**Q&A from December 7, 2021 Builder Forum Series | From Design to Testing Day: Strategies for Airtight Part 3 Buildings**
Presented by the Township of Langley (TOL) and Einar Halbig (E3 Eco Group)

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| Q: | Any plan to introduce GHGI targets on top of the Step Code? With a view to forcing down the operational emissions in new buildings, Step Code is of limited value if you continue to let all space heating and service water heating by gas. |
| TOL (Kevin): | The BC Energy Step Code was created with multiple priorities in mind and to be applicable across the province in an equitable manner. Greenhouse gas emissions (GHGs) were not included as a performance requirement as different municipalities may end up with grossly differing impacts of Step Code adoption.<br><br>There is work happening at the provincial level to bridge the gap between Step Code and many municipalities' commitments to address GHGs. When there is a provincial tool made available by BC Building and Safety Standards Branch and/or the BC Building Code (BCBC), the Township will investigate adoption impacts/benefits and conduct public consultation with our findings. |
| Q: | What is the ToL's approach to projects that do not hit their airtightness target prior to occupancy permit. If it is not possible at that stage to meet the target and the TEDI/TEUI are not met as a result, will occupancy be denied? Has the ToL denied occupancy on this basis in the past? |
| Q2: | What is the ToL's intended approach to this scenario if it arises? |
| TOL (Kevin): | The BCBC states for Part 3 buildings that are required to meet Step Code the applicant must provide an air tightness testing report and an updated model that incorporates the tested value. The Township requires those documents to be submitted before occupancy is provided.<br><br>There, technically, is no airtightness target value. The input value issued by CoV Energy Modelling Guidelines is only an input, however it is ultimately used in calculating end TEDI / TEUI values, which are in turn utilized to ultimately measure compliance for Step Code. If an applicant is concerned with meeting Step Code performance requirements, the design team can build in buffer in the TEDI/TEUI to account for infiltration rates that are higher than the inputted value.<br><br>The Township has not received any completed air tightness reports that pertain to buildings requiring Step 2 or above.<br><br>The Township relies on Letters of Assurance and we recommend applicants work with consultants who they can trust will meet the requirements of the BCBC and related standards. If there is conflict between BP applications and demonstrating constructed requirements with submission of Letters of Assurance, the Township may take further steps with the Registered Professionals and their associations if buildings are signed off but not fully compliant with the BCBC. |

Q: Can you please comment, (in your opinion) whether exterior or interior barrier has had impact or made any difference in achieving higher/better air-test result in P3 buildings?

Q2: What has Einar observed as the most effective Air Barrier approach? Interior poly, interior drywall, exterior Tyvek, exterior P&S, liquid-applied membranes, taped exterior sheathing, SIP/CLT wall panels etc.

Einar: First off, my opinion based on observation is that the "magic" is in how air barrier materials are applied, not in the particular air barrier materials themselves. Beyond that I would generally say you want your air barrier in the location with the least penetrations; this means an exterior air barrier system. An exterior self-adhered air barrier membrane has worked the best for local buildings we have tested.

Q: Would like to know if anyone has seen the actual blower door test target (L/s*m2 @ 75Pa / NALR75) listed in BP drawings/tender drawings/CSI specifications. Otherwise, how are builders expected to capture ____ air leakage in their scope of work?

Einar: Very good question. We have had several conversations with Builders (who are the ones having to deal with the implications of the airtightness) and they are quick to realize they better get some appropriate wording in their tender documents and on the drawings to indicate what the airtightness target is for this building. We have talked with Builders who have said, "We better print the airtightness target and the air barrier system on every page of our drawings". Not a bad idea. Most of the subtrades on a job will have something to do with the air barrier system- reminding everyone on the drawings is a smart idea.

Q: How do you do a blower door test and calculate air leakage only for walls? (if the building has decks or suspended slabs with occupied/conditional space?)

Einar: Excellent point. We are stuck measuring all the air leakage of the entire building, including leakage through the walls ceiling and below grade areas. From that whole building measurement there are calculations listed in the City of Vancouver Energy Modelling Guidelines that permit the air leakage through just the walls to be determined.

Q: Are multi-story buildings blower tested at each level?

Einar: Multi-story buildings could be tested level by level. However, it is more accurate and effective to conduct a blower fan test on the entire building at once. This omits the need to section off each floor as would be necessary if the building were tested level by level. The goal with a large building is to conduct the blower fan test on the entire building at once, just like we do on a house.

Q: How do we determine how many fans are needed?

Einar: The short answer is to leave it to your expert airtightness testing contractor to calculate the quantity of fans necessary. The more detailed answer is to apply the airtightness target of the building against the geometry of the building in order to calculate the amount of airflow needed to take the building to 75 pascals of pressure. Once this airflow is calculated, the number of fans needed can be determined based on one fan being able to move approximately 5000 cfm.

Q: Are leaky things like overhead doors included in the test or sealed up for the test?

Einar: Overhead doors that enter into a parkade would not be included in the building envelope that is tested for airtightness. If something like an overhead door was part of the air barrier system, then it would need to be included in the airtightness test of the building even if it were a source of leakage. The purpose of the test is to measure the airtightness of the building envelope while excluding airflow through the ventilation system where it exhausts and intakes air from the building. Therefore something like a door, whether it's an overhead door or other, is to be included in the airtightness test and cannot be sealed up specifically for the test

Q: Can the modelling of the building predict the impact on the cost of living in the building? In other words, if the airtightness improves, will the occupant notice savings in living there?

Einar: Yes, the energy model will determine the quantity of energy required to heat and cool the building. This energy will be reduced to some degree as the airtightness of the building improves.

TOL (Ajeen): In addition to the comments above, please keep in mind that energy models can be treated only as a representation of the building but not an accurate prediction of the actual building performance. These models are performed based on assumptions as per standards (ASHRAE 90.1 or NECB) and using 15 to 30 year average weather data. There are several moving parameters like occupancy behaviour, yearly changes in weather patterns, actual performance of mechanical systems and many more, that could change the actual energy performance.

Q: What kind of energy modeling software will be used for the Part 3 building?

TOL (Ajeen): All energy modeling software that complies with ASHRAE Standard 140 can be used to perform energy modeling. Some commonly used modeling software are eQuest (free software), OpenStudio, DesignBuilder & IES VE.