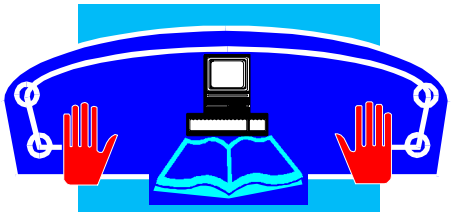

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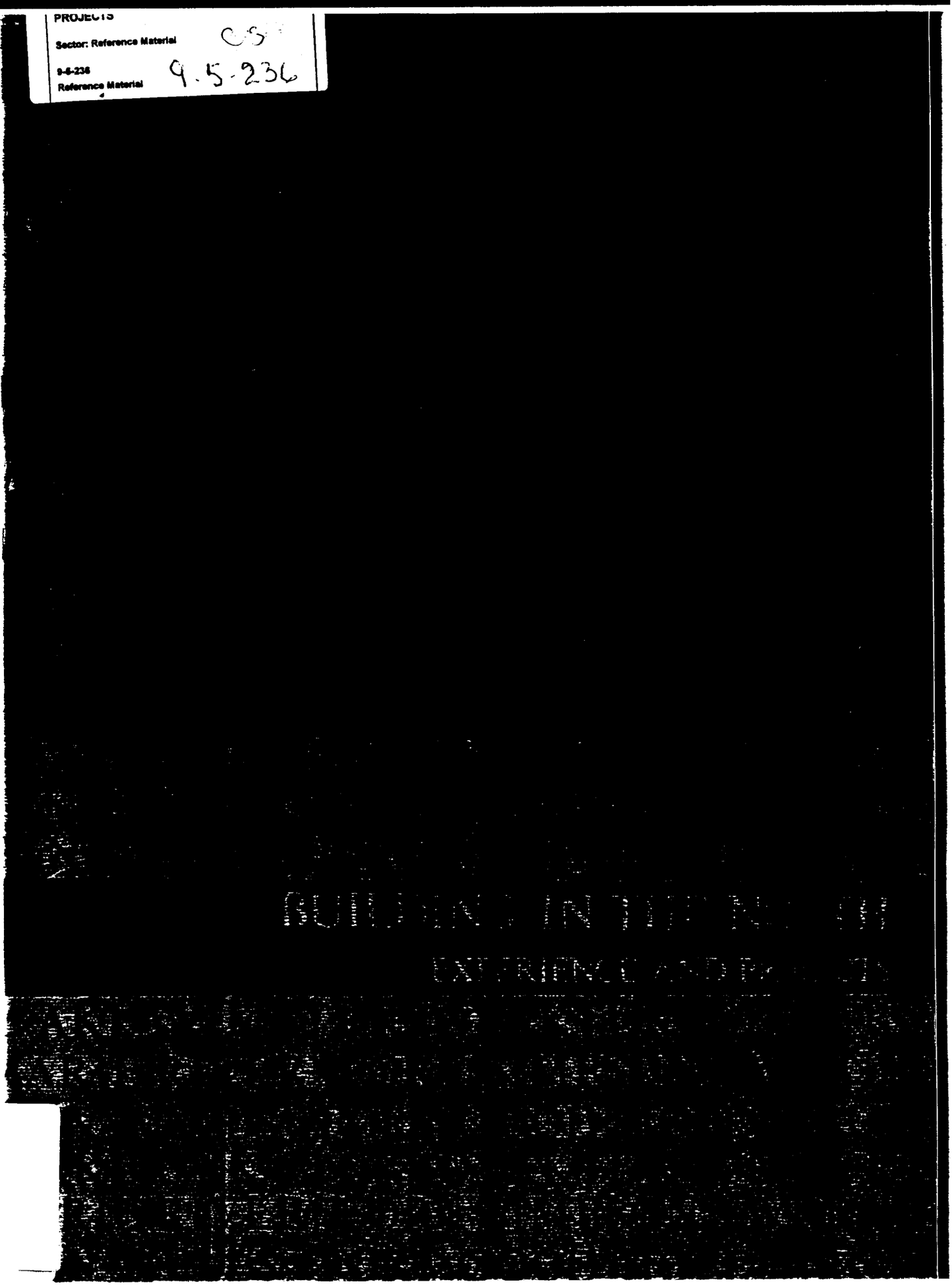

BUILDING IN THE NORTH

EXPERIENCE AND PROJECTS

VOLUME 2

PREPARED BY VAN GINKEL ASSOCIATES LTD.

FOR CANADIAN ARCTIC GAS STUDY LIMITED

AND GULF OIL CANADA LIMITED
IMPERIAL OIL LIMITED
SHELL CANADA LIMITED

MARCH 1976

This study was commissioned by Canadian Arctic Gas Pipeline Limited, Gulf Oil Canada Limited, Imperial Oil Limited and Shell Canada Limited as a part of their enquiries into the impact of development in the Mackenzie region and as a source of information for those who inhabit and build in the North.

BUILDING IN THE NORTH, appears in two volumes:

Volume I	Responding to the Environment
Volume II	Experiences and Projects

INTRODUCTION

BUILD NG IN THE NORTH, Volume I I, is a compilation of bui ding and plann ng projects in cold regions in various parts of the world. Cross references to Volume I are made throughout Volume I and inform- at ion appearing in a specific section of the first volume often is dispersed throughout the second. This is because the second volume, in many ways, acts as an appendix to the theories put forward in the first part of BUILDING IN THE NOR" H. Each case was selected as an example of a design or a construe ion response to the requirements and constraints which are discussed in Volume I of this study. Not all the examples have been constructed and few have been in use for a sufficient time to assess their performance. Nor do all the illus- trations exemplify the perfect solution to every aspect of the pro blems of northern building and housing. However, they do contain good solutions in particular elements of building - from the larger scale of town planning to the smaller scale of construction details. They represent a body of experience and an indication of new directions which can be usefu' to building in the Mackenzie region.

The design of hous ng and of communities should relate to the specific circumstances of a locale and of individuals. the examples of planning and design in the irst three chapters of this volume illustrate elements and ideas which may be relevant to some of the specific cir- cumstances in the Mackenzie region. The technical details of construc- tion and servicing in the last two chapters respond to particular con- ditions of climate and terrain which obtain in the north

The authors hank all the government agencies, industries, professional offices and ndiv duals who generous y contributed informs ion and drawings for use n this study.

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1 TOWN PLANS

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1 TOWN PLANS

The following town plans are examples of contemporary community design in northern locations. They range from a planned population of 2,000 to 30,000, but very few are completed since most were initiated only in recent years; some are still at a project or design stage, with construction anticipated in the near future. The plans are presented here at a uniform scale, so that their size may be easily compared: the town plans are at 1:8,000 and the siting plans are at 1:80,000.

1.1 FERMONT, QUEBEC

Deve loper:	Quebec Cartier Mining Company
Plan/design:	Desnoyers Schoenauer
Consul tants:	John Schreiber - landscape architect Ralph Erskine - special consultant Morrison, Hershfield, Burgers & Huggins, Ltd. - wind and snow studies
Locat ion:	Northern Quebec, latitude 53° 67' (approximately same as Edmonton)
Population:	5,000
Density:	26.3 persons per acre
Completion:	80%

The town was built by the mining company for its employees. The side is on a south facing slope on Lake Daviault. The soil is thin and poorly drained and supports a cover of black spruce, larch, birch, shrubs, grasses and mosses. There is no permafrost in the area. The northern part of the townsite had been denuded by forest fire. It is on this area that the most intensive development was sited. Strips were cut out of the remaining forest for construction of housing, retaining, as much as possible, the original stands for wind shelter. The changes in exposure and drainage caused a number of trees to die. Insufficient accommodation to natural drainage patterns has caused some structural problems.

The plan is fairly compact. All community facilities and apartments are in a single structure which is intended to screen the community from north and northwest winds. This structure, described in Chapter 2, contains schools, shops and services and has an interior walkway along its entire length. In its lee are townhouses, semi-detached dwellings and areas of public open space. Oetached and semi-detached bungalows are located on the southern part of the site.

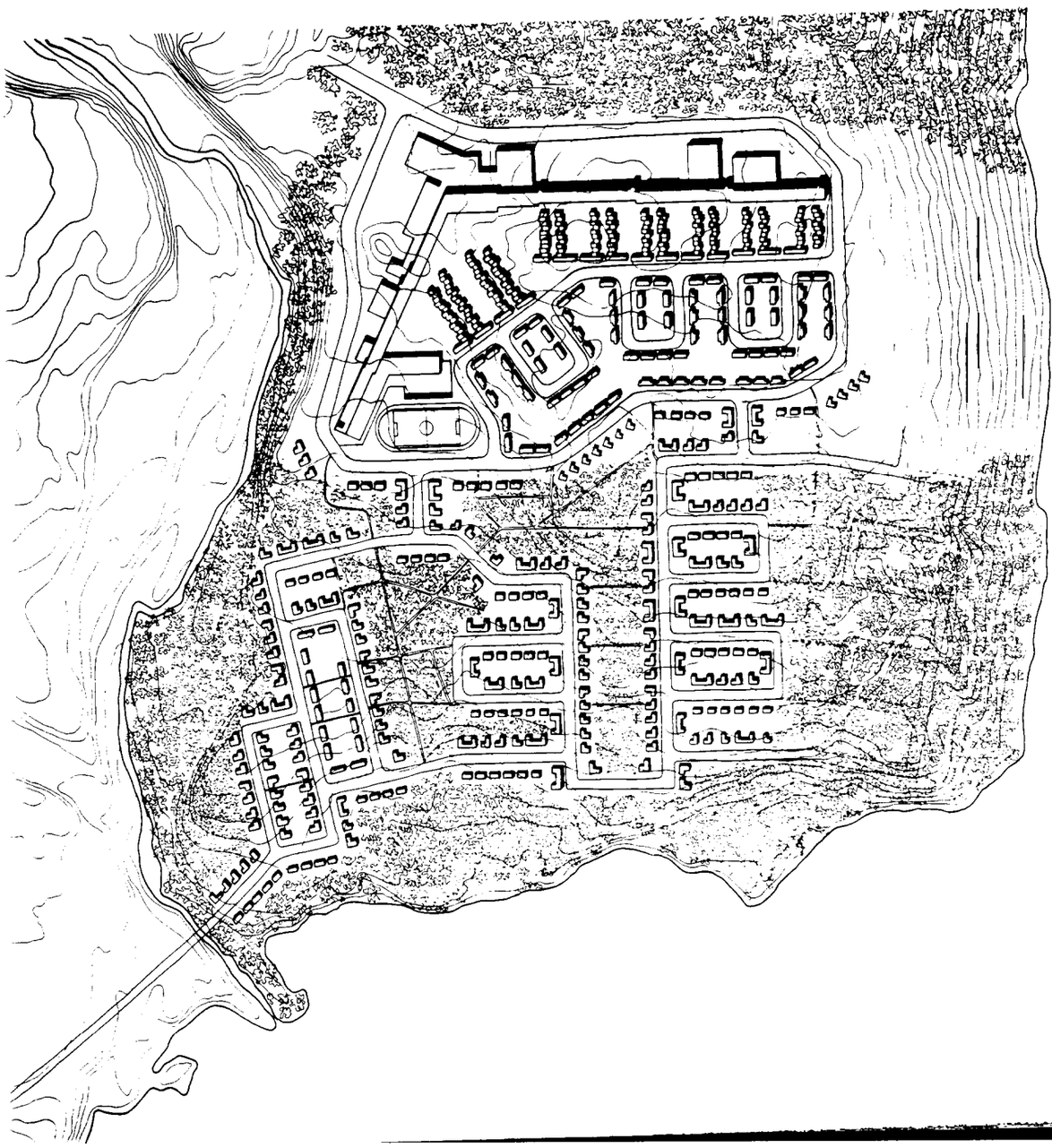
Since lower velocity of winds results in reduction of their snow scouring effects, snow is thus expected to accumulate on the lee side of the wind-screen building. For this reason, the first row of houses has been located some distance from the windscreen building. This is the first windscreen building to be constructed in northern Canada. Its performance over this, its first winter, should produce valuable information.

The compact plan results in shorter paths in and out, shorter paths within the community, and cheaper, more efficient municipal services. For greater safety, roads are laid out with T-intersections only. To discourage

excessive speed there are no long straight runs.

Originally the townhouses were linked to the pedestrian mall of the windscreen building and to garages at the foot of the rowhouses by interior walkways but these were eliminated by the developer because of costs"

The first residents have preferred the detached bungalows to the townhouses, apparently because of the convenience of the attached garage and open space. The architects feel that once the community facilities in the windscreen building are more completely operative the townhouses and apartments will become more attractive.



scale 1:8,000

1.2 FORT MCMURRAY

Client:	Fort McMurray Board of Administrators, Alberta Housing Corportaion
Plan/design:	Cohos, Evamy & Partners
Location:	Alberta, north of 56th parallel
Population:	12,000 (1974); 45,000 planned
Completion:	Area 1 in design stage - population 4,500

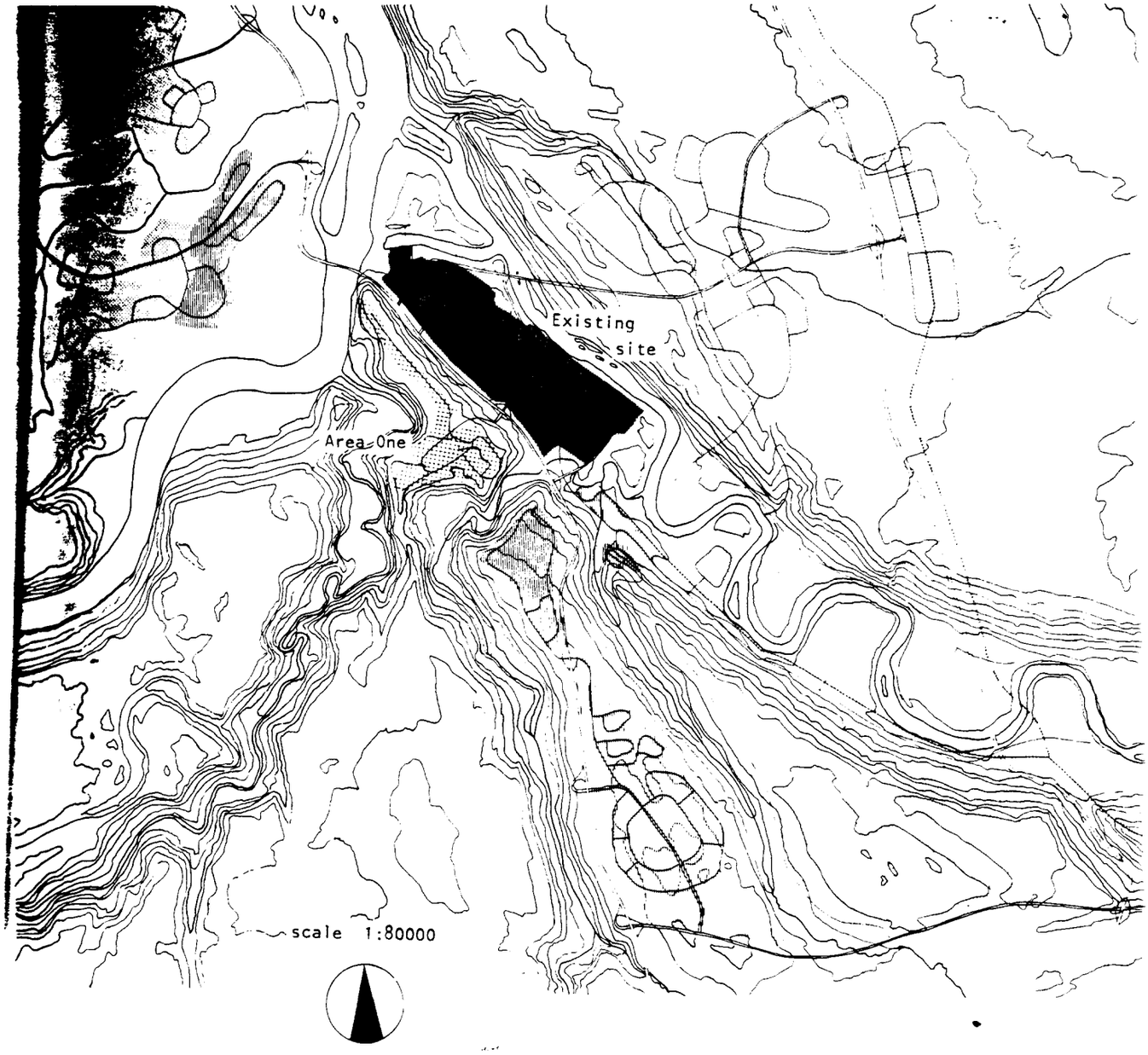
The existing town of 12,000 is expected to grow rapidly as the nearby oil sands are developed. The general plan for expansion and the detailed plan of Area I were prepared by Cohos, Evamy and Partners in 1974.

The old townsite of Fort McMurray is at the confluence of the Athabaska and Clearwater Rivers. Expansion is severely constrained by steep slopes, flood plans, areas of unstable clays and muskeg, and river crossings. Consequently the plan proposes:

- nucleated development of sites most suitable for construction;
- the locat on of central community functions in the old town;
- road system which focuses on the town centre.

Each residential area would contain a neighborhood centre, integrating schools, local shopping and recreation. Area 1, for a population of 4,500, is indicative of the approach to site planning and neighborhood structure. Sited on a height of land, the plan seeks to exploit the principle scenic views on main pedestrian ways. Most residences are clustered on cul-de-sac roads, so that there is a clearly defined pedestrian system, focussing on the village centre and separated from the road network. Since there is a single road access to the area, a main walkway and utility right-of-way serves as an emergency access. There is a mixture of housing types in each neighbourhood.

The planners defined a set of performance standards, applicable to all new development areas in Fort McMurray, based on the requirements of climate, topography, servicing, community and privacy. The standards describe required performance at the scale of the dwelling, a cluster of housing and the neighborhood without inhibiting design solutions for future development areas.


Existing
site
Area One
scale 1:80000


main access
Area One scale 1:8000
school
park
emergency access

1.3 INUVIK, N.W.T.

Developer: Department of Indian and Northern Affairs
Plan/design: Central Mortgage and Housing Corporation
Location: Mackenzie Delta, latitude 68° 22' N
Population: Original plan for 2,000 extended to 4,000+ by 1975
Completion: 100%

Inuvik was established in 1955 in the Delta of the Mackenzie on the east channel of the River. It was built on a virgin site by the Canadian government as the centre for administration, social services and education for the western arctic and has a government research establishment and defense base. In recent years, largley as a result of hydrocarbon finds in the Delta and off-shore in the Beaufort Sea, the town has grown beyond its original plan which was to accommodate 2,000. It now contains a number of business establishments and a sizeable transportation and expediting industry, and is the distribution and servicing centre for communities and industry in the western arctic.

Most of the townsite is underlaid with permafrost which severely constrains the design and engineering of buildings, roads and services. All buildings are on pile foundations and raised off the ground to avoid heat transfer to the soil. Building sites and roads are covered with a thick insulating mat of gravel.

The plan is similar to that of a typical Canadian town, hut somewhat more compact. The main street, Mackenzie Avenue, runs through the centre of the town and out to the airport, six miles to the southeast. With recent development of an industrial area northwest of the town, it has become a heavily travel led thoroughfare. Shopping, schools and community facilities are on Mackenzie Avenue, close to the centre of development. In the area between these facilities and the water are industries and government research and defense establishments. The first housing was southeast of the centre - groups of row houses, walk-up apartments and detached houses on crescents or cul-de-sac streets. The original residential sector has a greater coherence than the newer western area.

Most of the town is serviced by a utilidor which carries water, sewage and high temperature water for heating. The utilidor structure is boxed in wood, insulated and elevated. It was, in its time, an imaginative solution for the distribution of service in a permafrost area. However, it has become a ubiquitous feature which does not enhance the townscape and impedes pedestrian movement.

Unlike other Canadian examples of new northern towns, illustrated in this volume, growth has far exceeded expectations and planning. Homes were built in the western sector on an ad-hoc basis and without any services - mostly for native people. There is considerable literature on the social consequences.

1.4 LEAF RAPIDS, MANITOBA

Developer: Leaf Rapids Development Corporation

Plan/design: Town Centre - Leslie Stecheson
General siting & Churchill Place - Gary Hilderman
Leaf Grove- MMP Architects

Location: Manitoba, north of 56th parallel

Population 2,800. Planned extension to 12,000

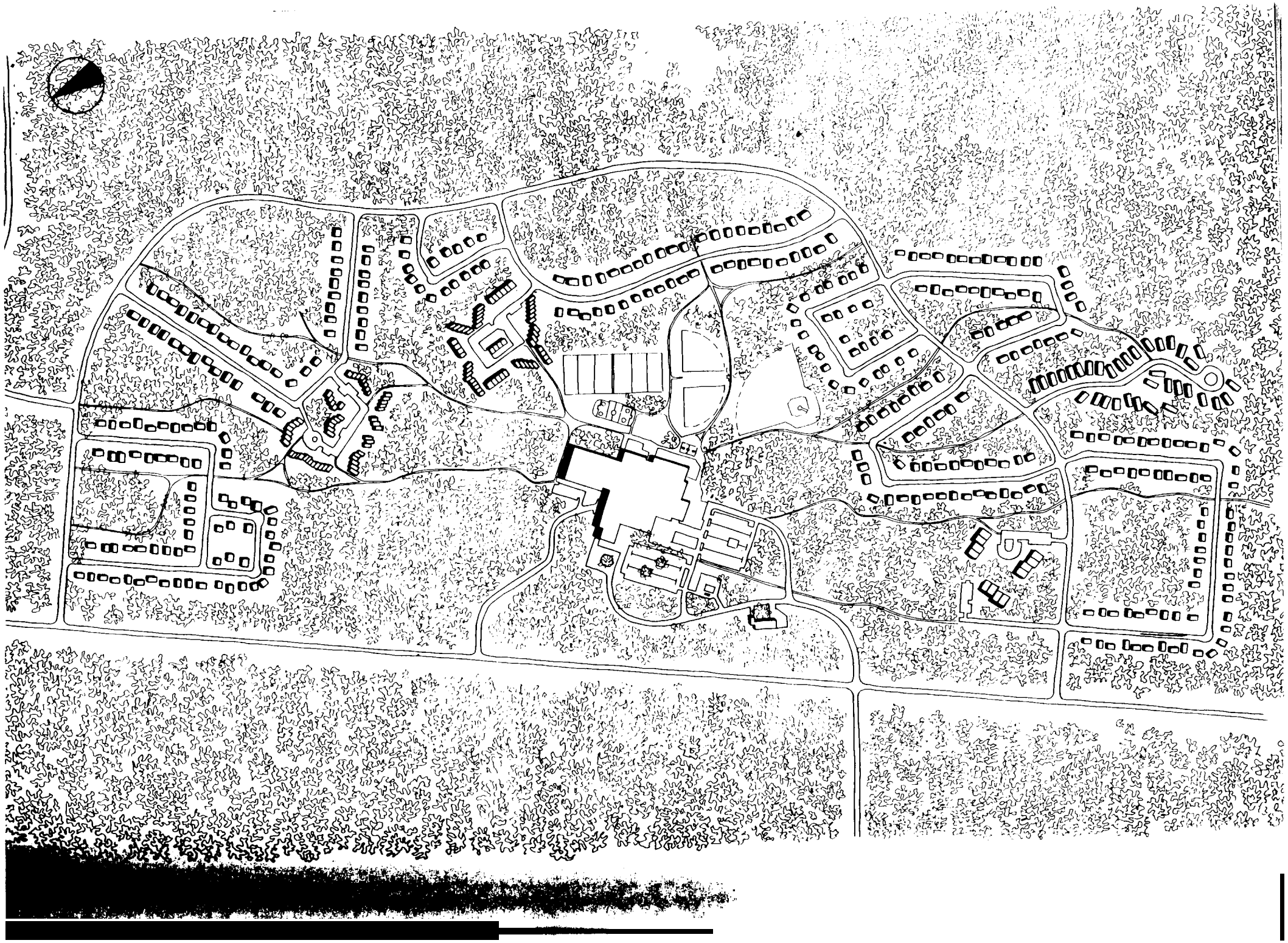
Completion: Initial plan almost complete with a population of 2,500 in 1975.

Though Leaf Rapids is located near the treeline in an area of discontinuous permafrost, the townsite is on an esker and is well wooded. A large proportion of the natural forest cover has been maintained and provides some shelter from the wind.

A variety of housing types are provided: apartments, row-houses, semi-detached and detached dwellings and a mobile home park. The buildings are clustered into small groups that give each dwelling place its own identity. Pedestrian paths connect the housing groups to the town centre with a maximum walking distance of one-half mile. However, large open areas separate the town centre from the housing groups.

The town centre was designed to encourage inter-use of community facilities, to afford protection from inclement weather and to minimize building envelope and utilities. It is described in Chapter 2.

Contrary to the traditional approach in mining towns where the company builds and owns the town, the Manitoba government created a crown corporation to plan and construct Leaf Rapids. The boundaries of the municipality encompass a large area, including the mine which thus becomes the major municipal tax payer. The area is sufficiently extensive to enable town control of possible peripheral development and large tracts of land on a nearby lake which are suitable for recreational use.



Long Range Development Plan

Deve loper:	Union MinièreExploratiɔn and Mining Corp. Ltd. (UMEX)
Plan/design:	Diamond and Myers, arch tects/planners Kilborn Engineering Ltd
Consultants:	Dames and Moore - environmental studies
Location:	Ontario, north of 46th parallel
Population:	Plan for 1,600; possible extension to 3,000 - 4,000
Density:	5 persons per acre

Pickle Lake is one of several small communities which came into existence as a result of gold mining activities in northern Ontario in the late 1920's. It had a population of 326 in 1973, when the decision was taken to extend the town because of diverse new mining developments in the region. The Pickle Lake site was selected because it is close to the first large mine likely to be developed and also central to the socio-economic region.

The existing town is on the shore of Pickle Lake with gentle wooded slopes behind it. The objectives of the proposed extension are:

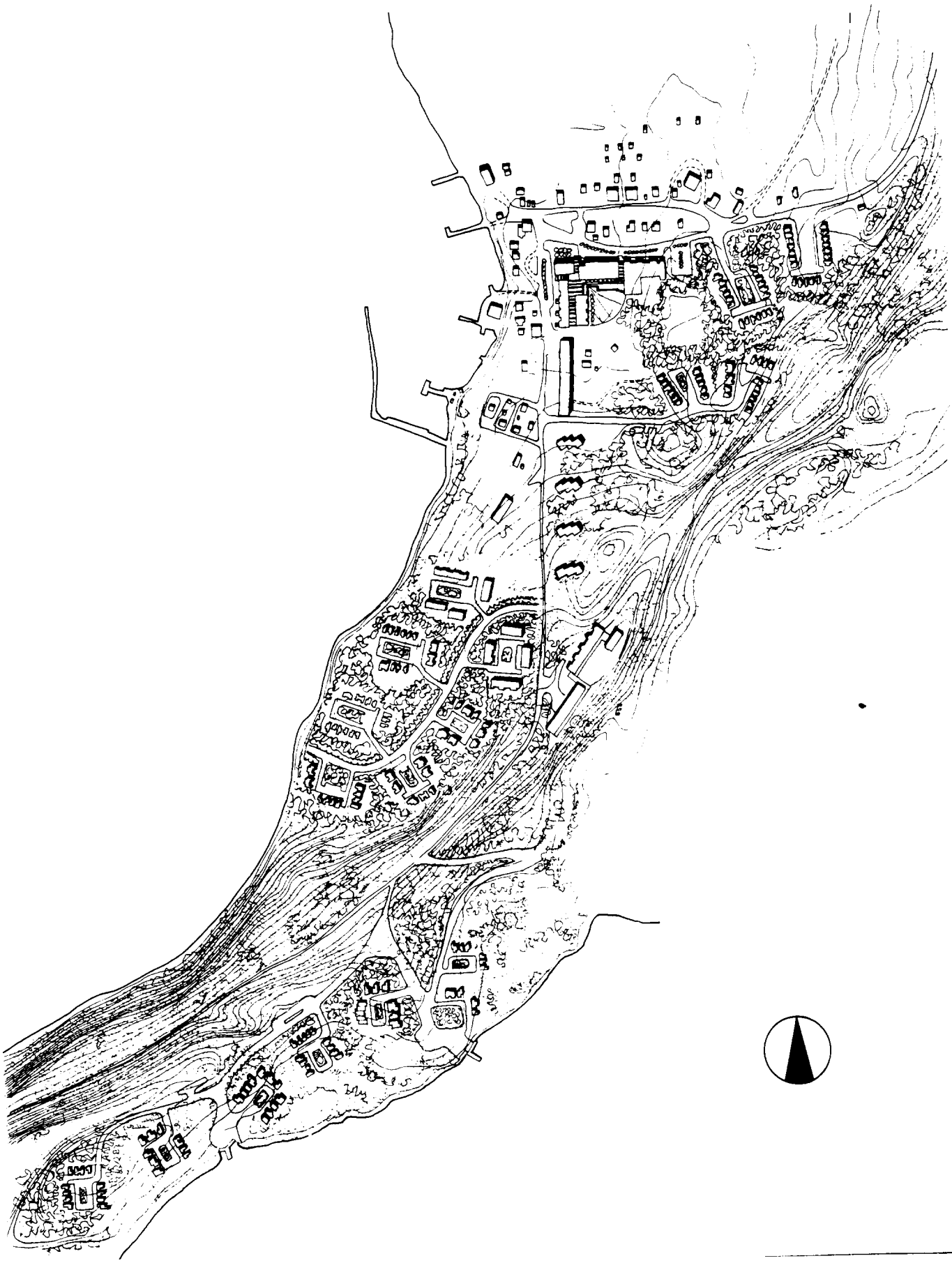
- to preserve the natural amenity of the lakes, hills, forests and the "resort atmosphere" of the existing settlement;
- to foster a sense of belonging in the community, at the neighborhood level through topographic distinction and at the town level through historic continuity.

The plan proposes that two areas of new housing be developed on the slopes of a gravel esker to the south and that additional housing and community facilities be built within the existing townsite. Maximum distance from residences to the town centre is 3,000 feet. The system of walkways minimizes street crossings and takes advantage of views.

Cluster housing is proposed, as described in Volume I Section 2.3.2.2. , in order to:

- lessen environmental impact by maintenance of trees and soil
- develop effective open space
  enhance relationship to existing landscape
- provide flexibility in housing types, social and income mix
- provide identifiable neighborhood units.

The concept of cluster housing was considered by the environmental consultants as appropriate for fragile ecosystems since it enables more detailed environmental input to the selection and design of the actualhousing sites than in the case of detached dwellings at comparable density.



1.6 RADISSON, QUEBEC

Developer: Société de Développement de la Baie James
Plan/design: Beauchemin, Beaton, Lapointe, planners
Consultants: Somer, nc.
Location: Quebec, north of 53rd parallel
Population: 2,000 - 5,000
Status: Design

This plan was commissioned to accommodate the families of workers at the nearby LG-2 hydro-electric plant.

On the basis of psycho-social, economic, ecological and urbanistic studies, criteria were developed as a basis for town design:

- the need for both intense social activity and nearby open space
- good access to recreation and "the outside"
- variation in views, topography, landmarks
- minimum capital and operating costs
- protection of dominant ecological systems
- response to c1 imate

The criteria were combined and compared in the manner of McHarg (Volume 1, Section 2.1). In the final choice of sites, psycho-soc al considerations tended to prevai 1 over economic ones.

In the des gn of the community, the centre was felt to be of crucial importance as a place where one could escape the feeling of isolation and identify with the social group. A variety of housing types was planned, with a large number of single family dwellings to satisfy the need for personal identity, individuality and possessions. Apartments are in the community centre complex. Major traffic circulation is on a ring road and the town centre is constructed over the road which services it. Consequently, there is freedom of pedestrian movement and ready access to the centre on foot.

1.7 RESOLUTE BAY, N.W.T.

Developer:	Department of Public Works, Government of N.W.T.
Plan/Design:	Ralph Erskine Arkitektkontor (Sweden) Bonnetto/Derome (Canadian associates)
Consultants:	Underwood McLellan - engineering Morrison, Hershfield, Theakston and Rowan - wind & snow studies
Location:	Cornwallis Island, latitude 74° 43' N
Population:	1,200 eventually
Completion:	first phase under way

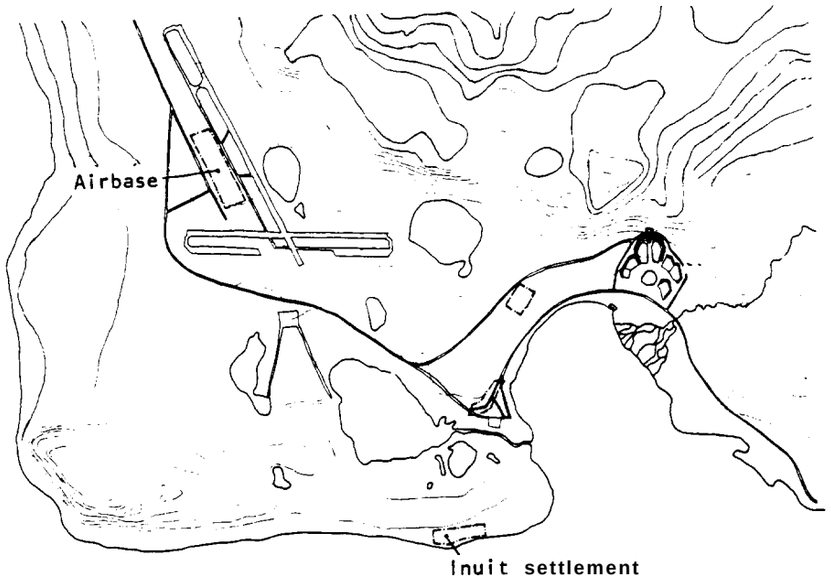
The existing Inuit settlement of Resolute Bay is located directly in line with the main airport runway. Housing is inadequate and the site is exposed to blowing snow. Most whites live at the airbase, where housing for fami l ies is insufficient.

A new town at a more logical site is being constructed for all members of the community, white and Inuit, with housing that is responsive to the climate and way of life.

Of five sites which were examined, the one selected was deemed most advantageous both in terms of its microcl imate (solar radiation, temperatures, wind and snow) and in the opinion of local people.

The plan for the new town s based on a perimeter "wall" building, closed to three d rections, open to the south. This structure includes the town centre, shopping, hotel , municipal buildings apartments and row houses. Within the protected area are ndividual houses for those who prefer a lifestyle directly elated to the outdoors. The close juxtaposition of different housing types was considered to be a means of avo ding segregation of ethnic and vocational groups, singles and families, while still providing for their various needs.

The buildings themselves are designed to minimize wind resistance and turbulence and undesirable snow drifting. Projection and irregularities are minimized. Additions and alterations by the user to the aerodynamic forms are discouraged but the open plans are designed to allow flexibility inside the structures.


Airbase
Inuit settlement

1.8 SVAPPAVAARA, SWEDEN

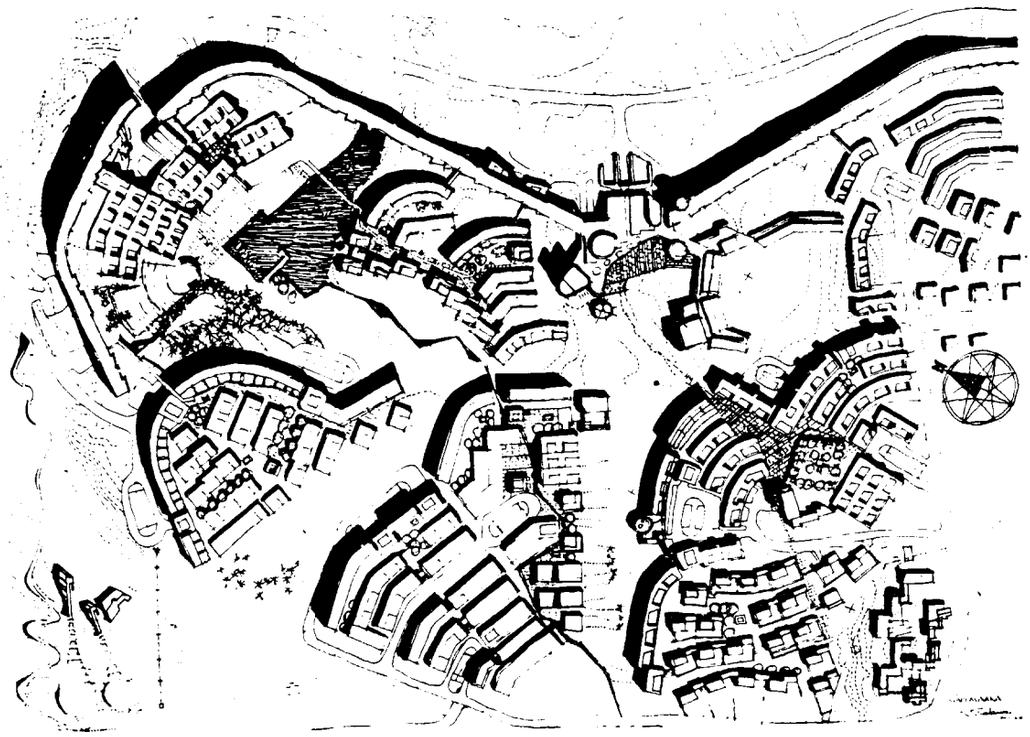
Developer: LKAB, a national mining company
Plan/design: Ralph Erskine Arkitektkontor
Location: Sweden, north of 67th parallel
Size: 1,500 dwelling units
Completion: 20%

First published in the early 60's, this plan became a reference point for subsequent attempts to plan arctic towns according to climatic and social criteria. The plan is a clear statement of these objectives. The buildings are designed and sited in recognition of the human desire for identification, community, sunlight and protection from severe weather.

The town is on a southwest slope overlooking a group of lakes. Long strips of three-storey apartments at the top of the slope act as a windbreak and are linked at their base by a community centre. Within its embrace, clusters of housing, each with a smaller windbreak apartment building, face into the southern sun. The town centre(Chaper 2) is the focus of pedestrian ways and accessible from indoor walkways along the base of the apartment buildings. These walkways also provide space for lounges and other localized public uses and give access to utilities.

Erskine felt that despite the harshness of the northern climate, it is essential to maintain a dynamic relationship with the outdoors. Consequently, the windscreen and smaller buildings are terraced into the slope and open to the south and public open spaces are in the lee of the windscreen buildings.

Vehicular traffic within the town was to be minimized by grouping of the housing. Pedestrian paths were planned separately from roads. Unfortunately the original plan has been only partially built and greatly compromised in the process - roads over-designed, housing more dispersed, only a small length of windscreen building and none of the town centre built.



1.9 STRATHCONA SOUND, N.W.T.

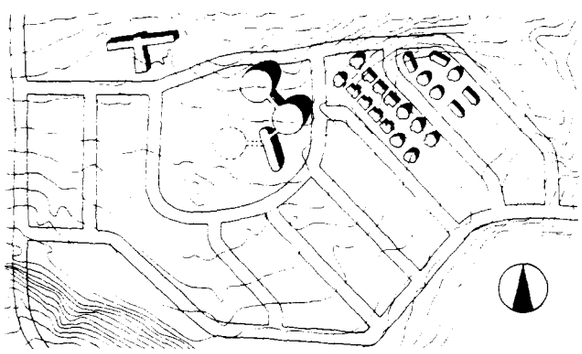
Developer:	Nanisiv k Mines Ltd.
Plan/design:	Had ley, Freeman, Mutrie/Domar Systems
	- town centre
	- housing
	Sankey Assoc./Tower Co.
	- housing
Consultants:	Underwood McLe lan
	- engineering
Location:	Baffin Island, north of 73rd parallel
Completion:	Under construe ion

The new townsite of Strathcona Sound was established mainly to house employees of the mining development nearby and their families. Some are Inuitfrom the community of Arctic Bay, 20 miles away, others will move to the area from the south.

The first stage of development includes a 116 foot diameter plywood panel dome which houses a cafeteria and recreation facilities, and several townhouses temporarily subdivided to provide dormitory accommodation for construction workers (see Chapter 3). The dome eventually will be connected with other similar structures containing shops, a school, a health centre, a winter garden and municipal services.

Utilities are enclosed in a buried insulated utilidor.

All mater als have to be transported to the site within an extremely strict scheduling by sea or by large capacity cargo aircraft.



2 TOWN CENTRES

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Leaf Rapids

2 TOWN CENTRES

The designs and projects illustrated in this chapter embody a variety of approaches to building communal spaces in a northern environment. There is a great variety of activities which need to be accommodated in even a small community: shops, offices, community administration, school, transient accommodation, library, cinema, meeting rooms, clinic. In a very large community each of these activities is of sufficient scale to warrant a permanent, specially designed structure. In a smaller community it frequently is advantageous to combine most activities under one roof, or even to design a building in which the spaces can be used interchangeably for a variety of activities at different times. This latter approach results in great economy by maximizing the use of the building at all hours and by savings in construction costs, maintenance and heating. Equally important, is the opportunity which it presents for meeting people in the course of daily work or personal errands and for creating a focus of community life.

The BP/Sohio Operations Centre in Alaska and the University of Alberta Student Housing in Edmonton have been included in this chapter because they illustrate elements of design and technology which are applicable to town centres in a northern environment. They are among the few examples which have been in use long enough for assessment.

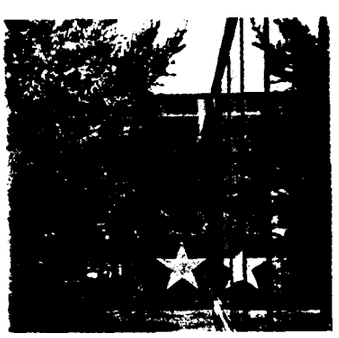
2.1 BP/SOHIO OPERATIONS CENTRE, PRUDHOE BAY, ALASKA

Developer: BP Alaska /SOHIO
Architects Wallace, Floyd, Ellenzweig Inc.

The BP/SOHIO Centre is included in this section because the principles on which it is based can be applied to the planning and accommodation of community facilities in the North. Completed in March, 1974, it is generally considered to be the epitome of intelligent planning using sophisticated technology, for remote facilities in the arctic. It houses 140 permanent operations staff, monitoring and control equipment for the oil field, communications centre, laboratories and services. Most of these functions are housed within a single envelope, the "composite building", in order to reduce the surface to volume ratio, construction costs, servicing and circulation. The building is raised off the ground and shaped to minimize snow drifting. Because of the short building season and high cost of skilled labour it was pre-built in Seattle and shipped by barge to the site.

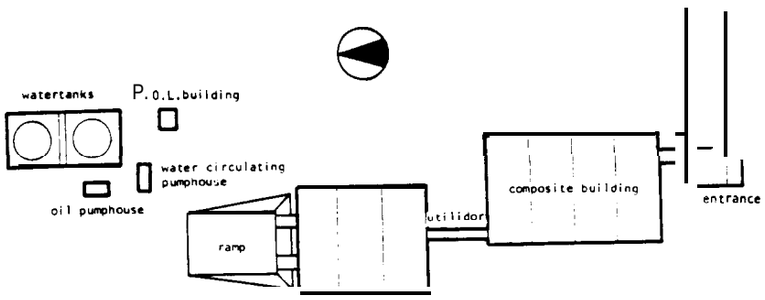
Two modules, one on either side of the building, contain operations and services at the lower level and bedrooms above. Between them is a skylighted space-frame enclosing a two-storey public area, at the south end of which is the lounge with a window-wall to capture the spring and fall sun.

Within the confines of the relatively limited space there is a variety of character and atmosphere produced by changes in ceiling height, colour and furnishings, related to enclosing partitions. Between the dining area and lounge is a landscape area planted with northern shrubs, pine and birch up to 30 feet tall. Claustrophobia is alleviated by the use of colour and light - both natural and artificial and by providing alternative routes through the building In many cases, the route between two points offers a choice of walking through the public space or a corridor. Walking through the public space offers a variety of long and short vistas.



The BP/SOHIO Centre is treated with great respect by those who use it, "contrary to experience in most remote camp facilities. This is undoubtedly because of the skilful design and the use of high quality furnishings and finishes.

2.1 BP/SOHIO OPERATIONS CENTRE, ALASKA



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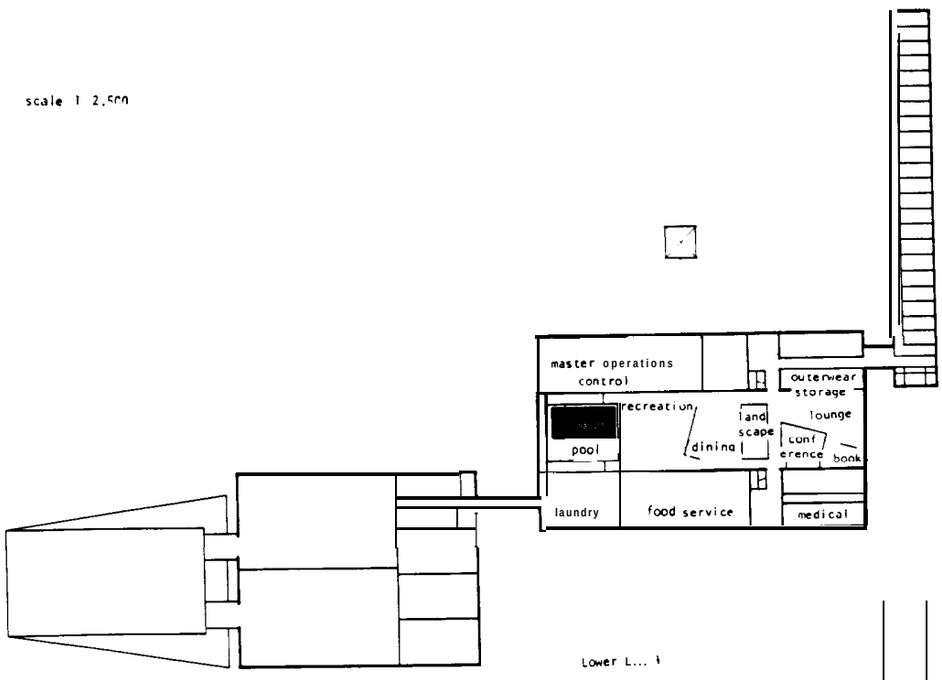

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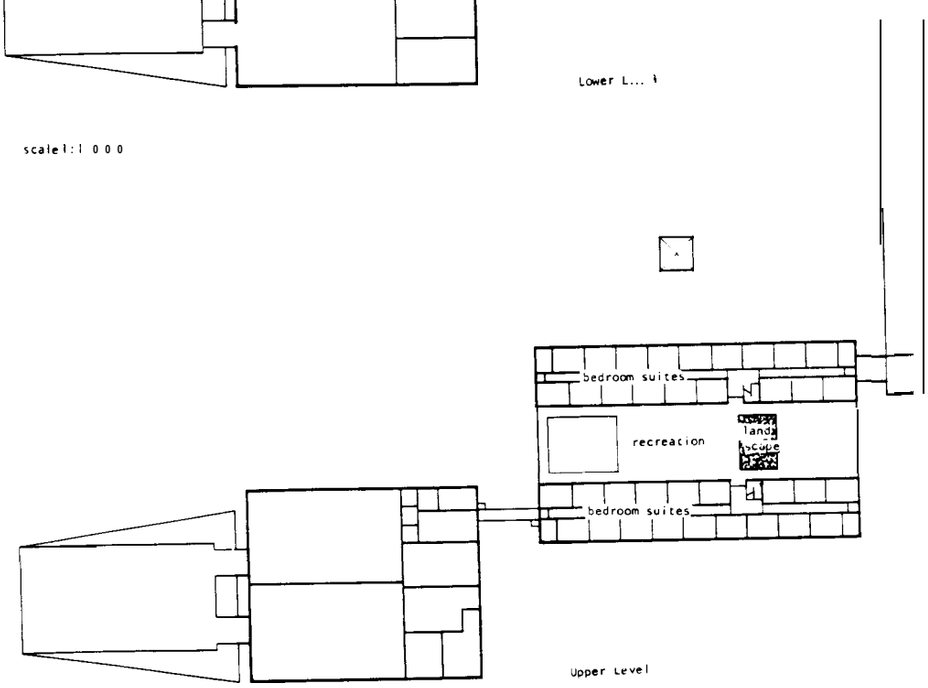


Upper Level

scale 1:1,000

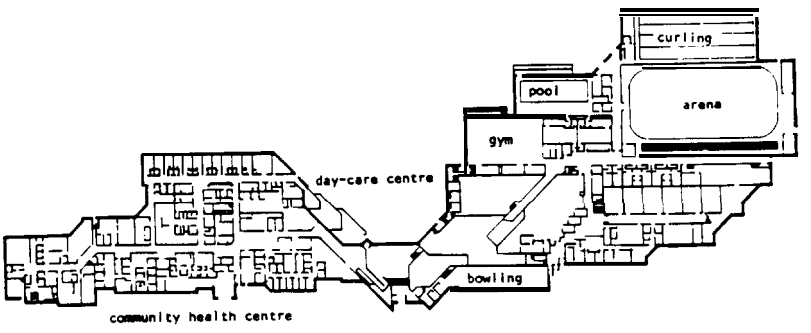
Architect: The Churchill Consortium (Gaboury,Lussier, Sigurdson and Number Ten Architectural Group)

The town of Churchill has been established for some time. Many of the existing community facilities are situated around a large central space open to the beach on Hudson Bay. In their redevelopment plan for the town, the architects sited a town centre building along this open side of Hudson Square and further enclosed the space with commercial buildings.

The town centre building comprises two wings - one containing a health centre, the other a school and recreation facilities embracing a large public space overlooking the Bay and a passage to protected terraces and the beach. The centre is connected to an existing school by an elevated walkway and may be entered from Hudson Square via the overhead walk or from the road below. Location and design of the centre al lows expansion in several directions. The articulated plan of the building creates a pleasing relationship between indoor and outdoor spaces.

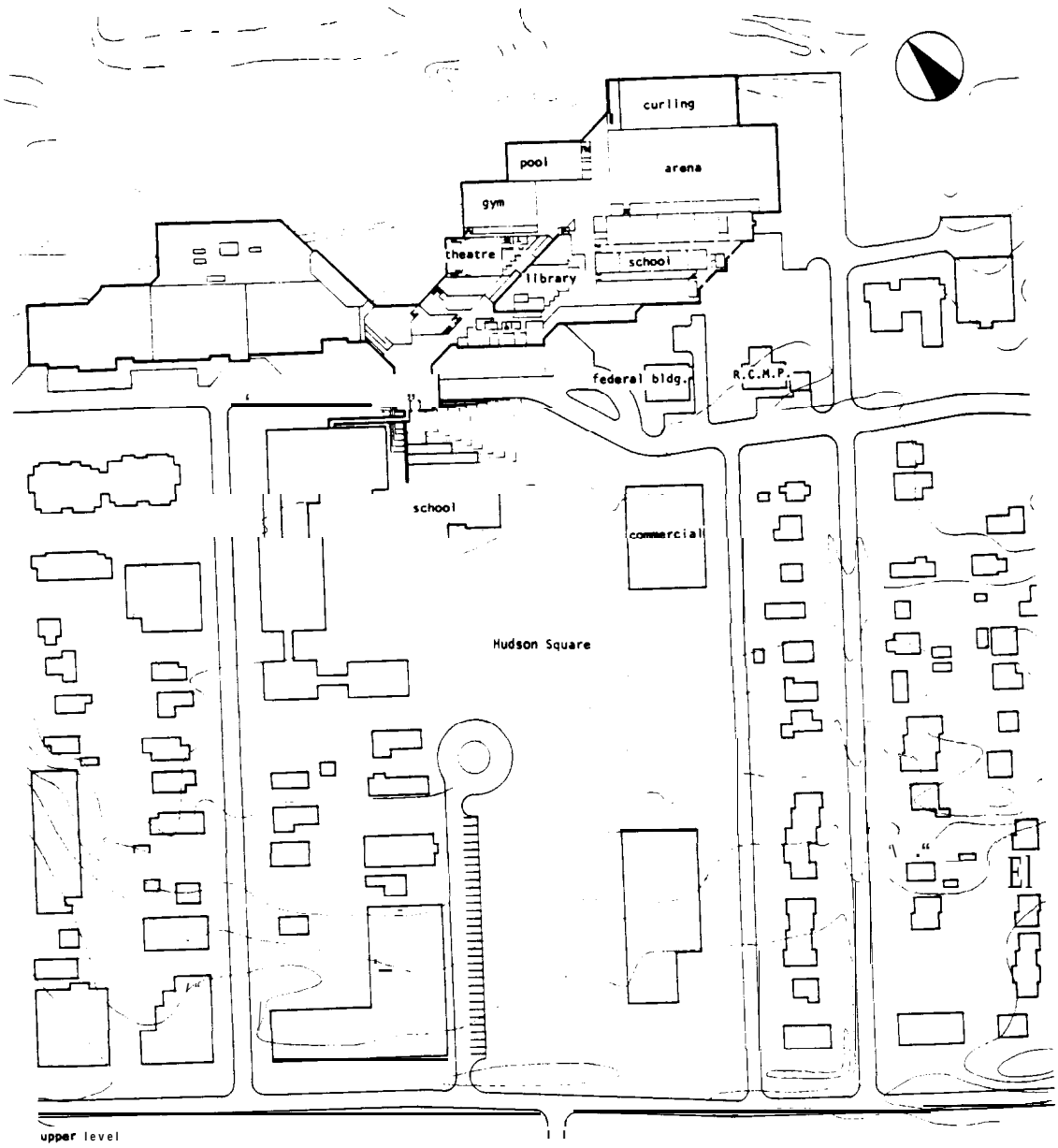
Hudson Square is central to the existing town, with housing immediately adjacent to it. The town centre building, by virtue of its functions, reinforces the focus of the town on Hudson Square. At the same time, the arrangement of protected spaces on the water side affords distant views and amenable contact with Hudson Bay. The central building which shelters the Square from winds which blow off the Bay, and the new commercial buildings along the east side reduce the expanse of open space and create a sense of enclosure which should make Hudson Square more attractive and usable.

CHURCHILL, MANITOBA



scale 1:2,500

lower level



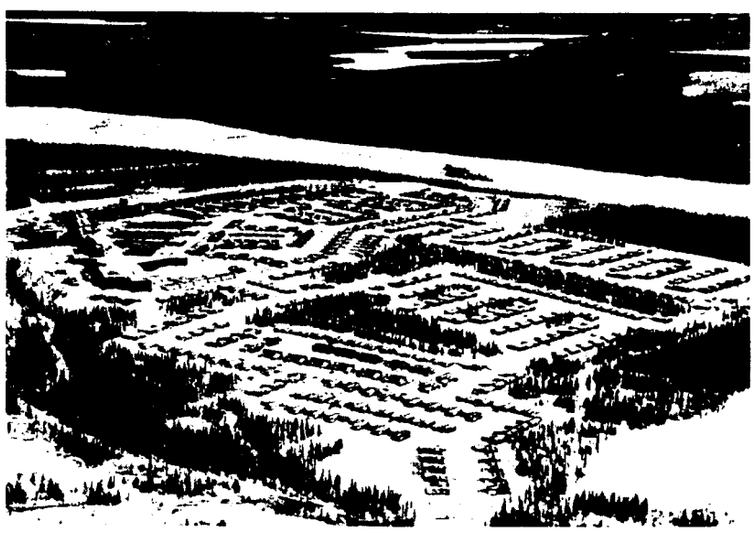
upper level

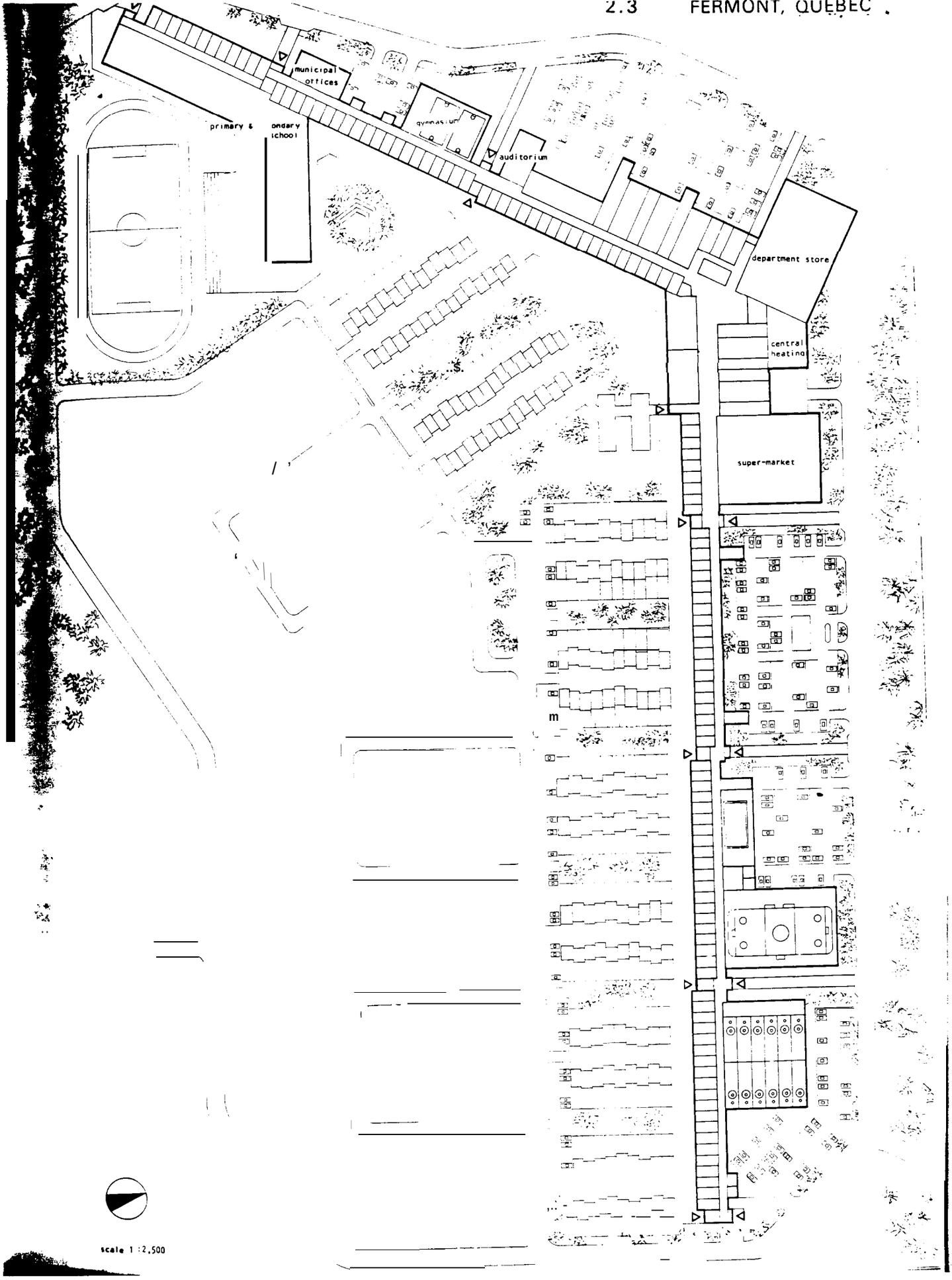
2.3 FERMONT, QUEBEC

Developer: Quebec Cartier Mining Company
Archi tect: Desnoyers Schoenauer
Status: Significant portion completed 1975

Community facilities are along an indoor walkway at the base of the windscreen-building which also contains apartments (see Chaper I). Access is from the main road and parking areas on the no th a d from the pedestrian system on the south of the bui ding

Shopping and commercial fac i ities are at the angle of the build ng where the enclosed walkways widen into a public space Municipal offices, gymnasium, auditorium and school are a ong one wing of the building and recreation facilities are a ong the other wing, Connection between the facil ties is thus alternated. However, there is a possibility of infill with extension for other activities if they are warranted at a future date.




municipal offices
gymnasium
auditorium
primary & ondary school
department store
central heating
super-market
m
scale 1 :2,500

2.4 LEAF RAPIDS, MANITOBA

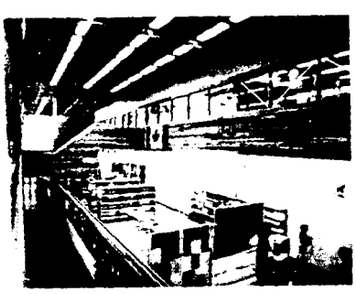
Developer: Leaf Rapids Development Corporation
Architect: Leslie J. Stecheson
Status: Opened 1974

The town centre of Leaf Rapids accommodates, under one roof, all the community facilities. The design criteria emphasized ecological preservation and integration of facilities, socially and culturally, as well as physically.

A study during the design process indicated that a single building combining all functions could include climate controlled public space without exceeding the total cost of separate buildings for each facility. The integrated uni-building produced the following advantages:

1. comfortable access to all community functions in protection from inclement weather conditions;
2. grouping of functions to encourage maximum inter-use of facilities, i.e., recreation by the school; kitchens by hotel and hospital; school by community groups; theatre for commercial school and community use;
3. compact building grouping to reduce land coverage and tree cutting;
4. housing the facilities in a single building enclosure to minimize operation and maintenance costs;
5. inter-use of mechanical components in the event of breakdown in any one section of the building.

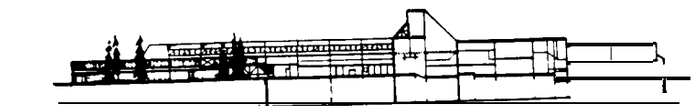
The building is planned in four quadrants around a mall system which focusses on the interior "Town Square". Extensions for future facilities are foreseen along the mall system and specific functions can expand out from the centre, e.g. the hotel, school and recreation complex.

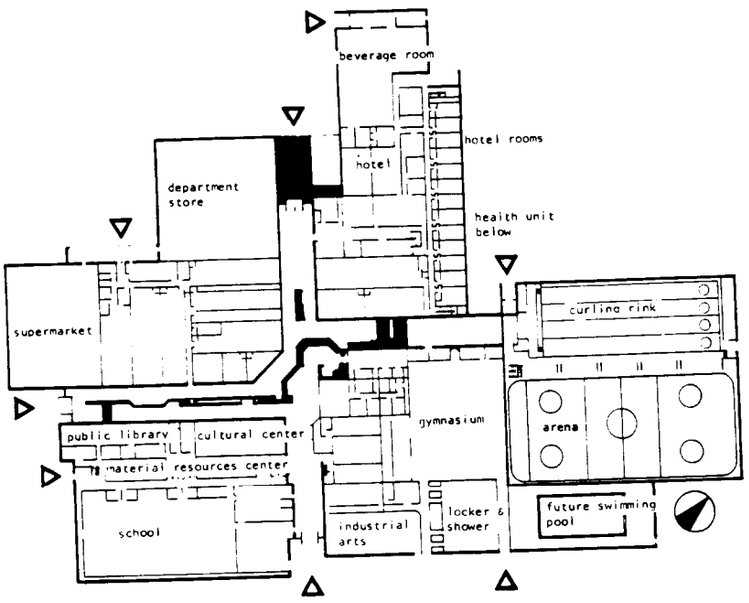


The complex steps down the east slope of the site. The low-angled winter sun penetrates the heart of the building through clerestories, the mall and Town Square catching south and west sun. Different levels, modulation of spaces, and the changeable characteristics of natural light create a variety of visual experience which is enhanced by the use of colour, natural woods and planting.

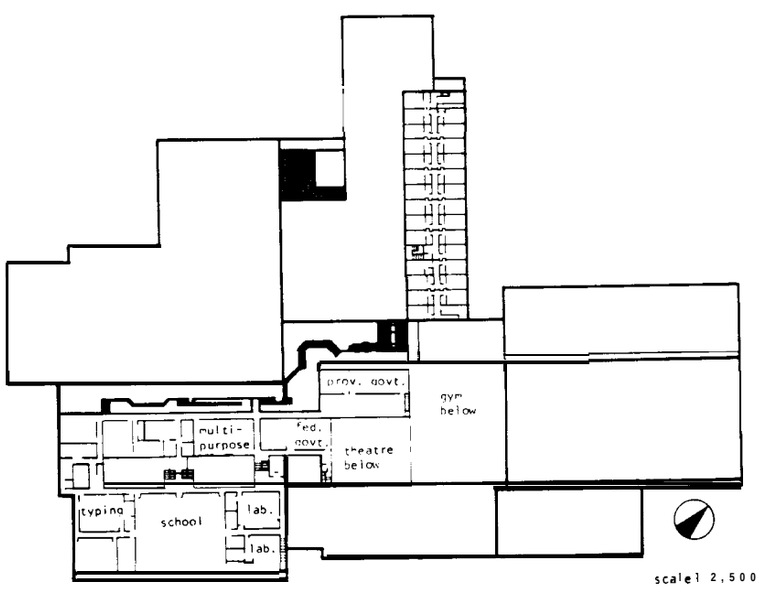
At the focus of a network of lighted pathways, the centre is a maximum of one mile from all existing housing. Outdoor

active recreation areas are immediately adjacent (see plan Chapter 1). Vehicular access is from the main road and separated from pedestrian access. Extension proposals for the town centre complex include apartments"





Lower Level



scale 1 2,500

Upper Level

Developer/Architects: City of Noril'sk,U.S.S.R.

The city of Noril'sk is at the 69th parallel in Siberia. An area of extension to house 50,000 people on 100 hectares was the subject of a competition in 1965. As a result three types of structures were selected, to be linked by covered pedestrian ways:

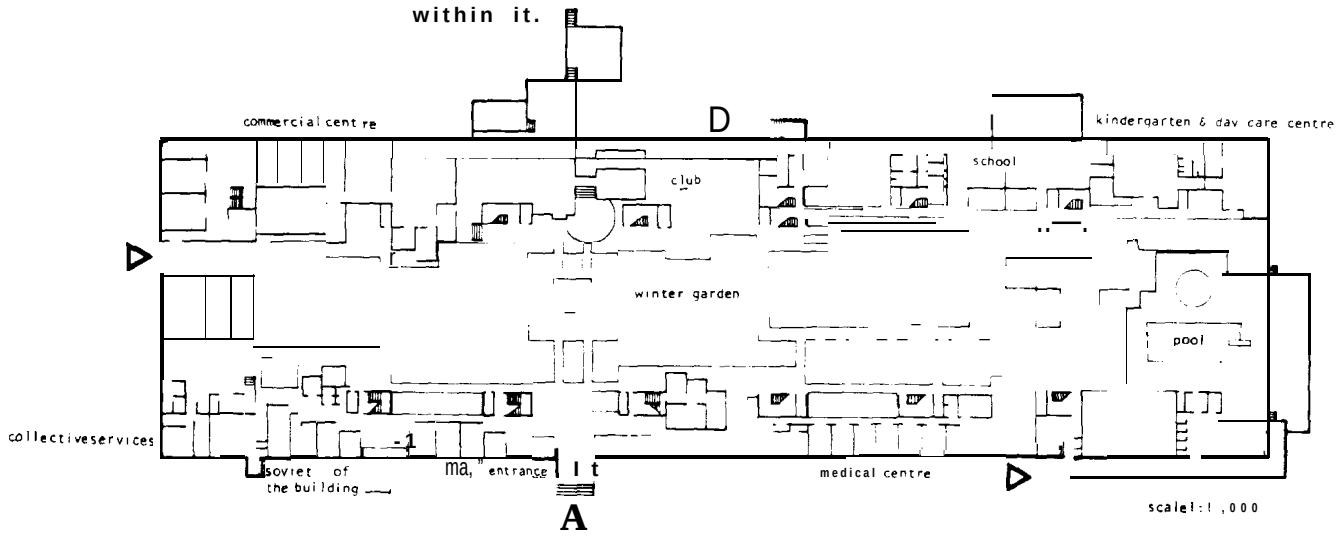
- 5 storey linear buildings, with a wintergarden on the roof;
- 26 storey pyramids;
- 16 storey "boulevard" buildings.

Illustrated here are the last two types, both of which are designed around an interior wintergarden with housing on the perimeter of the structure.

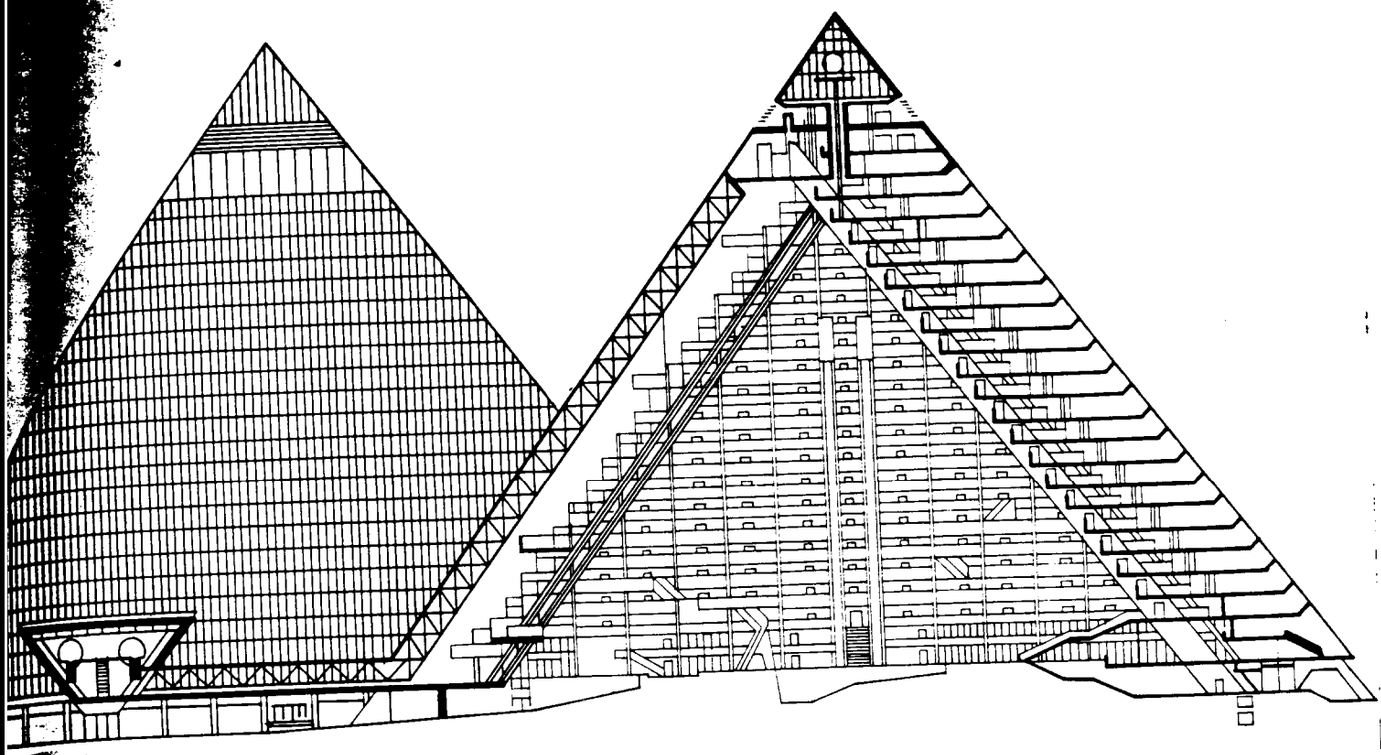
Each pyramid is intended to house 1,000 to 2,000 peep e. The structure has dwelling units on three sides - the north side being glazed to admit light to the central area. The wintergarden and recreation facilities are at ground level of the central space. The first two floors of the building contain communal facilities, twenty floors are for housing, and mechanical equipment is at the top of the structure. The shape of the building is derived from criteria for structural stability, maximum exposure to sunlight, least wind resistance, and enclosure of climate controlled, communal space.

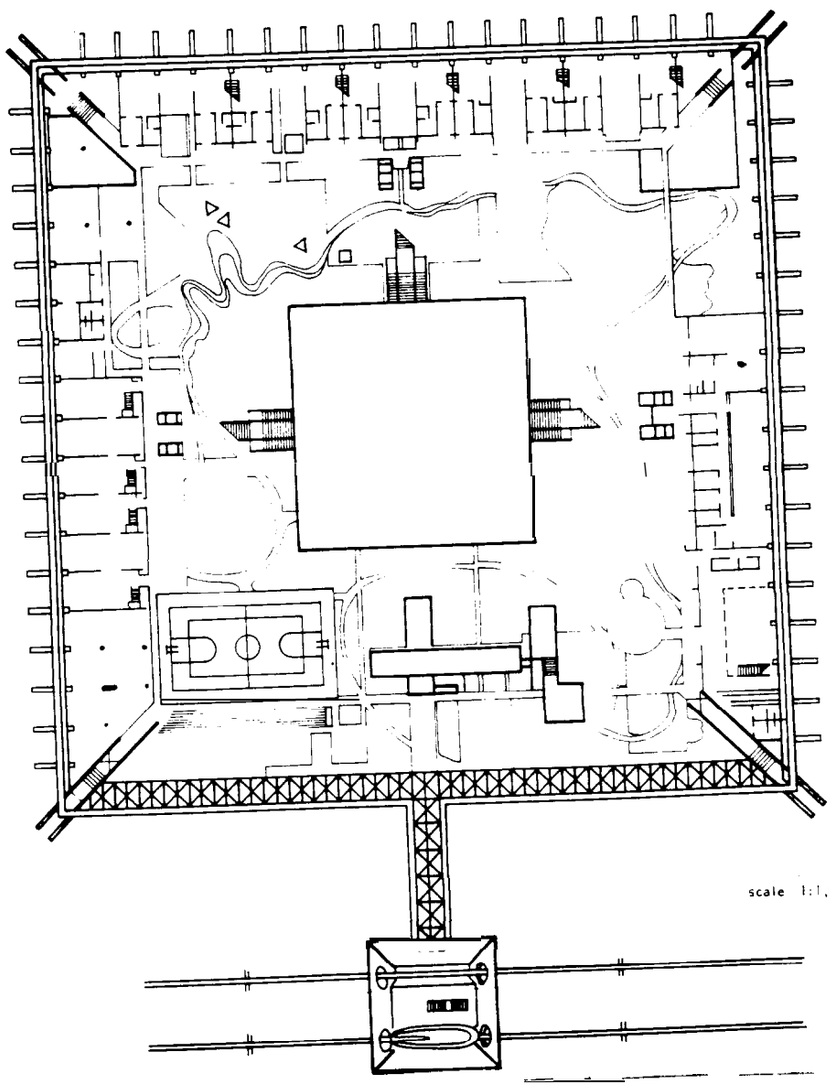
The central space of the "boulevard" building is open the full height of the structure. The end walls and part of the roof are glazed to admit sunlight. On either side of the boulevard, at the upper levels, are apartments running the length of the building, with access galeries overlooking the boulevard.

On the ground floor, gardens and recreation spaces are bordered by community facilities. The large space is articulated by changes in levels and the volumes of smal' structures within it.



5 NORIL'SK, U.S.S.R.





scale 1:1,000

2.6 RESOLUTE BAY, N.W.T.

Deve loper: Department of Public Works, Government of N.W.T.

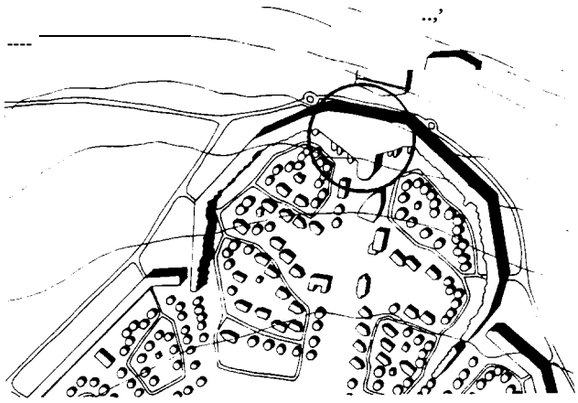
Architect: Ralph Erskine

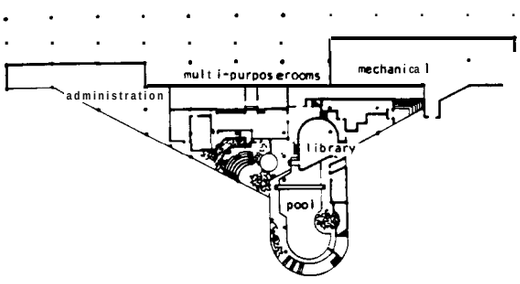
Status: Under construction

The town centre is designed as part of the perimeter windscreen bui lding, which also includes apartments, row houses and a hotel. The aim is to concentrate common functions in one location in order to maximize potential social interaction. Erskine felt, however, that it was equally important to provide for the possibility of withdrawal and privacy: public space should be such that interaction is not forced. This is the reason for arranging public space so that activities such as shops, restaurants, recreation and library arealong one side, the other side being open to public gardens and a view of the town. The indoor gardens break up the publ c space into sma ler, semi-secluded areas.

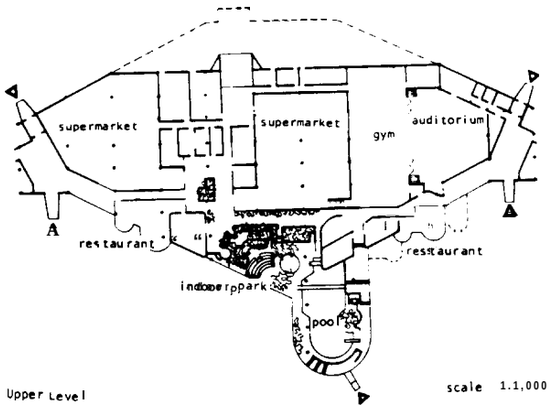
The inclusion of pub ic gardens n the centre may be regarded as an extravagant concession to southerners who have not adapted to the north or alternatively, as a means of enriching the daily experience (and perhaps the diet) of all those who live in the town. Part of the space is, in effect, a greenhouse where vegetables and flowers may be grown.

Outdoor play and recreation areas are in direct contact with the town centre. The perimeter build ng is des gned to improve the microclimate so that outdoor public space becomes more useful for activities that cannot occur indoors. The community is sufficiently compact that people can easily move about in it, outdoors as well as within the protection of the perimeter building.





Lower Level



Upper Level

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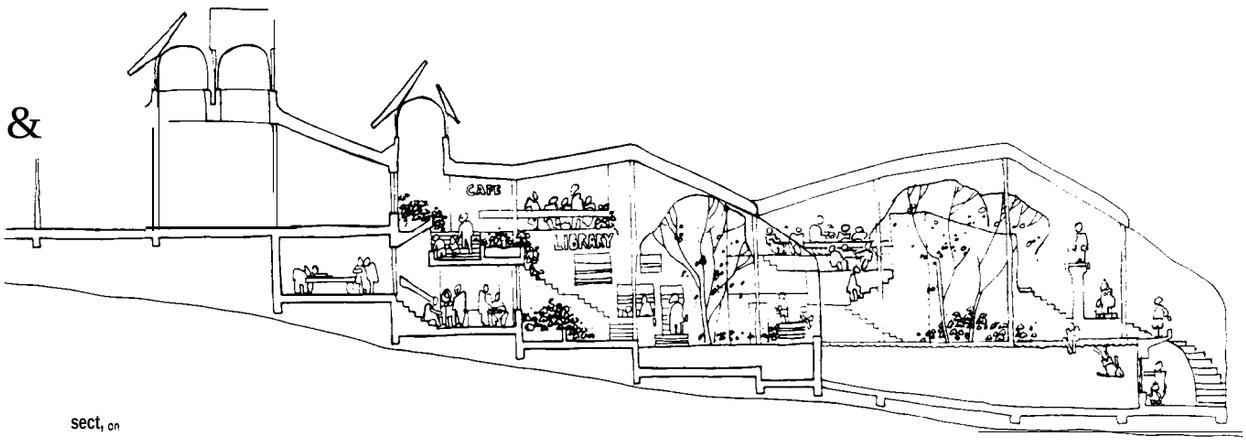
&



sect, on

2.7 SVAPPAVAARA, SWEDEN

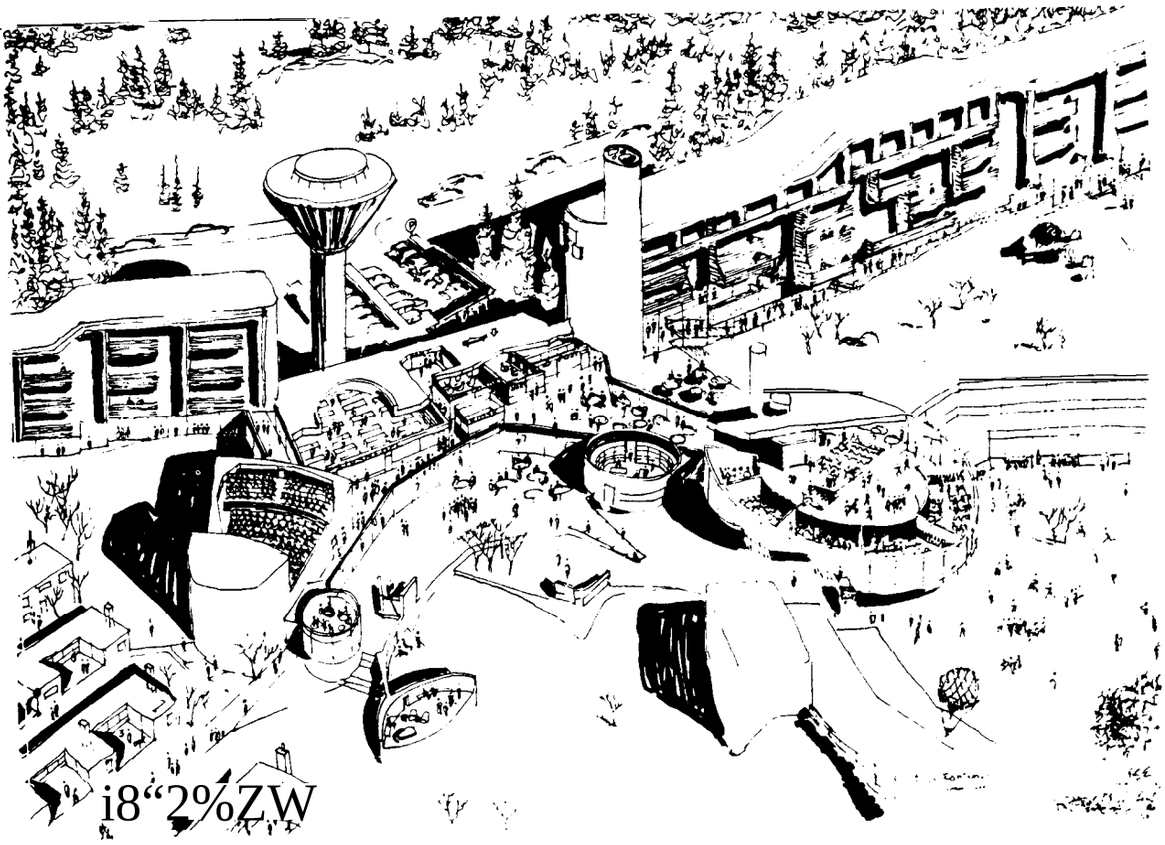
Developer: LKAB, a national mining company
Architect: Ralph Erskine
Status: Not yet constructed

The town centre is at the juncture of perimeter apartment buildings which serve as a windscreen. Pedestrian access is from the south in the lee of the windscreen and from enclosed passages at the base of the apartment buildings; vehicular access is on the opposite side of the buildings

The centre contains all the community facilities - school, recreation, shopping, offices and administration. These various functions are articulated in the structure, which is terraced into the slope and reaches into the central public open space. Linking the specific functions are a series of enclosed public spaces which look out onto the community through glazed walls. Visual y, these spaces flow into the protected terraces and ga dens embraced by the building form.

The Svappavaara town centre exemplifies the design philosophy of the town itself which is based on protection from severe weather and maximum use of the outdoors; strong communal contacts and varied degress of individual privacy; maximizing the winter sun and minimizing the midnight sun of the summer months; and at all times, a direct contact with nature.

2.7 SVAPPAVAARA, SWEDEN



2.8 UNIVERSITY OF ALBERTA STUDENT HOUSING

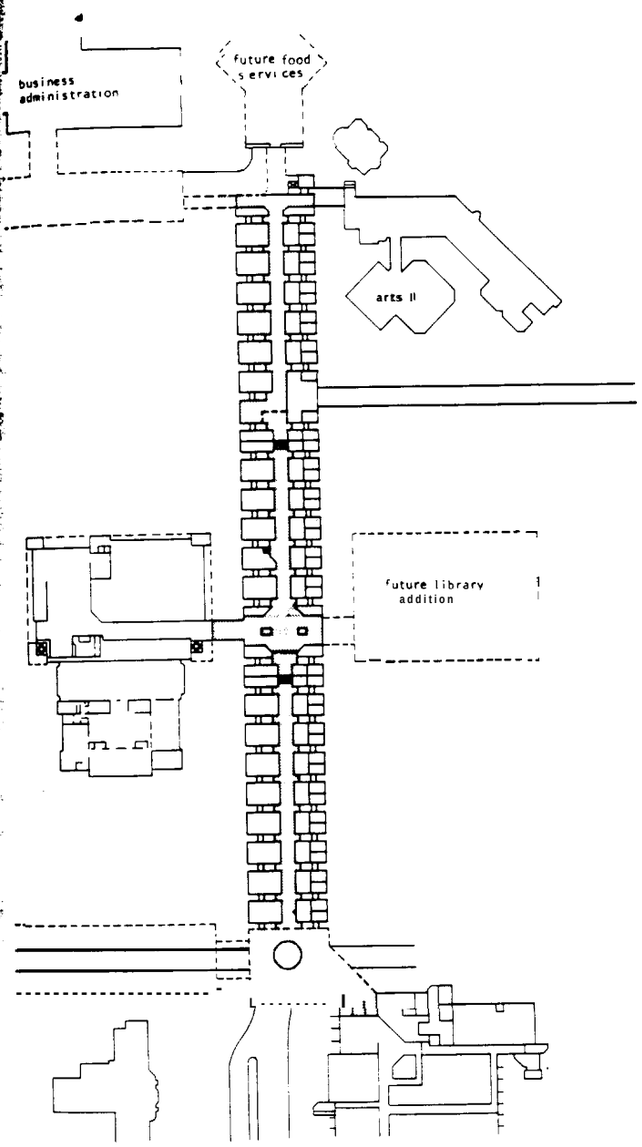
Developer: University of Alberta Students Union , Edmonton
Architects: Diamond & Myers
Status: Completed

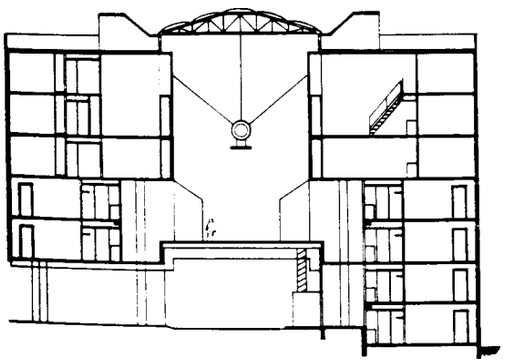
Buildings on the University of Alberta campus are dispersed by the grid of streets, by parking lots and by a network of open green space. Access between buildings in the sub-arctic winter is far from comfortable. Diamond & Myers, in their long range plan for the campus, propose that this problem be solved by constructing buildings over street rights-of-way, linking existing and new buildings with an all weather pedestrian network. Reclaiming the space above streets for buildings allows a greater density of building without loss of useful open space; well defined greens will provide alternate fair weather paths which the architects consider as important as indoor concourses.

The student housing bui ding was the first demonstration of the plan. Some aspects of its design are applicable to housing and community facil ties in northern communities.

The core of the building is the 950 foot longskylighted galleria. The floor of the galleria, which encloses the service street, houses utilities. The galleria itself is a shopping street, with lounges and cafes along its sides at "street" level and housing units above (described in Section 3.17). Most units have both an outdoor and indoor view. Since living rooms overlook the galleria, there is some problem of noise in the dwelling units. It has been alleviated by carpeted floors and acoustic-sprayed ceilings in the apartments, but it was decided not to carpet the galleria itself.

Because of the linearity and repetition of the plan and because only one side of the apartment structures is exposed to the weather, the building was quite inexpensive, particularly considering the amenities it affords. The galleria can be connected to future buildings almost anywhere along its length.


business administration
future food services
arts II
future library addition



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3 HOUSING LAYOUT

Recently constructed housing in the North ranges from simple log houses to sophisticated apartment buildings. Very few of the examples in this chapter meet the desirable conditions for the satisfaction of human needs and for efficient servicing and energy conservation which appear in Volume I of this study. However, many embody design concepts or technical elements which might be incorporated in new housing in the Mackenzie region. These span from the spatial arrangement of traditional housing to the forms which derive from factory fabrication and a recognition of energy conservation.

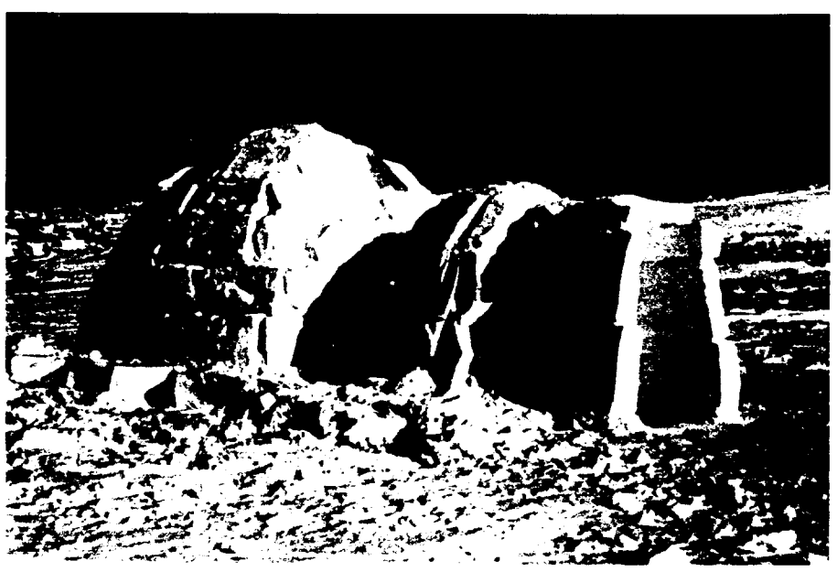
The scale of the drawings in this chapter is 1:200.

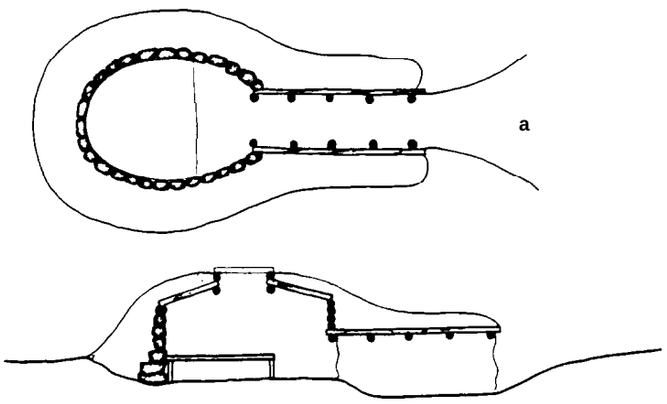
3.1 TRADITIONAL HOUSING FORMS

Traditional native dwellings in the western arctic are generally built around a central open living space. Usually there is a raised platform for s tting or sleeping.

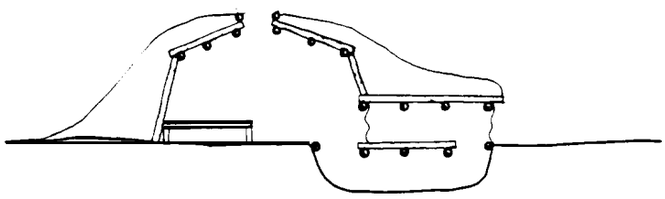
Access is via a tunnel with changes in elevation and door flaps of animal hide. This acts as a heat trap. In the examples shown here insulation is gained through massive construction - with snow in the case of the igloo or sod in the others. The sod houses are Alaskan native houses, The first uses piled rocks for structure, the rest drift-wood, whalebone or smal 1 poles. House 3 hasanalternate summer and winter entry. Houses 4 and 5 include a storage room at the entrance.

Igloo





Sod house 1



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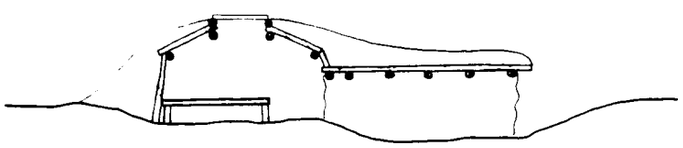

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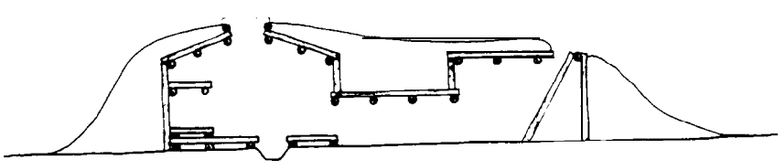

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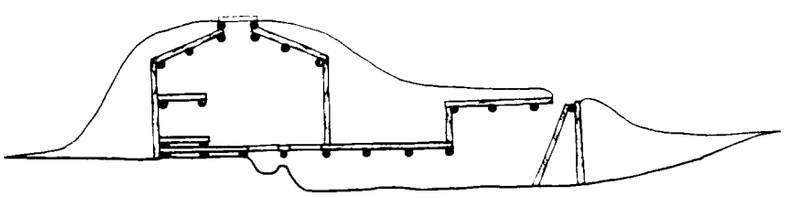


5

H PLAN

The H-Plan was developed for natives by the Alaska State Housing Authority who employed a Danish architect, Vetle Jorgensen, to investigate local ethnic needs and to prepare designs. The plan was based on numerous visits to villages, discussions with local people and observation of how they were living in existing dwellings.

Maximum flexibility in use of the space is achieved by concentrating the service elements - bathroom, kitchen, heating and storage - so that the remaining space can be used with or without partitions. At night bedrooms can be partitioned. During the day they can be left open for greater spaciousness or for supervision of playing children.

The first four variations shown here are wood frame construction - 2(IO of these were prefabricated at Bethel, Alaska. The last employs rammed earth - demonstration units were built at Kotzebue and MountainVillage, Alaska. Variation D has ordinary bedrooms for movable furniture. The others have built-in benches for sitting or sleeping.

LOG HOUSING

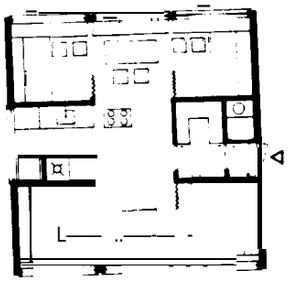
In an effort to improve housing in remote villages, the ASHA, along with the Alaska Health Research Centre and private consultants, studied log house construction methods and planning and introduced the three plans shown here. Traditional log cabins in Alaska usually are built directly on the ground and are subject to rot, heaving and sinking. These plans are designed for pile foundations.

The living space in houses A and B is very open, with bedrooms along one side so that the plan can be oriented well to local conditions. House B has no entry vestibule - a basic essential in northern housing. Only house C has two exits - another essential , though windows could be used as emergency exits in the other models.

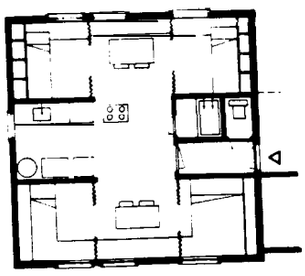
REMOTE HOUSING

These plans are based on a central living area insulated by bedrooms or storage on either side - rooms that do not require as high a temperature as the living space.

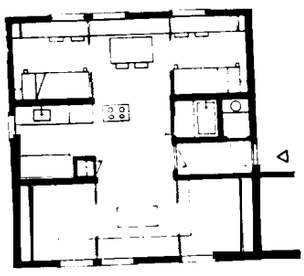
Other plan types in this program are described in the ASHA publication "Alaska Remote Housing Implementation Plan".



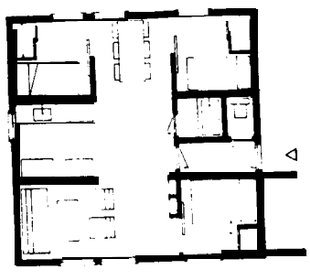
A



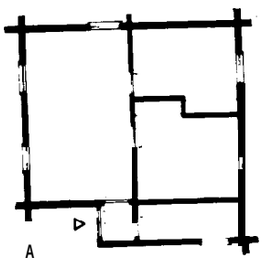
C



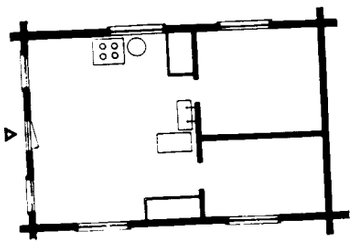
B



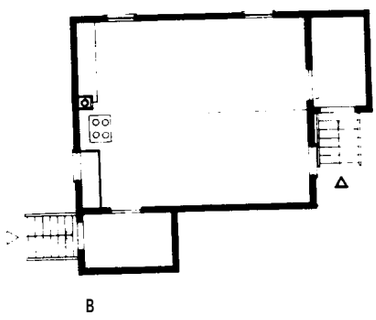
D



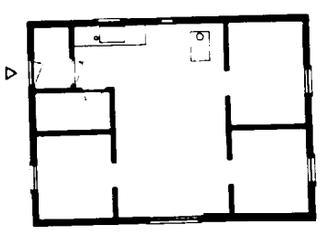
A



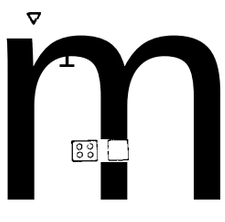
C



B



A



B

3.3 GOVERNMENT OF THE YUKON TERRITORY

This is a well serviced and spacious house for areas where basements can be built. The basement can be converted to an extra apartment. Planning of the unit is not exceptional - there is a lot of space lost to corridors on both floors. Entry vestibules are not shown, though with minor changes they could be bui l t in. Like typical "southern" houses, there is little opportunity for alternate use of bedrooms as living space, or of part of the living space for sleeping.

The placement of windows on only two opposite walls probably simplifies construction and may allow better orientation than if all walls contained openings.

3.4 ONTARIO HOUSING CORPORATION

This is a bas c plan which can be extended from three to four bedrooms As in the Yukon house the plan is fixed, allowing litt e flexibility in the way the house is used. Rooms are much smaller and there is less storage space in the bedrooms, but ample bulk storage is provided and the entries seem well protected.

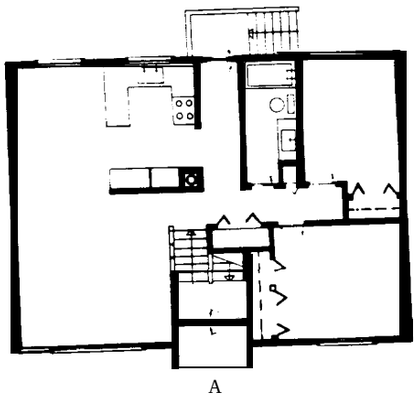
The houses are prefabricated and delivered to the site in two sections which are completely finished and include equipment. The houses are split lengthwise in the 12-foot width maximum for highway haulage. With this system housing conditions in remote areas could be upgraded at reasonable costs.

3.5 COURT HOUSE

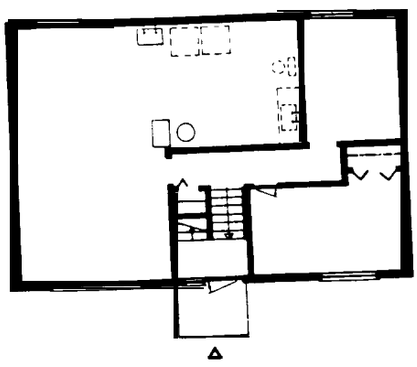
Architect: J.W. Francis

These designs were made by J.W. Francis, former Chief Architect for the Department of Indian Affairs and Northern Development. The concept is based on accessibility of open space and greenery to a house in the north. A central courtyard, enclosed by a skylight, fulfills that function. Unfortunately, circulation depends on a long corridor. It is not clear why the courtyard could not be used for access to the rooms. The house is raised off the ground in order not to disturb the permafrost and yet the courtyard is shown at grade. Even if plants were grown in containers the ambient temperature required in the courtyard would affect the thermal conditions of the ground.

GOVERNMENT OF THE YUKON TERRITORY

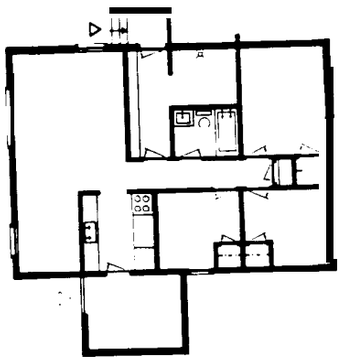


Main floor

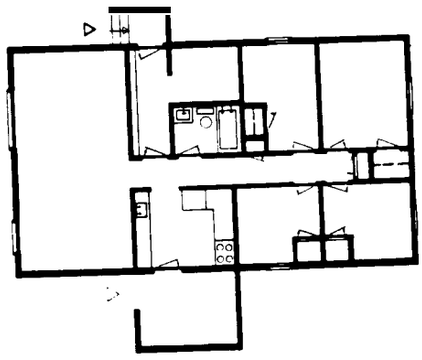


Basement

3.4 ONTARIO HOUSING CORPORATION

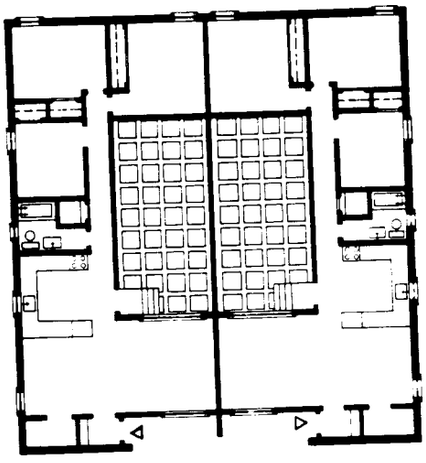


3 - Bedroom unit



4 - Bedroom unit

3.5 COURT HOUSE



3 - Bedroom unit

3.6 NORTHWEST TERRITORIES HOUSING CO RPORAT ON

The first of these houses, known in some commun ties as the "matchbox", more generally as the "512" bec use of its square foot area, provided a relatively secure and weatherproof shelter for many natives in the north in the early days of government housing. Though it is outdated in size allowance, construction method and services, its open floor plan may continue to make sense - more easily heated than partitioned space, more flexible for varying numbers of occupants (see the 'Dupont House' in this Chapter).

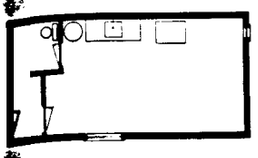
The three bedroom house shown here is common in many communi ties . Many native users of the house have complained that the design is based on southern traditions and lacks sufficient space for a large family. A further complaint is that families of varying sizes cannot be accommodated with a standard three-bedroom house. These problems would perhaps be less severe if planning were more open - closet space along the outside walls rather than in the middle of the house, raised sleeping platforms, movable partitions. There have also been numerous complaints about the quality of construction and services. The water tank, because floors were not strong enough to support it elsewhere in the house, was located in a storage room near the outside door (which had no heat trap vestibule) and was often frozen.

The newer four-bedroom house, thoughagain mainly a "southern" plan, solves some of these problems - better protection of the water tank and pipes, more storage space, a weather lock at the rear door (the "main" entrance still unprotected), and better quality construction, finishing and services. 'he sleeping area is well insulated from the rest of the house and the size of the rooms is generous, but the plan is fixed - there is no evidence that positioning of partitions can be changed.

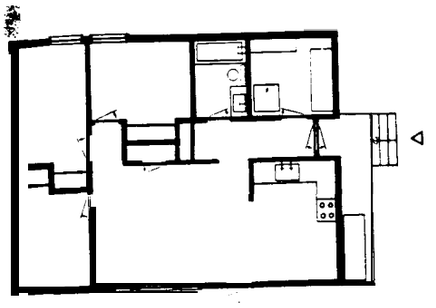
3.7 STRATHCONA SOUND HOUSING -TOWER COMPANY

Architects: Sankey Associates

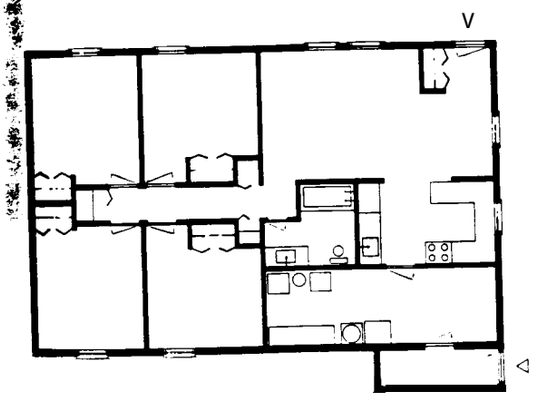
These semi-detached units and rowhouses are based on the panel construction method developed by the Tower Company Ltd. which allows a great deal of flexibility in arrangement of partitions. The units were designed for a dual



TYPICAL 370 A - 1963

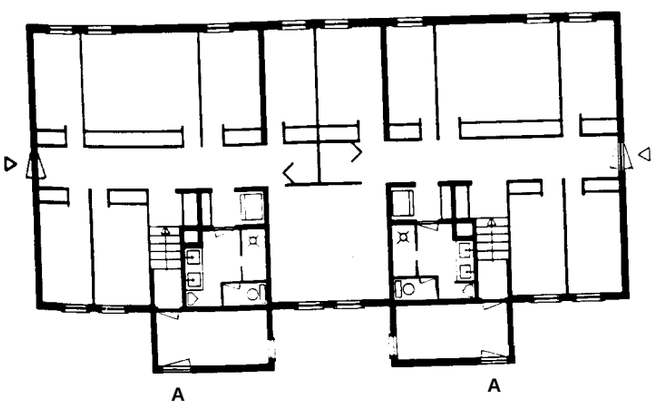


TERRITORIAL LOW RENTAL HOUSE

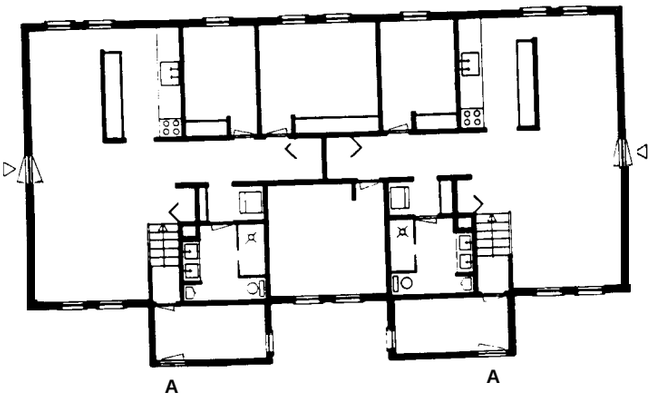


4 BEDROOM HOUSE BY WEBER HOMES

3.7 STRATHCONA SOUND HOUSING-TOWER COMPANY



Final stage



First stage

function. Initia ly they provide dormitory accommodation for workers build ng the townsite. They are converted to family accommodate on by moving partitions and installing kitchens.

Both the semi-detached and row houses are well planned, with fai rly large unobstructed 1 iving space, ample storage and weather locks.

3.8 FERMONT, QUEBEC

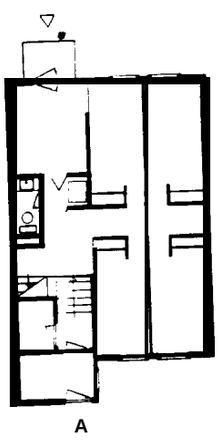
Architects: Desnoyers, Schoenauer

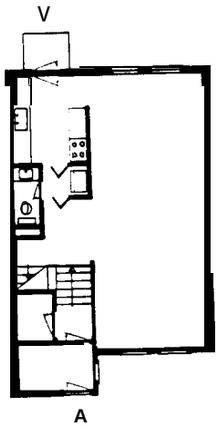
These houses were designed for a new mining town (see Chapter 1), for purchase by employees with a heavy subsidy by the company. All types shown here are three bedroom models.

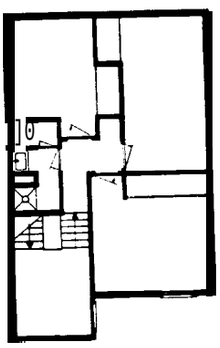
Though the design of the units fixes the way in which they are used, providing litt e or no flex bility in partitioning, they were skilfully planned for conventional use. In the townhouse and semi-detached unit, little space is lost to circulation. Much of the central area in the bungalow is corridor, however, and one of he bedrooms and the bathroom are extremely small.

Attached garages were prov ded for most houses since the residents consider driving an mportant recreation and a means of "getting away".

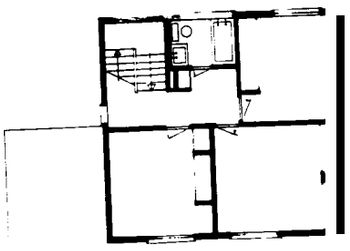
Main entrances are well designed, with heat-lock vestibules and storage space for outer garments.





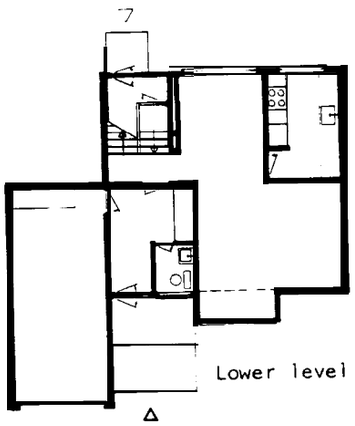


3.8 FERMONT, QUEBEC

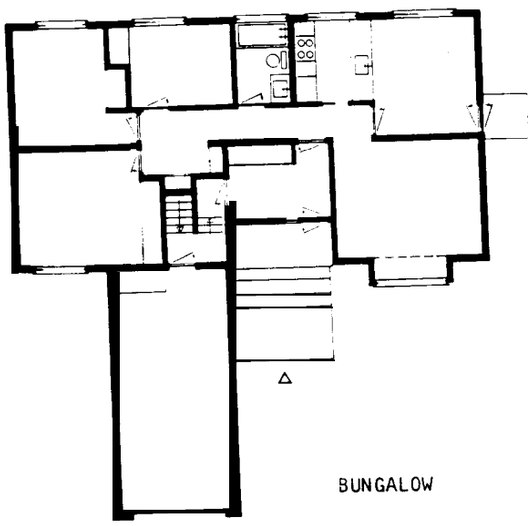


Upper level

SEMI-DETACHED HOUSES



Lower level



BUNGALOW

3.9 FRO BISHER BAY-REPLACEMENT STAFF HOUSING

Architect: Moshe Safdie

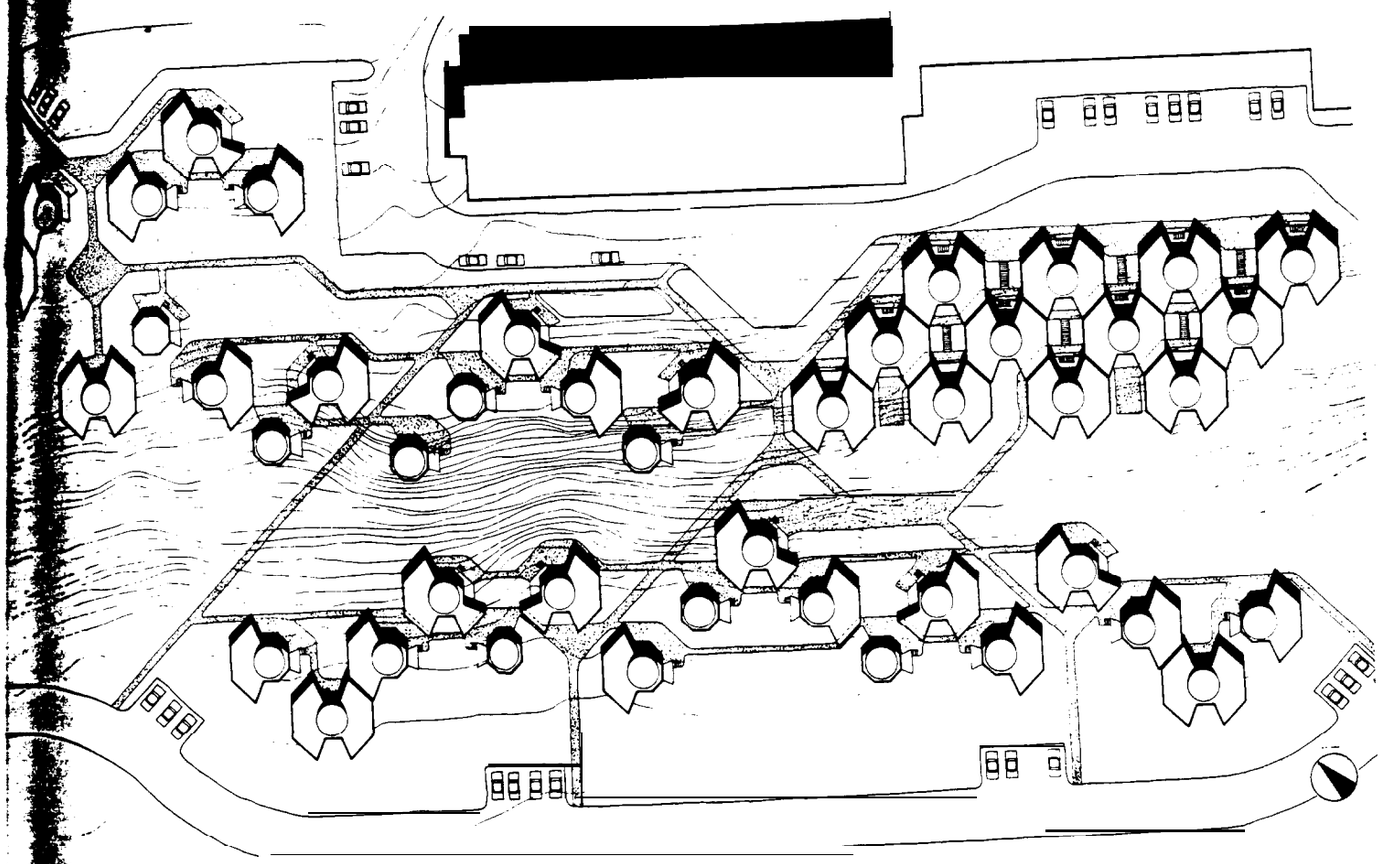
These houses were designed to be prefabricated from structural plywood panels, beams and columns, with a fiberglass covering. They are raised off the ground - to avoid problems of permafrost, to provide protected space under the house for skidoos and other outdoor equipment, and to trap cold air from the entry vestibule. There is extensive inside storage space at the lower level

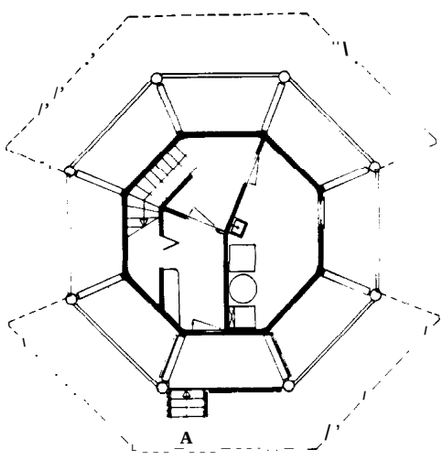
The geometry results from: the requirement for a central living space onto which other spaces can open (common to traditional housing forms); modularity (the units may be joined to one another in a greater variety of ways and in tighter patterns than if they were rectilinear); flexibility of plan (segments can be left out to provide balconies or enclosed for additional living space, the dining room could be enclosed for an extra bed or a bedroom could be opened up to increase living room).

Despite the advantages, the geometry results in corner spaces that would be difficult to furnish. Circulation from one part of the house to another is mainly through the living area. The practicality of the indentations in the plan is questionable. They increase the surface/volume ratio, are likely to cause air turbulence and heat loss, and complicate construction.

Except for the kitchen, windows are on walls protected from direct exposure. The central area receives daylight through a large double acrylic dome. At night, light from the interior would glow through the dome, having a similar cheering effect outdoors to that of a glowing igloo.

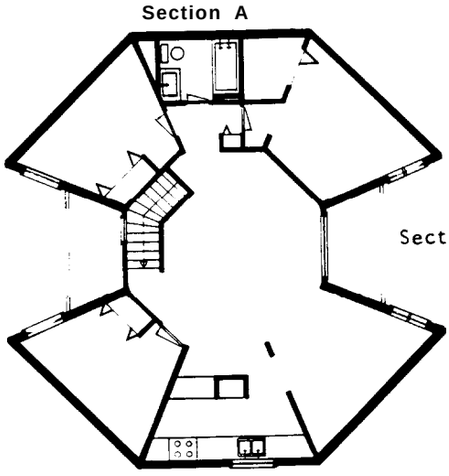
FROBISHER BAY —REPLACEMENT STAFF HOUSING





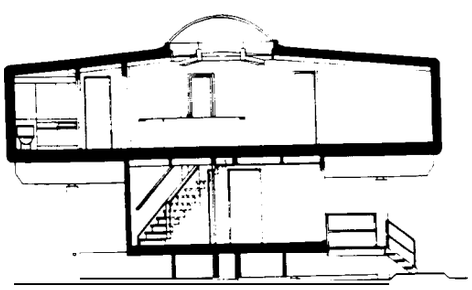
Lower level

Section A

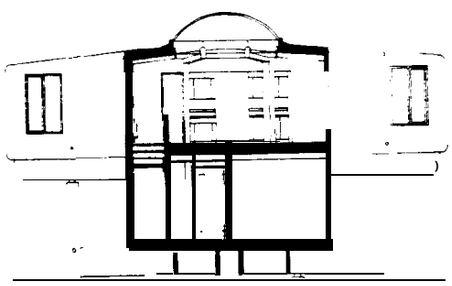


Section B

Upper 1 eve



Sect ion A



Section B

3.10 CHURCHILL, 20 UNIT APARTMENT BUILDING

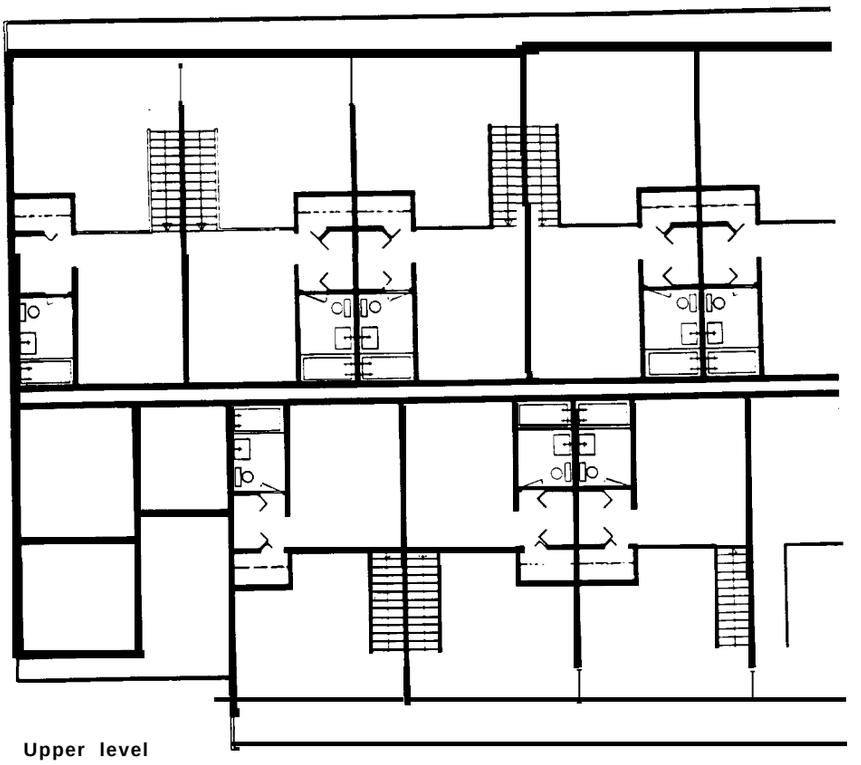
Architects: The Churchill Consortium

This apartment building is unusual (especially in the north) in that the building vo ume is designed to create good liv- ing space. The sloped roofs not only minimize wind resis- tance of the building (although there is likely to be turbulence at the eaves and clerestory), they also create great spaciousness, light and variety in the one bedroom apartments. The simplicity and clarity of the structure must result in economy.

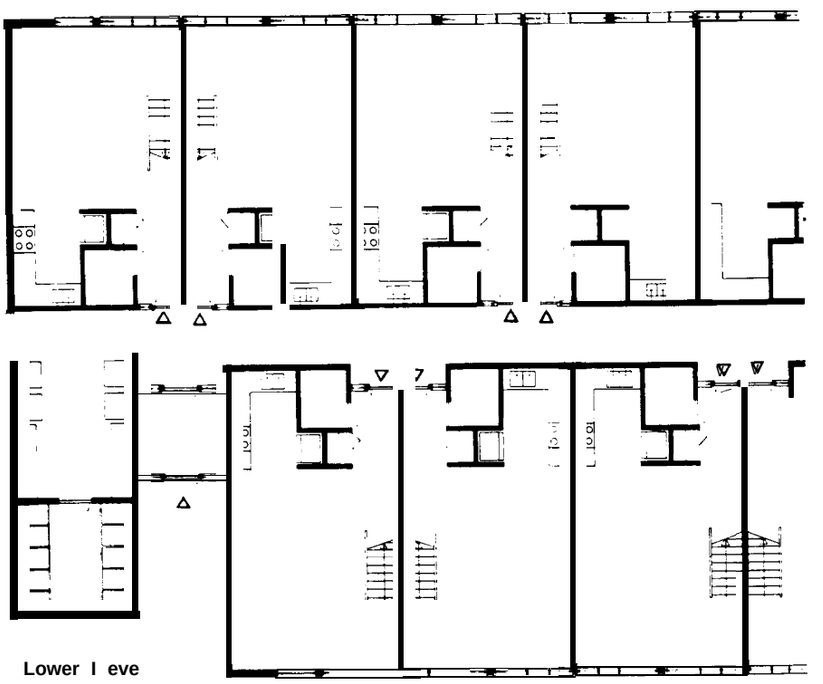
Planning of the units, al l one-bedroom, is consistently clear - services are concentrated along the centre of the building allowing free use of the remaining floor space. Storage space is adequate and well placed. Natural ven- tilation is excellent.

The corridor is enlivened by light from the glazed entrance lobbies and by glazing beside the apartment entrance doors. Recessing some of the apartment entrances modulates the corridor space.

CHURCHILL, 20 UNIT APARTMENT BUILDING



Upper level



Lower I eve

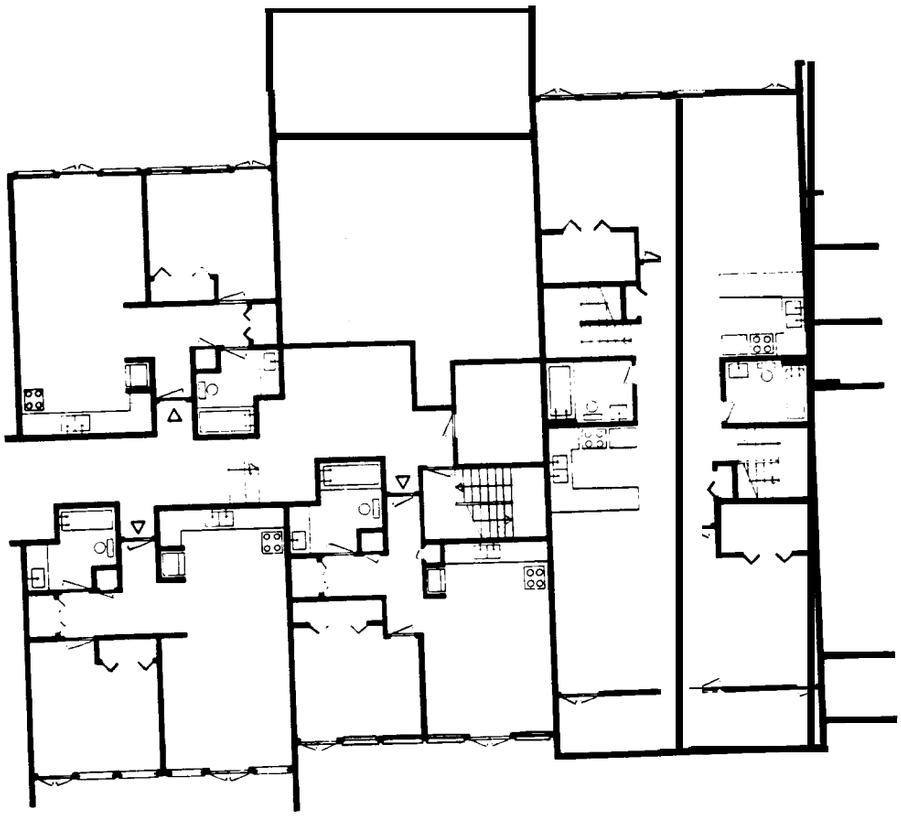
3.11 CHURCHILL, 50 UNIT APARTMENT BUILDING

Architects: The Churchill Consortium

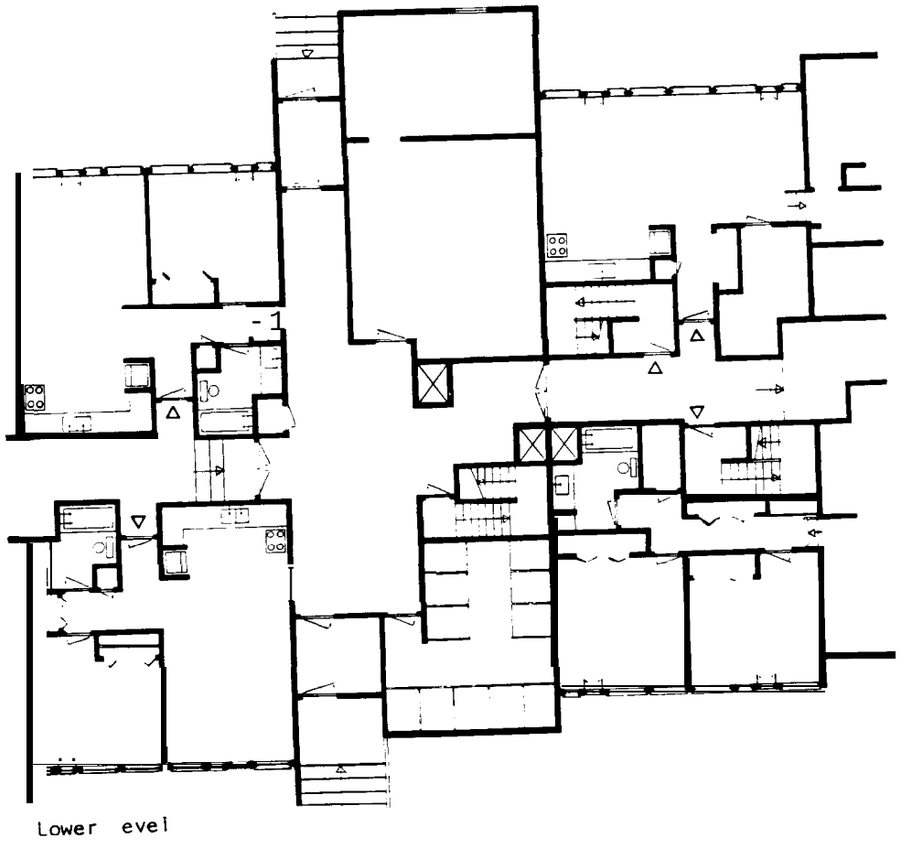
This s a far more complex building than the precedinq e xamp e, with serveral types of one and two bedroom apartments At the lower level the corridor runs the 1ength of th building occasionally jogging in direction and changing elevat on via steps. In-set entrance doors, changes in wa l texture and wall murals further enliven the corridor. On the upper level there is a corridor only in the central portion of the building. Most upper level apartments have their own internal stairs, entered from the lower level corridor. These apartments run the full width of the building.

The corridor changes in direction because the bu ldinq is designed in sections, each of which is off-set f om the next . This makes the building exterior interest ng and creates an identity for small groups of apartments but it has resulted in very complicated planning. As a result, much of the enclosed space seems to be devoted to circulation. Though the floor areas for the one bedroom apartments are approximately the same as in the 20 unit building (previous example) they are much less spacious in character.

ln a plan that is as complex as in this building, provision of emergency exits from each unit is difficult, but it appears to be at least to the standard of conventional apartment planning.



Upper level



Lower evel

3.12 RESOLUTE BAY, N.W.T.

Architect: Ralph Erskine

Designed by Ralph Erskine, these houses are undergoing some modifications as working drawings are prepared by the Canadian associates. Illustrated here are the original designs for the free standing dwellings. Other housing proposed for the new town of Resolute Bay is incorporated in a continuous perimeter wind screen building.

The houses are angled for aerodynamic reasons. Despite a number of tight corner ang es most interior space is usable and it appears possible to arrange furniture reasonably. The planning minimizes cor idor space and the living area seems spacious and open.

In the one storey house the two outside doors are close together. An emergency exit would be more useful at the opposite end of the house from the main entrance.

The structure allows interior partitions to be moved. In the first stage of the new town development one of the bungalows is to be used as a classroom.

One storey and two storey houses are to be built, presumably to test the effectiveness of each.

3.13 SVAPPAVAARA, SWEDEN

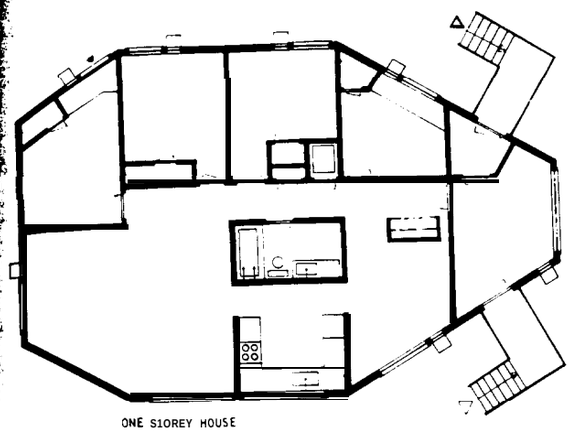
Architect: Ralph Erskine

As in the University of Alberta student housing, access to these 3-storey apartments in northern Sweden is by stairs serving two apartments per floor. Thus, all units are the full width of the building and have cross ventilation and a variety of view.

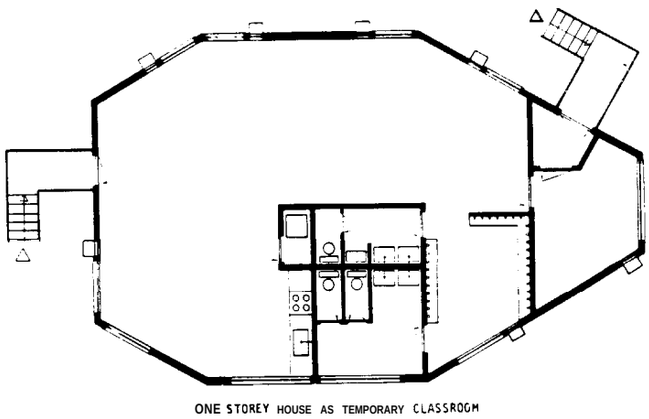
Bedrooms are on the north, living and dining area on the south. The balconies on the south are hung from the top of the building to avoid the dissipation of heat which would result from connection to the main structure.

The layout of the units is very simple and circulation space is minimized.

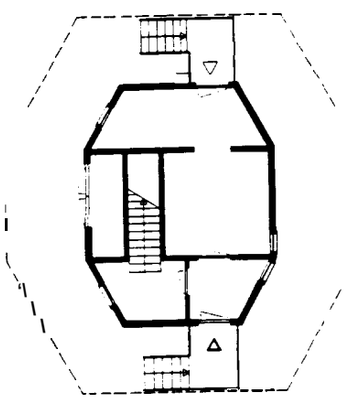
RESOLUTE BAY, N.W.T.



ONE SIOREY HOUSE

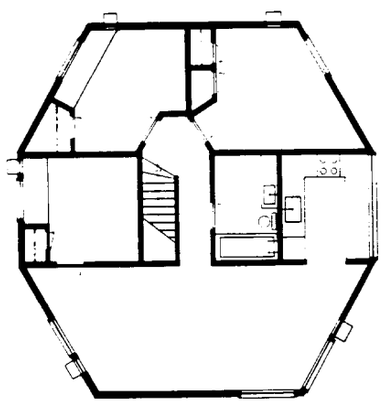


ONE STOREY HOUSE AS TEMPORARY CLASSROOM



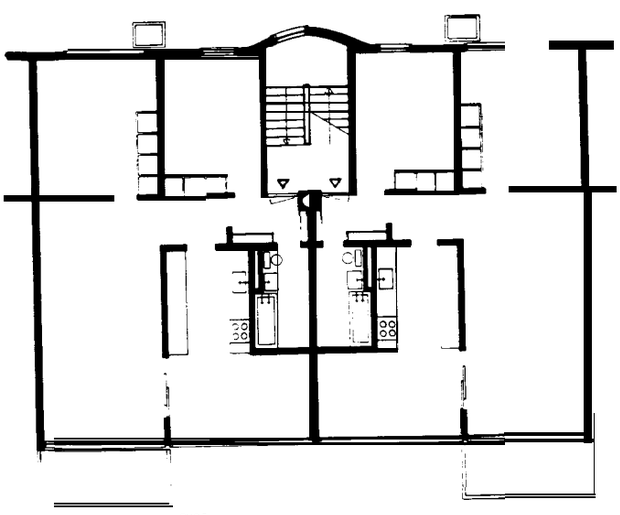
Lower level

TWOSTOREY HOUSE

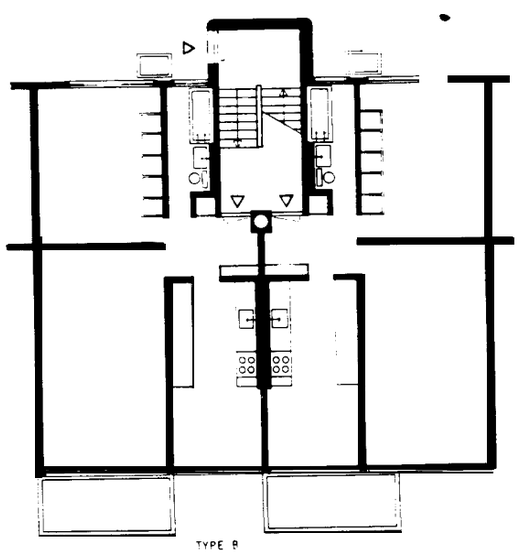


Upper level

3.13 SVAPPAVAARA, SWEDEN

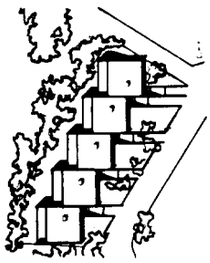


TYPE A



TYPE B

3.14 TAPIOLA, FINLAND

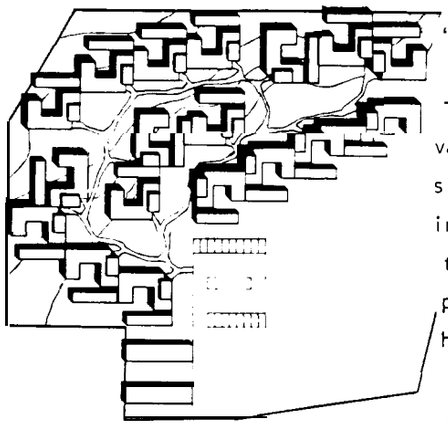


The town of Tapiola is at latitude 60°10' and located 6 miles from the centre of Helsinki. The Asuntosaatio Housing Foundation was constituted in 1951, and in the same year it acquired the 670 acre rural site for construction of a model "garden city". The Housing Foundation initiated, designed", built and continues to manage the town of Tapiola, whose population was 16,000 in 1973. There is a reasonably wide range of income and approximately 90% of the population own their own homes - whether apartments or houses.

The overall density of housing in Tapiola is low, but units are sited in very tight clusters in order to preserve the natural character of the terrain. All buildings in the town are supplied with heating, hot water and electricity from a central plant.

-TERRACE HOUSES

The terrace house has a simple plan with the main entrance and living spaces at the upper level . The set-back of houses in the row increases un t identification and privacy. At the lower level is a sauna which is standard to Finnish housing.

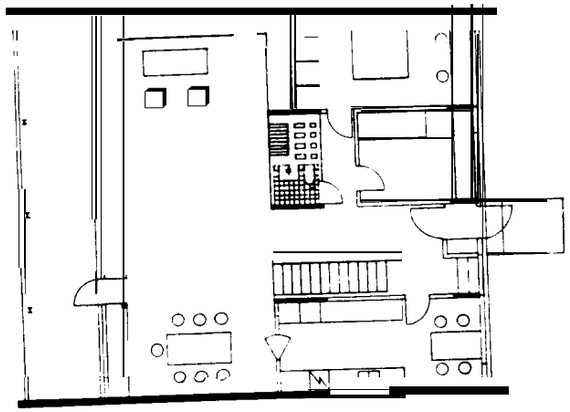


'-PATIO HOUSES

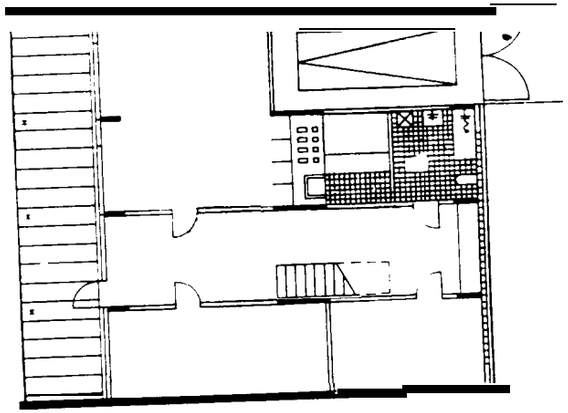
The patio houses can be attached, one to the other, in a variety of patterns The house is generous in its dimensions, yet a high degree of privacy can be maintained even in the high density of siting which is illustrated. In this p an the sauna is contained in a wing which has a protec ed outdoor connection to the main body of the house. This is typical in Finland.

—PATIO HOUSES

Floor plan



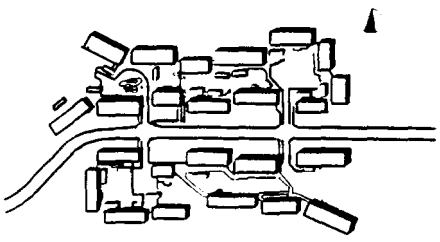
Upper level



Lower level

3.15 JACOBS HAVN, GREENLAND

Architect: Henning Larsen



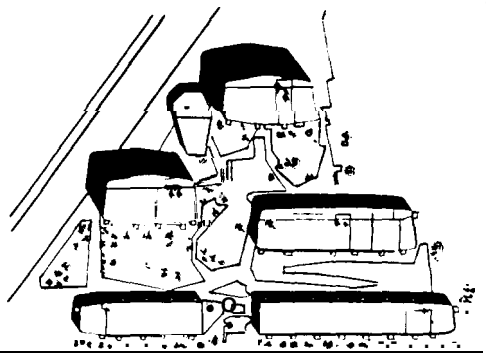
Site Plan

Jacobshavn is a small hamlet in Greenland consisting mainly of single dwellings built directly on the base rock. These rowhouses were designed to fit into the character of the hamlet while increasing the density they can be built singly, in groups or in rows. They employ a Swedish prefabrication system.

The plan is simple and well defined. There is ample storage at the entry, though none is shown in the bedrooms - movable wardrobes probably are the custom. In the case of the bachelor unit the entry vestibule may be too cold for bathroom access. The staircase is more compact than the straight runs or right angle turns standard in North America, but the angled treads are not as safe.

3.16 KIRUNA, SWEDEN

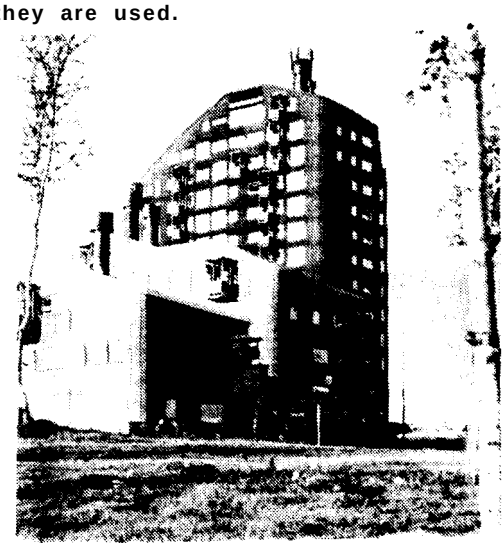
Architect: Ralph Erskine



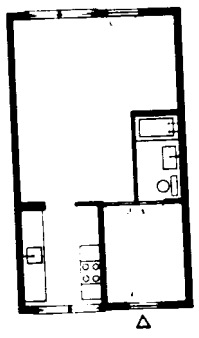
This apartment building is aerodynamically shaped in plan and section to reduce heat loss. The longer side faces south, the shorter side faces north. Balconies are hung from a separate structure to avoid dissipation of heat.

The angle of the walls is slight enough that it does not inhibit use of the interior space.

The two south facing apartments and the one north facing unit have a clear, livable plan, with little unusable circulation space. The planning of the larger end units is not as clear. Since the three smaller rooms are connected and without independent access, it is difficult to see how they are used.

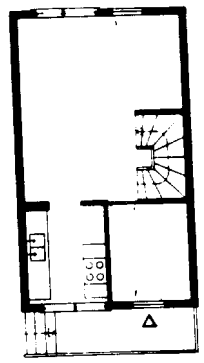


3.15 JACOBSHAVN, GREENLAND



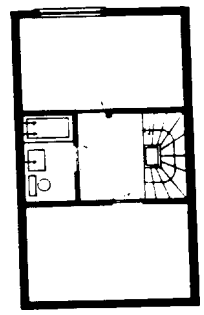
Level 1

SINGLEROOM UNIT

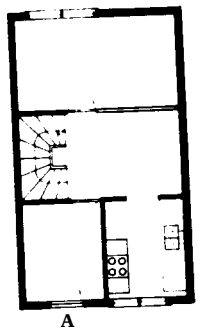


Level 2

TWOBEDROOM UNIT IN TWO LEVELS

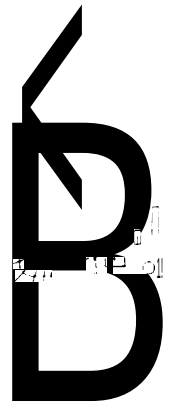


Level 3



Level 1

THREE OR FOUR BEDROOM UNIT



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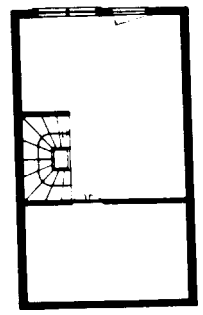
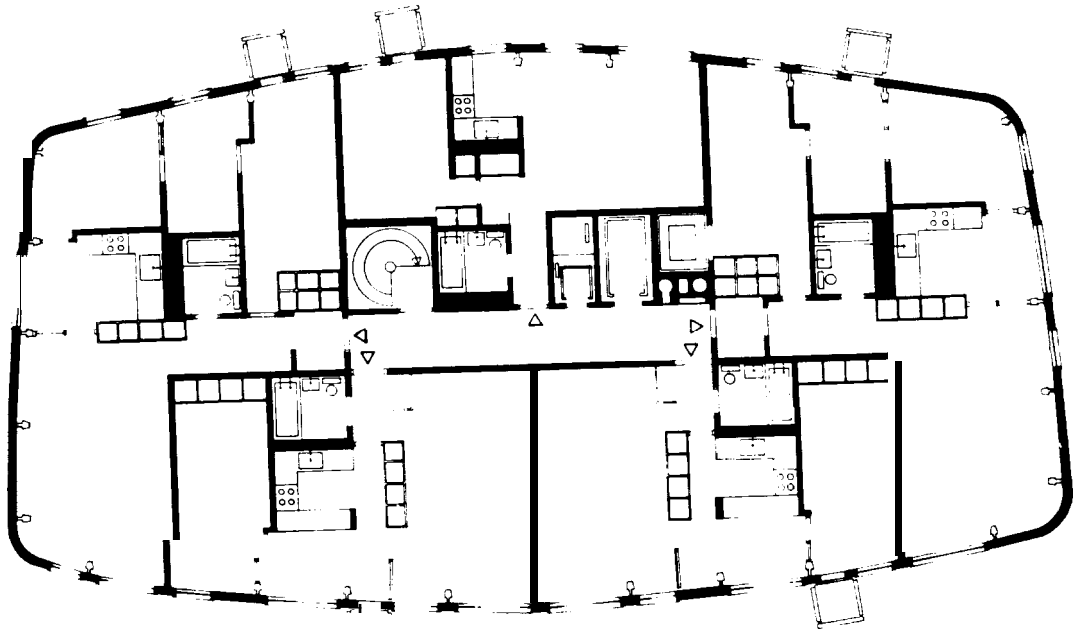


Level 3

3.16 KIRUNA, SWEDEN



Typical floor of apartment building

3.17 UNIVERSITY OF ALBERTA STUDENT HOUSING

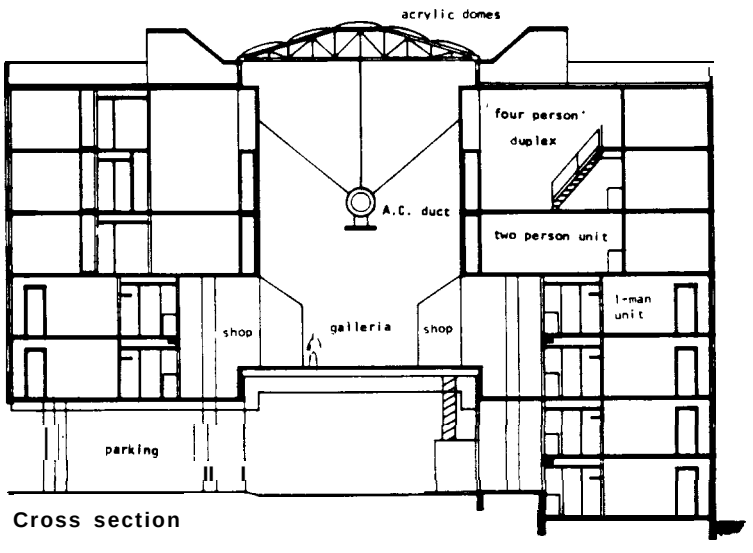
Architects: Di amend and Myers

The total project, of which housing is a part, is described in Chapter 1. The structure serves the multiple functions of providing space for shops, recreation and student accommodation and creating climate controlled circulation through the campus. These features and the characteristics of layout and access to the units are relevant to northern conditions.

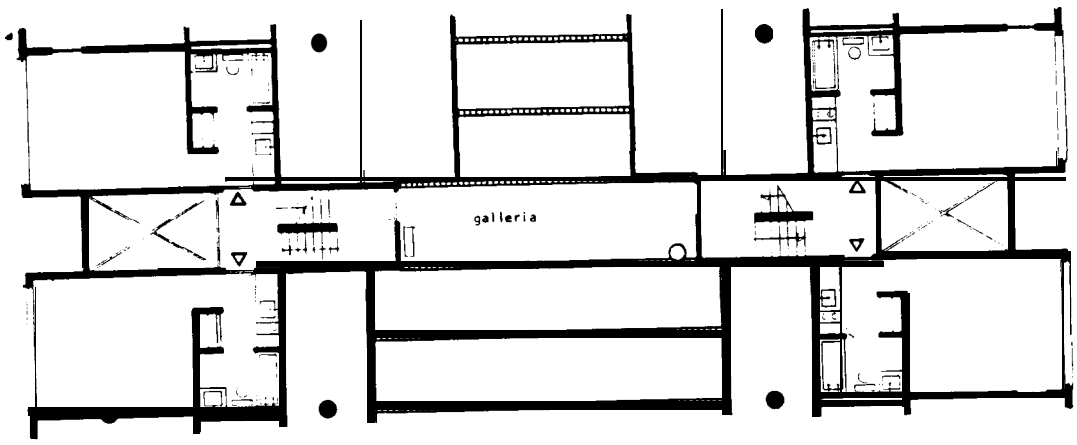
The housing units are designed for one, two or four person occupancy, each unit having its own bathroom and cooking facilities. Access to all units is by stairs from the interior street at level 3. The clustering of units around the stairways eliminates the impersonal characteristics of a public corridor. Since he living rooms face the cl imate controlled galleria, the apartments can be opened to the "outside" year round and have contact with others in the community. However, the galleria is also a sound chamber. The problem of noise in he apartments is mitigated by carpeting and acoustic sprayed ceilings in the units, location of bedrooms along the exterior walls, and hinged wood panels that can close the units to the galleria.

Since the housing units are designed for student accommodation, the standards of space and storage are understandably less than for permanent residence.

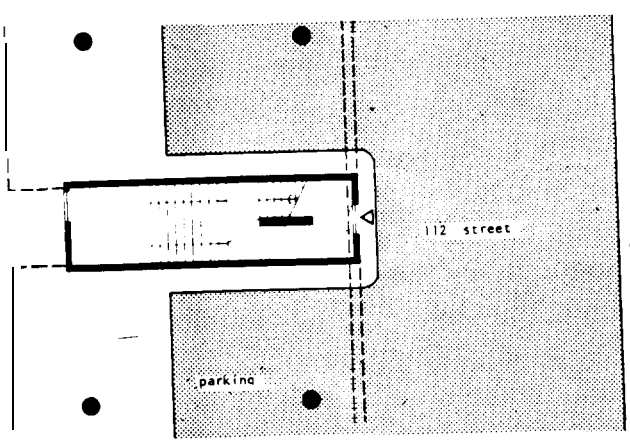
On the upper two levels are 2-storey, 4-person units. Though their communal space is the same floor area as in the units for 2 persons, it is twice as high, giving a more open feeling. The 2-storey arrangement allows the 7th floor to be used without elevators, and economizes on construction and servicing.

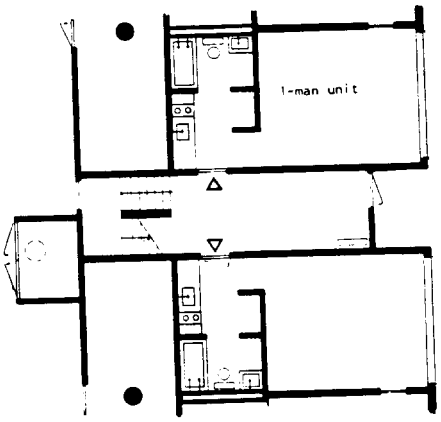


Cross section

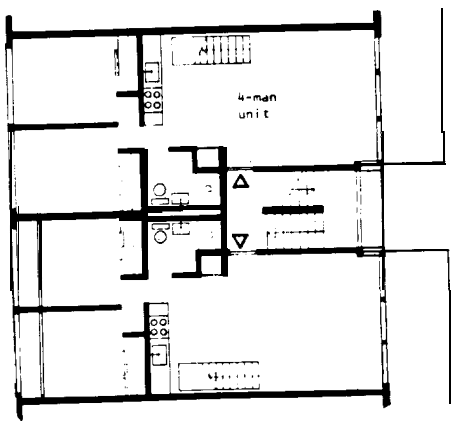


Level 4

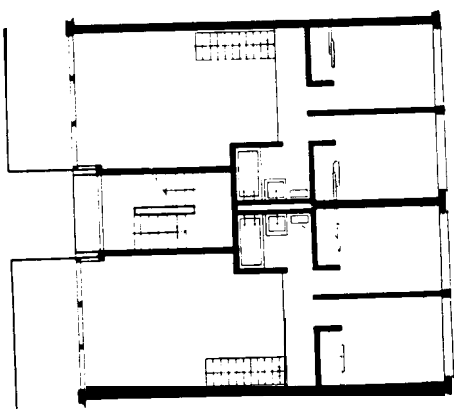




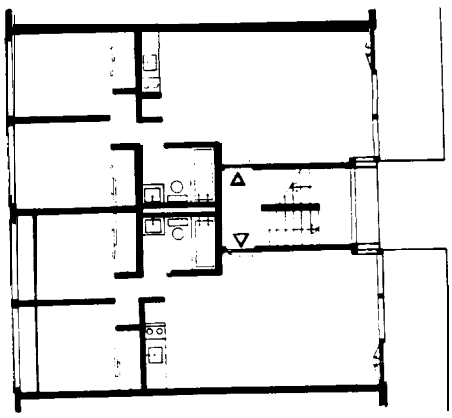
Level



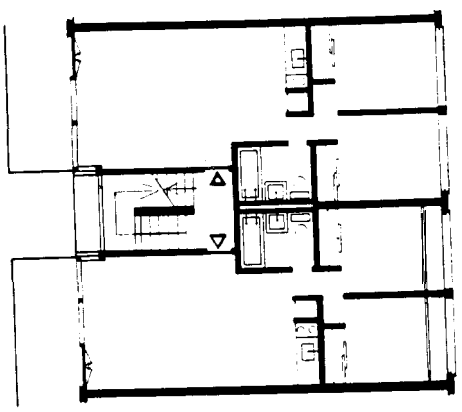
Level 6



Level 7



Level 5



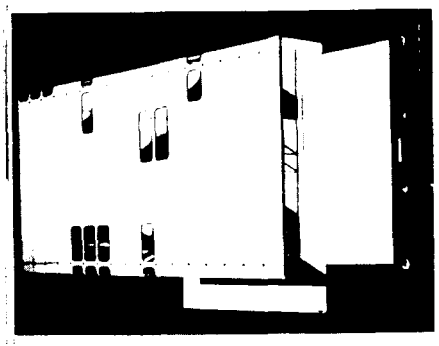
The Groupe Systemes d'Abris of the McGill School of Architecture has designed and is helping to construct a number of experimental dwellings for Indians in northern Quebec. The houses employ solar collectors along the south facing wall for space heating as described in Section 5.

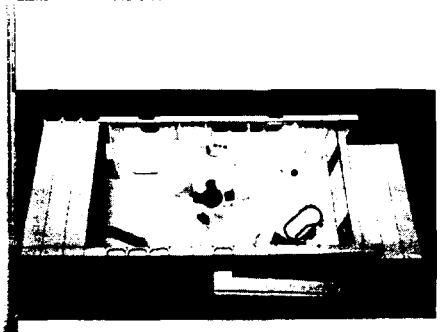
The Mistassini house is designed to minimize wind resistance. The house sits on a south facing slope. Wal s and roof are sloped to the north. The main living spaces (except one bedroom) all have direct access to the solar wa 1. Service spaces - kitchen, bath, storage and stairs - are al 1 at the rear, The angled walls have been generally well placed so that tight corners are avoided and space is usable. The house seems large enough for more than one family though it is not clear whether the lower level would be warm enough for extra bedrooms. There is space on the roof for a greenhouse.

The Pointe Bleue house is more compact. With less than half the floor area, its allocation of space to the actual living area seems to be as generous. All living areas are adjacent to the solar wall and the stove is central to the house. If the rear storage area had been located between the entry and the rest of the house it could act as a heat trap. A' ternatively the stairwell cou d be enclosed by interior doors . Presumably one of the windows will be designed as an emergency exit.

3.19 DUPONT 'HOUSE FOR TODAY'

Architec s: Piano & Rogers





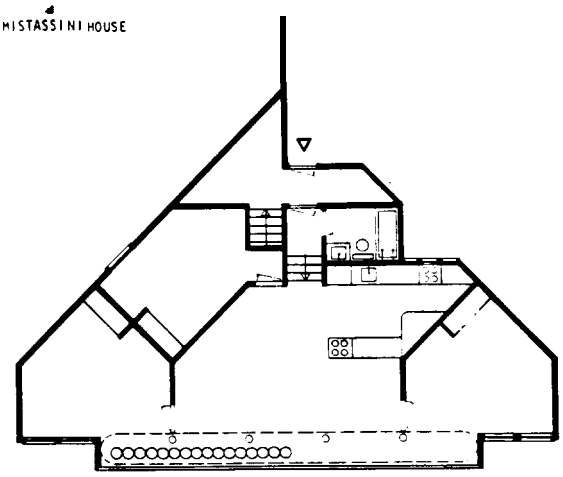
The arch tects were commissioned by Dupont to design a house emp1oy ng synthetic materials, competitive in price with tradit onal housing and providing flexibility for varying mode rn lifestyles.

Structural panels of aluminum skin filled with foam insulation are joined to one another with neoprene gaskets. The house can be supported on adjustable jacks.

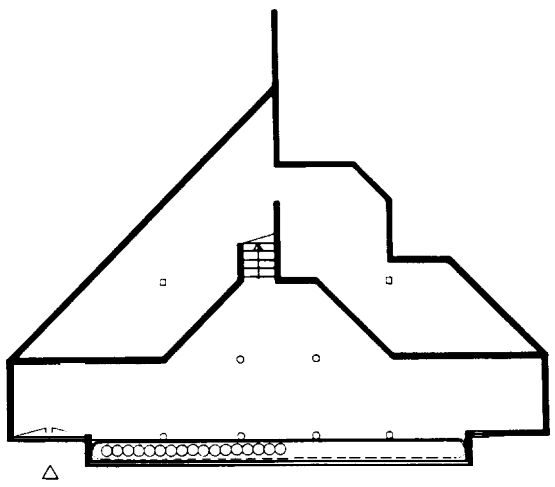
Interior planning is as open as possible. The partitions can be moved on retractable castors and are fixed in place with neoprene seals. Size of the house can be changed by adding or subtracting panels or by using different length panels. This type of dwelling could be advantageous in the north because of its simple structural system, its ease in assembly and its highly insulative materials.

-GROUPE SYSTEMS D'ABRIS

MISTASSINI HOUSE

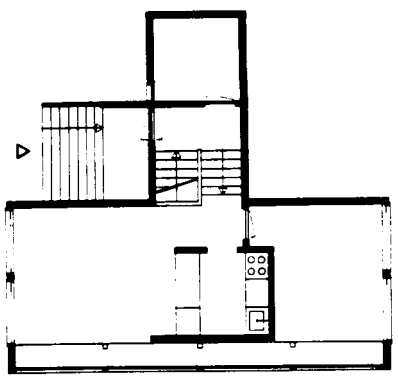


Main level

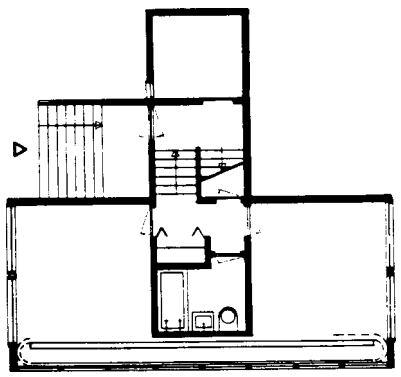


Lower level

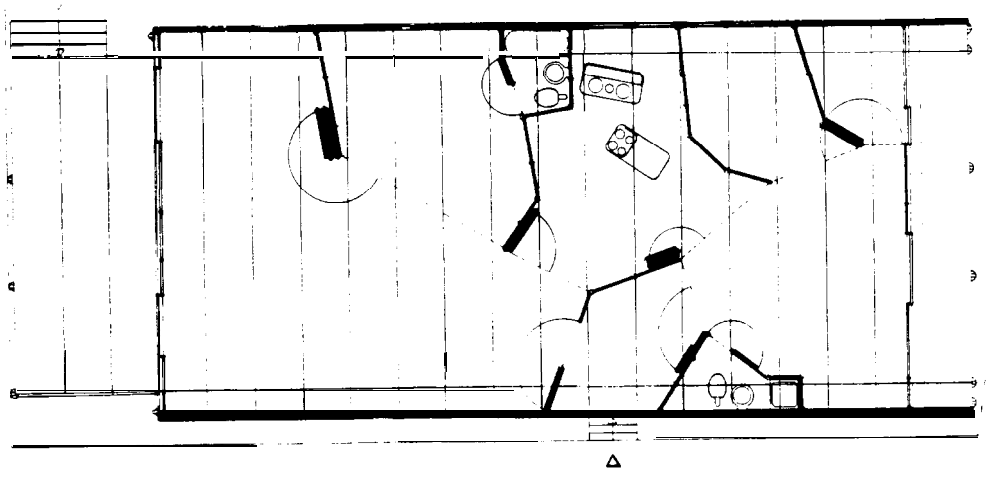
POINTE BLEUE HOUSE



Upper level



Lower level



4 CONSTRUCTION DETAILS

The construction details in this chapter illustrate a variety of solutions to particular problems encountered in northern building. Reference is made to many of these examples in Volume 1, Chapter 4, where construction is discussed in terms of requirements, constraints and the nature of materials.

4 CONSTRUCTION DETAILS

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4.2.4 MODULAR CONSTRUCTION

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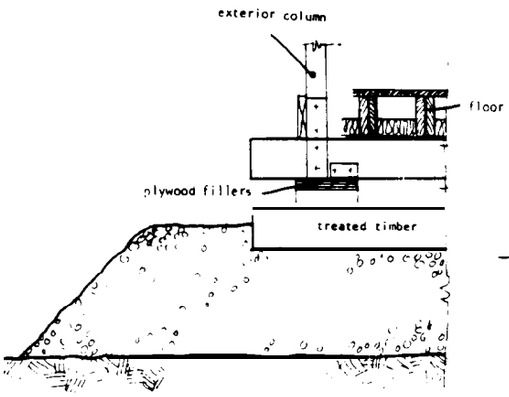
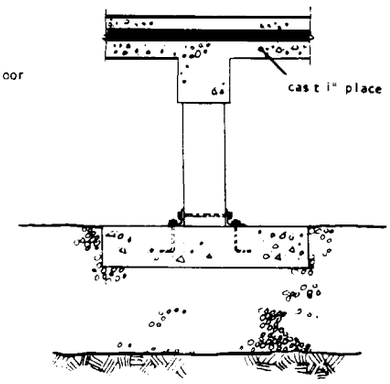
3 ZIP-UP ENCLOSURES, PIANO & ROGERS 90

4 STUDENT HOUSING, DIAMOND & MYERS 90

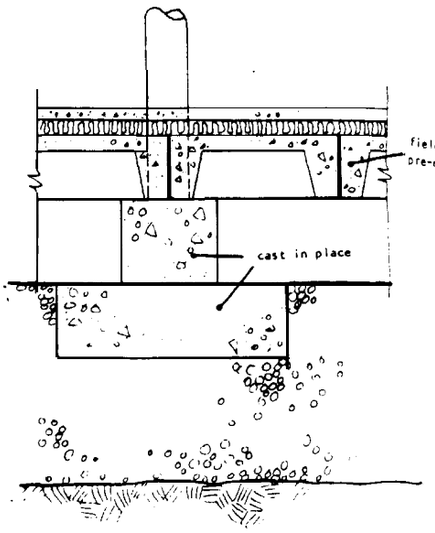
1.1 BARRACKS, THULE, GREENLAND



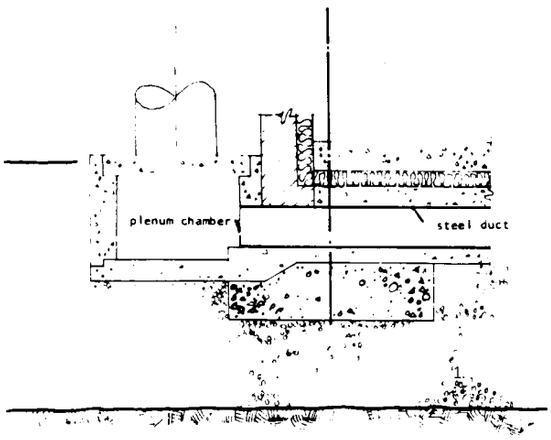
1.2 COMPOSITE BUILDING FORT YUKON, ALASKA

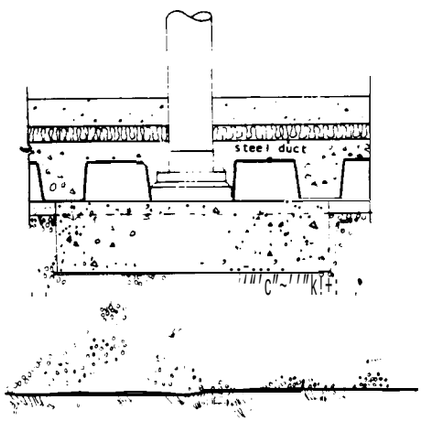


1.3 MEN'S CLUB, THULE, GREENLAND

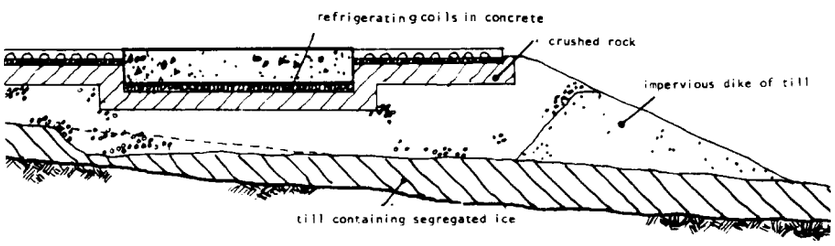


1.4 WAREHOUSE, SON DRESTROM, GREENLAND





1.5 RADAR STRUCTURE, THULE, GREENLAND



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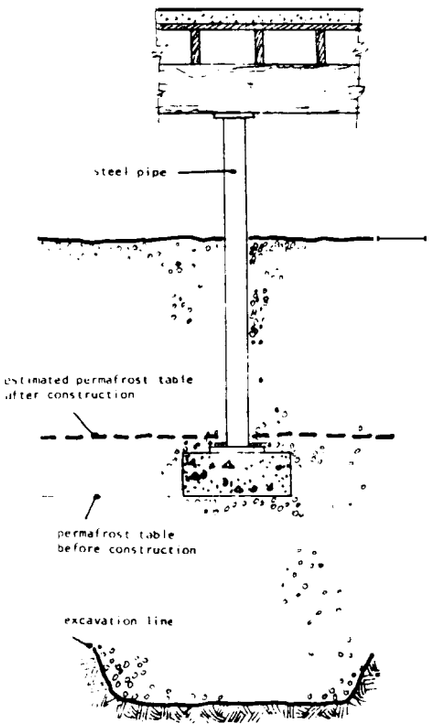
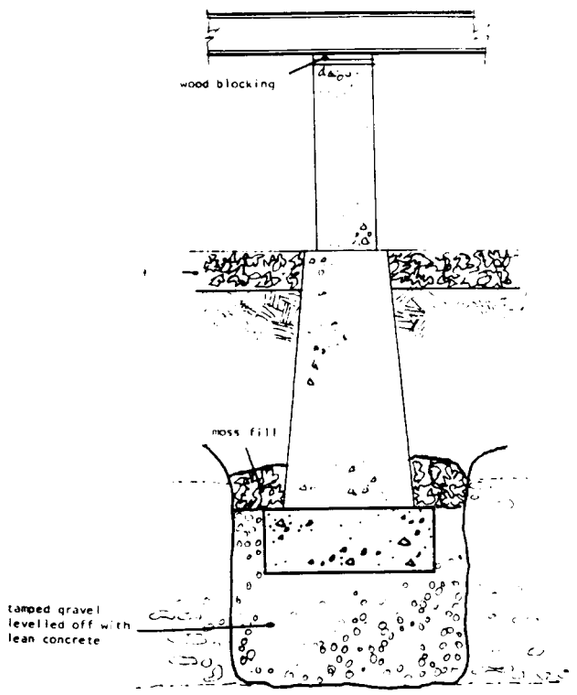
1.6 FOOTING ON PERMAFROST, BETHEL, ALASKA



1.7 CONCRETE PEDESTAL, CHURCHILL, MANITOBA



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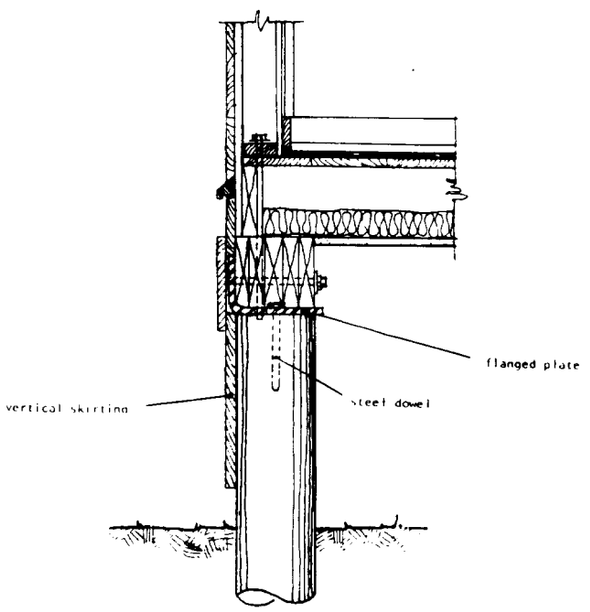
.8 WOOD PILE, FAIRBANKS, ALASKA



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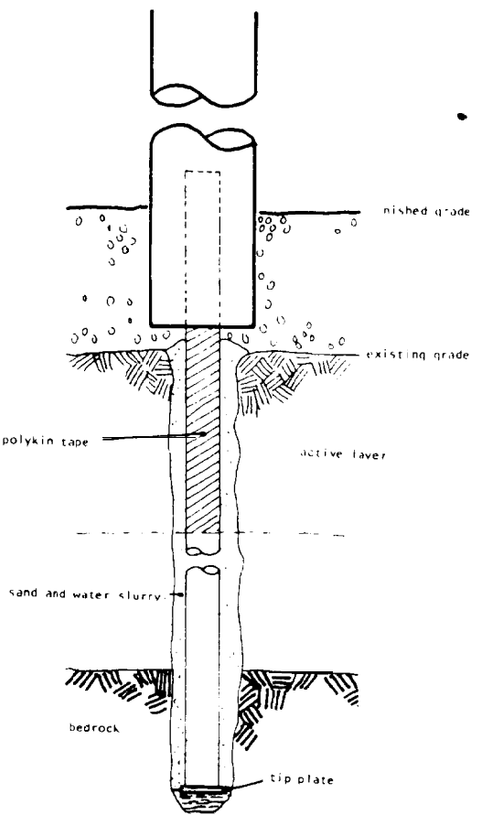
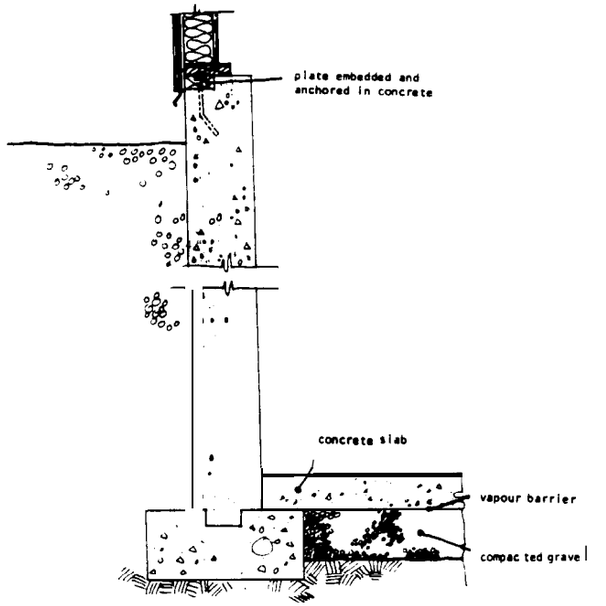
M STEEL PILE, FROBISHER BAY, N.W.T.



1.10 CONCRETE BASEMENT, CARMACKS, YUKON



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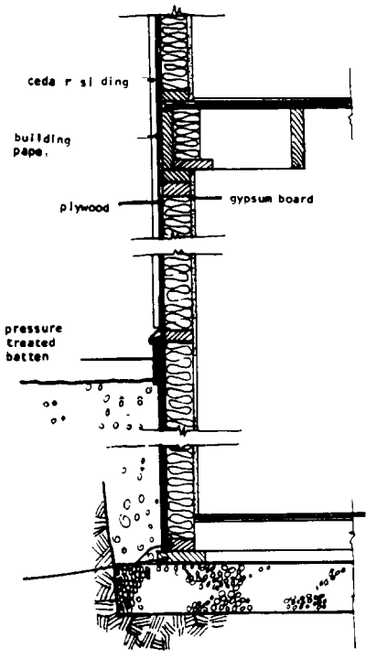
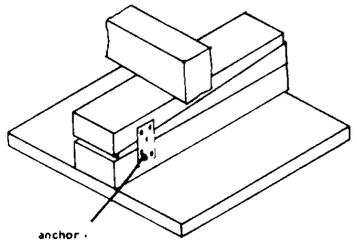
1.11 WOOD BASEMEN?, CARMACKS, YUKON



1.12 LEVELLING DEVICES

1 ,12.1 WEDGES, TOWER COMPANY



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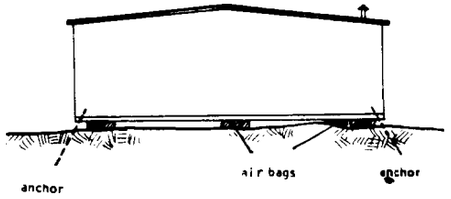
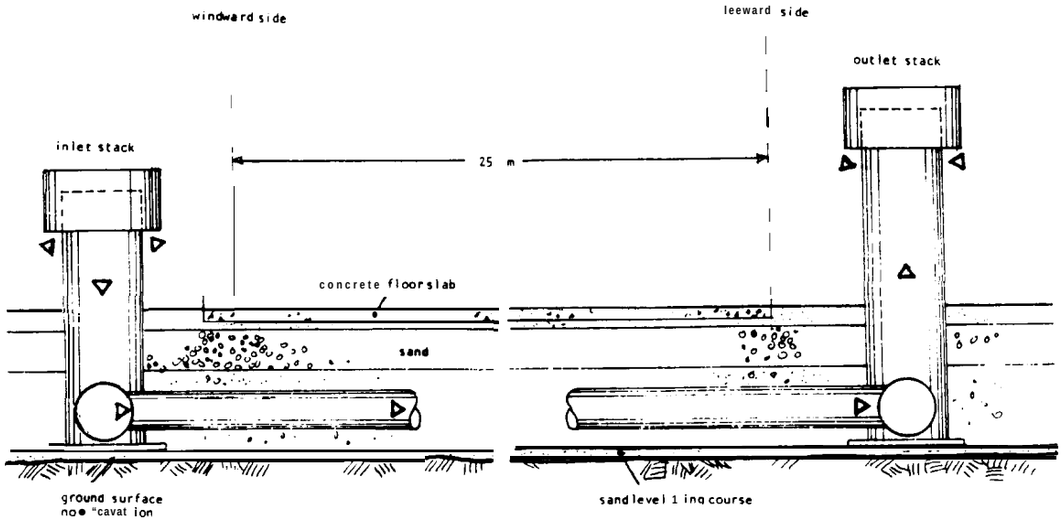
1 .12.2 AIRBAG



1 .12.3 HYDRAULIC JACK, CHURCHILL, MANITOBA

13.1 MECHANICAL COOLING, GREENLAND



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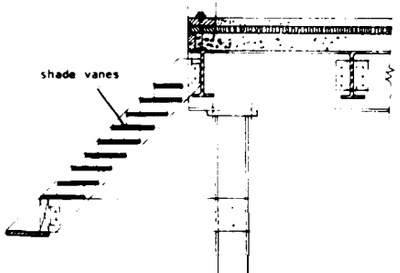
13.2 SHADING, BETHEL, ALASKA



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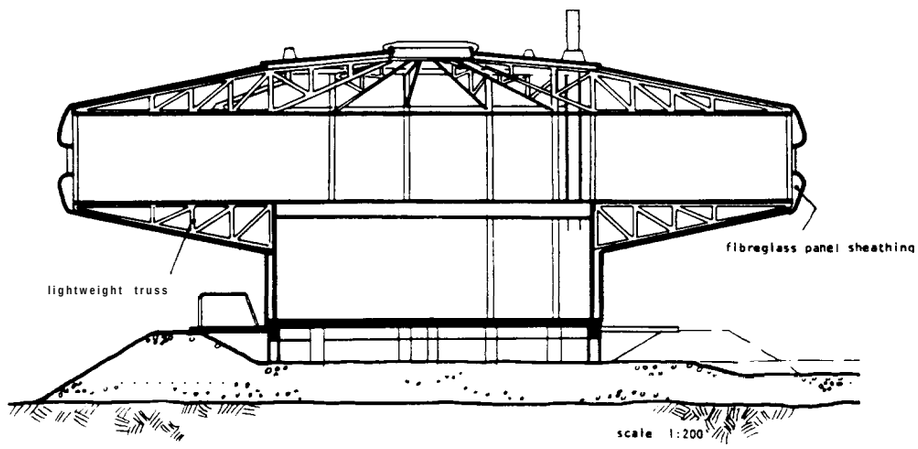
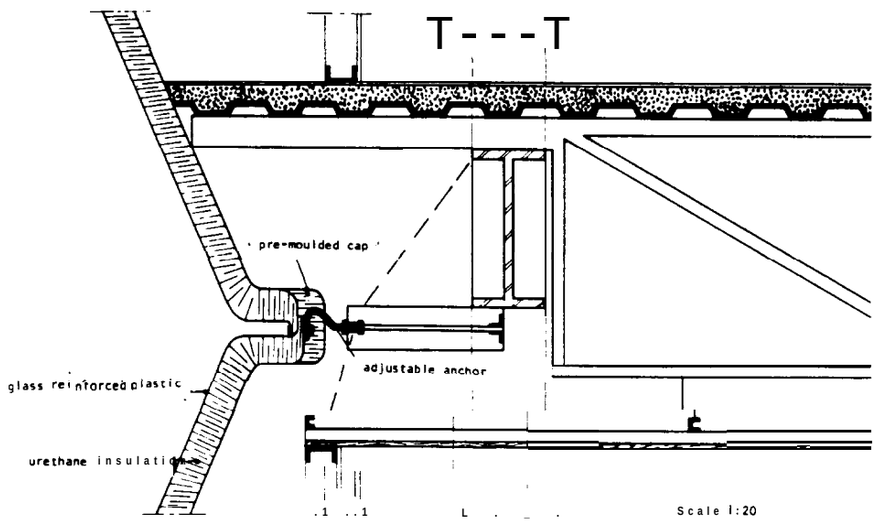
2.1 STEEL FRAME

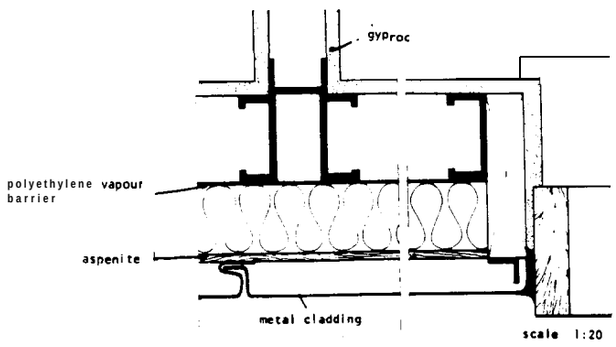
2.1.1 SCIENTIFIC LABORATORY, IGLOOLIK, N. W.T., PGL ARCHITECTS



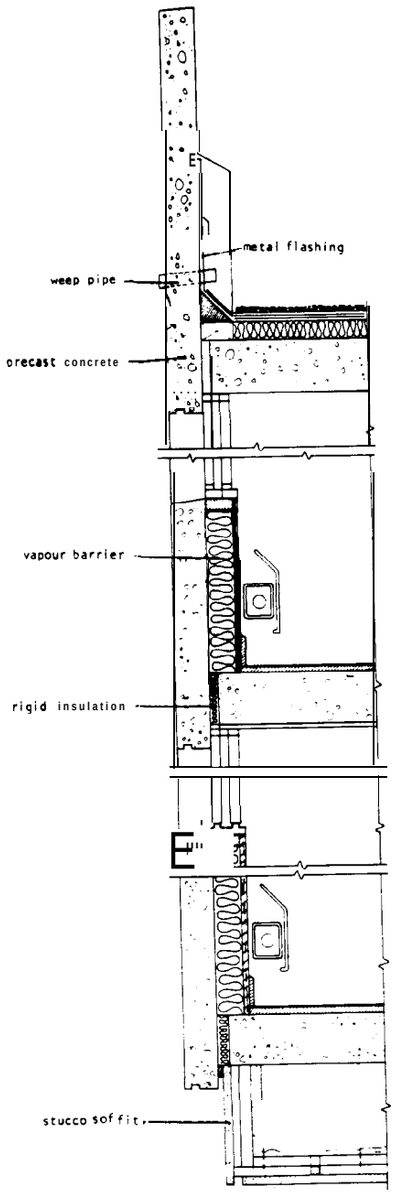
2.1.2 ELEMENTARY SCHOOL, FROBISHER BAY, PGL ARCHITECTS



2.1 3 WINDSCREEN BUILDING, FERMONT DESNOYERS SCHOENAUER



2.2.1 STUDENT HOUSING, UNIVERSITY OF ALBERTA, DIAMOND & MYERS



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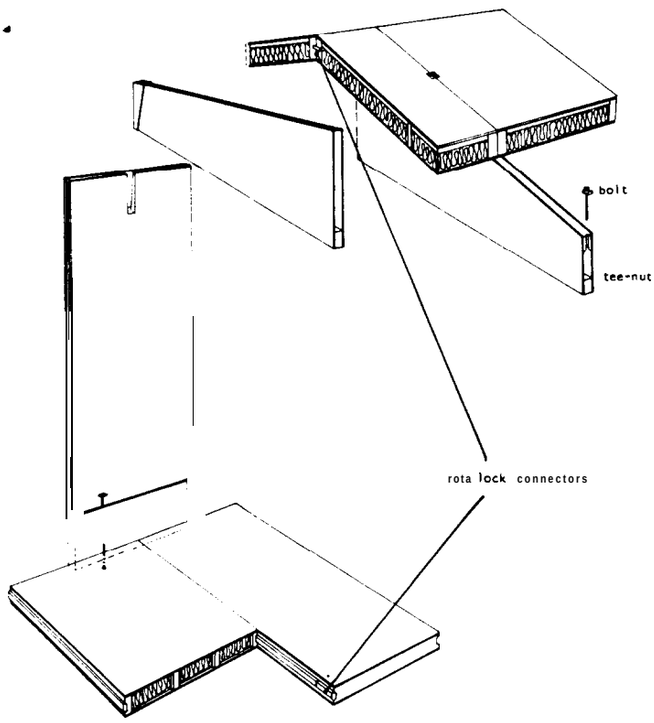
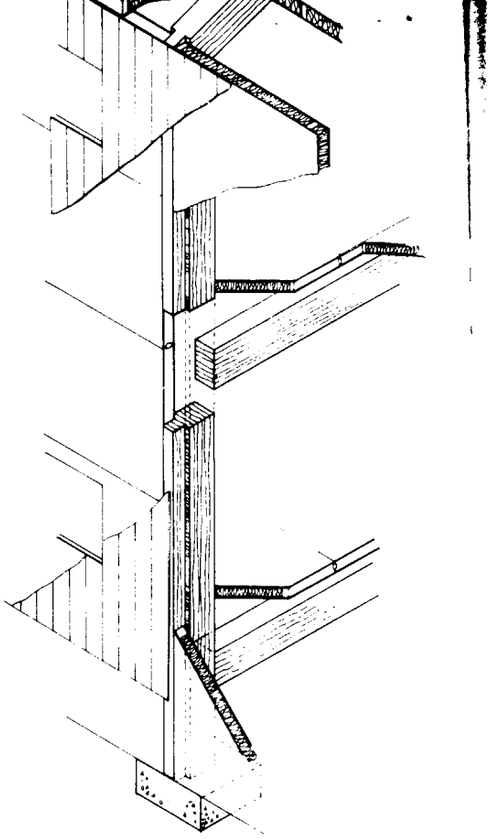
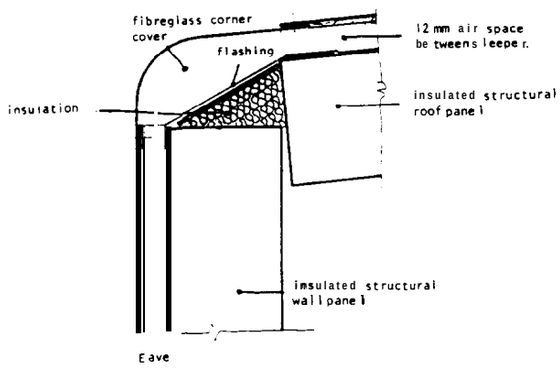
2.3 PANEL SYSTEMS

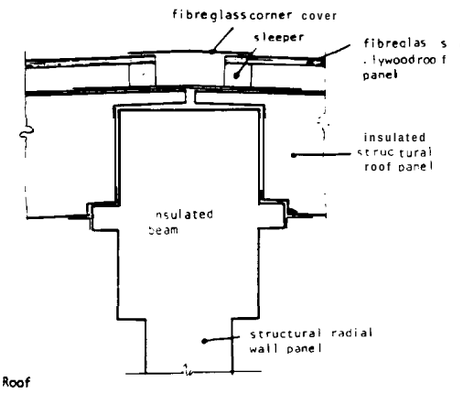
2.3.1 TOWER CONSTRUCTION

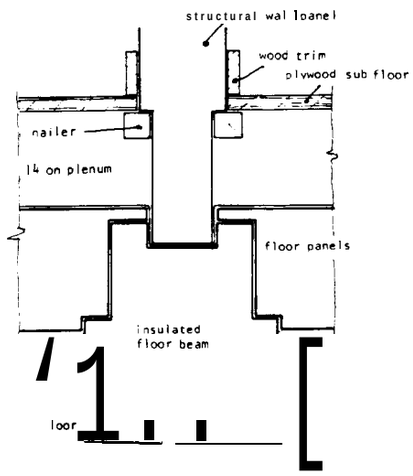


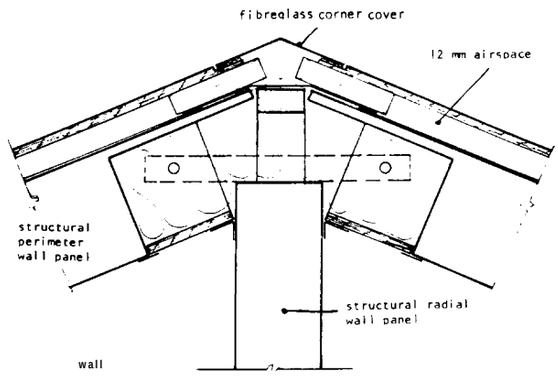


2.3.2 FROBISHER BAY HOUSING, MOSHE SAFDIE

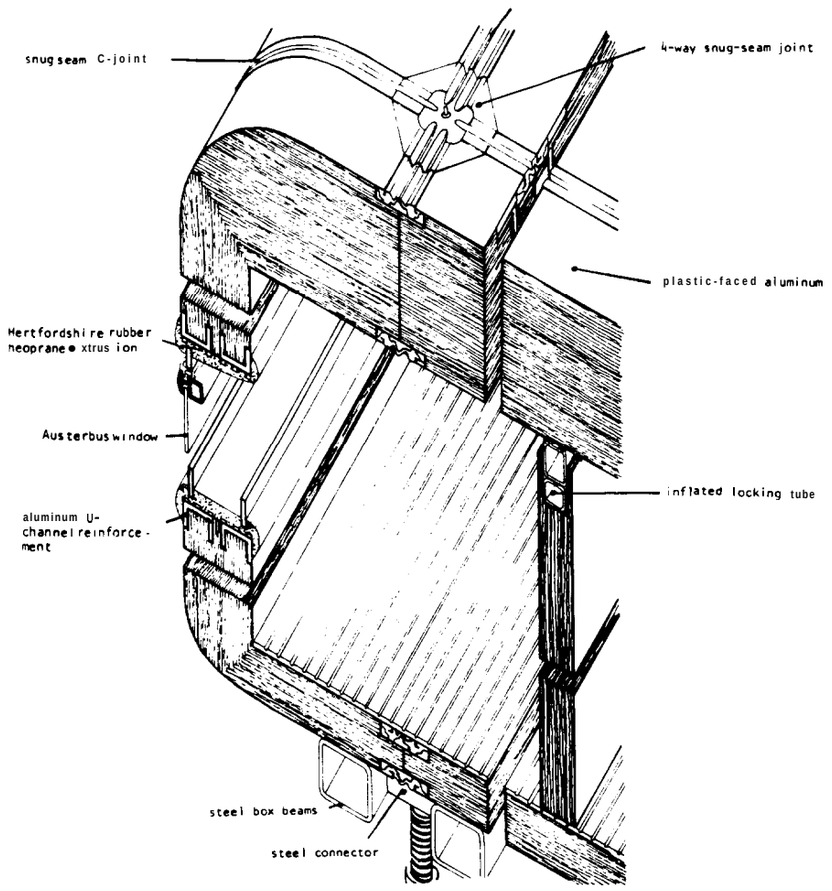




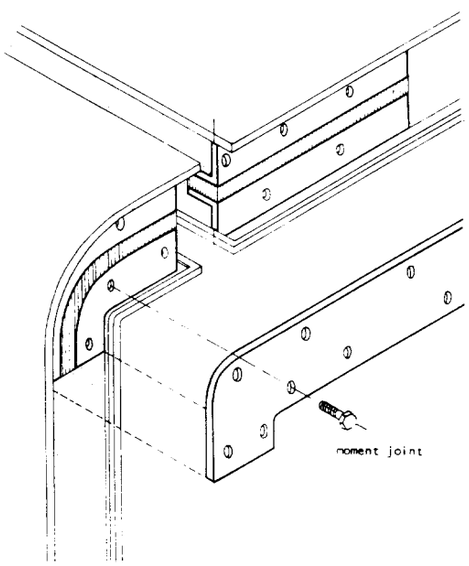




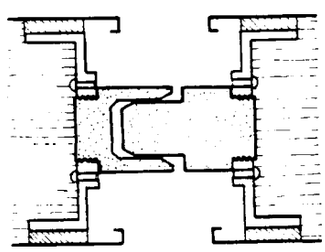
2.3.3 ZIP- JP ENCLOSURES, PIANO & ROGERS



S. G.B. scaffolding jack

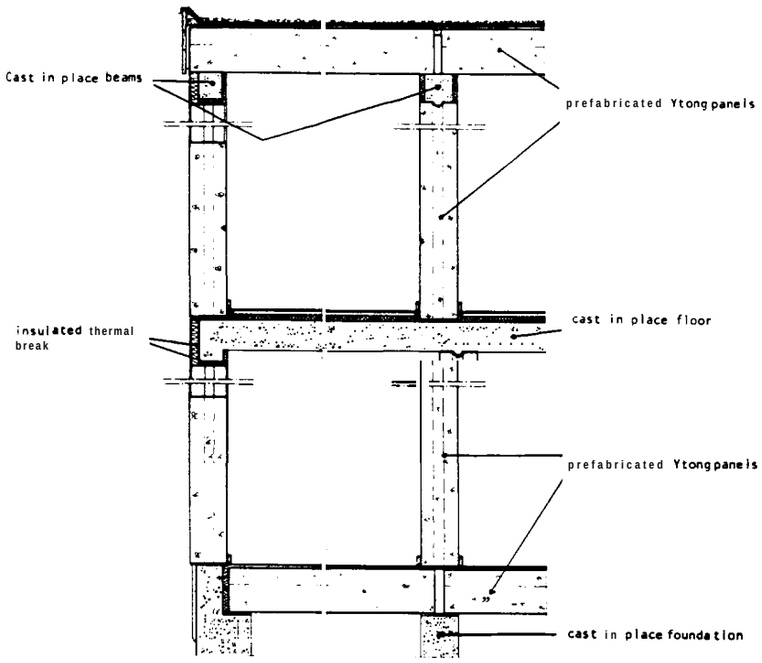


4-way joint and section



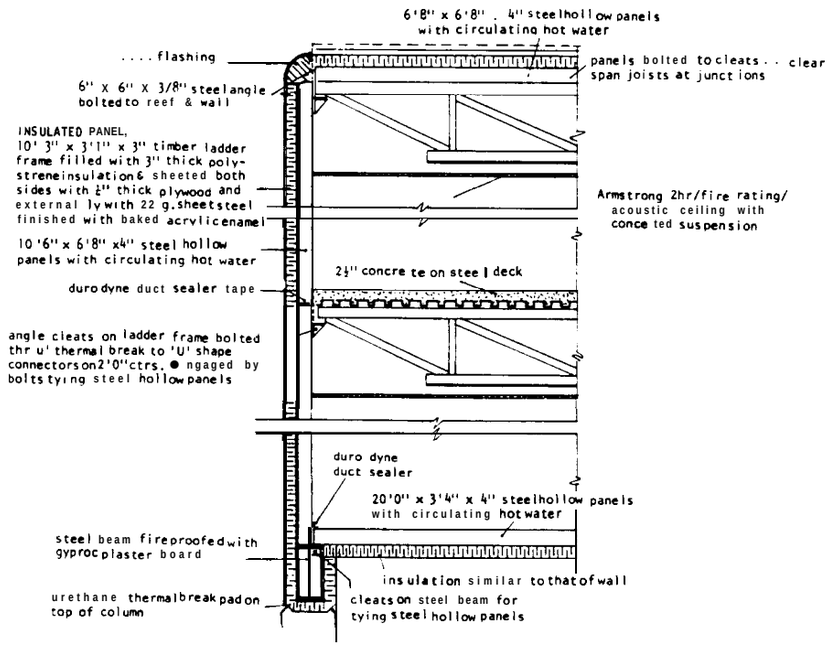
shear joint

2.3.4 YTONG LIGHTWEIGHT CONCRETE

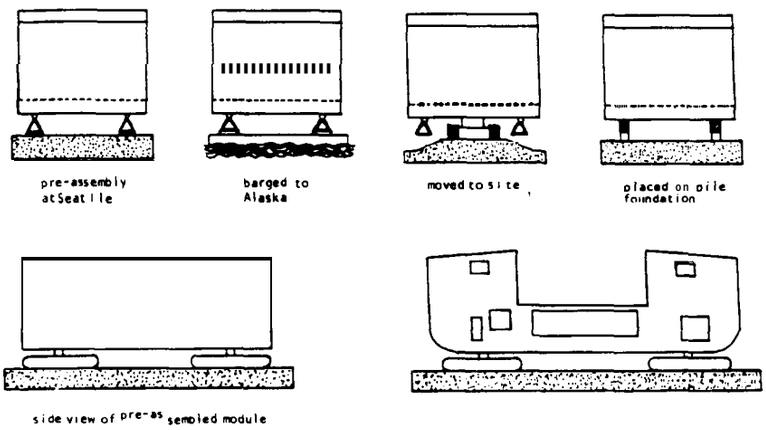


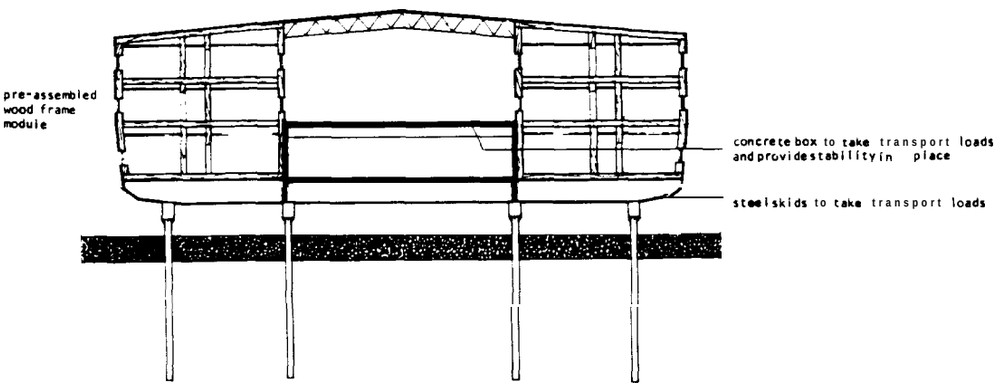
2.3.5 MARANI, ROUNTHEWAITE & DICK

Marani, Rounthewaite and Dick for the Department of National Defense



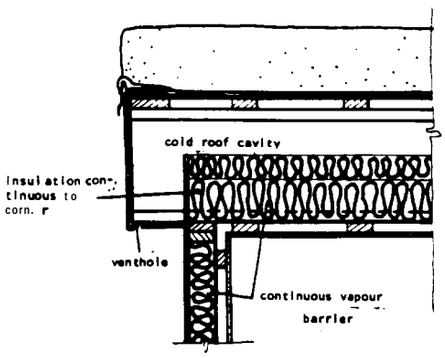
4.1 BP/SOHIO OPERATIONS CENTRE, PRUDHOE BAY, ALASKA

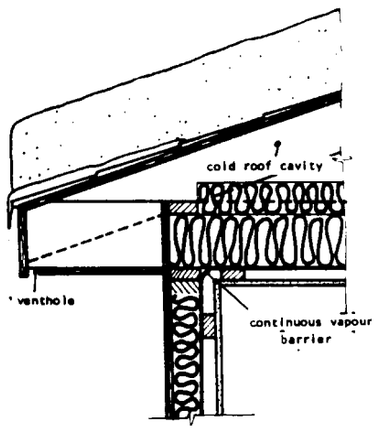




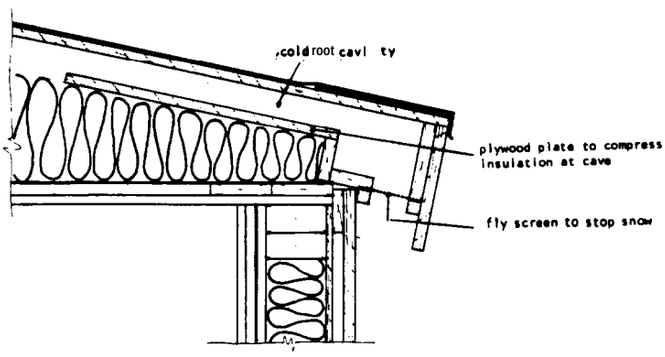
3.1 ROOF

3.1. f EXAMPLES BY AXEL CARLSON

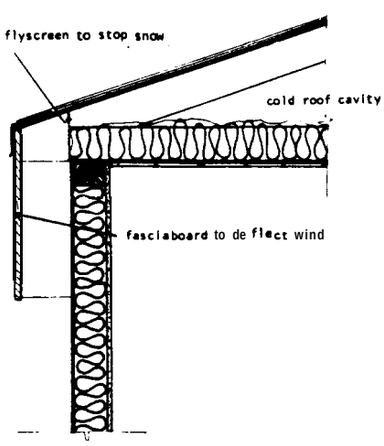




3.1.2 FERMONT, DESNOYERS SCHOENAUER

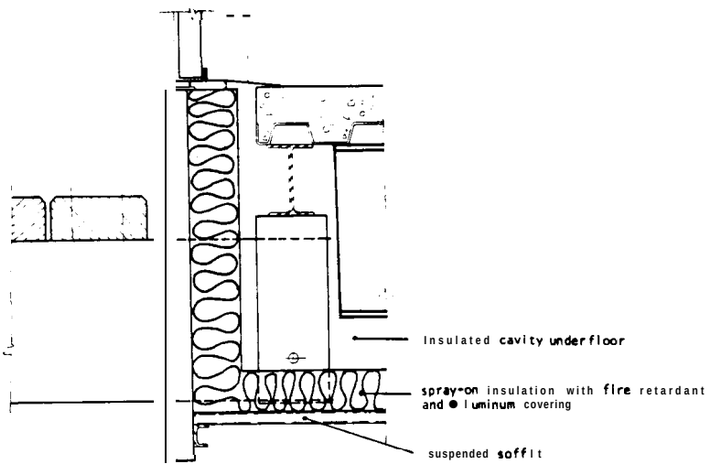


3.1.3 TOWER COMPANY

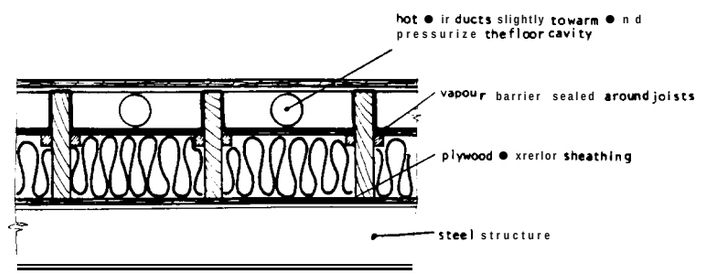


2 FLOOR

2.1 SCHOOL, BAKER LAKE, DEPARTMENT OF PUBLIC WORKS, N.W.T.

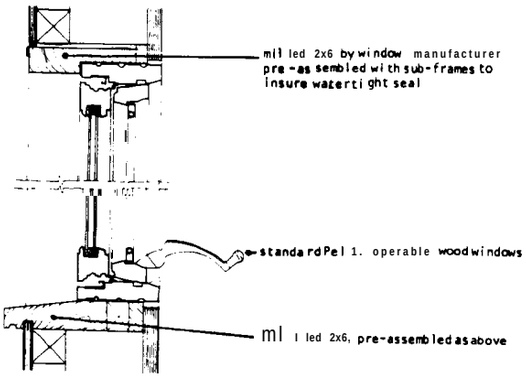


3.2.2 SCHOOL, CHURCHILL, THE CHURCHILL CONSORTIUM

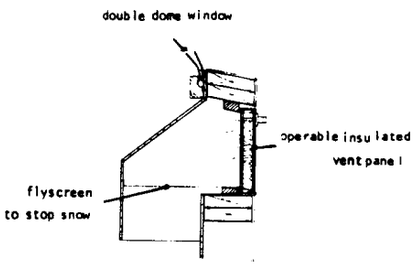


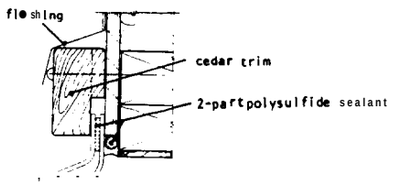
3.3 WINDOWS

3.3.1 FROBISHER BAY HOUSING, MOSHE SAFDIE

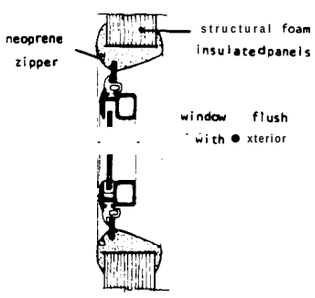


3.3.2 STRATHCONA SOUND, HADLEY, FREEMAN, MUTRIE

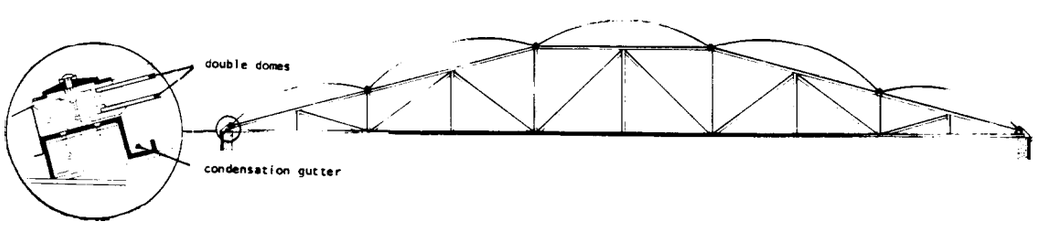




3.3.3 ZIP-UP ENCLOSURES, PIANO & ROGERS



3.3.4 STUDENT HOUSING, DIAMOND & MYERS



5 ENERGY AND UTILITIES

Although there are many examples of energy and utility supply to buildings, which are more efficient than the normal practice, there is to date no comprehensive experience of this kind at a community scale. The examples in this chapter are of building elements, equipment and systems which have some application to northern communities. The more sophisticated, complete systems are currently economically unfeasible, but further development may bring them into a reasonable cost range.

5 ENERGY AND UTILITIES

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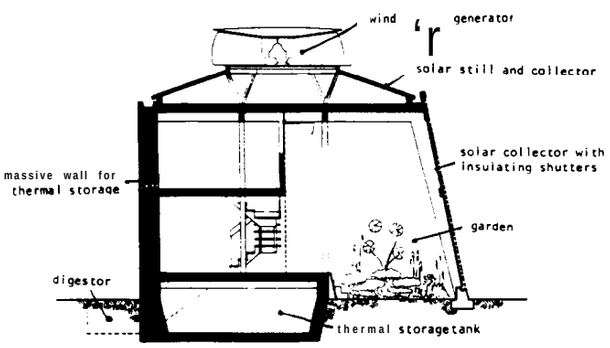
5.1 SOLAR HEATING

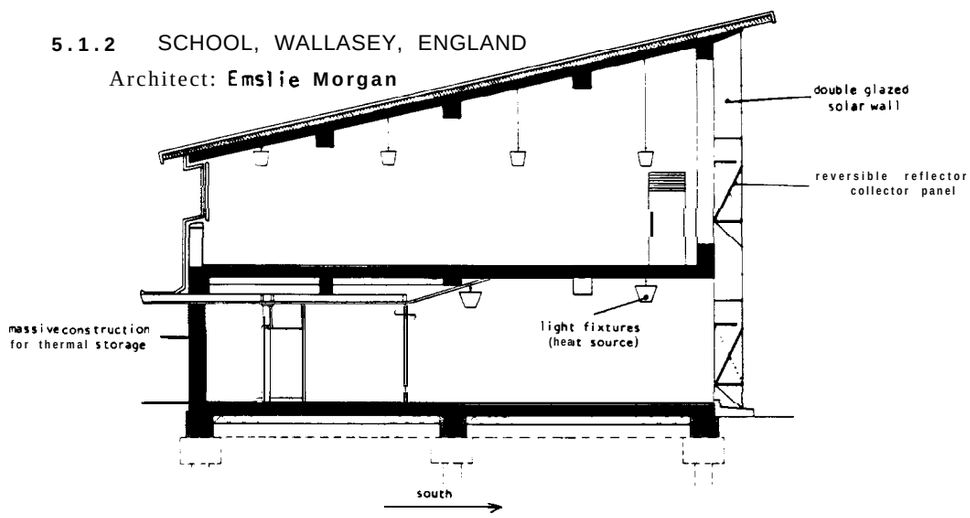
5.1.1 HOUSE, CAMBRIDGE, ENGLAND

Designer: Alexander Pike



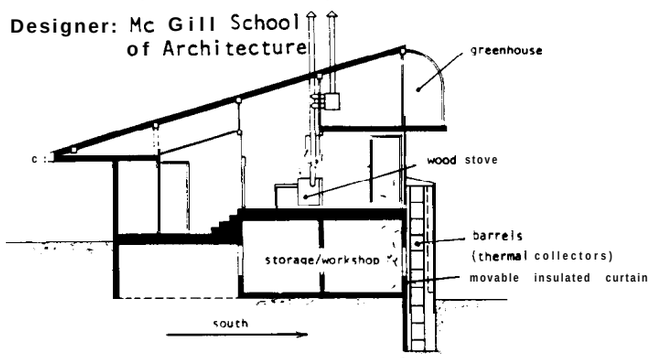
5.1.2 SCHOOL, WALLASEY, ENGLAND

Architect: **Emslie Morgan**



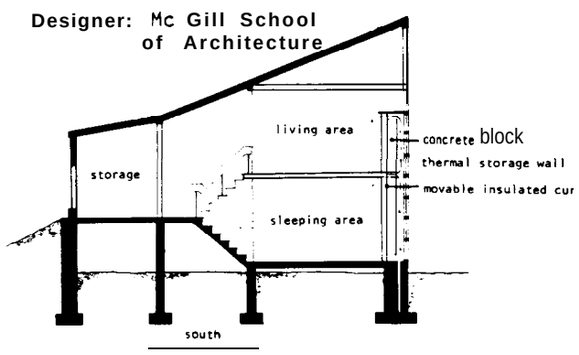
5.1.3 HOUSE, MISTASSINI, QUEBEC

Designer: Mc Gill School of Architecture



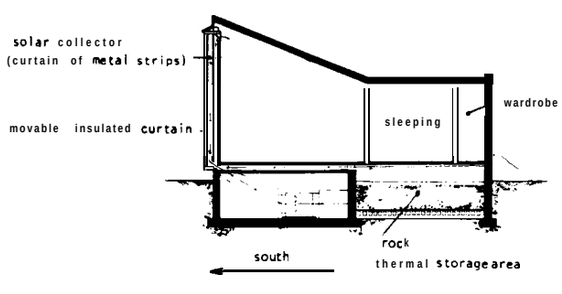
5.1.4 HOUSE, POINTE BLEUE, QUEBEC

Designer: Mc Gill School of Architecture



5.1.5 HOUSE, CO TE NORD, QUEBEC

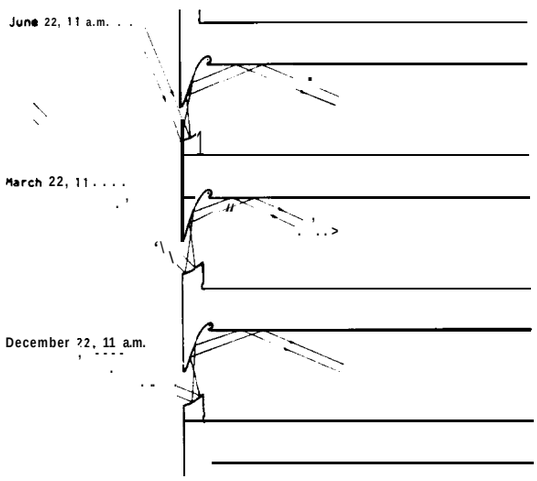
Designer: Mc Gill School of Architecture

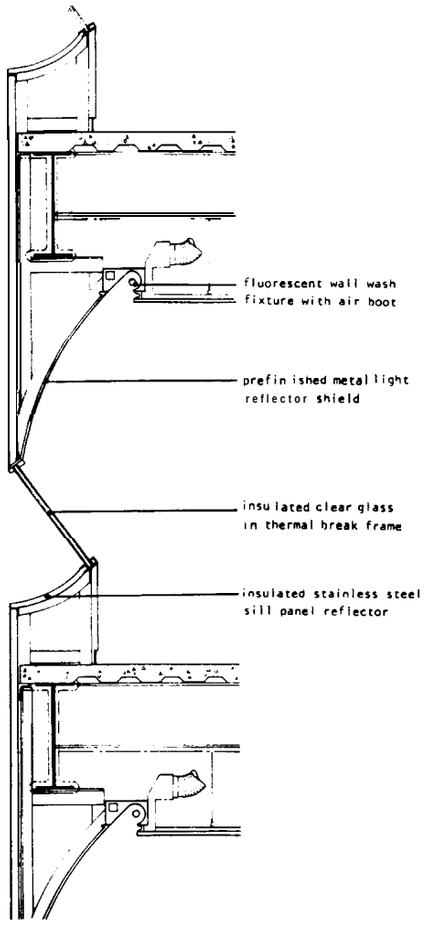


scale 1:200

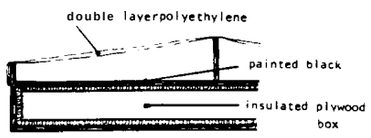
5.1.6 OFFICE BUILDING, DETROIT

Architect: Gunnar Birkerts

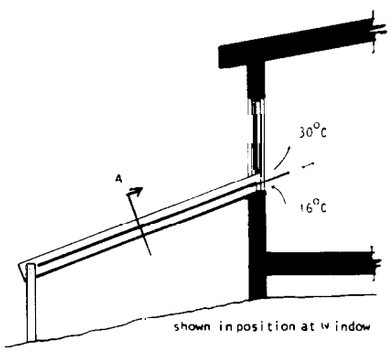




5.1.7 GRAVITY SOLAR COLLECTOR

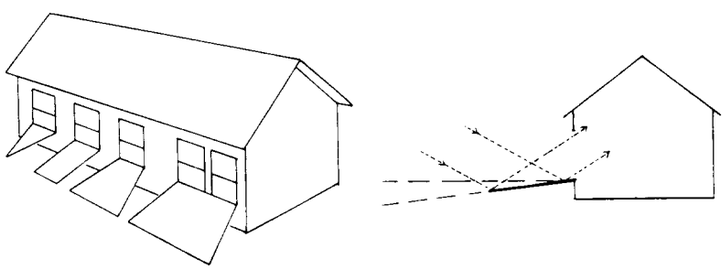


Section A through collector scale 1:20

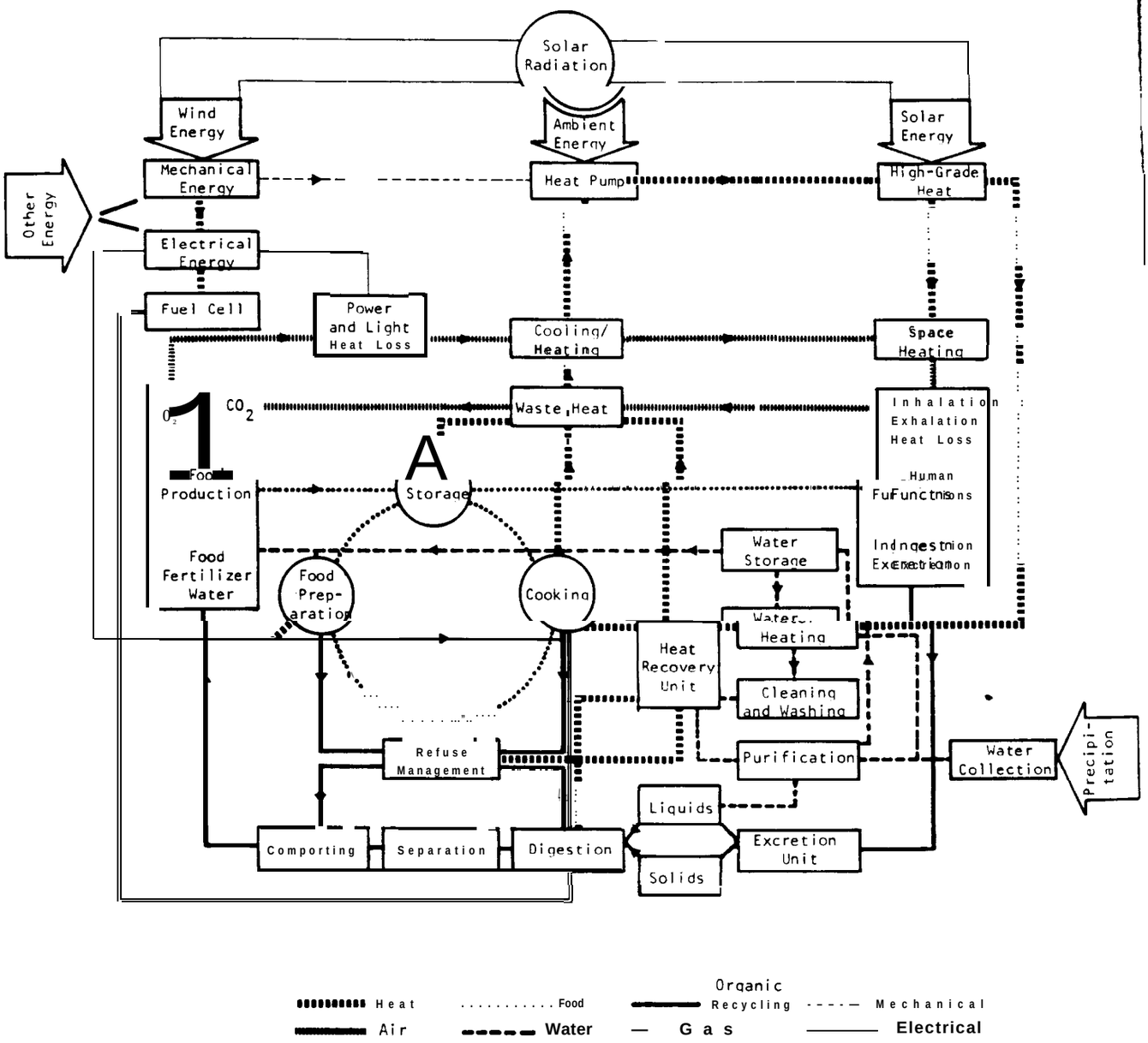


shown in position at window scale 1:100

5.1.8 REFLECTORS

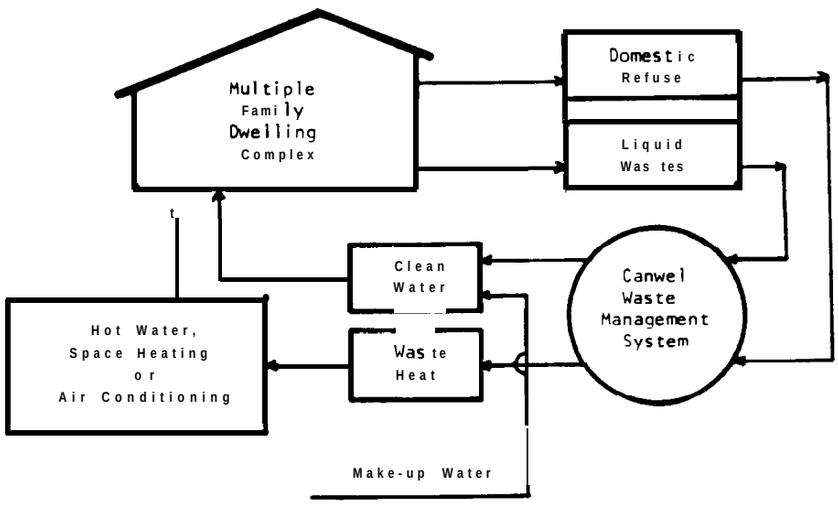


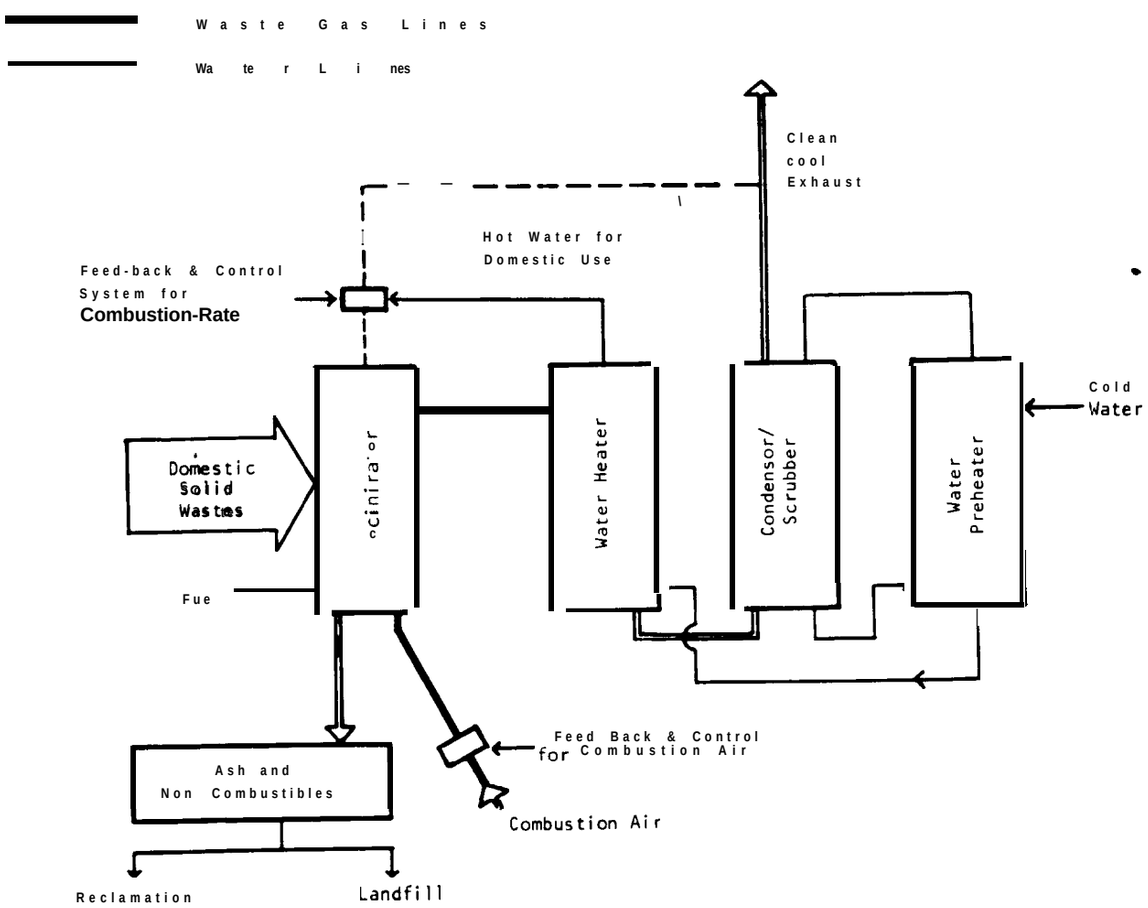
Focal, Water, Air, Wind, and Sun - All are part of the house's total energy system



The principle of integrated systems is exemplified by the above diagram of the Cambridge house, designed by Alexander Pike.

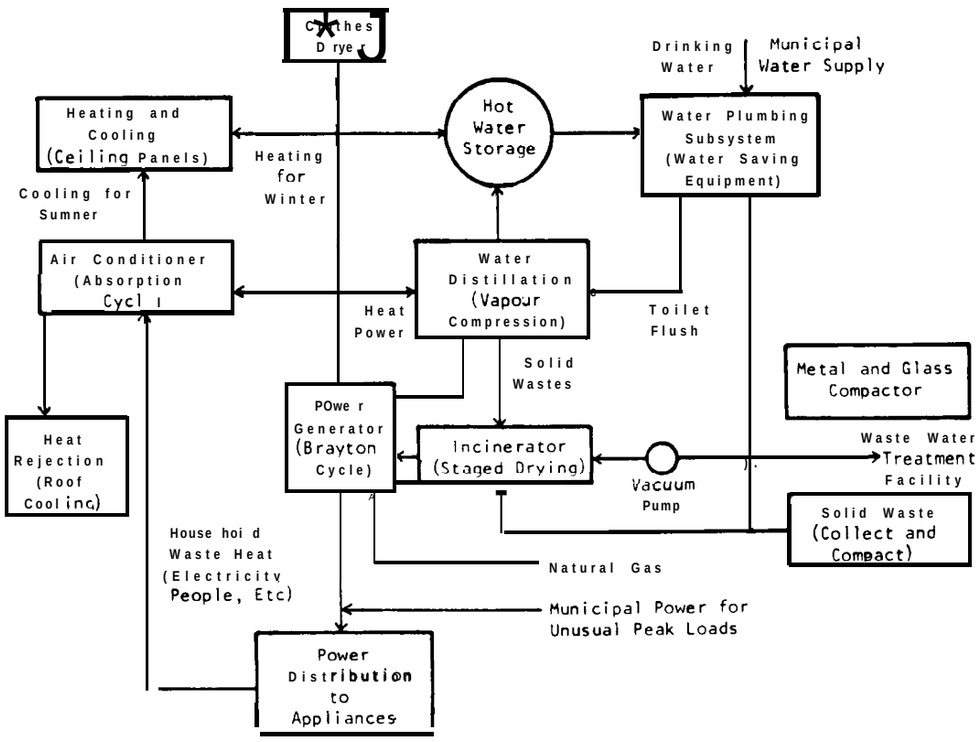
CENTRAL MORTGAGE AND HOUSING CORPORATION/ONTARIO RESEARCH FOUNDATION



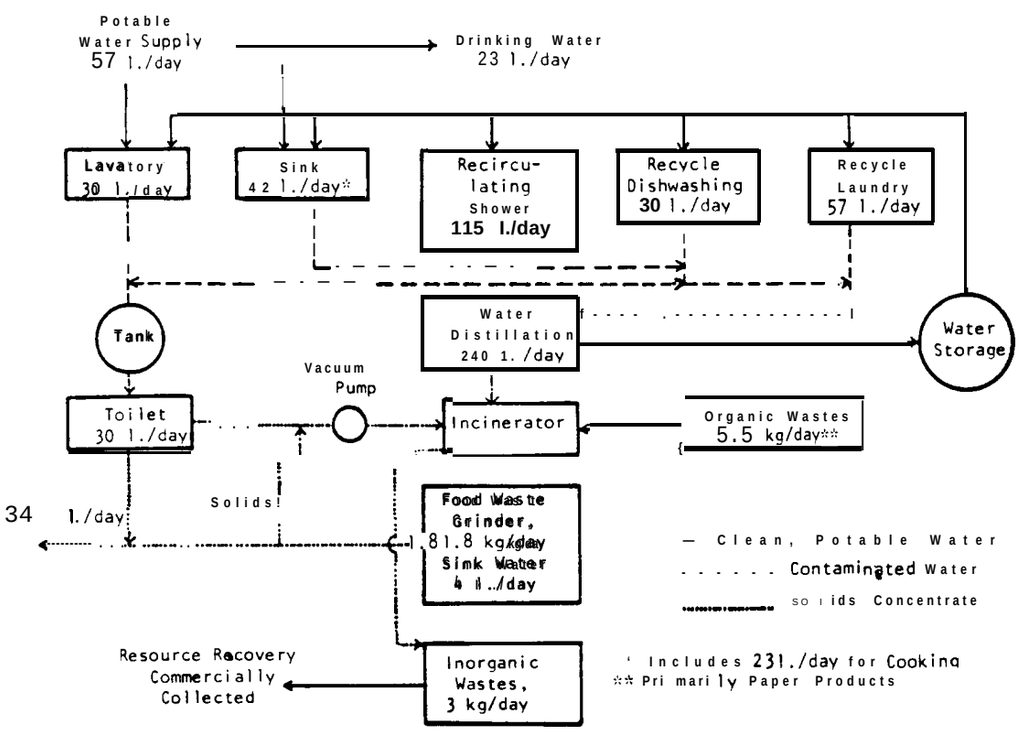


U.S. DEPT. OF NOUSING AND URBAN DEVELOPMENT/NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

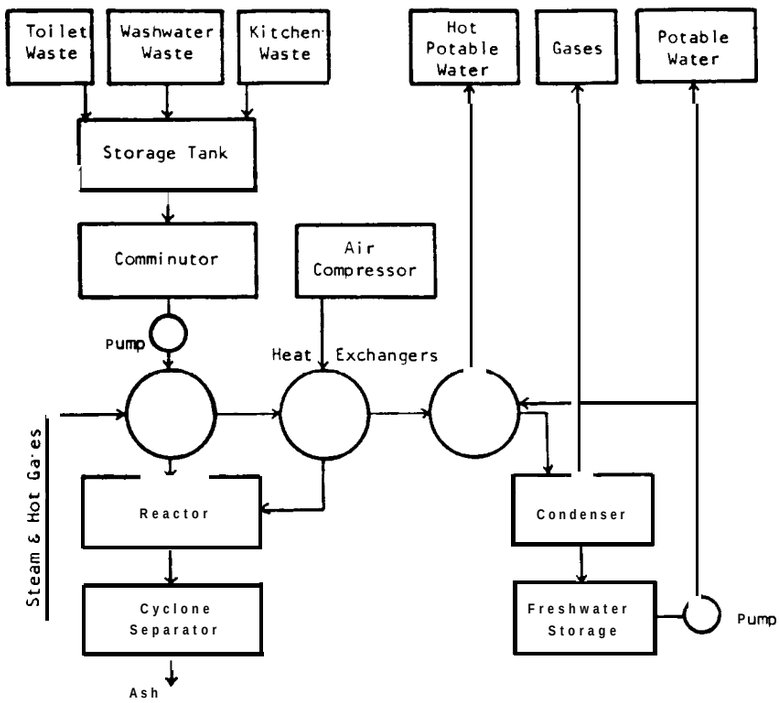
Concept:



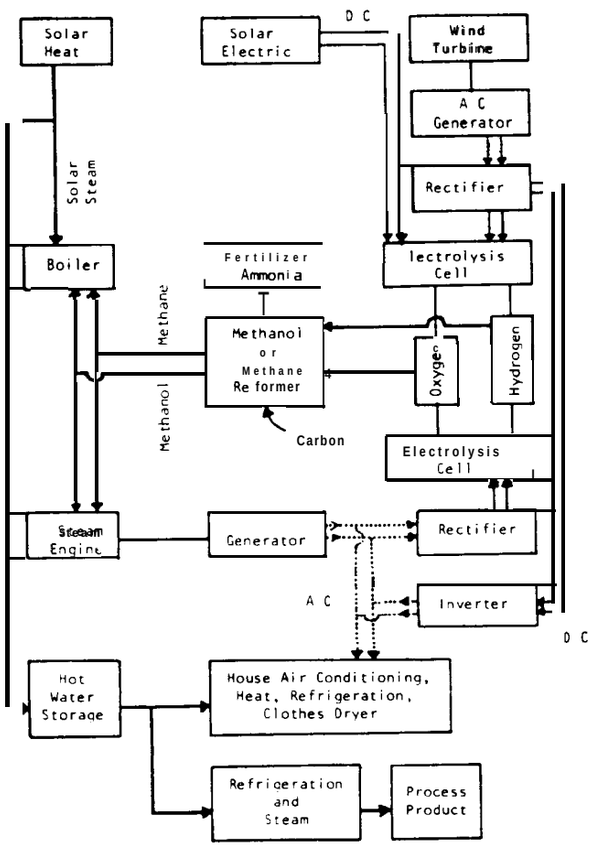
Quanti ties:



5.2.3 INTEGRATED WATER/WASTE SYSTEM
Us. NAVY



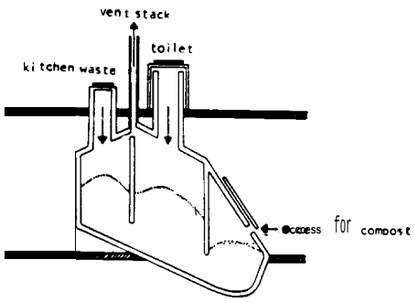
5.3.4 SOLAR/WIND TOTAL ENERGY SYSTEM
SMOKEY YUNICK



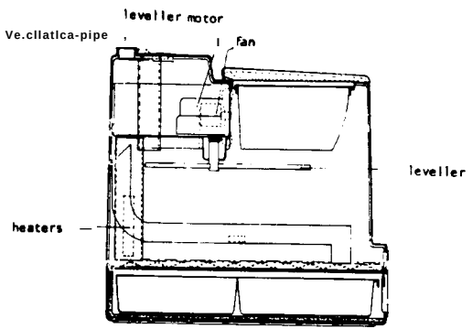
5.3 TOILETS

5.3.1 CLIVUS MU LTRUM

4

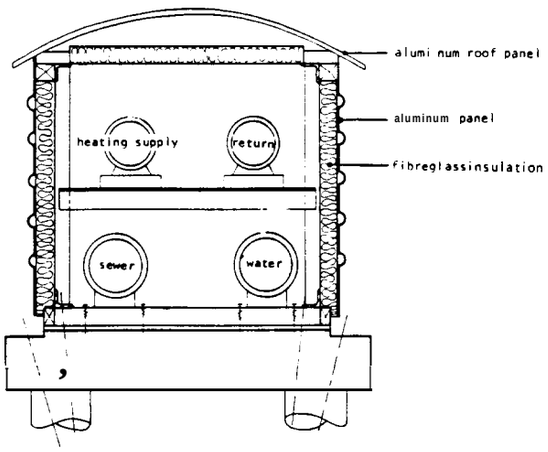


5.3.2 HUMUS CORP.

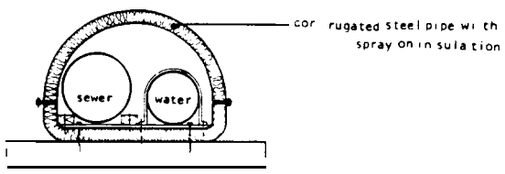


*tale 1:15

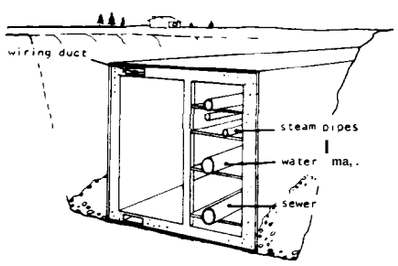
5.4.1 ORIGINAL UTILIDOR, NUVIK



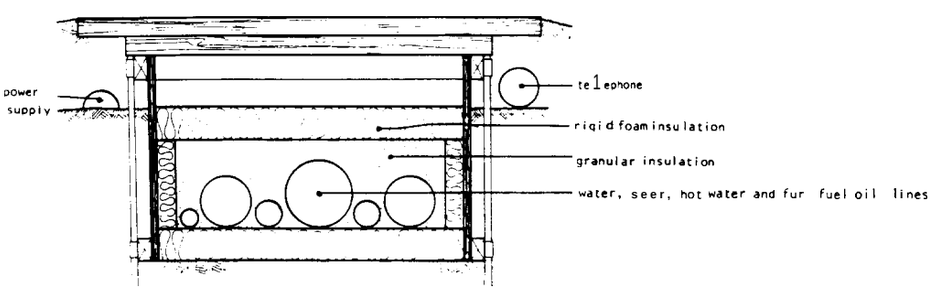
5.4.2 EXTENSION UTILIDOR,INUVIK



5.4.3 WALK THROUGH UTILIDOR



5.4.4 SETTLEMENT UTILIDOR, TOWER COMPANY



All drawings in this volume, with the exception of Svappavaara, have been redrawn by van Ginkel Associates. Information has been obtained from architects, developers and government authorities. Acknowledgement and appreciation for the use of photographs is extended to:

The BP/Sohio Co., Anchorage, Alaska.
Henry Kalen for the Canadian Architect.
The NWT Council Task Force on Housing.
Piano and Rogers, London, England.
Quebec Cartier Mining Company, Montreal.
John Fulker for Progressive Architecture,