in a detailed full-scale, real exposure test house study in Waterloo Ontario comparing earth-plastered and lime-cement plastered strawbale walls with elevated indoor humidity conditions. The walls were monitored for almost 3 years, and a Master thesis was written based on the results.

As a professional, this research has provided me the confidence that we have the experience and research data to support the use plastered strawbale walls in many types of buildings, from transit centers, to winerys and houses. There are now several authoritative books available that document good strawbale building practise learned from real world experience. I have been involved in supporting such plastered strawbale building construction in my home province, but also California, Virginia, Mongolia, and beyond.

In my experience there are two common questions raised about strawable construction in cold climates. The first is the control of water vapor and the need for a vapor barrier, and the second is the control of rainwater penetration and the need for a WRB.

1. Like all traditional wall assemblies, a specific vapor barrier is not needed for typical interior housing conditions during winter. The assembly is more of flow through assembly that also

has a tremendous amount of moisture storage capacity. Our research has shown that plastered strawbales are incredibly safe against vapor diffusion condensation and damage. However, on a side note, air leakage can be almost as big a problem for plastered strawbales as fiberglass batt insulated framed wall. Hence, the interior plaster has to be installed in a substantially airtight manner with transitions to other materials (like floors and windows) made airtight with sealant.

2. Plastered strawbale walls do not use the drained approach to managing rainwater penetration. Again, most historic systems, wether sod houses, cordwood homes, log cabins, or load-bearing masonry used the mass (storage) approach to rainwater penetration control. This is the method used by plastered strawbales, with the thicker exterior plaster finish providing the bulk of the storage. Of course, stucco cracks, and more water will penetrate at these cracks but will be stored in the plaster and will *not* be readily wicked into the highly porous straw. The inclusion of a WRB between the plaster and the strawbale will result in a high risk of failure of the assembly. In my experience this has never been a successful approach as it fundamentally undermines how the system performs structurally and allows outward drying. In areas of extreme exposure to rain, a rainscreen layer overtop of a plastered strawbale wall can be added, and this will significantly improve the rain control performance without sacrificing the other characteristic of the assembly. This approach is usually reserved for unique projects.

I have also investigated strawbale failures in my role as a forensic engineer. In all cases the failures have been due to aggregious violations of good building practise and violations of basic plastered strawbale design and construction. None of the failure I have seen have made me doubt the reliability and effectiveness of a properly designed and building strawbale building.

My aim in sharing my experience is to demonstrate to members of the TAG that a plastered strawbale wall system can perform well in Minnesota Climate zones 6 and 7. Based on the research conducted and the many successful cold-climate housing examples, I believe that plastered strawbale walls should be allowed in the Minnesota building codes. IRC Appendix BJ provides an excellent list of minimum standards can ensure durable plastered strawbale enclosure walls that perform well.

If the TAG has further questions, I offer myself as a resource - please do not hesitate to reach out.

Thank you for your consideration of this proposal.
Sincerely,

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