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Methods Used to Achieve Airtightness of 0.07 Ach@50Pa for an Industrial Building

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Abstract : The University of Northern British Columbia needed a new laboratory building for the Master of Engineering in Integrated Wood Design Program and its new Civil Engineering Program. Since the University is committed to reducing its environmental footprint and because the Master of Engineering Program is actively involved in research of energy efficient buildings, the decision was made to request the energy efficiency of the Passive House Standard in the Request for Proposals. The building is located in Prince George in Northern British Columbia, a city located at the northern edge of climate zone 6 with an average low between -8 and -10.5 in the winter months. The footprint of the building is 30m x 30m with a height of about 10m. The building consists of a large open space for the shop and laboratory with a small portion of the floorplan being two floors, allowing for a mezzanine level with a few offices as well as mechanical and storage rooms. The total net floor area is 1042m² and the building’s gross volume 9686m³. One key requirement of the Passive House Standard is the airtight envelope with an airtightness of < 0.6 ach@50Pa. In the past, we have seen that this requirement can be challenging to reach for industrial buildings. When testing for air tightness, it is important to test in both directions, pressurization, and depressurization, since the airflow through all leakages of the building will, in reality, happen simultaneously in both directions. A specific detail or situation such as overlapping but not sealed membranes might be airtight in one direction, due to the valve effect, but are opening up when tested in the opposite direction. In this specific project, the advantage was the overall very compact envelope and the good volume to envelope area ratio. The building had to be very airtight and the details for the windows and doors installation as well as all transitions from walls to roof and floor, the connections of the prefabricated wall panels and all penetrations had to be carefully developed to allow for maximum airtightness. The biggest challenges were the specific components of this industrial building, the large bay door for semi-trucks and the dust extraction system for the wood processing machinery. The testing was carried out in accordance with EN 132829 (method A) as specified in the International Passive House Standard and the volume calculation was also following the Passive House guideline resulting in a net volume of 7383m3, excluding all walls, floors and suspended ceiling volumes. This paper will explore the details and strategies used to achieve an airtightness of 0.07 ach@50Pa, to the best of our knowledge the lowest value achieved in North America so far following the test protocol of the International Passive House Standard and discuss the crucial steps throughout the project phases and the most challenging details.

Keywords : air changes, airtightness, envelope design, industrial building, passive house
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