Annotation Notes

1. * Avoid using the second person in technical writing except in cases where you are clearly, directly providing instructions to a second-party audience (e.g., procedures and instruction manuals)
2. Names missing:
   * Take ownership of your work. Consider implications for ethos/credibility when authorship information is not apparent/available.
3. * Date of submission is missing. This is an important element for readers of any piece of technical communication and should always be included.
4. If you choose to centre your headings, this large space between the heading number and text is somewhat disorienting in that the headings appear to be shifted to the right rather than centred. Either left-align your headings or remove this space.
5. * When writing for a Canadian audience, it is your responsibility to translate/convert language, currency figures, and units of measurements into a recognizable, local standard.

2 1 3

Efficient Home Insulation: Reduce Your Energy Bills and Carbon Footprint

4

I. Introduction

Due to Canada's cold climate, insulation is critical for homeowners as it reduces energy consumption, costs, and greenhouse gas emissions [1], [2]. Inefficient home insulation often arises from outdated or poorly installed insulation materials, leading to energy waste that impacts climate change. This report proposes a solution to address the issue of inefficient home insulation and promote sustainable development goals (SDGs) in Canada.

II. Problem Description

Poor insulating materials lead to energy waste and impact climate change. Notably, fibreglass and mineral wool have several issues that can lead to energy consumption and high heating costs. For instance, fibreglass insulation can lose up to 40% of its insulating ability when exposed to moisture [3], a common issue in areas with high humidity levels. Mineral wool can also lose up to 30% of its insulating ability due to inadequate installation or gaps between insulation batts [4].

III. Problem Solution

Expanded polystyrene (EPS), extruded polystyrene (XPS), and polyurethane foam (PUF) are insulation materials that provide improved insulation and are more resistant to moisture and air leakage. For instance, EPS has a thermal resistance (R-value) of 3.6 per inch [5], which is higher than fibreglass insulation. With an even greater R-value of 5 per inch, XPS is an ideal choice for colder regions. Insulation made of PUF may close cracks and stop air leaks, improving insulation and energy efficiency.

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References

[1] Y. Wang, A. Shukla, and S. Liu, “A state of art review on methodologies for heat transfer and energy flow characteristics of the active building envelopes,” *Renewable and Sustainable Energy Reviews,* vol. 78, pp. 1102–1116, Oct. 2017, https://doi.org/10.1016/j.rser.2017.05.015 [Accessed Mar. 2, 2023].

[2] S. K. Pouran Badr, F. Daneshjoo, A. Maasoumy Haghighi, and M. A. Shayanfar, "Impact of insulation and building management systems on reducing energy consumption and Energy analysis of residential buildings," *Journal of Structural and Construction Engineering,* vol. 7, no. 2, pp. 5-23, Jun. 2020, https://doi.org/10.22065/jsce.2018.117885.1452 [Accessed Mar. 2, 2023].

[3] D. L. Liu and W. Nazaroff, “Modeling pollutant penetration across building envelopes,” *Atmospheric Environment,* vol. 35, no. 26, pp. 4451–4462, Sep. 2001, https://doi.org/10.1016/S1352-2310(01)00218-7 [Accessed Mar. 2, 2023].

[4] D. Kostadinović, M. Jovanović, V. Bakić, N. Stepanić, and M. Todorović, “Experimental investigation of summer thermal performance of the green roof system with mineral wool substrate,” *Building and Environment,* vol. 217, pp. 1–9, Jun. 2022, https://doi.org/10.1016/j.buildenv.2022.109061 [Accessed Mar. 2, 2023].

[5] Progressive Foam Technologies, “EPS vs. XPS vs. GPS: The definitive comparison guide,” Jan. 2018, https://www.progressivefoam.com/eps-vs-xps-vs-gps [Accessed Mar. 2, 2023].

[6] L. Aditya, et al., “A review on insulation materials for energy conservation in buildings,” *Renewable and Sustainable Energy Reviews,* vol. 73, pp. 1352–1365, Jun. 2017, https://doi.org/10.1016/j.rser.2017.02.034 [Accessed Mar. 2, 2023].

[7] A. Abdeen, W. O'Brien, B. Gunay, G. Newsham, and H. Knudsen, “Comparative review of occupant-related energy aspects of the National Building Code of Canada,” *Building and Environment*, vol. 183, pp. 1–19, Aug. 2020, https://doi.org/10.1016/j.buildenv.2020.107136 [Accessed Mar. 2, 2023].

[8] Canadian Commission on Building and Fire Codes, “National building code of Canada: 2020,” vol. 1, Dec. 2022, https://doi.org/10.4224/w324-hv93 [Accessed Mar. 2, 2023].

[9] S. S. Biswas, M. A. Ahad, M. T. Nafis, M. A. Alam, and R. Biswas, “Introducing ‘α-sustainable development’ for transforming our world: A proposal for the 2030 agenda,” *Journal of Cleaner Production,* vol. 321, pp. 1–15, Oct. 2021, https://doi.org/10.1016/j.jclepro.2021.129030 [Accessed Mar. 2, 2023].

[10] United Nations, “The sustainable development goals report 2022,” July 7, 2022, https://unstats.un.org/sdgs/report/2022 [Accessed Mar. 2, 2023].

[11] D. Brounen and N. Kok, “On the economics of energy labels in the housing market,” *Journal of Environmental Economics and Management*, vol. 62, no. 2, pp. 166–179, Oct. 2011, https://doi.org/10.1016/j.jeem.2010.11.006 [Accessed Mar. 2, 2023].