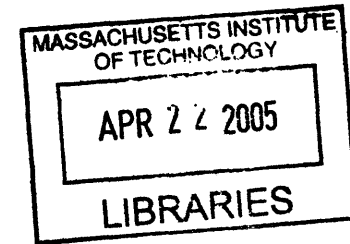


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building skills: A CONSTRUCTION TRADES TRAINING FACILITY FOR THE EASTERN CANADIAN ARCTIC
Submitted to the Department of Urban Planning and the Department of
Architecture in partial fulfillment of the requirements for the degrees of
Master in City Planning and Master of Architecture
at the Massachusetts Institute of Technology, February 2005.

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Submitted to the Department of Urban Planning and the Department of Architecture on January 28, 2005 in
Partial Fulfillment of the Requirements for the Degrees of Master in City Planning and Master of Architecture

by Sarah Katherine Roszler

ABSTRACT

On April 1, 1999, the Inuit of the Eastern Canadian Arctic achieved sovereignty over a new territory, Nunavut, envisioning economic self-reliance, political self-determination, and renewal of confidence in Inuit community. Life in Nunavut, however, remains circumscribed by adversities: poverty, crowded houses, and long winters. Both government and industry are constrained by inexperienced administration and insufficient budgets. Perhaps no sector is as challenged as the construction industry, caught between the vast demand of a housing crisis and the extreme cost of importing labor. The territory must invest in building skills to reduce the cost of housing. Trades training in the Eastern Arctic will have political, cultural, and economic significance for a community long dependent on remote governments and migrant workers. Moreover, local tradesmen will be indispensable to an affordable construction strategy for community buildings serving a population expanding at twice the national rate. Over the course of fifty years of permanent settlement in Nunavut, no construction system has yet been devised for civic spaces that respond to its social, physical, and logistical conditions.

This thesis proposes a Trades Training Center in Iqaluit, the capital city of Nunavut, that provides learning space to local apprentices, and gathering space for growing communities. The project recommends principles for public buildings that are spatially and materially responsive to the civic needs, environmental features, and seasonal rhythms of Nunavut. It does this by moving from large-scale observations of the social and physical fabric of the territory, to small-scale proposals for materials and joints. The thesis demonstrates that the architect-planner discovers the building in the qualities of the place, and, reciprocally, learns about the place by thinking about the building.

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This project is dedicated to my grandparents, Nelli and Jeno Varga, and Hy and Ida Koch. For their salty Hungarian songs, and sweet Yiddish endearments. For their wisdom, humor, generosity, and love.

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Point of arrival for the Eastern Arctic, Iqaluit's airport and airstrip

INTRODUCTION

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On April 1, 1999, 25 000 Inuit living in the Eastern Canadian Arctic achieved sovereignty over a new territory, Nunavut. This immense swath of tundra making up one-fifth of Canada's landmass, formerly the far northern and eastern reaches of the Northwest Territories (NWT), is populated by only 30,000 people, accounting for 1% of the national population but 50% of the national Inuit population.¹ The overarching objective of the creation of Nunavut is to restore the self-determinacy, self-sufficiency, and self-confidence of Inuit living in the Eastern arctic. This project is driven by the Inuit motivation to develop the arctic territory in which they control the operation of their own government, the preservation of their culture, management of the land and its resources, development of the economy, and the education of its stewards, Nunavummiut, the people of Nunavut.

¹ Inuit Population in Canada, <http://www12.statcan.ca/english/census01>.
Jan. 17 2005.

Over the course of the last five years since its creation, Nunavut has experienced profound changes in its social and physical landscape. The territory, once governed from afar by administrators in Yellowknife, capital city of the NWT, now has its own seat of government, the Nunavut Legislative Assembly, in its own capital city, Iqaluit. Its government rules by consensus, based on the manifestation of power in traditional Inuit society. Inuit are favored for employment within the government, and Inuit firms are prioritized for public contracts. Community leaders are working to integrate traditional Inuit knowledge, Inuit Qaujimagatuqangit (IQ), into "Made-In-Nunavut" government and industry. Government offices have been decentralized across the territory, in an effort to bring more jobs to Inuit, and to bring Nunavummiut concerns closer to government. Decentralization of the government to Nunavut's hamlets, the growth of its regional centers, and the rapid expansion of the capital city have produced building booms in the 25 permanent settlements across the territory. The vision of an empowered Nunavut has yielded unprecedented opportunities and amenities.

But life in Nunavut is still hard, and hopes for fulfillment of dreams in the immediate future remain

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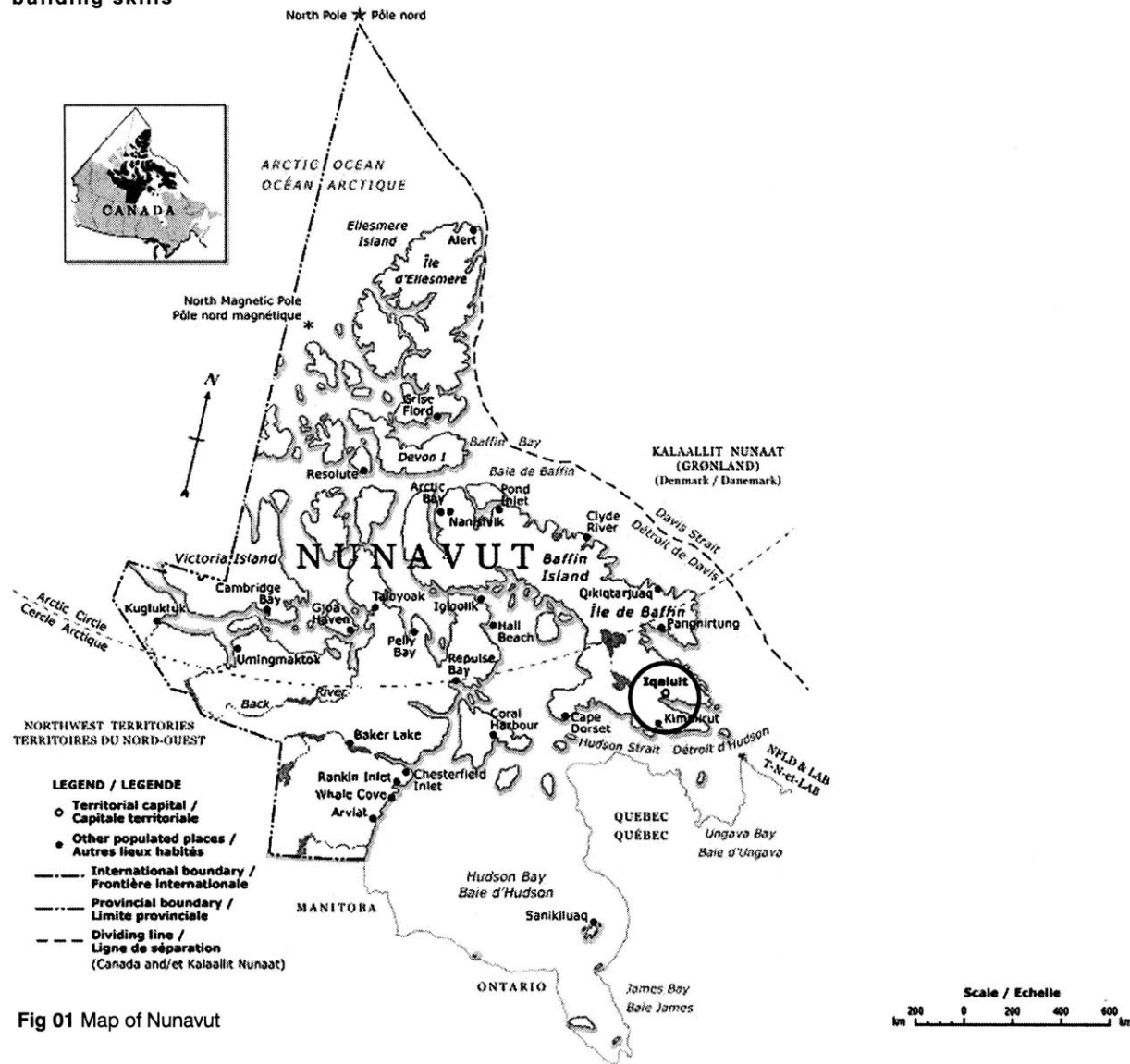


Fig 01 Map of Nunavut

limited. The young Inuit-led government is short both on funds and experience, and the private sector, mostly fishing, tourism, mining, and construction, is similarly constrained by the very same factors. Of each of these industries, perhaps none is as challenged as the construction industry, caught between vast demand and the extreme cost of importing material and labor to every jobsite. Material costs cannot be significantly reduced and prospects for local manufacturing are improbable. Labor costs, however, would be substantially reduced if the appropriate skills were available within the territory: the cost of importing and sustaining migrant tradesmen is an unwieldy financial burden on the construction sector. The planning research in this thesis demonstrates that a local force of Inuit carpenters, electricians, and plumbers will be instrumental to the development of industry and government, and the improvement of homes and lives. The thesis aims to make clear the need for investment in construction trades training in order to reduce construction costs, to make housing more affordable to low-income families, and to make public spaces more affordable to low-income communities.

The growth of a force of Inuit tradesmen will demand a broad and multi-tiered strategy encompassing economic incentives for contractors and apprentices; marketing efforts to promote the trades; administrative development to monitor trade participation; and public-private co-operation to craft curriculum and organize program delivery. Successful program delivery is likely to reach across elementary schools, high schools, community centers, and regional/territorial facilities. The design project of the thesis focuses on this last piece of the larger strategy: a trades training center in Iqaluit serving Nunavut's first carpenters, electricians, plumbers, and oil burner mechanics trained within the territory.

This proposal for a construction trades training facility in Nunavut is shaped by the economic

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Fig 02 Surveying the tundra

conditions, cultural needs, settlement patterns, climatic extremes, geological forms, and seasonal rhythms that, across the territory, will influence the program and design of public buildings in the anticipated growth of Nunavut's civic realm.

The building program is guided by the needs of trade apprentices for training space as well as the needs of community for civic space. The center therefore includes, in addition to trades training facilities, a central, multi-use public space, and community learning and meeting spaces. The building design is guided by a set of observations about the civic fabric of the city, the physical condition of the site, and the seasonal/logistical rhythms of the territory. As a result of these observations, the design presents a spatial strategy that clusters activities around a central gathering space, and a technical strategy that involves simple materials bound by flexible connections. The overarching aim of this design project is to propose a way of building in the Canadian arctic that transcends limitations constraining the growth of the Eastern Arctic construction industry (high material costs, low labor skills, limited administrative skill, uncertain shipping schedules and tight construction schedules) and emphasizes opportunities for developing labor skills and nurturing community empowerment. The thesis strives to establish a set of principles responding to the unique needs of Nunavut in the design of much-needed training space and, more broadly, civic space.

Each chapter produces observations leading towards the articulation of a Nunavut trades training center in Iqaluit. Chapters I-VI provide context for the project in the planning and design literature; in the history of Eastern Arctic construction; in current construction industry inefficiencies; in the discussion of public/private involvement in, and delivery of trades training; and in the design of public space in Nunavut. Chapters VII-VIII focus on the design of the building, describing the environmental factors idiosyncratic to Nunavut which give the building its form, and then presenting the building itself,

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modeled at three scales demonstrating the formal language, spatial quality, and detail prototype of the proposal.

Chapter I, the literature review, begins by pointing to the impetus for this project, overwhelming need for low-income housing in the Eastern Arctic, and describes why conventional demand- and supply-side policies recommended in the housing literature are unlikely to work in Nunavut. Demand-side subsidies are unfeasible because the government does not have the funds to bridge the wide gap between the resources of families and market rates for either rental or ownership units. Supply-side subsidies to landlords and developers are implausible for the same reason. Supply side policies to increase competition are also unlikely to work because of the oligopolistic business environment. “Grassroots” subsidies to low-income families as advocated by the self-help literature have been only moderately successful. Instead, a supply-side strategy from the economic development literature, investment in the labor force, seems most likely to make housing more affordable. Lower labor costs will also reduce the cost of public construction in the face of growing demand for community space. The literature on community space for low-resource, low-skill areas is reviewed, recommending a construction system based on the tenets of appropriate technology for the design of public spaces in Nunavut.

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Chapter II, on the history of settlement in the Eastern Arctic, describes how the act of creating buildings in the arctic had, and continues to have, powerful consequences for the political and cultural self-determination of the Inuit. Starting from the 50s, buildings made possible, and also very clear, the colonial presence of Southerners in the North. At the same time, permanent construction asserted unequivocally that Inuit traditional lifestyle was facing an end. Once beholden to the shelter provided by government, Inuit were beholden to government for much more, including food, welfare, and

education for their children. Today, however, construction has an opportunity to provide relief from the dependencies deeply entrenched in arctic society. If the industry can be designed by an increasingly Inuit-led government in coordination with an increasingly Inuit-administered private realm, Inuit will be able to reap the economic, political and cultural rewards of construction sector growth, and witness, for the first time since the permanent settlement of Nunavut, edifices of their own making serving their own needs and interests.

Chapter III identifies the economic inefficiencies in the construction industry, and demonstrates that labor costs can and must be reduced by greater Inuit participation in the construction sector. The chapter draws on data from the Nunavut Housing Corporation and interviews with government, contractors, and sub-contractors to show that a premium is being paid for skilled labor: local firms import tradesmen from outside Nunavut because locally available laborers do not have sufficient skill to meet deadlines within the tight, climate-dictated construction season. The deleterious effects of importing labor are broad: contractors increase their bids which, on public projects, the government is required to accept. Unemployment dollars leave the territory with migrant wage-earners, and Nunavummiut continue to participate only at the margins of the construction sector. The chapter concludes there is a strong economic argument for investing in the construction labor force, and that training, not manufacturing, is where both government and industry must focus development efforts.

Chapter IV recommends that the efficient evolution and functioning of the industry will require that public and private sectors pool resources, marshalling funding and ideas. Government and industry must coordinate in order to understand their mutual needs in crafting a labor-based strategy to increase the efficiency of the construction process.

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Chapter V, which describes the current discourse on training in Nunavut, illustrates what difficulties lie ahead in the articulation of a trades training strategy, especially with respect to choosing a delivery system. There is a Herculean task ahead of stock-taking, cost/benefit analysis, and community consultation in order to demonstrate the merits and disadvantages of community-based and centralized training.

Chapter VI makes the case for broad community access to a trades training center: in this rapidly growing part of the country where public space is severely limited and the need for congregation space is expanding, a new civic facility must open its doors to multiple constituencies, from Iqaluit and from across Nunavut. The opportunity to contribute to the small public realm demands articulation of a vision for public space appropriate to Nunavut. The chapter reviews the evolution of Iqaluit's small public realm, and looks to precedents in the circumpolar world and in First Nations communities across Canada for insights into spaces that welcome civic activity in small, remote, developing communities. Additionally, the chapter discusses an architectural language for public buildings in Nunavut that mitigates cost and time constraints of building community spaces in the Eastern Arctic, promoting community gathering in the development of the territory.

Chapter VII describes the social, physical, and logistical factors shaping the design of the center. The text describes six panels addressing civic needs, environmental conditions, and seasonal logistics in Nunavut, and establishes a set of principles for institutional and public buildings in the Eastern Canadian North. The chapter demonstrates that arctic design can strengthen relationships between the loosely-defined zones of activity in a Nunavut community, and at the same time fill gaps in the civic fabric by adding needed public space; it can work with, instead of against, the prevailing wind and diminishing daylight of the winter months; it can be programmed to accommodate the needs of the

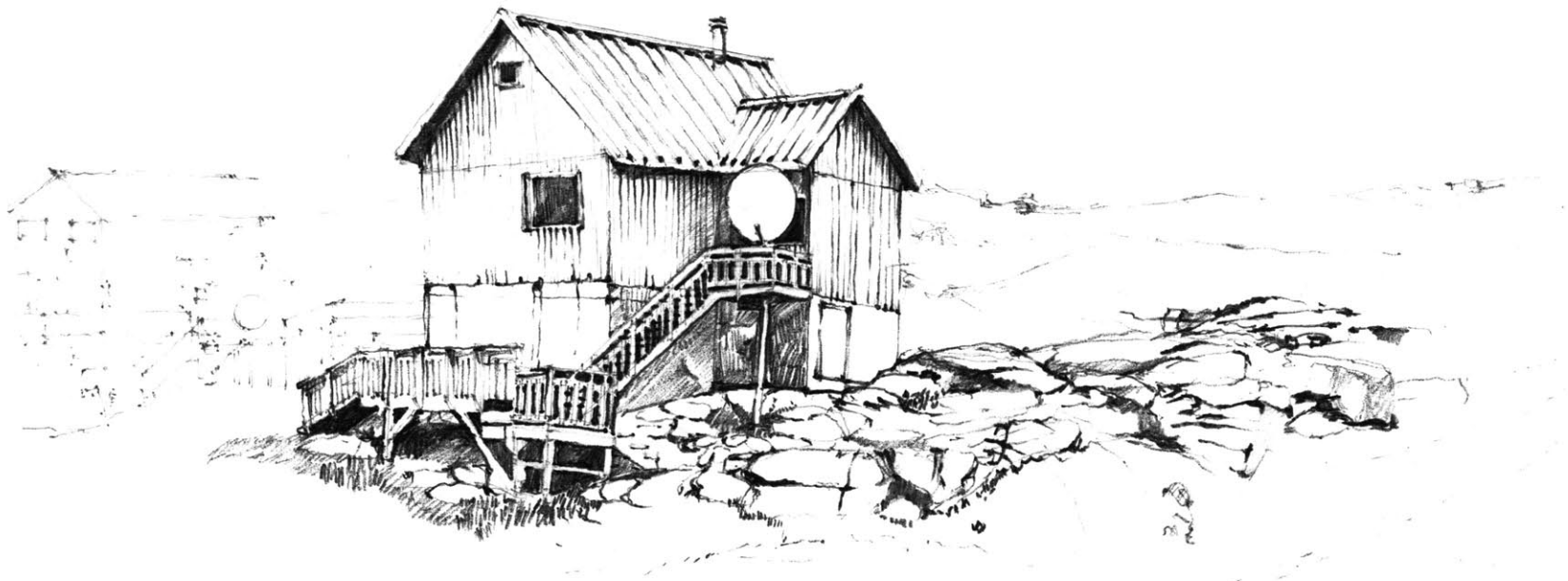
people who will use it through the year; and it can find an elegant architectural expression in simple construction strategies that respond to shipping and storage logistics.

Chapter VIII presents drawings and model images of the design that emerges from the design principles described in the previous chapters. Design studies at four scales illustrate the form of this irregular, spiny building in the landscape; the quality of its ribbed, double-skinned spaces; and the detailing of a construction system made up of short, slim, scarf-jointed members lashed together with straps that can be emulated in public building projects across the territory. Areas for further design research are identified.

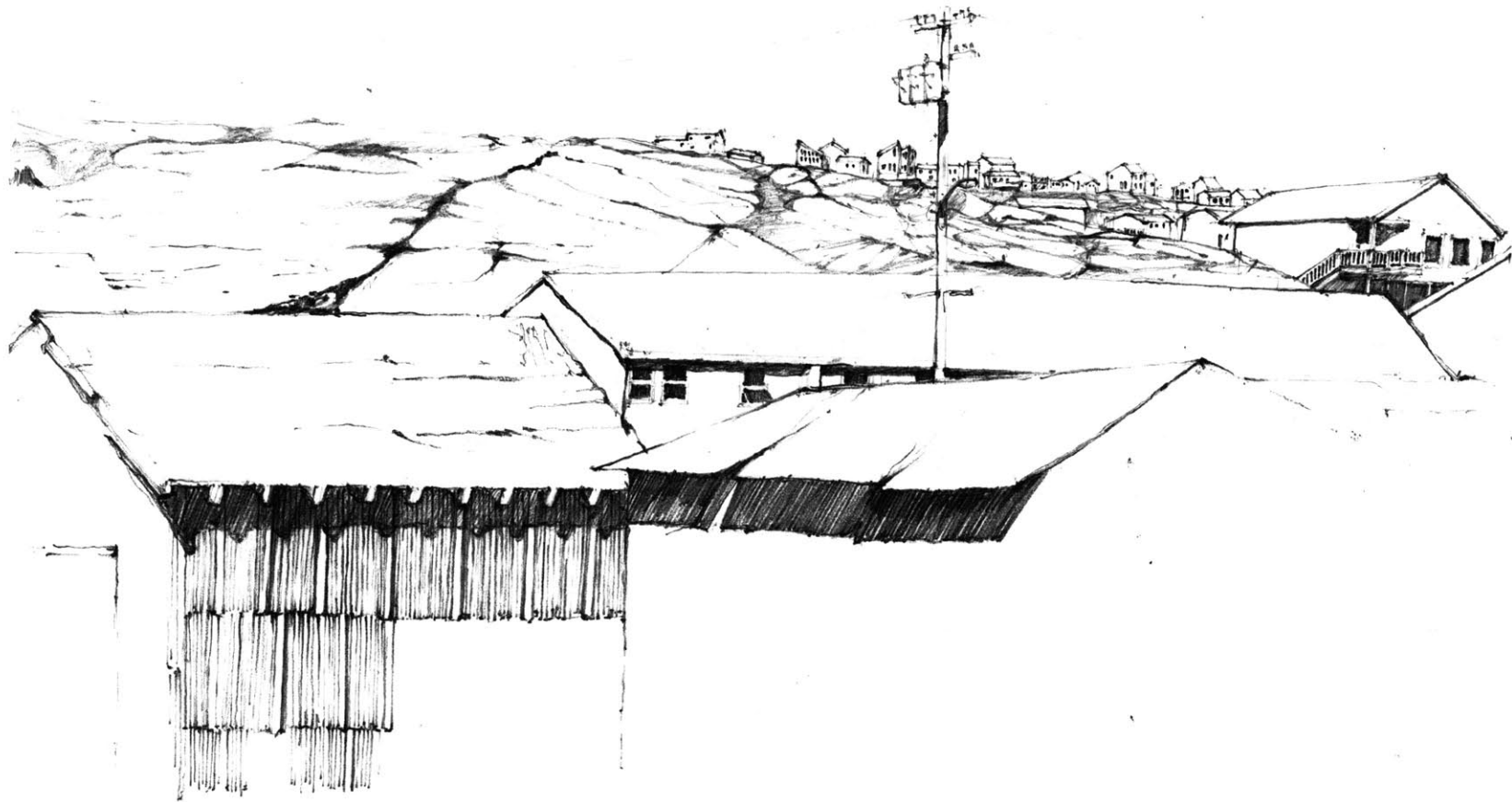
ROCKS, LICHEN, LAMPPOSTS, SIDING, PILES

SKETCHES

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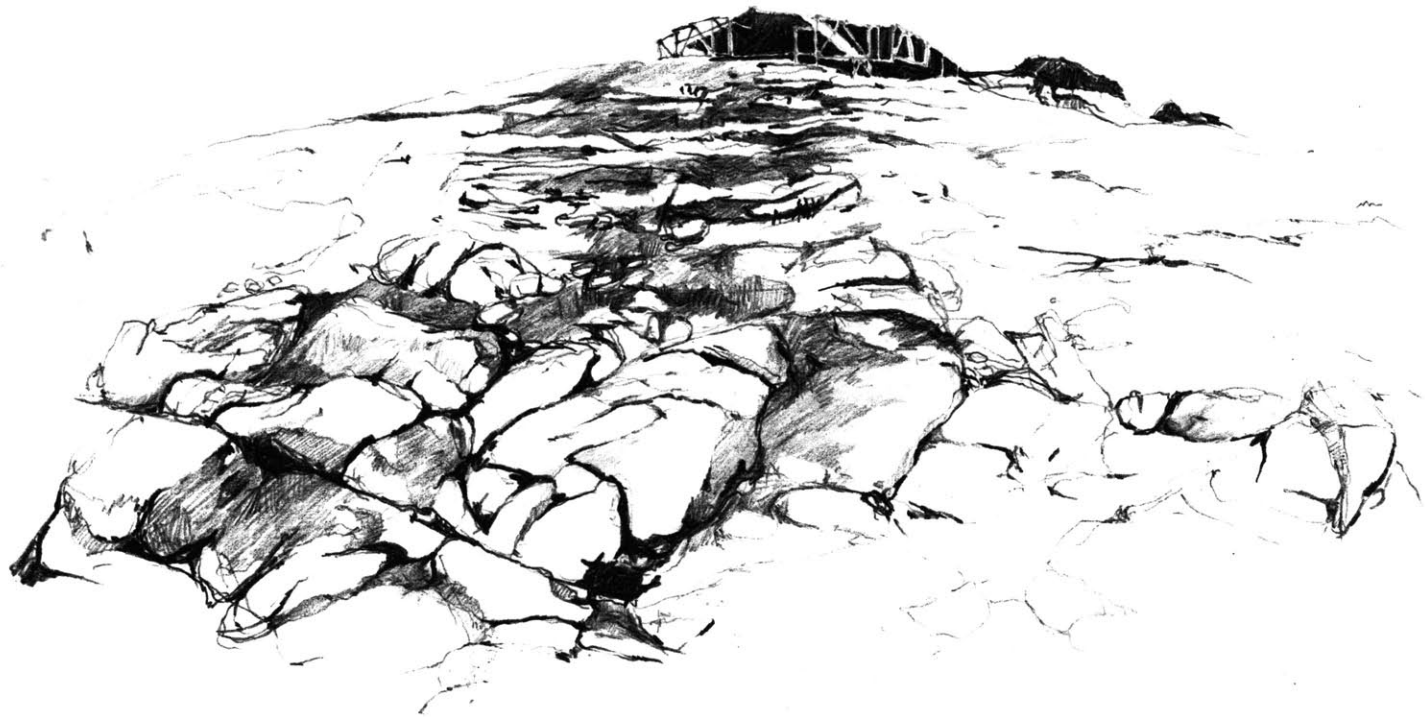


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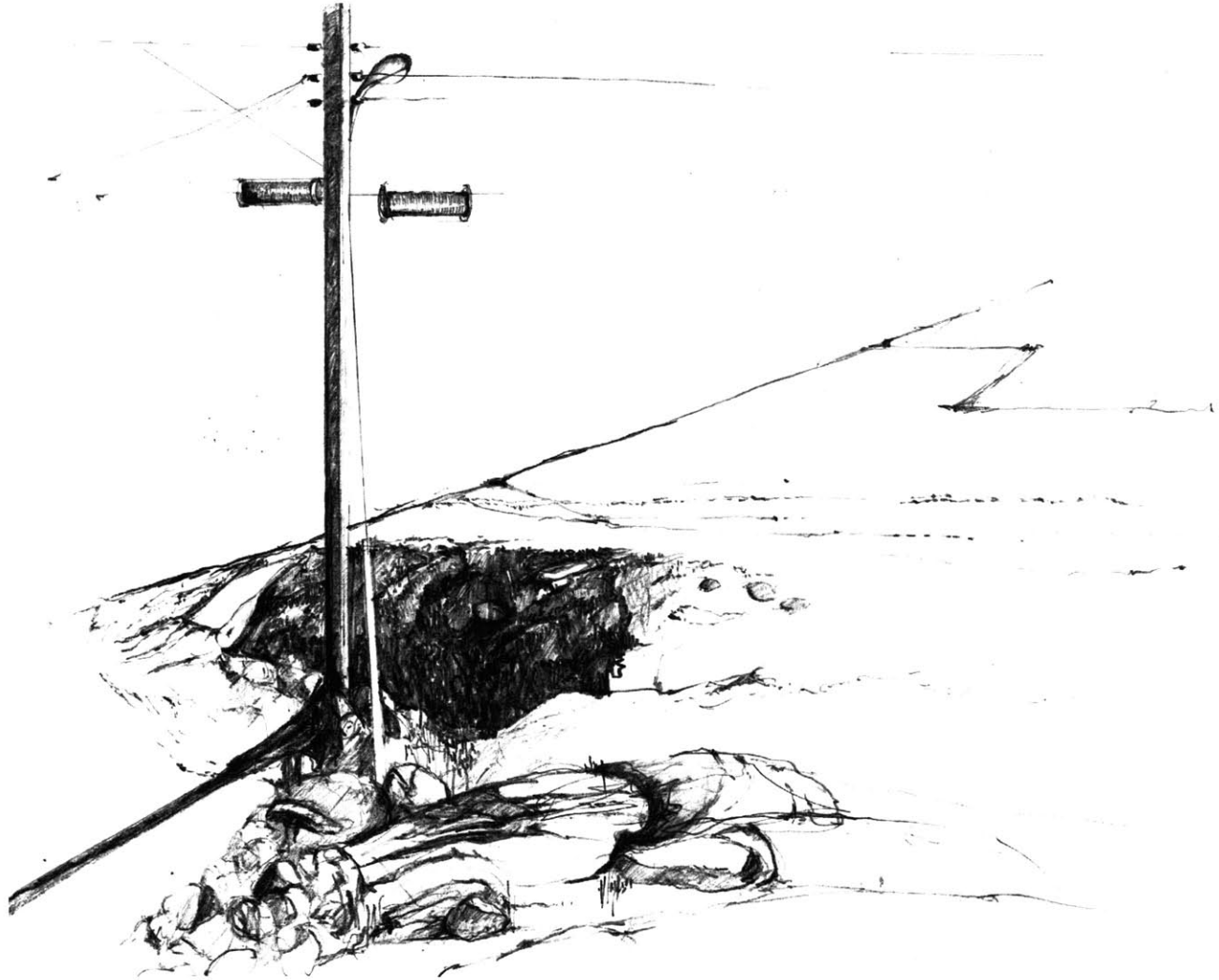


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Houses cluster on terrasses and along the bay, but demand far outstrips supply

Document REVIEW

CHAPTER I.

THE PROJECT IN THE CONTEXT OF THE LITERATURE

HOUSING POLICY AND ECONOMIC DEVELOPMENT
COMMUNITY SPACE AND APPROPRIATE TECHNOLOGY

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The literature review reveals a gap in the spectrum of remedies for areas like Nunavut—where the majority of families have nowhere near the means to procure shelter at market costs, where the government is impoverished with respect to public housing demand, and where housing suppliers face enormous costs that they can transfer onto a small number of buyers. Conventional demand- or supply-side solutions do not appear workable in these conditions. This thesis seeks to explore a solution under-served by the affordable housing literature: public investment in the training of local construction laborers for employment in the private sector. In the case of Nunavut, improving the capacity of construction workers will help produce lower costs, stimulate economic growth, and promote pride in the evolving Inuit-led construction sector.

The thesis also revisits the self help and appropriate technology literature to recommend that training skills be focused towards construction systems that are well-suited to Nunavut's unusually challenging physical environment. This is especially significant for the territory's increasing demand for public buildings, which currently depend heavily on expensive imported technologies also demanding imported labor. As this review will conclude, an appropriate construction strategy for Nunavut must consider the skills of a developing workforce together with the social, physical, and logistical environment of the territory. The main suggestions raised in the literature review, investment in the local labor force and development of an appropriate architectural language for public buildings, are later explored in this thesis through a design proposal for a training center in Iqaluit.

When this research began in the summer of 2003, neither demand- nor supply-side factors could be conclusively attributed with driving up the cost of housing and construction in the North. A common demand-side explanation heard was that the quickly expanding government, in its urgency to find housing for new bureaucrats, accepts the terms of any lease or sales price on staff housing. The

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government also acts as an institutional tenant, quickly acquiring new commercial/institutional space. Supply side explanations, meanwhile, pointed to the cost and risk of arctic construction, and to the oligopolistic business environment.¹

It is most likely that these factors work together to produce high costs for both residential and non-residential space. They reach a particularly pernicious confluence in the housing market, where need is overwhelming, and rental and ownership costs are prohibitive. In the face of these challenges to affordability, the Nunavut Housing Corporation (NHC), the government agency responsible for housing research, housing policy design, and public housing provision strains to meet its own standards of service provision and Canadian standards of household crowding. A review of the housing policy literature demonstrates the inadequacies of conventional demand- and supply-side strategies to stimulate affordability in Nunavut's rental and ownership markets. However, a strategy from the economic development literature may prove more effective for the particular conditions and needs of Nunavut.

DEMAND SIDE POLICIES

Demand-side policies, involving government transfers (cash or in-kind) to low-income families towards housing consumption in the private market, have political and economic appeal for Nunavut. Politically, demand-side solutions stimulate decision-making at the household level about how and where to live (albeit that choice is restricted to low-income housing). Household-level initiative resonates with political goals shared across the North promoting "bottom-up" empowerment and mitigating entrenched reliance on authority.² Economically, demand-side solutions move families into the private housing market, relieving pressure on an already burdened public housing sector.³

¹ Crystal Fuller, City Planner in Iqaluit Department of Lands, interview by author, Aug 20 2003, Iqaluit. Sheldon Nimchuk, Project Manager at Nunavut Construction Company / Nunavut Investment, interview by author, Aug 22 2003, Iqaluit.

² Gurston Dacks and Ken Coates, eds., Northern Communities: The Prospects for Empowerment, (Edmonton: Boreal Institute for Northern Studies, 1988), 10.

³ Chris D'Arcy, Director of Policy and Planning at Nunavut Housing Corporation, interview by author, July 12 2004, Iqaluit.

The appeal of demand-side solutions has resulted in a number of NHC programs that provide subsidies to households for the purchase of housing in the private sector. Foremost among these is the Nunavut Down Payment Assistance Program (NDAP), which “provides a grant to be used for a down payment towards bank financing” (\$15,000 for the purchase of an existing unit, \$25,000 for the construction of a new unit).⁴ When NDAP was announced in the summer of 2000, it was estimated that 42 families could be eligible for the plan.⁵ Within a year, 19 households had taken advantage of the program to either buy or build their own home.⁶

Homeownership subsidies, however, are unlikely to provide financial relief for most families that today depend on nearly fully-subsidized public housing. According to data from October, 2004, of Nunavut’s 3,854 social housing households, only 26 were assessed at “full rent,” receiving no rent subsidy. In contrast, 2,041 households were assessed “minimum rent,” indicating either very low income or income support in those families.⁷ The very low number of likely candidates for homeownership raises doubts about the impact of homeownership subsidies on government costs and market expansion in the near future.

There are also long-term problems related to homeownership subsidies that may only be revealed after the small, initial cohort of candidates has been served. Homeownership subsidies can promote “creaming” followed by “dredging”.⁸ When the government “creams” off the pool of public tenants those households most likely to become homeowners, it loses payments from households previously at the top of the rental scale. And when the government has exhausted the list of candidates who are truly in a financial position to become homeowners, it then “dredges” the pool of tenants for more candidates, recruiting households that may not be fully equipped to take on the demands of homeownership. Homeownership programs need periods during which to replenish the pool of dependable candidates.⁹

⁴ Nunavut Housing Corporation Business Plan 2004-5, (Iqaluit: Nunavut Housing Corporation).

⁵ “GN will help with down payments,” Nunatsiaq News, (June 30 2000), online at www.nunatsiaq.com.

⁶ “Nunavut legislative round-up,” Nunatsiaq News, (November 30 2001), online at www.nunatsiaq.com.

⁷ Jim Bell, “Are You Hopeless Yet?” Nunatsiaq News, (March 26 2004), online at www.nunatsiaq.com.

⁸ Tony Fahey, Social Housing In Ireland: A Study of Success, Failure, and Lessons Learned, (Dublin: Combat Poverty Agency, 1999) 20.

⁹ Ferguson, Simek and Clarke, Independent Evaluation of the Homeownership Assistance Program, (Yellowknife: Northwest Territories Housing Corporation, 1988), 17.

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The deleterious effects of “dredging” are evident in Clyde River, where, of five homes begun with funding from the Nunavut Down Payment Assistance Program, all save one had stalled during construction and remained unfinished, representing lost investment of both the NHC and the household.¹⁰ Although the government is anxious to help move families into homeownership situations, the downpayment cannot alone assure a successful transition from tenant to owner. Construction, mortgage and utility payments often bear down with great force.

It might be suggested that demand-side policies in Nunavut focus too strongly on homeownership, and that subsidies for households to enter the private rental market might have appeal across a broader section of low-income families currently in public housing. There is however, presently no low-income submarket in the private rental market. Moreover, no low-income submarket seems likely to evolve within the foreseeable future. A three bedroom home in a settlement can easily rent for \$2000 a month to one of many new GN employees or consultants desperate to find housing. The government does not have the resources to bridge the gap between the small amount that most public housing tenants can contribute, and the rent a landlord can exact in this tight market.

The difficulty of helping low-income families consume more housing, whether owned or rented, through income subsidies is not unique to Nunavut. The ineffectuality of income subsidies for families seeking housing is corroborated by the “well-established” observation in the literature that income elasticity of demand for housing in developing countries is low for both owners (0.4-0.8) and renters (0.3-0.6).¹¹ In the final analysis, conventional demand-side housing policies in the literature recommending subsidized, private sector homeownership or rental are unlikely to produce profound results for improving affordability of housing in Nunavut.

¹⁰ John Corkett, Housing Manager, interview by author, July 8 2004, Clyde River.

¹¹ Stephen Maplezzi and Stephen K. Mayo with David Gross, “Housing Demand in Developing Countries,” in World Bank Staff Working Papers No. 733, by the World Bank (Washington: The World Bank, 1985), 90.

SUPPLY SIDE POLICIES type 1: top-down

The implausibility of demand-side policies for Nunavut can, in part, be attributed to its learned dependence upon a supply-side approach.¹² Supply-side policies for the provision of affordable housing focus on the role of government to either build public housing, or subsidize private developers to build and manage low-income housing.¹³ Strategies for providing housing to low-income families in Nunavut are certainly dominated by the former. Of the 8,200 units of housing in Nunavut, 3,900, or 45%, are social housing, as described above. However, the need for affordable housing is quickly outstripping the capacity of the government to continue supplying public housing. In 2004, the Nunavut Housing Corporation received a one-time-only grant from the federal government permitting it to build 160 units over the next two years. The current number of public housing units needed across the territory, by contrast, is 3000. That number is expected to increase to 4000 in the next five years.¹⁴ Public housing is unlikely to provide a long-term response to the growing need for affordable housing. The other conventionally cited supply-side solution, subsidizing private developers to produce affordable rental or homeownership units, is unlikely to work for the same reasons described above. The disparity between the means of low-income household in Nunavut and the market value of rental or ownership units presents too great an expense for government resources to overcome through supply-side subsidies to developers or landlords.

A larger scale supply-side strategy in the literature recommends expanding the market, encouraging competition to decrease prices.¹⁵ This proposition recommends that in its movement from a government-dependent system to a competition-driven market system, the Government of Nunavut should be encouraging small businesses to enter the market. In its recent tenders for public housing, the NHC is attempting to stimulate competition by unbundling contracts for materials and labor. Separate contracts are an alternative to the conventional "Supply, Ship, and Erect" contracts that

¹² Michaela Rodrigue, "Thompson promises unknown number of new houses," Nunatsiaq News, (1999), online at www.nunatsiaq.com.

¹³ Arthur O'Sullivan, Urban Economics, (Toronto: Irwin, 1996), 409.

¹⁴ "Nunavut's housing crisis by the numbers," Nunatsiaq News, (May 7 2001), online at www.nunatsiaq.com.

¹⁵ David E. Dowall, From Central Planning to Market Systems: Implications of Economic Reforms for the Construction and Building Industries, (Athens: United Nations Industrial Development Organization, 1991), 12.

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Fig 1.1 Public housing in Clyde River

demand a sophisticated combination of skills, capital, and, experience. The smaller, unbundled contracts are ostensibly encouraging local, fledgling suppliers and contractors to develop capacity and enter the market. However, remoteness of location favors businesses that can achieve economies of scale, especially in the orchestration of materials. As will be described in further detail in chapter 3, the cost of construction materials is exorbitant in Nunavut, mainly due to risk factors and shipping fees. A large material order can produce needed savings on both the cost of supplies and transportation. As a result, the NHC bundled their material tenders for all public housing in 2004-2005 into 3 large contracts while labor contracts remained separate for every job. There is general agreement in both private and public sectors that the Nunavut construction industry will have a hard time evolving beyond its presently oligopolistic business environment.¹⁶

Not only, however, do local oligopolies make it difficult for small firms to enter the market: in order to succeed, claim stakeholders in the industry, even large suppliers and contractors will probably have to be secured by protectionist economic policies. Despite population growth, demand in Nunavut is small enough that only a few firms can be competitive in any market.¹⁷ The government confronted this reality in the 1960s with the failure of the “community freezer” project. A few communities had built rough but functional communal freezers, where community members could store shared or surplus meat, “country food,” from the hunt. If a neighboring community experienced an unsuccessful hunt, there was stock to be bought nearby. The network of community freezers sustained a small market for frozen country food. While one community replenished its bellies, its neighbors replenished their coffers. The government noted the success of the country food freezers, and built them in many more communities. In the process of expanding the number of suppliers, however, the once-viable market was smothered. The market for local goods and services is today, in its most basic features, unchanged since the 1960s—it remains small, with limited local demand. For any local business to succeed in the territory,

¹⁶ Mike Hine, Geologist with Federal Government, interview by author, June 28 2004, Iqaluit Michelle Bertol, Iqaluit City Planner at Iqaluit Department of Lands, interview by author, June 29 2004, Iqaluit.

¹⁷ Mike Hine June 28; Cook July 28.

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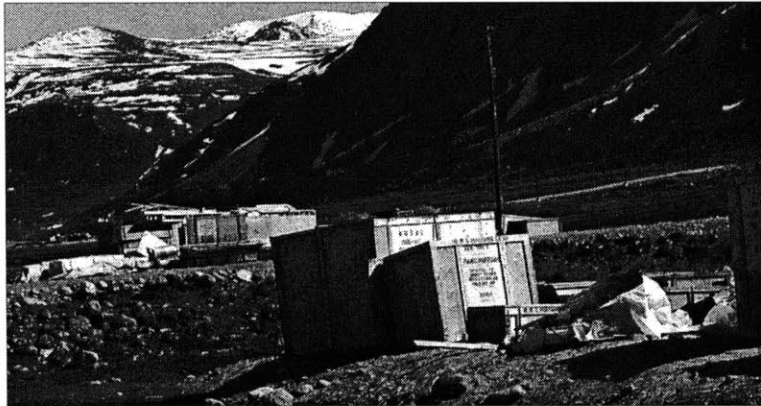


Fig 1.2.1 HAP materials waiting to be assembled



Fig 1.2.2 HAP house construction

it must capture a substantial part of the market, in order to “amass a critical capital”.¹⁸ While this prescription seems imperative for the longevity of Nunavut businesses, it is anathema to conventional supply-side policies that promote competition in order to achieve affordability.

SUPPLY SIDE POLICIES type 2: “grassroots” investment

The above policies, none of which appear appropriate for Nunavut, all highlight government as the central force of both demand and supply-side housing strategies. In each of these cases, government allocates subsidies directly to housing providers or consumers. In each case, direct, top-down transfers of funds fail to address the problem. A less orthodox, supply-driven solution that instead highlights the household as the generator of a stock of affordable housing has, however, showed more promise. In the late 1970s, when Nunavut was still part of the Northwest Territories (NWT), the NWT Housing Corporation experimented with a supply-side approach then in vogue in the housing literature: self-help housing. There is a substantial literature to argue for household-level construction, renovation, and addition, spanning both industrialized and developing countries. In the US, housing research in 1980 remarked that while developers spent \$47 billion on new construction in the US, existing property owners spent \$46 billion on maintenance, alterations, and additions. The resulting policy recommended that government should support the latter: investments in renovation and addition were stressed as particularly important sources of affordable housing for low- and middle-income households.¹⁹ Similarly, Barbara Kelly, in her book on the expansion of Levittown, illustrates that while the original inhabitants of the low- and middle-class community moved into the small, basic, and uniform suburban units, the homes evolved into “solidly middle-class” suburban units as residents added amenities; this was in stark contrast to the expectations of its critics that Levittown could only ever become a slum. Accordingly, Kelly argues that government subsidies for construction of new housing for low-income families can stimulate sustained investment and accrual of equity: the initial subsidy is leveraged into new renovations and customizations.²⁰

¹⁸ Dennis Simard, Former Senior Administrative Officer for Clyde River, interview by author, July 19 2004, Clyde River.

¹⁹ William T. Bogart, The Economics of Cities and Suburbs, (New Jersey: Prentice Hall, 1998), 291.

²⁰ Barbara Kelly, Expanding the American Dream: Building and Rebuilding Levittown, (Albany: State University of New York Press, 1993), 147.

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Parallel to its relevance in wealthy countries, self-help received its greatest attention for applicability to housing problems in the poorest communities of developing countries. In this part of the world, the self-help approach was meant to “direct attention away from expensive ‘package’ housing arrangements, such as fully-serviced housing projects with very high per capita production costs, towards ‘elements’ such as infrastructure, the provision of construction materials and technical advice, and the regularization of tenure—i.e., schemes that would reach a wider proportion of the population and stimulate their participation and investment in housing.”²¹ John Turner, one of the earliest and best-known proponents of self-help, makes the argument for self-help housing that: “the elementary resources for housing—land, materials, energy, tools, and skills—can only be used properly and economically by people and their local organizations that they can control personally.”²²

In the North, a self-help type project, the Homeownership Assistance Program (HAP), evolved over the course of a decade beginning in 1978 in the Northwest Territories representing the first supply-side housing strategies in the eastern Canadian arctic. A late-80s external evaluation of HAP described it as a success noting that HAP was a familiar “manifestation of Southern/urban attitudes about private homeownership, encouraging individual initiative and personal involvement in return for rewards of both satisfaction and property.”²³ The project ground to a halt, however in the early 90s; possible explanations include ill preparedness of clients to understand the working drawings and little reciprocal building help among clients.²⁴ Findings of the Evaluation correspond to the weaknesses of self-help criticized literature. The report points out that “the building process does not seem to have taught its clients new skills that would make them employable in the construction business after the HAP experience,”²⁵ just as Ward warns that self-help “retards necessary structural change.”²⁶ The Evaluation also suggests that HAP came to a natural end when the pool of most desirable clients, previously the highest-income tenants of public housing, had been exhausted and

²¹ Peter M. Ward, “Introduction and Purpose,” in Peter M. Ward, ed., Self-Help Housing: A Critique (London: Mansell Publishing Limited, 1982), 6.

²² John F.C. Turner, “Self-Help and Self-Managed Housing,” in Peter M. Ward, ed., Self-Help Housing: A Critique (London: Mansell Publishing Limited, 1982), 99.

²³ Ferguson, Simek, Clarke 29.

²⁴ Ibid. 149.

²⁵ Ibid.

²⁶ Ward 10.

each supplied with a HAP home. The “creaming” process described above can also affect self-help projects.²⁷

The weaknesses identified in self-help programs should not, however, eclipse the features of self-help processes that are promising for improved affordability of residential and non-residential construction in Nunavut. The self-help concept brings into clear focus the importance of readily available skill and appropriate construction technology. In Nunavut, where a quickly growing population aspires to self-sufficiency, and where materials from southern suppliers present a great expense, a practicable solution to the expense of construction must bring together local skills and available technology.

The importance of skills training in developing areas is undergirded by global experience. The World Bank states that economic growth in developing countries depends on the flexibility and productivity of its work force, which is in turn dependent on the competence of skilled workers and technicians, to “enhance the quality and efficiency of product development, production, and maintenance, and they supervise and train workers with lesser skill.”²⁸ In Nunavut, vocational training has emerged as a focus for economic growth efforts, soliciting attention from both government and industry in their common pursuit of development goals. In the construction industry investment in a competent local work force can produce lasting cost reduction in housing, as opposed to subsidies which have instead appeared to be stop-gap solutions, at best.

This thesis aims to demonstrate that construction trades training can succeed, where conventional demand or supply-side policies have failed, in reducing the cost of housing in Nunavut. To ensure that reduced construction costs benefit low-income families, not just contractors and developers, investment in training may have to be coupled, in private sector development, with policies stipulating

²⁷ Rod Burgess, “Self-Help Housing Advocacy: A Curious Form of Radicalism: A Critique of the Work of John F.C. Turner,” in Peter M. Ward, ed., Self-Help Housing: A Critique (London: Mansell Publishing Limited, 1982), 92.

²⁸ World Bank, Vocational and Technical Education and Training, (Washington: The International Bank for Reconstruction and Development / World Bank, 1991), 7.

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at-cost, if not affordable provision of housing. However, as local skills become more widely available, and more local subcontractors and contractors enter the market, competition for both NHC labor contracts and private development opportunities will, in turn, increase, discouraging firms from hoarding the profits of lower labor costs. The advancement of Inuit to more highly-paid positions will beget additional economic benefits as Nunavummiut (instead of imported tradesmen) locally reinvest earnings generated by expanding construction opportunities in the territory. Moreover, increased local involvement also has significant symbolic impact, as Inuit come together, drawing on their own skill, strength, and imagination to shape the built landscape of Nunavut according to their vision.

The thesis proposes solutions for the case of Nunavut to training-related questions that are pervasive in the vocational programming literature:

What is the balance of involvement between the public and private sectors?

What is the appropriate delivery system for training programs?

What is the skill set that trainees should learn?

The discussion of each issue and recommendations for solutions workable in Nunavut is raised in the chapters that follow. In response to the first question, Chapter 4 argues for the necessity of both public and private involvement in the funding and design of a territorial training strategy. In response to the second question, Chapter 5 recommends a centralized training facility in Iqaluit. The third question stimulates the architectural dimension of the thesis, Chapters 6-8, by raising the issue of what building principles and construction systems are appropriate to arctic construction. These principles and systems become, accordingly, those by which the training center itself is designed. The trade school is proposed in this thesis as an example of construction strategies and technologies that can be

emulated in institutional and public buildings across the arctic.

The architectural aspect of this thesis, then, suggests revisiting the appropriate technology literature with the addition of strategies appropriate to arctic construction. The tenets of appropriate technology, first popular in the development literature in the 1970s-80s,²⁹ and today experiencing renewed interest, particularly in public works projects,³⁰ are relevant to this thesis. These tenets describe construction strategies that draw low capital costs; use available materials; create jobs; demand modest equipment; adapt to changing circumstances; and avoid patented elements.³¹ Each of these features resonates strongly with the constraints of the arctic construction industry in the production of both residential and non-residential buildings. Although the NHC has experimented with imported panelized systems (what the appropriate technology literature might call a “modern” system) the least expensive, most available and readily flexible technology remains stick framing. Non-residential buildings in the arctic, however, have been less amenable to designs rooted in the fundamentals of appropriate technology, an experience shared across poor communities in developing areas.³² In Nunavut, the large scale and construction schedule demands of schools, community centers, and government offices have promoted designs that rely heavily on preassembly of patented elements outside the arctic (i.e. panelized systems), and specialized skills that are rare or absent in the local workforce (i.e. steel systems).³³

The architectural pursuit in this thesis of a flexible system using common materials for use in public construction should, as Ward asserts, provide “reasonable hope for a cheaper solution.”³⁴ The construction elements proposed in this thesis might prove useful to other remote pockets of the world where limited funds, skills, and materials necessitate a structural system that is simple in its connection details and flexible to spanning requirements, and elegant in its simplicity and flexibility. But the

²⁹ Carr 5.

³⁰ www.ruralroads.org/labour

³¹ Carr 8-9.

³² Stephen Drewer, The Transfer of Construction Techniques to Developing Countries: The Role of Expatriate Architects, Consultants, and Contractors, (Lund: Lund Committee on Habitat and Development Studies, 1982), 27-39.

³³ Bealeau July 29.

³⁴ Ward 7.

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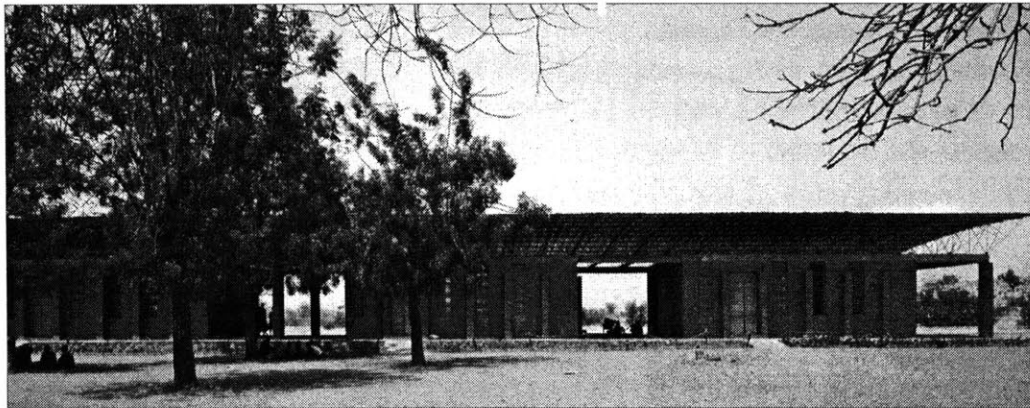


Fig 1.3.1 Kere's school in Burkina Faso



Fig 1.3.2 Cha's community center in Marcovia

aspiration for this technology transcends time and cost savings. It aims at the same time to establish a language for community buildings in Nunavut demonstrating sensitivity to the idiosyncratic social, physical, and logistical environment of the territory. A language that can describe the uniqueness of Nunavut can also evoke the shared heritage and hopes essential to restoring common cause and collective confidence to Inuit communities as the territory evolves.

Thus, this thesis contributes to the literature on both material construction and social position of community buildings in developing countries. Design publications have recently featured such exemplary buildings as David and Ajaye's Church/School in Ghana,³⁵ Jae Cha's community centers in Bolivia and Honduras,³⁶ and Kere's School in Burkina Faso,³⁷ winner of a 2004 Aga Khan Award for Islamic Architecture. The Canadian experience with public buildings in low-resource communities includes such celebrated examples as Peter Cardew's Stone Band School,³⁸ Acton Johnson Ostry's Haida Gwaii Elementary School,³⁹ or Patkau's Seabird Island School,⁴⁰ winner of a 1989 Canadian Architect Award of Excellence. No such example, however, yet exists in the Eastern Arctic.

In sum, the literature on developing areas does not address the provision of housing and the workable actions of governments and private sector in areas like Nunavut, with small markets, few resources, low skill levels, high material costs, a quickly growing population, and a quickly changing administration. Conventional demand- and supply-side policies appear inadequate to make housing more affordable to Nunavummiut, a quarter of which are almost fully reliant on government to meet all their housing needs. A more plausible alternative to government subsidies for housing is investment in labor, a strategy that emerges both from the self-help housing and economic development literature. The thesis therefore suggests a trades training focus for both public and private stakeholders in the Nunavut construction sector, and, as a part of a larger vocational strategy, a territorial training center in Iqaluit.

³⁵ Jessica Cargill Thompson, 40 Architects Under 40, (New York: Taschen, 2000), 34-35.

³⁶ "Urubo, Marcovia," Quaderns 233 (2002): 172-75.

³⁷ Sam Lubell and James Murdock, 2004 Aga Khan Award for Architecture: Promoting Excellence in the Arab World," Architectural Record (December 2004): 95.

³⁸ "Stone Band School," Canadian Architect (December 1990): 14-15.

³⁹ Adele Weder, "Native Intelligence," Canadian Architect 45:2 (February 2000): 22-26.

⁴⁰ Andrew Gruft, "Seabird Island Community School, Agassiz, B.C." Canadian Architect 37:1 (January 1992): 14-23.

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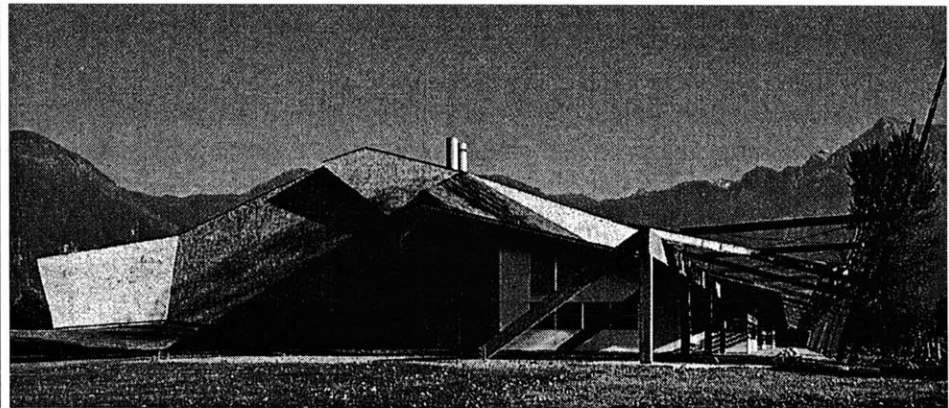


Fig 1.4.1 Acton Johnson Ostry's community school on Haida Gwaii, BC

Fig 1.4.2 Patkau Architects' community school on Seabird Island, BC

Further, in considering the technical and architectural expression of the training facility, the thesis draws on the principles of the appropriate technology literature to suggest a construction strategy suited to a young local labor force, and suited also to the social fabric, physical landscape, extreme climate and seasonal rhythms of Nunavut.



Downtown Iqaluit, capital city of Nunavut, occupied for a thousand years, settled in fifty

Political FOUNDATIONS

CHAPTER II.

HISTORY OF CONSTRUCTION IN NUNAVUT AND IQALUIT

POLITICAL AND CULTURAL ARGUMENTS FOR INCREASED
INUIT INVOLVEMENT IN THE CONSTRUCTION INDUSTRY

building skills

Over the course of the last fifty years during which Nunavut was permanently settled, relationships between the groups that commission, construct, and use buildings in the Eastern Arctic reveal the balance of political authority between Inuit and Qallunaat (non-Inuit). Prior to the establishment of colonial outposts in the arctic, Inuit had control over the design and construction of their domestic and community environments. The ease of construction and impermanence of igloos and camps accommodated a lifestyle of migration in pursuit of sustenance. The establishment of Southerners in the arctic during the 1940s stimulated construction of the permanent homes and edifices required to accommodate their expectations for comfort in the remote arctic. Inuit recruited to help build permanent settlements in the arctic quickly settled there themselves, provided by government with warm winter shelter for their efforts. However, Inuit quickly became dependent on the federal government for provision of housing. While construction jobs and other employment opportunities slowed in the Eastern Arctic, the dependence of Nunavummiut on housing resources outside Nunavut has lasted for fifty years.

Today, the political reconstruction process in Nunavut is matched by a physical building effort that is transforming the arctic landscape in the three Eastern Arctic regions: Kitiqmeot to the west, Kivalliq around the western edge of Hudson's Bay, and Qikiqtaaluk, encompassing the High Arctic and Baffin Island. Growth is most palpable in Iqaluit, where institutional, commercial, and residential projects have been galvanized by the creation of a territorial bureaucracy, mobilization of the territorial government to improve the crowded conditions of public housing, and migration of young Southerners towards jobs in the quickly changing North. However, in its efforts to capitalize upon this activity, the Nunavut construction industry now imports tradesmen from the Eastern provinces who can build more quickly and efficiently than local, less experienced laborers. The Nunavut construction industry is, then, at a turning point. If it continues to be dominated by migrant skilled workers from outside the territory, Inuit

building skills

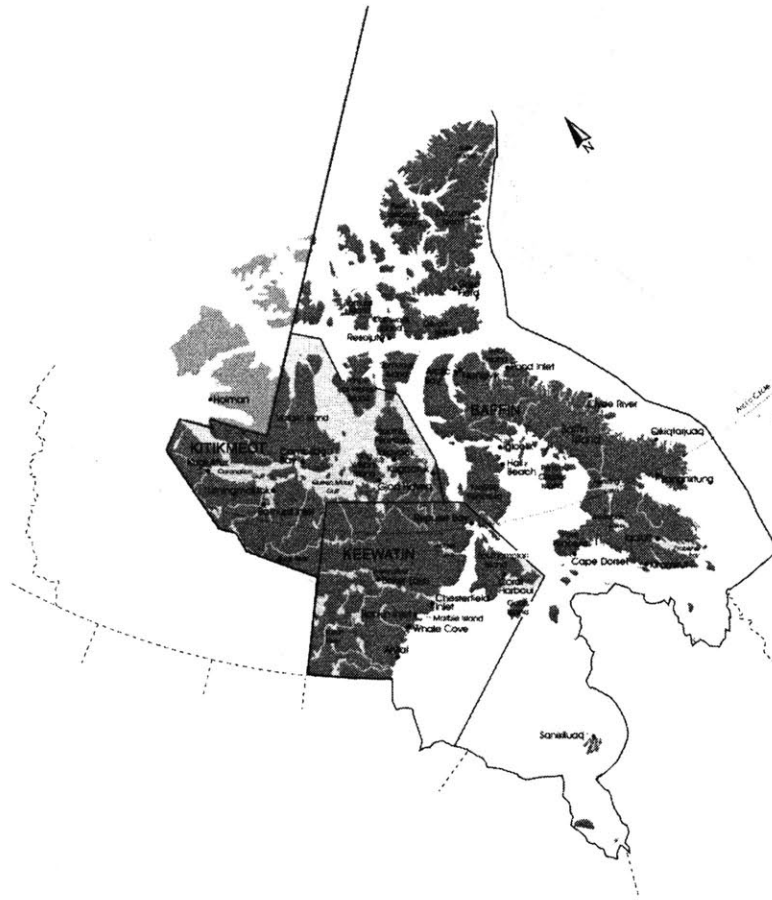


Fig 2.1 Kitikmeot, Kivalliq (Keewatin), and Qikiqtaaluk (Baffin) Regions

will have little opportunity to harness the financial benefits of increasing construction activity and exploit political and cultural opportunities to shape the built landscape on their own terms. If however, Inuit assume greater involvement and leadership in the construction industry, it can serve as an example of private sector growth in response to the founding goals of the territory—economic self-reliance, political self-determination, and renewal of pride and confidence in Inuit community.

Inuit occupation of Nunavut is predated by millennia of migration of pre-Inuit societies into the Canadian arctic, and towards its eastern reaches. Little more than half a century ago, the eastern Canadian arctic, then part of the immense North West Territories (NWT), looked much like it had for the previous 4000 years. During that time, Inuit culture evolved across its rock and ice, beating the odds of survival presented by the harsh climate and bleak landscape, and developing strategies for finding sustenance and shelter in the foreboding arctic.

Between 5,000 and 1000 years ago, pre-Inuit societies moved from the Bering Strait towards Greenland across the Canadian arctic, a land and seascape of tundra and frozen channels crossed by caribou, muskoxen, whales, and seals.¹ The area of southern Baffin Island around Iqaluit has been continually occupied by Inuit and their ancestors for the past 1000 years.² The first visit of European explorers under the command of Martin Frobisher in 1576 gave the bay and the city the name commonly used by southerners, Frobisher Bay. Non-Inuit presence across what is now Nunavut was fortified in the 1920s with help from the establishment of Hudson Bay trading posts and RCMP offices in the Eastern and High arctic.³ Iqaluit was permanently settled by the U.S. Air Force in 1942 following the construction of an air strip and associated buildings. In 1946, the Air Base was turned over to the Royal Canadian Air Force.⁴

¹ Nunavut history, <http://www.nunavut.com/nunavut99/english>. Dec 28 2004.

² Baffin history, www.nunanet.com/~jtagak/history. Dec 26 2004.

³ City of Iqaluit, www.city.iqaluit.nu.ca. Dec 26 2004.

⁴ Honigmann and Honigmann, *Eskimo Townsmen*, (Ottawa: Canadian Research Centre for Anthropology, 1965), 8.

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Fig 2.2 Community hall in Iqaluit in the 1960s

The Imperial Order of the Daughters of the Empire donated the I.O.D.E. hall to the people of Frobisher Bay as a community center.

At the same time, the Hudson's Bay Company moved a post to Iqaluit to take advantage of the transportation opportunities afforded by the military runway, and to be in closer contact with Inuit who were moving farther up the Bay towards the military station.⁵ In the 1950s, the U.S. government undertook another building project, turning their presence into a radar and polevault communication site. The Department of Northern Affairs established regional headquarters at Frobisher Bay. The settlement became a center of activity for sending supplies and staff to the eastern end of the Distant Early Warning system.⁶ By 1957, the population was 1,200, of whom 489 were Inuit living mostly in impermanent camps outside the city.⁷ By the late 1950s, the Canadian Government was bringing doctors, teachers, administrators, clerks and support staff to the area, and Inuit began in large numbers to settle permanently in Iqaluit.⁸

By the time the American Air Force left in the early 60s, Frobisher Bay had become the Canadian Government's center of administration, communications, and transportation for the Eastern Arctic.⁹ By this time too, the Government had established itself as a necessary presence in the lives of settled Inuit, who had quickly grown to depend on subsidies for housing and imported food. In their 1963 study of Inuit social relationships and community organization in Iqaluit, the ethnographers John J. and Irma Honigmann note that the involvement of Inuit in the construction of the military facilities produced the shift from hunting and trapping to wage-earning as the "mainstay of existence."¹⁰ When the wave of construction concluded, Strub recounts in his book on high-latitude building and planning, "people once fully employed on the land became chronically unemployed at the stroke of a pen, and were tarred with the stigma reserved by outsiders for people on welfare."¹¹

Dependence on government in the settlements was systematized by making family allowances contingent upon children's school attendance. This meant that for the duration of the school year,

⁵ Ibid.

⁶ Ibid.

⁷ Ibid; Harold Strub, Bare Poles: Building Design for High Latitudes, (Ottawa: Carlton University Press, 1996), 63.

⁸ www.city.iqaluit.nu.ca.

⁹ Ibid.

¹⁰ Honigmann and Honigmann 10.

¹¹ Strub 64.

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Fig 2.3 Housing in Iqaluit in the 1960s

families relying on the supplemental allowance income were bound to the community instead of free to pursue game. Dependence was then deepened by the appearance of public housing. The government realized that if families were obliged to spend winter in the settlement so that the children could be schooled, families would have to be provided with housing, as “drafty tents and damp snow houses occupied for longer than normal periods would make a mockery of public health ambitions.”¹²

However, the number and capacity of small and basic public housing units built by government could not meet growing needs as Inuit left the land for life in the settlements. And despite the evolution in size from the matchbox homes of the 60s to the multi bedroom public housing models of the 90s, supply of public housing has not caught up with demand: the NHC estimates that in order to meet current needs, it would have to achieve a pace of 350 units provided per year for the next 10 years. Of these, 250 per year would be needed to address an average crowding rate 54% higher than the national crowding rate. Another 100 would be required to accommodate a birth rate four times the national rate.¹³ Over the last five years, however, the NHC has provided between 50 and 75 units per year.

With the astronomical cost of construction in the arctic, the NHC would require a \$750 million infusion into the housing stock to satisfy demand for affordable housing. However, the operating budget of the entire GN is less than \$80 million per year. The GN has limited resources with which to provide opportunities for all Nunavummiut to have homes that support a “healthy, secure, independent and dignified lifestyle.”¹⁴ Clearly, only large transfer payments from the Government of Canada can bring an end to the Nunavut housing crisis within the ten year horizon. The creation of the territory, an event on which “Inuit hopes and aspirations hinge[d]”¹⁵ often appears to have left a residual economic dependency on the federal government.

¹² Ibid.

¹³ Chris D’Arcy, Director of Policy and Planning, and Peter Scott, President of Nunavut Housing Corporation, interview by author, July 12 2004, Iqaluit.

¹⁴ Nunavut Housing Corporation Business Plan 2004-5, (Iqaluit: Nunavut Housing Corporation).

¹⁵ Nunavut Tunngavik Incorporated, Response to the Recommendations of the Nunavut Implementation Commission on the Establishment of the Nunavut Government, (Iqaluit: Nunavut Tunngavik Incorporated, January 1996); quoted in Nunavut Implementation Committee, Footprints 2: A second comprehensive report of the Nunavut Implementation Committee, (Iqaluit: Nunavut Implementation Committee, 1996), section 1.1.

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In addition to GN dependence on the Government of Canada for housing funds, the Nunavut construction industry is now largely dependent on labor from outside the territory. Now perhaps more than ever, with the spate of building stimulated by sovereignty, Nunavummiut rely on building resources from outside the territory. This is truly a lost opportunity: while the escalation of activity in the Nunavut construction sector might have opened the industry to greater Inuit involvement in management and labor, they remain on the margins of participation. The economic costs of limited local participation are multiple. As will be described in the next chapter, contractors submit high bids on government projects to cover the costs of room, board, and airfare for transient workers. Unemployment insurance earned by migrant laborers leaves the territory.¹⁶ In addition, there are significant political and cultural costs to low Inuit involvement in construction: no investment is made in the accrual of skills in the local population that will encourage the transition to an Inuit-led building sector.

Clearly, options for Inuit stewardship of the construction industry are limited by the preparedness of the population to assume leadership positions. Experience in the construction industry must trickle up, as carpenters become contractors, contractors become project managers, and project managers become developers. Still, paraphrasing John Turner, the architect who helped guide disempowered communities towards organized construction systems, smaller opportunities have to be seized in order to be prepared as larger ones occur.¹⁷ The territory is ready to seize these small opportunities: the NHC conducted a survey in winter, 2004 that aimed in part to register current attitudes about Inuit participation in construction. Youth interest in access to trades training resounded in every community.¹⁸ While the territory may have to wait for its first Inuit developers, architects, and engineers, it has the capacity to nurture a force of Inuit builders in the very near future to begin gathering experience and assuming influence in an Inuit-directed growth industry.

¹⁶ Pam Hine, Deputy Minister of Education, interview by author, July 6 2004, Iqaluit.

¹⁷ John F. C. Turner, "Issues in Self-Help and Self-Managed Housing; quoted in Peter M. Ward, ed., Self-Help Housing: A Critique (London: Mansell Publishing Limited, 1982), 111.

¹⁸ Nunavut Housing Corporation, "Building Connections in the North" (Iqaluit: Nunavut Housing Corporation, 2004).

In addition to bringing Inuit closer to the housing delivery system, increased Inuit self-dependence in the construction industry will be politically and culturally significant in the creation of public spaces: Jose Kusugak, an Inuit leader who served as President of both Nunavut Tunngavik Incorporated and Inuit Tapirisat of Canada, anticipated that the establishment of a Nunavut Government would position Inuit to “shape public life and public services in ways that are more compatible with [Inuit] unique social and cultural characteristics.”¹⁹ However, the public sphere inherited by the Inuit of Nunavut is far from expressive of the “hopes and ambitions” that sovereignty was expected to fulfil. Zebedee Nungak, a Nunavik (Northern Quebec) Inuit, and former co-chair of the Inuit Committee on National Issues wrote that the lands claimed by Inuit under the Nunavut Land Claims Acts (NLCA), “wherever they may be, look like Apartheid-style ‘homelands’ in South Africa.”²⁰ The work to shape the public sphere is great, following at least thirty years in which Inuit had little control over its character. In the 1960s, Honigmann and Honigmann predicted the difficulty Inuit would face when they gained control over the civic realm; they noted that the 12 dozen or so public facilities in Iqaluit at the time of their study, ranging from the power plant, police dispatch, and medical office to the barber, Hudson Bay store, and tavern, were patronized by Inuit, but that Inuit had no responsibility for their development or management. As a consequence, the authors noted that the Inuit “received little deliberate preparation to assume the direction of such facilities.”²¹

Nunavummiut must mobilize to assume direction for the public realm if it is to be “compatible with the unique cultural characteristics” of Inuit society, and if it is to adequately serve this growing population. The high birth rate in Nunavut demands not only increased space for eating and sleeping as a family, but also increased capacity for meeting and learning as a community. In the 2004 NHC survey, *Building Connections in the North*, conducted by the Nunavut Housing Association to understand the housing and construction-related concerns of Nunavummiut, both youth and elders across the

¹⁹ Jose Kusugak, “The Tide has shifted: Nunavut Works For Us, and It Offers a Lesson to the Broader Global Community,” 27; quoted in Jens Dahl, Jack Hicks, and Peter Jull, eds., Nunavut: Inuit Regain Control of Their Lands and Their Lives, (Copenhagen: International Work Group for Indigenous Affairs, 2000).

²⁰ Zebedee Nungak, “Pigatsi Pivugut—You Attain, Therefore We Attain,” 144; quoted in Jens Dahl, Jack Hicks, and Peter Jull, eds., Nunavut: Inuit Regain Control of Their Lands and Their Lives, (Copenhagen: International Work Group for Indigenous Affairs, 2000).

²¹ Honigmann and Honigmann 45.

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Fig 2.4 Daycare in Arviat

territory raised the need for “community consultations,” “friendship centers,” “drop-in centers,” “study centers,” “youth centers,” and “elders centers.” Interest in these last two, youth and elders centers, was conveyed most consistently across the territory, expressing the desire for community spaces where “youth can come and ask questions; elders stay involved, and teach young people what they know.”²²

In these kinds of places, which welcome and unite Nunavut’s constituencies, the cultural heritage of the territory will be preserved, its political future crafted, and its physical identity envisioned. Jose Kusugak asserted that sovereignty for the Inuit “is proof positive that the strength of the human spirit can overcome the biggest of all political obstacles and transcend the most entrenched cultural prejudices.”²³ In assuming greater responsibility for construction, Inuit will begin the process of overcoming fifty years of dependency on colonial government and imported labor for the physical development of the territory.

²² Nunavut Housing Corporation, Building Connections in the North.

²³ Kusugak in Dahl, Hicks and Jull 28.



A neighborhood in Iqaluit with a row of public housing

Economic STRUCTURE

CHAPTER III.

IDENTIFYING INEFFICIENCIES IN THE CONSTRUCTION SYSTEM
ECONOMIC ARGUMENTS FOR INVESTMENT IN TRADES TRAINING

building skills

The political and cultural case for greater Inuit involvement in the construction sector is further supported by economic arguments for investment in the Nunavut labor force. The following analysis of the inputs to construction makes clear that of material and labor, the two inputs to construction, only labor costs are amenable to significant cost reduction. Presently, both public and private sector builders face high costs associated with importing construction industry inputs—building supplies and construction tradesmen—to Nunavut construction sites. Local availability of either of these inputs would produce lower construction costs of both housing and community spaces. Development of a manufacturing industry processing local natural resources is unlikely to prove financially viable. Development of the territory’s human resources, however, appears economically imperative for cost reduction in the construction sector.

To begin, prospects for manufacturing local construction supplies using natural resources may be, at first inspection, promising—with rock extending beyond the horizon, stone products seem likely candidates for development. But years of research and experimentation by the “Rock Shop” at Qikiqtaaluk Corporation (the 20-year-old economic development subsidiary of Qikiqtani Inuit Association, in turn the non-profit group representing Baffin and High Arctic Inuit) have shown that local stone building materials cannot succeed in the Nunavut market. Despite the Rock Shop’s capacity to quarry and finish stone products in the territory, it is less expensive to ship stone from halfway around the world up to the arctic than to extract and finish minerals from Nunavut’s endless rocky expanse. The lobbies of the two large hotels in Iqaluit are sheathed in Indian marble and California granite, testimony to the accessibility and competitive pricing of the international competition. QC discovered too, during the construction of the Nunavut Legislative Assembly Building for which local stone tile was specified on the lobby floor that it is less expensive to extract rock, ship it to Southern Canada for finishing, and ship it back, than to complete

building skills

the process within the territory: the high cost of water and effluent management are prohibitive to arctic industry.¹

¹ Hine, June 28.

Additionally, there is not enough demand in the territory to sustain a manufacturing industry, despite the current proliferation of construction contracts. This is especially true for luxury products such as stone tile unaffordable to most households and communities.² However, low demand for all products, regardless of cost, would require government protection of locally manufactured supplies to ensure their use in territorial construction. Products manufactured in Nunavut from very inexpensive imported materials, such as oriented strand board (from recycled shipping crates) or insulated concrete block (using spray-injected foam insulation), would have to be specified by Nunavut construction policy.³ Protectionism would encourage monopolistic business behavior, and so it is questionable that cost reductions would accrue in the final analysis to construction projects. The small construction supplies industry has already shown that it can incubate monopolies, for example in the case of the sole pile-driving service.⁴

² Ibid.

³ Bertol, June 29; Hine, June 28; Cook, July 26.

⁴ Hine, June 28.

Finally, local products, even when protected and also subsidized by government, may be too expensive to be consumed in the small, financially beleaguered communities. A Local Housing Organization Manager admitted that although he is required to purchase all stationery and office supplies from Titaq, the territorial office supplies outfitter, he buys and ships up what he needs from the South at lesser cost.⁵ If local stationery presents unaffordable costs compared to its southern competition, the disadvantage of locally-manufactured building products can only be imagined.

⁵ Corkett, July 8.

So much for the local development of material inputs to construction. The more likely strategy for cost

reduction in construction is the development of human capacity through training, a goal agreed upon by industry stakeholders ranging from the Nunavut Housing Corporation, the Department of Education, private construction businesses, and Inuit advocacy groups. Instead of arduously cultivating its material resources, Nunavut needs to nurture its growing human resources into a strong skilled workforce at the disposal of the private sector, with which to more cheaply bid on public housing as well as private development projects.

Training for the private sector is probably the single most important factor for cost cutting in public sector housing construction. Currently, responsibility for training rests largely on the private sector through regulations imposed by the Nunavummi Nangminiqagtunik Ikajuuti (NNI) Policy, which dictates hiring and contractual policies for GN construction projects. Any contractor bidding on public sector projects, either residential or non-residential, is bound by the NNI Policy which requires that a bid anticipate the employment and training of local Inuit. The NNI policy is, however, ambiguous about how and how much training should be provided on each project, and includes no requirements for training programs and objectives to be submitted with every bid.⁶ Making matters worse, the NNI policy is reportedly only loosely enforced once the bids have been submitted and accepted/rejected, so that it is left to the discretion, or integrity, of the contractor to train and employ local labor as they see fit for the well-being of the individual, community, and territory.⁷

The seed of high labor costs lies in the NNI clause requiring each community to establish a minimum quota for local labor. The quota is ostensibly based on local skill, and represents the proportion of total project wages paid to local laborers.⁸ According to the Nunavut Land Claims Agreement (NLCA), the 1993 federal legislature outlining the rights and responsibilities of Inuit in the Nunavut Settlement

⁶ Simard July 19.

⁷ Ibid.

⁸ Website of the GN, <http://www.gov.nu.ca/Nunavut/nni/nnie.pdf>. Dec 27 2004.

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Area, the GN has the mandate to achieve 85% Inuit employment in its labor force by 2010.⁹ In most communities, reaching a local labor quota of 85% is unlikely. The following table (Table 1.) demonstrates the labor quotas established and achieved by Iqaluit and the 24 hamlets across the three districts of the territory. The table shows the percentages established by each community for the year 2003-2004, and the percentages achieved as described by the labor contracts awarded in the same year. New percentages were established for 2004-2005 in response to achievement levels of the previous year. The table shows that 11 of the 25 communities lowered their expectations for local labor inputs in 2004-2005. Eight communities raised expectations, and 5 stayed level. Data for 1 community was unavailable. Decreased quotas were most common in the Kivalliq region; increases were most common in the Qikiqtaaluk, or Baffin, region, most likely stimulated by access to and activity around the capital city.

High labor costs emerge when a contractor bidding on a labor tender in a community anticipates that locally available workers will not satisfy the local labor quota, because the quota does not accurately reflect the range or quality of skill that actually exists within the community. Of the two, low quality of skill—lack of trade certification—is especially difficult for contractors to negotiate, because basic laborers on site cannot earn as much per hour as apprentices or journeymen, which makes the wage-based quota even harder to meet.

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The contractor in this position has few choices. One option is to pay a penalty established under the NNI policy for insufficient Inuit involvement. Another is to “accept anyone from the community who comes onto the jobsite,” even if they are significantly under-skilled, in order to meet the quota.¹⁰ But this choice only puts off another kind of penalty, as projects built by poorly skilled workers run late and miss the mid-December deadlines required for close-in on government projects. Yet another option is to fortify the

⁹ Department of Education, LMDA Labor Market Partnerships Phase I: Review of Kitikmeot Facilities and Capabilities for Trades and Occupational Training, (Iqaluit: Department of Education, March 31 2004).

¹⁰ Rejean Jacques, President of GCNorth, interview by author, July 13 2004, Iqaluit.

Table 1.
Inuit Labor Percentages in NHC Construction Contracts

District	2003-2004 Inuit Labor %			2004-2005 Inuit Labor %	
	Required	Achieved	% Diff Req/	Required	%Diff 03/04-04/05
Kitikmeot					
C a m b r i d g e	45	42	-7	45	0
Gjoa Haven	40	41	3	40	0
Kugaaruk	80	Pending		80	0
Kugluktuk	45	39	-13	45	0
Taloyoak	n/a	n/a		40	
Kivalliq					
Arviat	85	100	18	85	0
Baker Lake	75	n/a		60	-20
Chesterfield	60	53	-12	55	-8
Coral Harbour	75	55	-27	60	-20
Rankin Inlet	60	44	-27	50	-17
Repulse Bay	60	71	18	60	0
Whale Cove	60	53	-12	50	-17
Qikiqtaaluk					
Arctic Bay	30	75	150	50	67
Cape Dorset	35	43	23	60	71
Clyde River	60	60	0	65	8
Grise Fiord	30	n/a		30	0
Hall Beach	30	31	3	30	0
Igloolik	40	35	-13	35	-13
Iqaluit	0	n/a		40	
Kimmirut	35	32	-9	30	-14
Pangnirtung	55	86	56	60	9
Pond Inlet	40	36	-10	35	-13
Qikiqtaarjuaq	45	n/a		40	-11
Resolute Bay	0	n/a		30	
Sanikiluaq	60	65	8	65	8

building skills

local work force with experienced migrant workers brought in from outside the territory, and, to meet the local quota by paying local laborers to perform menial tasks, or worse, to stay home.¹¹ When there is little hope to advance beyond basic labor, attrition rates rise.¹² This deeply compromises the intention shared by public and private sectors to demonstrate that “work in the construction trades can be a decent living, and an honorable profession.”¹³

Compounding the “double hiring” markup, is the premium on imported labor: separated from their families and often posted to communities where it can seem that there is nothing else to do but work, imported laborers characteristically work 70 hour weeks, and require paid accommodations, travel, and food. Moreover, they are unwilling to stay on remote worksites at length, necessitating replacement workers and increased travel and administrative costs.¹⁴

Faced with the added costs required to compensate for insufficient local skill, the contractor places high bids for labor contracts: their costs are likely to more than double. The result is that the public sector is even further constrained in the service that it can deliver. This year, of the aforementioned 80 new units planned for the territory, 5 of 7 labor bids for the Kivalliq region were rejected—they were simply too high. Table 2 compiles information on the material and labor costs for new construction in the Hudson’s Bay region for 2004-2005. Costs listed for both represent the lowest bids submitted. The NHC rule of thumb is that cost of labor should approximate the cost of materials.¹⁵ The table illustrates the two hamlets, Arviat and Baker Lake, that will be the only communities in the Hudson’s Bay region of the territory to break new ground on public housing projects this year. In both of these communities labor accounted for between 50-60% of the combined costs of material and labor inputs. In the other five communities, labor costs were over 60% the combined costs.

¹¹ Bertol, June 29; D’Arcy, July 12; Don Gedham, Nunavut Construction Company, interview by author, July 8 2004, Iqaluit.

¹² Bebeau July 29.

¹³ Sheldon Nimchuk, Project Manager at Nunavut Construction Company / Nunavut Investment, interview by author, July 30 2004, Iqaluit.

¹⁴ Jacques, July 13; Dennis Simard, Former Senior Administrative Officer for Clyde River, interview by author, July 19 2004, Clyde River.

¹⁵ D’Arcy, July 12.

Table 1.

Labor and Material Costs for NHC Public Housing Construction in the Kivalliq Region 2004-2005

Community	Building Type	Material (M)	Labor (L)	Total M+L	%M	%L	Proceeding
Arviat	4plex	403,300	386,105	789,405			
	per unit	100,825	96,526	197,351	51	49	Yes
Baker Lake	3plex	276,450	362,500	638,950			
		92,150	120,833	212,983	43	57	Yes
Chesterfield Inlet	3plex	276,450	429,500	705,950			
		92,150	143,167	235,317	39	61	No
Coral Harbour	3plex	246,450	482,325	728,775			
		82,150	160,775	242,925	34	66	No
Rankin Inlet	3plex	312,625	474,400	787,025			
		104,208	158,133	262,341	40	60	No
Repulse Bay	4plex	345,675	563,400	909,075			
		86,419	140,850	227,269	38	62	No
Whale Cove	3plex	276,450	424,500	700,950			
		92,150	141,500	233,650	39	61	No
	detached dwelling	108,521	212,700	321,221	34	66	No



Fig 3.1.1 Platform framing in Resolute Bay, October



Fig 3.1.2 Roofing in Rankin Inlet, October

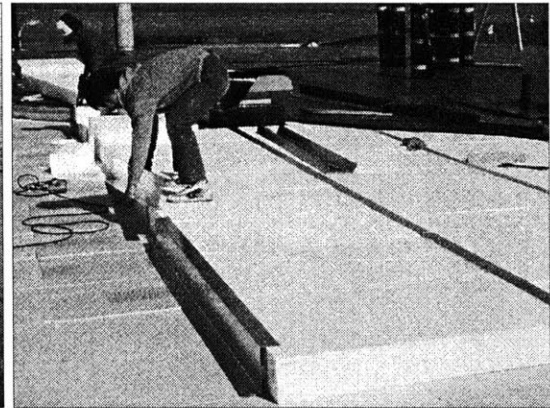


Fig 3.1.3 Roofing in Kugluktuk, August

The only way to deflate the high labor contract bids produced by insufficient local skill is to assure that local labor is capable of the job. Until this happens, even a windfall of federal money cannot produce a miracle solution to the housing crisis: the labor capacity does not exist to deliver the product efficiently. As a result, the NHC acknowledges that it will have to “tread water” while skills, and the facilities and programs to offer them, evolve.¹⁶ With improved training of construction laborers, apprentices and tradesmen, however, the government will be able to cut costs and spend more on increasing the supply of affordable units in the territory. And on a larger scale, money invested in the territory will stay and grow in the territory as welfare collectors become wage earners. Clearly, development of an economically sustainable construction sector depends on the development of a local workforce.

Though training appears to be fundamental to costs reduction in the construction industry, investment in vocational education demands inspection of the long-term sustainability of building activity across Nunavut. A central concern is that the current building boom in the big communities, and particularly in Iqaluit, will come to an end before the first generation of locally trained tradesmen can establish themselves in the industry. While activity may slow down, persistent crowding together with the toll of the arctic elements is sure to engender continued maintenance needs. Additionally, increasing population pressures are likely to maintain high levels of demand for residential construction. Most significantly, however, Iqaluit is building a \$100 million set of civic buildings in the near future, including the Justice Center, the Hospital addition, the RCMP building, and a replacement for burned Joamie Middle School. Possible projects in coming years include a new Legislative Assembly Building, a new Anglican Cathedral, improvements to the Baffin Correctional Center, an addition to the Arctic College, a renovation of the High School, a transitional housing and community space mixed use facility, a Cultural Centre, and a Conference Centre.¹⁷

¹⁶ Peter Scott, President of Nunavut Housing Corporation, interview by author, July 12 2004, Iqaluit.

¹⁷ Michelle Bertol, Iqaluit City Planner at Iqaluit Department of Lands, interview by author, July 5 2004, Iqaluit; Hine, July 6.

building skills

A related concern is that trainees may not all be able to find permanent positions or steady work in their home communities, given the welfare economies of many of the hamlets. But this concern applies to employment in every field of work. To find gainful employment in the government or the private sector, Nunavummiut are likely to have to look in the future towards the larger communities, such as Cambridge Bay, Rankin Inlet, and Iqaluit. John Corkett, the Housing Manager in Clyde River, a hamlet of 830 people in the north of Baffin Island (of which 98% are Inuit and two thirds are under 25), insists that the unemployed (72%) of his community will have to become more mobile and flexible with respect to job opportunities, much like northern Quebecers and Newfoundlanders who have flooded construction sites in the territory due to high unemployment rates in their own communities.¹⁸ In other words, Nunavummiut need not only the skills but the impetus to use them, which may in the future affect kinship structure in hamlets where family ties are strong, but livelihoods are impossible.

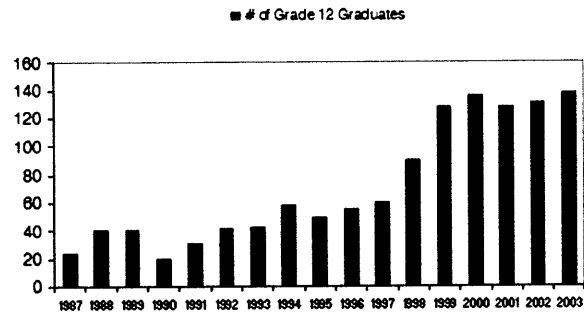
¹⁸ Corkett, July 8.

Finally, a fundamental factor for the success of a training program is that levels of secondary school achievement in the territory are sufficient to produce a force of successful apprentices. Pam Hine, Deputy Minister of Education, affirms that youth are increasingly well-prepared to enter apprenticeship programs based on improved high school performance and growing interest in post-secondary education. Last year, the drop out rate fell by 10%, and there was a 30% increase in access by high school graduates to financial assistance for post secondary education. As Chart 1. shows, the number of high school graduates per year leaped with the creation of the territory. Hine attributes these promising numbers to the growth of the educational system in Nunavut: in the five years since Nunavut gained self-determination, the Department of Education has equipped each hamlet with its own high school.¹⁹ Expanding opportunities for learning begets more learning.

¹⁹ Hine, July 6.

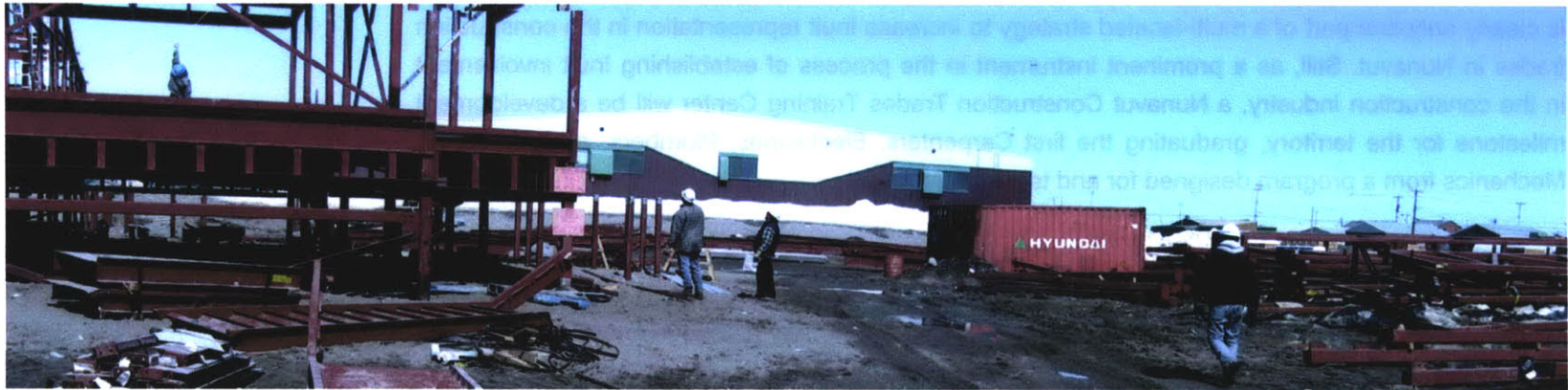
Chart 1.

New Grade 12 Graduates per Year in Nunavut



This thesis suggests an extension of existing post-secondary options and employment opportunities available to Nunavummiut in a proposal for a trades training center in Nunavut. A trades training center is clearly only ~~one~~ part of a multi-faceted strategy to increase Inuit representation in the construction trades in Nunavut. Still, as a prominent instrument in the process of establishing Inuit involvement in the construction industry, a Nunavut Construction Trades Training Center will be a development milestone for the territory, graduating the first Carpenters, Electricians, Plumbers, and Oil Burner Mechanics from a program designed for and taught in Nunavut.

The building has to accommodate and reinforce a curriculum that prepares apprentices for the idiosyncrasies of building in the Eastern arctic, with programs and learning spaces for the young adult and mid-career apprentices who will make up the territory's first locally-trained journeymen, as well as for the kids and teenagers who represent the workforce of the future.



A school construction site in Arviat, on Hudson Bay

Building CONNECTIONS

CHAPTER IV.

PRIVATE AND PUBLIC COLLABORATION IN CONSTRUCTION

SHARING RESOURCES TO BUILD A TRADES TRAINING STRATEGY

building skills

While the public and private sectors agree that investment in training is a necessary step towards reducing construction costs, there has been little discussion as to whether government or industry should be responsible for it. This chapter briefly examines the roles of government and industry stakeholders in developing the construction sector, and in financing and organizing a trades training strategy for Nunavut.

The coordination of public and private sectors to nurture construction industry growth is unclear, as government and industry each suggest that the other is better equipped to promote economic development. The private sector regards the GN as the “primary industry” in Nunavut, the “engine of economic activity and growth.”¹ This opinion is common across the territory, where, according to Michelle Bertol, current Director of Lands and Planning for City of Iqaluit, and former planner for the Nunavut Association of Municipalities, government is “widely viewed as the major economic draw and main job provider, promising a living salary and job stability...it is also the major employer designed to advantage Inuit jobseekers.”² The central position of the GN in the economy is based on employment statistics: the GN and the Government of Canada (GC) together employ close to 60% of all workers in the territory, while the private sector accounts for 24%.³

However, the belief that government can be a point of origin for solving all of the territory’s problems at so early a point in its history is bound to be disappointed.⁴ According to Michelle Bertol, “in 1999, everyone expected the political-economic disempowerment and cultural disadvantages of the Inuit to disappear, but instead they got worse because the young government had little experience and little funding.”⁵ The shortage of public funding in the face of overwhelming need, particularly for housing, provides a convincing financial argument for private sector involvement in economic development. “Resources are diminishing in Nunavut as everywhere else in Canada. Increasingly, there is room for the private sector to grow, and in the next 10 years it will grow substantially.”⁶

¹ Cook, July 26; Bertol June 29.

² Michelle Bertol, Iqaluit City Planner and Iqaluit Department of Lands, interview by author, July 5 2004, Iqaluit.

³ Department of Education, A Suggested Apprenticeship System for Nunavut Executive Summary, (Iqaluit: Department of Education, 2004), 15.

⁴ Dacks and Coates 9.

⁵ Bertol July 5.

⁶ Ibid.

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The public sector has reason to support the growth of the wage economy through the private sector if only to decrease its financial dependency on transfer payment from the GC. Today, only 8% of the territorial budget is generated within Nunavut.⁷ Steve Cook, Property manager at Nunastar Properties in Iqaluit and former president of the Iqaluit Chamber of Commerce, observes the significance of private sector development for continued federal support: “We keep telling Canada it is making an investment in Nunavut. If private sector doesn’t grow, how can we show Canadians that it was worth it?”⁸

⁷ Hine, July 6.

⁸ Cook July 26.

However, there are also political and cultural reasons for encouraging private sector growth: the broadening of job opportunities beyond government offers Nunavummiut the empowerment of choice. The GN Department of Economic and Sustainable Development aims to provide “the support needed for people and Inuit Organizations to develop and use their capacities to enable them to participate fully in decisions on development.”⁹ In the construction industry, this would mean that the construction laborer would be able to choose between working as a civil servant, a sub-contractor, or a self-employed entrepreneur. Michelle Bertol says: “People want the choice to participate in a more sustainable private sector, they want the economy to be diversified, as diversified as it can be.”

⁹ Nunavut Department of Sustainable Development, www.gov.nu.ca/sd. Jan 2 2005.

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An economic rationale for public sector support of the construction industry is that privately developed housing will ease the financial burden on government for the delivery of social housing. Expansion of the wage economy means fewer households to support in affordable housing. It also means more mobility for individuals who are no longer bureaucratically tethered to social housing in the community where they have it. Access to private rental units will give Nunavummiut the opportunity to pursue work outside their home communities.¹⁰

¹⁰ D’Arcy July 12.

Construction businesses in Nunavut, however, cannot come to the assistance of the government where help is needed most: in the provision of low-cost housing. As reiterated in every discussion of housing in the North, building is expensive and demand is deep and broad. As a result, the private sector has little incentive to develop affordable housing where the affluence of a growing government workforce produces copious demand for market rate units.

Ultimately, public and private sector expectations that the other will stimulate economic growth amount to discouragement on both sides. Steve Cook describes the tension or lack of understanding between government and industry with respect to the role of each in economic development, explaining that at the 2001 Northern Economic Development Strategy (NEDS) meeting:

“the Nunavut government urged the private sector to pick up the slack in providing services such as housing. But the private sector is a secondary industry, and government is the primary industry, so it is natural that the secondary industry should respond to the primary; it analyzes and reacts to the primary industry in a support role. The private sector is a service industry. Our government doesn’t see their role. They keep coming to meetings expecting the private sector to get moving.”¹¹

¹¹ Cook July 26.

The reasons why the private sector is having trouble “getting moving” emphasizes the need for improved public/private communication to foster growth in the construction industry. First of all, there is insufficient funding and counseling available to support young building services. According to Cook, none of the institutions set up to provide these, including the Baffin Business Development Corp, or the Northern Development Fund, have enough of it themselves.¹² Second, overhead costs are exorbitant for material supplies businesses that stock goods from one shipping season to the next. Jacques Bealeau, owner of Frobuild Building Supplies estimates that his costs are ten times as

¹² Ibid.

building skills

high as they would be in Montreal, and that he requires five times as much storage space. He brings in inventory one year in advance, and has to pay for it up front. He reported that in the month of July, 2004, he had ordered and paid in full for \$600,000 worth of inventory that he hoped to sell within the next 6-8 months.¹³ Third, with little business management capacity in the local population, businesses are challenged to survive in the long run.¹⁴ If it expects meaningful contributions from businesses in the process of developing the territory, the GN must recognize the lack of management skill and experience in the private sector.

¹³ Bebeau, July 29.

¹⁴ Cook July 26; Simard July 19.

Public and private sectors must deepen their awareness of the obstacles each faces in contributing to economic growth. This is especially true in the construction industry with respect to trades training, and here, private and public sectors are coming to the realization that lack of skill has deleterious economic, political, and cultural effects for both. According to Sheldon Nimchuk, Project Manager for Nunavut Investment Group, the construction and development company owned equally by each of Nunavut's four Inuit birthright corporations, labor must be "turned into something that's not an obstacle to private sector," however, "the private sector can't take a leap on its own to provide training."¹⁵ The funds and expertise of the private sector must be supplemented by public funding policy design, and administration Nimchuk emphasizes that government and businesses must "come together as an industry and try to understand the complexity of achieving goals." Cost reduction and improved efficiency in the construction industry is contingent upon this partnership.

¹⁵ Nimchuk July 30.

Describing construction as a collaborative industry with stakeholders ranging from government to contractors, and from architects to the certification board, Nimchuk focused on the importance of public/private collaboration for the development of the labor force: "the GN must try better to understand industry needs, work together to develop a framework within which training can be

delivered to the benefit of each.”¹⁶ Nimchuk stated that every stakeholder involved shares “a basis of good intent” but that “It’s time to roll up our sleeves and get at it...The reality is, the majority of work is from the government, so the government probably has to initiate the discussion, even if the private sector effectuates the project.” He adds, “At the end of the day, it’s not rocket science.”¹⁷

¹⁶ Ibid.

¹⁷ Ibid.

A model for a collaborative approach is offered by another territorial industry, mining, which together with the construction industry is likely to play an instrumental role in the development of Nunavut’s economy. The construction industry can learn from the collaborative actions taken by the public and private sectors to prepare the territory for increased mining activity by training Nunavummiut to participate in mines development. The GN Department of Education this past summer submitted an extensive report on training needs and a request for funding to the GC Aboriginal Skills and Employment Partnership Program (ASEP) to implement mine-related training across the territory. The ASEP application stated that if funding could be marshaled for training, a non-profit organization, the Nunavut Mine Training Partnership, would be formally established to “administer and direct activities, provide for accountability, and report functions.”¹⁸ The partnership would be made up of a core group including:

¹⁸ Nunavut Mine Training Partnership, “Application to ASEP,” working draft, (Iqaluit: Department of Education, July 15 2004), 9.

- Kitikmeot Economic Development Commission
- Kivalliq Partners in Development
- Kakivak Association (Baffin)
- 1 representative of each of the three Regional Inuit Organizations
- 1 representative of the GN Department of Education
- 1 representative of the Department of Economic Development and Transportation
- 1 representative of Government of Canada
- 1 representative of Nunavut Arctic College
- 1 representative of NWT/Nunavut Chamber of Mines
- 3 representatives of Mining Industry

building skills

The main goal of the Partnership is to “develop and maintain a strong partnership among all members of the Partnership, through a shared vision, responsibility and action.”¹⁹ In the relationship between public and private sectors, the public sector is in a position to administer the program by “establishing targets, monitoring vacancies, linking training and education, reporting on the success of the plan.” The input of the private sector, meanwhile, is harnessed to “link industry training requirements with labor force development,” and “identify industry labor force requirements, competencies, and training needs, and update regularly.”²⁰

¹⁹ Ibid 52.

²⁰ Ibid 53.

The construction sector must learn from the partnership approach developed by the mining sector. A similar collaboration, involving representatives of the three Regional Chambers of Commerce and of the Construction Industry, is crucial to the clarification of vision and direction for construction trades training in Nunavut. The involvement of both the private and public sectors in the fulfillment of a skilled labor force is central to meeting needs in an industry that is quickly growing in the territory. Bruce Rigby, Senior Analyst in the Department of Education’s Adult Education Program, laid bare the task at hand by asserting that: “We have to design training services to meet a moving target.”²¹ The private sector must keep the public sector informed of changing needs, and the public sector, in turn, must respond by flexibly incorporating new skills into the curriculum, and monitoring the number of trainees in the program.

²¹ Bruce Rigby, Senior Advisor of Adult Learning Strategy at the Department of Education, Hugh Lloyd, Senior Advisor of Community Development Initiatives at the Department of Education, and Mark MacKay, Acting Director of Income Support Programs at the Department of Education, interview by author, July 26 2004, Iqaluit.

In short, the roles of government and industry in the expansion of the wage economy in general, and in the growth of the construction industry in particular, are not yet clear, as each expects the other to be better-positioned to stimulate development. Construction trades training, however, demands that public and private sectors regard each other as collaborators in the improvement of industry efficiency. Creating, monitoring, and adapting a trades training program will require an ongoing

discussion between policymakers and builders, which aims to fully understand demand for labor in Nunavut, in order to articulate a training curriculum and delivery strategy for the territory. These are discussed in the next chapter.



The industrial center of the city and territory faces the project site at the edge of the tundra

Building WORKFORCE

CHAPTER V.

THE CONTEXT OF CONSTRUCTION TRADES TRAINING IN NUNAVUT

DEMAND, CURRICULUM, DELIVERY, AND LOCATION OF TRADES TRAINING

building skills

As industry stakeholders come together to lay out the context for trades training in Nunavut, a set of issues emerge as paramount to the design for a trades training facility: the magnitude of demand for labor, the features of curriculum, and the strategy of deliver.

The Department of Education's application for funding from the Aboriginal Skills and Employment Partnership Program (ASEP) provides the most recent data on construction trades apprenticeship and registration, from 1999. According to the ASEP application, from 1985-1999, 53 carpenters, 33 plumbers, and 28 electricians, were registered in Nunavut.¹ The application continues that in the near future, the mining sector alone anticipates with some certainty a need for, at a minimum, 7 carpenters, 5 plumbers, and 46 electricians.² No data was found providing similar predictions for the construction industry, but if the mining predictions prove to be correct, 52 carpenters, 26 plumbers and a deficit of 18 electricians would remain to be spread across construction sites (no data is provided for trades certification between 1999-2004). Although the construction sector does not yet produce data on industry demand for labor, it can be shown that certification levels (from 1999) are low. According to Eegeesiak Aniqmiuq, a journeyman carpenter who is the Maintenance Supervisor of the Iqaluit Local Housing Office, and his coworkers, Thomas Gray, (a carpenter), Marc Denault, (a journeyman plumber), and Joetanie Davidee, (an apprentice plumber), each hamlet needs one plumber, one oil burner mechanic (OBM), and one electrician at the very least given current populations, and that for new construction, the ratio of carpenters to plumbers to OBMs to electricians should be 3:1:1:1.³ If each of the 25 communities built only one small project at a time, the territory would need, roughly, 75 carpenters, 25 plumbers, 25 electricians, and 25 oil burner mechanics. By this crude estimate, the territory has just enough plumbers; carpenters, electricians, and oil burner mechanics are all in demand. This estimation provides only a very rudimentary illustration of demand for labor. Improved reporting of industry needs and up-to-date accounting of trade certification will impact upon development of training resources.

¹ Nunavut Mine Training Focus Group 16.

² Ibid. 15.

³ Eegeesiak Aniqmiuq, Maintenance Supervisor at Iqaluit LHO, Thomas Gray, Maintenance Officer at Iqaluit LHO, Marc Denault, Plumber at Iqaluit LHO, and Joetanie Davidee, Apprentice Plumber at Iqaluit LHO, interview by author, July 20 2004, Iqaluit.

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Industry stakeholders concur that training resources currently available to Nunavut apprentices are unsuccessful, highlighting the need for a training curriculum and delivery strategy that is tuned to the unique construction environment of the eastern arctic and also sensitive to the cultural preferences: the ASEP application points out that “Historically, moving the Inuit of the eastern Arctic to training programs in the western Arctic has yielded poor results.”⁴ This is certainly true of construction trades training experience to date in Nunavut. The only complete training currently available to Nunavummiut is at Thebacha College, in Fort Smith on the border of the Northwest Territory and Saskatchewan; it falls far short of equipping Nunavut trainees for work on Nunavut job sites. Fort Smith is almost as far a trip from the eastern edge of the territory as is Boston, and it is in many ways just as remote from eastern arctic familiarities. Fort Smith has a small aboriginal population, and what population there is speaks Athapaskan, not Inuktitut. Fort Smith sits beneath the tree line, and has access to local lumber in addition to southern imports. Fort Smith soil is only 10-50% permafrost, permitting concrete foundations and basements instead of piles and above-ground structure. Most importantly, Fort Smith is connected to southern cities by all weather highways, accommodating year-round shipment and construction. Clearly, some of the technical and organizational skills taught at the Fort Smith training facility are irrelevant to trainees who want to work in Nunavut.

⁴ Nunavut Mine Training Focus Group 9.

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The Nunavut apprentice is unlikely to learn skills in Fort Smith that are particular to Nunavut construction. Moreover, the Fort Smith construction programs, which run through the late summer and fall, force the Nunavut apprentice to choose between completing training requirements and logging work hours. All of these incongruities support the need for a “Made-in-Nunavut” curriculum, offered instead at a Nunavut facility that operates within and teaches about the idiosyncrasies of territorial construction.

Towards these goals, the Department of Education is beginning the process of crafting an apprenticeship strategy for Nunavut. Two central themes prevail in the discussion of vocational

education and trades learning: what the curriculum should be, and how it should be delivered.

Drawing on best practices observed across Canada, the Nunavut Department of Education has begun to articulate an apprenticeship curriculum for the territory by observing strategies that have been successful across the other provinces and territories, and understanding which ones might be appropriate for or adapted to Nunavut. The comprehensive report, [A Suggested Apprenticeship System for Nunavut](#), surveys features of training programs across Canada. The following curriculum-related features from “best practices” in the other provinces are likely to have design implications for the development of trades training facilities:

Core curriculum: involves courses based on common knowledge and skills across related trades to provide broader theoretical knowledge and a common set of skills for all apprentices. It integrates teaching resources and classrooms in the earlier phases of trade technical training, and allows learners to choose about what trade to enter after they’ve been exposed to their options (in Ontario and Nova Scotia)

Modular training: describes short term, competency-based modules designed in consultation with industry (in Ontario and Prince Edward Island)

Academic vocational streaming: combines paid work experience and/or vocational training with high school education, and has been found in the other provinces to encourage youth success in the trades (in Manitoba)

Cooperative classroom training: promotes more up-front co-op classroom-based training (in British Columbia)⁵

⁵ A Suggested Apprenticeship System for Nunavut Executive Summary 9-16.

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The more heated debate on apprenticeship and training in the territory surrounds the mode of delivery of training which provokes strong reactions about the political, cultural, and economic merits and drawbacks of decentralized versus centralized delivery of training. There is no consensus on whether delivery should be community-based or focused in one community, and if the latter, which community will best serve its region or the territory.

The ASEP Mine Training Application broaches the issue of modes of delivery and urges the importance of multimodal access to and delivery of training, including community-based career counseling and training, and on-site training.⁶ There is broad agreement among the stakeholders in the construction industry—the NHC, the Department of Education, Contractors, tradesmen, and interested youth—that a multimodal approach is necessary to the development of construction skills among Nunavummiut, incorporating community-based career counseling, distance learning, remote delivery programs, and institutional or facility-based learning.⁷ There is, however, no coherence on whether the bulk of off-site learning, typically 7-8 weeks per year for each trade, should be offered in the communities, or in 3 regional, or in 1 territorial facility. The debate between decentralized and centralized facilities may be the most difficult to resolve in the establishment of a Nunavut training strategy.

Decentralized decision-making in trades education is supported at the national level by the Canadian Labor Force Development Board (CLFDB) (a national advisory body made up of 90 national organizations representing labor market partners and training providers) in reconciling issues relating program design and delivery mechanisms. In the Department of Education document A Suggested Apprenticeship System for Nunavut, the CLFDB is cited as recommending that “there is no one size fits all apprenticeship approach and that programs must assess the regional and community economic conditions in the development of apprenticeship programs.”⁸

In order to understand the capacity for decentralized training delivery in Nunavut, the Department of

⁶ Nunavut Mine Training Partnership 30.

⁷ Scott and D’Arcy July 12; Rigby July 22, Simard July 19; Aniqmiuq, Gray, Denault, and Davidee, July 20.

⁸ A Suggested Apprenticeship System for Nunavut 14.

Education has undertaken an extensive information-finding mission to document facilities available for trades and occupational training in each region. So far, results from the Kitikmeot have been compiled. The study is a result of a Labour Market Development Agreement (LMDA) between the GN Department of Education and the Government of Canada's Department of Human Resources and Skills Development, which gives the territory responsibility for the design and delivery of employment and training program within its jurisdiction. It offers comprehensive information on the "facility requirements for training courses in ten trades/occupations, and assesses the suitability of existing facilities as training sites" for ten trades, including Carpentry; Cabinet-Making; Housing Maintainer; Plumbing/Oil Burner Mechanic; Electrician; Cook; Welder; Automotive Service Technician; Heavy Equipment Technician; and Heavy Equipment Operator.⁹ The LMDA study finds that most communities have the basic spatial capacity to accommodate most of the trades.¹⁰ More research, however, is needed to "assess the capital cost associated with improving facility deficiencies and the cost/benefit of offering training at a facility where deficiencies exist."¹¹

While the results of the study provide preliminary evidence that a decentralized approach is feasible, at least in the Kitikmeot region, with respect to availability of facilities, voices within the Department of Education argue that decentralization is imperative with respect to cultural norms. According to Bruce Rigby, Senior Analyst in the Department of Education's Adult Education, regional culture varies from one side of the territory to the other so much that residents of each region learn in different ways. "When we do interviews in the territories, we find that we can't talk to people from one hamlet in the same way as from another."¹² For Rigby, a community-based approach will "put needs of learners first."

The push for decentralized program delivery in Nunavut is nurtured too by a political climate that has embraced decentralized decision-making and governance in the North. Mark O. Dickerson's book on political change in the North describes how community level political authority escalated through in

⁹ LMDA Labour Market Partnership Phase I 1-5.

¹⁰ Ibid. 4-132.

¹¹ Ibid. 1-7.

¹² Rigby July 22.

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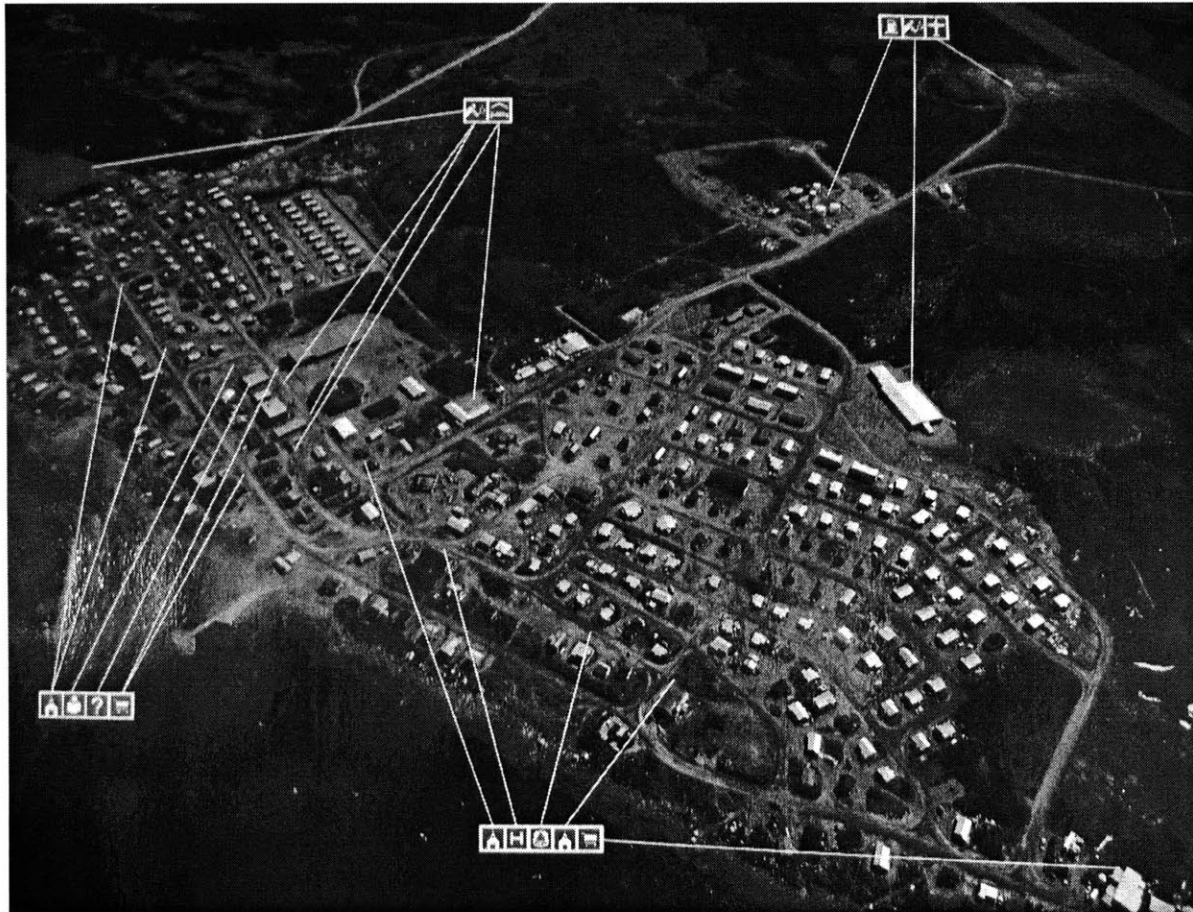


Fig 5.1 Aerial photo of Arviat, where the NHC has decentralized offices

the arctic the 80s and 90s.¹³ In 1988, a volume published by The Boreal Institute for Northern Studies titled Northern Communities: Prospects for Empowerment urged that the empowerment of native northerners could be supported by increasing the political authority of communities and noted that though progress seemed to be gradual and obstacles were many, “community empowerment is certainly under way.”¹⁴

The creation of Nunavut made a permanent place for decentralized governance in the North. According to the report evaluating the success of decentralization in Nunavut entitled Building Nunavut Through Decentralization, the GN relocated 340 jobs through communities in 1999, in an attempt to provide employment and training opportunities in communities; to provide community opportunities for capacity building while strengthening local economies; to improve access to programs and services; and to build healthy communities by increasing self reliance. In 2002, approximately 59% of the community jobs were filled with Inuit, compared to 42% across the Nunavut public service and 28% in the capital.¹⁵ A decentralized construction trades training strategy would fit comfortably into the broader political agenda of decentralized governance pervasive across the territory.

A final argument for decentralized delivery of training relates to the cultural norm of attachment to kinship networks and their home communities. Attrition is likely to be minimized where students do not have to confront the anomalies of life in an unfamiliar community, and compounded when alcohol is available. An interview with Bruce Rigby and his colleagues at the Department of Education, Hugh Lloyd, Senior Advisor of Community Development Initiatives, and Mark Mackay, Acting Director of Income Support Programs, illuminated the following example of alcohol-induced culture shock and consequent effects: A welding training course in Northern Labrador was well-advertised for admissions, and originally received 65-75 applications. As a screening device, only Employment Insurance-eligible candidates prequalified. They had to write a pre-trades exam. After being submitted to these criteria, only 30-35 were eligible, and these were interviewed, and finally, hand-picked. They

¹³ Mark O. Dickerson, Whose North? Political Change, Political Development and Self-Government in the Northwest Territories, (Vancouver: UBC Press and Arctic Institute of North America, 1992), 135-141.

¹⁴ Dacks and Coates, ed. 9-10.

¹⁵ Millennium Partners, Building Nunavut Through Decentralization: Evaluation Report, (Iqaluit: Department of Executive and Intergovernmental Affairs, GN, 2002), 1-10.

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were chaperoned locally for 1 week, then flew to Goose Bay to meet up with a local chaperone. The course started in September, and by Christmas there were only 10 students. Alcohol and related poor money management skills, along with homesickness whittled down the class size.¹⁶

¹⁶ Rigby, Lloyd and Mackay, July 26.

Evidence from the Department of Education clearly warrant close inspection of the strengths and weaknesses of decentralized training in the North. However, Aluki Rojas, Director of Inuit Qaujimagatunqangit, (traditional knowledge), or IQ, in the Department of Culture, Language, Elders and Youth (CLEY), as well as Lori Idlout, Policy Director in the Department of Health and Social Services, feel that the welding class, with its well-directed efforts at retention, does not prove the futility of education outside the home community so much as it demonstrates the need for continuing non-curricular support for students away from home. According to Rojas, “When people leave their relatives, [they] have to be able to start feeling around, and make new relationships.”¹⁷ She expresses frustration with teachers who are inattentive to students’ needs for guidance outside the classroom, where they may need it most: “Teachers who only relate to students as pupils between 9-3 are a disservice to the trainees.” Lori Idlout stresses the need for “excellent facilitators” to lead orientation programs, and to listen to students as they complete their course away from home. The facilitator has to convey the message that the student must take the lead in being responsible for their own well-being while “on course.”¹⁸

¹⁷ Aluki Rojas, Director of Inuit Qaujimagatunqangit, interview by author, July 28 2004, Iqaluit.

¹⁸ Lori Idlout, Policy Director of Health and Social Services, interview by author, July 22 2004, Iqaluit.

Rojas and her colleague, Claude Beachamps, Senior Policy Analyst for the Dept. of CLEY, also point to the success of Nunavut Sivuniksavut, a 1-2 year academic ‘transition’ year in Ottawa for Nunavut high school graduates interested in learning more about Inuit history and culture, and at the same time, trying out the experience of living away from home in anticipation of applying to a southern undergraduate program. Since its founding in 1985, the college has graduated about 175 students. About 26 Inuit enter the program each year, and participate in courses on political history of Inuit,

Inuktitut, and cultural performance, group activities promoting life skills.¹⁹ Teachers make it clear that they should call any time, and the “good staff attracts good students; word of mouth travels fast across the territory.”²⁰ The experience and exposure gained in a supportive educational environment outside the home community can “build confidence and decision-making skills.”²¹ Moreover, suggests Steve Cook, an experience away from home may help Nunavummiut prepare themselves for leaving the territory to work, whether by choice or by economic circumstance.²²

¹⁹ Nunavut Sivuniksavut, www.nstraining.ca, Dec. 30 2004.

²⁰ Rojas and Beauchamps July 28.

²¹ Ibid.

²² Cook July 26.

Ultimately, points out Lori Idlout, interest in staying in or venturing outside of the community depends on the individual. The Department of Health and Social Services finds that although elderly aren’t often willing to leave home, young people are often enthusiastic about traveling for educational and recreational opportunities, evidenced in high attendance at arctic- and Nunavut-wide conferences, and the arctic games. “People are excited to come when it increases their skill and experience.”²³

²³ Idlout July 22.

The arguments in support of a centralized facility emerge from the same document which approved Nunavut’s progress in decentralization: the Evaluation Report on decentralization points out that housing shortages in the communities are obstacles to decentralization, employee morale in decentralized communities is consistently low, and communication is very difficult between headquarter and community offices.²⁴ These drawbacks would certainly apply to decentralization of trades training. Others include cost of building multiple facilities, cost of flying trainees to small communities, unreliable schedules for flights to small communities, and the difficulty of recruiting staff to the hamlets. A centralized approach would respond to these shortcomings of a community-based delivery system.

²⁴ Millennium Partners 2-4.

A centralized approach, however, raises issues surrounding the choice of a location. The first issue of contention is whether it should be in eastern, central, or western Nunavut. The sudden emergence of the Baffin region as the center of political and economic activity has nurtured tensions between

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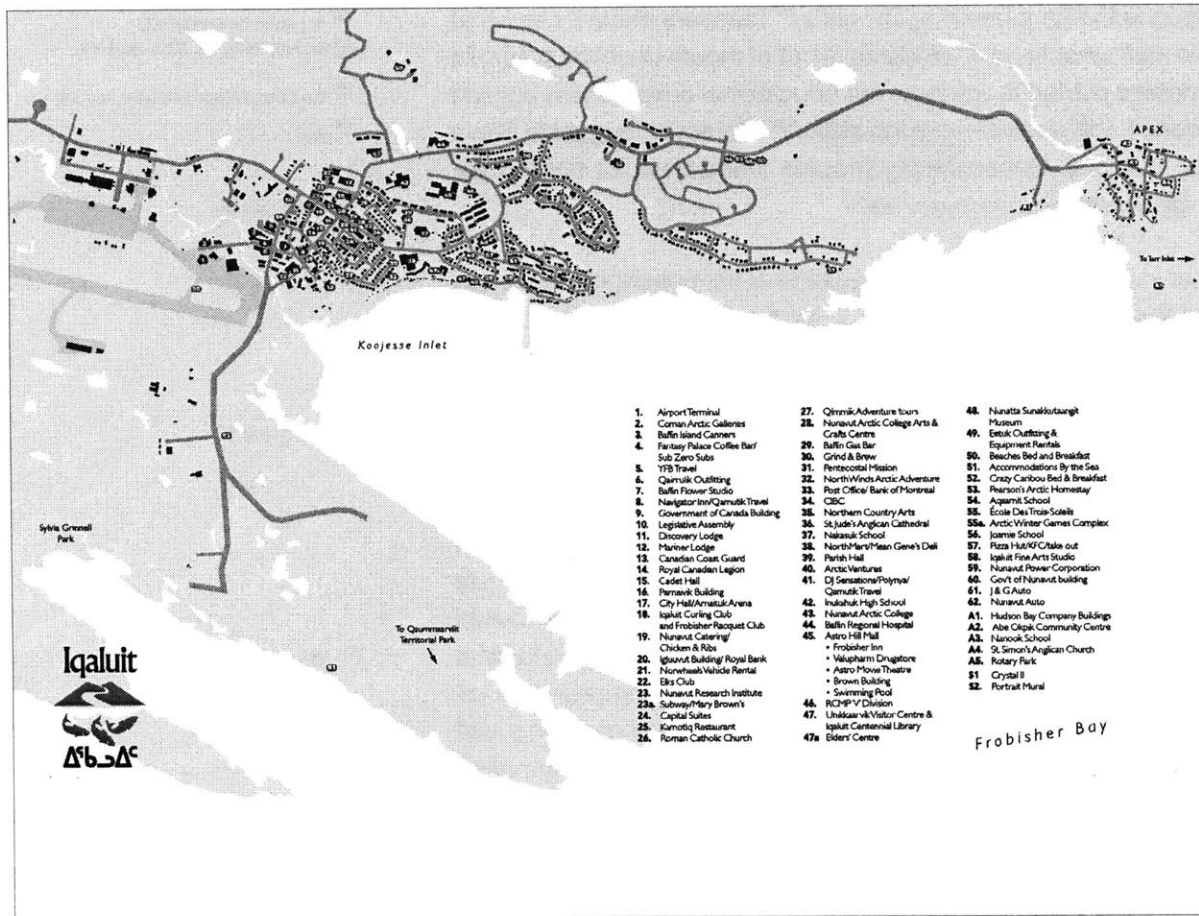


Fig 5.2 Visitor's map of Iqaluit showing local destinations

east and west sides of the territory, with each Member of the Legislative Assembly lobbying for their constituency. As Lori Idlout says, “There are so many strong demands in Nunavut.”²⁵

²⁵ Idlout, July 22.

Despite the possibility that “western Nunavut feels slighted by the Baffin”, Iqaluit remains, for logistic and pedagogic reasons, the most obvious location.²⁶ Idlout states that “there is only one place to do it, and that’s Iqaluit.”²⁷

²⁶ Cook July 26.

²⁷ Idlout July 22.

The capital city has its critics, however. The most prevalent argument against the location of the Center in Iqaluit in particular is its sometimes-cited reputation as the “Sin City” of the territory. Nunavut’s communities decide individually whether they will permit alcohol to be sold in restaurants or bars; Iqaluit does permit bar and restaurant alcohol consumption, a fact which many feel should disadvantage it in a bid for government and educational program. Steve Cook feels strongly that if the Training Center is going to be centralized, Iqaluit “is the last place to put it...if you take them out of the community, don’t throw them into the fire.”²⁸

²⁸ Cook July 26.

Location in a dry community is supported by anecdotal evidence implicating access to alcohol as the scourge of well-designed training programs. In addition to the welding example above, is the case of Pond Inlet, which was chosen as the site for a new Nunavut-wide Health office. Ten local individuals were identified as having the potential to run the office. They were brought to Iqaluit where 8 dropped out because it was the first place they had ever been where they could buy alcohol over the counter.²⁹

²⁹ Ibid.

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Cook acknowledges that Iqaluit “is the best place for all logistical reasons, and the worst for social and cultural reasons. But logistical reasons are the wrong ones on which to base the choice, because they don’t serve the client.” To be sure, he admits, students have to have accountability for their own actions. “But if they’re free between 5 and 9 o’clock, what else is there for them to do? On the one

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hand, adults are free to make their own decisions. On the other, they have to be policed because other people are footing the bill.” Lori Idlout, however, believes that sudden access to alcohol can be mitigated by strong and trustworthy student support. Facilitators should make it clear that there is “such a thing as drinking responsibly...that you don’t have to get drunk every time you drink.”³⁰

³⁰ Idlout July 22.

The final decision about where the training center should be made in consultation with the communities and its elders, says Cook: “the issue needs to be discussed with elders. If we do it in such a place, here are the pros and cons. The elders and the communities have to decide because they’re the ones at risk, not residents of Iqaluit, who are already exposed to vice.”³¹ Rojas and Beauchamps agree that deference should be shown “to community choice—do they want it? Would it put more pressure on local housing?”³²

³¹ Cook July 26.

³² Rojas and Beauchamps July 28.

As much as Iqaluit draws criticism as a location for a central trades training facility, its merits are numerous. The clearest argument is for its transportation connections with Southern Canada and the rest of the territory. As a marine and air transportation hub, Iqaluit offers ease of access for staff and teaching materials coming from the South, and possibly also for teaching kits or modules traveling out to Nunavut’s communities and back to a central preparation and storage facility.³³ With its easy access and growing amenities, Iqaluit has most promise for attracting high quality teachers that will help a Nunavut training center attract high quality students.³⁴

³³ Idlout July 22.

³⁴ Jacques July 13.

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Another compelling argument in Iqaluit’s favor is its proximity to industry. There are opportunities in Iqaluit for a co-op or mentoring program with contractors and construction-related businesses concentrated in the capital city.³⁵ Additionally, the built landscape of Iqaluit features a wide range of construction strategies and technologies implemented across Nunavut over the course of the last five decades, providing trainees with the opportunity for firsthand exposure to the assemblies, techniques, and mechanisms they are likely to encounter in their own work. And with construction activity in the

³⁵ Scott and D’Arcy July 12.

Capital anticipated to remain strong, students will have a chance to visit buildings mid-construction and learn about prevailing building practice for both housing and public buildings across the territory.

The discussion about the delivery of training in Nunavut is, at this point, in its beginning stages with respect to both curriculum and delivery. Of these two, the latter is likely to provoke disagreement, because the location of a new institutional facility in Nunavut has significant implications for community development, family organization, and student well-being. Persuasive arguments exist for both a decentralized and centralized approach to the delivery of training programs. Continuing research in the Department of Education will produce a better understanding of the feasibility of each system in terms of existing facilities, cost, and demand, and the attitudes of Nunavummiut with respect to location and duration of training programs. However, convincing appeals were made for a centralized facility in Iqaluit drawing on ease of transportation, attractiveness to high-quality staff, proximity to trades mentoring, and access to industry activity. Located in the capital city, a Nunavut Trades Training Center will be a landmark visible in Nunavut and abroad, signifying the participation of Nunavummiut in an industry growing under their guidance.



A summer outing to watch the stream carry cold water and plastic bags into Frobisher Bay

Building COMMUNITY

CHAPTER VI.

THE CONTEXT OF PUBLIC BUILDINGS AND COMMUNITY SPACE

SPATIAL AND MATERIAL ORGANIZATION OF CIVIC SPACE IN NUNAVUT

building skills

While a Nunavut Trades Training Center in Iqaluit signifies an unprecedented investment in Inuit involvement in the construction sector, it also represents an equally considerable, and rare, contribution to the city's fledgling public realm. With desire for more communal gathering spaces expressed across the territory and necessitated by rapid population growth,¹ the construction of new public space produces an opportunity, perhaps even responsibility, to welcome and gather non-trainees in, through, and around the building. In its orientation to the city, the building must present an invitation to broad constituencies including Iqaluit's residents, as well as visitors from the territory, country, and beyond. In its program, its organization, and its construction, it can offer principles to Nunavut's communities for the design of public buildings. The structural and material systems of the Center acquire heuristic value for the trainees who may in the future apply them to civic spaces in their own communities.

Public architecture has historically confounded designers working in the Eastern Arctic who, as settlement needs grew, appealed to southern experiences and solutions when they did not identify formal, structural, and material precedents in the native construction language. The Inuit building tradition presents, in the igloo, a residential vernacular that is instantly recognizable; there is however distinct counterpart in communal space.² A large igloo, or qaggik, would be built for community meetings.³ Inuit artists depicting scenes from life on the land illustrate that the realm of public life either drew friends and family tightly together into the central space of a large snow house, or into the sheltered space formed by a ring of igloos or tents. Gatherings are otherwise illustrated in the endless space of the landscape. Prints show public activities happening in the foreground of an otherwise blank page; the broad communal space of the tundra cannot be captured in the frame.

The first buildings expressly serving community activity emerged only with the colonial presence.

¹ NHC, *Building Connections in the North*.

² Strub 64.

³ Annette Bourgeois, "Talks begin on Nunavut's Assembly Building," *Nunatsiaq News* (February 14 1997), online at www.nunatsiaq.com.



Fig 6.1.1 Drawing for 1979 print *Spring Dance* by Napatchie Pootoogook

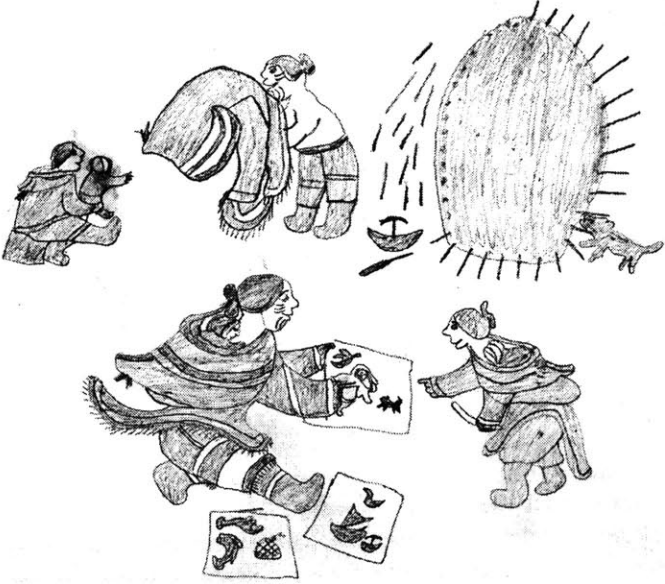


Fig 6.1.2 *Women at Work* by Napatchie Pootoogook

Along with missionaries, Mounties, bureaucrats, traders, and their families came churches, offices, bars, stores, and community halls. In Iqaluit, these quickly evolved from small stick-frame edifices into large-scale experiments in arctic construction, most relying on imported assemblies and labor. The suite of public buildings in Iqaluit built between the 1960s and the 1990s demonstrates the persistent attitude among their Southern designers that large public buildings demand complex construction. The panelized, steel, and reinforced concrete systems that characterize successive generations of public buildings in the Eastern Arctic no doubt imposed substantial costs relating to patents, materials, shipping, and labor. Moreover, the administrators, designers, and engineers responsible for building and community design in the Arctic over the course of the last fifty years have been criticized for shutting “people accustomed to seeing and hearing the land that supported them” into buildings whose windows “ignored views and preferred exposure to sunlight.”⁴

⁴ Strub 64-65.

The 1940s US Air Force building is the earliest building with community facilities standing in Iqaluit. A 300 ft long superblock with provisions enough to keep sequestered enlistees busy, it shared the prevailing attitude towards arctic construction by Ralph Erskine’s wall buildings enclosing cold climate cities. The building now serves as the Arctic College student residence, and has weathered sixty years in the face of the twenty year life spans usually expected for arctic buildings. The explanation for its endurance, however, is also the culprit of its poor perception by Iqaluit residents as “an austere and overpowering mass”⁵: the building is an inward-facing block that allows glimpses out, never in, through small, upper-level windows. The building is certainly “iconic,”⁶ but in its unwieldy enormity. The structure was designed and built by servicemen most likely unaccustomed to the arctic conditions; they overcame the wear of the elements with brute force, for example, using massive concrete pile cap foundations.

⁵ Nunavut Arctic College 5.

⁶ Ibid. 9.

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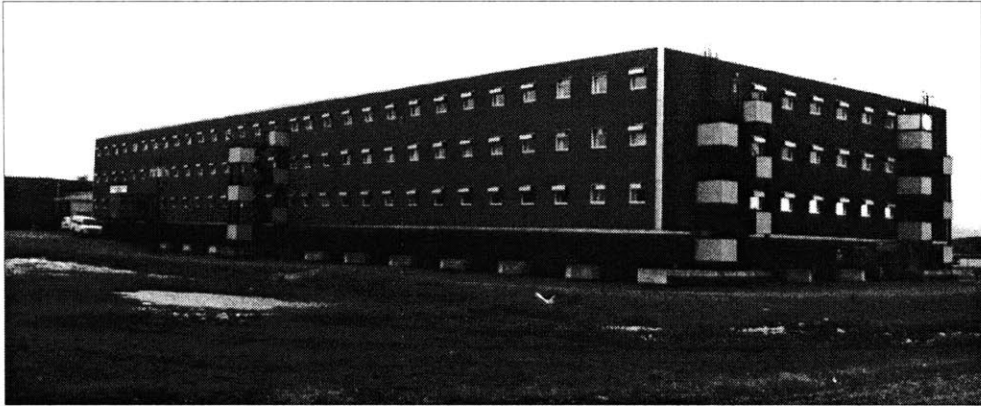


Fig 6.2.1 American Air Force Base

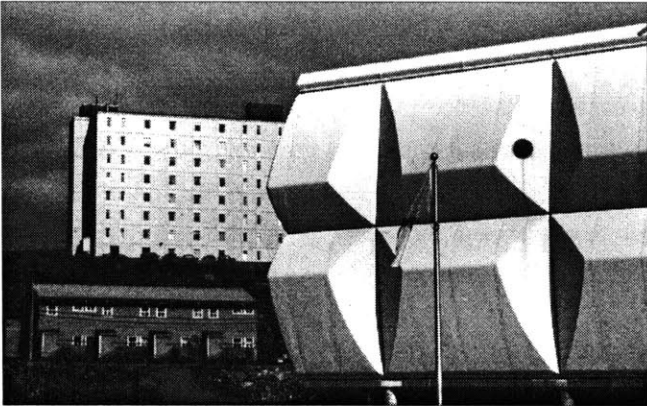


Fig 6.2.2 Nakasuky school (foreground) and Brown Building

The windowless concrete interiority of the USAF was emulated in civic design in the sixties. Iqaluit's multi-use "Astro Hill" complex, which houses a hotel, restaurant, bar, movie theatre, pharmacy, and swimming pool, was originally conceived as part of an even larger network of buildings connected by underground tunnels; the tunnels were built, but they were dark, dank, and soon deserted. Moreover, the strategy favoring indoor complexes was abandoned upon the observation that instead of bringing people together, it was separating the community into "those who stay inside and those who move around outdoors."⁷ The 8 storey, reinforced concrete tower that is the centerpiece of the Astro Hill complex has earned it the superlative of highest building in the Canadian arctic, but with the exception of the hospital, no public buildings have since modeled themselves on its technology. Concrete is very expensive in the arctic, demanding laborers experienced with testing and pouring, and weather favorable to pouring and curing. Moreover, despite the preponderance of rock, aggregate must be shipped at tremendous expense to most communities, where gravel is not naturally available.

⁷ Leo R. Zrudlo, Psychological Problems and Environmental Design in the North, (Quebec: Centre d'études nordiques, Université Laval, 1972), 71.

In the 1970s and 80s, civic buildings turned away from concrete to panelized construction in the hope that preassembled building components would save on-site construction costs and provide spaces tightly sealed against the cold. This strategy led to a highly-identifiable generation of buildings in the city in a style of "pioneer futurism", including the City Hall, Nakasuk Elementary School, and Inuksuk High School, "dominated by the slick materials, bold colors, and extruded forms which express the power of technology."⁸ The style is defined by prefabricated insulated panels, and streamlined forms to reduce heat loss and snow drift, and very small, very few windows. The smooth windowless surfaces make them oppressive throughout the year, and have earned these buildings their local reputations as "Coleman Coolers." The panelized public buildings of this era have the certain advantage of being maintenance free, however, they are expensive to ship and assemble. Moreover, they are highly disliked by the students and city employees who work in their sealed, dark spaces.

⁸ Hallwalls Gallery, Aesthetics for the Cold: Emerging Architectural Ideas, (Buffalo: Hallwalls Gallery, 1983), 9.

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Fig 6.3.1 Nunavut Legislative Assembly building

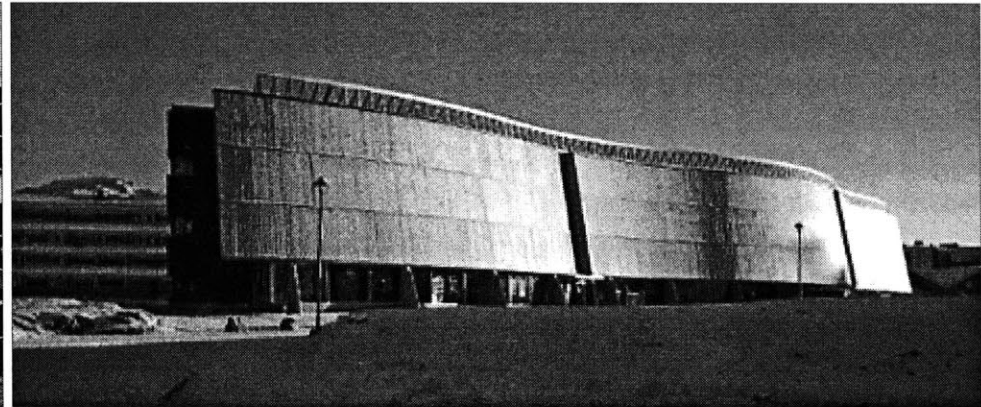


Fig 6.3.2 Nuuk Community and Culture Center with programming schemes for central space, above

Today, improvements in building technology make it easier to improve the quality of public spaces. Windows and their fittings, in particular, are much better insulated. Though new public buildings in Iqaluit are better lighted than they were twenty years ago, their structures have been cost-engineered to the most basic framed spaces. Iqaluit's new Core area and Capital District Development Plan calls for a city that "inspires interest," hoping to stem the appearance of banal, boxy buildings in the capital city that do little to support its vision of a "City of Places."⁹

The creation of the territory produced, in 1999, what may be the one exception to the otherwise bleak public sphere: Nunavut's legislative assembly building, or "the leg", is viewed as "standing nearly alone among Arctic buildings—it's beautiful to look at."¹⁰ The seat of Nunavut's public, consensus government, "in form and scale, flowing and contoured...easily resists comparison with all other building projects in Iqaluit."¹¹ With its blue wood cladding and arching profile, the building has proved notable enough to warrant an endearing nickname: the "blue mouse." The building divides into two main programmatic areas, the legislative functions in one, and administrative functions on the other. These each flank a high central space—a lobby with a small gallery—that is open to the public and has become an indoor link on a well-used town shortcut. Accordingly, one of the building's principle architects, Bruce Allen of ARCOP, notes that the leg is unique not only in Iqaluit but in the world as an intimate house of government "open to the outside, to anybody."¹²

The two features which distinguish the legislative building among Iqaluit's public buildings, the wind-sculpted profile and central public space, are reinforced throughout the circumpolar world. In the capital city of Greenland, Nuuk, Schmidt, Hammer and Lassen's Culture Center features a canted undulated wall that appears to be sweeping wind along the front of the building, possibly scouring the main façade.¹³ Also in Greenland, KHY Arkitekt's Naturinstitut is pulled out of the rough landscape by

⁹ Office for Urbanism, "Core Area and Capital District Development Plan," (2004), unpublished.

¹⁰ Dwane Wilkin, "A design for all time: Nunavut's legislative assembly," Nunatsiaq News, (May 7 1999), online at www.nunatsiaq.com.

¹¹ Ibid.

¹² Ibid.

¹³ Kim Dirckinck-Holmfeld, "Schmidt, Hammer & Lassen: an office portrait," Arkitektur DK 41:8 (1997):462.

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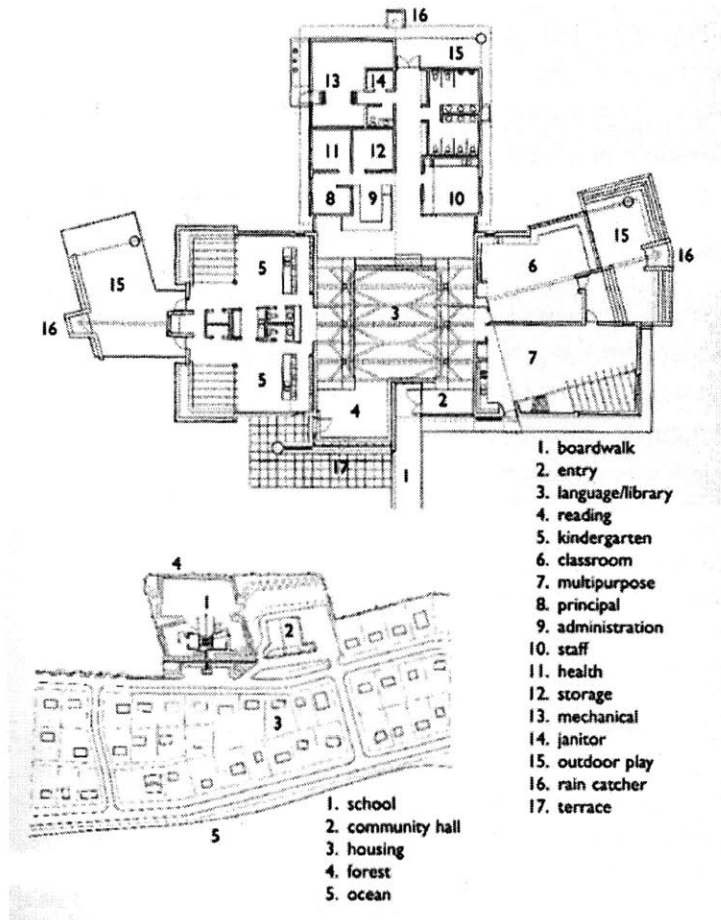


Fig 6.4.1 Haida Gwaii school, central library and reading space, and adjacency to community hall

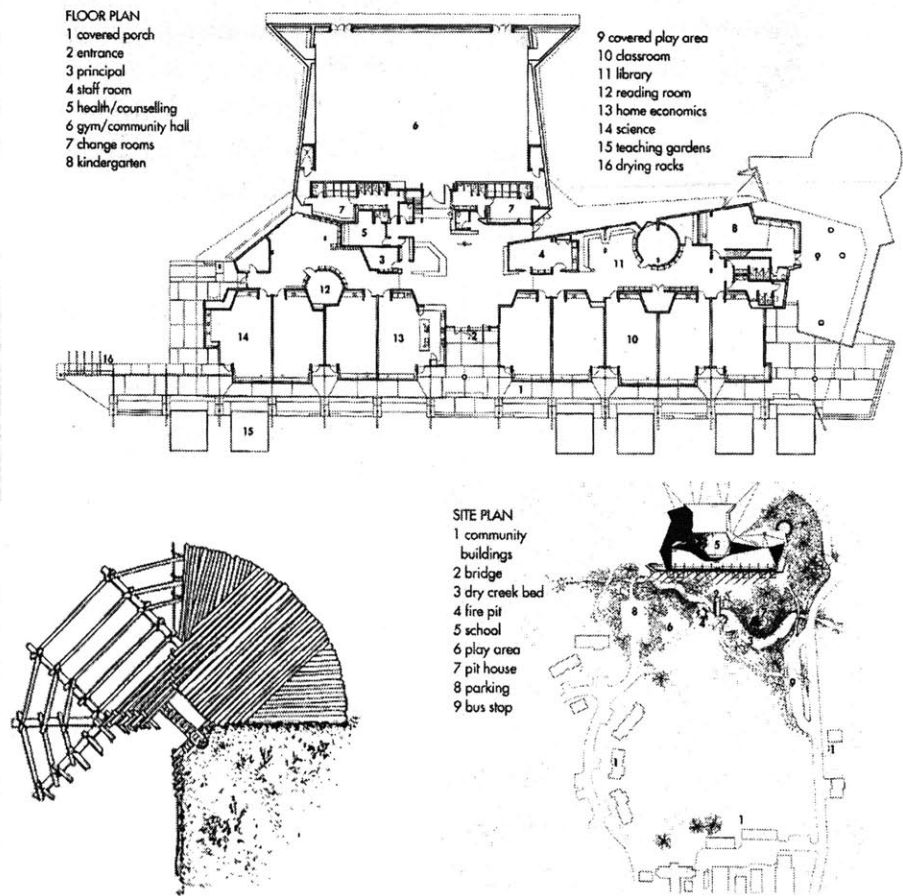


Fig 6.4.2 Thompson Indian Pit House, precedent for Peter Cardew's Stone Band School

Fig 6.4.3 Seabird Island School, entrance onto central assembly space, and accessibility of school to community

a roof which angles up towards the surrounding mountains.¹⁴ Similar to the legislative assembly, both Greenland buildings organize the buildings around a central gathering space. In the Cultural Centre, the central space is a multiuse plasma into which are set volumes containing programmatic elements. In the Naturinstitut, the central space is a wide, multistory central atrium with a well-lit canteen. In all these examples, and also in KHR Arkitekt's Istak headquarters building in Reykjavik,¹⁵ the central space gathers groups together in a way that suggests the clustered warmth of an indoor sanctuary, and perhaps also evokes the crevices and nooks of the outdoor wilderness.

The central space of the legislative building, however, is less a place for gathering than a corridor through the city, albeit a symbolic one that allows passersby to brush up against the force of their government. It is not the kind of public place that encourages meeting with friends, studying with schoolmates, or sitting and reading alone in the cold winter months. The value of a communal gathering space for small isolated Canadian communities is shown in northern British Columbia, where the generous central spaces of local schools built by the Patkau Architects for the Stone Band,¹⁶ by Peter Cardew for the Seabird Island Band,¹⁷ and by Acton Johnson Ostry for the Skidegate Band¹⁸ helped make these buildings accessible assets for the whole community. Public spaces in Nunavut must be designed to welcome groups and individuals seeking an opportunity to convene, a rest from home, and a retreat from the weather. Nunavut remains in need of a multiuse public space to demonstrate how communities in the territory can be served by the civic realm.

While no spatial language has yet been established for public buildings in Nunavut, neither yet has a technological language emerged that can be useful across the territory, in its larger communities and smallest hamlets. The finely appointed legislative building cannot be considered a model of technology widely appropriate across the Eastern Arctic. The material palette is beautiful but rich,

¹⁴ Merete Ahnfeldt-Møllerup, "Greenland's Nature Institute," Arkitektur DK 42:6 (October 1998): 332-342.

¹⁵ Gudmundur Gunnarsson, "Istak new headquarters in Reykjavik," Arkitektur DK 49:3 (May 2004): 238-255.

¹⁶ Gruft 14-23.

¹⁷ Stone Band School 14-15.

¹⁸ Weder 22-26.

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beyond the means of most communities seeking an architectural language involving readily available and easily connectable materials. For reasons of budgetary and technical constraints, the structural system is of massive post-and-beam construction, with members built up from laminated layers of wood. Although this system is, as the architects note, “more flexible and more forgiving than steel,”¹⁹ the heavy laminated beams were manufactured in Southern Canada and shipped to the site for assembly. This is not a technology that can be learned and built in Nunavut’s small, remote settlements.

¹⁹ Wilkin 1999.

An appropriate technology that is likely to have wide applicability to building projects across the territory is one that brings together materials that are inexpensive to ship and easy to store, replace, and even salvage from old buildings or town recycling. A structural and material system relying on such commonly available materials as dimensional lumber and sheet wood can help to lower material costs and labor costs. This kind of construction system, described in further detail in Chapter VII, can also have heuristic value for trainees, who may in the future apply its concepts or details in their home communities. Finally, as the territory tries hard to incorporate Inuit Qaujimajatuqangit (traditional knowledge) into government processes, educational environments, and community activities, a construction system of strong, modest, and ubiquitous materials can convey traditional Inuit values. The values of resourcefulness, environmental stewardship, and leadership by example²⁰ are embedded in a building system that draws on readily available elements, incorporates recycled materials, and endeavors to set a precedent useful to other communities. This appropriate technology can, hopefully, strike the balance envisioned by IQ Policy Director Aluki Rojas between traditional Inuit values and current Inuit needs, demonstrating to native Nunavummiut that “they can still be Inuk and learn something modern at the same time.”²¹

²⁰ Idlout July 22; Rojas July 28.

²¹ Rojas July 28.

To conclude, while the legislative building succeeds as a landmark symbolizing the presence of government in Nunavut, it did not intend, as this thesis does, to establish principles of design. “What the leg can do,” said architect Ketih Irving, summing up the potential impact of the structure on future development, “is to show people the value of design, the value of involving professional designers in a building.”²² The trades training center and community space proposed in this thesis aim instead to show Nunavummiut the value of accessible, welcoming gathering space, and also, of low-cost, elegant technology. The thesis strives to establish spatial and material principles that will be applicable to communities outside the capital as Nunavummiut build public places—within which to build the territory. These principles, suggesting prototypical responses to the social needs, physical conditions and logistical constraints of Nunavut, are elaborated in the following chapter.

²² Wilkin 1999.



Across Federal Road from motor repair and construction businesses, saxifrage grows in a wind-protected, sun-exposed patch of the site

Construction PRINCIPLES

CHAPTER VII.

FACTORS SHAPING THE FORM AND THE CONSTRUCTION OF THE BUILDING

LAND USE, PUBLIC ACCESS, LANDSCAPE, CLIMATE, SHIPPING SEASONS

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PATTERNS OF ACTIVITY AND PUBLIC ACCESS COMMUNITY ORGANIZATION IN A NUNAVUT SETTLEMENT

ZONES OF ACTIVITY AND LAND USE IN IQALUIT (Panel 1)

While the city of Iqaluit is unusually large for the Eastern arctic at 6000 people, its fabric is not unlike the other 24 communities in the territory: like the 23 hamlets that make up the centers of settlement within the territory (Iqaluit is the only city), the original layout of Iqaluit was dictated less by the coordination of land uses than the alignment of utilities. When the arctic communities emerged in the 60s and experienced quick growth, services were demanded under conditions of a severity that had never been studied in the technical schools of the South.

“For the graduates of such schools and their government employer the task of implementing housing and services in remote northern settlements became a technical challenge...The technicians filled the apparent vacuum of local determinants for planning permanent settlements with the determinant most familiar to themselves, the efficient distribution of utilities. The planning of utility networks dictated the planning of the community. Compact utility networks were cheaper to build and operate than extended ones.”¹

¹ Strub 64.

As a result, the map of Iqaluit describes a frontier town where buildings seem to have organically emerged between one another. The experience of the city on the ground reinforces this quality: with no property ownership to distinguish thresholds between private and public, pedestrians shortcut across patios and yards, and cars park on sidewalks and plazas. Instead of a division between public and residential uses, civic buildings are interspersed between clusters of homes constituting a heterogeneous fabric. The city at first inspection appears to be a casual wash of buildings and uses.

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Still, there is a rhythm to its layout, however loose. The city flows out from a central loop along civic veins which describe the main pedestrian and car/truck routes of the city. From the Four Corners, the most heavily trafficked intersection in the city and, with the NorthMart, a reference point for measuring distances in the city, most public buildings are less than a 5 minute walk away. Moreover, land use structure in Iqaluit and the hamlets has been reinforced with advent of urban planners in the North, so that, in examining the map of activities predominant across the city, land uses can be broadly ascribed to different zones. The most Westerly zone is a center for commercial/industrial activity in Nunavut. The site for the Training Center is proposed in this zone. Scattered with contractors, electricians, recycling piles, motor repair companies and the Public Works department, the area abuts directly onto the next civic zone, the center of government. Each within a few steps of the Four Corners are the Government of Canada building, the Nunavut Legislature, and Iqaluit City Hall. Proceeding to the east is the financial/retail center of the city. Between the two most important reference points in the city, Four Corners and the NorthMart, are the majority of banks and shops. Farther east and towards the shore, the small cultural zone counts the Centennial Library and the Nunatta Sunakkutaangit Museum. Up the hill, following from recent residential expansion is a zone of educational and recreational activity including Joamie School, the French School, Aqsarniit Ilinniarvik Middle School, and the Arctic Games Arena.

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In each of these civic zones, housing often sits between and around public buildings. Without the demarcations imposed by private property, civic activity spills into residential patches. In particular, activity from the two main grocery stores, the NorthMart and Arctic Ventures, suffuses the entire central area with groups of shoppers, cliques of teenagers and streams of mountain biking kids.

The site is proposed in the westerly commercial/industrial zones for a few reasons. The first is that there are few other sites zoned for institutional use available for development in Iqaluit. The second is that the site is on a large swath owned by the Qikiqtaaluk Corporation, the Inuit-owned birthright development corporation created by the Qikiqtani (formerly Baffin Region) Inuit Association to provide direct opportunities for Inuit in economic development.² Considering the QC mandate for investment in Inuit capacity and Inuit leadership in the economy, QC is likely to be willing to invest in this project, if only by contributing land.³ This would be a substantial investment, as land leases in Iqaluit, where the city develops parcels and then distributes them by lottery, are very expensive and rare. Third, the location would allow the training facility to be close to the industry it will supply, and possibly encourage mentoring or Coop learn/work programs. Finally, the site is a 7 minute walk from the center of town, and features prominently against the hill viewed from the Four Corners, offering a significant visual relationship with the city.

² Qikiqtaaluk Corporation, <http://www.qcorp.ca>. Jan. 3 2005.

³ Nimchuk July 30.

PUBLIC ACCESS NOLLI MAP(panel 2)

The second panel zooms into the social context for the project, showing the building in a Nolli plan of central Iqaluit. The Nolli plan makes painfully clear the fact that civic space in Iqaluit is severely restricted to corridors and foyers. However, in a city where winter lasts 9 months and home can be stifling, and where indoor meeting spaces are limited to 4 bars, 2 grocery stores, Subway Sandwiches, and a Mean Gene's Burger joint, multiple constituencies are in need of space where they can meet without having to buy anything, or read or study at their own table. The building aims to provide Iqaluit with a shot in the arm of much-needed civic space.

This map illustrates the positioning of the building vis-à-vis the industry it helps support. The location positions apprentices to be in close contact with mentors and employers in the industry, including

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Fig 7.5.1 and 7.5.2 Film stills from Atarnarjuat, meeting in a qaggik



Fig 7.5.3 Film stills from Atarnarjuat, building a qaggik

major contractors, such as Nunavut Construction Company, and important sub-contractors, such as KRT Electricians, and Narwhal Plumbers. The neighbors also include all the major non-trades businesses that contribute to the construction process, such as North Eastern Artic Shipping, Canadrill Pile-driving, and Frobuild and BBS Hardware building supplies.

Finally, the map also shows the relationship between civic buildings and residential clusters. As described above, civic buildings are often surrounded by residential clusters. In this sense, civic buildings in Iqaluit offer adherence between one residential areas. The building is in a position to link up the western edge of the city with a large new residential cluster currently in development. It sits at the convergence of pedestrian and skidoo trails planned by the city to formalize existing shortcuts across the rocks.

The overall layout of the building learns from contemporary and traditional spatial organization in the North, where, as described earlier, the central or communal space prevails as a generator of form and sequence, gathering together activity and warmth. The prominent central space appears in contemporary civic architecture in the circumpolar region.

While there was no specific communal architecture in traditional Inuit construction, the central space figured prominently in the organization of igloo clusters. As shown on the panel, a ring of igloos looks towards the water in anticipation of travelers and visitors, and faces away from the wind, protecting entrances from penetration while scouring them of snow. The ring also protects the central space, here outdoors, from the wind. The central space also reappears in each aggregation of igloos. Circulation space in each aggregation is minimized by abutting dome to dome, decreasing surface-to-volume ratios and helping to maximize the amount of habitable space. The main space is flanked

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by extra storage and sleeping space.

The building is organized in reference, then, to the social and environmental logic that continues to guide extreme cold weather architecture. The communal space is a long low spine along the south face of the building, varying in depth according to changes in program. Spaces relating to the Training Center abut along the edge of the central space. The main space for training, the shop, provides the communal space for trainees and teachers, with work and storage rooms for each of the trades abutting, in turn, directly onto the shop.

ICONOGRAPHY AND LANDSCAPE PHYSICAL CONDITIONS SHAPING THE BUILDING

ICONOGRAPHIC RESPONSE (panel 3)

The mythical immutability of the arctic landscape belies the thousands of years over which it isostatically rebounded from under the weight of Ice Age icecaps. "Rising coastlines with shallow foreshores developed new gravel beaches every few hundred or thousand years. Standing old beaches and tidal lagoons high above sea level."⁴

⁴ Strub 5.

Still today, the points and dots of civilization in the Arctic, no matter how tenacious, are cowed by the tremendous terrain of outcrops, gravel, icebergs, and swamps of the tundra, where rocks and marshes conceal veins of metal and fragments of bone, and where natural "artifacts older than humankind clearly outnumber manufactured objects in the high latitude landscape."⁵ The city of Iqaluit has settled onto all the flat gravelly areas of land within walking distance of the NorthMart,

⁵ Ibid. 27.

which were raised up onto successive plateaus by millennia of rebound. As the city moves quickly towards capacity, now estimated at 10,000 people which it expects to reach by 2020,⁶ development pressure on easily graded land is likely to become increasingly difficult to support. New buildings may have to find footing on the rocky hills that cradle the city.

⁶ City of Iqaluit General Plan: Bylaw 571, (Iqaluit: City of Iqaluit, 2003), 25.

The project makes a first foray onto the hill, docked with permafrost-penetrating piers half into a grassy flat and half on top of a rocky mound, at the foot of a granite rise. The building hovers over the site as it climbs from a flat edge along the road up onto the tundra. In its position between the end of the city and the beginning of the tundra, the building looks out in one direction onto the entrepreneurial frontier of the territory just across the road and in the other direction, opens onto the rocky land that continues to be a foundation for Inuit identity.

Mounted on the rock and visible at a distance, the iconography of the building draws on the logic of the Inuksuk, the cairn of rocks made by the Inuit and their ancestors to appear from far away as a deliberate mark of man on the landscape, signaling one of many meanings, for example, thanks, mystical events, propitious hunting, and direction, .

Strub tells the story of a glacier team on the lower reaches of Sverdrup Glacier. A team preceding them had established a cache of supplies somewhere on its upper reaches. The members of the team strained through binoculars to make out the location of the trove in the immense and inscrutable landscape until an anomaly appears:

“the cache is too far to make out, but the presence of an anomaly is plain as day. What humans do on the landscape always stands out...The anomaly finally resolves itself into a small fuel drum with a lengthy ice drill leaning against it. A tin of honey rests on top of the drum. These angled silhouettes stand out because they have no parallel in this landscape.”⁷

⁷ Strub 27.

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Fig 7.6 Inuksuit on southwest Baffin Island

While the pile of provisions is a small but indispensable sign indicating provisions, the building is a marker signaling community accessibility and educational opportunity.

SITE CONDITIONS (panel 4)

Strub refers to traditional Arctic buildings as “a sophisticated product of centuries of cultural evolution, a compact bundle of building principles full of lessons for today’s designers and builders....It is well-worn and honed to perfection—it seems made for its setting.”⁸ While the project doesn’t aim to revisit or romanticize the form of the igloo, it does seek to extract ideas from traditional settlement about response to environmental conditions. In Iqaluit, the most significant of these are the wind, the sun, and the topography.

⁸ Ibid.

Wind: impact on form and skin

The wind blows across the site from the Northwest 10 months of the year. Mean wind speed for the year is 16kph with little variance. Iqaluit has reported, however, sustained gusts above 100kph.⁹ Design for polar wind should aim “not to banish its effects” because, as Strub says, “people at high latitudes are used to wind, and would be lost without it—but to minimize negative effects in the vicinity of buildings.”¹⁰ The first goal for wind design is to shape the building so that the wind helps to minimize snowdrifts instead of amass them. In order to do this, the building is elongated in the direction of the wind. A “fuselage” shaped profile helps to move wind and snow along the surfaces of the building, including the roof, outer walls, and underbelly. The entrance to the building is in the plane of the wind, which scours the door.

⁹ Ibid. 51.

¹⁰ Ibid. 95.

The other wind-related design goal is to minimize the effect of wind whisking heat away from the building, especially parts of the building where program dictates a warmer environment. As a



Fig 7.7 Midnight twilight in Iqaluit, July

response, a double skin selectively wraps spaces in one or two layers with an air gap in between. The warm spine is doubly wrapped, as are the individual trade work spaces. The shop area, which can be cooler, is singly wrapped in the outer skin that continues on to wrap under the building and clad the curving underbelly. The space between the two skins is sometimes inhabitable, as is the case along the front of the central civic space. Where the interstitial space is not inhabitable, as above the workspaces, it holds lighting and services.

Sun: impact on orientation, windows, and heating

Sun and Daylight are delivered to the arctic in feasts and famines. During the three months of summer, kids stay out playing in the streets until 3 am. During the many months of winter, the sun comes up briefly over the mountains then drops back down again. During December, it doesn't come up at all, and the city is bathed in twilight for a few hours around noon. The site is well situated to take advantage of what sun it can, opening out towards the south. In summer, a large patch of purple saxifrage testifies to the flood of light. Only a gravelly strip of the site along a streambed never receives any sun.

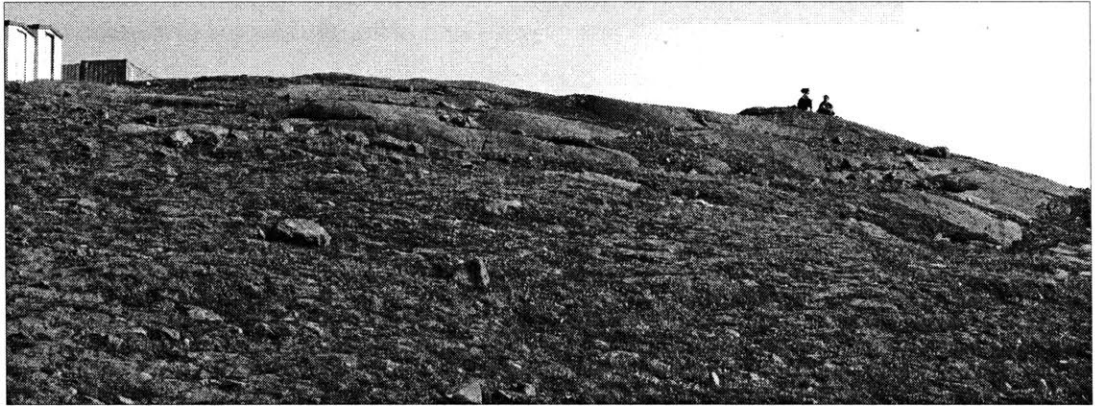
The building attempts to take advantage of what sun it can during the winter months, when, as will be explained below, the training facility is at its most active, and when the public spaces might also be expected to greet the most visitors. The communal space faces south as the "warm spine" of the building. Windows, an especially expensive building material in the North, run along the south face, drawing in heat along the front façade to warm the hot civic spine. Skylight windows over the shop area offer spots of natural light, and attempt to bring low-angle light into the building. View-framing windows in the north-facing work and storage spaces bring in light reflected from the snow-covered landscape.

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7.8.1 Playing against an outcrop



7.8.2 Sitting and talking on the rocky hill

The orientation of the long axis towards the sun together with the double skin section, suggests a heat recovery system for the building. Sun entering the civic spine heats air in the habitable interstitial space between inner and outer skins. This air is joined by warm outtake from the doubly skinned public area, and moved up between the skins to the central duct. This warm air is then mixed with fresh intake and cycled through the building.

Topography: impact on circulation

As the wind shapes form and the sun shapes orientation, so does the topography of the site shape circulation, both around the building and through it. The hilly topography that defines Iqaluit offers shortcuts from one part of the city to the next, as well as adventurous meandering up and along the outcrops. There are two ways of moving across this landscape, and most routes demand a combination of both. The first is to follow the contour, and clamber along its edge. The second is to move up along the gradient in dry or trickling streambeds. Walking in the streambeds offers direct routes with protection from the wind.

These two types of routes are extended under, through, and along the building, organizing indoor flow along the spine, and outdoor flow, for skidoos, under the edge of the spine, and for pedestrians, under the building and up the hill, leading towards two navigable streambeds.

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LOGISTICS AND SEASONAL RHYTHMS TEMPORAL CONDITIONS SHAPING THE BUILDING

SHIPPING MAP (panel 4)

The arctic is tethered to the rest of the country by marine and air shipping routes. The marine routes in particular are the lifeline of the North, bringing every necessity to remote communities in shipments that begin in Montreal and Yellowknife in late spring, and following, respectively, the St-Laurence and the Mackenzie Rivers, aim to visit each community at least once.¹¹ From these shipments come cars, outboard motors, sofas, toothbrushes, diapers, hundreds of thousands of bottles of beer, and enough construction material to last a year at minimum.

All of this, however, is completely dependent on the vagaries of the weather and the sea ice, so that shipping schedules are tentative at best. The unpredictability of deliveries adds a risk factor to construction, and further driving up the cost of building. This is especially true in the case of civic buildings, which are usually designed with specific imported materials that are unlikely to be available in the North, should replacements be needed for damaged or inadequate shipments.

The response of the building to these conditions is to propose a construction system for this project which uses materials that are ubiquitous, likely to be sitting around in the community supply stores or even in the local recycling pile. The language that emerges is one of dimensional lumber, plywood, and corrugated metal sheathing. The design challenge is to demonstrate that more can be made of these materials than the generic, hermetic arctic boxes that stick frame conventions have produced across the territory. Moreover, in order to span lengths in large public spaces, a connection system must be devised to join one short member to the next. As a result, the scarf joint becomes a focus for

¹¹ Nunavut Shipping Routes, <http://atlas.gc.ca/site/english/maps/peopleandsociety/nunavut/transport>. Jan. 3 2005.

structural and tectonic inquiry. The scarf joint allows for many different angles to be achieved between two connecting members, and can transfer loads between beam/beam connections, and beam/column connections with slight modification to create a continuous structural rib.

Uncomplicated construction systems—systems that use basic assemblies and common materials—are appropriate to construction industry goals to reduce costs. This is especially true for non-residential projects: when new, technically involved construction products come on the market, manufacturers commonly require that only their own specially-trained workers, or outside laborers who have paid for a training course, can apply the system or material. As a result of new products, then, even experienced journeymen may be excluded from the job.¹²

¹² Bealeau July 29.

Finally, this way of building honors and learns from the resourcefulness of traditional framing strategies. Without access to lumber, Inuit used whalebone and driftwood traveling up towards the Arctic in watersheds that tilt towards the Arctic Ocean.¹³ Bones or driftwood were lashed together roughly with sinew to form resilient frames for shelter in summer camps. Similarly, a framing strategy today using readily available materials can offer a language of civic expression that is affordable, simple, and elegant, and that that can be emulated across the territory.

¹³ Strub 27.

SEASONAL SCHEDULE (panel 6)

The final panel looks at the seasonality of the arctic with respect to the use of the building through the year. The natural environment in Iqaluit moves between extremes over the course of a year. Daylight hours per month go from 600 in June to 150 in Dec. Mean temperature follows the same trajectory, from 8 degrees in July to -26 in January. Mean snowfall takes an opposite course, from 0.3 in July straight up to 38.8 in October. Days with driving snow peak at 10-11 between December and February.¹⁴

¹⁴ Ibid. 169-179.

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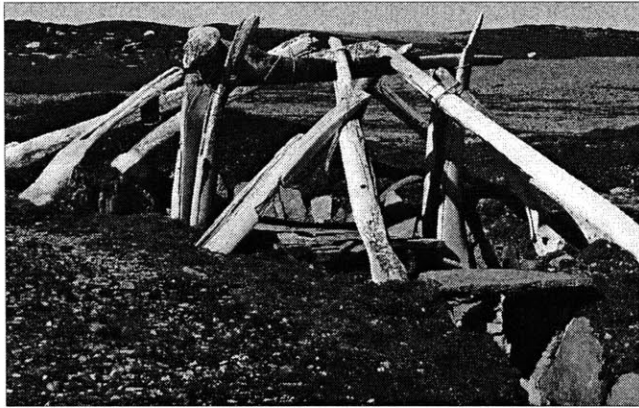
7.9 The arrival of the sealift, Iqaluit, early July

The seasonal cycles affect two of the most important cycles in Arctic life, the shipping schedule, and the hunting schedule. Shipping, in turn, affects the construction schedule. Activity in both construction and hunting peak at the same time. While foundations are often laid in the season or year before a building project begins, the construction season begins in earnest when the year's supplies arrive by sealift starting in July. The building is quickly framed beginning in August. Between August and December, the building must be completely framed, sheathed and closed in so that interior work can conclude during the winter. For the laborer collecting workweeks to qualify for Employment Insurance, and for the apprentice logging time towards certification, the boom and bust cycle of construction work over the course of a year imposes pressure to make the most of all hours available.

As the crates full of construction supplies appear in the Bay, however, so do the Narwhal, Ringed seal, and the Arctic char. Caribou hunting season begins in late summer/early fall, and ptarmigan hunting resumes when the snow is on the ground. The concurrency of the construction and hunting seasons presents a difficult choice for Inuit who want to develop on-site experience and participate in the wage economy, but are equally compelled to hunt for the animals that provide important nutritional and cultural sustenance for their families and communities. For construction trades apprentices, the difficulty of this decision is made one degree more difficult by the fact that required classroom training begins in the early fall, when both construction and hunting are in full momentum.

The project aims to ameliorate the rhythms of adversity, and absorb the rhythms of seasonality through a training schedule that accommodates competing demands for time, and spaces that accommodate year-round, full-scale construction. Training courses are concentrated in the winter months, interfering as little as possible with the already busy construction/hunting season. In order to maximize use of the training space, non-construction-oriented courses, including the Home Maintainer, Train-the-

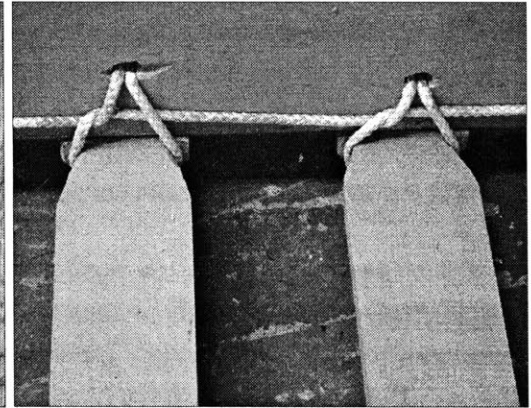
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7.10.1 Tethered whale-bone tent frame



7.10.2 Ubiquitous plywood shipping crate



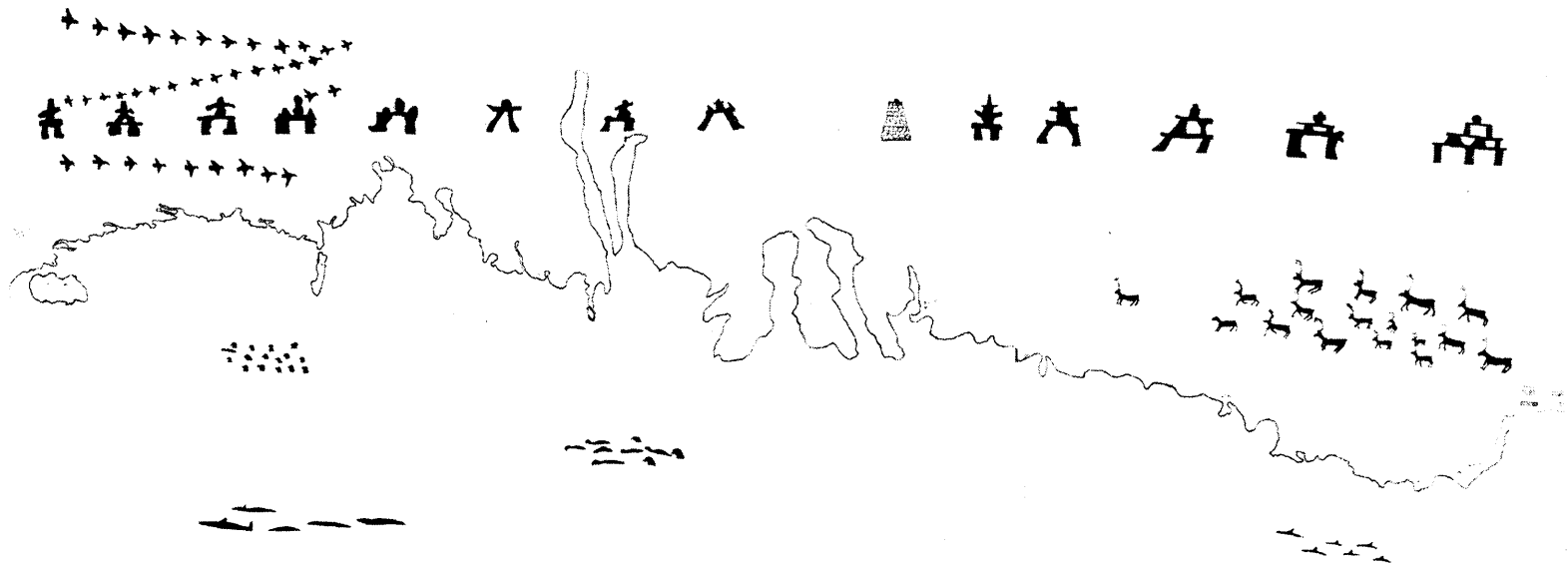
7.10.3 Lashed details on a *kamotiq*, traditional sled

Trainer, High School Pre-Employment, and Intro to the Trades programs are offered during the fall. The final courses across each trade are coordinated to end simultaneously at the end of June, allowing advanced students the opportunity to interact and consider business collaborations. To provide off-season construction experience for trainees as well as established journeymen, the building includes a space large enough for modest prefabrication projects that can continue through the year.

The need to consider seasonal routines in the planning of the curriculum is central to a training strategy that attracts and retains participants. Sheldon Nimchuk of the Nunavut Investment Group asserts that the construction industry must do better to “work with the reality of seasonality.”¹⁵ Consideration of the natural cycle of the year will also help to confirm that the territory’s training strategy has truly been “Made-In-Nunavut.” In the report from the first GN-hosted workshop seeking to integrate Inuit Qaujimatunqangit (IQ), loosely, Inuit traditional knowledge into government workplaces, the final recommendation was that working hours become more conducive to Inuit lifestyles, and that Traditional Leave be granted to allow Inuit to hunt and gather traditional foods. The sponsors of the event, the Department of Culture, Language, Elders, and Youth, remind readers that traditional hunting is not only necessary as a means of procuring the provisions of an Inuit diet, but as a learning experience in its own right.¹⁶

¹⁵ Nimchuk July 30.

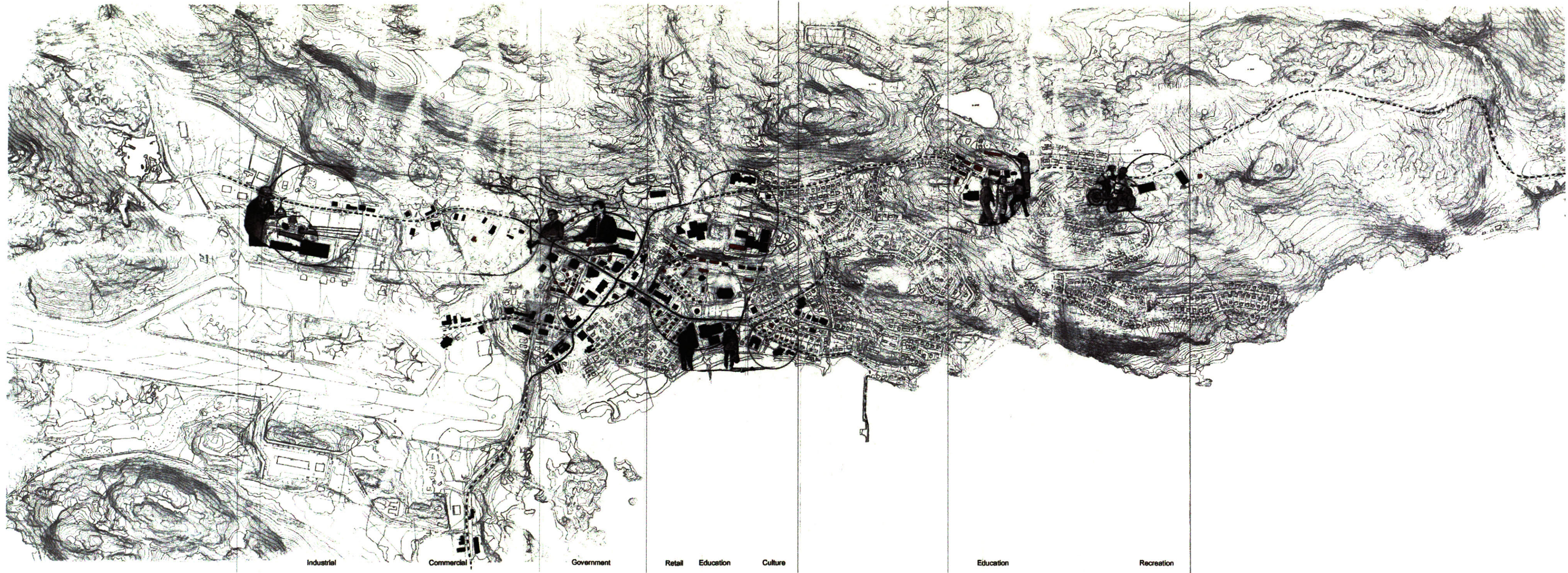
¹⁶ Report from the September Inuit Qaujimatunqangit Workshop, (Iqaluit: Department of Culture, Language, Elders, and Youth, 1999), 13.



The Coast of Southwest Baffin Island, by Simeonie Quppapik, Kinngait (Cape Dorset), 1990. The large drawing is of the coast from Kinngait (far left) to Simeonie's birthplace near Ammaarjuak (far right), some 300 kilometres (190 miles) distant. He identifies the location of whales, square-flipper seals, walrus, small seals, fish and birds. He also shows the migration path of geese and the reindeer herd once tended by Laplanders (the people of the pointed shoes) at Ammaarjuak. The inuksuit in the large and small drawings are symbolic. They are not meant to show the structure of inuksuit but rather to communicate a variety of impressions. The three small inuksuit in the small drawing (far right, top to bottom) are the type used in caribou hunting.

The economy of line and expressiveness of marks in this map inspired the drawings in this set of panels

PANELS



Industrial

Commercial

Government

Retail

Education

Culture

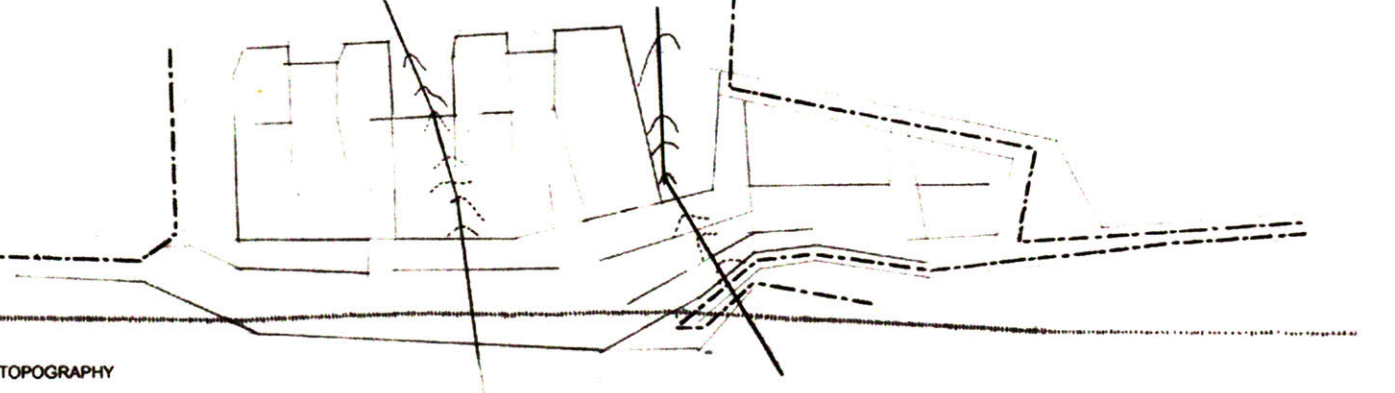
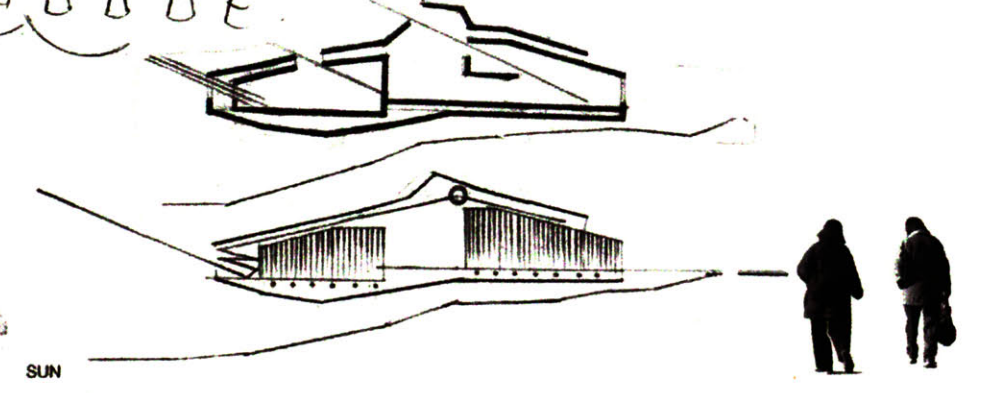
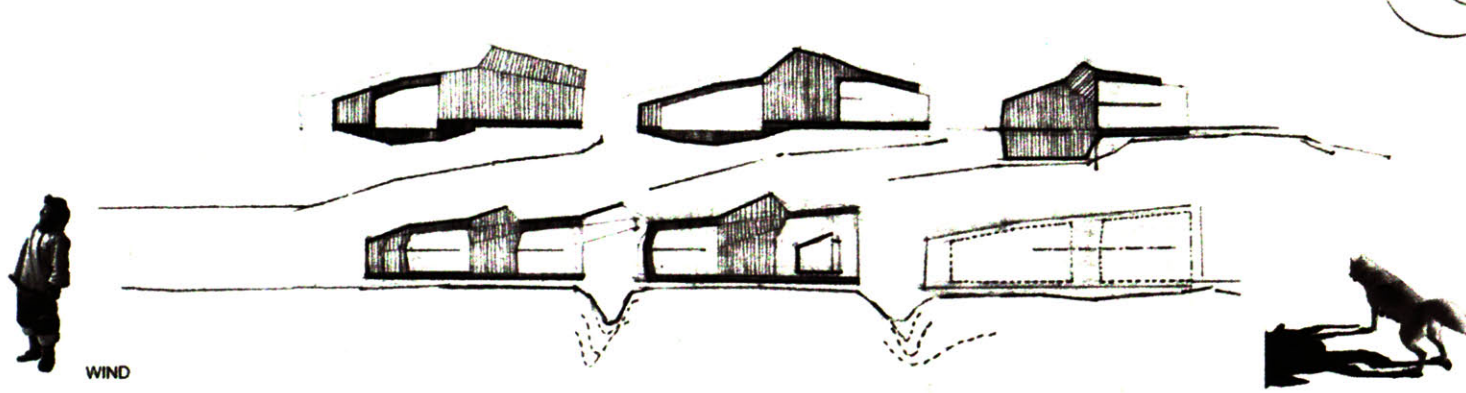
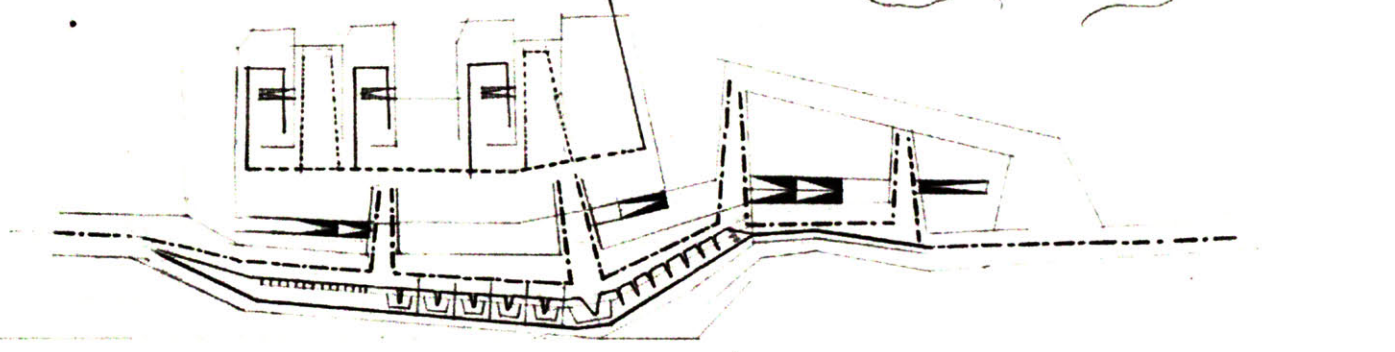
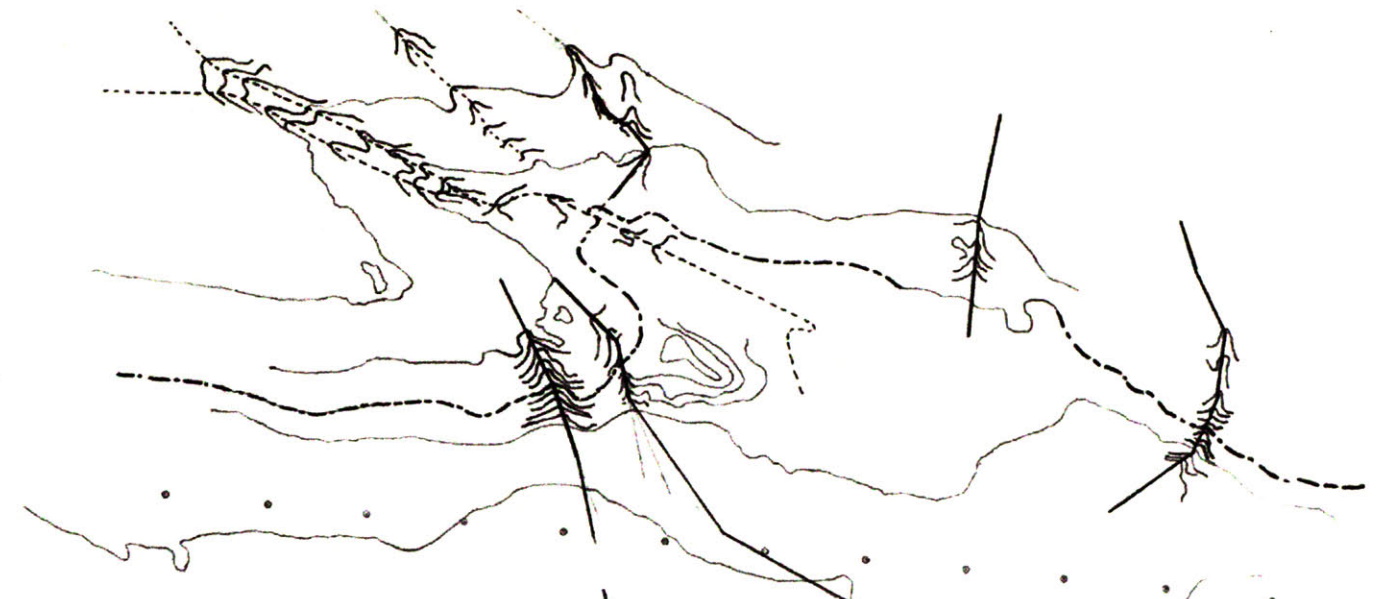
Education

Recreation





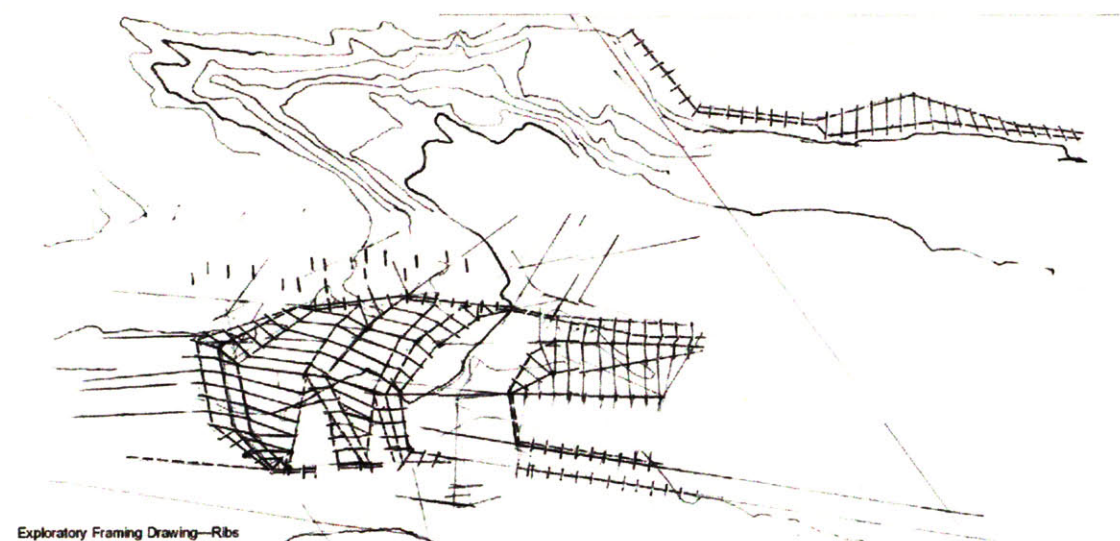
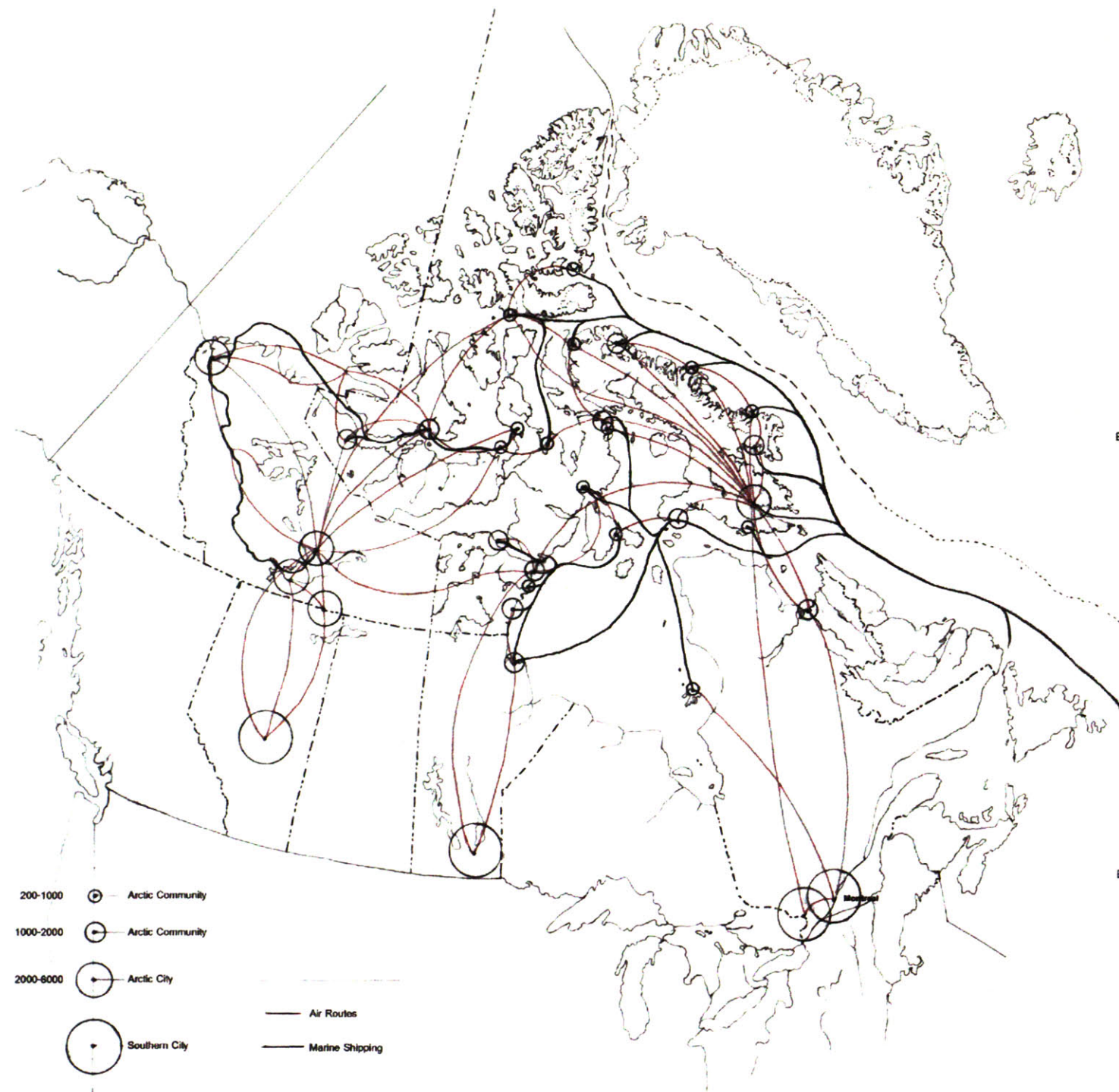
Panel 3 Iconographic Response



WIND

SUN

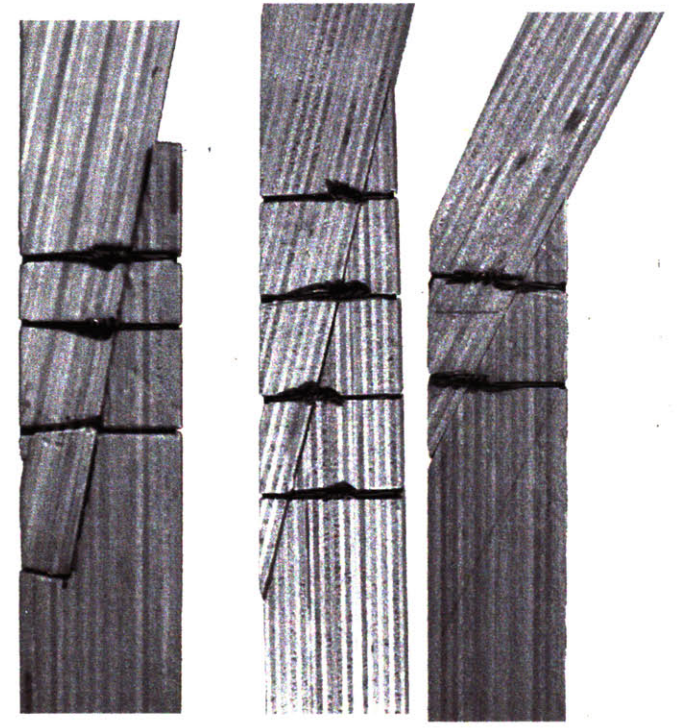
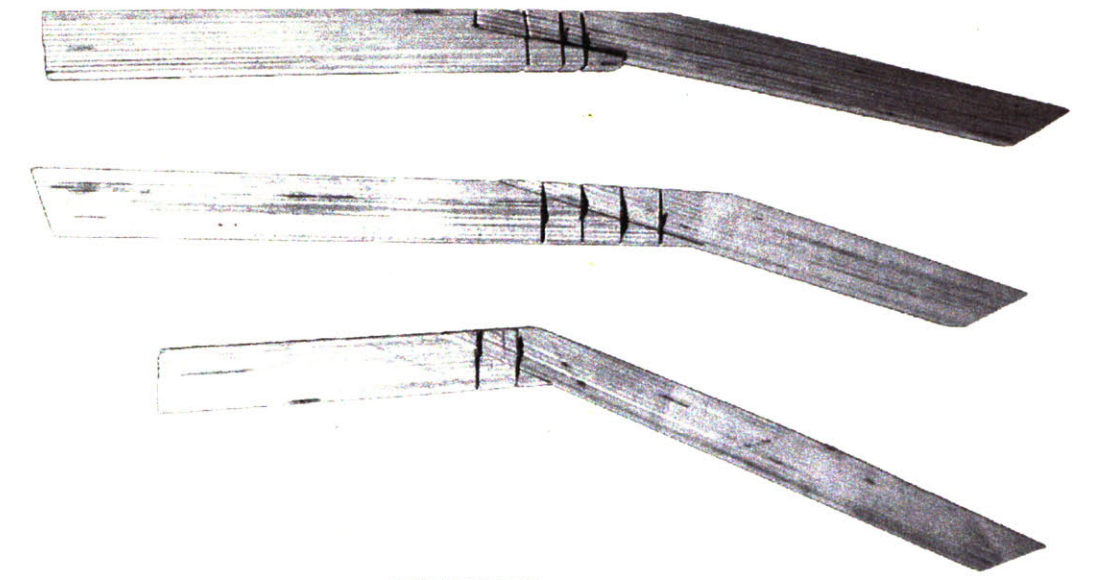
TOPOGRAPHY

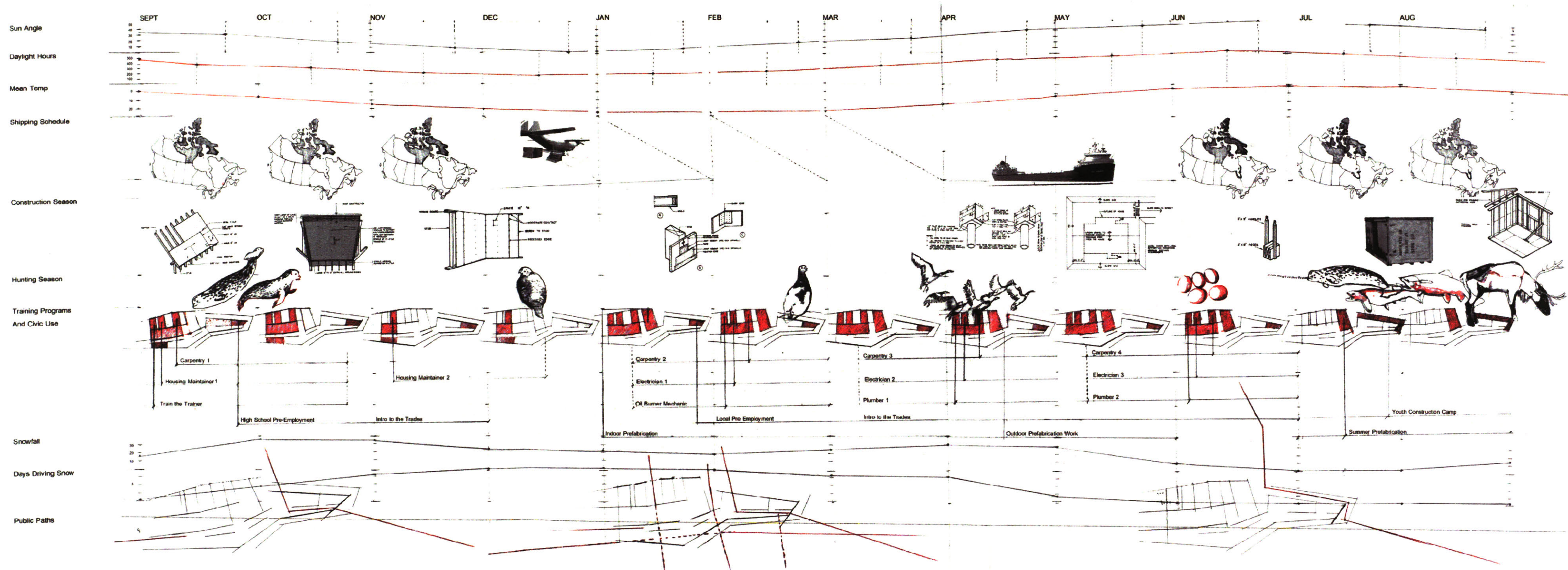


Exploratory Framing Drawing—Ribs



Exploratory Framing Drawing—Edges







The site rises from grass and gravel along the road up towards hills of broken rock

Construction PROPOSAL

CHAPTER VIII.

SITE , BUILDING, STRUCTURE, DETAILS. THE BUILDING AT FOUR SCALES

building skills



Site model at 1"=50'

In this final chapter, needs earlier identified for trades training facilities and community gathering spaces are met in a proposal for a training/community center in Iqaluit. Strategies for meeting these needs in conditions unique to the Eastern Arctic are drawn together in this design, which organizes trades training spaces along a multiuse public spine programmed to receive large and small groups of visitors. The building is oriented towards the city and touches back onto the land. It is shaped to move wind over its surface and draw sun into warm public areas. Its construction system of available bits, of small members simply connected to span big spaces, produces a ribbed tectonic, the arch, rhythm and thickness of which changes in response to the program within.

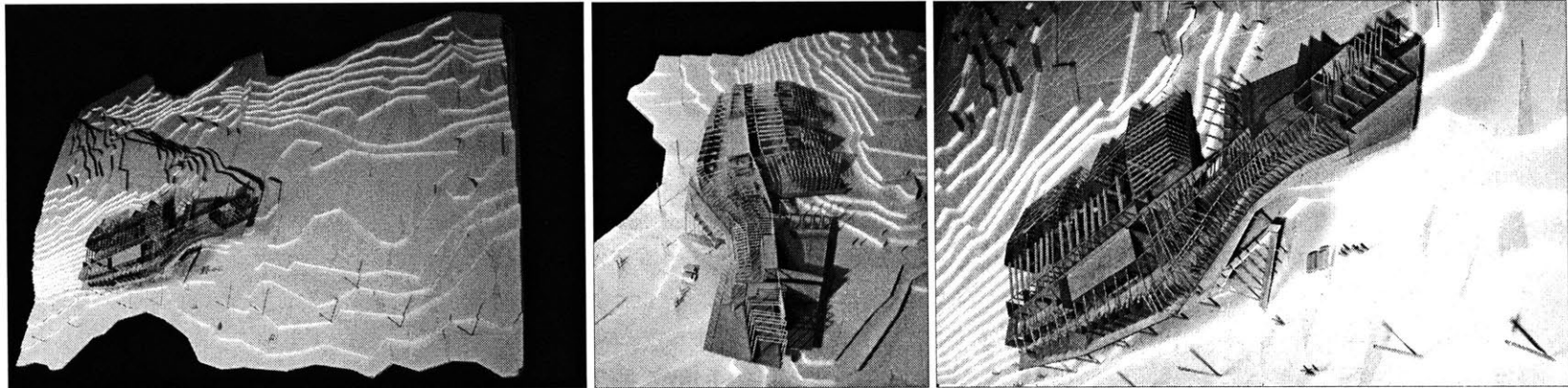
BUILDING MODEL, PLAN, AND SECTION

The building sits on Federal Road at the industrial edge of town opposite a skidoo supplier, a motor supplier, and a construction group. While the building looks out towards the machines and technology of everyday life in Nunavut, it sits back against endless tundra expanse of grass, marsh, gravel, and granite.

In accordance with its mandate to serve training and community needs, the building is organized into two parts: the civic program, which faces out towards the city, and the trades training spaces, which look back onto the land. The central civic space is the south-facing hot spine of the building, along which are strung all its public uses. The spine flows with the prevailing northwest winter winds, which scours the main city-facing entry so that it remains clear of snow throughout the season. There are two entries; one is a warmer weather entry on the main floor of the building accessed by a long ramp from the grassy area along Federal road. The other is below, a winter entry leading from the parking area for visitors arriving by truck and skidoo. Both entries lead into a foyer space that typifies the construction logic and tectonic quality of the project with a stress skin pulled over ribs of built-up

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Site and structural model at 1"=16'

dimensional lumber. The feeling of this main foyer is like entering into a whale's rib cage, or lying in the narrow belly of a kayak. The foyer is the head of the central spine, which elongates into a sequence of public activities and gathering spaces. While the central space is continuous, changes in program are articulated by changes in the cadence and depth of the structural elements.

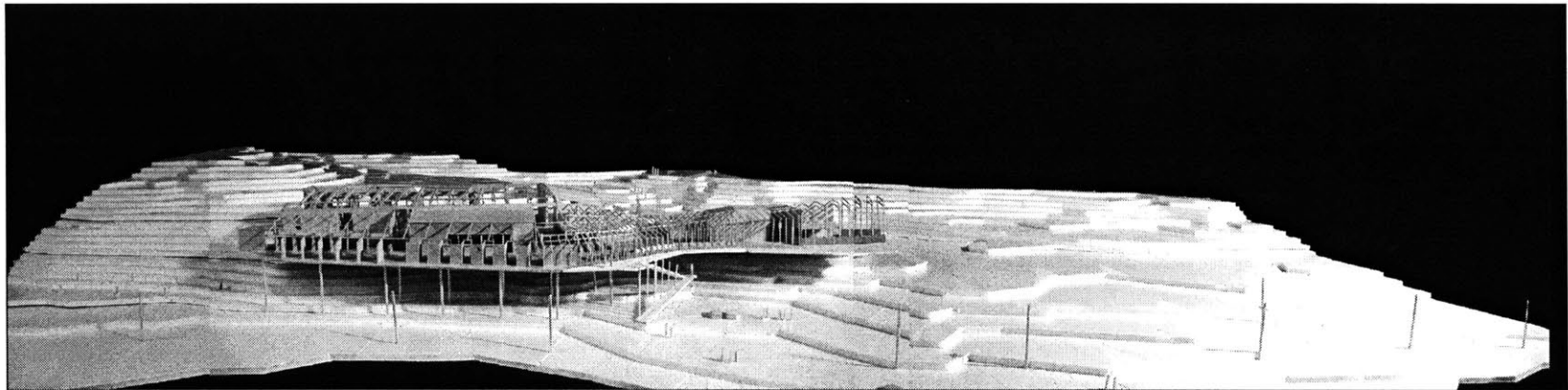
The first space past the foyer is a reading and reference space, with a small construction library, and a set of computer stations. Next is the kitchen, servery, and canteen, with long tables ending in large booths where groups can gather for meals or meetings. The canteen gives onto a wide corridor with the offices of the apprenticeship registrar on one side, and changing spaces and lockers for students on the other. This linear space can be added to along its length to accommodate new public program.

The long public spine is also a pier along which large programmatic pieces can be berthed as community or industry needs evolve. Program pieces abut directly against the public spine, strengthening its role as the central gathering space, while minimizing the need for hallways and their attendant construction and heating costs. In this proposal, three large spaces abut the main spine. In sequence, the first, pointing towards downtown, is a community classroom for pre-trades teaching and studying and for youth trades introduction courses. The second is a conference hall, providing convention space for the circumpolar, federal, and territorial delegations that come to Iqaluit for meetings currently limited in size by hotel meeting rooms. The third is the complex of spaces comprising the trades training center.

The training center, in turn, consists of three types of spaces: the main shop, individual classrooms for each of the trades (plumbers and oil burner mechanics use the same classroom at different times

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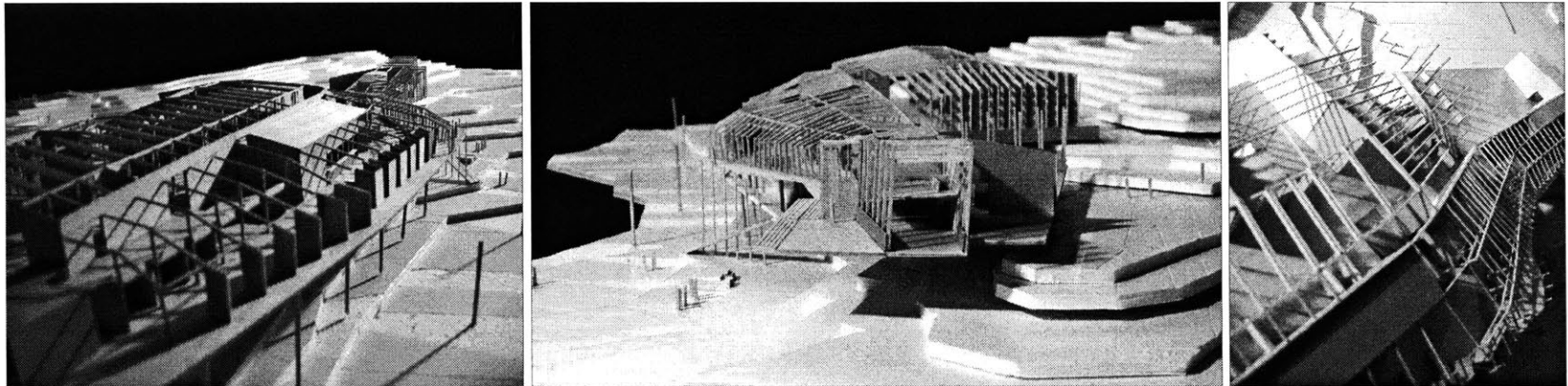
Site and structural model at 1"=16'

of year), and a large, high room for housing prefabrication. The main shop runs adjacent to the civic spine, tethered to it by two ramped entrances. The shared shop, encompassing modular power tools for wood and metal working, responds to interest expressed in a “core curriculum” strategy to share workspaces among the trades. This allows trainees to become familiar with the work of other disciplines, and also saves space and cost. Three classrooms abut onto the shop offering learning, working, and storage space for each of the trades. The classrooms face North, opening directly onto the tundra, offering visual and physical connections with the land. In the coldest penumbral months, light reflects off the snow-covered hill into the classrooms. In the summer, workspaces can extend out onto the rock. Also abutting onto the shop space is the prefabrication room. Long and high, the prefabrication room can accommodate two halves of a 32' x 32' home one behind the other, for students or tradesmen seeking work experience during the winter months when on-site construction activity thins. In the summer following the sealift when the year's teaching materials arrive, loading occurs at the large service doors into the prefabrication space.

The median line of the building follows the seam between the public spine and the abutting training spaces. This seam travels under the main roof ridge as a thick service and storage wall. It also supports mezzanine spaces for training staff offices, pre-trades staff offices, study spots, and viewing areas from the public spine into the training center giving youth a glimpse of trades education, and offering visitors firsthand exposure to the evolution of Nunavut's workforce.

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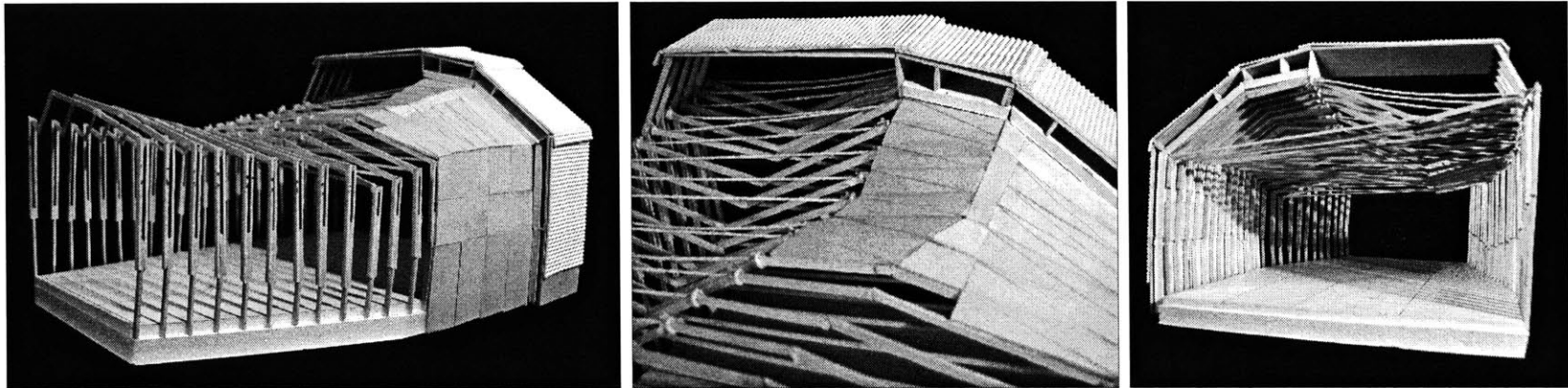


Details of structural model at 1"=16'

The section illustrates the double skin of the project which is shaped to move wind over, under, and along the building's longitudinal ridges. The double skin strategy prevents wind from whisking heat away from spaces which should stay warm: the civic spine and the working spaces are blanketed under two layers of skin, and the central shop space, which should stay cooler, is under the single skin. The section also shows the stance of the building in a position of repose along the rocks, settled over a stone outcrop, and rooted into the permafrost.

building skills

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Framing model at 1"=4 testing ribbed structure, plywood sheathing of complex curve and double stress skin

FRAMING MODEL AND DETAIL MODEL

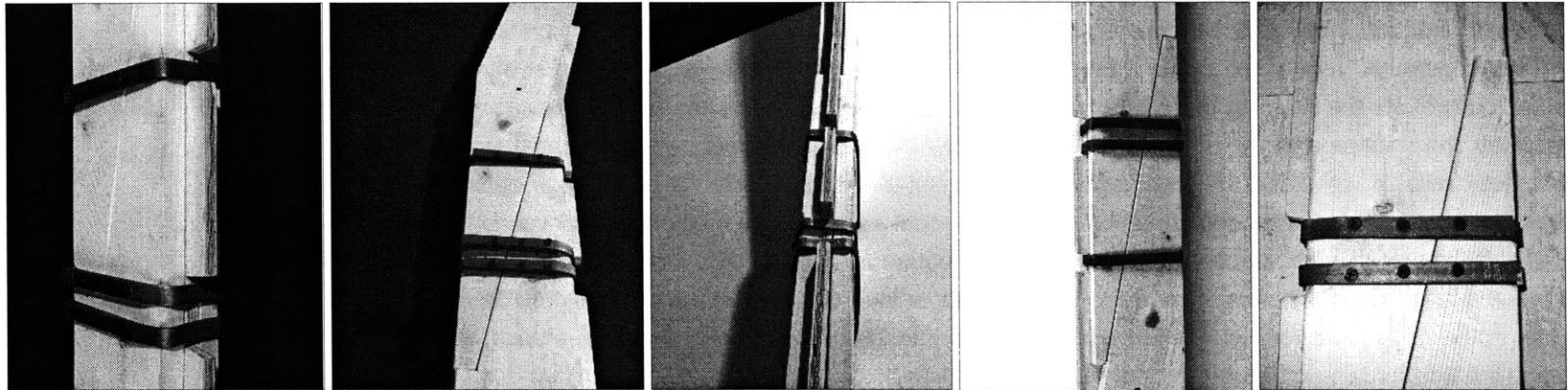
The model, plan, and section demonstrate the spiny, irregular, organic qualities that emerge at the building scale as a product of the wood-ribbed construction system. The framing and detail studies investigate the qualities and challenges of a scarf-jointed, stick-frame construction.

Framing model

The framing model demonstrates the ribcage-like, or kayak-like, environment of a space structured by a series of wooden members. The space modeled is the approximate size and shape of a trade classroom. An issue tested by this model is the appropriate profile of a rib with respect to wind loading. The ribs here are in the plane of the prevailing wind. The profile presented here is too vertical to counter wind-loading, and relies on tension ties and compression rods to maintain stiffness; a more appropriate profile would be a stiff arch leaning into the wind. Ideally, the space would be made of a majority of ribs or sections leaning into the prevailing northwest wind, and others leaning in the opposite direction into the occasional southeast summer wind in order to anticipate wind-loading in both directions. This would make it possible to remove the tension ties and compression rods, which complicate the skinning of the structure. Another issue tested by this model is the relationship between the ribcage and the stress-skin. In this study, the double-curved surface is sheathed by triangular cuts of 4x8 wood sheets. Larger scale mockups will better test the pliability of different plywood or oriented strand board sheets. Finally, the model examines the relationship between inner and outer sheaths of the double skin envelope. Thin, regular ribs support the inner wood stress-skin spanning in the short direction. Broader members at larger intervals support the outer metal skin and span in the opposite direction. Further studies should minimize the amount of materials used, and refine the coordination of these layers of structure and skin.

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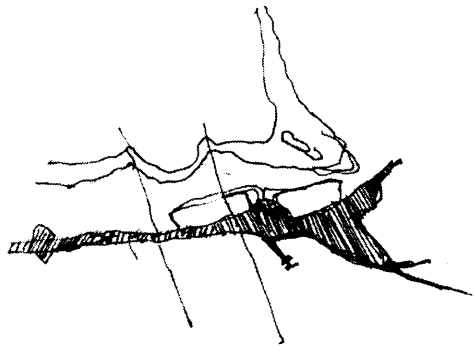
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Detail at 1/2 scale of scarf joint with forged steel straps

Detail model

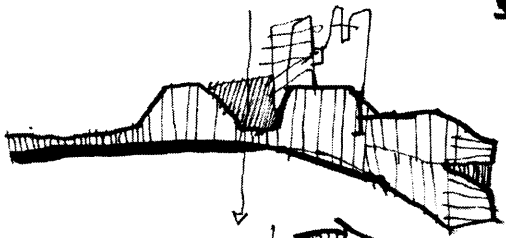
The notional half scale detail develops a beam/column connection. The members are doubled with a plywood plate running the length of the joint to stiffen it. Forged steel straps wrap around the joint to hold all the elements together, and screws through the steel straps into the wood prevent slipping and secure the joint. While this prototype is built to demonstrate the principle and quality of the joint, a full scale version would demand further consideration of the fabrication of straps, and their location along the joint. The straps built for this mockup, while uncomplicated in design, demand considerable labor and elude precision measurement. A more desirable strap design would specify commonly available hardware that can be adjusted on the joint for a tight fit. Also, placing straps higher along the cut will strengthen the joint. While this first iteration demonstrates that an elegant assembly can be achieved with such simple materials as steel band and scarf-jointed dimensional lumber, further iterations at full scale will refine both splicing and binding elements to produce a joint that will transfer loads efficiently; that is easy to preassemble or build on site; and that can offer warmth and texture to public spaces in Nunavut's communities.



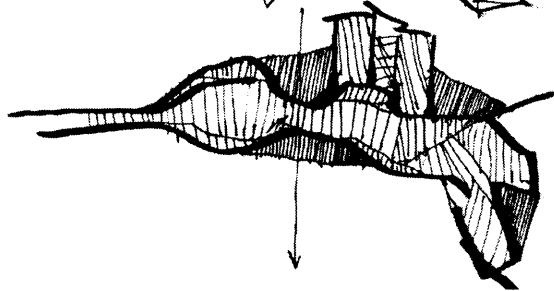
① spine



② wall + volume



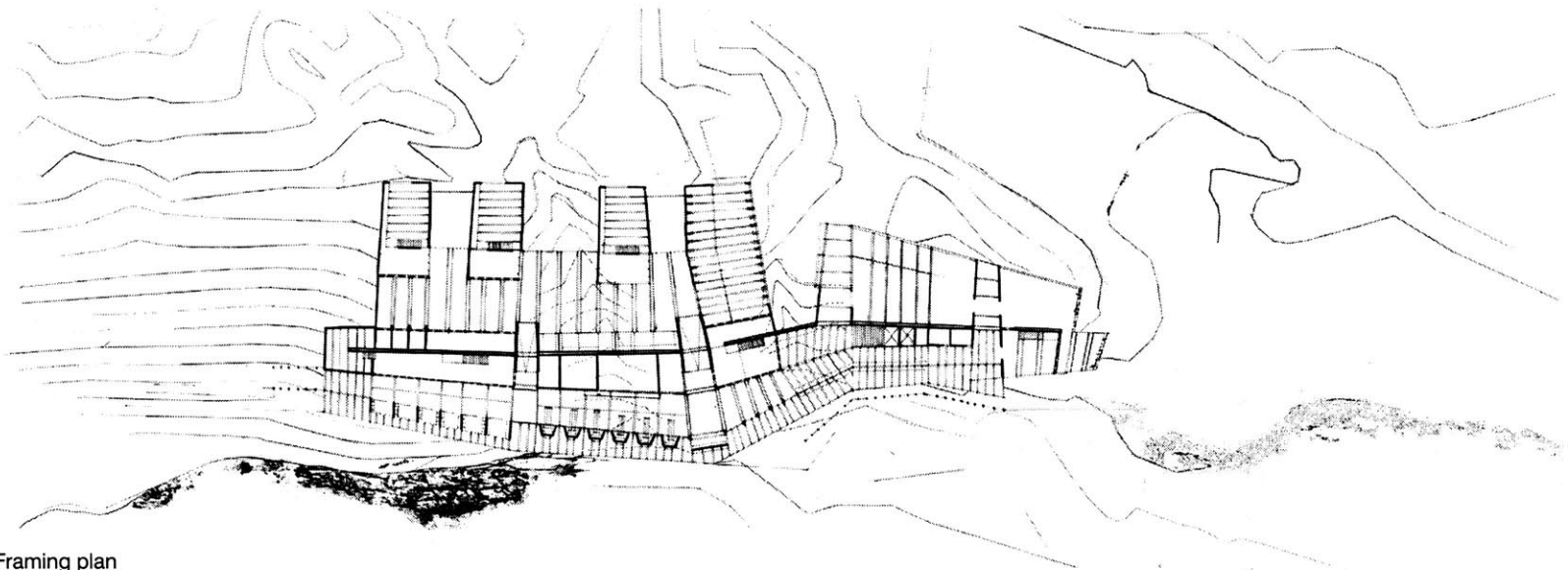
③ extensible - 1 side



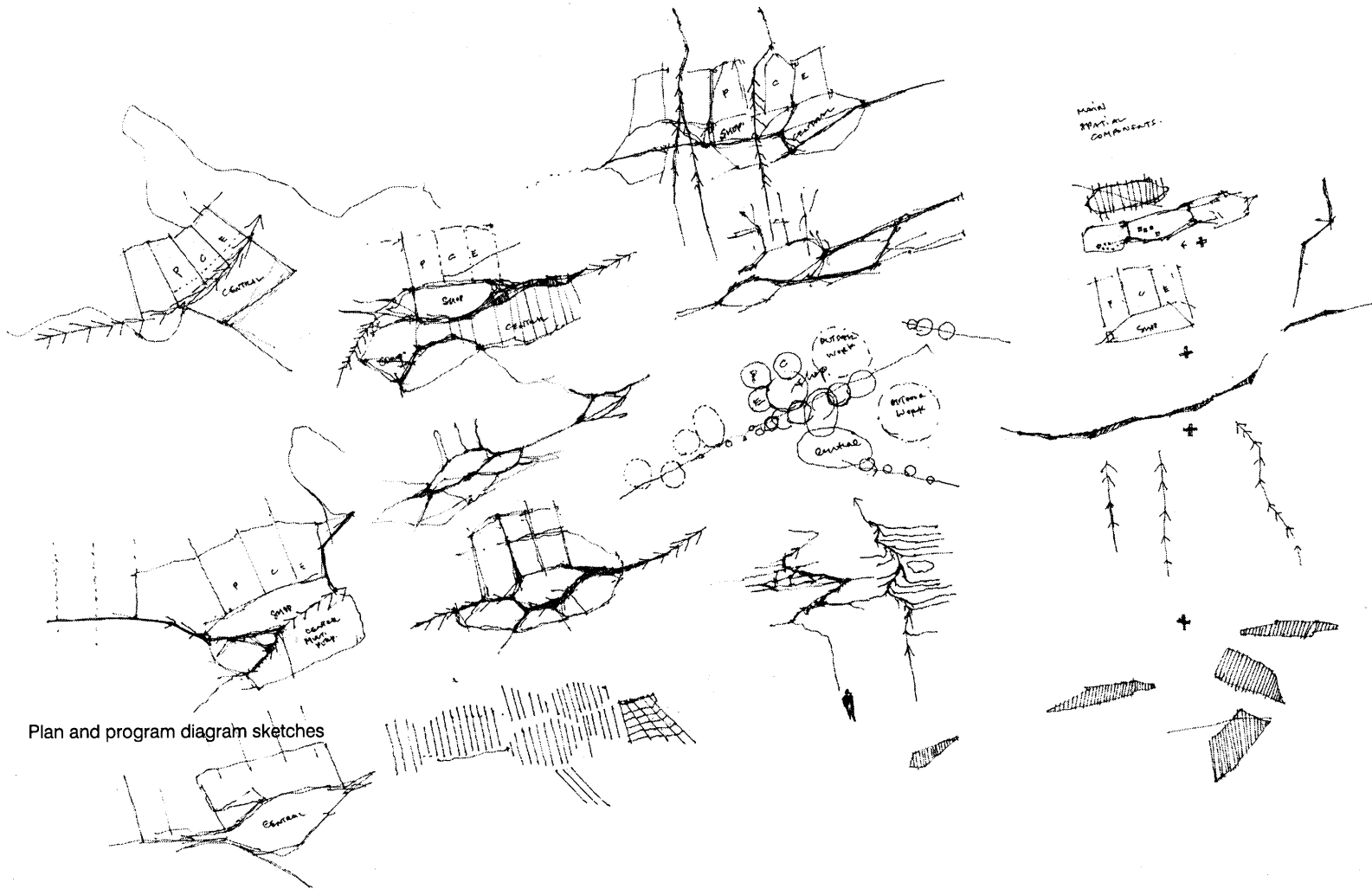
④ extensible - 2 sides

SKETCHES, PLANS, SECTIONS, AND PERSPECTIVES

DRAWINGS

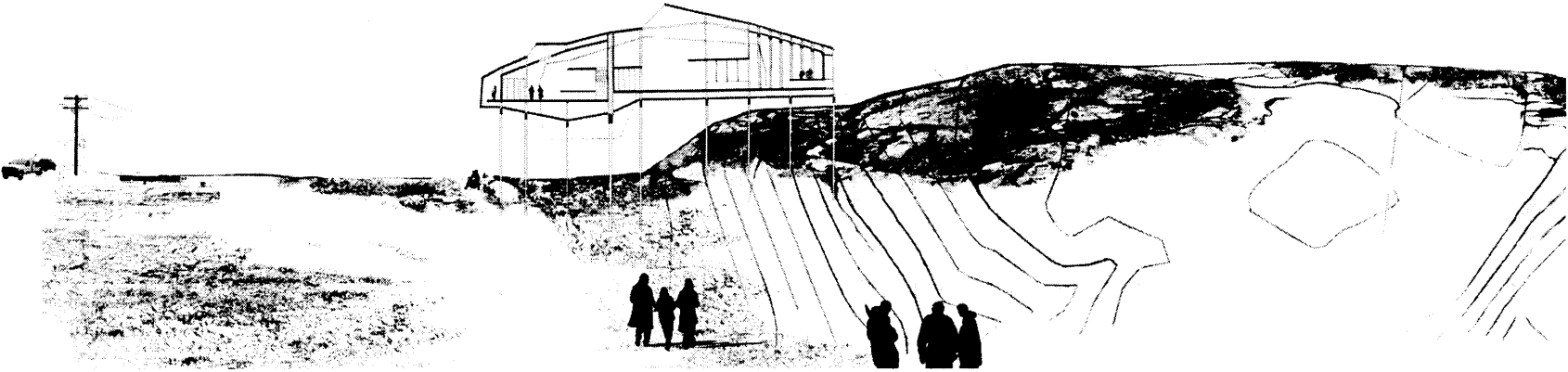


Framing plan

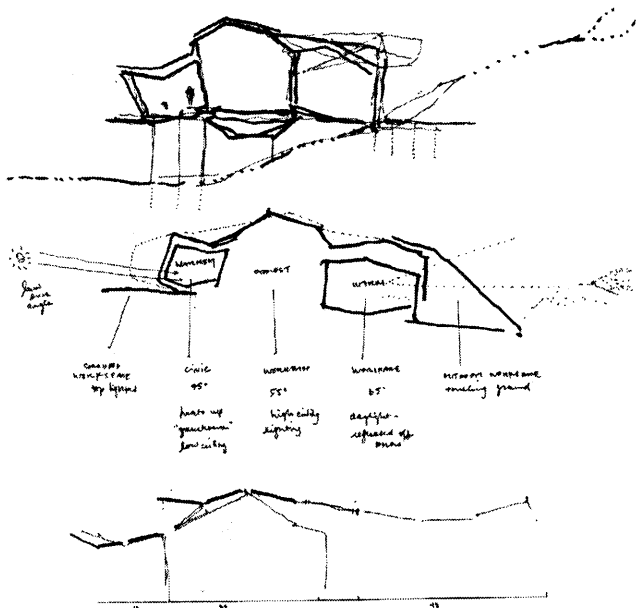


Plan and program diagram sketches

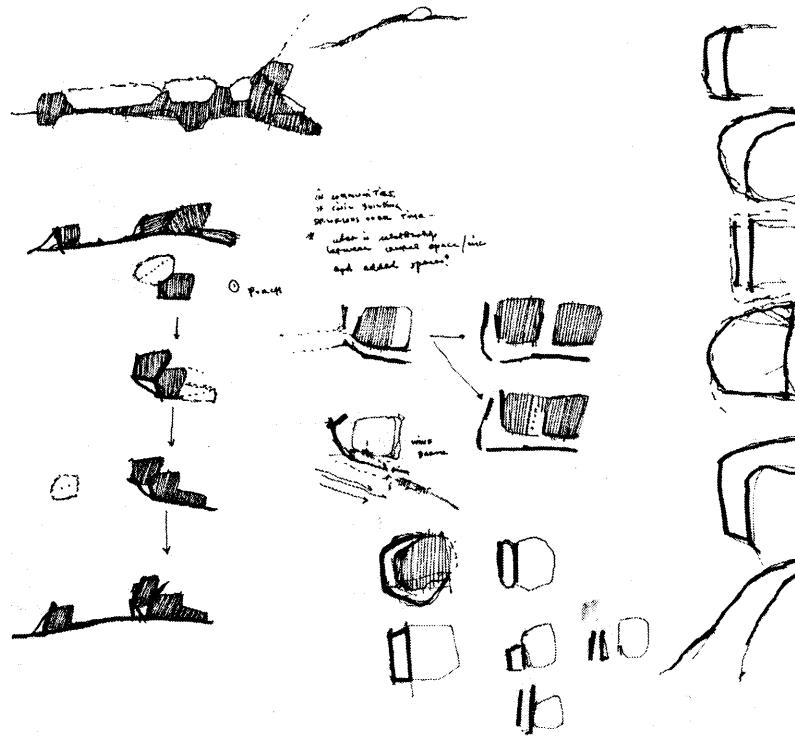
176

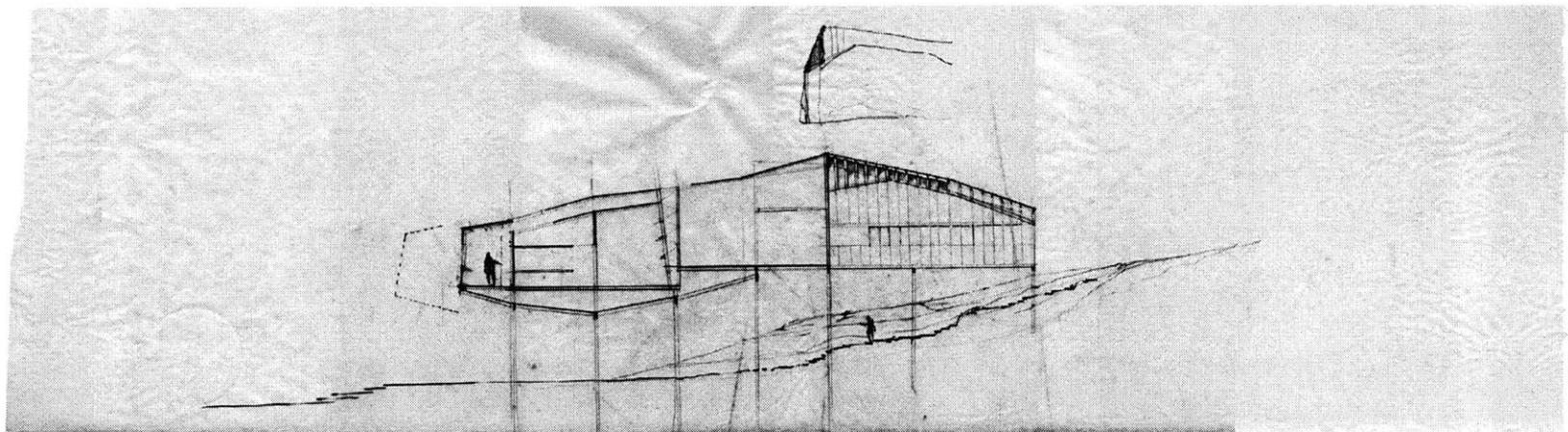


Section

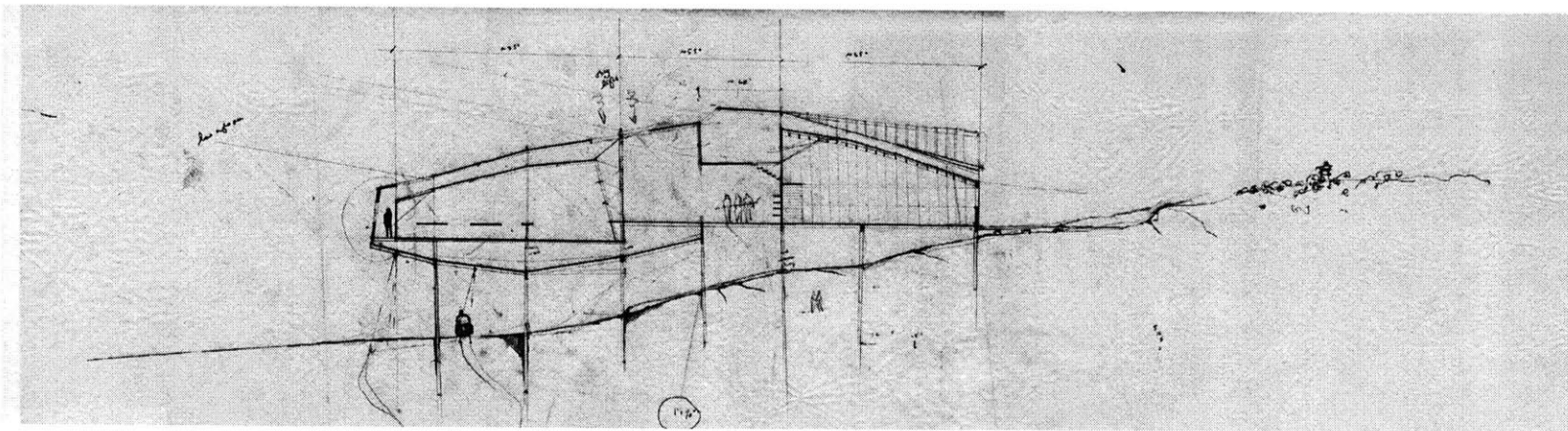


Section and double skin sketches





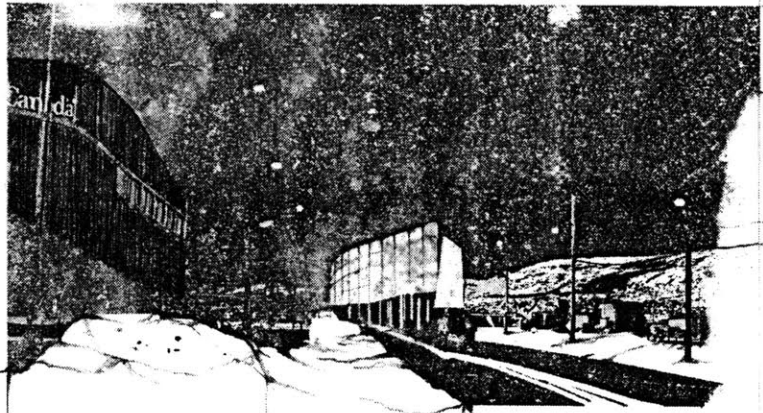
Section



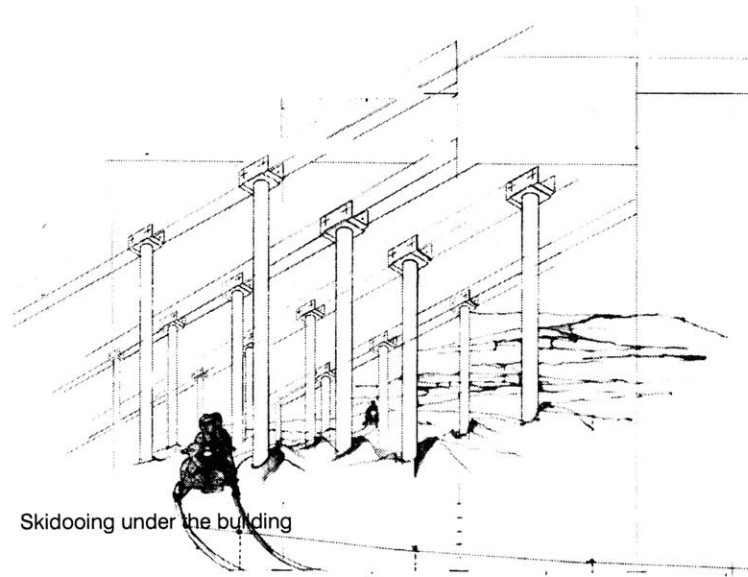
Section

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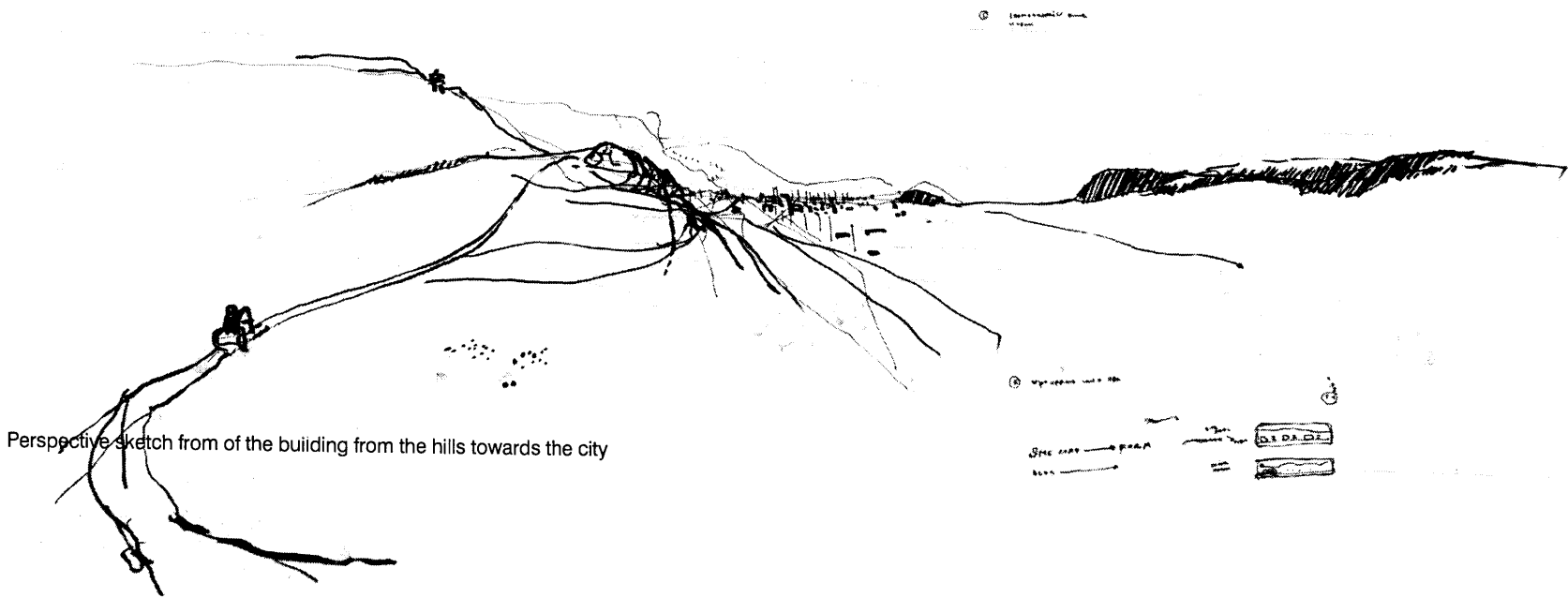
180



Preliminary perspective of building at night in winter viewed from Four Corners



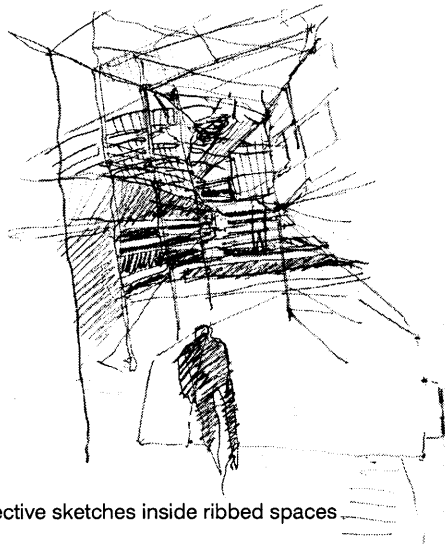
Skidooning under the building



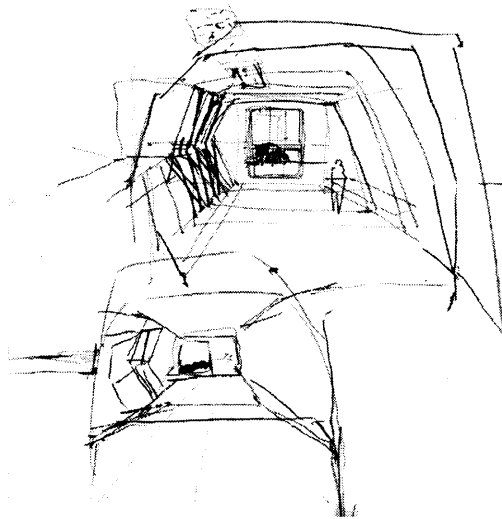
Perspective sketch from of the buiding from the hills towards the city

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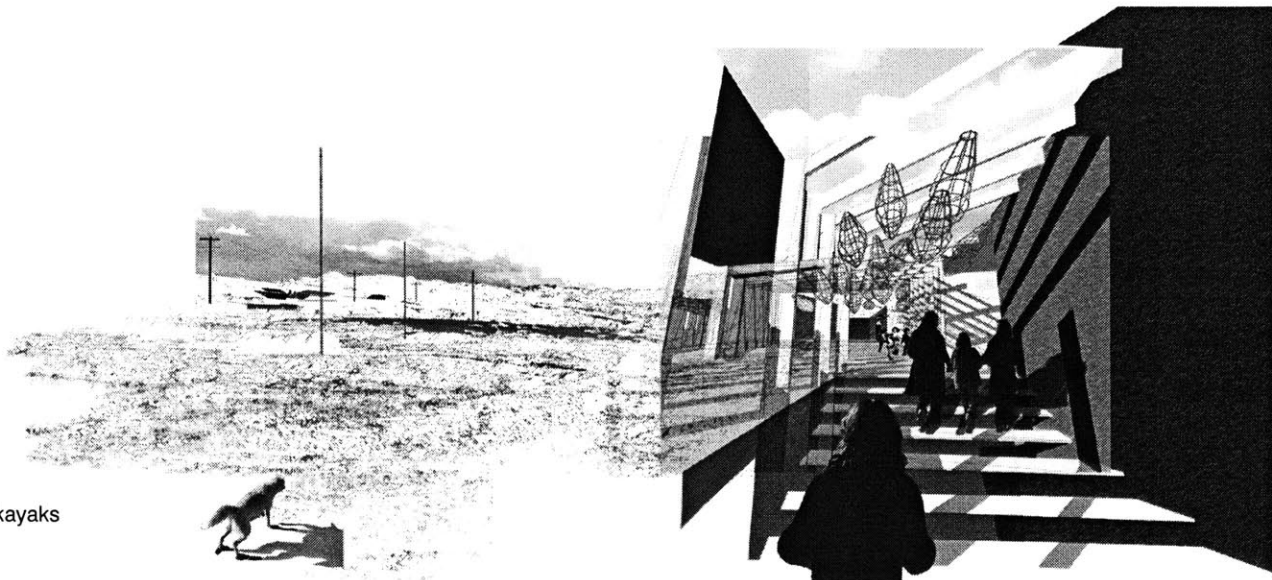
182



Perspective sketches inside ribbed spaces



Rendering of foyer under suspended kayaks

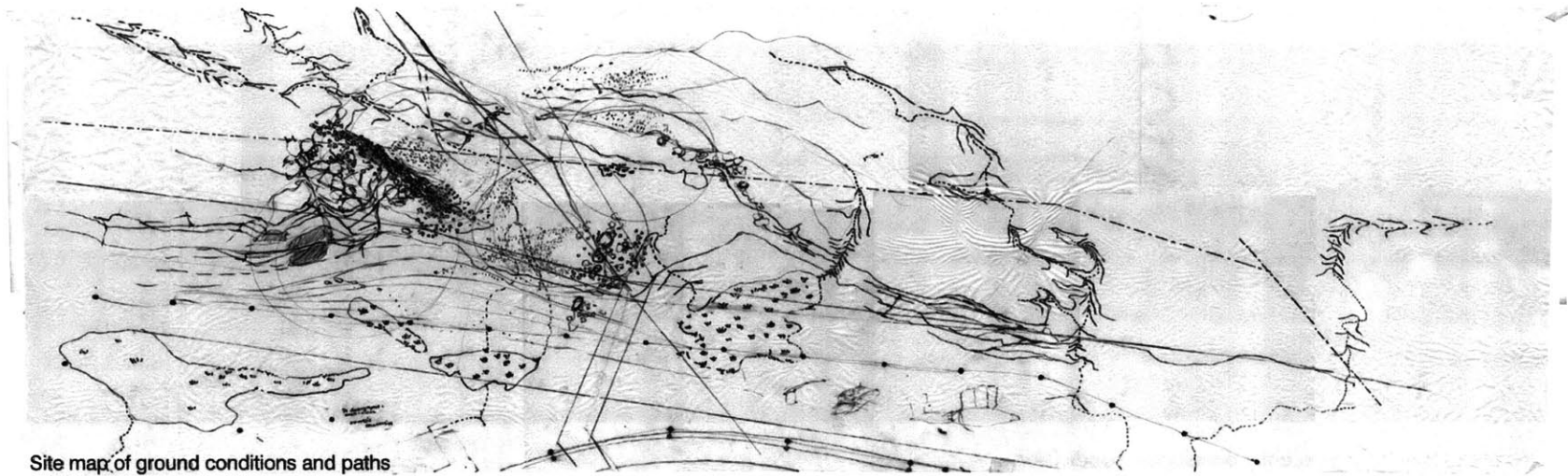


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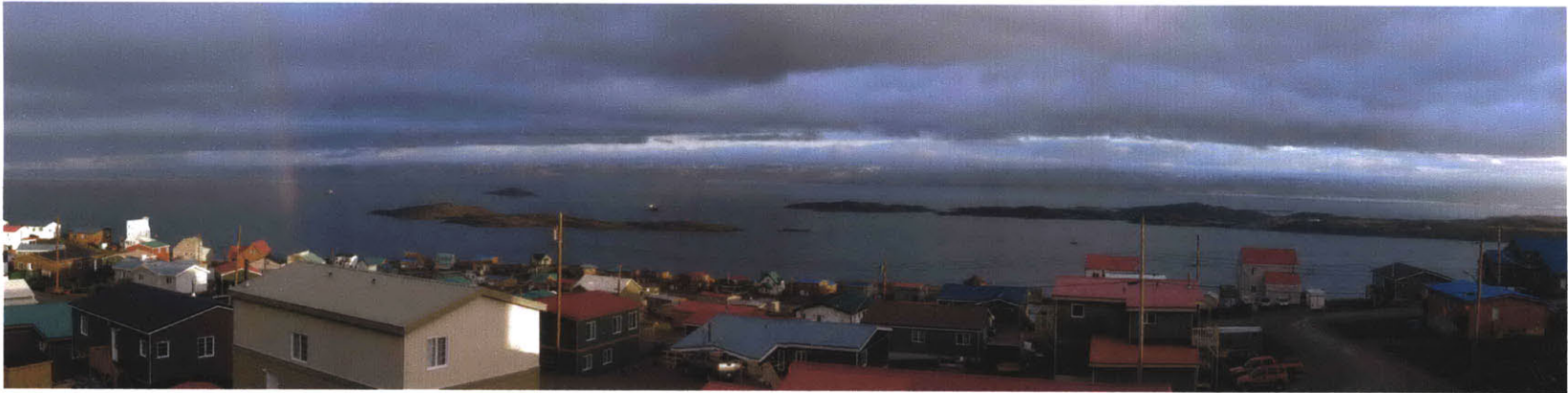
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Quick site sketch of rocks



Site map of ground conditions and paths



View of the Bay from a recently developed subdivision

CONCLUSION

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Jose Kusugak, among Nunavut's leading political activists, asserted that sovereignty for the Inuit "is proof positive that the strength of the human spirit can overcome the biggest of all political obstacles and transcend the most entrenched cultural prejudices."¹ As this thesis has shown, sovereignty marked only the first leap over a set of obstacles along the path towards political, cultural, and economic self-dependence in Nunavut. Among these, the improved efficiency of an Inuit-led construction industry is paramount. A competent, resourceful, and cost-effective building strategy territory is fundamental to solving the Eastern Arctic housing crisis.

¹ Kusugak in Dahl, Hicks and Jull 28

This thesis demonstrates that conventional subsidy-based solutions for housing are unlikely to make housing more affordable to low-income families. It also demonstrates that the high cost of construction is largely produced by the expense of importing labor to compensate for the lack of local skill. Accordingly, the thesis proposes that construction trades training for Nunavummiut should be a target for development and investment by both the public and private sectors. In addition to improving the efficiency of the construction industry, profound political, cultural, and economic benefits will accrue from investment in trades training. Trades education will help Inuit enter a workforce with vast opportunities for upward mobility to management positions. It will broaden the education, career, and lifestyle choices available to young people as they strive for higher levels of academic achievement. Finally, it will support the growth of the wage economy, decreasing the dependence of the Government of Nunavut on federal funding.

By studying the array of arguments for trades training and discussing options for curriculum, delivery, location, and scheduling, the thesis offers to construction industry stakeholders a broad view of many of the major issues surrounding the development of training in Nunavut. Other central aspects of a training strategy that are outside the scope of the thesis, such as management and financing, should

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be added to this discussion. In drawing the large picture of trades training, two criteria for success appear paramount, and it is towards these that this thesis has aspired. The first is that the many aspects of a trades training strategy for Nunavut must be systemically presented and understood. In this regard, the thesis describes the impacts of public sector policy on private sector training; of construction deadlines on local hiring; of training delivery on family relationships; and of training scheduling on trainee demand. The second is that each of the many industry stakeholders witness their opinion represented in the discussion, and also perceive in it different points of view. The creation of a trades training strategy for Nunavut has already, and will certainly continue to provoke differences of opinions on what, how, and where trainees should learn. This thesis aims to present a complete and fair synthesis of current evidence and opinion, and based on these, to produce recommendations which can stimulate partnerships and progress towards a Made-in-Nunavut skills training strategy. Prospects for progress are favorable, as consensus emerges among stakeholders that training is the most promising solution to reducing the cost of housing.

The thesis should also demonstrate to stakeholders and Nunavummiut that a local construction workforce will cut construction costs for much-needed community space. Rapid population growth across the territory is increasing demand for places where friends, families, and visitors can find relief from crowded homes in the long winters, and gather to share traditions, ideas, and visions within the community. The public realm, even in Iqaluit, the capital city, is limited to stores, bars, and corridors. The cost of expanding the arctic civic realm is, however, prohibitive. In addition to the short supply of local labor, these large projects have in the past relied on expensive imported materials. This thesis suggests a way that evolving skills can be applied to a simple construction system using inexpensive materials that are commonly available in the territory.

This construction strategy is applied to a proposal for a building in Iqaluit that brings together training facilities and community gathering space. In its formal quality, spatial organization, and material palette, it responds to the unique conditions of Eastern Arctic communities: the loose layout, rocky terrain, vast tundra, extreme climate, and seasonal rhythms. These responses can be emulated in public building design across the territory, and in other areas that, like Nunavut, contend with remote location, harsh environment, and low material resources and developing human resources. In sum, the thesis illustrates a way of building in Nunavut that helps turn adversity into capacity, by encouraging resourceful use of common materials, and supporting trades training for local apprentices:
by building skills.

The opportunity to spend time in Nunavut and learn about its government and industry, its history and future, has led me to personal conclusions that will deeply affect my work in the future in Canada and abroad, as an architect and a planner. Although I had previously lived, studied, and worked abroad, the unprecedented experience of being in direct contact with the issues, land, and people addressed in this thesis encouraged me to learn along the way how to research and design for a culture of which I am not entirely a part. Most important were skills that I have only just begun to refine: talking and reading. In talking to Nunavut's policy designers, business leaders, construction foremen, and tradesmen, I learned how to be quiet and flexible, to quickly grasp a part of the problem I had not yet perceived, and to patiently allow its details and complexities to become clear. In reading, I learned that it was as good to scribble on a page as to peruse it. I read the landscape by drawing it. And even though this was sometimes uncomfortable, with fingers frozen, or ears mosquito-bitten, it was often in trying to commit a rock or shack to the page that I felt most deeply connected to the thesis.

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The most moving personal discovery of this thesis is to find that there is a way to bridge the scales of design and to bring together planning and architecture in the same project. This depends on identifying those fascinating, urgent problems that are concurrently rich in large and small scale design challenges. The thesis does that by showing that a scarf joint materializes out of an intention to address the shipping seasons, that ceiling height can have a meaningful impact on unemployment, and that a structural rib made out of the most conventional materials can help promote an understanding of the history of Inuit survival in the face of the persistent challenges of arctic life. That the resolution of architectural details can be meaningful for social processes gives me conviction that designers can work at the scale of the building and contribute, at the same time, to development and empowerment at the scale of society.

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INTERVIEWS

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Crystal Fuller, City Planner, Iqaluit Department of Lands, Aug 20

Sheldon Nimchuk, Project Manager, Nunavut Construction Company/Nunavut Investment Group, Aug 22

2004

Eegeesiak Aniqmiuq, Maintenance Supervisor, Iqaluit LHO, July 20

Claude Beauchamps, Senior Policy Advisor, Dept. of Culture, Language, Elders, and Youth July 28

Michelle Bertol, Iqaluit City Planner, Iqaluit Department of Lands, June 29, July 5

Steve Cook, Property Manager, Nunastar Properties Ltd., July 26

John Corkett, Housing Manager, Clyde River July 8

Chris D'Arcy, Director of Policy and Planning, Nunavut Housing Corporation June 28, July 12, July 13

Joetanie Davidee, Apprentice Plumber, Iqaluit LHO, July 20

Marc Denault, Plumber, Iqaluit LHO, July 20

Don Gedham NCC July 8

Thomas Gray, Maintenance Officer, Iqaluit LHO, July 20

Terry Grey, Manager, Ferguson Simek Clarke, Iqaluit Office June 21, July 17

Mike Hine, Geologist with Federal Government June 28

Pam Hine, Deputer Minister of Education July 6

Lori Idlout, Policy Director Health and Social Services July 22

Rejean Jacques GCNorth July 13

Lorne Levy, Director of Capital Planning, Dept. of Ed July 12

Hugh Lloyd, Senior Advisor of Community Development Initiatives, Dept. of Ed., July 26

Mark MacKay, Acting Director of Income Support Pograms, Dept. of Ed., July 26

Sheldon Nimchuk, Project Manager, Nunavut Construction Company/Nunavut Investment, July 30

Bruce Rigby, Senior Advisor, Adult Learning Strategy, Dept. of Ed., July 22, July 26

Aluki Rojas Director of Inuit Qaujumajatunqangit, Dept. of Culture, Language, Elders, and Youth July 28

Peter Scott, President, Nunavut Housing Corporation July 12

Denis Simard, Former Senior Administrative Officer for Clyde River, July 19

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WEB SITES

“Appropriate Technology” in public works

www.ruralroads.org/labour

Jan 9, 2005

Atanarjuat The Fast Runner

www.atanarjuat.com/gallery

Jan 23 2005

Baffin history

<http://www.nunanet.com/~itagak/history>

Dec 26, 2004

Inuit Population in Canada

<http://www12.statcan.ca/english/census01>

Jan 17, 2005

Iqaluit history and map

<http://www.city.iqaluit.nu.ca>

Dec 26, 2004

NNI Policy

<http://www.gov.nu.ca/Nunavut/nni/nnie.pdf>

Dec 27, 2004

Nunavut history

<http://www.nunavut.com/nunavut99/english>

Dec 28, 2004

Nunavut Sivuniksavut

<http://nstraining.ca>

Dec 30, 2004

Nunavut Department of Sustainable
Development

<http://www.gov.nu.ca/sd>

Jan 2, 2005

Nunavut map

<http://www.qikiqtarjuaq.com>

Jan 21, 2005

Nunavut Shipping Routes

[http://atlas.gc.ca/site/english/maps/
peopleandsociety/nunavut/transport](http://atlas.gc.ca/site/english/maps/peopleandsociety/nunavut/transport)

Jan 3, 2005

Qikiqtaaluk Corporation

<http://www.qcorp.ca/>

Jan 3, 2005

IMAGE CREDITS

Qikiqtarjuaq.com. Fig.01

City.iqaluit.nu.ca. Fig 5.2

Atanarjuat.com/gallery Fig 7.5.1-7.5.3

Strub. Fig 02; Fig 3.1.1-3.1.3; Fig 7.10.1.

Ferguson Simek Clarke. Fig 1.2.1-1.2.2.

Lubell, Sam, and James Murdock. Fig 1.3.1.

Urubo, Marcovia. Fig 1.3.2.

Weder. Fig 1.4.1. Fig 6.4.1.

Gruft. Fig 1.4.2; Fig 6.4.3.

Jens Dahl, Jack Hicks, and Peter Jull, Eds. Fig 2.1.

Honigmann. Fig 2.2; Fig 2.3; Fig 7.8.1.

Blodgett. Fig 6.1.1; Fig 6.1.2.

Hallendy. Fig 7.6.

Stone Band School. Fig 6.4.2

Dirnckinck-Holmfeld Kim. Fig 6.3.2

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