# INTRODUCTION BOOKLET:

## TECHNICAL GUIDE FOR NORTHERN HOUSING

## GUIDING PRINCIPLES

First Nations National Building Officers Association

Association nationale des agents du bâtiment des premières nations

# GUIDING PRINCIPLES

The following guiding principles were used to assess the effectiveness of typical southern construction materials and methods for use in northern communities. They can assist in addressing logistical challenges.

## 1. Durable / Robust

The delay and cost of repairing or replacing building elements can easily make materials more costly over the lifespan of a house. Materials and assemblies in houses generally need to be more durable than what is typically used in the south.

Improper shipping, storage, and handling of construction materials for northern communities can easily damage materials so that they are not usable. Many northern and remote locations are subject to severe environmental conditions, which is demanding on construction materials and labour practices. Required repairs and material replacements often have to be postponed until the next shipping and construction season.

Durability includes resistance to:

- Extreme cold (e.g. vinyl siding easily cracks when very cold)
- Thermal movement (e.g. exposed fastener metal roofing; fastener holes are prone to getting stretched open)
- Structural movement (e.g. masonry readily cracks with ground settlement and is high risk in permafrost regions)
- Wildlife (e.g. woodpeckers, rodents, bears, etc.)
- Fire (e.g. protection from wildfires, protection from interior fires, smoke alarms, woodstove clearances)
- Water and moisture (e.g. roof leaks, plumbing leaks, exterior drainage)
- Freeze and thaw cycling and ice formation causing damage to some materials and assemblies
- Sunlight (e.g. UV radiation deteriorates asphalt shingles, degrades sealants around windows)
- Wind (e.g. tie-downs to foundation and roof to wood-frame walls, snow drifts)

Materials, assemblies, and equipment to be specified and installed should last the anticipated life span of the house, where possible.

The minimum service life of a house is considered to be 40 years. For example, it is likely more economical and practical to install a quality metal roof that could last up to 40 years, instead of installing a typical 15- to 20-year service life asphalt shingle roof (assuming the house stays in use longer than 12 to 20 years). If you are using local labour for the shingles, thus contributing to the local economy, it may be determined to be the better choice. A simplified life-cycle cost analysis would determine the best alternative.

Cover Image: Fort Good Hope, Northwest Territories. Also known as the Charter Community of K'asho Got'ine, is situated in the Sahtu Region. The K'asho Got'ine Housing Society continues to tackle homelessness and inadequate housing in the community, and has established a sawmill that began operating in 2018. Consultation in developing housing programs is helping to improve and build longer-lasting homes that function properly, but much remains to be done.

Brockman, A. (2019, March 05). How Fort Good Hope is faring as it tackles a housing crisis. Retrieved April 06, 2021,from https://www.cbc.ca/news/canada/north/fort-good-hope-housing-crisis-next-steps-1.5042791

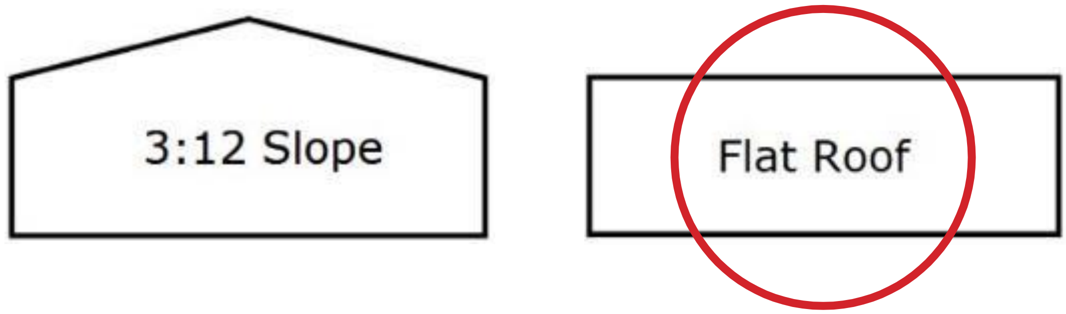
## 2. Back-Up Systems

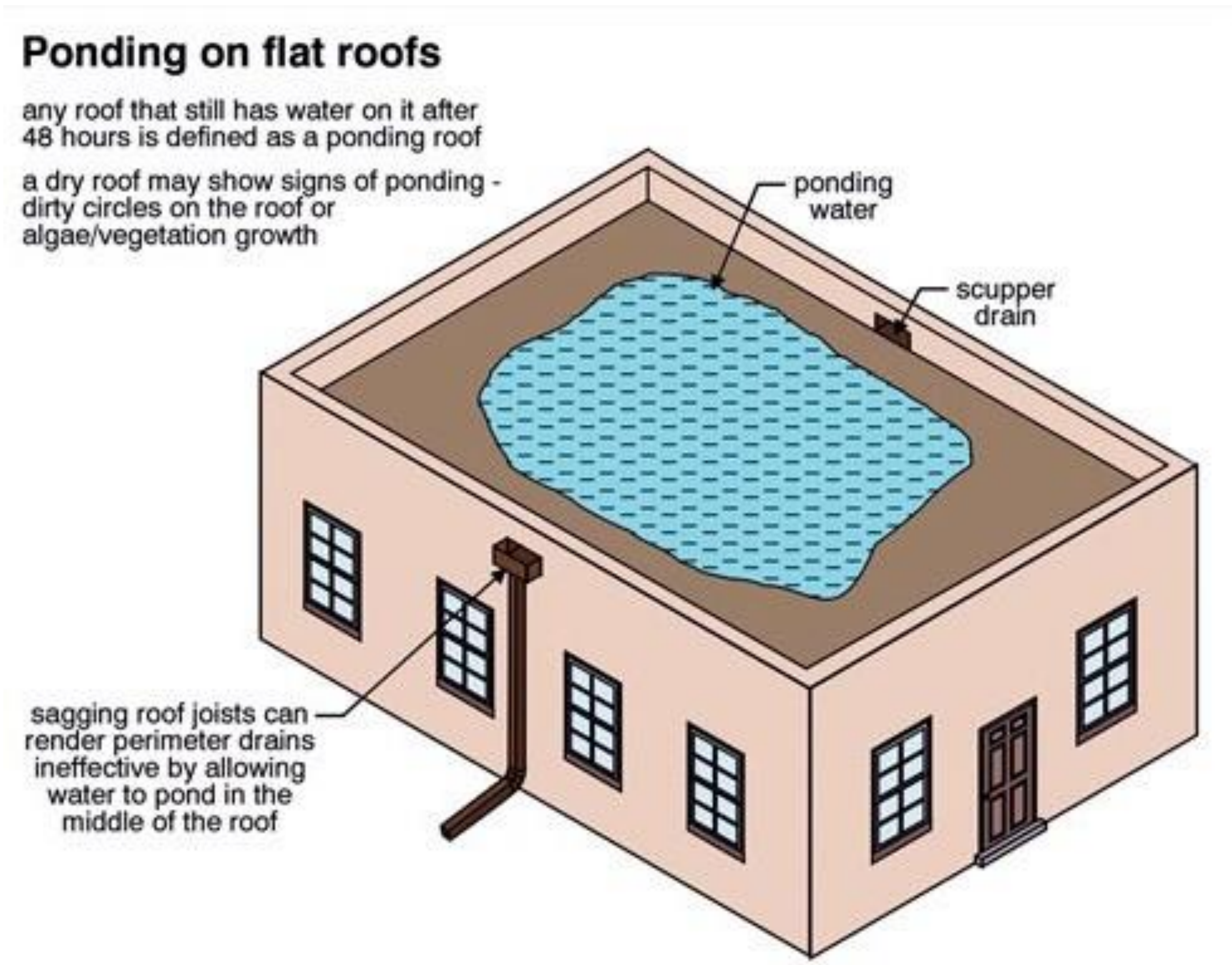
If an element in the house fails, the house still needs to function over the delay period until the failed element can be fixed or replaced. One example is if the furnace, the primary system for heating the home. There needs to be a backup system to keep the home warm. In cases where the oil-burning forced air furnace fails or stops working, a combination oil/wood furnace that can run both oil and wood would function as a reliable backup system. A generator can also serve as a backup to power the furnace or to power supplemental electric heaters.

Combination Oil/WoodHot Air Furnace

### 3. Repairable

Materials and assemblies need to be easily repairable, both temporarily and permanently. For example, a leak in a flat roof is generally more difficult to temporarily patch where water can accumulate. A sloped roof is usually made up of overlapped layers of protection that can be patched, and water drains away.



## 4. Tolerant to Installation Errors

Materials and assemblies need to tolerate errors in installation. For example, mineral wool batt insulation is very easy to work with. It can be installed at any temperature, and errors such as gaps/voids can be easily fixed, as it can be removed and reinstalled. In contrast, spray foam insulation (not canned foam window/door sealant), requires skill and training, and is difficult to correct if errors occur. Spray foam cannot be re-used, and becomes waste. If spray foam is not installed properly, it can shrink and crack, or if installed at too cold a temperature, it will not cure properly and could cause off-gassing issues that are a health hazard.

## 5. Simple

As most construction will likely be performed by local workers with limited knowledge, the materials, assemblies, and systems need to be as straightforward and simple as possible. It is important to avoid highly specialized and complex systems. Where possible, construction materials that can be re-used should be considered instead of non-re-usable materials. An example is the use of foam board insulation that can be re-used instead of spray foam that cannot (see bagged spray foam waste below).

## 6. Low Maintenance

Where possible, no- or minimal-maintenance construction materials and systems should be used. High-maintenance details that rely on exterior sealants have a relatively short lifespan (5-10 years). Instead, use good building practices, such as direct and reliable detailing, to keep rain and snow out, such as layering exterior finishes and flashings that lead moisture back to the exterior with little to minimal sealant use.

## 7. Flexible

Consider systems in a house that are adjustable to changes, such as screw-pile jack adjustable foundations,over less preferred rigid, inflexible systems. Foundations directly connected to the ground, such as in southern climates, do not have to consider more extreme northern climate issues such as frost heave, permafrost, heavy snow accumulation and drifting, and shifting ground.

## 8. Shippable and Erectable

Using house designs and layouts based on four-foot increments will reduce construction waste, such as plywood sheathing. Avoid large, awkward pieces that require hoisting equipment or cranes beyond what is readily available in the community (e.g. large trusses). This also apples to any bulky systems that are inefficient to ship (e.g. trusses) and excessively heavy materials (e.g. masonry and concrete).

## 9. Job Properly Done

Given the shortage of housing in remote and northern communities, lowering costs is important. There are two initial categories of cost to consider: construction and maintenance (energy cost is another, not dealt with here). A lower quality of construction will be less expensive to build but more expensive to repair and maintain, so it is important to consider the lifespan of the building and materials when considering costs. Of the following two photos, the first is a good example of a high-quality housing prototype properly done in Quaqtaq, Nunavik. The second photo is a home in Wasagamack First Nation, Manitoba, where the homeowner made repairs with salvaged materials foraged from this Indigenous community. This is often seen in communities without a new housing plan and little sustainable repair funding.

## 10. Safe

Safety considerations are essential for construction and maintenance workers, as well as house occupants. The safest building designs and materials should be selected over other options, where possible. For example, a 4:12 roof slope is generally safer than an 8:12 roof slope, reducing the risk of damage and injury during installation and maintenance, or from sliding snow.