Building Better
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What year was this house built?

Changing construction materials over the years.

Trying to identify when a house was built should be as easy as researching the local office for the date a permit or occupancy certificate was issued. Unfortunately, with no process in place to verify the year a unit was built, the inspector has to use detective skills and knowledge of construction methods and materials used over the past 40 years to pin down a date.

CSA numbers: All materials used in Canada must be tested and certified as safe to use. Several testing agencies do that, such as ULC, CSA, CGSB and the Wood Council. The date of manufacture is often an indication of the year of construction, since typically the component will have been built in that year. Some examples include: metal spacer bars on windows with an IGMCC number and year of manufacture; labels in the toilet tank show years as YYYY, or may be imbedded in an identifying number MYY.

Changing siding use: Over the years, different siding has been used and then discarded in favour of new materials, based on cost and longevity. Older homes, pre-'60s for example, used asphalt-impregnated rolled material resembling brick. Glass or rock dash stucco lost favour in the late '60s. For a while, insulated aluminum siding was the rage, but lost favour in the early '70s, as it sealed in moisture, causing mould. While hardboard siding has been in use for awhile, Can-excel, with a smooth finish, was discontinued in the early 1990s. Louisiana Pacific hardboard siding could still be found on manufactured trailers until the late '90s, when the company was involved in a class lawsuit. Vinyl siding was introduced in the early 1960s, but did not gain much attention until the '70s.

Electrical: Knob-and-tube glass fuses are examples of older style houses, pre '60s. Additional electrical appliances, such as ranges, washers and dryers, changed the standard service from 60 amp to 100 amp today. Homes built in the 1960s and '70s were equipped with less expensive aluminum wiring, rubber insulation from the 1960s or earlier vinyl-shielded lines. House wiring did not have ground copper wires until the mid '60s. GFCI plugs were introduced in the early '70s.

Window styles: Rail and style single panes, aluminum single-pane sliders and awning-style windows are all examples of technology not used today. Most communities quit using wood windows in the early '90s because of maintenance issues. Regional manufacturing companies come and go; the window industry is particularly susceptible to economic downturns. Smaller companies get bought up or they fold.

Foundations: Timber beam on grade, concrete using boards for forms, even the type of aggregate used, indicate age. At one time, boulders and large rocks were the preferred choice.

Plumbing lines: Galvanized plumbing lines, lead seals, clay drainage lines, kitchen sink traps, copper lines, Poly b, pex: If there is one industry that has had major changes in material usage, plumbing is it.

Flooring: wood subfloors, plywood, OSB, asbestos floor tile, linoleum, shag carpets, fir finish floor. All of these products have had their time in the sun; at one time, asphalt floor tile was a popular choice. Laminate flooring has been around since the 1890s, however, an indication of age may be had by dating the manufacturer of flooring materials.

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President's Message

"You know what CEAP retrofits have done, Bud?" This question came as we were getting ready to do final inspections for the CEAP retrofit program. "It's exposing everything that's wrong with housing. The band is repairing these houses, but they are not repairing the root cause of why they needed repair to begin with."

Al continued by comparing the situation to a doctor putting your arm in a sling to relieve pain without fixing the broken arm. It reminded me of the housing demonstration project of 1996. You may remember that one: The project would reward bands a one-time infusion of minor capital dollars, provided the band could demonstrate it had in place a housing policy (i.e. a rental regime), a five-year capital plan to increase housing stock and reported yearly with results and revisions to the five-year capital plan.

In the middle of reviewing the band's existing housing policies, Anil (a consultant writer I was working with) said to me, "I hate getting my teeth cleaned. You think you are doing a good job and the dentist exposes all these little cavities. It's not enough that he cleans your teeth, he has to jab away with a pick at all those little imperfections until he sees you flinch."

After a thoughtful pause, Anil continued. "It's the lecture though that I hate most: You have to brush your teeth after every meal, floss more often, and come here more often for a check-up, not just when you have a problem."

Good ideas, I thought at the time, so as part of the housing policies, we recommended a database of all band houses be developed and maintained by updating entries once every five years. In addition, we recommended that a maintenance policy be developed that outlined the responsibilities of the band versus the homeowner. Funding would come from the collection of user fees to increase housing staff levels, so they could respond to maintenance issues normally done by off-reserve heating and electrical contractors. This fee would supplement the maintenance dollars set aside under the Section 95 operating agreement. We liked the idea of a "rainy day" fund to ensure that when major capital such as replacements of shingles, furnace or other high-cost items, a separate bank account would hold the resources necessary to respond in a timely fashion.

Fifteen years later, the CEAP retrofit program has revealed a lack of rental collections, leading to deferred maintenance and housing program deficits, a shortage of skilled tradesmen who could take advantage of the infusion of additional capital, a poor housing inventory system that doesn't identify houses in need or houses that are overcrowded, construction practices that lead to premature deterioration and lack of occupant involvement in home maintenance.

On the positive side though, the CEAP program also brought attention to well-run housing programs that allowed bands to increase the energy efficiency of their housing stock to EG80 values. These communities had an inventory system on hand that allowed them to

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set priorities well ahead of the application deadline, and allowed them to maximize their allocations. These communities had little in the way of interior renovations, and focussed on improving the building envelope and mechanical systems.

As the CEAP program winds down this year, much will be made of the final reports. The opposition in Parliament will focus on the cost effectiveness of the program: Did it increase the amount of jobs available? Did the expenditure have an impact on the economy? How large a debt burden does the Canadian public have to bear?

All good questions, for sure, but here in our communities, the success of the program will be measured by how well it improved our housing. Bands that accessed the program need to look for sustainable options. What worked, what didn't and most importantly what caused these failures?

T. K. Gussman Associates, has been contracted by Indian and Northern Affairs Canada (INAC) and the Canada Mortgage and Housing Corporation (CMHC) to conduct a summative evaluation of housing-related programs, policies and initiatives in Canada's First Nations communities. The final report should be available by the summer of 2010.

Compliance in First Nations Communities

INAC Inspections:

(a) relative to minor, major and housing capital projects, for each of the projects listed in the approved capital and site plan, prepare and carry out a project-implementation plan, appropriate to the size and nature of the project, which will:

> (v) obtain all inspections by duly qualified inspectors needed to certify compliance with all applicable federal and provincial codes, protocol, standards and guidelines, and in accordance with departmental protocols, guidelines and level-of-service standards, as may be amended from time to time. This includes the Protocol for Safe Drinking Water in First Nations Communities.

(c) relative to minor and major capital projects, ensure that the designs for all public-access buildings are approved by the Labour Canada - Fire Commissioner's office, and that facilities under construction are inspected by them to ensure that fire codes are met; and

(d) relative to housing capital projects, ensure that all housing construction projects are inspected by qualified inspectors for compliance with code requirements at, as a minimum, the following stages: site, foundation, framing and completion.

CMHC Inspections

CMHC inspections are done in support of CMHC programs. Since CMHC is not a building regulator, the inspections have no statutory authority.

CMHC's *Native Inspections Services Initiative (NISI) Guide* lists inspections as having two purposes:

1. To monitor the progress of construction so funds can be advanced.
2. To review construction for general conformance to accepted building practices, applicable codes, plans and specifications.

By carefully completing inspections, NISI inspectors help minimize risks to CMHC.

The objectives of the technical review and inspection are:

- To ensure that plans and specifications are in reasonable conformity with established construction standards.
- To ensure that a building is in reasonable conformance with approved plans.
- To assess the level of completion.
- To review and report on the performance of building materials and systems.

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- To verify construction-cost estimates.
- To promote better housing through information transfer to First Nations

Inspections are usually scheduled at these critical construction stages:

- Site inspection
- Foundation inspection
- Framing inspection (including insulation and air-barrier inspection)
- Final inspection

NBCC Inspections

In Canada, provincial and territorial governments have the authority to enact legislation that regulates building design and construction within their jurisdictions. This legislation may include the adoption of the National Building Code (NBC) without change or with modifications to suit local needs, and the enactment of other laws and regulations regarding building design and construction, including *the requirements for professional involvement*.

Code Provisions

Every NBC provision must address at least one of the Code's four stated objectives, namely:

- safety
- health
- accessibility for persons with disabilities
- fire and structural protection of buildings

2.2.7.2.Review of Construction

1. The designer or another suitably qualified person shall review the construction of any building or part thereof to determine conformance with the design.

The First Nations National Building Officers Association has been raising the issue of compliance to building standards since its inception and responded to OAG's 2003 report on housing in FN communities. Specifically, there is no compliance mechanism on reserve and thus the building inspector can only make recommendations to the FN on code issues. CMHC and INAC both take the view that Chief and Council are the Authority Having Jurisdiction, based on the National Building Codes preface which clearly identifies territorial governments as having the authority to adopt, amend the NBC model building codes and to establish the competency requirements for individuals responsible for administering and enforcing building regulations.

In order to sign off on projects, the practice has been to get a statutory declaration from Chief and Council stating that the project is in compliance with the National Building Code or greater. While this may work for progress advances on government-funded projects, a guarantee that the house is in compliance becomes a liability issue for Chief and Council should the building fail. Builders and developers working independently of band monitoring also raise the issue of liability for poor construction leading to harm or injury to person.

To date, inspections on reserve relate for the most part to CMHC's Native Inspection Services Initiative (NISI). NISI was developed in 1995 to provide greater First Nation involvement in inspections for new construction and renovations, funded through CMHC housing programs such as the Non-Profit Rental Housing Program and the Residential Rehabilitation Assistance Program (RRAP). Under NISI, First Nations technical-service providers undertake technical reviews (plans examination and inspections) under contract to CMHC. INAC, for its part, has devolved its inspection sector through the transfer of Technical Services to Tribal Councils and larger First Nations.

CMHC has identified Minimum Technical Qualifications through NISI, however, INAC has not provided a definition of a qualified person, allowing the First Nations to make that determination.

Both CMHC and INAC request that field reviews be done periodically throughout construction to monitor adherence to building codes and standards. While these technical reviews may comment on code compliance, they are not meant to be relied upon as an assurance that construction reasonably meets codes, standards and specifications. Their primary role for the funding organi-

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zations is to indicate percentage of completion for advancing purposes.

The question of determining compliance to minimum building standards comes at the end of the project. Depending on the housing program, this can be handled in one of three ways:

Band Council Resolution

BCR provides assurance to funding agency that house meets Minimum Building Code Standards. Typically done during budget meetings, in most cases this BCR is presented and passed as part of bands' reporting requirements. Incomplete work (usually seasonal) and deficiency are not part of submission reports and are typically only read by the housing portfolio holder. In worst-case scenarios, the contractor provides an invoice to Chief and Council suggesting that the work has been completed and is in compliance. While there are competent contractors, and they may meet the definition of qualified, self-monitoring as a compliance measure is risky at best and exposes Chief and Council to liability should harm come to persons in the house.

Statutory Declaration

Chief signs declaration that house is in conformance with Minimum Building Code Standards. Usually submitted to the Chief by the Housing Manager as part of CMHC Section 95 reporting requirements. This declaration may not necessarily be discussed amongst Council, nor accompanied by prior inspection reports. For CMHC programs, the band's housing manager usually relies on the reports from the agency representative under the NISI. Agencies under NISI must meet NISI's Minimum Technical Qualifications as administered by CMHC . But disclaimers on NISI reports clearly state that the inspection is for advance purposes only, and operating agreements state that compliance is the responsibility of the Authority Having Jurisdiction.

Letter

Housing Manager signs off on project. Typically sufficient to receive funds from INAC for minor capital (renovation) projects, the letter will state that all of the funds requested have been used for the purposes submitted in the initial proposal. For renovation projects, the work is listed as complete or incomplete. No inspections are requested for compliance. There is only verification that work has been done. In some cases, the back-up will be submitted invoices from suppliers and contractors.

Certified versus Qualified

From a risk-management perspective, establishing the qualifications of the individual providing advice to Chief and Council is paramount in reducing both harm to the occupant of homes built in FN communities and litigation from occupants injured in poorly built homes. Many First Nations however, have poorly defined what qualifications are required for reporting on compliance. A driver's licence and some construction background may well be sufficient to verify project completeness, but it will not be sufficient to advise Chief and Council on code issues. Where Chief and Council are relying on the contactor's advice, it may be difficult to have an honest assessment of field conditions, since it is not in the contractor's interest to report code violations.

What is needed is an independent report by an individual with relevant training and experience in construction under the specific discipline i.e. electrical, structure, plumbing etc., measured against an established competency standard. All provincial jurisdictions have identified what the competencies are in relation to all disciplines for safety inspections including fire safety, small buildings, electrical and so on. In Alberta, these certificates of competency are administered under The Safety Codes Act.

Points to consider when First Nations wish to define competency levels are:

- A credible method of recognizing those practitioners working in the field
- Long-term certification in the context of changing codes, and professional requirements that includes elements of continuing education.
- Ethics and professional practice
- Disciplinary framework
- A mechanism to establish portability outside the jurisdiction.

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Eagle's Eye on Housing: Preventing Falls on Stairs – Reduce your risk of injuries at home

When seniors fall, the consequences for their health can be both severe and long lasting. Thankfully, many of these falls can be prevented with a little careful planning and a few simple strategies. To help seniors protect their health, mobility and independence, Canada Mortgage and Housing Corporation (CMHC) has a number of tips on how seniors can reduce the risk of falls on stairs at home.

- Avoid visually distracting patterns on the tread (the horizontal part of a step) that can make it difficult to distinguish one step from another. If the edges of the stairs can't be seen clearly, mark them by painting a permanent stripe on the edge in a contrasting colour.
- Improve lighting on steps and stairs. Use lighting that makes the edges of stairs visible without causing glare or strong shadows, and consider installing low-intensity night lighting, as well as a light switch at both the top and bottom of the stairs.

- For steps with short treads or a high rise (the vertical height of a step), keep any coverings thin and tightly affixed to maximize the useable tread space. Avoid soft treads with a large rounding at the edge. If you're renovating or building new stairs, allow for ample tread space and a gentle rise, and make sure all the steps are of a uniform size and height.
- For winding or curved stairs, be sure to provide a handrail on both sides, especially where the stairway includes combinations of rectangular and tapered treads. Handrails are strongly recommended regardless of the number of steps and, where possible, should be installed on both sides of the stairs.
- Steps that are non-uniform in size are an especially common cause of missteps and falls. Consider a partial or complete rebuilding of the steps to make them of uniform size and height. This is very important!
- Use a slip-resistant, rough finish on stairs that are prone to getting wet.
- Make sure to fasten all coverings on stairs securely.
- Don't place any objects or loose rugs on steps, landings or at the top or bottom of the stairway.
- Position handrails at about adult elbow height, and extend them on both sides for the full length of the stairway as well as beyond the top and bottom of the stairs. Repair loose or broken handrails. Ensure that the handrails have a tactile indicator that warns when a stairway is coming to an end, and are easy to see even in low light or at night.
- Lastly, always be cautious, deliberate and not rushed when taking the stairs. Hold on to the handrails, wear shoes or slippers that fit properly and have a non-slip sole, remove reading glasses, switch on stair lights and – most importantly – always take your time, especially when using an unfamiliar stairway.

For more information or a free copy of the "About Your House" fact sheet *Preventing Falls on Stairs* or other fact sheets on owning, maintaining or renovating your home, visit www.cmhc.ca or call CMHC at 1-800-668-2642. For more than 60 years, Canada Mortgage and Housing Corporation (CMHC) has been Canada's national housing agency, and a source of objective, reliable housing expertise.

Eagle's Eye on Housing: Embodied Energy

Will that be paper or plastic?

Remember when you had that choice standing in line at the grocery till? Most people choose convenience over environmental impact. For several decades, scientists have struggled with the question of how to measure that impact in building construction. They have come up with the term embodied energy, which is, according to *Canadian Architect*, "the amount of non-renewable energy it takes to acquire, process, manufacture, transport, construct, and repair/replace a building material." For those who wish to reduce greenhouse gases, having a measured choice in selecting building materials would influence them when designing houses. But the process isn't that simple. As more tools become available and more factors come into play, it is becoming clear that embodied energy is a complex problem.

Several methods of measuring embodied energy exist. But scientists have yet to determine a universal measuring standard. Most do agree that products can be compared to determine which has the least amount of embodied energy. One example is to take into account the amount of energy required to transport the materials from their raw state to the manufacturing plant and finally to the job site. In its simplest form, this has led to the "Hundred Mile Challenge" – the decision to only eat produce grown within 100 miles from home (sorry, no bananas and coffee). Home construction, however, must also take into consideration life-cycle assessments; measuring the use of energy over the lifetime of the building.

According to *Canadian Architect*, there are two types of embodied energy:

Initial embodied energy

"The initial embodied energy in buildings represents the non-renewable energy consumed in the acquisition of raw materials, their processing, manufacturing, transportation to site, and construction. This initial embodied energy has two components:

- Direct energy – the energy used to transport building products to the site, and then to construct the building
- Indirect energy – the energy used to acquire, process and manufacture the building materials, including any transportation related to these activities."

Recurring embodied energy

The recurring embodied energy in buildings represents the non-renewable energy consumed to maintain, repair, restore, refurbish or replace materials, components or systems during the life of the building.

In most First Nations communities, initial capital costs determine the selection of building components and construction methods. In remote communities, selection of building components depends on access to construction-supply companies. Material transport in some communities is by winter roads or airlift. While it may seem that total energy use for those communities cannot be reduced, an interesting article by Cole and Kernan suggests otherwise.

Cole and Kernan examined the life-cycle energy use for a typical Canadian office building with no underground parking, averaged over wood, steel and concrete structures. By cumulatively adding the operational costs of maintaining the building they found that, by year 50, the initial embodied energy was only a fraction of the total energy use of the building. In fact they found that eight per cent of the total energy use was for operational costs vs. five per cent for initial embodied energy and seven per cent for recurring embodied energy (replacement costs). Clearly reducing the total energy use in buildings is accomplished more by reducing the operational energy than by reducing the embodied energy of the building materials.

Reducing Operational Energy

There is a directly proportionate link between home size and the consumption of materials and energy. Additionally, conventional construction techniques can be optimized to reduce material use through thoughtful design.

Operational energy from the building's demand for heating, ventilation and lighting can be reduced through the recommendations outlined in the FNNBOA Healthy Housing™ course.

Taking advantage of passive heating systems through

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Newer flooring companies such as PREGO began selling laminate flooring in the early '80s, but didn't receive popular support in residential use until the early to mid-'90s.

Heating Company Information: A history of the band's use of mechanical-supply contractors is always good information as well. Furnaces in particular seem to gain or lose favour. Knowing when the band quit installing particular appliances will help in pinning down the age of a unit. Remember Flame Masters? Chance are, if you come across this type, you will recommend replacement, regardless of the condition of the unit, as they have a history of failed thermal-heat exchangers. Labels can be found on the furnace panel walls when you remove the cover, and are a good indication of age. As houses become more airtight and thermally efficient, the need for high-output furnaces declined, and BTU outputs have decreased from 100,000BTU to 60,000BTU, serving houses the same size.

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First Nations wishing to establish competency levels may use FNNBOA certification requirements, which have all of these elements, and added skill and knowledge levels relating to FN reporting requirements, funding agreements and Building Sciences in relation to repair of existing building. In addition, the FNBO provides progress inspections as part of field reviews.

FNNBOA is currently helping several communities to establish building-permit systems. Building-permit systems help to create a regulatory environment in which all homes built in the community meet the objectives of the National Building Code of Canada: safety, health, accessibility for persons with disabilities and fire and structural protection of building.

For help in establishing permit systems, contact:

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orientation of the house to face the sun, using more energy-efficient appliances and improved building envelopes can reduce energy consumption significantly without substantial capital costs.

Attention to construction details to increase air tightness and the thermal efficiency of the building envelope also substantially decreases operational costs.

Some First Nations have made attending the Better Builder Series mandatory for all employees, and have seen a significant decrease in operational costs. Recent Energuide For New Houses tests on housing built in Manitoba passed EGH80 simply because they were built by competent contractors (.57 air exchange rate). The homes were the standard three-bedroom bungalow built on a four-foot crawlspace. While many consultants and engineers are promoting energy-efficient house designs, clearly we can build better and more efficient homes using existing plans, and training our workforce.

Because much of the energy we use in Canada is produced from fossil fuels such as coal, oil and gas, the energy you save heating your home could also reduce the greenhouse gas emissions that contribute to climate change. And that helps our environment.

FNNBOA Healthy Housing™ - a house that is good for the people who live in it, good for the community and good for the environment. Developed with the help of Health Canada and CMHC, this training course is available through FNNBOA.

Better Builder Series - the benefits of changing building designs, improving tendering and employing a life-cycle (longer-term) approach to assessing the costs of housing. It's available through CMHC Aboriginal Capacity advisors.