GREEN TECH THE SERIES COLUMN FOR NOVEMBER 25, 2015
HEADLINE: THERMAL BRIDGING 101

For the past couple of weeks, we have been looking into home siding, where it's going and advancements and there are plenty of improvements. Having received e-mails from readers with questions, it appears that the value of a continuous insulation barrier and the effects of heat loss from a wood frame home are not fully understood. Given the technical side is not well explained to the average homeowner, I will give this subject a try to make it as clear as possible.

There is a constant barrage of information on air loss through the walls from inside a home and how this can affect your heating costs and. What is often not explained, however, is that something around 2% of moisture movement and the contained heat loss is all that escapes through walls in a modern home. The balance escapes from simple air leakage, around windows, doors and any openings in your walls, like a dryer vent for example.

How we address this 2% is a complex question. For the most part, the lack of a consistent thermal wall or even insulation, with correct air barrier, is the most commonly accepted deficiency in the air envelope of a home. The more even the wall and the thicker or denser the insulation, the better the overall energy performance will be. This is a larger issue, with the wall leakage being greater, in older homes, say from the late 80s and older, where consistent insulation and plastic air barrier was not used to the advantage we use it today.

So let's look at the term thermal bridging and how this affects the overall performance of an insulated exterior wall. Thermal bridging happens when a conductive material, like wood studs in the exterior wall of a home, become the path for heat to flow around insulation in the cavity between the studs. This bypassing of the less conductive material, your insulation, significantly reduces the effectiveness of the overall wall assembly. In a conventionally built home, wood frame can make up nearly 25% of the exterior wall exposure and it's not just the vertical studs that should be considered. It's also the wood plates that the wall sits upon, on the concrete foundation. Yet another conductor of heat are the top plates; there are usually two of them before the trusses or rafters are set on the walls.

I've chuckled every time I've seen ads for new homes in the past where they've advertised R12 or R20 walls for insulation values. In actual fact, while the insulation had that R factor, when you encompass the entire wall "including" the wood frame this number drops by over 25%. A 2x6 wood frame wall becomes R15

overall and, if it was a steel studded wall, it drops to an even lower number, R9. Now let's not give wood a real bad rap, as compared to steel, concrete or masonry, it actually does well. A 2x6 stud has an insulated value of around R6, so you can see the issue. For every home built, the exterior wood frame walls have a reduced insulation value. I have included some thermal imaging pictures to accompany this column that clearly show this issue.

What do we do? The answer for most older homes, especially if they are getting a new exterior siding is to install continuous sheathing of one kind or another. All of these methods, be it foil faced, rigid foam like SM, or one of the newer composition materials attached to a rigid foam core, are capable of doing the same thing. They improve energy efficiency and moisture resistance. As well, they will help with heat flow reduction, rain penetration and condensation to some degree. Properly installed over the wood frame of a home, sealed or taped at the joints, it will dramatically reduce the effects of thermal bridging. One thing to be aware of is that this type of rigid foam sheathing is not structural sheathing. However, in the case of most of the applications in a siding retrofit, this is not an issue.

Everyone knows that heat flows from warm to cold following the path of least resistance. The effects of thermal bridging are significant and difficult to control. If not controlled, wood decay, mold and condensation issues will quickly become an issue. If there is one age of homes that really concern me it's those built just before 1990 through to the late 90's. This was the era where we developed the extensive use 6mil plastic as an air barrier. The building industry followed the code, but, unfortunately, the code failed. Sealing up around windows, doors and electrical plugs on the exterior walls, in fact any opening was flawed. The code had us packing strips of fibreglass insulation between the rough opening and the actual window or door. I am now seeing some of these windows and doors replaced and the level of decay is disturbing. If I was asked today about a home built in the late 80's, I would recommend the entire window and door trim be removed and that the fibreglass strips be torn out and replaced with low pressure spray foam.

One final comment; adding continuous foam cladding will reduce the thermal bridge factor significantly. This insulation thickness does bring up another issue and that concerns "hanging" the new siding off the insulation, almost cantilevering the siding to some degree. If at all possible, use screws to attach any new siding and, preferably, the walls should be strapped using screws to attach the wood strips, then whatever fastener or nail can be used effectively. Thermal

bridge effect is the latest detail in home assembly to affect better and better control over air movement and insulation efficiency. It's about time.

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