Technical Guideline Development for High Performance Coastal First Nations Housing

UBC Sustainability Scholars

Project Summary

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Coastal First Nations
GREAT BEAR INITIATIVE

Executive Summary

This CEEN596 and UBC Sustainability Scholars project has evaluated a number of standards, technologies and methods for new home construction in the remote communities of the Great Bear Initiative Coastal First Nations in British Columbia. Current home construction in these communities does not address a number of technical, social, economic and cultural needs. The key issues to be addressed in new home construction, and the recommended solutions proposed in this study are summarized below:

Technology Summary

Category	Recommendation	Implementation	Cost Analysis
Passive Solar Design	-Incorporate all aspects of passive solar design wherever the building site allows	-Passive solar must be considered in the design phase -Sourcing concrete and high-performance windows may be an issue	-Does not add significant cost unless concrete is at a premium
Foundation	-Build slab on grade foundations wherever site conditions permit	-Sites must be suitable and well-prepared -Plumbing and ductwork must be well-planned -Requires good source of concrete	-May be the most affordable option, depending on cost of concrete
Frame	-Use advanced framing techniques in stick-build construction when labour is available	-Code and structural requirements must be checked	-Should lead to cost savings compared to traditional stick-build
Insulation	-Use cellulose insulation where available for walls and roofs -Rigid foam for foundations -Spray foam to seal gaps	-Cellulose requires special equipment and qualified person to install -Traditional fiberglass may be only option where this is not feasible	-Rigid foam and spray foam insulations are costly, use only as much as necessary
WRB	-Use a flexible house wrap, combined with exterior rigid foam if possible	-House wraps are standard on most houses and already in use e.g. in Nuxalk	-Flexible house wrap is affordable option -Adding foam insulation is costly
Weatherproofing	-Create a rainscreen underneath exterior finish -Design effective eaves, gutters and covered entryways	-Requires expertise in furring and attaching cladding -Nuxalk is excellent resource	-Weatherproofing adds marginal extra cost, dramatically increases lifespan of building

Windows	-Use triple-glazed windows with thermal break wherever possible	-Triple-glazed windows may be difficult to source and replace	-Cost premium for high-performance windows balanced by energy savings
Doors	-Use steel or fiberglass doors where possible	-Usually no difference in implementation	-Steel and fiberglass doors are more affordable and perform better than wooden doors
Space Heating	Highly community specific: -Use air source heat pumps where possible -Radiant underfloor heating as a good alternative with concrete floors -Pellet stoves where fuel is available	-Mini split heat pumps can provide heat to several rooms -Heat pumps require proper maintenance -Radiant heating can be easily combined with slab on grade foundation, requires less maintenance -Pellet stoves require some manual labour	-Heat pumps more expensive than baseboard, but have lower operating cost -Similar cost to forced air furnace
Space Cooling	-Use of air conditioners if required -Hydronic underfloor heating systems can also be used for cooling	-Cooling is rarely necessary in coastal BC climate	-Cooling system adds extra cost
Ventilation	-Include mechanical ventilation in new homes -Use HRVs where possible	-HRVs require regular maintenance and proper operation, as well as qualified installation -Fan-only ventilation where HRVs are infeasible	-HRV carries cost premium
Lighting	-Use LED lighting in new home construction	-Usually no difference in implementation -Less maintenance	-Up-front costs will be higher, but pays off over time
Water Heating	-Use storage water heater -Heat pump water heater as stretch goal	-Storage water heater is standard practice -Heat pumps would require specialized installation	-On-demand heaters may not be worth extra cost -Storage heaters still most economical
Appliances	-Use ENERGY STAR® certified appliances where possible	-Usually no difference in implementation	-Extra cost quickly pays off in energy savings
Onsite Renewables	-Not currently recommended	-Solar PV or wind requires extensive planning and specialized equipment	-Cost savings unlikely to pay off in project lifetime

Community Needs Summary

Existing Housing Issue	Solutions for New Housing
Issue #1: Water Leakage and Pooling	• Rainscreening • Covered entryways and steel doors • Effective gutters and eavestroughs • Weatherproof building envelope • Sealed ducts and other openings • Graded site and well-drained foundation • Sufficient ventilation
Issue #2: Mould	• Elimination of basement or crawlspace • Airtight building envelope • Mechanical ventilation • Heat pump or forced air heating • Mould-resistant drywall, insulation and paint
Issue #3: Cold and Drafty Spaces	• Airtight building envelope • Slab on grade foundation • Heat recovery ventilation • Heat pump or forced air heating
Issue #4: Inadequate Gathering Space	• Passive solar design • Open floor plans • Flexible common areas
Issue #5: Food Preparation and Storage	• Larger kitchens and pantries • Outdoor preparation facilities for fish and game • Adequate ventilation for cooking areas • Canning rooms or smokehouses if desired
Issue #6: Energy Efficiency and Sustainability	• Passive solar design – triple glazed windows • Advanced framing techniques • Extensive use of insulation • Airtight building envelope • Sealed ducts and other openings • Heat pump space heating + advanced controls • LED lighting and energy efficient appliances • Use of recycled or sustainable materials • Heat recovery ventilation
Issue #7: Affordability	• Use of affordable insulation materials • Minimizing shipping to remote communities • Passive solar design • Airtight building envelope • Sealed ducts and other openings
Issue #8: Local Capacity and Materials	• Use of locally available material when possible • Use of local labour and expertise when possible