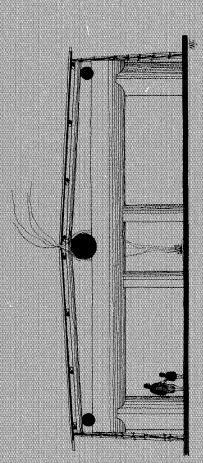
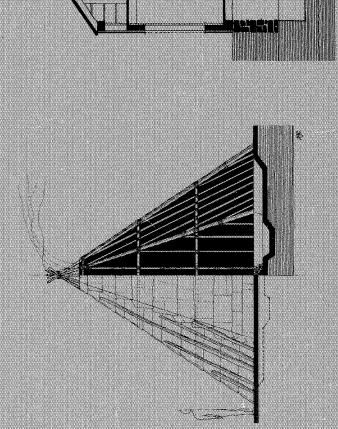


An historical perspective by Maurice J. Clayton with an introduction by CMHC.





CANADIAN HOUSING IN WOOD

An Historical Perspective by Maurice J. Clayton

Canada Mortgage and Housing Corporation 1990

Canadä

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CMHC INTRODUCTION TO CANADIAN HOUSING IN WOOD

Canada, with one-tenth of the world's forest resources, is recognized internationally as a leader in wood-frame house construction, techniques and products. The industry forms an important part of the country's economy, making Canada a leading exporter not only of wood products, but also of housing techniques and expertise. The world-wide demand for Canadian materials has made the industry flourish in order to meet this market. Many countries look to Canada to assist in the development of their own wood-frame housing industries.

Wood-frame construction is a practical choice for house building, as it offers the distinct advantages of energy conservation, durability, design flexibility, and offers exceptional strength that counters natural disasters, such as earthquakes. Through a standardization of building materials, the wood-frame industry also features low construction costs and shorter construction times.

The prominence of Canada's wood-frame housing industry is testimony to a long history marked by an effort to perfect both construction methods and materials. Influences on the evolution of wood housing in Canada have come from such diverse sources as the native tribes of the American continent to the European settlers that migrated to North America several hundred years ago. While early settlers brought their own building methods to Canada, they either adapted them or sought new ones in what proved to be a unique environment. with geographical and climatic diversity, an abundance of building resources, and housing traditions of its own. Today, the Canadian wood industry continues to serve the varied needs of a population that spreads from the Pacific Ocean to the Atlantic, from the Great Lakes to the Arctic Circle.

Canada Mortgage and Housing Corporation (CMHC) has been committed to helping to house Canadians since 1946. Through the development of a stable housing market, a commitment to assisting those in need of social housing, and intensive research, development and communications activities, CMHC strives to be a catalyst for change in meeting the housing needs of Canadians today and in the future.

Maurice Clayton left Britain in 1953, and established an architectural partnership in Victoria, British Columbia the following year. Shortly after his arrival in Canada, he became acquainted with Mungo Martin, a Kwakiutl Indian and well-known carver. His admiration of Martin's work marked the start of a career-long interest in early native architecture and its complex use of design and materials.

In 1958 Maurice Clayton joined CMHC as an architect. During his 25-year tenure with the Corporation, he travelled to every area of Canada, and was introduced to the regional variations that were typical of native architecture and construction. Throughout the mid 1960s, he travelled throughout Europe, developing associations with members of building industries, and responding to questions about the history of wood-frame construction in Canada.

CMHC was eager to play a role in telling the story of Canadian wood housing when in 1980 Maurice Clayton requested support for an extensive research effort on the subject. Sharing the author's fascination with Canada's wood-housing traditions, and conscious of the lack of published material on the subject, CMHC provided Maurice Clayton with a research grant and a paid sabbatical that would result in this publication: Canadian Housing in Wood.

In conducting his research, Maurice Clayton studied in many parts of the world, including Sweden, the United Kingdom, France and Japan. He also consulted with Canadian wood-construction experts, as well as with numerous archaeologists and museum directors. Information from these sources, combined with over 20 years' architectural experience, enabled the author to develop a unique perspective on the history of Canadian wood housing.

In preparing this book, which is organized by historical period, ethnic group, and construction technique, the author gathered or created many illustrations, photographs and maps that accompany the text. Many of these are used to aid in the understanding of certain architectural techniques, while others serve to portray geographical elements that affected construction methods.

Canadian Housing in Wood takes a unique approach toward the history of Canadian wood construction, and explains aspects of early Canadian architecture that have never been documented. It also provides a comprehensive view of a vibrant component of Canadian cultural history, told with a deep commitment to architectural and social evolution. The book will therefore interest a wide variety of readers, from architecture students, to members of the housing industry, to the general public.

Canadian Housing in Wood should be recognized as the work of an individual. It should not be interpreted as an authoritative work on behalf of CMHC, but rather as an independent perspective that is unique in its exploration and interpretation of the history and influences of Canadian wood housing.

CMHC hopes that the publication of Maurice Clayton's review results in a greater appreciation of a Canadian tradition that has housed its population for centuries, and that has resulted in an industry that has placed Canada at the forefront of international recognition.

ACKNOWLEDGEMENTS

I would like to express my sincere thanks to Canada Mortgage and Housing Corporation for making it possible for me to write this book. Also, my thanks to the archaeologists and ethnologists of the Canadian Museum of Civilization who willingly shared their expertise on our aboriginal people; especially before contact with the European. And my appreciation is due to Parks Canada for making available to me their meticulous "as found" record drawings.

Over the years I have sought the help of many people, authorities in museums, academics, colleagues in CMHC and Canadians who share a common interest in our past, to all I am grateful for their assistance. Finally, I must thank my family for their patience and understanding of my search for the past.

Maurice J. Clayton

Architect

MRAIC

MAIBC

RIBA

CANADIAN HOUSING IN WOOD

An Historical Perspective by Maurice J. Clayton

INTRODUCTION

The history of a nation's housing is a record of the way its people have responded to the environment, as well as how they viewed their future. The frame of reference for a society is normally its political history. Other aspects of a nation's culture have their own ways of relating to this common framework.

Canadian housing does not have a chronological and recorded history. This book attempts to provide its history based on a recording of methods of housing construction. Housing construction is a good basis of judging significant change in a society. It can signal change in the provision of its housing, invariably by new forces acting upon the economic structure. The process of home building, the methods, as well as why homes were built, will be discussed in order to understand the history of housing.

Built environments are moulded by influences from many sources. Housing is mostly socio-economic in nature and has remained rather constant throughout history. However, it is the different degrees of pressure exerted by these influences that distinguish house-building techniques over the centuries. Economic issues are broad. ranging from the condition of the marketplace, to costs of materials and labour. This also includes availability, which was a major issue before easy transportation of goods and services was available. Concerns of topography was an important consideration before the development of earth-moving equipment. The

climatic conditions of a location must also be considered.

Another issue is the combining of cultural and architectural style. The interrelationship of structure and aesthetics is a complicated subject. Over the years aesthetics have become an integral part of the total design of a house.

The terminology used in describing buildings can also be helpful in determining housing history. French and English methods used in Canada present problems

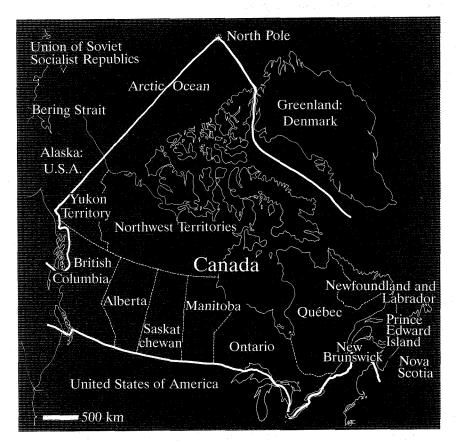
through translation. Each language has its own range of names for the same thing. Comment on the name of a particular technique will be given; however, only one term will be used. This term will be the most appropriate one for presentation on an overall historical basis.

Traditional terms are not always selected, however, both terms may be used. For example to avoid confusion the titles of "designer" and "builder" will both be used in this book. It is important to understand the housing of earlier periods and how people perceived their homes.
Gathering this information is a difficult thing to do. In Canada, different attitudes of class and cultures are just the basis of such a view. The different attitudes of immigrants,

particularly of the first generation, often base the quality of housing not within Canadian context, but within the conditions of their native land. These attitudes not only embraced the quality and type of space, but also the quality of construction. At that time, people were prepared to accept the most unattractive standards of building. To simply be in a new land was, for

most, a start. As a result "housing of the period" is mostly the housing of the wealthy. This is not the result of an historic class structure but the result of an upward mobility within a generation or so, the continuing improvement in the quality of our housing has become almost a part of our ethic.

It is to be hoped that a greater understanding of Canada's past will encourage the process of improvement to evolve towards quality not quantity of what is built. As in the past, what we build now will be a contribution to the heritage of Canadian housing.



Map 1

2 CANADA

St. John's, Newfoundland is 6 880 kilometres from Victoria, British Columbia. Consequently, St. John's is closer to London, England than to Victoria. The southernmost part of the country is Point Pelée sharing the same latitude as Rome, while the northernmost point is so far north that it is uninhabitable. In this vast land, 24 million Canadians live in nearly nine million homes.

Canadian history tells of the battle to create a nation in spite of a stern geography.1 The land is hard and raw at times, mild and forgiving at others, but it is rarely gentle. Canada (Map 1) has been home for aboriginals and Europeans alike, and over the past half century our perception of the country has altered dramatically. We know more about Canada but we are losing the urge to go visit this vast land of ours and see it first-hand.

The history of housing must be observed by the builders

and their reasons for building. In a country such as ours, with many nationalities, housing is more than just buildings. It is an opportunity to live a life that most people were unable to live in their native country.

There is another barrier to the past. This is one of time and distance. Although distances have remained the same, the time to travel these distances has not, and this has coloured our perception of the country.

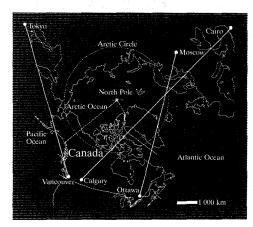
The tremendous increase in international travel has forced Canadians to view the country from a fresh perspective: the polar projection (Map 2).

Quicker and easier transportation has allowed the same materials for house building to be available in every corner of the country, and at nearly the same price. The democratic process has made housing material indistinguishable from one area to another.

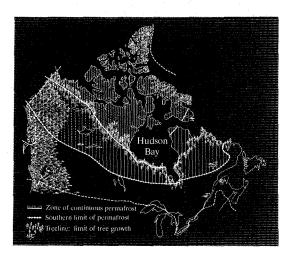
A condition unique to northern countries is that of permafrost. This is the thermal condition of the ground when its temperature remains below 0°C continuously for one year. The prevalence of permafrost and the tree line is shown in Map 3.

Note to Chapter 2

 J.M.S Careless Canada: A story of Challenge (Toronto: The MacMillan Company of Canada Ltd. Reprint of Laurentian Library, 1979).



Map 2



Мар 3

3 HISTORY

The first people to settle in Canada were the ancestors of our present aboriginal people. They came from Asia by way of the Bering land bridge some thousands of years ago. Regrettably there is little information on the evolution of their housing due to a lack of written history, consequently, this present work deals with it employing the base line of precontact with the European.

The earliest record we have of Europeans coming to North America is about

AD 1000 when a small group of Vikings came to L'Anse aux Meadows, near the present town of St. Anthony. Newfoundland. However, their stay was seasonal and even then lasted only for 25 years or so. It was not until the start of the 17th century that Europeans returned to North America to establish permanent settlements. In Europe this gap of approximately 600 years saw societies gradually emerging from a brutal feudalism into the relatively civilized times of the Renaissance.

The Viking presence in North America at the start of this millennium represented only a tip of a tentacle stretching back to Scandinavia. Other tentacles spread throughout coastal Europe via numerous rivers

penetrating into its interiors. Importantly, the Vikings developed permanent settlements both in England and in France. In the case of France, the region of Normandy was given to the Vikings for settlement in AD 911, in return for their protection in stopping forays up the river Seine to attack Paris. About 100 years later, both the rulers of England and of Normandy were the descendants of original Vikings. It was then the historic friction between the French and the English began, a thread that was run through the history of both people until today. It is an intriguing fact that parallels to the first forms of house construction. It illustrates the fact that homes are invariably a direct response to the socio-economic conditions of the period.

In the middle of the 11th century, William, Duke of Normandy, considered he possessed a more legitimate claim to the throne of England than did the incumbent,

Harold. In AD 1066, he invaded England, was victorious and is known in history as "William the Conqueror," Over the next centuries, the Kings and Queens of England acquired more and more territory in France by way of inheritance and/or marriages. The French believed the Kina of England could not own parts of France unless allegiance was pledged to the King of France, however the English refused to do this. The situation was further aggravated due to the disagreement over the Salic Law, which denied any possible dynastic succession through the female line. Today it all seems a simple case for a supreme court, but it was not so then. It was the root cause of almost 500 vears of intermittent but bloody warfare. On the other hand we may safely assume the French were not unmindful that if the English were driven out of France, the spoils of war would include the vast landholdings under dispute. By the end of the 15th century the English had been driven out of continental Europe and the combatants then turned their eyes to new conquests beyond the horizon.

The 16th century could be called the century of explora-

tion so far as the presence of the French and English in North American waters are concerned. The impetus driving them was the hope of finding a short route to the Orient, or failing that, riches: gold preferably. By the start of the century Christopher Columbus had reached the West Indies, soon after, John Cabot had sailed from England. Cabot did arrive on the shores of Atlantic Canada although the precise location has not been identified. Jacques Cartiers made three voyages to North America, he explored the Gulf of St. Lawrence and sailed up the river as far as modern day Montreal. On two occasions he wintered in the region, but the intent of establishing a permanent base was foiled. principally due to the severity of the winters. The British had also attempted to establish themselves in Virginia, but they were not successful. In this case they were unsuccessful because of an attack by the Indian inhabitants. The most fortunate of all were those who sailed to the vast fishing grounds around the Newfoundland coast. They were the English, French. Spanish and Portuguese. The Basques from northern Spain left a permanent record of

their presence in Red Bay, Labrador, of the clay roof tiles used on their stone buildings constructed for their fish and whales. By the end of the century the south coast of Newfoundland was recognized as British and with the north and west coasts as French. There does not seem to be records of other maritime nations sailing to these fishing grounds but it would be surprising if they had not done so.

The next century, the 17th, saw the beginnings of permanent settlement by the British and the French. For the British it was the start of what would eventually become the "Thirteen Colonies" on the Atlantic coast. For the French it was the start of "Nouvelle-France" their far-flung empire from Quebec to the Mississippi and down to New Orleans on the Gulf of Mexico. But once more the French and British had begun to fight each other, not only in Europe but wherever they encountered each other in the different parts of the world.

The British colonies of James Town and Massachusetts were established. The Acadians were on the Nova Scotia side of the Bay of Fundy and Samuel Champlain had founded Quebec. These tentative starts on settlements. employed at first the squared timber techniques brought from their homelands. Interestingly, it was not after too many winters the colonists began to cover the outer walls with boards of one kind or another. This not only protected the exterior but it also cut down wind penetration into the interior. By the end of the century both the British and the French had begun the lucrative fur trade. The Hudson's Bay Company had received its charter from England as had La Compagnie

du Nord received theirs from France. Two other European countries had also founded their colonies. New Sweden and New Amsterdam by the Dutch. Eventually, both were absorbed by the British sphere of influence. One of the important aspects of British and French colonization was that from the start in North America, there was a tremendous disparity in the demographic situation between them. For example, the white population of Massachusetts in 1645 was 21 000, whereas that of

Nouvelle-France in the same year was about 450. A situation which has always played a significant role in the relationship between ourselves and our neighbour to the south.

The 18th century was, in the New World, one of expansion. It saw the growth of trade with Europe as well as constant warfare. But as before, the cause was the result of a global conflict between the two protagonists. The turning point for the British and French came after the

British captured Quebec in 1759. This resulted in the Treaty of Paris in 1763, which ended the French political and military presence in Canada. This was not the end of the French people themselves. and the friction today between the English and French has as its roots these events in the mid-18th century. One measure of this "cultural separateness" is the fact that house building techniques in Quebec, almost to the recent past are derived from 17thcentury France, not from Britain.

In 1776 the British settlers of the Thirteen Colonies rebelled against their rulers in Britain and their Declaration of Independence proclaimed the new United States of America. Those not wishing to become citizens of the new country

migrated north to Canada and became known as "Empire Loyalists." They settled in Ontario, parts of Quebec, New Brunswick, Nova Scotia, and in Prince Edward Island. Once again the building techniques brought with them from the South, had their origins in 17th-century Britain.

It was at the end of the 18th and start of the 19th centuries that saw the arrival on the Pacific Coast of Europeans who came by sea and overland. The overland expansion in Canada was the result of the thriving fur trade. In 1821 the Hudson's Bay Company and the Northwest Company merged. The crews and tradesmen of the fur brigades were invariably French Canadians and most domestic types of buildings in Western Canada up to the mid-19th century could trace its ancestry back to 17th-century. France.

A significant problem in the United States in the early part of the 19th century was the lack of skilled carpenters to build the heavy frame type of housing employed in the East, nor was the timber available

on the Prairies for such construction. But as so often happens a solution was available in a new concept for building "light-frame construction." It quickly became known as "balloon-frame construction" with its first recorded use in North America being St. Mary's Church, Chicago in AD 1833. By the mid-19th century the opening of the American West saw a flood of migrants but because of the lucrative fur trade, a similar opening of new lands for farming in Canada was delayed. At the latter part of the century, in an attempt to hold back the tide of Europeans from the East, the Indian and Metis of the Canadian Prairies rebelled. tragically. It ended with the hanging of the rebel leader, Louis Riel in 1885. The rail line across the country from Montreal to Vancouver was completed in 1886 and the government actively sought immigrants from Europe to farm the great Prairie. These people brought the housebuilding techniques from their homelands but these forms of construction eventually died out in favour of the light-frame method already in use. Between World War I and World War II the balloon-frame technique evolved into "platform-frame construction" used throughout Canada today.



THE ABORIGINAL PEOPLE

There are four distinct groups that comprise the aboriginal people of Canada: the Indian, the Inuit, the Métis, and the Non-Status Indian. The Indian are often incorrectly referred to as the Red Indian. The Inuit are the aboriginal inhabitants of the Arctic, previously known as Eskimo. The Métis are both Indian and European, and the Non-Status Indian is an administrative term used to identify those Indians not belonging to a particular band or reserve.

The cultural areas of the Indian and Inuit throughout North America are shown in Map 4. Each group has its own distinct geographical region: the Northwest Coast, Plateau, Plains, Eastern Woodland and Sub-Arctic. The Inuit were linked across Canada's Arctic from Greenland to Alaska. The cultural boundaries of native people bear no relationship to contemporary political boundaries.

America was populated by migrants from Asia, who came via the Bering land bridge. Archaeologists agree this began more than 20 000 to 40 000 years ago. The Ice Ages made it possible for migration to occur, the latest being about 10 000 years ago. The relationship between migration and an Ice Age occurred because water would lock up and lower the sea level around todays Bering Straight. It could have been lowered by as much as 91.5 m (300 ft.). 1 By examining the undersea contour in Map 5, it can be noted that the land exposed to the Ice Age was vast. This bridge was in fact about 1 600 km (1 000 mi.) across. It contained flora and fauna similar to that found around the lands and lakes of the northern parts of our Prairie Provinces today. Although such a bridge existed, an icecap still covered the northern part of North America. Fortunately, there was a route through the ice wall as shown on the map.²

Although this gives the origin of our aboriginal people, it must be seen in perspective. Writing the origins of the English and French 10 000 years ago, was done by the cave painters of southern France. When writing of the origins of the West Coast Indian, John Dewhirst refers to their belief they have always lived there. Present archeological evidence from Friendly Cove indicates they have indeed lived there for the past 4 200 years, and as he rightly says: which is almost like always.³ The problem of the relationship between the aboriginal and the non-aboriginal people today is highly complex and even after so many generations of contact, it is only now the enormous chasms separating the two are being spanned, but the process is extremely slow.

The Métis and the Non-Status Indian, have lived in European forms of housing, the base line for the description of Indian and Inuit housing. This was before contact with the Europeans, which began to change original forms, however, this base line was fluid in time and place. And that is a part of the chasm that has to be bridged in the future.

To draw a line on paper to scale requires that a dimension or a length, be determined. Drawing a house to scale meant working from a variety of sources. Occa-

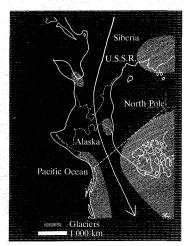


Map 4

sionally a measurement has had to be interpolated, but not in too many cases. Moreover, we have to bear in mind these people were just as individualistic as we are today and were quite as capable of developing numerous variations on the theme of a particular technique. What is shown should therefore be taken as being representative of the construction methods used by the different groups.

Notes to Chapter 4

- P. Farb, Man's Rise to Civilization, (New York: E.P. Dutton, 1978).
- R. McGhee, Canadian Arctic Prehistory (Toronto: Van Nostrad Reinhold Ltd., 1978).
- J. Dewhirst, The History and Survival of Nootkan Culture (Victoria: Sound Heritage, 1978), Vol. 7, No. 2.



Map 5

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THE NORTHWEST COAST INDIAN

The territory of the Northwest Coast Indian lies on the Pacific rim of Canada but does extend into the United States. More specifically, it lies north into Alaska and south into California. The location of the main linguistic groups—Tlingit, Tsimshian, Haida, Bella Coola, Kwakiutl, West Coast and Coast Salish—are shown in Map 6.1

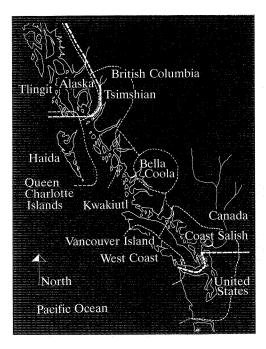
This coastal region is mountainous, with numerous twisting fords and a maze of islands. The only practical

means of communication was by sea. In most areas the mountains rise immediately behind the sea coast, stretching inland, range upon range, for hundreds of kilometres. The Coast Mountain Range, as well as the Vancouver Island Range was the first to directly affect the lives of the Northwest Coast Indians. The sea was tremendously rich in many species of fish and sea animals. On land there was an equal abundance of game and berries, all for the taking. A virtually unlimited supply of food and extremely difficult overland travel combined to establish a population that was largely sedentary, unlike many other North American aboriginal peoples. Because of a plentiful food supply, and a climate of moderate temperature, the Northwest Coast Indians had a measure of time to do as they wished. This lifestyle allowed them to develop their widely acclaimed forms of art and ceremonials.

The form of their houses was determined by their large family groups. Usually four to six families lived in one dwelling, but there could occasionally be more. However, whether large or small, all houses followed the same basic form of the particular cultural group. Because of the terrain, the more northerly housing could only be located on the narrow strip of land lying between the beach and the steep forested areas rising immediately behind. As a result, the appearance of a village from the sea was a continuous facade, punctuated by vertical carved poles.

More southerly locations usually were less restricted, permitting a freer siting. Whether north or south, the overriding factor for all was direct access to the sea, which was in effect both their farm and their highway.

Most housing ranged from a square plan of 12 m by 12 m (40 ft. by 40 ft.) to a slim rectangle plan of 9 m by 18 m (29 ft. by 60 ft.). These dimensions could be larger or smaller. Most homes had one entrance, although some had an exit to the rear. There were no windows and smoke escaped through the roof. All roofs were constructed of roof planks laid over each other. They were not lashed into position, only held down by stones and logs. Consequently, by using a long pole from inside the house, it was possible to move the planks apart to make the required opening. The exception were the Haida who used a simple. but highly efficient controlled smoke hole. All construction was of wood, using the structural principle of post and bean. The homes were at times massive in dimension. but they were always single storey in height.



Map 6

There were two distinct methods of wall construction in use at that time. Neither were load bearing. Instead, the walls were added after the structural frame was in place. The northerly groups, Tlingit, Tsimshian, Haida, Bella Coola, and Kwakiutl, used a permanent method of wall construction. Those to the south, the Coast Salish and West Coast, used horizontal overlapping planks.

The building material that was most readily available was the western red cedar Thuia plicata. This is one of the largest trees found in the Pacific region, frequently reaching heights of 45 m to 60 m (150 ft. to 200 ft.) and diameters of 2 m (7 ft.) and more (Plate 1).2 The wood of the cedar is soft, straightgrained and non-porous. Its colour is reddish-brown with near white sap wood. It can be split cleanly and is extremely resistant to decay. The bark is thick and fibrous and was often used as slabs for roofing. The inner bark could be used for weaving baskets, capes, or even mats for a variety of uses. The roots or even slender whippy branches could be braided or twisted into rope. The cedar withes were principally used

for lashings in building construction. The roots and small branches of the sitka spruce *Picea sitchensis*, were also used for this purpose.³ Capes and mats were made from the inner bark of the yellow cypress *Chamaeaypavis mottkatensis*.⁴

An important question, still not answered adequately, concerns the tools that the Indians used to cut and carve wood in the precontact period. There were the usual range of primitive implements such as mauls, wedges, cutting tools of bone or stone. and so forth, but how prevalent was the use of iron tools? There are those who believe that only iron tools could cut and carve in the manner observed by the first Europeans. The iron could have came from the remains of Chinese or Japanese junks washed ashore. It could also have been possible that the iron was obtained by trade from other Indians who had acquired it from the Spaniards to the south or the Russians to the north. Others argue

that many early cultures used a variety of non-metal tools to produce the most complex work in wood. The earliest specific information comes from the archaeological discovery of housing at Ozette, a village located on the northwest tip of the Olympic Peninsula in the State of Washington, U.S.A. The remains of houses were found buried in a mudslide c. AD 1520. Chisels and knives armed with metal blades were recovered from the site, but adzes formed only a small proportion of the woodworking tool inventory.5 The conclusions derived from

the metal tools used by all Coast Indians is not clear.

The general standard of craftsmanship was high but varied in quality. Small carvings could be rubbed down with sharkskin, but finish of larger carvings might be achieved by using a small adze. This gave a uniformly indented surface, not unlike that obtained in metal by peining. Adzing was also used to achieve a fluted effect on structural members not otherwise carved. Though the carvers of the larger artifacts were specialists, the vast

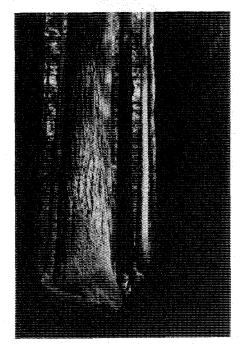


Plate 1

amount of material available, nearly all from after the first quarter of the 19th century, suggests that many who were not specialists must have helped create such a wealth of powerful beauty.⁶

The Northwest Coast Indian design possesses a unique quality, which has placed it among the foremost of aboriginal cultural traditions in the world. This quality is the remarkable integration of the decorative and the functional in even the most utilitarian objects they produced. Their art is two-dimensional with the ex-



Plate 2

ception of some forms, such as the mask. What appears to be three-dimensional is in reality the incising of the two-dimensional. This is quite different from the sculpted artifacts of the European. To study the housing of these people demands an understanding of how wood was used in all its guises throughout their total living environment.

The distinctive appearance of most of these Indians housing, is largely created by the various types of carved poles, or large painted images, on, or near, the front elevations. At first glance there seems an apparent chaos, especially with the northerly housing, however there is an order

present. The elements of carved or painted designs were similar throughout the Northwest. They conveyed meanings through the stylization of fish, mammals, birds, or supernatural beings. These become crests, somewhat similar to the heraldic symbols of Europe (Plate 2). There are three types of poles used: the free standing, or totem pole: the house frontal pole. attached to the centre of the house front; and the mortuary pole, which carried the remains of the deceased.

A totem pole could be anywhere from 7 m to 14.5 m (24 ft. to 48 ft.) in height. It was usually carved in the round shape and was most often carved to the top. Beaks, wings, fins, and so forth were created by attaching pieces of wood to the pole. Such poles normally commemorated a particular event or indicated the standing of a group or individual in the community. Totem poles

were common among the groups north of the Coast Salish and West Coast. A rare one might be seen in the south but such poles tended to be more literal in their designs.

The house frontal pole was used mainly by the Haida and Tsimshian, and occasionally by the Tlingit. It was attached to the centre front of the house but served no structural purpose. Its height ranged from 8 m to 12 m (26 ft. to 40 ft.). It was carved in the half round with the heartwood removed to retard decay. leaving a shell about 250 mm (9 in.) thick. Usually a hole was cut out for the entrance to the house. The carving depicted the lineage or status of the owner of the dwelling (Plate 3).

The mortuary pole was about 4 m to 6 m (13 ft. to 20 ft.) high. Sometimes it was set up by a grave but normally it was the grave itself. The remains of the deceased were placed in a niche cut into the top of the pole. The pole, or even double poles, was left in the round and was sometimes carved. A rectangular flat facing of split boards, usually carved or painted to commemorate or identify the

dead, was fixed at the top. However, this kind of pole was only used for the wealthy. After a death in the house, the deceased was taken out via the back and the body placed in a small channel house located behind the house. The body remained there for two years and only then were the remains placed in the mortuary pole.

Originally, all poles were painted, however the natural pigments used faded quickly. Original poles, although they were not necessarily ancient, invariably were seen in the weathered condition of exposed red cedar.

We view these Indians in relationship to the land and tend to ignore their sea-going abilities. They in fact, were skilled seamen. These Indians did not normally travel out of sight of land, but on this Pacific Coast of islands, with inlets and irregular seas, here was little reason to do so. That it was, is indicated by the regular coast trips, made in the middle of the 19th century by the Tsimshian of Fort Simpson down to Victoria. It was a round trip of 1 600 kilometres.⁷ Some communities went whaling but most fished and canoes were also used in the seasonal moves to

summer villages. Canoes indeed were always highly regarded.

The foregoing outlines the more common characteristics of Northwest Coast Indian housing, but there were considerable variations on the theme. To illustrate the range we will look at Coast Salish, West Coast, Kwakiutl, and Haida housing. Chilkat housing will also be touched upon briefly because of its unique technique of jointing.

The descriptions are based on construction techniques used about the early part of the 19th century before contact with the European had had any significant effect. Each is a synthesis of the ways they would be constructed since much depended upon tradition, available funds, local practices

and the social standing of the owner. Although photographic records were not made until later, sufficient evidence exists to know something of the designs. When photographers such as Dally, Dawson, Hastings, Dossetter, Maynard, Newcombe and Curtis were hefting their cumbersome equipment into what to them could only have been a seagirt wilderness, the images they captured were of a culture already in transition.

Notes to Chapter 5

- P. Drucker, Indians of the Northwest Coast (New York: McGraw-Hill Book Co. Inc., 1955), p. 6-13.
- R.C. Hosie, Native Trees of Canada (Ottawa: Information Canada, 1975), p. 100-101.
- 3. Hosie, p. 68-69.
- 4. Hosie, p. 102-103.
- J.E. Mauger, Shed Roof Houses at the Ozette Archaeological Site, (Pullman: Washington State University, 1978).
- B. Holm, Northwest Coast Indian Art: an Analysis of Form, (Washington State University, 1978), p. 19.
- 7. Log of Outfits of 1853-'56, Fort Simpson, Hudson's Bay Company, 1957.



Plate 3

THE COAST SALISH INDIAN

The Coast Salish territory stretches from Bute Inlet on the mainland across to Vancouver Island and down as far as the Columbia River in the United States (Map 7). The area encompasses much of the gentler terrain in the Coast Region, but the need for direct access to the sea or river was the governing factor in siting villages.

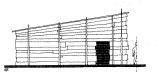


Figure 1



Figure 2

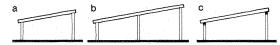


Figure 3

The two forms of houses used are commonly referred to as the shed and gable roof. The shed type is shown in Figure 1 and the gable in Figure 2. Since the Coast Salish and West Coast Indians used both forms of houses. the shed form of the Coast Salish will be described here and the gable form of the West Coast will be described in the following chapter. In the both villages the shed form predominated, but usually at least one gable form would be built. The

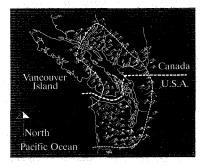
gable form houses were more costly because of the larger structural members needed. They did however, provide a large unobstructed internal space for meetings. Doubtless, when only one gable roof type was built in a village, it would be owned by the chief.

The three ways to construct the shed roof house were: the single span, Figure 3a; the double span. which requires a centre line of support. Figure 3b: the last method is similar to the others but the separate frames were joined by a continuous beam at the wall lines, Figure 3c. A common feature of Coast Salish and West Coast housing is the external wall construction of overlapping planks, which could be taken down and re-erected.

The size of houses could vary enormously, particularly in length. The plan shown here is about 7.6 m (25 ft.) wide and 9 m (63 ft.) long,

Figure 4. The internal height on one side is about 3.6 m (12 ft.) apart. One family would occupy one bay with circulation on the high side. Since it was customary to site the house parallel with the shore, entrances could be placed at any place along this wall. There does not seem to have been set rules for their location.

The number of bays occupied by one family would vary according to status, but all would have some means for delineating their territory. Possessions or low side walls were used to mark the boundaries of a family's space. The walls were about 1 m (3 ft.) high and made by lashing overlapping planks to poles driven into the ground. Families had their own fires and roof planks could be parted for a smoke hole. Usually a sleeping platform about 1 m (3 ft.) wide and about 450 mm (1 ft. 6 in.) high ran along the back wall and probably along the side walls. Fish drving racks could be arranged in the roof



Map 7

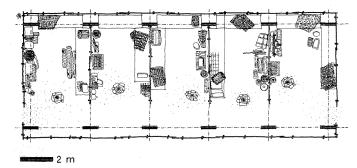


Figure 4

space. Private storage would be dealt with in a variety of ways; one is shown in the cross section, Figure 5.

Occasionally, woven mats were hung between spaces for privacy. Mats were also hung against the outside walls to ameliorate the effect of winds penetrating their loose construction.

A painting by Paul Kane, c. AD 1851-1856, shows the interior of a shed-roof house with centre roof supports (Plate 4). This work corroborates data from other sources on the low partitions, but the structure of the house illustrated is grossly undersized. Conflicting information, such as this, raises the question of the degree of reliance which may be placed on paintings. Kane was one of the better known artists of the latter part of the 19th century who painted scenes of the West. The West during this period was the greater half of an unknown continent which lay

beyond the Mississippi, in Canada: the confluence of the Assiniboine and Red Rivers. These artists were capturing images of a land and people known only to a very few Europeans. It was impossible for the artists to be completely knowledgeable on what they painted. Most of their final paintings were composed from notes and sketches when they returned home.

Detailed information on the structure of the single-span house in limited but roof supports ranged from round posts to rectangular slabs, and all roof beams were in the round. A bay system of construction using identical structural frames spaced at regular intervals were used. The space between the frames were referred to as a bay. In this particular house the supports are slabs 200 mm (8 in.)

thick, by 700 mm (2 ft. 8 in.) wide with the roof beam being approximately 500 mm (1 ft. 8 in.) in diameter. A hypothetical illustration of construction is shown in Figure 6. Once bays were started, technically there was no limit on the length of house. Wilson Duff refers to one structure being as small as 7.6 m (25 ft.) square and quotes Simon Fraser who saw one in 1808 at Langley, which was 18.5 m (60 ft.) wide and 195 m (640 ft.) in length, and records occasionally mention houses even longer. 1 Clearly. length was of little significance, but it was awesome to those not familiar with the concept.

The connection between the roof beam and its support is shown in Figure 7. The beam sits in a notch at the top of the slab. The 150 mm (6 in.) diameter pole rafters were laid over the beam in a similar manner and then lashed in place. Because a beam and its support are not jointed, the stability of the structure relies on the ability of the supports to resist forces acting upon them (Figures 8 and 9). The horizontal line represents the grade at

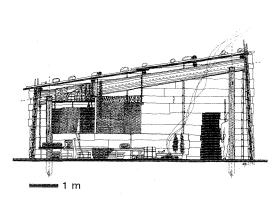


Figure 5

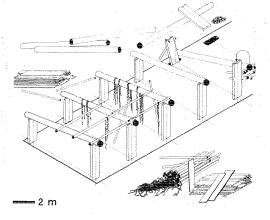
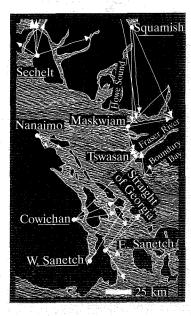


Figure 6



Map 8

the point at which the opposing force of the earth starts to prevent overturning of the support. In either Coast Salish or West Coast housing, these supports ranged in width from about 600 mm (2 ft.) to as much as 1 200 mm (4 ft.), although the use of larger supports were not common.²

The wall construction is shown in section and plan in Figures 10, 11 and 12. The purpose for using this system was to permit the wall planks to be removed from the main frame of the winter home and transported to a frame at the summer village and re-erected there. The planks were about 40 mm (1.5 in.) thick, but could vary in width from 300 mm to 1 200 mm (1 ft. to 4 ft.). Lengths also varied. but generally were from 3.6 m to about 4.8 m (12 ft. to 16 ft.). Two vertical poles were connected by slings of twisted cedar withes, or small flexible branches. The planks were slung between the poles. This form of wall construction enable the planks to be transported by lashing a number of

planks across two canoes. With planks about 3.6 m (12 ft.) in length and the beam of each cance about 1 m (3 ft. 6 in.) the appearance was similar to a contemporary catamaran. The planks were taken to summer villages and reused on a permanent frame. This procedure was time-consuming, and consequently the planks became too valuable to be left at the summer villages. Since these shelters were smaller, the winter complement of planks was not required. It is most likely that the wall planks left at the winter village were tied in a more permanent manner. There is in fact more than one reference of planks being drilled to take the ties.

Generally the pitch of the roofs was low, about 10° or 1:6. Practically every report on roof construction of Northwest Coast housing refers to overlapping planks running down the slope, overlapping both sideways and in their length.

Stones and sometimes logs were placed on the planks to hold them down. Planks could be moved aside from within the house by means of a long pole whenever a smoke hole, or more light was needed. But the real problem was not parting the planks, but getting them back into a rainproof position.

The annual cycle of the salmon returning from the Pacific to journey up rivers to spawn played a major role in the life of the Coast Salish Indian. Five species of salmon come through the Strait of Juan de Fuca and up the Fraser River. They came

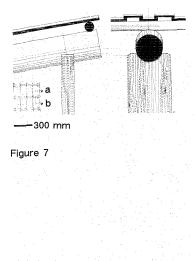


Figure 8

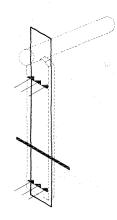


Figure 9



Figure 10

in sequence, so a summer village could be occupied for at least two months. This was an acceptable time to make the transportation of planks worthwhile. Movements across the Strait of Georgia are shown in Map 8.3 The vovage across the Strait for the "West Sanetch" people was about 80 kilometres.4

To give an idea of the number of people involved. two quotations given by Duff indicate the great number of people drawn to the Fraser:

"The Cowichan villages [summer ed.] were situated on the South Arm of the Fraser ... and McMillan estimated their total population to be 1 500."

On August 25, 1827, McMillan wrote: "Families from the Sanch Village at Point Roberts have been passing in continued succession during the day all bound for Salmon Fishery."5

In his chapter on "Summer Visitors," Duff quotes further records, indicating movement of hundreds of canoes.

At the end of the 18th century, Captain George Vancouver reported a great number of villages in ruins. A

reasonable assumption is that he had come across the frames of houses in summer villages. Vancouver was in the Strait of Georgia in the spring, before the Indians had arrived for summer, explaining the large number of the abandoned houses.

Notes to Chapter 6

- 1. W. Duff, Upper Stalo Indians of the Fraser Valley, (Victoria: British Columbia Provincial Museum, 1952), p. 16.
- 2. T.T. Waterman and R. Greiner, Indian Houses of Puget Sound (New York: Museum of the American Indians, Heye Foundation, 1921).
- 3. H.G. Barnett, The Coast Salish of British Columbia (Eugene: University of Oregon, 1955), Chapter 3.
- 4. W. Duff, The Upper Stalo Indians of the Fraser Valley (Victoria: British Columbia Provincial Museum, 1952).
- 5. Duff.



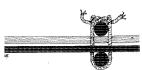


Figure 11



Figure 12

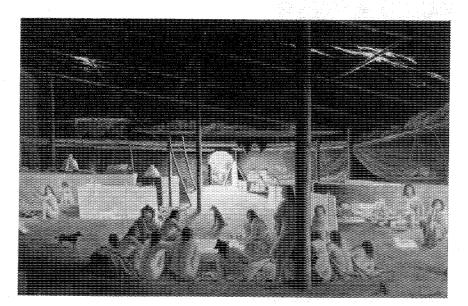


Plate 4

THE WEST COAST INDIAN

The West Coast Indians are located on the Pacific side of Vancouver Island, from Cape Cook down the coast and across the Strait of Juan de Fuca, to the northern tip of the State of Washington in the U.S.A. (Map 9).

The terrain is mountainous throughout the region and the coastline is serrated with deep fiords and inlets. The larger inlets are called sounds, and provide protection from the open seas of the Pacific. Most are islands, coves and

for one or two villages. The dominating mountains behind inhibited overland travel, and the storms in the ocean prevented contact between Indian groups for extended periods. The sounds became areas in the villages that formed miniature social groups within the general cultural region. However, heavy seas were not the only elements that had to be endured. The annual rainfall was another problem often reaching 2.5 m (100 in.) per vear.

beaches and provide shelter

The Coast Salish along with the West Coast Indian used removable planks for the wall construction, for both their winter and summer villages. They also made use of gable and shed-roof house forms. Plate 5 shows shed-roof houses at Nootka Sound in 1778.1 An isometric projection of a gable roof house is shown in Figure 13.

The plan, measured to the centre lines of the structure, is approximately 18 m by 12 m (60 ft. by 40 ft.). Because an open plan was required, it had to be without internal supports. As a result, the ridge beam was about 900 mm to 1 m (3 ft. to 3 ft. 6 in.) throughout its length. To achieve this, it weighed somewhere in the order of 3 629 kg (4 tons). The wall and roof construction were identical to that of the Coast Salish. The gable roof for both the roof planks stopped short of meeting at the ridge, thus allowing smoke to escape.

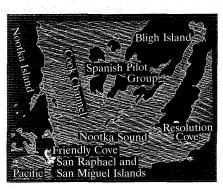
Depending upon the status of the owner, there would be a large open fire in the centre of the house. There could also be other fires for families

within the house. The delineation of private space for the occupants was again by means of the 900 m (3 ft.) high partition wall, or by possessions in the way of boxes. baskets and so forth. A width of 12 m (40 ft.) would have permitted family spaces, with sleeping platforms, to have access from a central corridor, but in practice it was not likely to have been a sharply defined one. Carving was done on the interior corner. posts and central rear support post. However, individual custom would have dictated the type of carving.

To appreciate the size of the structural members involved, three variations on the basic principle of the end frames are shown. Figure 14 is the front frame of the house just described. The horizontal beam across the axis of the house is 1.2 m (4 ft.) in diameter, as are the two corner posts and the back post. The ridge beam is about 900 mm to 1 m (3 ft. to 3 ft. 6 in.); the front centre posts are 600 mm (2 ft.) in diameter; and the side beams about 450 mm (1 ft. 6 in.). However, the side beams are supported in mid-span. The rafters, are about 230 mm (9 in.) in diameter and over these, the roof poles are about 127 mm (5 in.) in diameter. This is the method most



Map 9



Map 10

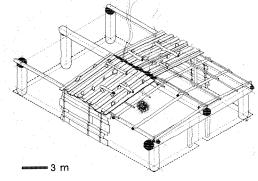


Figure 13

likely used by the Hesquiat, one Sound to the south of Nootka Sound.² Figure 15 illustrates the use of a double ridge beam, and Figure 16 is of a further permutation.

A drawing of the interior of a house at Friendly Cove. Nootka Sound was made by John Webber in 1778, it is shown in Plate 6. Unfortunately, his house would not stay erect because the posts were not supporting the roof beams as they should. The Indian was highly knowledgeable about the structural aspects of housing and the massive posts were there for structural support, and not merely for decoration as Webber would have us believe.

In 1970 a translation of Noticias de Nutka was published. The original, in Spanish, was a contemporary account of Juan Franciso de la Bodega y Quadra's visit to Nootka Sound in 1792. It was written by José Mariano Mozino, the botanist to the expedition.³ In the 1970

translation appears a drawing entitled "Interior View of Maquinna's House," in which the chief is shown dancing and his servants are singing and playing musical instruments (Maquinna was the Yuguot chief at Friendly Cove). The photograph is shown in Plate 7. Clearly, John Webber is plagiarized once again. Though by now, one of the main posts has disappeared completely, and Spanish officers and sailors have been added.

Clearly historical records of this kind must receive the closest scrutiny before their acceptance as true information on the past.

Philip Drucker comments on the hereditary right of some chiefs that allowed them to project the end, or ends, of the ridge beams, and have them carved in the symbolic representation of sea lions.⁴ Another practice was the fluting along the length of the ridge beam by means of a small adze. There was also the occasional painting of rings around the beam in either red or black. Drucker provides a description of the process for raising posts and beams:

"For handling heavy weights, levers were the chief tool to supplement sheer manpower.... For a post, a hole was dug with one vertical side, the other sloping ... (a) board was stood against the vertical side so that the butt

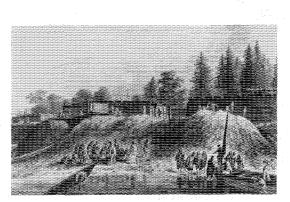
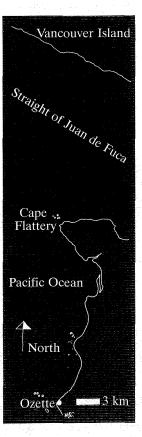


Plate 5



Map 11

of the post, which was placed against it, would not catch.... The end of the post was raised with levers and blocked up so that cross poles could be inserted under it. As many men as could get a grip on the cross poles seized them, while others pried on the end of the post with levers."

and:

"A shear legs was usually made ready to be slipped under the end of the post when the latter was at an elevation of about 45°....
Throwing in the offering was

the signal ... to straighten up the post with one great effort. Then it was twisted about so that the shallow notch lined up for the beam, and large stones and dirt were filled in against it. If the post was a carved one, the carving was done before raising it."

also:

"To raise a ridge pole or side beam ... heavy poles ... were made.... One end of the beam was raised by means of levers until one of the poles could be laid under it crosswise, then the other end was raised and another pole put under it about 15 feet from the first. A pair of poles was laid across the ends of the

first pair, parallel to the beam, then the ends were raised, one at a time, for the insertion of a third pair of poles. This process was continued, forming a cribwork under the beam. The members of the cribwork were wedged in place and secured with withes wherever there seemed any likelihood of them slipping." 5

From archaeological evidence, the west coast of Vancouver Island has been inhabited for over 4 200 years.6 In European terms, this equates with the time Abraham left on the Euphrates in his search for freedom of worship. At the time of contact in the latter part of the 18th century, the aboriginal population in the region was approximately 6 000. This contact was completely accidental. The European countries involved were Britain and Spain. Although both

were involved, they had different reasons for being in this part of the Pacific. The search for a route to the Orient via a sea route, north of the North American land mass, was still a constant goal of the British. But the search was not as random as was expected because the extent of North American land mass was slowly being defined, especially by northern land explorers and fur traders such as Samuel Hearne and Peter Pond. The Russians had also been exploring. Bering and Chirikov, in separate expeditions, had discovered the Bering Strait and sailed down the Alaska coast by 1740.

In 1776 Captain Cook of the Royal Navy was directed: "... not to lose any time in exploring rivers and inlets or upon any other account until you get into the before-mentioned latitudes of 65°...."

This is the latitude of the Bering Strait. Due to a deterioration in the weather pattern, sailing north from what is now San Francisco, the first land sighted on which

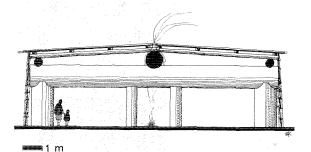


Figure 14

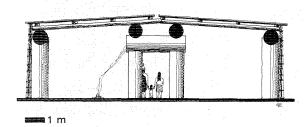


Figure 15

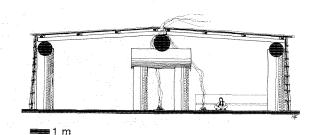


Figure 16

French water could be found. was Nootka Sound (Map 10). Here, in 1778, Captain Cook found not only fresh water but also timber of a remarkable size and quantity. However, all he really wanted at the time was a relatively small mizzenmast. In turn, the Indians wanted to trade sea-otter pelts. Returning home to Britain via the Hawaiian Islands, (where Cook was killed), his crew put into Canton and Macao and found the pelts could be sold for astonishinaly high prices. The future naval captain of the Bounty, William Bligh, sold his collection for a 1 800 per cent profit.8 On publication of this information by the British, the great fur trade of the period began, with Nootka Sound being the focal point. Cook had claimed the region for the British Crown but he was not the first European in the area. Juan Pérez, a Spaniard, had been sent north from Mexico in 1774 to verify the southern penetration of the Pacific

Coast by the Russians. When the Spaniards eventually heard of Cook's exploits they sent an expedition to Nootka Sound and established a fort at Friendly Cove. The Spaniards stayed until 1795. Spain and England agreed the region would be British and both sides withdrew for a time leaving Friendly Cove in the hands of its Indian owners. At this time they did not realize what the appearance of the European would come to mean.

The description of a house's shed roof, used by the West Coast people is based upon the finds made at the archaeological site of Ozette in the State of Washington, U.S.A. (Map 11). Ozette was traditionally a winter village of the Ozette Indians. They were part of the Makah people, all of whom belonged to the linguistic group of the West Coast

Indians. In 1967 the remains of four houses were discovered, which had been buried by a mudslide c. AD 1520.

Excavations have been carried out on Houses 1 and 2 at Ozette and excavation is continuing. A house at Ozette is described because the find is about 350 years earlier than present records of Northwest coast housing. Since the site is water-saturated, decay has been minimal and the dimensions of the structural remains are extremely precise. The description is a synthesis of the discoveries of the two houses and is based upon the doctoral thesis of Jeffrey Mauger⁹ as well as on-site discussion.

Historical records of Makah housing indicate the structural system was of post and beams used for a shed type of roof. The walls were horizontal planks. This information has been verified by the archaeological findings. The overall dimensions are 12 m by 19 m (40 ft, by 62 ft.) and five sets of posts and beams were used. They were erected at right angles to the axis of the house, with the axis being parallel to the beach. Posts are trapezoidal in section and two were cut

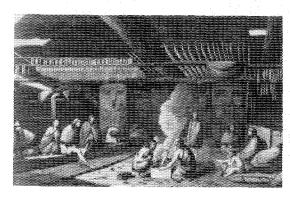


Plate 6

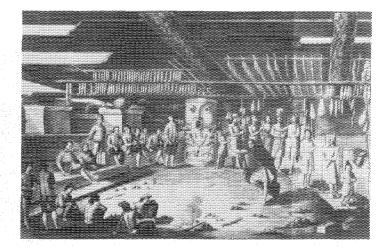


Plate 7

out of one tree in the profile shown in Figure 17. The dimensions are about 4.4 m (14 ft. 8 in.) high, 560 mm (1 ft. 10 in.) wide at the top and tapered to about 400 mm (1 ft. 4 in.) at the base. The supports are about 200 mm (8 in.) thick. Roof beams were not found, and it is assumed they were carried away by the slide. From an examination of the notches at the top of the posts, such beams seem to have been approximately 600 mm (2 ft.) in diameter. Rafters were approximately 4 m to 6 m (13 ft. to 20 ft.) in length and about 200 mm (8 in.) in diameter. A cross section is shown in Figure 18. The exterior wall planks run horizontally and overlap each other, as well as their butts. Their length was usually about 4 m (13 ft.), 400 mm (1 ft. 6 in.) in width and 25 mm (1 in.) in thickness. All the planks were assembled in the manner described earlier. At Ozette. the bottom planks of the walls were intentionally buried in ground. Archaeologists do not believe the depths of the interior and exterior middens could have caused this burying.

The internal height at the wall farthest from the beach

was 3 m (10 ft.) and the nearest to the beach was 4.5 m (15 ft.). The roof construction consisted of interlocked trough-shaped planks about 4.8 m (16 ft.) long, 400 mm (1 ft. 6 in.) wide, and 28 mm (1.25 in.) in thickness. As usual the planks were being held down by logs and stones. However, Mauger feels there were insufficient trough-shaped logs found to cover the total roof areas in the interlocking manner and he gives reasons as to why this was so. In particular, he suggests the trough shape was used for the bottom planks with the grooved planks on top. But whatever system was used, the planks were not long enough for the full run of the roof slope. The low slope of the roof had a dual purpose. The first was the need to shed rain and the second, was to provide a platform for drying fish. Findings also indicate vertical drving racks were used above the

roof. This relates to the same principle used in housing (Plate 8). A unique feature found during the excavation was the construction of a drainage system which ran behind, and down the sides of the houses. Because the annual rainfall was so high, it was essential to carry away the run-off water from the hill behind. These drains were made of boards and numerous large whalebones, all set on edge. Drainage channels with board sides and tops were also found under the houses.

The site location is interesting. It is above the beach line with a fairly steep hill rising sharply behind it. This particular land slide, was not unique. Archaeological evidence and local tradition confirm that other slides had happened both earlier and later. This was a winter village, and though the houses themselves were completely exposed to the winds and rain from the open Pacific, the location of the site was of greater importance. Out from

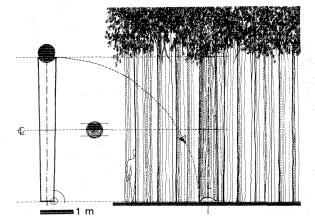


Figure 17

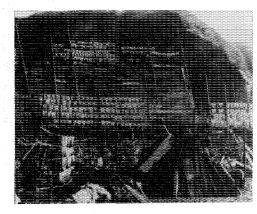


Plate 8

the beach, there are numerous rock outcroppings which together with a large reef, are exposed at low tide. This reef breaks up the surf before hitting the beach. Offshore are a number of islands that are accessible at low tide. These, together with the rocks, gave protection from marauders, particularly as Tskawahvah Island seems to have been used as a lookout. Even at high tide, a good knowledge of potential hazards would have been necessary to ensure a safe beaching.

Excavation continues year-round and more information was discovered to tell how these people lived. One point of interest discovered at Ozette, was the outlines of the houses are not particularly square, that is, their corner angles are not 90°, leading to speculation they were set out by eye; a reasonable possibil-

ity since the shed technique of building is far more forgiving than the gable; this is not seen in other Coast housing. Chisels and knives armed with metal blades were major significant recoveries of c. AD 1520.10 A study on the woodworking tools is being prepared and it should add enormously to our knowledge of how the houses of the Northwest Coast were built so long ago, well before contact with the European.

Notes to Chapter 7

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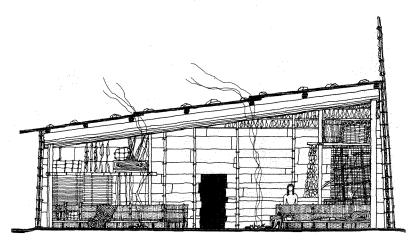


Figure 18

THE KWAKIUTL INDIAN

The Kwakiutl Indians live on the northern part of Vancouver Island and on the mainland from Bute Inlet north to the start of Hecate Strait (Map 12). Because of the topography and the need for easy access to the sea, the choice of building sites was limited to the land between the shore and the mountain towering behind.

The housing of these people usually provided accommoda-

tion for four to six families but this could be exceeded. The same form of construction was used for all sizes of dwellings. The Kwakiutl used only a gable form of structure, but variations on the same theme could be found throughout the region. The principal differences between Kwakiutl and West Coast houses were the structural members, which were reduced in scale and, most importantly, a permanent wall construction was

2 m

Figure 19

employed. The house described is based upon the work of Franz Boas as well as other sources, which comment on the subject, however obliquely.1

The house is square measuring 11 m by 11 m (35 ft. by 35 ft.) to the centre lines of the corner posts (Figure 19). The gable end faces the sea. Twin main posts are set at both ends of the house. Each post is about 750 mm (2 ft. 6 in.) in diameter: and they are 1.75 m (5 ft. 9 in.) apart from each other. As identified on the figure, the posts are located inside a surrounding platform that is approximately 1.4 m (4 ft.) wide. Over the posts are set beams each the same size as their supports. On the beams rest the two longitudinal beams, about 750 mm (2 ft.

6 in.) in diameter. As noted in the cross section (Figure 20), the purpose of the cross ties is to provide a firm frame around so the remainder of the structure can be built.

After the frame is in place. posts of about 300 mm (1 ft.) in diameter are set in position to support the edge of the roof beams. These are about the same diameter as their supports. In this structure. rafters are placed in position. each about 230 mm (9 in.) and approximately 1.8 m (6 ft.) apart and lashed in place with cedar withes. The spacing within the house is related to the overall dimension of about 11.3 m (37 ft.), however, it could be narrower or wider if desired because the rafters were not spaced in relation to the supports of the edge beam. The frame for the entrance consists of two posts about 300 mm (1 ft.) in diameter. A plank lining al-



Map 12

lowed a woven mat to be suspended from the top of the frame, as could any other type of cover.

After the erection of the supporting frame the roof and walls were constructed. For the roof, poles about 100 mm to 130 mm (4 in. to 5 in.) were lashed over the rafters about 1.8 m (6 ft.) on centres, but spacing would depend very much on the roofing material available. Normally cedar boards were used, but occasionally cedar bark would be employed. The bark of these trees was at least 50 mm (2 in.) in thickness and lengths of more than 1.8 m (6 ft.) could easily be obtained. The general subject of roof boards has already been discussed, however, in the case of the Kwakiutl. Frans Boas mentions that:

"The roof consists of a peculiar kind of boards, which run from the gable to the side of the house and rest on the beams. They lap on their sides like Chinese tiles, "2

We may take from this comment one more confirma-

tion of the channelled roof board that was being used for a great deal of the Northwest Coast houses.

As indicated on the plan and section, a raised platform of earth was built around the perimeter of the interior. It was about 550 mm (1 ft. 10 in.) high and 1.7 m to 1.8 m (5 ft. 6 in. to 6 ft.) wide at the sides, becoming narrower at the ends. The framework to hold this rammed earth consisted of an inner lining and the exterior walls themselves. The first procedure would have been to fix the front and rear wall sills in place. These were about 900 mm (3 ft.) in width, at least 100 mm (4 in.) in thickness with groves on their upper edges about 50 mm by 50 mm (2 in. by 2 in.) wide and deep. These sills were partly buried to provide some resistance to the pressure from the earth platform. The vertical wall planks of the sides did not have sills. They were buried directly into the

earth and lashed at the top to the edge beam. After this work was complete, the interior lining of the platform was placed in position with the earth being placed between the forms.

For the front and rear walls, vertical poles 100 mm (4 in.) in diameter were spaced at about 1.5 m (5 ft.) on centres. They were driven into the earth of the terrace and lashed to the side beams and to the roof poles. Horizontal poles were fixed across these vertical poles, all as shown in the cross section

(Figure 20). The vertical wall boards were seated in the grooves and lashed to the framework of poles just described. Holes were then drilled in the boards to take the cedar withe lashing. The details of construction for the side, front and back walls at grade are shown in Figure 21. To complete the house, exterior and interior steps were required because the platform ran unbroken around the perimeter of the house. The walls on the front and back elevation were finished with

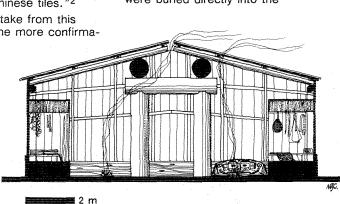


Figure 20

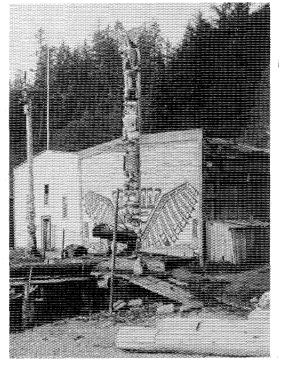


Plate 9

boards that followed the pitch of the roof, similar to today's barge board. Finally, the front was often painted. It followed the traditional symbolism of the Northwest Coast shown in Figure 22.

A house of this size would normally accommodate four families. One family would be in each corner. Each family would have its own fire, explaining the need for a flexible roof covering. Boas's comments on the interior:

"The corners belonging to each family are divided off

300 m

Figure 21

from the main room by a rough framework of poles, the top of which is used for drying fish or other sorts of food.

On each side of the fire stands the immense settee which is large enough for the whole family. It has no feet, is about 2.1 m (7 ft.) long and 1.2 m (4 ft.) deep and its sides slope slightly backward, so as to form a convenient support for the back."

It is doubtful if every Kwakiutl family possessed such a settee, but there was always some form of seating in these locations. Concerning sleeping arrangements, he goes on to say:

"These bedrooms have the form of small houses which are built on the platform running around the house. Most of these bedrooms have gable roofs and their fronts are finished off with moldings."

Boas' descriptions provides the earliest detailed information available, but at times these descriptions appear to be too detailed to apply to Kwakiutl houses in general. It is advisable to approach the information with caution, and to understand that every house of the Kwakiuti was not precisely as Boas described. Because the structure itself had innumerable variations it is reasonable to assume the layout of the interiors would have had a similar flexibility.

The internal height from the platform against the exterior wall to the roof is about 3 m

(10 ft.) and from the same level to the roof peak is about 4.4 m (14 ft. 6 in.). Another form of Kwakiutl house not using the earth platform are those built on a steep grade and even over water. In both situations the entrance is on the high or land side, and are supported on high foundations to maintain a level house. Most illustrations of this requirement indicate piles were used. The height from the ground was less than 1.2 m (4 ft.), rock cribs were employed in lieu of the piling.

The Kwakiutl erected totem poles but did not use house frontal poles. They preferred to paint designs on the house fronts, but it is inevitable that something should confound such a generalization. The photograph of houses at Alert Bay in Plate 9 shows an example of a frontal pole combined with a painted design. The pole probably came first, then the European siding, afterwards came the painting. It appears to be a successful melding of two ideas, but probably the purist would disagree.

The interior of another house frame is shown in Plate 10. In this case fluting is used instead of carvings.

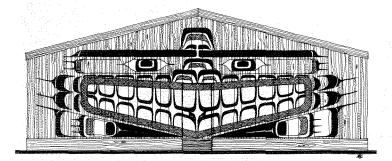


Figure 22

The result is achieved by the accurate use of a small concave bladed edge. For all its simplicity, the resulting texture is remarkably effective. The house was at Mamalilaculla, on Village Island at the south end of Queen Charlotte Strait. This Strait is a part of the inland passage between Vancouver Island and the mainland of British Columbia.

The Kwakiutl used summer villages but not in the same manner as the Coast Salish, their neighbours to the south. This raises an interesting question regarding wall design. From photographs, we know that some southern Kwakiutl housing used removable wall-plank construction. The mixing of the two can be seen in Plate 11. This photograph was taken c. AD 1900 and is part of Gwavasdunis Village on Bonwick Island, which is close to Mamalilaculla. As an aside, the carving at the roof line of

the centre house is unusual. These carvings were of the Sisiutl or Double-Headed Monster, a representation believed to bring protection to those living in the house. Getting back to house construction, it is occasionally suggested that the permanent form of a wall, which has just been described, is superior to the movable type of the Coast Salish and West Coast Indians. The housing of the Haida to be described later, also employed permanent wall construction, as did all Northwest Coast housing to the north of the dividing line between the Coast Salish and Kwakiutl. This does not question one construction technique over another. From the limited data available, both are a response to the needs of the occupants. Since the Coast Salish and West Coast people moved to summer villages for an ex-

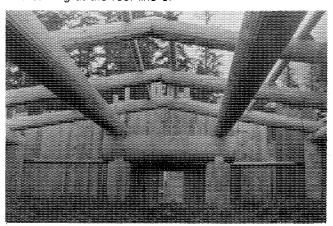


Plate 10

tended period during summer, they considered it logical to take with them the wall planks from a number of houses. But the people to the north did not follow precisely the same pattern of annual dispersal, and consequently, had no reason to use the same technique of house building.

Captain Cook visited
Nootka Sound in 1778 but did
not land in the territory of the
Kwakiutl. The Englishman,
George Vancouver, and the
Spaniard, Bodega Y Quadra,
probably did land, since both
had circumnavigated
Vancouver Island. To mark
the occasion, the first Spanish
map published in 1792 gave
the name of Vancouver Island
as "Isla de Quadra y
Vancouver."

Notes to Chapter 8

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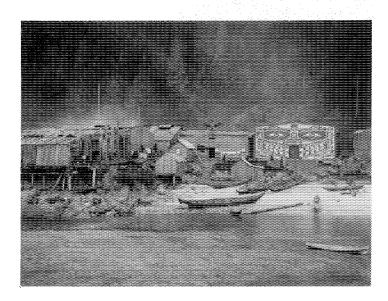


Plate 11

THE HAIDA INDIAN

The Haida live on Queen Charlotte Islands and on the southern part of Prince of Wales Island, Alaska (Map 13). The terrain is generally rugged and villages were built on stretches of land between the forested mountain and the sea (Plate 12). The sites selected were also sheltered from onshore storms and were close to good fishing grounds. Ninstints, one of the Haida villages on Anthony Island, was desig-

nated a World Heritage Site by the United Nations, in 1981.

The front of the houses have a classic simplicity. They are symmetrical and dominated at the centre by a magnificent carved house frontal pole (Figure 23). The low-pitch, roof-gable end is facing the sea. At each corner of the house are great corner posts, which were carried up above the roof line and sometimes but not always, carved above this line (Plate 13).

were treated were used to provide support for the roof of the house. The different styles can be seen by comparing Figures 24 and 25. In Figure 24 the roof beams are formed from half-round logs and are seated on the front beam with the projections being cut hexagonally. But in Figure 25, the beams are full-round logs stopped off at the inner face of the front beam that are supported by posts. The splitting of logs to provide the half-round roof beams would be time-consuming, but, the improved distribution of the roof load

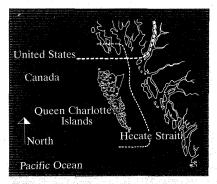
Two different styles con-

cerning the manner in which

the longitudinal roof beams

permitted the front and back beams to carry it without too great a change to their dimensions. The hexagonal shape seems to have been purely decorative.

The house to be described uses the projecting beams, in practice, the choice of construction was the owner's prerogative. 1,2,3 The size of the homes depended largely upon the wealth available and the number of people to accommodate it. The plan is rectangular and has a frontage of about 12 m (40 ft.) and is about 15 m (50 ft.) deep. These dimensions refer to the centre lines of the corner posts. The internal height of the roof, from grade to the roof planks, would be about 3 m (10 ft.), rising to about 4 m (13 ft. 4 in.) in the centre, as seen in the cross section (Figure 26). A smoke hole was located in the roof. with its centre directly over



Map 13

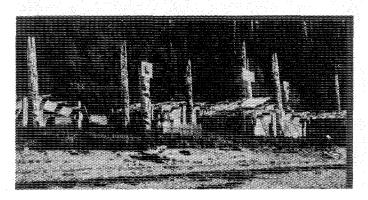


Plate 12

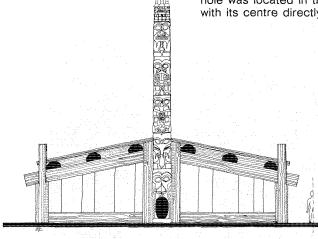


Figure 23

the middle of the hearth below.

The terracing defined a simple and practical manner in which floor space could be used. Fires and working would be on the bottom level: sitting or even sleeping on the intermediate level and sleeping and the storage of private possessions on the upper level. The upper level, in line with the external grade, often provided a space at the back of the house for an owner's private sleeping cubicle. It was made with planked sides and even had a pitched roof. In larger houses, small cubicles could also be built along the side walls for other families to use. This arrangement of terraces formed an ideal miniature amphitheatre for various types of gatherings (Figure 27). This longitudinal section also reveals complete proportioned internal space.

The support structure consisted of four large corner

posts, each with a base diameter of about 800 mm (2 ft. 8 in.). Rectangular sloping main beams 650 mm by 125 mm (2 ft. 2 in. by 6 in.). were slotted through the corner posts and projected about 500 mm (1 ft. 8 in.) beyond the posts being haunched to carry them. Two rectangular support posts were located at both ends of the house close to the ridge. They were about 600 mm (2 ft.) by 300 mm (1 ft.) and about 1.2 m (4 ft.) apart. The posts were occasionally carved on the interior face. The house frontal pole would be positioned against these posts with a small entrance opening cut through at the base.

The roof beams were approximately 600 mm by

450 mm (2 ft. by 1 ft. 6 in.) and set across the front and rear beams. Each was a half-round log in section that usually projected about 1 m by 1.2 m (3 ft. by 4 ft.). The space above the wall line between the extended beams was filled with blocking. Either planks or cedar slabs were laid over the roof beams. On ground level, the sill beams only touched the posts and were about 125 mm by 650 mm (5 in. by 2 ft. 2 in.). At the front and back of the house, on the top of the sills and on the underside of the rectangular main. beams were aligned directly over each other and both were grooved to take vertical planks. The grooves were

about 50 mm by 50 mm (2 in. by 2 in.). The side sills were similarly grooved, but the groove at the tops of the planks were cut into the underside of the end roof beams. These wall planks were about 50 mm (2 in.) thick and often of a surprising width, as much as 1.4 m (4 ft. 9 in.). The construction of the corner was the most critical aspect for the Haida house. The interior corners of the house were always square, prohibiting the posts to be visible from inside the house. The corner post had to be haunched and tenoned

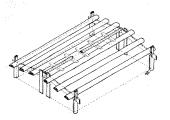


Figure 24

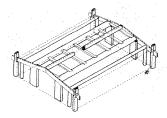


Figure 25

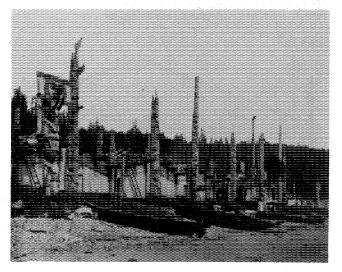


Plate 13

to take the front beam. This cutting also had to allow the end beam of the roof to sit over the ground sill.

Construction of the smoke hole meant that a continuous ridge beam could not be used, instead, cross purlins spanned between the upper roof beams. This meant the beam could be stopped on either side of the opening. The cover was made of planks joined together and located so the centre point was exactly over a small beam spanning the smoke hole. This acted as a fulcrum, al-

lowing the balanced covering to be tipped to one side or the other. It was controlled by a cedar withe rope carried from both edges of the cover down into the houses' interior.

The floors at all levels were covered by boarding that were covered with mats, either for general use or for sleeping. Lining for the sides of the terraces was normally of single massive planks, as thick as 150 mm (6 in.) and approximately 750 mm (2 ft. 6 in.) deep. The hearth is about 3 m² (30 ft.²) with a wood lining to retain sand or fine gravel that provided the base for the fire (Figure 28).

Their houses held a cosmological significance for the Haida.4 Essentially, the Haida's believed there existed an Upper and Lower World. and the axis mundi ran through the centre of their homes. Rising smoke from the fire in the centre of the hearth led to the Upper World. They believed ascent or descent could be expressed in symbolic paths radiating from the centre. One path led out through the front and one out through the rear, with the four corner posts representing the four corners of the earth.

This concept applied to each house (Figure 29). The path from the front led to the beach and to the bottom of the sea, which was the Lower World of the Killer Whale. The path to the rear led up the forested mountain: the Upper World of the Thunderbird.

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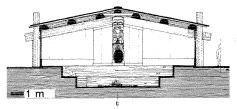


Figure 26

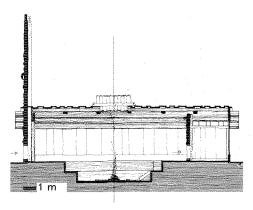


Figure 27

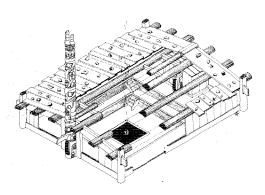


Figure 28

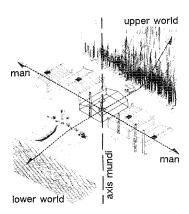


Figure 29

10 THE CHILKAT INDIAN

The Chilkat Indian belong to the Tlingit group of the Northwest Coast Indians who live in the Alaskan panhandle (Map 14). The principles of their house construction were not especially different from those to the south. Their methods of jointing practices differed significantly, enough to warrant particular mention. The predominant type of wood used in this case was the sitka spruce, also known as tideland spruce: Picea sitchensis and western hemlock: Tsuga heterophylla. The description which follows is based upon the work of the Shotridges and Emmons. 1,2

A typical house was about 12 m (40 ft.) wide and 13 m (46 ft.) deep (Figure 30). A sunken space, about 900 mm (3 ft.) deep was provided, and the surrounding platform was about 2 m (7 ft.) wide. The cross section facing the front of the interior is shown

in Figure 31 and that facing the back in Figure 32. Two main beams, each 600 mm (2 ft.) in diameter spanned the full length of the house and were supported on rectangular shaped posts set in from the ends of the house. The roof was formed by a system of cross rafters and longitudinal beams. A feature not found in other Northwest Indian structures is a massive ground sill at the front of the house about 1 m (3 ft.) deep. It is not unlike those used by the Kwakiutl and Haida but theirs much smaller in scale. The ground sill's purpose was to clear the average snow level in the winter. In concept, the front of the house is similar to that of the Kwakiutl. Vertical boards were let into a grooved sill and finished at the top with a flat beam with the Kwakiutl, but with the Chilkat, the beam sat on a haunch cut into the flat corner posts. The view of the rear of the house is seen in Figure 32. This figure shows a screen fitted between the two supports. The screens were painted with the usual symbolic forms of this culture and were set in place on special occasions. The pitch of the roof was steeper than elsewhere presumably because of winter snow conditions.

The location of the joints are identified on the plan shown in Figure 30 as a, b, c and d. Figure 33a illustrates horizontal wall planks slotted into grooves cut into centre posts of the side walls. The planks were tapered for that

purpose. Figure 33c is an interesting detail of the interior made of sitka spruce, but the carving itself was done in western red cedar and pegged into position. Figure 33d shows the lap joint at the intersection of the board to the platform.

Figures 33a and b, raise the question of origin. Are the carvings European or had they evolved within the Indian culture? The profiles illustrated are taken from the Shotridges' work and are probably from the middle to latter part of the 19th century.

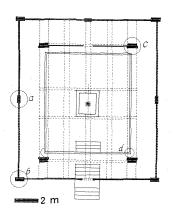
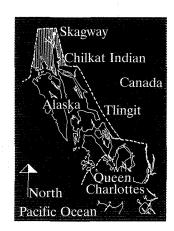


Figure 30



Map 14

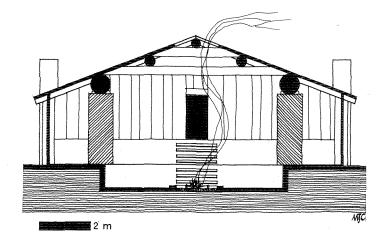


Figure 31

However, similar details were also used in the widely known Whale House built in the early 1830s. If details of construction required many years for this kind of assimilation, their use is put back to say the latter part of the 18th century. If indeed, this post and groove form of construction evolved within the Northwest Coast Indian culture exclusively, especially in the northern house forms, then a major

coincidence in contact between the North American aboriginal people and the European exists. The first permanent and sustained housing was built on the Pacific Coast by the European who used the same post and groove construction. This house, and the Hudson's Bay trading post at Fort Victoria, were constructed in 1843 by French-Canadian carpenters.

On the other hand, if the Chilkat construction was in-

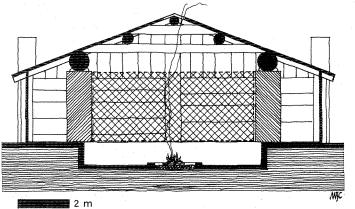


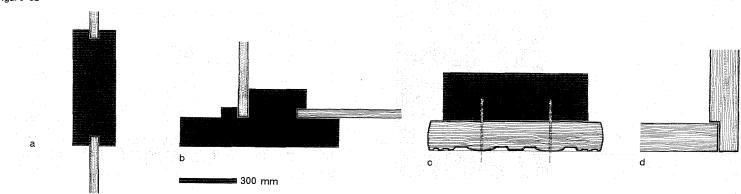
Figure 32

fluenced by the European, it would have been through Russians as there was no sustained contact with the British or other Europeans during this period. In the treaty of 1825 with the British, Russia abandoned claims to the Alaska coast south of the 54°40' parallel. The remainder of Alaska remained Russian territory until 1867. The Russians would have carried their knowledge of this traditional post and groove form of house construction from Eastern Europe to the Pacific. Because the method of construction used at Fort Victoria had its origins in the same region of Europe, do we see a transworld meeting of the two forms of construction. At the moment, there is no clear evidence to support either proposition. The only hope

evident would be for a water-saturated archaeological site to be discovered in this region and of a date well before European contact of any kind. A northern Ozette per-

Notes to Chapter 10

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haps?

Figure 33

11 THE PLATEAU INDIAN

The Plateau Indian lived in the lowlands and valleys between the mountain ranges of the interior of British Columbia (Map 15). In such a terrain the climate varied enormously. Winter snows ranged from being light to blocking all movement. Generally, summers were warm and dry but desert conditions may be found occasionally. Fish abound in the rivers and lakes, berries and game were plentiful.

In winter, the Indians lived in pit-houses, and in summer in tents or light framed lean-tos. Separated as they were by mountains, subdivisions of the culture existed however, basic principles of house construction was the same for all. The winter house to be described is based upon the reconstruction of the Shuswap pit-house built at Shuswap Lake Park in 1972. It was built by the Provincial Museum of British Columbia. 1 and the Teit. 2,3 In 1971, the National Museum of Man built a reconstruction of a Chilcotin pit-house at Anahim Lake.4

The principle of the house is shown in Figure 34 with the depth of the excavation being about 1 m (3 ft.). Because the form above grade is approximately that of a low cone, the exterior wall has minimal exposure to the elements as well as minimal heat loss. Today, the term pit-house carries a negative flavour, but a half-basement does not, and vet some contemporary housing apply the same notion of using the earth to conserve energy.

The true elevation of the Shuswap house can only be seen as captured in Plate 14. The plan of the house is shown in Figure 35, and the cross section in Figure 36. Four structural pillars are located 750 mm (2 ft. 6 in.) down from the tops of the inclined principal roof beams and slope to the centre of the

house. The excavation is 6 m (20 ft.) in diameter with the exterior walls being 9.6 m (32 ft.). The interval height from the floor level to the top of the roof opening is approximately 3.6 m (12 ft.). The size of the structural members varies from about 150 mm to 220 mm (6 in. to 9 in.) in diameter, however its size often depended upon the intended loading as well as the spans.

The sloping beams have the rafter poles spanning between them. The roof poles are laid over the rafters. The poles are then chinked together with grass and bark and a covering of clay was applied with earth tamped over it. A final layer of sod is used for the roof finish. Sod

was an excellent material for topping because the mass of fibre in the roots added significantly to the insulation, and, the grass finish enabled the housing to merge into the surrounding landscape.

Neither the Shuswap, nor the Anahim Lake houses provided revetting to the face of the earth excavation. It is not clear if this was omitted in both locations because the Indians did not use it originally, or if it was not known if they did, at least with some certainty. A ledge or shelf at grade would have been ideal for some storage, but could the shape have been kept



Plate 14

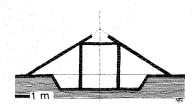


Figure 34

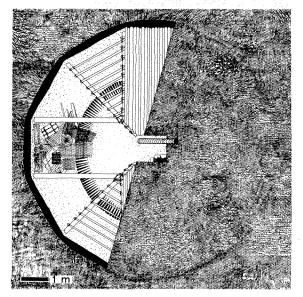


Figure 35

without revetting? A house such as this could have been the home for at least 14 people and children and an exposed earth face would have disappeared in the remarkably short time. Teit does not indicate a ledge or revetment in his drawing of a Thompson pit-house but even if the Indians did not have a lot of possessions, they would have had sleeping mats and so forth. The occasional mat is shown here in the interior. over the slope, but is only supposition on my part.

A notched log leant against the roof opening marked the

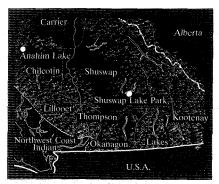
exit from the house. During this era however, women and children had to crawl in and out via a small hole in the side. Climbing the log was considered an ascent to the upper world.

Construction of the structural frame in the Shuswap house might appear to be complex, but in fact, it was remarkably simple. The essence lay in the use of a rectangular frame, whether visible or implied. Although top beams were not actually used in this particular house, they were at Anahim Lake. The squared frame was a sophisticated step in the

evolution of wood structures, primarily because it permitted unlimited expansion in all directions. Furthermore it provided a central space for the fire as well as a roof opening above.

The summer homes had light-framed structures (Figure 37). These structures were usually enclosed with mats of various kinds (Plate 15). A popular mat in some areas was the tule mat, a Spanish word for cattail. This form was also used extensively by the Eastern Woodland Indians for the same purpose. Teit shows the great number of shapes used by the Thompson Indians and it may be assumed they were also constructed elsewhere. Teit also photographed a superb example of their conical tent.5 The Plateau Indians were not isolated from outside influences. The Kootenay Indians for example, crossed the Rocky Mountains to join in the summer hunts on the plains, and it was not surprising to see the topmost mat on the tent being used with poles as a smoke control. The same method was used on the tipi by the Plains Indian.

- Discussion, and data supplied;
 The Provincial Museum of
 British Columbia.
- J.A. Teit, The Thompson Indians of British Columbia, (New York: American Museum of Natural History, 1900).
- J.A. Teit, The Shuswap The Jesup North Pacific Expedition, ed by Franz Boas (New York: American Museum of Natural History, 1909) Vol. 2, Part 3.
- Discussion, and data supplied. (Ottawa: National Museum of Man, now Hull: Canadian Museum of Civilization).
- J.A. Teit, The Thompson Indians of British Columbia, (New York: American Museum of Natural History, 1900).



Map 15



Figure 36













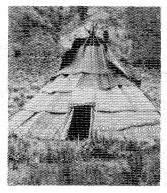


Plate 15

12 THE PLAINS INDIAN

The Indian has occupied the Great Plains of North America for many thousands of years. During this time, tribes have moved, settled and moved again, from East to West and from North to South throughout this vast territory. The Canadian part of the Plains is shown in Map 16. Much of the evidence of this ancient occupation is based upon the age of tipi rings, the circle of stones which held down the cover of their conical house form. The oldest tipi rings discovered so far are about 9 000 years old. The tipi of this age was not as sophisticated as those from the past 200 years. Its origins began the conical wigwam used some 5 000 years ago in the northeastern boreal forest. When nomadism was adopted, dogs were used for transportation either as pack animals or to pull the travois. With the western expansion of the Cree after AD 900, the conical wigwam reached the northern plains and from this house form, the tipi evolved.1

Until about the 18th century, relatively few Indians who lived on the Plains in permanent or semipermanent villages, practiced a rudimentary form of agriculture or hunted game and the buffalo.

When the Spaniards arrived to the New World, they brought horses from Europe. The horses did not become available to the Indian until after New Mexico was settled in 1598.2 The sale of horses to Indians was legally banned. but a black market thrived. Horses also escaped, and eventually wild herds began to roam. The approximate dates of their dispersal throughout North America are given in Map 17. When horses became available. Indians of the West and East poured onto the Plains. By 1800 over thirty different peoples had merged and a flamboyant, vigorous culture evolved. After an astonishingly short

time the Plains Indian excelled in horsemanship. This skill, coupled with guns from the East, brought to the new culture a wealth previously unimaginable. The horse also replaced the dog to pull the travois, and so, the equestrian culture of the Plains began (Plate 16).

In Canada, the Plains cover the grasslands and most of the adjacent parklands. Not only does the region include the flat prairie, but it also includes wooded areas, low rolling hills and broad river valleys. The Indians, as well as the buffalo, sought shelter from the frigid winters in the latter terrain. The Plains Indians were nomads since they followed the roaming buffalo as their way of life. This constant movement was required because the vast distances involved made predictions of the animal's whereabouts difficult to estab-

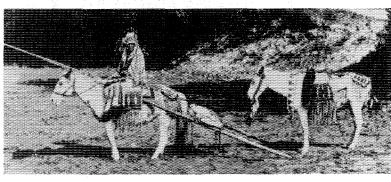


Plate 16

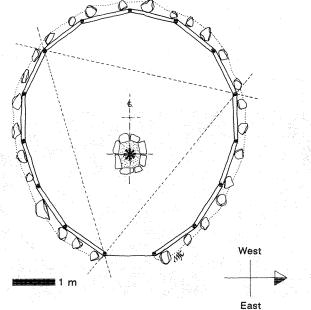


Figure 38

lish. On horseback, hunting parties could range far and wide. Real problems existed not in the kill itself, but transporting the families to the carcass for butchering. This was imperative because the Indian used most of the animal for food and their everyday needs.

The Plains Indian home was the tipi. It consisted essentially of a frame of poles with a cover. The highly visible

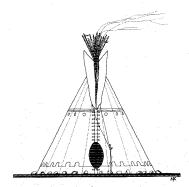
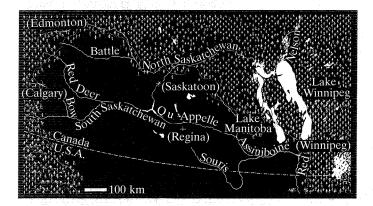


Figure 39



Map 16

features of the tipi were the smoke flaps located at the top of the covering. Throughout the Plains different tribes incorporated individual versions of details in its construction, but the structural principle remained the same for all (Plate 17).

An average size for a tipi to house a family would be about 4.8 m (16 ft.) in diameter.³ The plan is shown in Figure 38; the front elevation in Figure 39; and the side elevation in Figure 40. The shape of the tipi is not a true

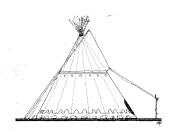


Figure 40

cone. They were built this way because the back of the tipi always faced into the prevailing wind. In order to provide a bracing effect, the front poles were inclined at a lower angle to the ones at the back, as illustrated in Figure 41. Since the prevailing winds on the Plains are westerly, entrances to tipis usually faced east. Another reason for the shape of the plan was to locate the crossing of the poles behind the smoke from the fire, located at the centre of the tipi.

For this size of tipi, 15 poles were required for construction, each 6.4 m (21 ft.) in length, and ideally, with a diameter at the base of 85 mm (3 in.), tapering to about 50 mm (2 in.) at the point of crossing. This gave a crest of poles about 1 m (3 ft.) measured above the crossing. A tipi of this size needed at least 16 hides for its cover. These would be

fitted and sewn together with sinews from the buffalo. When spread out, the cover resembled a semicircle as in Figure 42.

The description of construction sequence is based largely upon the work of the Laubins.4 Before construction began, the plan was marked out on the ground and a tripod erected. The Cree and Sioux used three poles. whereas the Blackfoot and others used four. Seemingly tribes using one form or the other maintained that their procedure was superior. The three poles were laid together and tied with a rawhide line at the crossing, the point where the top of the cover would come. One end of the line used for tieing was left hanging down to the ground and peaged. The poles of the framework were then laid into the crotches at the top. The rawhide line, previously pegged to the ground, was untied, brought outside the frame and taken around to tie



Plate 17

all poles firmly into position at the crossing. The line was then brought down one of the poles and hitched at ground level. At times of high winds, the line was pegged in the centre of the tipi to help in riding out storms.

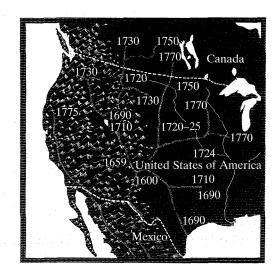
The cover was folded onto the lifting pole.⁵ The pole was placed in position and the cover unfurled around the frame to the front. It was then fixed in place with wood lacing pins. Finally, the poles were eased out to their final position, to make the cover a snug fit. The entrance was provided in a variety of ways, two are shown in Figure 43. To complete the structure, two poles were slipped into pockets at the top of the smoke flaps and crossed at the back of tipi, which can be seen in the back elevation.

The interior lining was then fitted into place. First a rawhide line was fixed around the tipi, about 1.8 m (6 ft.) from the floor. The lining was tied to the rawhide and then to the poles. This part of the tipi is often viewed as a purely decorative finish to the interior, but it had a greater functional role (Figure 44). The bottom of the tipi cover was turned outwards, and was held down by rocks. The bottom of the lining was then turned inwards and was covered by a floor of buffalo skins. Incoming air at ground level was directed up between the inner lining and the outer cover. It also prevented vermin from getting in. The stack effect drew smoke from the fire and expelled it from the top of the tipi, which

was assisted by the judicious setting of the smoke flaps. Consequently, the lining was as essential as the flaps themselves. David Mandelbaum notes that the Plains Cree stuffed grass into the space in winter as a means of insulation. At this point, the space between lining and cover was approximately 75 mm (3 in.) deep.⁶

The painting on the exteriors of tipis, which only amounted to about 10 per cent of those in use, as related to the rituals of the tribe. Ted Brasser wrote of the Blackfoot paintings, and commented:

"The paintings on the tipi covers among Plains Indians were either pictographic or symbolic in nature. Tipis painted with symbolic pictures are considered sacred since the paintings refer to visions or other mystic experiences of the original tipi owners. The symbolic meaning of all these conventional designs is to be found in the tribal mythology and constitutes a link with the major rituals of these people. The tipi represents the cosmos as known to the Indians. whereas the combination of



Map 17

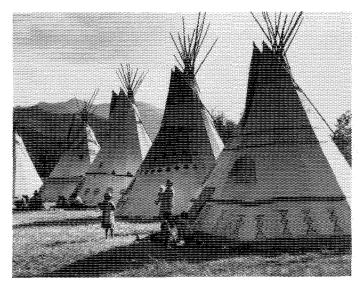


Plate 18

individual vision symbols combined with those of the tribe as a whole confirms the acceptance and incorporation of the individual's religious experience within that of the group." A painting may be seen in Plate 18.

Skirmishing between the Indian and European began soon after the first landing in North America during the early 17th century. At times, fighting flared into open warfare or shouldered under the surface like a forest fire, ready to burst into flames at any time. The end of Indian resistance took place on the Plains during the latter part of the 19th

century. At that time, the United States had concluded that the only way to conquer these Indians was to starve them into submission. At the start of the century, millions of the buffalo roamed, but by the end, the whole species had been exterminated in a frenzy of slaughter. The Indians did not only starve. their nomadic culture was also tattered. Of what use was the tipi now? In Canada, the last desperate attempt to stem the European tide onto the Plains was made by the combined uprising of the Métis and Indian living there. The precise end of this particular era lay in the execution of their leader, Louis Riel, in 1885,8,9 But as events still show, it was not the end of their battle.

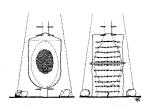


Figure 41

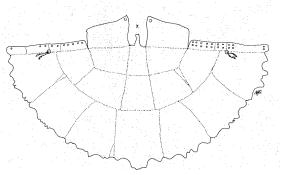


Figure 42

Figure 43

- T.J. Brasser, The Tipi as an Element in the Emergence of Historic Plains Indian Nomadism. (Plains Anthropologist, 1982), Part 1 p. 27-28.
- P. Farb, Man's Rise to Civilization: The Cultural Ascent of the Indians of Northen America (New York: E.P. Dutton, 1978), p. 104-105.
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- T.J. Brasser, Tipi Paintings, Blackfoot Style, (Ottawa: National Museum of Man, 1978) Paper 43.
- 6. Mandelbaum.
- 7. T.J. Brasser.
- G.F.C. Stanley, Louis Riel (Toronto: The Ryerson Press 1963).
- 9. Flanagan, Riel and the Rebellion (Saskatoon: 1983).

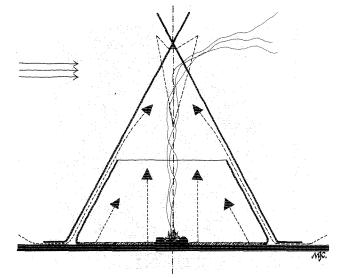


Figure 44

13 THE EASTERN WOODLAND INDIAN

The region of the Eastern Woodland Indian stretched from the Plains to the shores of the Atlantic Ocean as may be seen in Map 18. It ranged from Hudson Bay to south of the Great Lakes and from across New England. The forests consisted of both deciduous and evergreen trees of numerous species. For transportation, the Indian used canoes on the myriad lakes and rivers. The number of designs were surprisingly large but all made use of a birchbark covering. The canoe was so essential that the French soon adapted the Indian canoe for their own needs of trading and exploration.1

In spite of the arrival of the European in the first part of the 17th century and the founding of New France, very little information had been passed down on how the Indian housing was built. The light, cage-like structures were quite alien to the European and only evoked comment as curiosities. A point too often ignored is the penetration into the hinterland,

on a permanent basis, by the European was minimal considering its vastness. For almost 200 years in Canada, apart from communities on the Atlantic coast and the St. Lawrence River, the principal contact with Indians was via a widespread network of fur trading posts throughout the interior. When there was a greater contact it was primarily a case of warfare in which the European were more intent on destroving housing rather than examining its construction for posterity.

Although tribes moved the location of their villages for a variety of reasons, these people were not nomadic. As described earlier, the home of the Nomadic Plains Indian was the tipi. It was conical in form with a covering of buffalo hide that could be dismantled and moved rapidly and regularly.

Tipis were the mobile home of that period. The home of the Eastern Woodland Indian was the wigwam. It was semi-permanent in nature, made of a light-weight wood frame or cage. The frame was dug slightly into the ground with a covering of bark, usually but not always, made from the birch tree. The wigwam normally housed one or two families. Its shape was always geometrical, ranging from pyramids to domes. The one exception was the longhouse of the Huron, which was generally located in what is now the southern part of

Ontario. The longhouse had the same construction principle as the wigwam, but it could house up to 50 people. During the summer months many of these Woodland Indians lived in summer tents, which were always temporary in nature.

The description of the Huron longhouse that follows is based upon the archeologi-

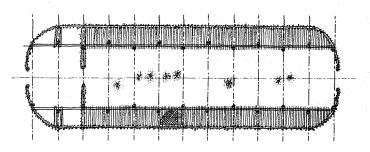
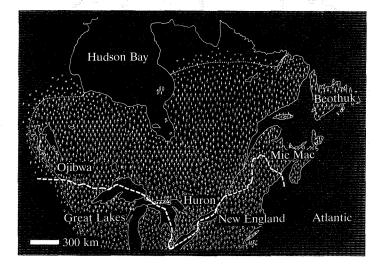


Figure 45



Map 18

cal findings and deductive work of J.V. Wright, however it is only representative of actual discoveries.2 The site in question is called The Nodwell Site located at Port Elgin on Lake Huron. It consisted of a mid-14th century palisaded village built by the predecessors of the Huron and Petun Indians. It contained 12 longhouses. The village was probably occupied for 10 to 20 years and contained a population of about 500 people. All engaged in a modest form of agriculture, as well as hunting, and fishing. The site was excavated in 1971 and a reconstruction of the longhouses took place in 1973.

A house was approximately 23.4 m (76 ft.) long and 7.3 m (24 ft.) wide (Figure 45). Internally there was a cubicle at one end separated from the living space. Within the longhouse sleeping platforms ranged down each side with fire hearths at intervals down the centre. The entrances were located only at each end. A cross section of the house is shown in Figure 46.

Wright points out that Huron ethnographic literature is consistent in describing their housing as being as high as they were wide. An unpublished map of Fort Frontenac c. AD 1740 gives a scale drawing of a longhouse. It illustrated the ratio of wall height to the roof as being 4 to 1. With such information the house form could be established. A further piece of archeological data was the internal lines of posts that were much greater in diameter than those used for the exterior walls, thus, the loading must have been taken by these posts. Also, the internal posts were staggered alternately to ensure the structure of sleeping platforms became a part of the main frame and were firmly in line; as shown in the plan. The platforms

were 1.5 m (5 ft.) wide and from ethnological data are known to have been 1.2 m (4 ft.) high. Because the springing point of the curved roof was known, as well as the height, the radius could be calculated. A small but vital piece of evidence discovered was the presence of a drip-line a short way out from the wall at grade. The inner posts ranged in size from 130 mm to 230 mm (5 in. to 9 in.) in diameter, with others of a reduced diameter according to their use. The smallest posts being from 50 mm to 75 mm (2 in. to 3 in.) in diameter.

Structural analysis of the longhouse illustrates that the structure of frames to which a curtain wall was attached as shown in Figure 47. The hatched portion of the diagram showing one frame. It is doubtful that the Huron Indian perceived the structure

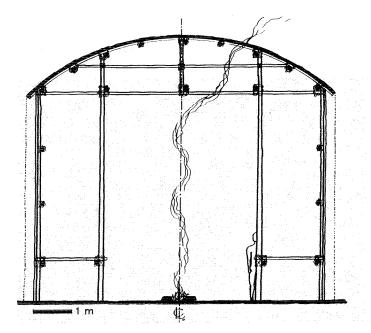


Figure 46

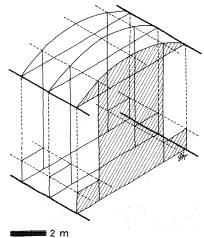


Figure 47

in this manner. It can be fairly safe to assume that they had their own concept, otherwise such a delicate form could not have been erected.

In Figure 48, a part elevation and part exposed framework is shown. Large sheets of bark were used for the cover, usually made of birchbark, but cedar bark could also have been used.

The Oilbway used smaller forms of wigwams, sometimes shaped like a cone, and sometimes shaped like a dome. The smaller wigwams were not always perfectly geometrical, however, when the skills of canoe building are considered, with ribs having to be steamed into shape and a watertight cover of bark applied, it is safe to assume that they knew very well what they were doing. Indeed, throughout these woodlands it is not perfect geometry that is most important, but the ability to respond to a particular need, not an inability to conform to a theoretical ideal. A plan of a domed form is shown in Figure 49 and a part

elevation and part exposed framework in Figure 50. The great advantage with birchbark was due to its lightness and durability. It could be rolled up and easily transported to a new location and poles would always be there for the cutting. This construction technique was also used for small summer hunting lodges.

In Maritime Canada other geometric forms were also used, such as the pyramid, the hexagonal pyramid and the ubiquitous cone. The Mic Mac Indian wigwam now to be described is based upon the work of Ruth Whitehead.³

The perimeter was marked on the ground and a number of poles, usually five, were lashed together 300 mm (1 ft.) down from their top. These poles were erected equidistant from each other around the perimeter as shown on plan Figure 51. The poles were dug into the ground about 300 mm (1 ft.)

deep. Next, a wood hoop, made from moosewood, Vibernum cassinodesit, was fixed to the main frame already in place. Its hoop was 1.5 m to 1.8 m (5 ft. to 6 ft.) from the ground. Lighter poles were set around the perimeter and lashed to the hoop as may be seen on Figure 51 and in elevation on Figure 52. There is no mention of a second hoop at the

these poles in place but since they were cantilevered from the hoop, quite probably they were whippy at the top. It is improbable that an extra hoop was used because it would have been mentioned in records, but cross pieces could have been lashed across the main poles if such restraint was required. Long strips of

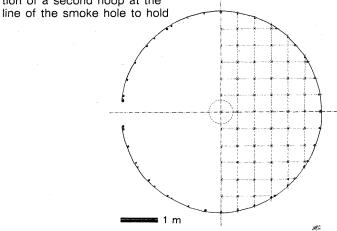


Figure 49

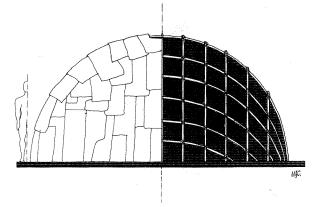


Figure 50

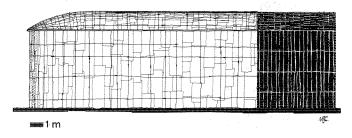


Figure 48

white birchbark were then laid around the cone starting from the ground, as may be seen in the elevation figure. Another layer was lapped over the previous one and this procedure continued up to the smoke hole. A collar of bark was made for the smoke hole and fitted in place during inclement weather. The door covering was normally of a deer hide. Whitehead's detailed observations indicate

the Mic Mac were meticulous with the bark cover. It was stitched to prevent splitting and strengthened at the edges with fine strips of wood sewn into place and the whole cover was carefully tied to the frame. This covering had a valuable commodity and it can be compared to the value the Northwest Coast Indians placed upon their cedar wall planks.

Unquestionably, the most poignant information recorded on aboriginal housing is the drawing of a winter wigwam, in which the Beothuck Indian, Shanawdithit had lived. She

was one of the last survivors of the Beothuck Indians of Newfoundland. Shanawdithit made her drawing in 1819, and a facsimile of it is shown in Figure 53, which is based on Howley's work of 1915.⁴ The following is a hypothesis of how her wigwam might have looked.

It is improbable that Shanawdithit knew what the framing of her home looked like from the exterior since it would only have been visible during its construction. The framing from the interior however, would have been in front of her constantly. Assuming her drawing was an attempt to illustrate her wigwam from inside, (a most difficult thing for anyone to do), it is clear that it was a polyhedron form, but it is not certain how many plane surfaces are seen. In 1970. Helen Devereux re-

ported her findings at an archeological site of the Beothuck Indian at Indian Point, Newfoundland, 5 The shape of House B5 of her study, was in the form of a shallow hexagonal shaped pit. Since this site is in the region where Shanawdithit came, it is not unreasonable to start with hexagonal shape, at least until other evidence becomes available. A suggested plan of her wigwam is shown in Figure 54 and the exterior/interior elevations shown in Figure 55. There is a shallow pit with a broad circular hearth, similar to Devereux finding at Indian Point. It suggests that the vertical lines at the bottom of Shanawdithit's drawing are not a wall as such, but the inner face of the pit's excavation. Moreover, the unfinished line of the right-hand side of her drawing would appear to be an attempt to indicate the entrance. It has been stated that the view of her home is from the exterior and the

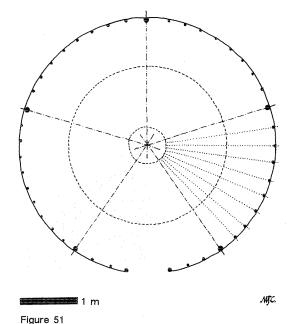


Figure 52



Figure 53

vertical lines represent a wall, but structurally, this is almost impossible to achieve, certainly in a semipermanent form in wood. The thrust from the structure sitting over it could not have been properly supported. If a European canvas bell-tent, which is similar in appearance is considered, the small vertical wall is not structural at all, but only a brailling to be rolled up as needed. Howley calls the horizontal cross members hoops. These hoops could have been of the type used by the Mic Mac, however, if the base of Shanawdithit's drawing is accepted as facets, then horizontal members would be straight, and lashed between the six main poles. Her drawings indicate a second line of members near the top of her wigwam. Perhaps this was the support that was not needed for conical wigwam of the Mic Mac? Howley men-

tions an interesting point, but not in connection with Shanawdithit, which explains the techniques used to winterize a wigwam. The Beothock Indians would place layers of grass over the bark cover, and another cover would be placed over the grass. All layers were held down securely with wood poles and leant against the wigwam providing a sensible form of energy conservation. This practice is referred to occasionally in other Indian housing in different parts of Canada, but unfortunately adequate data on the subject is not available. Might this have resulted because contact by the Europeans, at least by those writing on the subject, was always in the spring and summertime and rarely in the winter?

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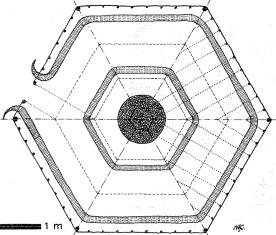


Figure 54

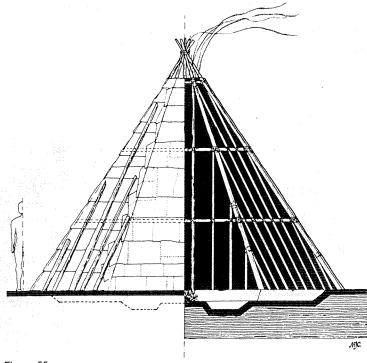


Figure 55

1 4 THE SUB-ARCTIC INDIAN

The northern boundary of the Sub-Arctic region is the general tree line. The southern limit abuts the cultural areas of the Northwest Coast, the Plateau, the Plains and the Eastern Woodland Indians. The cultural area is divided into two linguistic groups, the Algonkian and the Athapaskan. The Algonkian people lived in the eastern part of Canada from the Plains to the Atlantic and were composed of tribes who spoke dialects from the Algonkian

root. Their houses were primarily variations upon those of the Eastern Woodland and therefore they are included with that group. The Athapaskan people lived in the western part of Canada from the Plains up to the Yukon. They also spoke in dialects of their original root (Map 19).

The Athapaskan people used building forms similar to that of the Eastern Woodland however, they also used some different forms that will be dealt with separately. The Sub-Arctic Indians were hunters in a harsh environment. They were scattered widely and lived in groups of about 20 during the winter. In

summer however, they came together in bands of 100 people. In locations where the hunting was good in winter, a band might well stay together as a small village.

The terrain consisted of streams and lakes with numerous areas of muskeg. To the northwest it became mountainous as it divided the Mackenzie and Yukon Rivers.

In the south, conical lodges with a covering of birchbark were used. Where the land drainage was appropriate, pit-houses were occasionally used. They were normally variations on those used by the Plateau Indians. Throughout Canada, as the climate and terrain gradually changed so did aboriginal housing in order to adapt to the different environments.

A unique concept in construction material for housing was found in the Yukon. This

entails quantities of brush. used with the structural elements. This brush served as a windbreak and insulation. especially so when covered in snow during the winter. Rainfall is not heavy in this region and in the summer temporary shelter was all that was needed. The summer forms were called open brush camps and could range from lean-tos to conical forms. Brush refers to any branch of a tree, but in this context, it refers the pliable branches and crown of the white spruce, Picea glauca. Its crown was used extensively. During Murray's visit to the Yukon in 1847-48, he came across a house form which was unique in its construction and use of materials. It was located 100 kilometres northeast of Dawson in the Yukon. He provided a sketch with a brief description worth quoting in full:

"Each family is provided with a deer skin lodge, the hair is always kept on for warmth in winter, the lodge is seldom used in summer. In winter they encamp in a

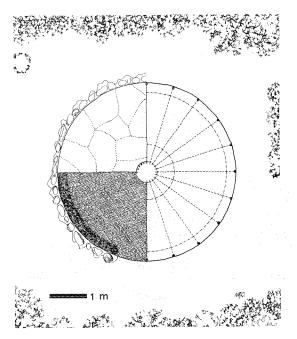
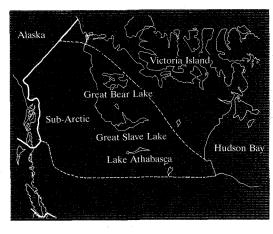


Figure 56



Map 19

thicket of pines, the ground is cleared and the lodge put up on willow poles which they generally carry with them on their sledges. Snow is then packed up half way up, the inside is lined with small pine brush, and the small hole used for a door closed with a double deer skin. Although they have small fires it is as warm as most houses."1

The foregoing is interpreted in plan Figure 56 and in part elevation and section in Figure 57.

At first glance the house sketch appears to be a poor drawing of a dome structure. but closer examination reveals this is not the case. The clue lies in each rib of the house which ends just beyond the opening in the cover for the smoke hole. A series of ribs would require tie members and two have been indicated in the section. The observation concerning the lining of the interior with small pine brush is most likely to have been as shown. Small pine

brush almost certainly refers to the tops of small trees, which are dense and soft. Any kind of jagged branches that could pierce the deerskin would have been avoided. The size of tree growth in this region would have made such a procedure quite reasonable. Soft branches would also be used as the covering for the floors.

Murray's description of what he saw in use was a small but invaluable contribution. The simplicity of construction and its easy transportation made it reasonably certain that this house form went a great deal beyond the location he visited. From the archaeological point of view, a house of this kind abandoned for 100 years, leaves absolutely no trace. The discovery of where a house might have been and

the excavation carried out is focussed not on finding the house but the artifacts left behind in it.

Descriptions of other houses using brush as a component are given by Johnson and Raup based on their studies in the region of Kluane Lake in Southwest Yukon. Their findings were published in 1964.2 Open brush camps, and probably winter housing were used up to and during the post-war period. A few local Indians would still of had some inkling of what earlier housing had been like. The local Indians assisted by locating areas containing ruins in various stages of decay.

However, only general data could be gathered, and the two houses to be described

are interpretations of the information in Johnson and Raup's work. One form of house was shaped like a pyramid as is illustrated in Figure 58 and by section in Figure 59. The floor dimensions were 2.4 m by 4.2 m (8 ft. by 14 ft.). In this case, the cover was of moosehide with a layering of spruce brush about 1.2 m (4 ft.) high. Once again, care would have been needed to avoid damage to the hides. The brush placed outside and inside the house, as well as the snow cover, provided good insulation. It provided warmth and shelter enough to withstand temperatures that could dip below -30°C even without a windchill factor.

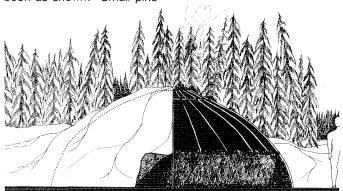


Figure 57

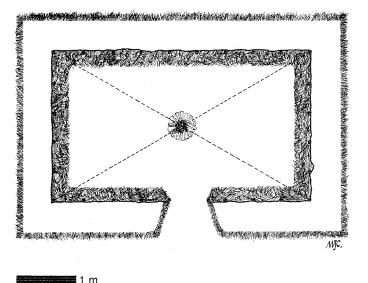


Figure 58

Information on the second house is incomplete because its remains were inadequate to establish all details of construction, however, its form has not been seen elsewhere. The plan is 3.6 m (12 ft.) long by 2.4 m (8 ft.) in width and shown in Figure 60. The walls were built of logs that lay on top of each other at the corners. The openings be-

tween the logs lead to the assumption that brush was piled against the walls. These logs were laid without the branches trimmed. This was certainly an unorthodox procedure. If the logs were jumped on enough, the branches would interlock sufficiently to provide an adequate support to the wall, especially for the small sizes being dealt with here. It is assumed that the inner branches would be trimmed and/or interlaced as

shown on the plan. Roof beams were found, however, it was not possible to determine how the infilling for the gables was provided, or how a ridge pole would have been supported. Lengths of 50 mm (2 in.) diameter poles were found and assumed to be the roof covering, with a layer of riven logs laid over them (Figure 61). The unsolved problem questions how the roof was made watertight. Bark and turf perhaps?

A very unusual feature is the use of two logs whose butts come together at the fire. The only reasonable explanation is that warmth was a necessity not a luxury, and in winter the butts would be continually smouldering for basic heat with a full fire being started immediately when required. In other houses, reference is made to hide doors coming down over the protruding logs. It is a great pity more is not known at the moment of these intriguing building techniques.

- A.H. Murray, Journal of the Yukon (Ottawa: Publications of the Canadian Archives, 1910), No. 4.
- F. Johnson and H.M. Raup, Investigations in Southwest Yukon (R.S. Peabody Foundation for Archaeology, 1964), Vol. 6, No. 1.

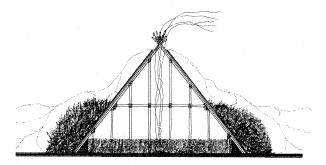


Figure 59

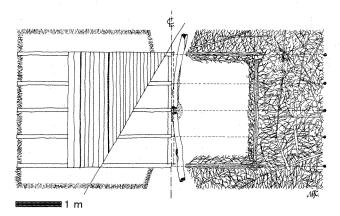


Figure 60

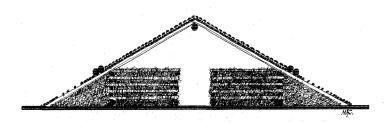


Figure 61

15 THE INUIT

Canadians know little about the history and culture of the Inuit people. One reason for this undoubtedly is the lack of contact caused by the large population of white people who live over 1 500 kilometres to the south. To begin with, the name Inuit needs an explanation. To use a much quoted term, "all Inuit are Eskimo, but all Eskimo are not Inuit." Historically and today, those people living in the vast Arctic rim of the world are Eskimo and speak an Eskimo language. However, the people of North Alaska, Arctic Canada and Greenland speak dialects of a single stem called Inuktitut and therefore they refer to themselves as Inuit. Thus, there is a distinction between the Eskimo populations of west and south Alaska as well as Siberia. This is important because the Eskimo people do not consider themselves to be Inuit.1

Human beings have lived in the Canadian Arctic for thousands of years. As with the Indian population, there has been an ebb and flow of people bringing new cultures or adopting old ones. Cultural heritage of the present Inuit is based upon that of the Thule people who originated in Alaska and spread throughout the Canadian Arctic at this period. Most of the changes to the original single culture are the responses to different environmental conditions in the region. It is believed there were nine individual areas and these are shown on Map 20. The hatchings only indicate areas, not absolute boundaries.2

It has long been considered that a very limited amount of wood was used in the construction of Inuit housing. Archaeological findings how-

ever, provide evidence than wood was more widely used than first believed. It would be more accurate to say that wood construction provided the support for the covering of sod, which in turn, would have a deep layer of snow over he complete structure. There are two places in the Arctic where some information has been gathered on how wood was used in the superstructure. The two places are the Mackenzie Delta and Labrador. This is not surprising since the Delta has a great deal of driftwood, and the southern part of Labrador is just within the tree line. William Taylor, in 1963 investigated the area between Cape Parry and Cambridge Bay and

found evidence of wood house construction.³ It included a log wall tunnel, vertical posts, flooring and so forth, at the Jackson site near Cape Parry. Regrettably, little more evidence has come to light to enable a concept to be developed of what that superstructure might have looked like. It may have been similar to Father Petitot's work in 1876, to be discussed later.

A type of house used in Labrador is shown in Figure 62 and a cross section in Figure 63. It is somewhat of a hybrid since what is illustrated is based mainly upon three small wooden models recently

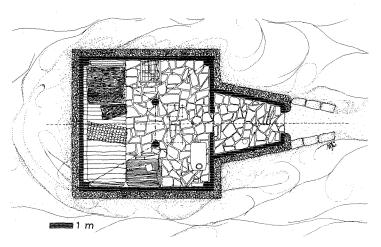
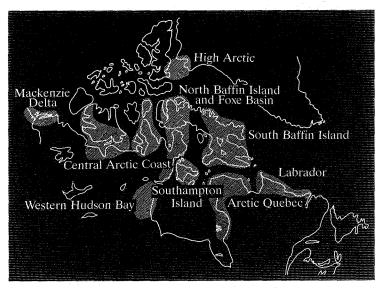


Figure 62



Map 20

discovered in Germany by Garth Taylor. This house form was influenced by the Moravian missionaries who came to Labrador in 1776 and eventually built their great mission buildings in Nain, Hopedale and Okak.

Mission diaries confirm these models and were almost identical in construction and style to the housing found by the first missionaries.

Contact with the Europeans changed the entrance of the tunnel from 6.5 m (20 ft.)

long, to a side porch. An intermediate stage is shown here. This change evolved because the missionaries took exception to the long crawl through the excrement of the dog-team living there. So much for the evolution of housing being based upon technology alone. The sleeping platform and the drying rack still remained. A great innovation was the use of the iron stove, and wood for the floors. The exterior was covered in sod, and in winter the entrance was extended by

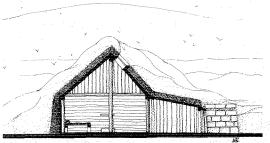


Figure 63

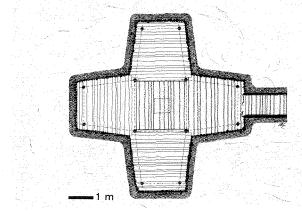


Figure 64

snow blocks. These models made at the Okak mission, closed in 1919.

In 1974 Robert McGhee published details of the archaeological findings he made at Kittigazuit in the Mackenzie Delta⁵. In his book he refers to a drawing by Father Petitot in 1876 entitled, Coupe Ionaitudinale et plan à terre d'un Igloo ou maison d'hiver des Esquimaux. He also makes reference to Stefansson's work of 1919. Although Petitot's drawing is small and complex it is very close to Stefansson's observations. Based on these two sources. as well as McGhee's findings. drawings are shown in Figure 64 indicating the plan, and Figure 65 indicating the cross section. McGhee records Stefansson's description as follows:

"The houses were built in the shape of a cross with three rectangular sleeping platforms surrounding a square floor area.... The floor contained a trap door leading to the subterranean entrance tunnel which formed the fourth arm of the cross. The structure was supported by four central upright posts, one at each corner of the floor area, together with smaller uprights at the outer corners and beams joining the tops of these posts. Upright logs were then leaned against this frame, horizontal logs laid across the roof, and the hole covered with sod and turf. The floor was excavated slightly below the surrounding surface, and both platforms were covered with planks or half-round logs. A skin-covered window above the trap door admitted light and was used as a ventilator. The largest of the house mounds at Kittigazuit measures about 18 m (60 ft.) across."

McGhee excavated a cruciform type house, but because of time and resources he could only attempt, "to determine whether the construction of the house coincided with the historical descriptions of such structures." This proved to be the case.

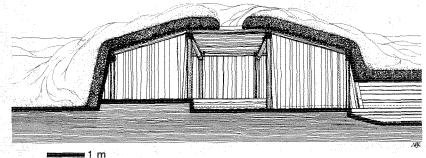


Figure 65

This house had two side platforms measuring 2.5 m (8 ft. 3 in.) from front to back with floors of whole or split logs 100 mm to 150 mm (4 in. to 6 in.) in diameter. which were laid across the front and rear platforms. The square floor in the centre was 2 m (6 ft. 6 in.) square and 200 mm to 300 mm (8 in. to 1 ft.) lower than the platforms. The entrance tunnel was 400 cm (13 ft. 2 in.) lower than the floor and walled with horizontal logs. This was all the evidence which could be determined. In the plan and section, the trap door referred to by Stefansson, and shown by Petitot, has not been illustrated because the scale used for the drawing is based upon McGhee's dimensions with the rest of the superstructure interpolated. Since the entrance itself could not be identified in the excavation, and this house is only about half the size of Stefansson's and no assumption has been

made on how it was built. All that has been shown is a slope between the floor level of the house and the floor level of the tunnel, as given by McGhee. It would be interesting to note whether the recurrence of the four posts at the corners of the floor square were the same used for the Plateau Indian pit-houses.

When wood was available for the summer tent, or tupek, the forms were fairly consistent and limited to a few basic solutions throughout the Arctic. The photographs and illustrations which follow all use tent frames of wood. But when curved whalebone was available the ingenuity of the lnuit undoubtedly came into its own.

The type shown in Figure 66 could be used singly or as semidetached tents with whalebone ribs providing support for the link between

them. This form was recorded in use by Boas at Cumberland Sound on the southern part of Baffin Island. He also describes a form used at Admiralty Inlet at the north of the Island. Here a vertical pole is used to support the high end of the tent at the back, with one of the double ridge poles left loose for the overlapping of skins at the entrance.6 The double ridge with a twisted thong acting at the ridge is unique in the Canadian aboriginal housing. Since the thong is not rigid it does not provide a point at which the sewn skin cover could tear apart. The form is shown in Figure 67. The tent in Plate 19 is also from Baffin Island and the carefully made cover well illustrates the care with which even tents could be made when warranted.

- R. McGhee, Canadian Arctic Prehistory (Toronto: Van Nostrad Reinhold Ltd., 1978).
- 2. Mc Ghee.
- W.E. Taylor, An archaeological Survey Between Cape Parry and Cambridge Bay, N.W.T. in 1963 (Ottawa: Archaeological Survey of Canada, 1972), Paper No. 1.
- J.G. Taylor, Them Days (Labrador Crafts, 1982)
 Vol. 8, No. 2.
- R. McGhee, Beluga Hunters (Newfoundland: Memorial University of Newfoundland, 1974) Study No. 13.
- F. Boas, The Central Eskimo (Washington: Smithsonian Institution, 1888).

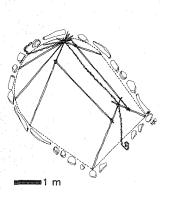


Figure 66

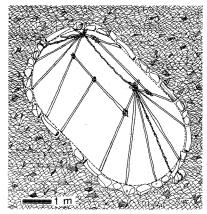


Figure 67

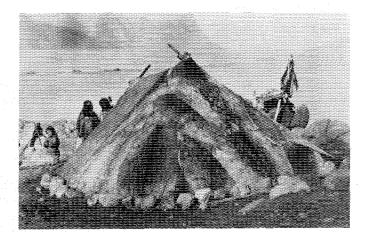
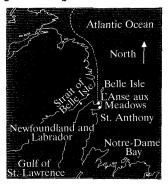


Plate 19

16 THE VIKINGS

The only Viking settlement in Canada which has been found to date is located at L'Anse aux Meadows on the northern tip of Newfoundland, near St. Anthony (Map 21). It has been designated as one of the World Heritage Sites by the United Nations because it shows the earliest recorded presence of Europeans in the New World. The settlement was built about AD 1000. The housing itself is of undoubted importance, but perhaps of greatest significance is the



Map 21



Figure 68

demonstration of the Viking's overall skill in the use of wood. The superb design and craftsmanship of the Viking's ships made their ships the most advanced form of transportation in the known world; nothing would rival them. Amongst other tests of seamanship, the Vikings were able to sail across the unpredictable North Atlantic, and what is more, they could return when they chose.

The site, which is located in Epaves Bay (Figure 68), was discovered in 1960 by Helge Ingstad who led seven archaeological expeditions between 1961 and 1968. The bay is shallow and from the

shoreline the ground rises gently for 100 m (330 ft.) to a level of 4 m (13 ft.) above the high tide mark.2 The land looks like a giant meadow with waving grass and patches of heather (Plate 20), but the site has the drawback of being fully exposed to the north winds. The buildings referred to by their archaeological identification, are situated close to the edge of the higher land. Buildings A. D and F were longhouses and the remaining five were outbuildings of one kind or another (Figure 68). To the west, runs Black Duck Brook. their vital source of fresh water. It is estimated about 20 people were able to live in each of the three longhouses. making a probable population of some 60 people.3

Because all previous claims to the presence of the Vikings in North America were eventually proven to be spurious,



Plate 20

there was a natural caution in official and academic circles in accepting the find. It was not so much a questioning of their work but the need to verify the evidence for international acceptance. Consequently, an International Advisory Committee of eminent scholars from Scandinavia, Iceland and Canada was formed. Parks Canada with the willing co-operation of Helge and Anne Stine Ingstad, took the leading role in carrying out a thorough re-examination of all data including the site itself. Of the small number of artifacts found at the site, some could be identified as being of Norse usage while others, such as identifiable worked wood, could be dated to the period. These finds were subjected to carbon-14 dating and this established the date of the settlement as c. AD 1000. However, the most significant find was a small smithy where nodules of iron ore, taken from the peat bog, had been smelted to make rivets for ship repairs. The North American did not know how to smelt iron.4

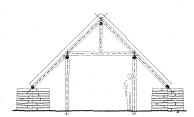


Figure 69

After unequivocal agreement that the settlement was indeed of Norse origin, Parks Canada undertook the research required to reconstruct three of the buildings; longhouse A and outbuildings B and C. When the research was completed, designs for the reconstruction were developed and subsequently approved by the International Advisory Committee. The basic principle of the building technique that the Viking used is common to all three buildings, however, the details of each vary according to the form of the building (Figure 69 and Plate 21).5

One of the distinctive characteristics of Viking construction is the manner in which most of the roof load is taken by the internal framing. This feature made it possible to use a variety of materials for the exterior wall.

Examples of this can be found in northern Europe of this era.

In the building at L'Anse aux Meadows, slabs of peat were used. Another characteristic was the "bay" system of construction. This repetitive feature was described in the Coast Salish shed-roof houses and the Huron longhouse.

Longhouse A has internal dimensions of 24 m by 4 m to 5 m (53 ft. by 13 ft. to 15 ft. 6 in.) (Figure 70), and is 3.5 m (11 ft. 8 in.) in height (Plate 22). Dimensions will vary because of the boat-like shape in both plan and section (Figure 71a, b, and c). This feature occurs in many Viking structures, probably the best known being the enormous war-barracks at Trelleborg and Fyrkat in Denmark. The walls of the

longhouse are approximately 1.8 m (6 ft.) in thickness. Cross walls divide the space into four rooms, although the end room to the west was almost certainly a later extension. The boat-like shape seems to be a complex structure, but in fact it is extremely simple. All that is required is for adjacent frames to be reduced or enlarged as shown in Figure 72. The rafters are covered with roof poles, 25 mm to 50 mm (1 in, to 2 in,) in diameter, They were laid next to each other, and fixed in place with green willow twigs and strips of seal skin. Turf was laid over the poles for the roof finish. Four smoke openings in the roof were operational from inside. These openings incidentally provide a surprising amount of daylight when open. Sleeping platforms ran along the interior of the walls. 400 mm (1 ft. 4 in.) above the earth floor, and fires were located in each room. Although the longhouse may appear primitive on a raw dank day with a wet mist drifting in off the sea, the warmth inside, even without fires, is quite remarkable.

This settlement at L'Anse aux Meadows must be seen in



Figure 70

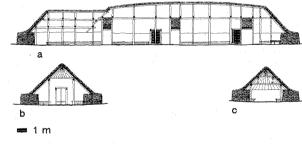
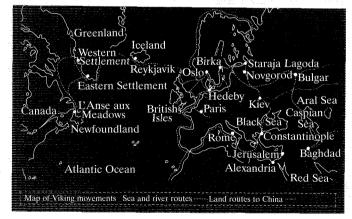


Figure 71



Map 22

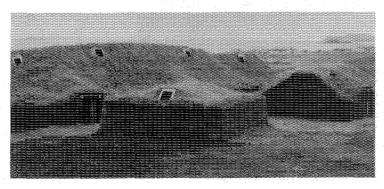


Plate 21

its historical context because the housing of the Vikings as an influential part of the European housing of that period. It especially influenced the housing of England and northern France. The Viking houses later evolved into forms brought to the New World 600 years later.

The Vikings erupted from Scandinavia at the beginning of the 9th century. The early period saw them raiding practically all areas of Europe that could be reached in their shallow draft longships. Parallel to this, they developed trade as well as founding

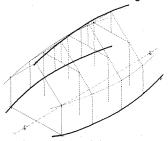


Figure 72

settlements in occupied lands. While travelling down the rivers of eastern Europe they reached Constantinople and the Mediterranean (Map 22). To the west, their prime targets were Britain, France and Ireland. Across the northern seas they established settlements in Iceland. Greenland and North America. To carry cargoes they built the "Knarr," a ship similar in concept to the longship, but broader in the beam. It was decked fore and aft, and capable of withstanding the buffeting of heavy seas (Figure 73), 6,7

The colonization of Iceland and Greenland was led by Eirik the Red, originally from Norway. During the latter part of the 10th century he set out from Iceland, with his family and others, to settle in Greenland. The Eastern and Western settlements were founded. The climate being about 5°C warmer during this period enabled their population to reach a peak of about

3 000 people.

About AD 1000 Leif Eiriksson, son of Eirik the Red, set out from the Eastern Settlement to explore the land known to exist in the west. His intent was recorded in the Groenlendiga Saga. It can only be assumed that he eventually reached L'Anse aux Meadows but whoever it might have been, it seems likely that the families wintered in the Eastern or Western Settlements and used L'Anse aux Meadows as a summer base for trading, food gathering and exploration. This lasted for perhaps 20 years. Even though the climate was somewhat milder than today, due to the site's exposure, winter extremes could have been severe.

The name given by these Vikings for the place they reached in North America was Vinland. Over the past years many claimed to have found it, but they lack evidence. Perhaps it is yet to be found, or it never had a precise location, or after all it was L'Anse aux Meadows.

- 1. A.S. Ingstad, The Discovery of a Norse Settlement in America (Oslo: 1977), p. 4-51.
- 2. Ingstad, p. 12.
- 3. Discussion: Canadian Parks Service, Halifax.
- D. Jenness, The Indians of Canada (Ottawa: National Museum of Canada, 1957), p. 28-39.
- 5. Data provided: Canadian Parks Service, Ottawa,
- Discussion: Viking Eskibshallen, Roskilde, Denmark.
- O. Ohen and O. Coumslin-Pederson, Five Viking Ships from Roskilde Fjord Translation by Barbara Bluestone (Copenhagen, Denmark, 1978), p. 116-121.

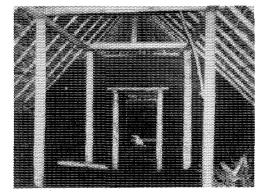


Plate 22

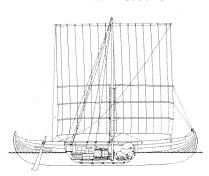


Figure 73

17 EUROPEAN WOOD TECHNOLOGY

The most remarkable aspect of the Viking presence in the New World was their ships. With these ships the Vikings were able to sail anywhere they chose. Their ships represent the high level of wood technology in Europe at that time. Until fairly recently, history mainly recorded the Viking onslaughts, especially in those countries which bore the brunt of the attack. It is now recognized that a major part of their activities were in fact devoted to trading and establishing settlements. These were not only agricultural settlements but were centres for craftsmen for all kinds, ranging from jewellery to weapons and from woven goods to houses. The new archaeological finds at Coppergate, York in northern England, is only one example attesting to this.

For millenia before the present one, there had been a slow but gradual evolution in the knowledge of wood and its capabilities in the forested areas of Europe. The importance of the Viking Age in this process, especially in the regions of England and on the opposite coast of France

shown in Map 23, was the sea routes that were established for the flow of ideas.

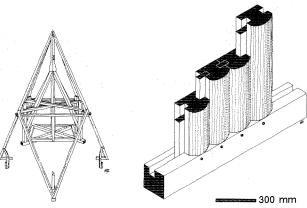
In AD 911 the Viking, Rollo. swore allegiance to Charles III of France in return for a land settlement. When the Duchy of Normandy was born, and for the following 155 years extensive settlement of Norse people took place. In 1066, William of Normandy, the rightful heir to the throne of England, crossed the English Channel and defeated the incumbent. King Harold. At this time the Vikings spoke Norman French and had begun to think of themselves as French rather than Viking, however their material culture still remained. The hundreds of ships built for the invasion were longships. The ships are recorded in the Baveux tapestry made to commemorate the conquest.

In the history of nations, some dates tend to overlap others. The year AD 1066 is such a date in English history.

Most English people consider their history to have begun at this time. Indeed some consider it to be the beginning of all history. For the English it was the start of a new page in their history, yet for others it was the closing of a chapter. Magnus Magnusson writes of the time, "... the world changed and the Viking Age was effectively over."2 This is true for Vikings both in England and in France. From this time on. Vikings became either English or French, but their contribution to the knowledge of wood and of the seas was never lost by either group.

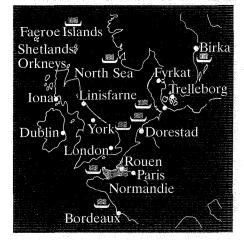
For the following hundreds of years there was some form of warfare or strife between England and France. The battle was over the English claims to land in France, due to inheritance or by marriage,

or so they considered; at any rate the French disputed such claims. On the other hand. the 600 years between AD 1000 and AD 1600, shows a fairly constant interchange of people and current thinking. For the first two or three centuries there was a common tongue between the nobility. as well as a common religion most of the time. The first five kings of England spent a major part of each year in France, which they considered to be more their home than England. Throughout Europe. wood technology continued to evolve. The lack of airtight national boundaries that is evident today, helped in merging common technology. Therefore it is not strange to see both France and England,









Map 23

although acting independently, having virtually the identical method of construction for early housing in their new colonies in North America.

Before AD 1066, the Anglo-Saxons (by now English) had achieved a high degree of craftsmanship, and the spire of the Church of St. Mary, in Sompting, Sussex which still stands, is an excellent example. Hewett comments it is a rare form known as the Rhenish Helm and undoubtedly was built before AD 1050. Based upon his drawings, Figure 74 shows a view with some members omitted for clarity.3 Another example of building construction for that period is the

Church of St. Andrew at Greenstead-iuxta-Ongar. Essex, which was built before AD 1000. Based upon Hewett's work, the church is 9 m (29 ft. 9 in.) long and 4.2 m (14 ft.) in width and is 1.7 m (5 ft. 6 in.) high to the wall plate. Construction of the base of the exterior is shown in Figure 75.4 As reported in a magazine of 1849, the church was restored with undue severity, but some original structure remains for study. What is shown in particular, is that:

"... English oak if so allowed to do so will survive outdoors for a thousand years and survive in a condition to defy saws."⁵

The wall construction is the same used for the Norwegian stave churches of the period

and bears a remarkably close relationship to the grave chamber of the Gokstad ship in Norway.

Another building form of the period was found in the great barns belonging either to the feudal lords or to the church. The two shown here are based upon the work of Horn and Born.⁶ Figure 76 shows the barn of the Abbev of Ter Doest, built in Flanders c. AD 1250. Both buildings belonged to the monastic order of the Cistercians. Although the principles of construction were the same, that in Flanders was larger and the detailing varied from that at Great Coxwell. Interestingly. the authors comment that:

"Passing into the interior, one observes with surprise that the principal load of the vast roof is carried not by heavy masonary piers, but by two rows of slender posts of timber...."

These barns therefore employed the aisle form of construction with the inner posts supporting much of the roof. This same principle was used at L'Anse aux Meadows, and was found throughout Europe during this period. Even the massive stone cathedrals were built in this manner.

In his paper on the origin of the medieval bay system. Horn contends the design of the gothic cathedrals in northern Europe changed to monolithic Early Christian basillicas. They employed the complex bay system of skeletal structures still in existence today. The change took place because the wood system had been in use for many centuries.8 On viewing the gothic cathedral, the vast amounts of wood scaffolding and formwork required, were often overlooked. Moreover, massive steep pitched roofs of wood were used, substantial enough to carry the tremendous loads of the lead covering. Stone was not used for all vaulted ceilings. After creating the great spaces,

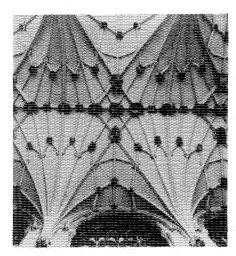


Plate 23

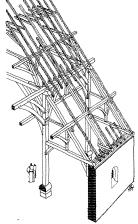
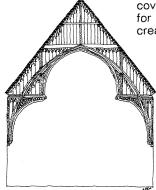


Figure 76



Flaure 77

builders were frequently reluctant to use stone for the ceilings because of its weight. instead they used wood. It could be expressed as simulated stone over the choir of Winchester Cathedral (Plate 23).9 The wood cathedral of St. Catherines at Honfleur, France, was in fact built by shipwrights of the port. The nave is shown in Plate 24. When viewed upside down the affinity of the vaulted roof with a ship's hull becomes clear.

A change to aisled structures was seen in the middle of the 14th century with the introduction of the hammer beam roof truss. This enabled halls to be built with large open interiors. A prime example is the largest feudal hall in Europe, Westminster Palace. It was built and aisled in the conventional manner by William Rufus in AD 1099. In AD 1368 Richard II ordered his master carpenter, Hugh Herland to construct the magnificent hammer beam trusses, still to be seen today (Figure 77). In the case of dwellings the bay and skeletal system also evolved, without the necessity for the aisle. 10

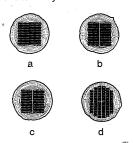


Figure 78

The gulf between the palace and the hovel remained limitless and the houses now to be discussed were in fact, the housing of the day. They were possessed by a rising middle class, normally only merchants and bankers could afford them.

An early form of the small house in England was built using cruck construction. Crucks, or arches, were always paired, being halved from the same tree. The technique was imprecise and limiting in design. The design died out about the 14th century, but the concept of using arched ribs from the growth of the tree continued.

Today, a carpenter receives wood for a house that is already processed, but in the period under discussion, the carpenter began with the log. With heavy types of wood construction the power for movement within a large beam or post was enormous. This was due primarily to shrinkage and great care was

taken to equalize stresses in the frame. Consequently, the carpenter had to become familiar with the amount of possible distortion in each member. One of the ways to overcome the problem was to ensure that each piece of timber was positioned in the frame of the house in such a way as to counteract the forces in the other timber as much as possible. After the piece was selected, joints were cut and all were marked for later assembly by using roman numerals, which were easily cut with a chisel. The tree could be cut as boxed heart as shown in Figure 78a; halved in Figure 78b; quartered as in Figure 78c or slabbed as in Figure 78d. So much of the house-building technique was halved, it took on the name of Half Timbered, 11

There existed both urban and rural house forms but essentially the construction was the same. By the 16th century, housing had already been designed for centuries on the bay system, which means that its length was divided into separate spaces. The width between bays was not fixed or repetitive, thus flexibility in design was assured. The house was considered, in principle, to be a number of frames as illustrated in Figure 79. In this figure, "a" shows the house form; "b," the frames for the ends and interior division: "c" the front frame, and "d," the back frame. The second floor was also considered a frame, as may be seen in "e." As these houses were prefabricated, the concept of frames

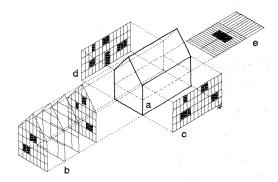


Figure 79

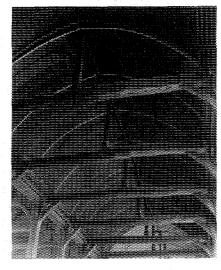


Plate 24

was critical because it permitted the pre-cutting of all joints. Each frame was pre-assembled to ensure a fit, then it was dismantled and erected on site, usually member-by-member, however this would largely depend on the design adopted. The process allowed for flexibility in design. Most of the smaller houses followed a similar lay-

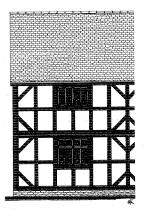


Figure 80

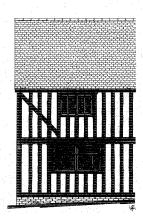


Figure 81

out; a central entrance flanked by two rooms, a staircase in the centre, as well as a massive chimney of masonry. The next major change saw the separation of the single chimney, into one at each end, with a lean-to addition at the back.

There were essentially two ways of framing the exterior walls, square framing and close studding, as Harris describes them:

"... square framing usually consists of panels 750 mm to 900 mm (2 ft. 6 in. to 3 ft.) square, two to each storey, while close studding consists of storey height studs placed fairly close together, the exact spacing varies from building to building." 12

Broadly speaking, the two forms are those used on one side of England or the other.

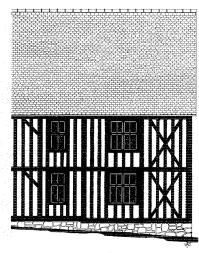


Figure 82

Square framing was used in the west and close studding in the east, but there were always exceptions. Square framing is shown in Figure 80 and close studding in Figure 81.

Close studding in France, with its Croix St. André at either end is shown in Figure 82. A simplified division between its use, and square framing is not so evident as in England. The two regions where close studding is the dominant type are Normandy and Les Landes.

The European history of North America, whether it be that of the French in the north, or the British to the south, began with the first landings in the early part of the 17th century and both peoples. At first they used the same methods of construction for their houses as in their respective homelands. The crossing of the Atlantic Ocean therefore has to be viewed merely as a pause in the development of building forms. Only after the different environments of the New World had been experienced and analyzed, that the evolution of house construction in North America gradually began to diverge from its oriains in Europe.

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- C.A. Hewett, English Historic Carpentry (London: Phillimore and Co. Ltd., 1980).
- 4. Hewett.
- 5. Hewett.
- 6. W. Horn and E. Born, The Barns of the Abbey of Beaulieu and its Granges of Great Coxwell and Beaulieu St Leonards (California: University of California Press, 1965).
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 Structures: The Gothic Vault
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- 12. Harris.

18 LOG CONSTRUCTION

The term log construction includes forms of building in which logs make up the walls and take the structural loading. This includes both horizontal and vertical uses, the salient aspect being the logs adjoin each other as illustrated in Figures 83a and 83b. Figure 84a shows the direction of the load being taken when the logs are used horizontally. and Figure 84b when the logs are used vertically. In this latter situation, some means is always required at the top of the wall to ensure an even distribution of the load.

Another quite separate technique is stackwall construction. As will be described, logs, 600 mm to 1 m (2 ft. to 3 ft.) in length are laid at right angles to the line of the wall with their butts facing outwards.

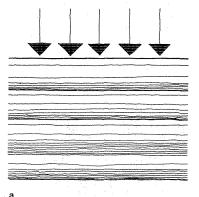
Log construction has played an important role in

the history of Canadian housing. It is natural it has done so, because in most locations the pioneers were virtually hemmed in by the forests. Some houses were built by excellent craftsmen, but generally many were not. Moreover, the log house was generally perceived as a stepping-stone to something else. Regrettably, this has created the notion the technique itself inherently produces a poor quality of housing, but this view is entirely erroneous. In the past 25 years or so there has been a great revival of interest in log house construction. Society is rapidly nearing the stage whereby today, the number of finely constructed log houses rivals or even may exceed, the

number of homes so built in our past.

Over the years myths have sprung up around the log cabin, but as time has gone by, romanticism has often deteriorated into plain nonsense. Undoubtedly the author most quoted on the subject is Harold Shurtleff with his work The Log Cabin Myth. 1 A recent scholarly work is that by Terry Jordan, his book being American Log Buildings: An Old World Heritage. He has carried out extensive research in Europe to find the origins of this most captivating way of house building.2

- H.R. Shurtleff, The Log Cabin Myth (Gloucester: Harvard University Press, 1967).
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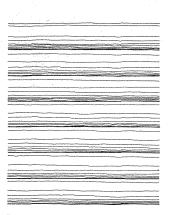
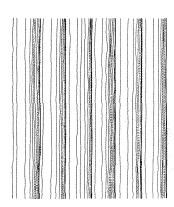


Figure 83



b

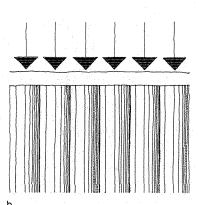


Figure 84

HORIZONTAL LOG CONSTRUCTION

Renewed interest in log construction for houses has led it to be an acceptable contemporary house building technique. Providing that certain standards are met, log homes are now eligible for conventional mortgage financing. The humble cabin of the pioneer has indeed come a very long way. A recent house built in Prince George, British Columbia is shown in Plate 25. Reference is only made to building the exterior

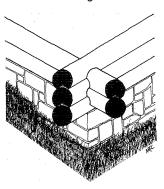


Figure 85

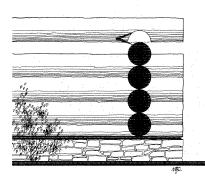


Figure 86

walls, because all other parts of the construction can vary according to what is appropriate to the location in which the house is built. This kind of heterogeneity is the hallmark of traditional empiric forms of construction.

With this technique the external corners of a house are customarily referred to as notches or joints. For example, the round notch or dovetail joint are names that have been arrived at by centuries of usage. Since reference is only to the external walls, identification is done by naming the notch or joint used. Historically, the number and complexity of joints used in Europe, es-

pecially up to the 17th century in central and northern regions, are quite staggering. Most however, are variation upon variation and, more often than not, many became the signature of a master carpenter rather than unique structural joints. Though highly valued for what they represent, they are not in demand today. If such jointing was required in Canada today, our leading log builders could easily provide the skill needed for the intricate cutting.

Knowing what to build is relatively simple. Books are available, as well as the implements to use, the only tool without its historical counterpart is the indispensable chain saw. Broad axes, heavy chisels and so forth are still manufactured and can be purchased in Canada. Moreover, good log building schools are located in most parts of the country. Although knowledge

of the technique is simple to obtain, the difficult part is learning the skills to carry it out. Actual on site experience is critical. With the revival of interest in log building today there are leaders who rightly insist on excellence in the craft.²

The round or scribed notch in Figure 85 requires logs that are round in section throughout their length. The notch is made by cutting the underside of a log to fit snugly over the one below to lock it into position. The profile for the cut is achieved by scribing. This method is shown in Figure 86 with the scriber tool in position. In the past, the top of the lower log was occasionally cut out and a full round log laid into it. This permitted water to drain into the joint with subsequent decay. The only explanations for this dubious practice would seem to be ignorance of good practice in log building.

The butt-joint (Figure 87) and the tenon-joint (Figure 88) do not lock the corners, yet both are frequently listed as doing so. In reality these joints are only ways of fitting

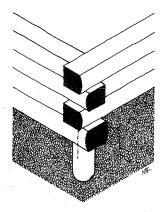


Figure 87

the ends of logs together. Strength at the corners has to be provided by driving steel drifts, or wood dowels, through their point of intersection, as well as along the upper logs down into those below. The requirements for this type of construction are covered by the regulations of Canada Mortgage and Housing Corporation.

The dovetail joint (Figure 89) is rarely used today. It does provide a firm lock, however, different schools of thought consider the faces of the joints can shrink away from each other all too easily. A critical aspect of setting out this joint is to ensure the bevels slope outwards, otherwise water will collect in the joint starting immediate decay. The three joints, the butt, the tenon and the dovetail can be used with any cross section of log, providing the ends are cut to the correct profile for the joint.

The historic use of this technique was to build farm-houses and outbuildings. Quite often, after a new house was built, the original one was kept to become another out-

building. Plate 26 shows a contemporary situation whereby an old structure has been completely renovated, a common practice in Ontario today.³

Today's chain saw has made the practice of hewing practically obsolete, however, the term refers to the process of making the round surfaces of a log, flat. Figure 90a shows a log which has been debarked, a chalk line stretched along it and snapped to leave a straight line. Figure 90b shows cuts at right angles to the line on the working face. This is done by the use of a scoring axe. This process is called scoring to the line. Figure 90c shows the removal of the wood between the score marks by standing over the log and using a long-handled broad axe. This process is called hewing to the line. A short-handled broad axe may be used instead. The axe eye

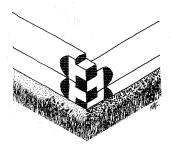


Figure 88

is at an angle facing the log giving it a substantial offset. This enables the user to stand beside the log not over it, permitting the axe to work precisely on the line without removing the user's knuckles (Figure 90d).

A great problem for dwellers of log houses in the past was the infilling, usually called chinking, of the spaces between the logs in order to stop the wind penetration. When the temperature is -20°C and with a high wind, the air can penetrate the smallest of cracks. The wind can feel like needles driven into the skin. The common method in use today is shown in Figure 91. The cut is made with a chain saw, insulation is then placed in position and held in place by the weight of

the logs above. In the past, when a builder knew he could not achieve a perfect fit, especially with taper in the log. he would deliberately leave a space of 25 mm (1 in.) or more between logs and deal with the problem in a more manageable way. This meant wood wedges, or similar materials, would be inserted between the logs and then mortared over. In this photograph, the craftsmanship demonstrated in the cutting of these dovetails is of a very high standard. If a house

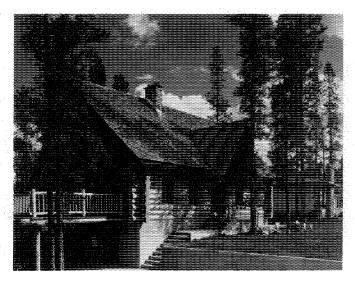


Plate 25

built in this manner was structurally sound, but the chinking did not provide an adequate wind barrier, when time and money were available the house would be boarded over and finished with ship-lap siding or even at times, a brick veneer.

Great care must be taken with the problem of shrinkage in log construction. Even if air-dried for a year, logs still contain moisture relative to that of its environment. Therefore, when a log is built into a house it will continue shrinking as a result of the higher temperature inside the

house; conversely, if higher humidity is present, it will cause a log to swell. Consequently, about 12 mm (0.5 in.) of shrinkage for each 250 mm (10 in.) has to be allowed for in the construction. In itself that may not seem like a great deal, but it is the incremental effect that creates the problem. The point is discussed by Hutcheon and Mattar:

"The walls of log buildings can shrink up to 76 mm (3 in.) per storey as the wood dries. This may be of little consequence when the wall consists of logs or planks and the structure is a simple one. However, when other members are attached or

framed into a wall, many complications can arise."4

Shrinkage along the grain of the wood, called long-grain, is negligible when compared with the shrinkage across the grain, called cross-grain. Shrinkage in the long-grain is small enough for it to be classified as stable in this direction, but cross-grain shrinkage is not a stable condition. ⁵

The incremental effect is shown in Figures 92a and b. Figure 92a shows a liner for window set into a wall with no allowance for shrinkage. In Figure 92b the liner is shown in precisely the same position and the problem of shrinkage can be seen. In practice, the liner would sit on the support-

ing log and settles with it. The log that started as the header in Figure 92a has to be cut to allow it to settle down along the side of the liner (Figure 92b) and the log above it now becomes the header. To allow for the incremental settlement of the side logs, splines, usually square battens, are fixed to the window and slotted into a groove cut into the ends of the adjacent logs. They are not fixed to them. This permits the logs to slide up or down. The principle used with all such elements that relate to the external log wall (Figures 93 and 94) show two kinds of internal partitions fixed in position.

Today, there are a number of prefabricated log houses available. Some have been around for a number of years while others have recently





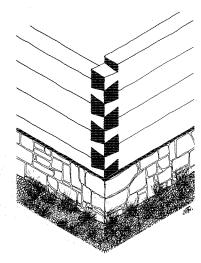


Figure 89

joined in the attempt to satisfy a sentimental yearning for the past. In almost every case the machined products are excellent but generally the designs are simply poor attempts to capture an unobtainable past. Manufacturing in Scandinavia today illustrates ways in which prefabrication can be used for contemporary designs without attempting to imitate traditional construction.

There may have been an intermittent use of round-log construction in Canada before 1784. This date marked the first land grants to United Empire Loyalists in Upper Canada.6 If the round-log construction was used there does not appear to be records of it. The stream of people coming north from the fledgling United States was great, arriving in Upper Canada, Lower Canada and Maritime Canada. The important fact about those who arrived, was that almost all had been brought up, or had lived in North America long enough to be quite aware of pioneer life. John Rempel covers this point and provides a history of log construction in early Central Canada.7 An interesting aspect on the numbers of log houses in Ontario is also given:

"... only in Erin and Caledon townships was there an absolute increase in their numbers. In these two townships log houses still outnumbered all others by two to one during the 50s. This ratio seems to have prevailed in the province as a whole around 1832 and was perhaps even larger in the three or four decades before. The 1832 figure is based on returns given by John McGregor of 42 857 dwellings of a description in that year and of 14 297 superior (frame, brick and stone) houses recorded in the census of 1831, giving an almost exact proportion of two to one in favour of log houses."7

As a matter of interest, the preferred size of log house then seems to have been in the order of 4.8 m by 3.4 m (16 ft. by 12 ft.).

The immigrants from mainland Europe were often skilled in some form of simple log construction, as were immigrants from the United States. This inflow of new people meant new settlements and new frontiers. Another reason for the creation of new communities was the exploitation of natural resources. Examples of this are the gold rushes in British Columbia during the 1860s and in the Klondike at the end of the last century, when every kind of construction was put to use.

With this expansion, log construction was put to use in a variety of ways. Plate 27 shows a camboose shanty for loggers in Ontario, around 1906. The roof construction was also of interest, because it was hollowed-out, interlocking logs. Plate 28 shows the home of Robert Service in the Yukon. Here the logs were rectangular with a European locking joint at the corners.

The earliest record we have for the use of a queue d'aronde (dovetail Corner) in New France concerns the construction of a church at Trois-Rivières in 1664:

"Extrait de les Ursulines des Trois-Rivières, Vol. 1, p. 15....

"(1664) La première église paroissiale construite en 1664 était en bois rond fermé aux angles en queues d'aronde. La façade de cet édifice regardait la basse-ville, son flanc longeait la rue Saint-Pierre....

"The first parish church built in 1664 was of round log with dovetail corners. The front of this building looked out on the lower town, its side faced onto rue Saint-Pierre." 8

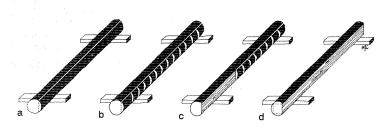


Figure 90

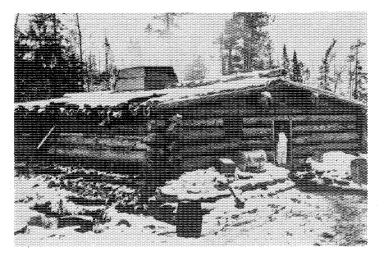


Plate 27

A likely reason for the lack of earlier data is provided by A.J.H. Richardson when he points out that notarial records up to the 18th century tended to use the generic term of pièce sur pièce, which could mean pièce sur pièce à queue d'aronde or pièce sur pièce poteaux en coulisse. R.L. Seguin also discusses this problem at this period of having a multiplicity of names used for house construction.

In considering the use of this corner joint before its use at Trois-Rivières, it is highly improbable that a French carpenter would attempt to use an untried technique on a new church. It is reasonable to

assume the joint was used at some unspecified time in Quebec before 1664. The Dovetail Joint was known throughout Europe during this period, either as the lapped dovetail for sills in heavy wood-frame housing, or as the complete joint in a wide variety of structures. 10 Log construction was not prevalent in the Normady of the time but there is no doubt Norman carpenters were aware of the joint itself and almost certainly at least the use of a horizontal log with the dovetail corner. From 1608, the founding of New France, to 1664, a gap exists but Richardson's previous comments almost certainly accounts for this situation.

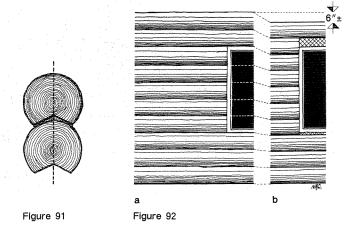
Some historians, unaware of the astonishing scope of the use of log building in Europe during this period,

have made the suggestion that the technique was learnt from the English to the south. The English did not use log housing in England, but they did use it occasionally in Massachusetts before 1700, however, this use had been learnt from the military construction of blockhouses. The same technique was used to build one, or perhaps two garrison houses in each village on the frontier. 11 The houses were intended to provide refuge for families in case of enemy attack. This was hardly a tradition of log-house building.

Another refrain was the Swedes brought log construction to New Sweden on the Delaware River in 1638. This is quite true, but the reference is always made to round-log construction and the round notch. However, the dovetail notch was brought to New Sweden at the same time. The first settlers who arrived in 1638, were led by Dutchman, Peter Minuit, and his crew consisting of 27

Finns and Swedes plus a few soldiers. The Dutch from Manhattan, annexed it 10 years later. The settlement then consisting of about 400 people, half Finnish and half Swedish. Of the two houses extant, one used the round log with saddle-notch corners. (a variation of the round notch), however the builder is unknown. 12 The other house is a well preserved squared log house using the dovetail-joint. 13 This was built by the Finn. Martti Marttinen in 1655. His great grandson was John Morton, one of the signatories of the American Declaration of Independence. In writing of the Finns in North America, Engle comments on the earliest housing of the colonv:

"The earliest homes along the Delaware were one room cabins hastily built of round, undressed logs, by peasant farmers who had very few tools to work with. The logs were saddle-notched, the doors fitted badly and the windows were simple, uneven openings, covered with movable boards. Cracks and holes in the walls were chinked with clay or moss. Chimneys were made of sticks covered with clay; the roofs were insulated with turf laid over tree limbs or puncheon planks. All the timbers were cut by hand. Cabins were erected without the use of square or level."14



With a total population of 400 people, a generous occupancy would give about 70 houses. Some were built well and others were not. Some employed round logs with saddle notch corners and other houses employed the dovetail joint with squared logs. While it is true that log construction was first used in this part of North America at New Sweden, it is nevertheless beyond belief that this minute mixture of houses, tucked away quietly on the Delaware River, could have spawned the vast number of log houses across North America.

The instances given of the English, Swedish and Finnish usage is the only way the French theoretically could have learnt of à queue d'aronde construction from the south. Considering the fact that no love was lost between the French Catholic Monarchists of New France. and the English Protestant Republicans of Massachusetts Bay, nor with other Protestants on the Delaware, it strains credibility to think of influences coming north from this quarter. Another, and even greater factor that effectively limited consultations on building techniques, and is quite ignored, was that the territory of the Iroquois Confederacy lay across any direct lines of communication.

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Figure 93



Figure 94

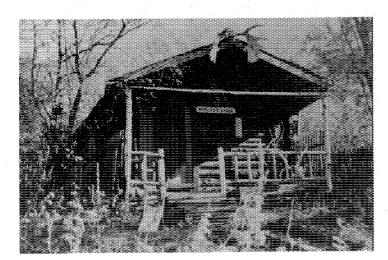


Plate 28

VERTICAL LOG CONSTRUCTION

With this form of construction the logs are buried directly into the ground. It is a primitive way of building since this type of structure has a relatively short life span due to decay of the logs at the grade line. As shown in Figure 95, rotting takes place 50 mm. (2 in.) above and 50 mm (2 in.) below the line, furthermore, the escape of heat at floor level with its higher moisture content, only exacerbates the problem.

Use of this structural technique goes back into antiquity. The most recognizable technique is probably that of defensive palisades. This is only a step to consider in the

building of a simple form of housing. Over the centuries. the military have used the technique and have incorporated the principles in their engineering manuals. Since there were always soldiery in the early colonies of North America, house-building methods were often taken from their practices. The civilian garrison-houses which have previously been mentioned, are one example of the influence.

The procedure of cutting down trees, excavating trenches and setting up vertical log walls did not require highly skilled labour, however, the next stage of construction did present a technical problem. It involved the method of fixing logs together at their tops to ensure they acted in

Plate 29

concert. The military usually employed baulks of timber and hand-forged spikes for a palisade as shown in Figure 96. But for a small private structure, 4.8 m by 9 m (16 ft. by 30 ft.), or even smaller, such materials were rarely available, and if they were, they would usually be prohibitively expensive. At times, the logs were tied together with rope or with anything at hand, but the most suitable way was to cut the tops of the logs into tenons and fit a mortised, or rebated, beam over them. Figure 97 shows this with pegging driven in for a tight fit. It may be assumed that those using this method of construction were perfectly aware of the relatively short life span of these buildings and doubtless 40 years or so represented an acceptable proposition.

A good example of vertical log construction used on the Prairies, was François LeBlanc

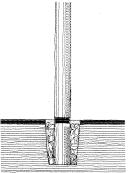


Figure 95

and James Finlay's Free trading post built in 1768 at Nipawin on the South Saskatchewan. The Post was rectangular and divided into three rooms with one of them for storage. In this situation the cross walls acted as sheer walls to strengthen the basically weak structure. The remains of this trading post was excavated by an archaeological team, who discovered the burnt outline of the building. It consisted of post holes with the remains of the charred posts inside them.1 This technique of building was not uncommon with the smaller trading posts prior to the later merging of the various independent fur trading companies. Even as early as 1768, the fur trade was not an entirely hit-and-miss affair. There were risks of course. but in this particular instance LeBlanc had been a member of La Vérendrye's historic explorations to establish new routes for fur trading. He recognized the potential of the area and returned from Montreal in partnership with James Finlay. It may be taken that he well knew what building materials were, or were not, available and what is more, had a good idea how to use what could be obtained.

Newfoundland has a historical form of shelter called a "tilt." From records of church ministers of the first part of the 19th century it

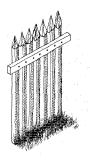
meant a basic home, but it is possible there was one for winter use and one for summer, each located in favoured areas for hunting and fishing. Whiteway mentions the tilt2 and Tibbets has amplified upon it.3 It is also difficult to ignore the fortified French fishing village at Placentia Bay before 1714. When it was taken by the British many of the houses were of vertical logs set in the ground with a roof of poles and finished with turf. There might be a connection here. with the tilt, but perhaps it is only a case of similar condition, dictating similar solutions. O'Dea provides an annotated bibliography on vertical log structures in Newfoundland.4

The front elevation of a tilt is shown in Figure 98. There was a built-up stone hearth and possibly with a rudimentary chimney. When occupied on a temporary basis, the tilt might have only had a fire in the centre on the floor with a hole in the roof; not an uncommon form of dwelling for many of the poor in the British Isles up to the latter half of the 19th century. The roof of the tilt is of rafters, with small poles, across them and a bark and turf finish. In her paper on the architecture of Newfoundland, Whiteway mentions that a later development of the tilt employed vertical 51 mm (2 in.) planks buried in the ground and chinked with moss; the sides and roof being covered with wood shingles.5

Probably the most significant use in Canada of vertical logs was at the Fortress of Louisbourg. Adams prepared a paper on its use at the Fortress, 6 and Krause made a comparison between the two forms of house building employed there. Piquet and charpente,7 the former covering the use for vertical logs, the latter being the name for the heavy-frame houses of France at this period. Adams

provides a table of 50 buildings of piquet construction with an average width of 6 m (20 ft.). This is fairly constant but length varied enormously, from 6 m to 36 m (20 ft. to 120 ft.). The question arises whether we are looking at the same phenomenon found with the houses of the Coast Salish Indian housing, where length was of little significance? If this is so, there must be a bay system in the construction, however simple. Vertical logs were used in three distinct ways at the Fortress of Louisbourg: as an infilling to charpente construction (Plate 29); as Piquet construction when logs were dug into the ground; and lastly, as a part of a bay system of framing with buttress logs forming an integral part of the construction.8

- 1. Museum of Natural History, Regina.
- 2. L. Whiteway, Towards an Art of Architecture in Newfoundland (Newfoundland: Memorial University).
- 3. D.C. Tibbets, The Newfoundland Tilt (Ottawa: 1968), Vol. II, No. 5.
- 4. S. O'Dea. A Selective Annotated Bibliography for the Study of Newfoundland Vertical Loa Structures (The Association of Preservation Technology, 1981), Vol. 13, No. 1.
- 5. L. Whiteway, Towards an Art of Architecture in Newfoundland.
- B. Adams, Piquet Houses (Fortress of Louisbourg).
- 7. E.R. Krause, "Private Buildings in Louisbourg 1713-1758," Architectural Magazine (Canada, 1974), Vol. 1, No. 4,.
- 8. Y. LeBlanc, (Fortress of Louisbourg: 1980).







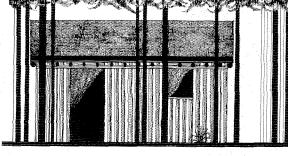


Figure 96

Figure 97

Figure 98

2 st

STACKWALL CONSTRUCTION

The stackwall technique of house building is simple. This technique can be extremely economic and the fundamental aspect of the craft can be learnt rapidly. Nevertheless, the method is best utilized when it meets all the requirements of an owner at a particular building site. Indeed, it is true to say that the decision on whether to use stackwall construction at all has to be assessed separately for each new building.

In a sense, the technique is the most unusual of all

Canadian house-building methods because it cannot be categorized as either mass or frame walling. On the one hand it certainly has mass but on the other, it relies on the structural support of the corners for complete stability. It is grouped with log construction because it is generally perceived to be of this form.

The use of stackwall construction goes back into antiquity in Europe, but its use in Canada is only found during the 20th century, and then only intermittently. The appearance of a house built

with the method is shown in Plate 30. This particular home was built at Gimli, Manitoba, over 40 years ago. Gimli is situated in one of the colder climatic regions of the country. The house has been occupied since construction with complete satisfaction regarding both performance and appearance.

As with all methods of house building, there are different ways of dealing with the details while keeping to the essential principle. Various methods are shown here, but what might be appropriate in a specific instance depends on the economic availability of materials at the time of building. The description that follows is based principally upon the work of Sparling and Lansdown.¹

The elevation of a wall is shown in Figure 99. Here a concrete foundation is used; the corner is built up by squared timber, about 200 mm by 200 mm (8 in. by 8 in.), and the logs are approximately 175 mm (7 in.) in diameter. A rough liner is used for the window opening, and a continuous beam is shown at the top, even though it is not crucial for it to be so. Figure 100 shows a combined elevation and section, and Figure 101 indicates on plan where the cross section is taken. The section is important because it illustrates that throughout the major part of the wall, logs are completely surrounded by loose insula-

Corners for support are built up as illustrated, in Figure 102. In this drawing a preserved timber foundation is used, which is laid on a thick

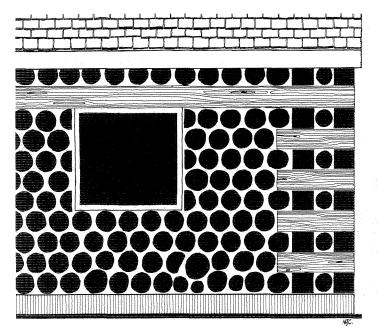


Figure 99

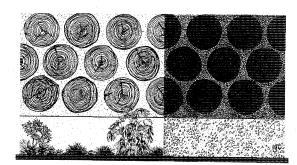


Figure 100

pad of crushed rock or gravel. For this method there must be a way for water to drain away from the bottom of the pad, and therefore under no circumstances, should the spaces between the bottom rows of foundations be filled in. A filler board is then laid on the top of the foundation timbers. The corners are first built up 600 mm to 900 mm (2 ft. to 3 ft.) or more in height and when the mortar is reasonably set, the walls are laid as described above. Although it is not essential to use squared timbers they do enable more precise workmanship and consequently a stronger wall.

Critics of the stackwall technique base their criticism on the thermal efficiency of the wall. Comparison could be made with today's platform-frame construction with an insulation factor rating up to R-20. Meaning in effect, the use of exterior wall studs of 38 mm by 139 mm (2 in.

by 6 in.) and 150 mm (6 in.) of insulation. In 1977 Bruce Hutcheon and S.G. Mattar wrote that:

"A preliminary conclusion, which may be drawn from the discussion so far, (on the shrinkage and swelling of wood) is that logs used in construction may themselves not be air tight. This is especially the case in stovewood construction (ed. stackwall) where log pieces, instead of stones, are embedded in mortar. The radial cracks in the log pieces which are placed across the plane of the wall provide a direct path for air leakage. Differences in the dimensional changes of the wood and mortar with moisture and temperature variations in service may decrease the airtightness of the construction still further."2

Since these observations are correct, why is this issue of little concern in practice, even by those who have built with the technique since the time it was written? It is suggested the amount of loose insulation now used may be in excess of what was used to make the above observation. This is in spite of the fact a small shrinkage gap might be seen on the exterior face. Those who use the technique are fully aware of potential problems including radial cracking along the log and minor annual maintenance for the first couple of seasons. Probably the best advertisement for the technique is the statement from people who live in such houses. They

protest that there is no significant difference between their annual heating costs when compared with those with more traditional methods of construction.

There are many ways to finish the interior of this kind of house. Workmanship can be done carefully to have a flush face internally and left exposed; or the face can be flush on the exterior with the internal one, receiving an applied finish. If the latter is done, an airtight vapour barrier would be provided automatically as in other contemporary construction.

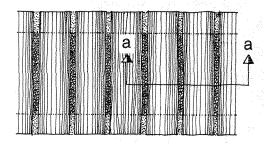


Figure 101

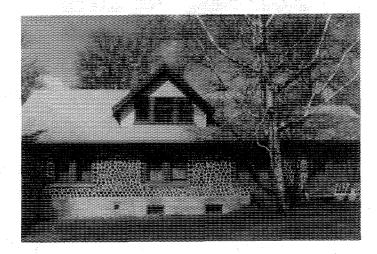


Plate 30

From the cost point of view, stackwall is extremely labour intensive and is not used by conventional builders. But because of the ready availability of small logs in many parts of the country, the basic material can be cheap and even free at times. One great advantage of the stackwall technique is that species such as poplar, or cottonwood, Populus L., and others in a similar category useable only for pulp and similar purposes. These species are ideal materials because their cell cavities are large thus

providing high insulating value. Since most prospective owners will do the construction themselves, labour falls into quite a different category than is normally the case. This category is comprised of people who have little money, little prospect for a mortgage under existing practices and who propose to live in a rural or semirural location. The stackwall technique allows them the opportunity to create their own homes: in a day when a successful life has to be a balance between technology and personal creativity. It would seem that every effort must be made to

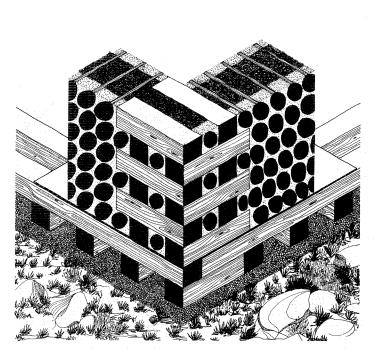


Figure 102

encourage the use of latent skills, and what better way than by building your own home? It would be retrogressive to abandon standards of quality, but standards have to be agreed upon with those who have experience with the technique in order to have a workable approach for all concerned.

Insofar as design is concerned, particularly the appearance of the exterior. the potential for stackwall is great. Much depends of course on the range of materials at hand, but for example if two diameters of logs can be obtained there is no reason why simple wall patterns cannot evolve. If the corners and wall supports are of a timber frame, as used in Plate 31, then the logs become infilling, and a wide range of possibilities for design become available.

- A. Sparling and A. Lansdown, Stackwall: How to Build it (Manitoba, The Northern Housing Committee of the University of Manitoba, 1977).
- N.B. Hutcheon and S.G. Mattar, Wood Buildings - Log or Frame (Montreal: Concordia University, 1977).

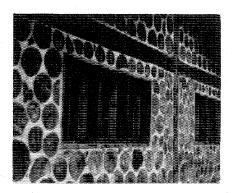


Plate 31

22 FRAME CONSTRUCTION

The principle of frame construction in wood are similar to those for steel or reinforced concrete. A framework of structural members is built first and the spaces between them are filled with the appropriate materials for walls, floors, and roofs. The loads of the infilling are taken by the horizontal beams and transferred to the vertical posts, as shown in Figure 103. This technique is rarely used for housing today.

Not only does the frame carry the loading described, but it also has to resist external lateral forces. Throughout the history of wood-frame house construction, the connection between a post and a beam has been made by using a wide range of simple or complex wood joints. This type of joint has to perform the twin functions of transferring loads to posts, and preventing the members from pulling apart causing deforma-

tion in the structure. Wood is constantly responding to the moisture content of the environment and therefore moves. causing it to expand and shrink. It is impossible to make a perfectly rigid joint and consequently, most structure joints employed a simple mortice and tenon with a dowel to lock it in place shown in Figure 104. Another joint is shown in Figure 105 where the load is transferred by a bevel cut with or without a dowel.

The time-honoured method is to strengthen the frame by use of corner bracing of one type or another (Figure 106). Failure of joints in frame construction rarely means an immediate collapse of the structure. Excessive forces start movement in one joint

and would gradually move to others, however, before failure occurred the house would suffer deformation as illustrated in Figure 107. Some comfort in frame construction is that failure in wood structures is always heard long before collapse.

The framing techniques to be covered in this category are:

- Colombage pierroté construction,
- Poteaux en coulisse construction.
- Heavy-frame construction,

- Medium-frame construction.
- Post and groove construction.
- · Madrier Construction,
- Post and rail construction.
- Buttress-frame construction, and
- Post, beam and plank frame construction.

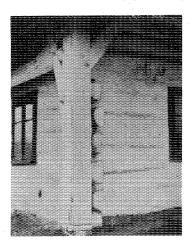


Plate 32

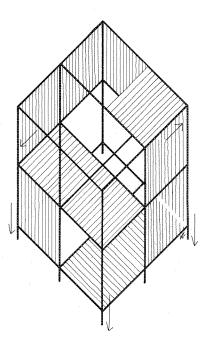


Figure 103

North America's vast distances make it impossible to describe framing techniques in one chronological or cultural sequence. The techniques used were as different as their locations. The listing provided appears to be the most sensible way to deal with the subject and the reason for each technique is given below.

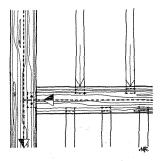


Figure 104

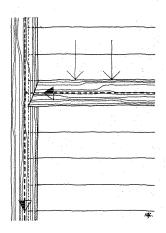


Figure 105

Colombage Pierroté

The French name is retained because there is no counterpart in British construction, in Canada, or in Britain.

Poteaux en coulisse

This technique also does not have an English equivalent. French names are more common and are most frequently used in contemporary writing. The four principal sources are the works of Seguin, ¹ Richardson, ² Laframboise, ³ and Lessard and Marquis. ⁴ Secondary sources are the contemporary works of French rural tradi-

tional housing of wood. To illustrate the extent of the problem, Figure 108 is taken from Seguin's study of the housing in New France.⁵

Heavy-Frame Construction

Today, it is common to refer to our house building technique as being of light-wood construction. In contrast, as used here, the term "heavy frame" refers to the Post-Medieval form brought to North America by the British, covering the period of 1608 to approximately 1750.

Medium-Frame Construction

By approximately 1750 heavy-frame construction had

been in North America but the technique was now classified as medium-frame construction. The principle remained the same but structural members became lighter and milled studs were making their appearance. In Canada, methods of construction used by the United Empire Loyalists generally fall into this category. A very approximate period in Ontario is from 1790 to 1870.6

Post and Groove Construction

This form of building is also referred to as Hudson Bay frame, Red River frame, Manitoba frame, Canadian frame and the list continues. Virtually all carpenters who built with this technique, from the edge of the Precambrian Shield to the Pacific shores. were French Canadians using a modified form of poteaux en coulisse. In placing this method in a historical context, the simple translation from French into English clearly identifies the evolution of the technique.

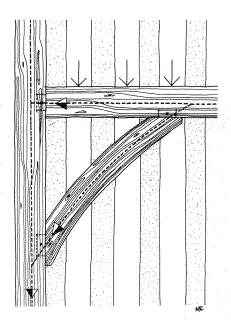


Figure 106

Madrier Construction

This name identifies the later evolution of poteaux en coulisse in Quebec. This is another technique employing milled planks and nails in lieu of hewn timbers and wood joints.

Post and Rail Construction

This name applies specifically to one Acadian form of house construction.

Buttress-Frame Construction

This name is used because no other has been available. Largely because the technique has not previously been identified as a separate method of house building.

Post, Beam and Plank Frame Construction

The method was used mainly on the West Coast from about 1946 to 1968.

Both log and frame construction co-existed for thousands of years in Europe. One did not evolve from the other, therefore there have always been strong advocates for one technique over the other, but sometimes a compromise is made. The example from Poland in Plate 32, shows that at least one carpenter decided to play it safe.

- R. Séguin, La Maison en Nouvelle-France (Ottawa: Musée national du Canada, 1968), Bulletin No. 226.
- A.J.H. Richardson, A Comparative Historical Study of Timber Building in Canada (The Association for Preservation Technology 1973), Vol. 5, No. 3.
- Y. Laframboise, L'architecture traditionnelle au Québec (Montréal: Les Éditions de l'Homme Ltée, 1975).

- M. Lessard and H. Marquis, Encyclopédie de la Maison Québécoise (Montréal: Les Éditions de l'Homme Ltée, 1972).
- R.-L. Séguin, La Maison en Nouvelle-France (Ottawa: Musée national du Canada, 1968).
- J.I. Rempel, Building with Wood (Toronto: University of Toronto Press, 1980).

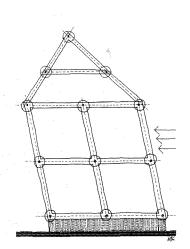


Figure 107

	General Types		
	Base Structure	General Designation and Period of Use	Specific Designation (comments from Archives)
Vertical Framework	with vertical members planted in the ground (in ground)	pieux ou piquets (XVIIº siècle)	pieux en terre pieux en sol piquets pieux plantés poteaux en terre pieux debouts
	with vertical members resting on a (window) frame, or on the ground, or on a bed of dry stone, or on a masonry foundation (buried or in sait water) (on sole plate)	colombage (XVII° et première demie du XVIII° siècle)	de pans de bois bois de charpente colombage-pierroté colombage-bousillé pieux sur sol pieux debouts bois de colombage madriers debouts
Horizontal Framework	window resting on either a bed of dry stones, or on the ground, or on a masonry foundation	pièce sur pièce en coulisse (XVII°, XVIII°, XIX° siècles) pièce sur pièce à queue d'aronde (XVII°, XVIII°, et XIX° siècles) Bois rond (XVII°, XVIII°, et XIX° siècles)	de pans de bois bois de charpente pieux sur pieux bois en coulisse poteaux en coulisse madriers en coulisse pièces sur pièces en coulisse poteaux entourés de pieux charpentes entourés de madriers poteaux entourés de madriers en poteaux et clos de pieux bois de charpente pieux sur pieux pièce sur pièce à queue d'aronde pieux sur pieux bois rond pièce sur pièce assemblées à enclave et biseau, à mi-bois, en T (désignation populaire orale)

Figure 108

28

COLOMBAGE PIERROTÉ CONSTRUCTION

This method of construction was brought to New France during its early days. It came from northwest France after being greatly used in Normandy. The technique employed a heavy wood frame with studs set close together. The infilling was of stone that could be left exposed or have a protecting coat of mortar. In Canada, colombage pierroté was largely supplanted by other forms of construction in the middle of the 18th century in favour for

ones more appropriate to the northern climate. Although New France itself was centred on the St. Lawrence River, the French empire in North America included the Great lakes and the enormous length of the Mississippi to New Orleans. The colombage pierroté technique was used extensively along this route especially in St. Louis, then the provincial capital of upper Louisiana. 1 This method of construction is described by both Lessard and Marquis,² and Laframboise.3

The appearance of a house built with this technique is

shown in Figure 109 and the end elevation in Figure 110. It is based upon La Maison Pichet, which was first built on l'Ile d'Orléans c. AD 1733.4 To overcome the deterioration of the mortar, and possibly of the stone itself, the exterior of the house was covered with some kind of boarding, either vertically or horizontally. There was of course the additional advantage of making the house more wind and weatherproof. The wood finish to many old houses has become so familiar, it is easy to forget what the original appearance might have looked like. The figure mentioned has been illustrated as it would have appeared in the early years of the house's

life. This style was so typical of Normandy and this region of France that it is not necessary to belabour its historic roots. At the time this house and others were built, the feel of the environment became far more evocative of France than the bland image we have today.

There are two reasons why La Maison Pichet was not intended to be boarded over originally. First, in the two photographs shown by Lessard and Marquis. 5 it is clear that the first laver of boarding was carefully scribed around the projecting tusk tenon structural joint. It is most improbable this type of work would have been done at the time of the original construction. The second reason supports the notion of the later application of boarding as well as ties this form of construction to Normandy specifically.

Part of the house's wall is illustrated in Figure 111. It shows the stone between the studs as well as its cover of

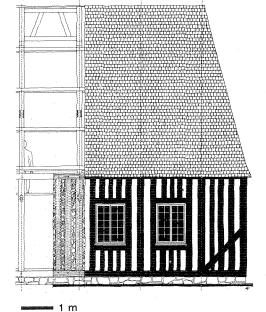


Figure 109

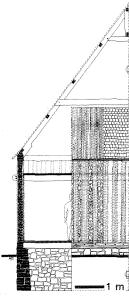


Figure 110

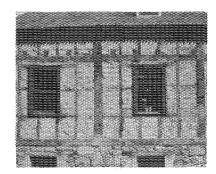


Plate 33

mortar. It was customary to apply a coat of limewash to the mortar, and at times the studs. The profile of the studs is fascinating. They have been shaped to provide a key for the infilling as well as to reduce through joints for wind penetration. The contraction and expansion in the wood, but not in the stone, was taken into consideration by the French carpenters of that day. In the case of the Pichet House the walls are slightly inclined inwards, presumably for strength. This is an astonishing detail uncommon to the colombage pierroté technique. A good example of the use of this stud detail in Normandy is at La Ferme de Pommereuil, at Ste. Marthe, Eure built in 1561. Here it was used to construct the pigeon house shown in Figure 112. This was no small dovecote but a solid structure about 6.0 m (21 ft. 8 in.) square and 5 m (16 ft. 6 in.) high internally. The wall section is shown in Figure 113 which is identical to that of the Pichet House.6

All stone has a natural bed, similar to the end grain of

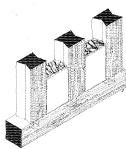


Figure 111

wood. When a stone is laid in its natural state, it is referred to as its bed. When it is laid in a wall in a similar manner it will withstand the onslaught of severe weather. But if it is not laid in its natural bed position, it will begin to spall and break down in extreme cold, due to the action of rain and of ice. With colombage pierroté construction the studs could be close together or far apart. When close, the distance between them ranged from as small as 50 mm (2 in.) to as large as 1 m (3 ft. 4 in.). When studs were placed far apart, the minimum space was established by the stonemason who laid the stone on its natural bed, and laid in a wall (Figure 114). If the studs were close together (Figure 115) the stone was laid on its end.

With the wider spacing of the studs, the stone itself was not affected by the climate and thus was left exposed, however, when the stone was laid on its end, a coat of mortar was used to protect it.

This construction method was almost certainly known by Samuel de Champlain as early as the founding of the colony in 1608. Whether de Champlain used it in the early days is not at all certain. This construction method could be traced to such an early date because of its much quoted reference in a letter of La Mère Marie de l'Incarnation written to her son in France in 1644 from Quebec. After describing her house she wrote:

"Celles des habitants, ex-

cepté deux ou trois, sont de colombage pierroté."⁷

She used the construction technique knowing her son would be familiar with the term.

In housing of the time, including Pichet House, attention is invariably drawn to the quite different proportion of the roof and wall to what is used today. The origins of this technique go back for centuries in France. It was originally due to the steep pitch required for the run-off of water on thatch and to obtain the greatest space possible for storage and

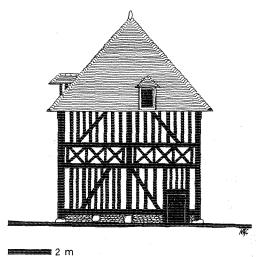


Figure 112



Plate 34

sleeping areas. Once other materials were substituted there was need for height, but as so often happens in housing, the space was needed because people and society had become accustomed to its use and its appearance.

Two good examples of this technique are at Lower Fort Garry, near Selkirk, Manitoba. In the restoration it was found that the rear wing of the Big

House, built in 1840, was constructed of colombage pierroté. Plate 33 shows the framing after the original coat of mortar had been stripped exposing the framing and stone infilling. The stone infilling was laid as random rubble. The separate Men's House is another example of identical construction.

Lower Fort Garry was the headquarters for the Hudson Bay Company in the West and this no doubt is why the front of the Big House is of stone, as in Plate 34. It is one of the most graceful buildings that evolved out of the frontier environments from the early 19th century. In Charles

Peterson's writings on the buildings of the French from St. Louis down the Mississippi. he discusses the development of the porch. He provides a series of photographs showing the changing profile of the roof reaching its unique French-Canadian construction.8 An excellent example of Colombage Pierroté with an exposed stone finish is the reconstruction of the Latigue House at the Fortress of Louisberg originally built in the 1730s (Plate 35).

Since the word Colombage refers to the wood frame, colombage pierroté refers to the infilling of the wood frame with stone. The French used the name colombage briquetée technique when the infilling was of brick. The Colombage Bousillé was used when the infilling was of clay.⁹

- C.E. Peterson, "The houses of French St. Louis," The French in the Mississippi Valley (Urbana: University of Illinois Press, 1965).
- M. Lessard and H. Marquis, Encyclopédie de la Maison québécoise (Montréal: Les Éditions de l'Homme Ltée, 1972).
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Figure 113

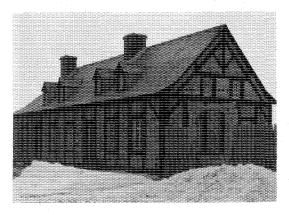


Plate 35

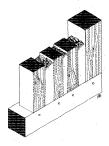


Figure 114

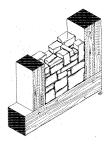


Figure 115

24 POTEAUX EN COULISSE CONSTRUCTION

This method of construction is one of the most important methods of house building that has been used in Canada. Including its derivatives, it was employed by French-Canadian builders from the middle of the 17th century until recently. This has amounted to over 300 years of constant use. Loosely translated, the name means groove in posts or grooved posts. This technique was rarely, if ever, employed by the English. Even when used in Ontario during the 19th century, it was invariably done so by French-Canadian carpenters. 1 Consequently, it is incorrect to translate the name into English. The derivatives poteaux en coulisse are: post and groove construction and madrier construction. These will be described later.

Poteaux en coulisse is a frame system in which horizontal logs fill the spaces between posts (Figure 116). To some extent the length of logs available governed the spacing of the posts, which ranged from about 1.8 m to 3 m (6 ft. to 10 ft.). A length of about 2.4 m (8 ft.) was most popular. The significant feature of the technique is the

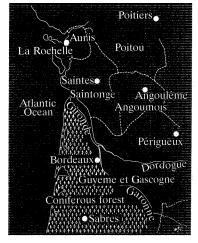
mortise and tenon joint between the post and a horizontal member (Figure 117).

A typical example of a house built with this technique is illustrated in the part elevation shown in Figure 118 and is based on the details used in La Maison Fafard. Cap-Sante, Québec built about 1720.2 This particular house was approximately 14.6 m (48 ft.) long and 9.7 m (32 ft.) wide, and contained three floor levels. The top floor was most likely only used for storage because the depth of the roof construction made it awkward for general use. The pitch of the roof was 51°. The junction between a floor beam and a post at the heel of the roof truss is shown in Figure 119. Here, the ingenious use of a metal tie to lock the beam in place replaces the traditional

wood tusk tenon joint. Figure 120 shows the complex corner and roof joint, with Figure 121 illustrating a part of the roof construction. With roofs of this immense size. lateral bracing, to counter wind forces, was also needed. The manner in which it was done was brought from France and consisted of connecting types of king-post roof trusses together and in effect created a transverse truss. These houses, including those like La Maison Pichet, discussed previously, have a great feeling of strength and

dignity, which extends not only from their great roofs but also from the proportion and simplicity of the complete house.

Figure 122 shows an erected frame with the infilling logs being slid down the grooves and pegged into place. In



Map 24

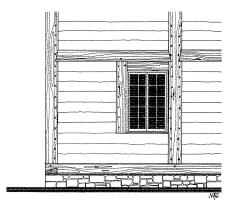


Figure 116

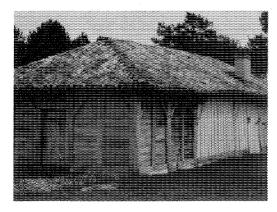


Plate 36

some cases the bottom of the tenon was bevelled to permit easy manoeuvring of the member. The last logs directly under a beam were placed in position by cutting out the side of the groove on the interior face of the post. After the infill was in place, the side of the groove was replaced and pegged into position. Posts were invariably squared to facilitate the cutting of



Map 25

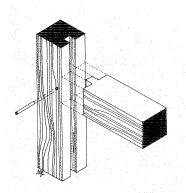


Figure 117

grooves, but the log infill, providing it had the appropriate tenon, could be of almost any cross section. There were no rules governing the dimensions of various members but squared logs ran from about 150 mm to 250 mm (6 in, to 10 in.). Rectangular and round logs also fell within this range. The size of the posts were often greater than that of the infill, in which case the exterior face of the infill was made flush with the post. Occasionally, there is confusion in distinguishing a house constructed with poteaux en

coulisse technique when the corners are of dovetail construction. This change was introduced to give a greater strength to the corners, as they are the weakest part of the poteaux en coulisse construction. This was especially true when the pegging of joints was not carried out.

The legal structure of Nouvelle-France required copies of all notarized contracts to be filed in its archives. This practice has given us some insight into the construction methods used in the early years. Unfortunately, after examining them it was apparent that more information was left out than

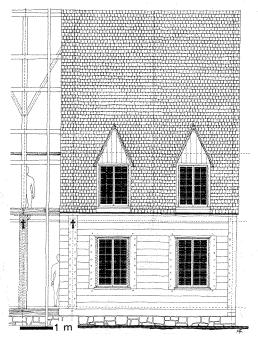


Figure 118

recorded. Contracts covered aspects such as amenities. materials, completion time, and so forth, but omitted reference to building details. These would be implicit in the contract as common practice, and was not believed to require any elaboration. The lack of detailed information supported the fact that when it was considered necessary. to mention details of construction, it would usually be done by stating a generic name or, more often than not, done obliquely by reference to an existing structure. It was an entirely logical procedure for the day but is frustrating for today's researchers who have to put together vital details of a jigsaw puzzle that has missing pieces. 3,4,5

The earliest use of poteaux en coulisse in Canada was during the middle of the 17th century. The various locations of the use of this technique in Europe, which are suggested as Canada's origin will now be discussed.

In southwest France there is an ecological area called Le Parc Naturel Régional des Landes de Gascogne, with the village of Sabres approximate-

ly as its centre. It is about 80 kilometres south of Bordeaux and 220 kilometres south of La Rochelle. This marked the historic trading port between France and its fledgling colony. Map 24 indicates the locations as well as the provinces of La France de l'ancien régime. The farmhouses and barns of the 18th century, have been collected together to form an open air museum. They are only a part of the transformation of the Sabres park, which will return its appearance to that of two centuries ago.

The photograph in Plate 36, shows a house with a barn attached to the left-hand side. The barn has grooved posts into which boards about 25 mm (1 in.) in width, have been slotted. The most significant aspect is the corner bracing shown in detail in Plate 37. The infill is loose and provides no stiffening to the structure, therefore the

corner bracing is clearly an integral part of the building method. It is noted that the joints of the frame themselves are pegged. An elevation of the end of a barn is shown in Figure 123. The roof covering has been omitted to show the structure, and the plan of the wall is shown in Figure 124.6 Since the wall needed more protection for the animals, sheaves of long straw or reeds were often slipped behind an outer set of boards.

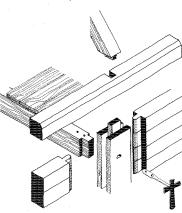
There is a remote similarity between the relatively primitive barns and the house-building technique of poteaux en coulisse in Canada, but that is all. It is inconceivable that the barns of this part of France had any influence on the Norman car-

penters who came to Nouvelle-France.

In Western Poland, a fortified village, dated approximately 500 BC was discovered in 1936 near the village of Biskupin about 300 kilometres south of Gdansk (Map 25). The housing was built using a technique with principles identical to those of poteaux en coulisse.

At that time, this area of Poland was inhabited by the Lusatian people. Being threatened with invasion, they took refuge within fortifications constructed mainly on islands and peninsulas in the many lakes of the region. Biskupin was one such fortified village.

Further, there was a climatic change and the water level rose 1 m to 2 m (3 ft. 4 in. to 6 ft. 7 in.) and inundated this particular village. Over the years the site became covered with a thick deposit of sand and mud which preserved the remains in excellent condition. The lower parts of the houses were found almost intact as were the defence works, corduroy roads and breakwaters.





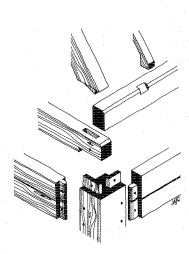


Figure 120

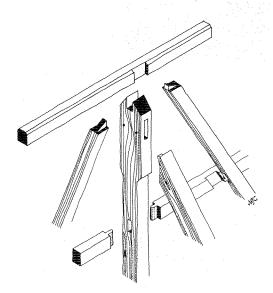


Figure 121

Upper parts of structures fell inwards and they too were preserved.

The settlement consisted of about 100 houses and was surrounded by a massive stockade built of wood cribs. The houses, which were all built of the same plan, can be identified by their white hearth stones. Plate 38 shows a corner joint immediately after its excavation. It has a post with grooves into which round logs had been tapered to fit.



Map 26

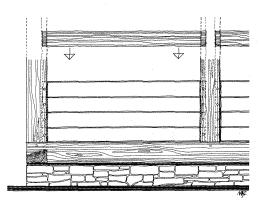


Figure 122

There was ample data available to reconstruct two rows of houses and part of the fortified wall. The front part of a row house is shown in Plate 39. Its doors were wattle and pin hinged, as were used in the Viking houses at L'Anse aux Meadows.

It is clear that neither the method of construction nor the principle of site planning was developed just for this village. Therefore, it is not unreasonable to assume it had already been used for hundreds of years prior to Biskupin. Exact dates are not important but if this method of

building construction was in use only 500 years earlier, then the time of 1000 BC is before the civilizations of Greece or Rome. Biskupin itself has no direct influence on Canadian housing, nor can we be certain how widespread the knowledge of the technique they used, but it is extremely unlikely for this technique to have been employed only in this precise region. Biskupin shows us that however poteaux en coulisse came to be used in the New World, the tradition and principle of the technique goes back for over 3 000 years.⁷

During the excavation of an older part of Arhus in Denmark (Map 26), a Viking centre was discovered. From the data collected, a house from that era was recon-

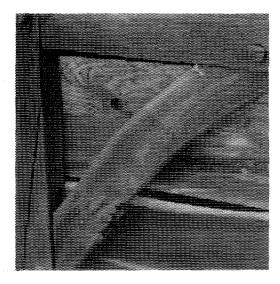


Plate 37

structed in the grounds of the museum in nearby Moesgard. It is shown in Plate 40 and dates back to the beginning of the present millennium. When examining this house and those at Biskupin, it is difficult to believe that the difference in time between Arhus and Biskupin is greater than the time between the present time and the Viking era, yet the details of construction had hardly changed.

The Frilandsmuseet, an open air museum about 24 kilometres north of Copenhagen, has displayed examples of bulhus construction. This was used widely in rural Denmark and southern Sweden from the 12th to about the end of the 18th century. There are two variations in its use — one for barns and outbuildings and the other for housing.

The variation used for farmhouses is almost the same as for poteaux en

coulisse. From a study of Clemmenson's comprehensive and classic work on the subject, posts were not set along the length of a wall of a house, but only at the corners where a mortise and tenon joint was used.8 The drawing in Figure 125 illustrates the front elevation of a connecting house and barn located at Skane, in southern Sweden. It is noted that the lower logs of the house wall on the right-hand side are continuous, with no posts being placed alongside the windows, however a different technique is used with the barn on the left. The plan in Figure 126 shows the differences quite clearly. Differences in the planks are also evident. The infilling planks shown in "a" are plain, but the planks on the walls of the house as shown in "b" are almost triangular. The roof is of thatch and the dotted line indicates the ceiling level of

both structures. The building is 15.3 m (50 ft.) long in all, but the part comprising the house is 7.7 m (25 ft. 6 in.) long and 6.3 m (20 ft. 6 in.) wide. The ceiling height of the house is about 3 m (10 ft.) and that of the barn 2.1 m (7 ft.). The cross section of the horizontal log infill shown in this house was not the same for all Bulhus construction. The majority of log infills were either square or rectangular. 9

As in other parts of Europe the forests were becoming depleted and in Sweden during the 16th century Log House Construction, Bulhus Construction, and heavy-frame construction were all used at the same time. Their use changed according to the

availability of an economic supply of the right wood species. The depletion of the forests was one of the most important economic factors that began the search for new techniques and materials, especially for house construction. In Denmark the shortage of wood was so severe that in 1554 and again in 1577, Bulhus Construction was banned by royal decree, but as so often happens with a recalcitrant population, it had to be repeated in 1733.

From the investigations in Europe, we still do not know precisely how poteaux en coulisse arrived in Canada,

but we can begin to eliminate some of the theories put forth. First, research cannot find houses built in Europe that used posts and planks on barns. Such barns had been built in Normandy, but because of the enormous labour in sawing planks, master carpenters would not have used them for housing in the New World, especially as so much excellent timber was an actual hindrance to development of the land. Therefore, the notion that a plank infill was

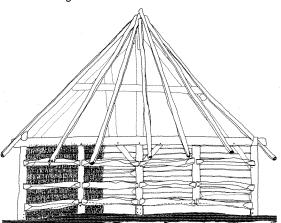


Figure 123

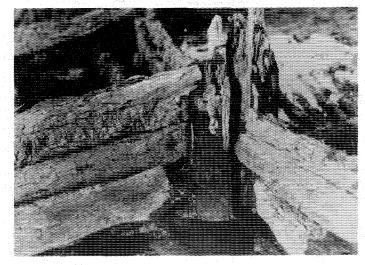


Plate 38

changed into an infill of square or rectangular logs is hardly logical or valid. With some regret, vague references to the actual use of poteaux en coulisse placed somewhere in western France at the end of the 16th century cannot be substantiated. Doubtless Bulhus Construction had its roots in the Viking form mentioned, but, when the details of each are com-

pared Bulhus Construction was not precisely the same as the form used in Nouvelle-France.

In Europe during the 16th century, poteaux en coulisse construction was used in most parts of northern, central and eastern Europe, including all the Alpine regions. Further, derivations of it are found in southwest France, Denmark and southern Sweden. Historically it was used c. AD 1000 by the Vikings in Denmark, and 3 000 years ago, in Poland. This encircles western France, but why

should there be no record of its use there? Even so, the technique blossomed full-grown in some manner before the end of the 17th century in Nouvelle-France.

One hypothesis of what might have occurred takes us back to the end of the last millennium and to the Vikings in Normandy and parts of Brittany. There was extensive settlement and undoubtedly most of the houses built would be similar to those at Arhus. To appreciate why these buildings were neither recorded nor any remains found, it is only necessary to read Barbara Tuchman's writing of France during the 14th cen-

tury. She describes in detail the ravages, destruction, looting and burning of buildings of every kind. These acts were by rebellious aristocracy and armies of England as well as France. This continued over many centuries.¹⁰

If the work of a Norman carpenter of the 16th century is examined, it becomes clear that every detail needed to build in poteaux en coulisse was already known to him. This technique included the groove in a post, the tenon, the joints in the frame and their pegging. 11 Moreover. the dimensions of the squared wood, which was used in Norman framing was similar to that of poteaux en coulisse. Since the framing of the two were similar, all that was needed was horizontal infill instead of vertical. As shown. Normandy was surrounded by house-building techniques at different periods, and it may



Plate 39

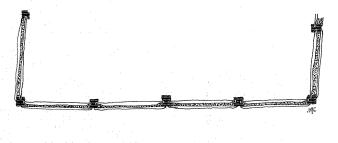


Figure 124

be of interest to question what a Norman master-carpenter would have seen in his travels.

Based upon the circumstantial evidence presented, it seems virtually certain that poteaux en coulisse was brought to Nouvelle-France by Norman master carpenters. and it required little if any evolution in the New World. But until specific data is available, that would link a craftsman and the building technique in some manner, an exact connection between Europe and Canada on this subject remains tantalizingly elusive. An archaeological wet-site, as at Biskupin, would be a gift!

The last word is from Canada. The Convent of the Grey Nuns at St. Boniface, Manitoba was built in 1849

and is of poteaux en coulisse construction. It is a magnificent building, but regrettably, boards now mask the great timbers by which it was constructed. Fortunately, there is a part of the timbers exposed on the inside of the convent. The great logs are all pegged in place, a definite sign of a master carpenter from Quebec. Although the technique continued to be used in Quebec and Ontario, the convent seems to be the last building of pure poteaux en coulisse construction this far to the west. The technique changed slightly and, as we shall see, became post and groove construction.

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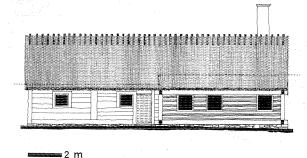


Figure 125



Figure 126

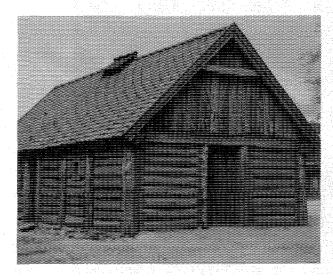


Plate 40

25

HEAVY-FRAME CONSTRUCTION

The first permanent British settlements in North America were at Jamestown in 1607, Plymouth in 1620 and Massachusetts Bay in 1628. The latter two were the nucleus of what was to become New England. Settlement continued along the Atlantic Coast, not only by the British but also by other nations. Eventually all territories were absorbed by the British and became the 13 Colonies of North America (Map 27).

For more than 200 years there were few changes to the methods of construction brought from rural England. Instead a refinement of techniques took place. Post-medieval concepts of design soon changed and the Colonies that followed precedents in Britain where architects such as Wren. Hawksmoor. and Inigo Jones were making their mark. Their influence was being made in North America mainly through the use of pattern books. These contained detailed designs intended for copying, similar to, but far more sophisticated

versions of today's books of house plans. Numerous homes of this time period in the 13 Colonies were created by master carpenters using pattern books as their guide for both town and country situations.

A minor but relevant historical note that gives cause for confusion is the Act of Union 1707, which joined England and Scotland into one country making "British" or "Britain" the new official names. These names will be used from now on except where a specific reference to either is required.

The evolutionary thread of today's method of construction in Canada runs back to England via the 13 Colonies.

It is important to examine the housing from approximately 1630 to 1770 to understand what the United Empire Loyalists and others brought to Canada after the American Revolution of 1776.

After the first landing by settlers during the early times, anything at hand would be put into use to combat the elements; the priority being to provide any kind of shelter for the family even pit houses. The methods used varied enormously, particularly because occupancy could last for months or even years much simply depending upon luck in gaining even a foothold in the New World.

After this stage, a house would be erected. It would be a recognizable detached house following local practices. The quality of construction could range from excellent to appalling. Every-



Map 27

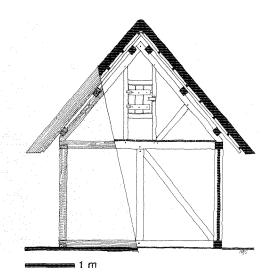


Figure 127

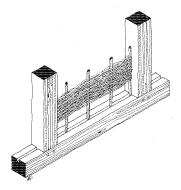


Figure 128

thing was governed by the skills possessed by the individual, the time available and the degree of co-operation with neighbours. The next and last stage was the building of a new home by hired craftsmen and normally following the style and construction of similarly more affluent neighbours. It is true that each stage was a climb up the social ladder. A home represented much more than this, it was the symbol of having succeeded in a new world. often against tremendous odds. Yet most would not achieve this last stage in their lifetime, but their children might and that was the key. In this, lies much of the essence of what North America was all about, a land of limitless opportunities. The foregoing general pattern of development explained why housing in the 13 Colonies varied in both quality of accommodation and construction. The same condition can be seen in most parts of Canada, where the first immigrants invariably had to depend upon their own abilities. Due to this process, the term "housing of the period" normally refers to the housing of the relatively affluent.

The type of housing in the Colonies left an indelible mark on future housing throughout North America. Although New England cannot claim all the credit for home development there is no question of its powerful influence. People were creating their communities from scratch and the heavy framing of Europe proved to be entirely appropriate for their needs. New

ways to build wood-frame houses was not high on the list of priorities for the 13 colonies. The aspect that set the course for refinement from the start, was largely the ethic of the early Puritans. They came from East Anglia in England, the home of Oliver Cromwell, the Republican who became Lord Protector of England in 1649. Others of the same persuasion came from different parts of England, mostly from the English West Country. The Puritan movement was led by middle-class merchants and wealthy farmers. They were

all rebelling against the political and religious conditions of the time. The settlers were principally yeomen farmers with shrewd, hard-nosed leaders. These characteristics account for the large number of well constructed two-storey houses in New England built well before the turn of the 17th century. Although they were radical in their political outlook in England, in North America they were sufficiently

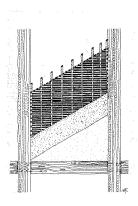


Figure 129

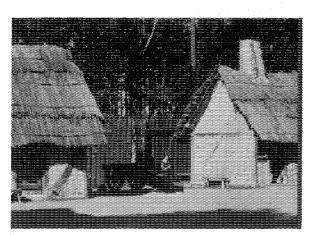


Plate 41

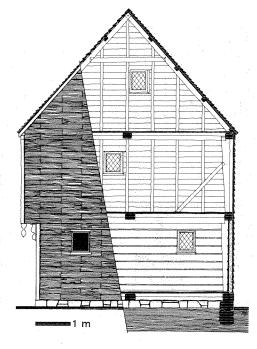


Figure 130

pragmatic to find their outlook in refinement, rather than change for its own sake.

The ships that brought the early settlers to the New World were sophisticated in their construction because they had been built with all the facilities at the disposal of the shipwrights. By contrast, the carpenters in the new settlements had to start afresh with only the simplest

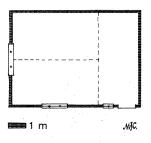


Figure 131

of hand tools at their disposal. Plate 41 shows the first crude houses built at Jamestown. The sills of the houses sat directly on the ground and the floors were of beaten earth (Figure 127). The roof was of thatch and the infilling to the wood frame was of wattle and daub. Even though the first housing was simple, it is certain the thatch would not have been done as badly as in this reconstruction. In the photograph, the walls do not have a final coat of daubing to provide a smooth finish. The thickness of a thatched roof

remains constant because it is carefully layered, and sewn evenly to the thatching poles with the roll at the gable. Thatchers were skilled in many aspects of life of that day. As only one example, they would have made the wattle for the walls; it is inconceivable one would not have been included in the expedition. Figure 128 shows a wattle infill for a large panel. the vertical members being of riven oak laths with green willow or similar pliant wood woven through them. Figure 129 shows wattle for a small panel, all sticks are lighter and the clay finish is shown. Plate 42 shows wattle even used in the reconstruction of a Viking house of AD 850 in Denmark. It should

be emphasized that wattle and daub is precisely as shown here; no other kind of infilling is called by this name.

The significant difference in appearance between North American European wood housing of the same period is that housing in North America used a finish of shiplap, effectively hiding the same method of construction. The part elevation and section shown in Figure 130 is dated c. AD 1640 and was built with variations from Virginia to New England. One of the first exports from Virginia to England were barrel staves. Similar lengths of oak were used as clapboarding for houses. It has been suggested that since the staves were 1.2 m (4 ft.) long this was the origin in North America of the 0.4 m (16 in.) module for studding, that is to say, one stave spanned three spaces. But in any event saw

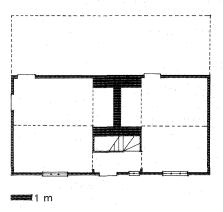


Figure 132

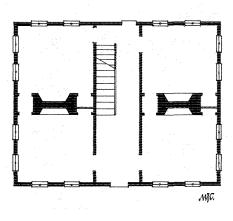


Figure 133

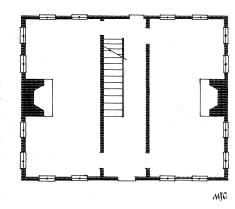


Figure 134

mills were in use by the mid to latter part of the 17th century to produce siding of much greater lengths. One reason for the early use of clapboarding was the difficulty in finding time to make the limewash finish. This made the daub fairly moisture-proof as well as inhibiting vermin. But another reason was that a good supply of wood for clapboarding was on the very doorsteps of the houses. However in England clapboarding gradually turned to brick as a finish. Another use of wood in North America was the manufacture of wood roof shinales.

The early housing of Massachusetts Bay often had the upper floor of the house overhanging the lower one. The detail at the front, as well as others can be traced back to particular locations in East Anglia by the types of joints used because carpenters had their own way of cutting the same joint, or even their own designs. There was usually a

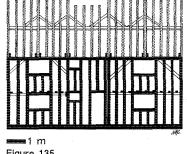
stone foundation but no cellar. In this example, the exposed post's beams and floor joists are seen with wainscotting on the first floor level. Spaces between studs were filled with clay mainly to keep vermin from nesting in the walls. The construction principle is one of bays. The main beams that ran across the house, or more usually down the centre. were called summer beams, and those on the sides of framing were called girts. The frames were normally of wood, but occasionally some houses followed an English practice of using metal casement frames.1

The development of the basic house plans used in New England is shown by Cummings.² The one room plan was first two bays of a

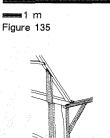
later house shown in Figure 131. Figure 132 is of the well known plan with the massive central fireplaces and chimney. The lean-to addition is dotted in place. This latter is the North American version of the British outshot of the 16th century.3 For those who could afford it, the next development was the separation of the chimneys shown in Figure 133 and an even later version is shown in Figure 134. During the late 17th century the sizes of houses were about 4.8 m to 5.4 m (16 ft. to 18 ft.) in width, and from 6 m to 7.3 m (20 ft. to 24 ft.) in length, but

a small number were larger than this range.

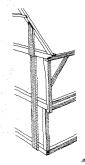
Generally, only singlestorev height studs were employed in two-storey construction but occasionally full height studs would be used. All frames for houses were prefabricated using the bay system of English house construction. Framing for the Fairbanks House at Dedham, Massachusetts, c. AD 1637 employed studs two storeys in height. This house happens











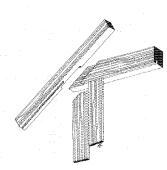


Figure 137

Figure 138

Figure 139

to be the oldest surviving house in the United States. The front of the framing is shown in Figure 135 and the gable end in Figure 136.4 The Gedney House at Salem, Massachusetts, c. AD 1665 also followed the same principle. The detail in Figure 137 is shown to illustrate the complexity of joints used in this housing construction in ap-

proximately 1689. It shows a rafter for the lean-to tenoned into a cantilevered tie beam, but the joint is not typical for the construction of the lean-tos, since single length rafters were in use about ten years earlier. This indicates that lean-to's were by no means always a later addition.

A different type of covering for the frame is shown in Figure 138, illustrating the use of planking without studding. The house is the White-Ellery House at Gloucester, Massachusetts c. AD 1703.

The planks were slid into the rebates as shown in Figure 139, and they were pegged to the first-storey girt and then nailed at the sill.

The part elevation and section shown in Figure 140 illustrates construction at the latter part of the 18th century, and at the end of the American Colonial period. The framing has been refined but as can be seen, the corners of the posts and beams still shown on the interior but now they were often disquised as decorative work. Another common practice as the infilling of brickwork between the wall studs, as well was the provision of a cellar.

Housing at the end of this epoch, represents the epitome of the influence of Georgian England translated into the wood of the North America.

- A.L. Cummings, The Framed Houses of Massachusetts Bay: 1625–1725 (Cambridge and London: Harvard University Press, 1979).
- 2. Cummings.
- R. Harris, Discovering Timber-Framed Buildings (London: U.K. Shire Publications Ltd., Aglesbury Bucks, 1978).
- 4. A.L. Cummings, The Framed Houses of Massachusetts Bay: 1625–1725 (Cambridge and London: Harvard University Press, 1979).
- 5. Cummings.

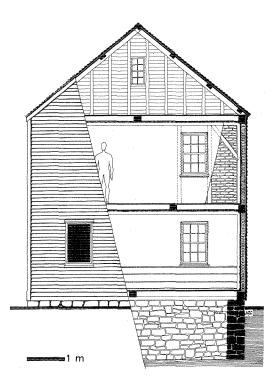


Figure 140

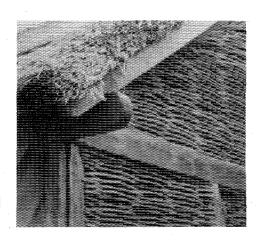


Plate 42

26 MEDIUM-FRAME CONSTRUCTION

The transition from heavy-frame construction to medium-frame construction was smooth and it went unnoticed by most people. This was understandable since only the refinement of technique was involved. Medium-frame construction began to be used in the latter part of the 18th century and, in some regions it lasted for almost 100 years. It was inevitable that with the varied pattern of settlement throughout North America over this period, the evolution of house-building methods varied along with it. Change might occur in one place but may not reach another part of the continent for as long as 50 years. As already noted, from its first use in Virginia and New England, heavyframe construction underwent continuous refinement, in particular, there was a steady decrease in the size of the

structural members. This resulted not so much from the improvement of structural calculations, even though this did happen, but from the increasing practice of distributing the loads throughout the framing in a more even manner. This meant the number of smaller members in house construction began to increase. The transition was assisted by the introduction of the steam sawmill to North America. This produced smaller and lighter wall studs, much as we know them today. From the point of view of style, the classicism of Georgian England was evolving in North America. This led to the refinement of both framing and millwork.

The technique of house building was brought to

Canada by the United Empire Loyalists after the successful rebellion of the 13 British Colonies to the south. It is estimated that between 40 000 to 50 000 people came to this country. Approximately 35 000 people went to Maritime Canada, 7 000 to Upper Canada and 1 000 to Lower Canada. Today, such numbers seem minuscule, but then, they

represented an enormous influx of people. This foreshadowed an eventual majority of English speaking immigrants compared to the existing French population. The later arrivals coming north lured primarily by the offer of free land for settlement resulted in the English outnumbering the French.

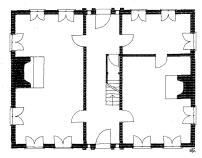


Figure 141

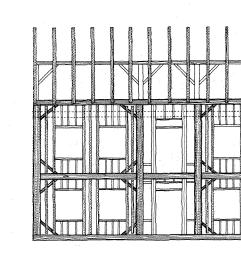


Figure 143

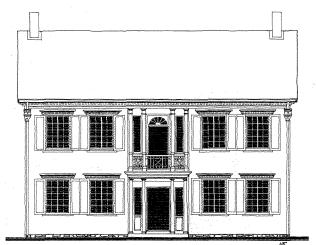


Figure 142

The first deed of Crown land to the United Empire Loyalists was in Upper Canada dated 1783. Macrae and Adamson classify the style of housing then built as Georgian. It should be noted that most of the houses they describe are of masonry construction. However, by the end of the War of 1812 between Canada and the United States, the Americans were calling it the Federal style while in Canada it became known as the Neoclassic style.²

The description of medium-frame building is based upon the construction of the Billings House at Ottawa.3 It was built in 1828 and the framing is virtually identical to the Fisher House in Toronto, which was built in 1836. John Rempel describes the Billings House and makes an interesting comparison with the Gleason House at Farmington, Connecticut, dated c. AD 1650.4 The Billings family came to Canada from Massachusetts. Bradish Billings, eventually came to the region now known as Ottawa, prospered in the lumber industry and built his house in Gloucester Township. The house has since been restored by the City of Ottawa as it existed in 1974, the date in which it was acquired.

Built in 1828, this house uses the structural principles of house building employed in England during the 15th and 16th centuries, as already described in European Wood Technology. The plan, shown in Figure 141 measures 10 m by 12.8 m (32 ft. 6 in. by 42 ft.). It is divided into three bays with four main frames. Following the English perception of frames for the purpose of prefabricating them, the front and back of the structure of the Billings House are frames even though the supporting end posts of each, already form a part of the cross frames. The usual practice with this method of building, and one almost certainly used here, was for the ioints to be cut on the ground and the frame assembled to test the fit. It would then

either be dismantled and erected in place, or, if convenient, the frame could simply be raised into its final location.

The probable appearance of the front of the original house is shown in Figure 142. It is with this first construction we are now concerned. The front and rear wall framing is shown in Figure 143, and that of the gable ends in Figure 144. The latter design is also used for the two internal cross frames with the studding amended as needed. As can be seen, the end studs of the front and back framing are notched over the braces and do not continue to the girts. This indicates that even by this period all loading from the upper structure was not yet taken by the walls. Two sizes of studs are employed: 75 mm by 150 mm (3 in. by 6 in.) and a small size of 50 mm by 150 mm (2 in. by 6 in.). The larger are rebated into the lower girts shown, in Figure 145, and the smaller

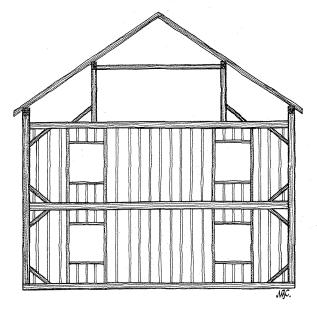


Figure 144

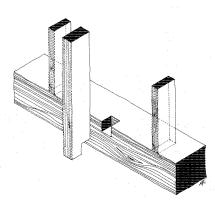


Figure 145

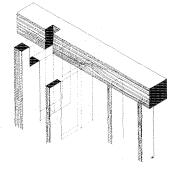


Figure 146

toe-nailed into position, fixing into the upper girts as shown in Figure 146. A 75 mm by 200 mm (3 in. by 8 in.) floor joint is step-notched into a 200 mm by 200 mm (8 in. by 8 in.) floor beam as shown in Figure 147. The joint between a 230 mm by 330 mm (9 in. by 1 ft. 1 in.) main post, and a 200 mm by 200 mm (8 in. by 8 in.) floor beam, is illustrated in Figure 148. Even though nails were used for toe-nailing, wood pegging was still employed for the structural joints. When there is transition based upon empiricism it is inevitable that the process will be a slow but sure one. As if to emphasize such conservatism, all load bearing members of the framing for the Billings House were hewn, whereas all other components were milled. Finally. the frame was boarded over and shiplap siding applied as the finish.

A part of the framing not yet mentioned is the roof construction. The roof construction is unusual because we are accustomed to consider triangulated struc-

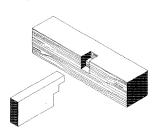


Figure 147

tures almost from the earliest of times in Canada. The roof of this house has employed the same principle as the Vikings at L'Anse aux Meadows. Newfoundland in AD 1000. The form is also similar to that of the Benjamin Fish Mill at Markham, Ontario c. AD 1832. Rempel provides a description, but unfortunately this building is now demolished. The roof of the Mill did not have corner-braces at the upper ceiling level as did the Billings House. Instead, it relied on a centre prick post.5

When the Billings House was built, it was extremely handsome. It had an air of simplicity, undoubtedly because of its Classic style. The side bays follow the golden section of proportion with a centre bay of two squares. The windows are also of this proportion, making

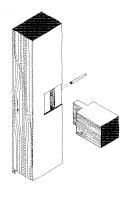


Figure 148

it almost certain that the basic design and its details were taken from a pattern book of the time. The simple but elegant cross section of the house is shown in Figure 149. This figure reinforces the notion that the fine hand of a sensitive designer was somewhere in the background.

Because of the decision to maintain the house to show its history, the changes made over the years have had to be retained. In a sense this is unfortunate because the additions detract from the dignity of Billings' original concept. This situation illustrates the dilemma so often facing those who preserve our heritage of buildings.

- D.G.G. Kerr, A Historical Atlas of Canada (Toronto: Thomas Nelson and Sons, 1960) p. 47-48.
- M. Macrae and A. Adamson, The Ancestral Roof (Toronto: Clarke, Irwin and Co. Ltd., 1963).
- 3. Data supplied by the City of Ottawa.
- 4. J.L. Rempel, *Building with Wood* (Toronto: University of Toronto Press, 1980).
- 5. Rempel.



Figure 149

27

POST AND GROOVE CONSTRUCTION

Post and groove construction evolved from poteaux en coulisse construction because of the new environment in which it was used. It was used to build the forts or trading posts for the fur trade during the 19th century. The fur trade crossed the vast lands from the edge of the Canadian Shield to the shores of the Pacific.1 For all practical purposes, the only inhabitants were the aboriginal people, consequently, trading posts had to be established to which the Indian could easily travel. Most of the posts

were extremely isolated, and for many, the only contacts with other Europeans from the outside, were once or twice a vear, when the canoe brigades from the East brought supplies for the occupants and trade goods for the following year. On their return, the brigades took out the year's acquisition of furs. eventually to reach Montreal. By 1821 the fur trading companies had amalgamated with the Hudson's Bay Company and it is difficult to appreciate the complex network of posts across the country then administered by one company.²

The builders in the West had always been the French

Canadians, and they were to continue in this historic role. Inevitably, the name of the technique was related to the company or to the area of its headquarters. It was variously called the Hudson's Bay Frame, Manitoba Frame, Red River Frame, or just Canadian Frame. The technique differed from poteaux en coulisse because the company used large timbers that were transported to almost all sites and provided protection for the staff and the trade goods in case of an Indian attack. An urgency in construction, and the handling of unusually large timbers meant the finer points of jointing, pegging and sound foundations were largely abandoned. Privately owned housing built in the re-

gion did not use the poteaux

en coulisse construction as in

Quebec, instead they used

the western post and groove technique.³

Two-storey structures were the forms generally used. In essence, they were warehouses, and they looked like it. Occasionally, if the men did not have their single storey or one and-a-half storey house, they would live in part of a two-storey building and the rest of it would be used for other purposes. The person in charge of the post, usually called the factor or chief factor, and his family would live in a two-storey structure, termed the Big House. Apart from this being his home, it also was the administrative centre and it provided accommodation for visitors. Not all buildings used at a trading post would employ either of the methods mentioned above. For example, the Big House at Lower Fort Garry, (present day Winnipeg), was of stone. and the men's quarters were built of colombage pierroté. At Fort St. James in British

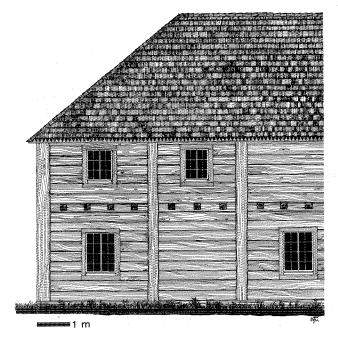


Figure 150

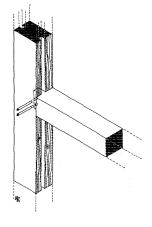


Figure 151

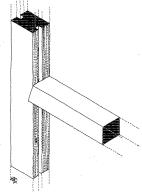


Figure 152

Columbia, built in 1806 before the merger, A queue d'Aronde was employed for construction for the Men's House. Nevertheless, the most used form at the posts and housing outside it in the early days, used post and groove construction.

A part of an elevation is shown in Figure 150. Its most distinctive feature is the hipped roof. The timbers for the structural frame were not consistent in size, mainly because all members were invariably oversized structurally and there was no purpose in squaring timbers down to a theoretic dimension.

As with housing utilizing a heavy frame, all cutting was done on the ground whenever possible, and as much of the frame as necessary was set up with temporary bracing. A sill could be about 400 mm (1 ft. 4 in.) square, normally continuous in length, and dovetailed at the corners. There were two ways the horizontal beams at the second-floor level could be jointed to the posts. One way

is illustrated in Figure 151. This method is the same used in poteaux en coulisse construction. The more favoured way seems to have been the bevel-joint shown in Figure 152, but it does not often appear to have been pegged in place. The normal method for this to be done. even in France, was to cut the bevel at the sides only and leave the centre as a tenon that would fit into the post. It was this part that could be pegged. Figure 153 shows the cross-tie, which was usually employed at the top plate and the second-floor line. It was a half-dovetail joint and because the corner posts were fixed in place at their tops and bottoms, this made a triangular tie of substantial strength. The corner posts were tenoned into the lapping of both the sill and the top plate, shown as dotted lines in Figure 154. Extra reinforcement of strap iron was often added at the base, as was used in the Ross House, near Winnipeg. Strap iron was also used in other ways as shown in Figures 155 and 156.4

The plan of the wall in Figure 157 shows a liner pegged in place to take a window or a door. It was also practice with this technique to set all members of the structure flush on the exterior face, as in the reconstruction of Fort Langley, British Columbia. The flush surface can also be

seen in the Seven Oaks House, near Winnipeg, and built in 1871 (Plate 43). One of the main problems with Post and Groove construction was with the sill, or sills. These usually rested directly on the ground and only levelled under the intermediate posts by stones, as shown here. The practice of ignoring the construction of sound foundations, in many cases led to the severe distortion in the building's basic structure.

A common practice used to provide some protection from the elements, but more

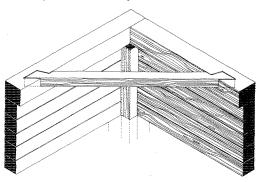


Figure 153

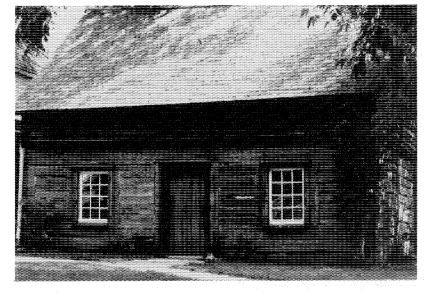


Plate 43

particularly to deter vermin from entering the house was that of mudding the exterior. This was the coating of the outside with lime mortar or just a wash of lime. Vermin could not chew through the lime that could be obtained locally or shipped to the site. One good source was the mud of the Red River, which had a high lime content. It was probably this latter that accounts for the term, "mudding." 5

To continue with techniques, there is one detail that

seems to have been a common practice. This was the cutting of the ends on the bottom row of wood roof shingles. To mention only a few examples, it can be seen at the Men's House at Lower Fort Garry, Fort St. James in British Columbia (Plate 44) and Fort Pelly in Saskatchewan. The detail could be considered as a purely decorative feature on otherwise gaunt exteriors. On the other hand, even this amount of decoration was quite unusual. It was most likely done to limit the splitting of the butt ends of the shingles.

In contrast to the western headquarters at Lower Fort

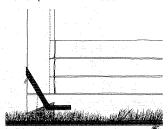


Figure 155

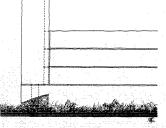


Figure 154

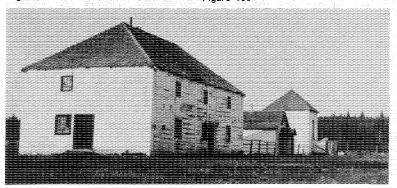


Plate 44

Garry, the appearance of these trading posts were completely stark and utilitarian. They were not military forts. yet a stockade was usually built and the lavout of the buildings was orderly. This would lead us to wonder at the lack of features that distinguish the homes of people, whether it was communal or not. Perhaps the answer lies in the fact that these outposts were set in an alien land surrounded by alien cultures. The factors of the Hudson's Bay Company were usually Scots by birth, recruited in Scotland at an early age, and worked up the ladder of the Company structure. They were tough and hardy businessmen who, having spent their lives in this environment. had little else for comparison.

Most accounts of how far West the French Canadians travelled are not always precise, but there is quite specific evidence of their role in founding Victoria, British Columbia. In describing the city's origin, Gregson says:

"The Hudson's Bay Company fort was built by 53 Company men, mostly French-Canadians who had served in other parts of the Pacific Northwest." 6

This was in 1843, and the Chief Factor was James Douglas. Post and Groove was used for the construction. In 1852, Dr. J.S. Helmcken arrived from England. He was the first qualified doctor on this northwest coast of the Pacific. The first part of the new house he built is shown to the right in Plate 45. It is the oldest unchanged house in the Province. In his Reminiscences he describes the start of construction:

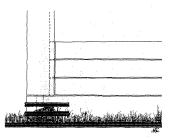


Figure 156

"To build a house is now a very easy matter-but a very different matter then. How we studied over the design, i.e., interior divisions of the building 9 m by 8 m (30 ft. by 25 ft.)! Then to get it done for there were no contractors. everything had to be done piecemeal. There being no lumber, it had to be built with logs squared on two sides and six inches thick. The sills and uprights were very heavy and mortised-the supports of the floors likewise-the logs had to be let into grooves in the uprights.

Well, the timber had to be taken from the forest—squared there and brought down by water. All this had to be contracted for by French Canadians, then when brought to the beach I had big

oxen of the Company to haul it to the site.... And then the shingling, the Indians at this time made shingles—all split."⁷

This final note shows that the French Canadians, even though they worked for the Hudson's Bay Company for years, and even though they were thousands of miles from Quebec, had not lost their entrepreneurial spirit. In describing the overnight increase to Victoria's population, caused by the gold finds on

the Fraser River in 1858, every kind of shelter was used for homes. Gregson comments on the French Canadian:

"To illustrate further the demand—small log houses built by the Hudson's Bay Company for its men at a cost of \$100 fetched 50 and 70 times this price." 8

- H.A. Innis, The Fur Trade in Canada (Toronto: University of Toronto Press, 1977).
- National Atlas of Canada, (Ottawa: MacMillan and Company with the Department of Energy, Mines and Resources, 1974) p. 79-80.
- 3. Discussion, Canadian Parks Service Winnipeg.
- 4. Discussion, Canadian Parks Service Winnipeg.
- Discussion, Canadian Parks Service Winnipeg.
- H. Gregson, A History of Victoria (Vancouver: J.J. Douglas Ltd., 1977).
- 7. Information from the Provincial Archives of British Columbia.
- H. Gregson, A History of Victoria (Vancouver: J.J. Douglas Ltd., 1977).

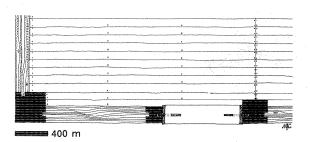


Figure 157



Plate 45

28 UKRAINIAN HOUSING

The housing built by the first settlers from the Ukraine employed the methods of construction that were an integral part of their folk culture. This only refers to the period from 1892 to 1914. Subsequent arrivals in the early 1920s and the latter part of the 1940s built homes almost exclusively in the traditions of Canada. The land area of the Ukraine in Eastern Europe is

bounded approximately by the region in which the Slavonic language. Ukrainian is spoken. The regions which are important to us are the western provinces of Galicia and Bukovynia situated mainly in the treed foothills of the Carpathian Mountains (Map 28). At the end of the last century these provinces formed a part of the Austro-Hungarian Empire, today they are divided between Romania and the Soviet Union along with a small part in Poland.



Map 28

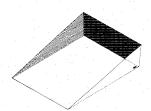


Figure 158

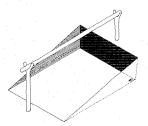


Figure 159

The settlers were predominantly small farmers and farm workers who came seeking new lands. They located in the Canadian Parklands (Map 29), because the topography was not unlike that from which they had come. Undoubtedly the major reason for settlement was due to the Homestead Act of 1872. It encouraged the opening of the West at \$10.00 for 160 acres, which was hard to resist. To place events in a historical perspective, the through train service of the Canadian Pacific Railway from Montreal to Winnipeg did not start until 1885, similarly, the first service of the Canadian Northern Railway from Winnipea to Edmonton did not start until 1905. Surprising enough this period is only the time of the grandparents of many Canadians alive today, 1,2

Most early settlers on the Prairie came from all parts of Europe. They found themselves isolated and were forced to draw upon their own

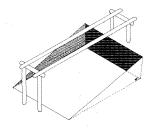


Figure 160

resources to construct some kind of basic shelter, however temporary it might have been. They based the construction on either the application of knowledge brought with them or the copying of what neighbours had done. The Ukrainian settlers were no exception, but they had one advantage over others. Most Ukrainians knew how to build a zemlianka, their traditional form of temporary dwelling. This house form was also known as buda or burdei. The zemlianka followed the world-wide principle of pit-houses. It consisted of excavated pit, of any geometric shape (rectangular, circular or hexagonal), covered by a framework of wood poles. which supported the roof fin-

Andriy Naheachewsky identifies four variations used in Alberta but it is safe to assume that some, if not all, were used in other parts of the Prairies. There was the primitive type: little more than a covered sleeping space built in a matter of hours; deep-hole type: almost subterranean with logs laid over the excavation at

grade level for the roof, a variation to this was a roof of bent saplings to create a vault form. The main difference between the primitive and the deep-hole was a person could stand upright inside the deep-hole. Next, was the slanted-roof type that consisted of a pitched roof over the excavation. Lastly came the log-wall type, a temporary form of the horizontal log house. Space dictates that only a description of the most used kind the slanted-roof type, can be given here.3

Ideally, a pit would be dug into sloping ground to provide a degree of insulation, a reduction in the amount of digging, but most importantly, to control the drainage around the dwelling. The excavation would be about 3 m by 4 m (10 ft. by 14 ft.) and about 1 m (3 ft.) at one end (Figure 158). A structural frame was then erected. At its simplest it consisted of two forked posts with a ridge-pole spanning between them, with each member about 200 mm (8 in.) in diameter

(Figure 159). The internal height was about 2 m (6 ft.). Other frame systems were used occasionally for example, three posts with a single ridge-pole or four posts with a double ridge (Figure 160).

As shown in Figure 161, light poles spanned from the ridge to the grade, next was a layer of grass. At times, they were mortared over with a mixture of clay and chopped hay, which provided an excellent barrier against the onslaught of vermin. Two layers of sod provided the roof finish, each piece being about 100 mm by 200 mm by 400 mm (4 in. by 6 in. by 8 in.).

A typical house plan is illustrated in Figure 162. The door normally consisted of rough boards about 1.2 m (4 ft.) high, the dimension being limited by the structural frame. A clay stove with some metal parts was installed at the back. A metal

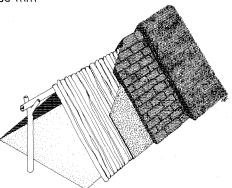
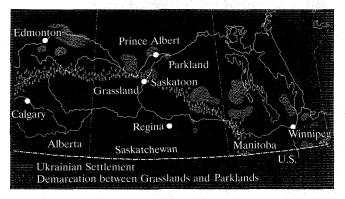


Figure 161

flue was angled through 90° and then rose vertically to emerge at the high part of the roof. A bed and a table were provided, often by driving small posts into the ground with cross rails fixed to them and a finish of light rails as shown. Two small panes of glass were installed in the gable walls, one at the rear and the other positioned over the doorway. The elevation in Figure 163, shows the latter pane adjacent to the main post. The gable ends were filled in with vertical logs and mortared over with clay.4

When a pit is dug into flat ground, the structure over it is

simple, but when it is dua into a hillside complexity arises. The plane of the sloping roof becomes a warped surface. This is brought about because the inclined front pole of the roof is different in both angle and length from the rear pole. In theory, every pole for the roof has a different length and a different angle of inclination. as may be seen in Figure 164. The structure is shown here as a diagram, and comprises the plan, front and side views, and an isometric



Map 29



Plate 46

drawing. Since point CG has length, and point D does not, JD is greater in length than KG. But because JD, DG, GK and KJ are all fixed in location, the difference between JD and KG has to be taken up incrementally by poles between them. If, for example, this surface consisted of one piece of plywood, the gradual change would show clearly as

a warped, or twisted plane. Because we are dealing in practice with irregular lengths of poles and pieces of sod, this geometry would not have been especially noticeable, however the builder undoubtedly would have been aware of the problem.

As a type of housing the zemlianka is indigenous to Eastern Europe. It is described in detail because it may be taken as representa-

tive of the forms of temporary dwellings used by many of the first settlers coming to North America from Europe. In 1650, Cornelius Van Tienhoven, secretary of the Province of New Netherland, wrote:

"Those in New Netherland and especially in New England, who have no means to build farmhouses at first according to their wishes, dig a square pit in the ground. cellar fashion, six or seven feet deep, as long and as broad as they think proper, case the earth inside all around the wall with timber ... floor this cellar with plank and wainscot it overhead for a ceiling, raise a roof of spars clear up and cover the spars with bark or green sods so they can live dry and warm in these houses with their entire families for two, three and four years."5

Forms of pit-houses were known throughout Europe for millenia before the depletion of the vast forests triggered the change to other materials for house construction. Moreover, the structural principles used for all housing prior to the disappearance of the forests have a commonality unrelated to political or sectarian boundaries. Thus, Abbott Lowell Cummings was quite correct when he said of Massachusetts Bay in 1630 "newly arrived Englishmen" may indeed have borrowed from some long familiar subvernacular building traditions, "6

When Edward Johnson, wrote in 1650, of the same Colony after 25 years:

"... the Lord hath been pleased to turn all the wigwams, huts and hovels the English dwelt in at their first coming, into orderly, fair, and well built houses, well furnished many of them..."

He might just as well have been describing the situation with our Canadian Ukrainian settlers some 250 years later.

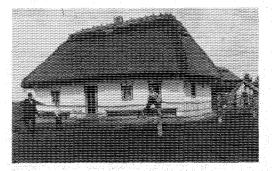


Plate 47

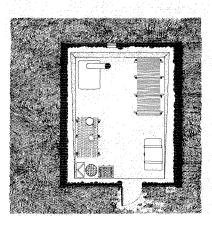


Figure 162

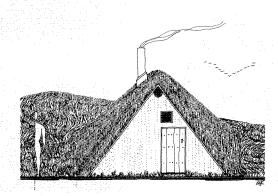


Figure 163

Permanent housing was invariably single storey in height but because of the use of thatch, the pitch was steep enough to allow use of the attic space. The appearance of the thatch on the roof, especially at the hips, is quite different from that of Western Europe where neither the hips nor the ridge are accentuated (Plate 46). It is interesting to note the use of cross-sticks at the ridge, similar to those at Skane and southern Sweden illustrated earlier. The use of thatch as a roof covering. gradually changed in Canada to the use of wood shingles.

Houses were almost always oriented to the south, a common practice in the older farming regions of Europe. Wide overhanging eaves were common, as well as the practice of limewashing the exterior (Plate 47). John Lehr suggests complete clay plastering followed by a lime-

wash, largely depended upon quality of wood available for the house, and presumably, traditional practices. As a generalization, housing in Galacia did not have a ready access to long, well-shaped logs for construction, consequently, the logs were squared on two sides and willow lath applied to hold clay (Plate 48). The reverse was true for Bukovynian housing. The principles of construction used by the Ukrainian were already in use in Canada. horizontal log and post and groove. Horizontal log construction employed both the round notch, and the dovetail ioint.8,9

By this time nails had become plentiful. It was no longer necessary in the Post and groove construction to cut grooves into the sides of

GHF

CB

posts, instead they were nailed onto a squared log. Not every log was pegged; the practice of using interlocking the top and sill plates was employed for the required strength at all corners. This form was similar to the form of Scandinavian Bulhus construction. The Ukrainian method of post and groove construction was already in use in the regions to which they immigrated, having been brought to Nouvelle-France some 200 years earlier. Both methods had the same origins because they were brought from forested regions of ancient Europe.

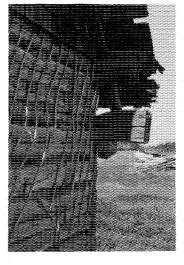
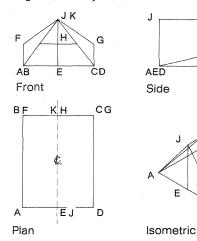


Plate 48

- 1. Kaye, Early Ukrainian Settlements in Canada (Toronto: 1964).
- O.T. Martynowych, The Ukrainian Bloc Settlement in East Central Alberta 1890–1930: A History (Edmonton: Alberta Culture 1985) Occasional Paper No. 10.
- A. Nahachewsky, Ukrainian Dug-out Dwellings in East Central Alberta (Edmonton: Alberta Culture 1985), Occasional Paper No. 11.
- 4. Nahachewsky.
- A.L. Cummings, The Framed Houses of Massachusetts Bay: 1625-1725 (Cambridge and London: Harvard University Press, 1979).
- 6. Cummings.
- 7. Cummings.
- Lehr, Ukrainian Houses in Alberta (Alberta Historical Review: 1973).
- Dr. Hoholl, The Grekul House: A Land Use and Structural History (Edmonton: Alberta Culture 1985), Occasional Paper No. 14.





MADRIER CONSTRUCTION

This technique evolved from the poteaux en coulisse construction after the middle of the 19th century, however, its first use, or its demise in a particular location varied in time. The change came about because technology had made the cost of building with this technique more economical than its more laborious predecessor. The structural principle consisted of nailing together a framework of planks and infilling it with planks laid horizontally and on edge. These planks were also nailed in position.

The wood structure was never left exposed invariably having a finish of brick veneer, although any other type of finish could be used. Because of its development from poteaux en coulisse, Madrier construction (plank construction) was used exclusively by French-Canadian carpenters in Quebec, as well as in the eastern parts of Ontario and the northeastern part of the United States. Cost constraints resulted in its death about 20 years ago.

The appearance of the structure itself is illustrated in Figure 165 and a horizontal section of the wall is shown in

Figure 166. Two thicknesses of planks used were 50 mm (2 in.) but with another layer of 25 mm (1 in.) boards applied. A 75 mm (3 in.) thickness was also used for the description. It should be noted that this dimension of 75 mm (3 in.) was the actual size of the planks since they were used rough sawn.

For single- and two-storey construction, 50 mm (2 in.) planks could be used providing that 25 mm (1 in.) layer of boards were added. However, 75 mm (3 in.) planks could be used for both of these storeys as well as a third storey. Boarding was not required whenever this thickness of planks were employed¹. Balloon-frame construction was adopted for internal construction such as partitions, floor systems, sill details, and so forth.

The predominant use of Madrier construction was for simple and repetitive designs such as row housing or three-storey, walk-up apartments, but it was also used

for single housing. The technique is inherently limiting in its possibilities for design because it is structurally inappropriate for more complex shapes. For the most part the roofs were flat, but pitches could be used, indeed with its earlier uses most of them were.

Loads were taken on the plank posts, its frame was invariably 75 mm by 250 mm (3 in. by 10 in.). The horizontal components of the frame were seated into the plank posts by the use of a bevel joint (Figure 167a). Although poteaux en coulisse occasionally used this bevel-joint, its use in Madrier construction related more to Norman framing of the 16th century.² Charles Grenier illustrates an alternative joint to the bevel (Figure 167b).3 However, the birdsmouth check is not a convincing detail especially if it comes under tension; moreover, the joint has to be cut perfectly if the same bearing as the bevel joint is to be achieved. Corners of the frame are made by butting the face and edge of two planks and fixing them at intervals with double

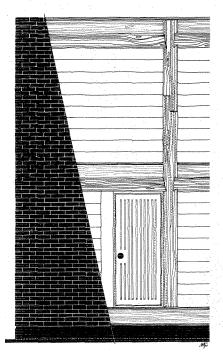


Figure 165

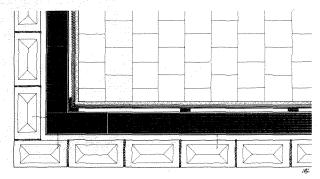


Figure 166

150 mm (6 in.) nails. The scarfing of the planks in the posts can be made by using either of the methods shown in Figures 168a or 168b.

The infilling planks were angle-nailed to the posts by two 100 mm (4 in.) nails. All openings within the frame required vertical members alongside them, illustrated in Figure 169. Here, the upper window has a lintel to transfer loads to the vertical members, which rested on an infill beam that took the loads as well as the weight of the window itself. It also transferred the complete load to the posts of the frame by the repeat use of a bevel joint. The vertical infill shown below this window was not for support but to enable off-cuts to be used up. The maximum spacing of posts was 2.5 m (8 ft.) but all infilling did not need to be continuous over this distance, providing that enough nails were used to hold everything together.

Liners for openings that were fixed to the planking had to project sufficiently to permit the appropriate detailing around the final exposed opening. In the process of building, the planks were erected plumb on the interior faces, thus any slight variations in thickness was taken up in the air space between it and the exterior finish.

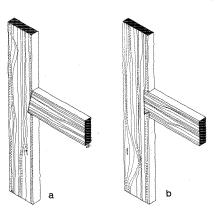
The construction of the total wall as used c. AD 1947 consisted of:

- A brick veneer with ties to the planking.
- 25 mm (1 in.) air space.
- · Sheathing paper.
- 75 mm (3 in.) thick planks.
- · Vapour-barrier paper.
- 19 mm (0.75 in.) furring strips.

- 9 mm (0.375 in.) gypsum lath.
- 12 mm (0.5 in.) plaster.⁴

Madrier construction is uniquely Canadian and served the French-Canadian house builders when it was economically feasible. It could be built rapidly for the period and it had a good insulating factor as well as excellent acoustical properties because of its mass. But when material costs rose and it became increasingly difficult to find skilled carpenters in its construction, the technique died out and did not evolve into something else.

- 1. C. Grenier, Guide du constructeur (Québec: 1942).
- J. Fréal, L'architecture paysanne en France: La Maison (Serge: 1979).
- 3. C. Grenier, Guide du constructeur (Québec: Technique, 1942).
- Canadian White Pine Bureau, Plankwall Construction (Ottawa: 1964).





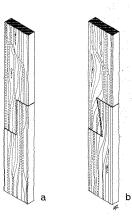


Figure 168

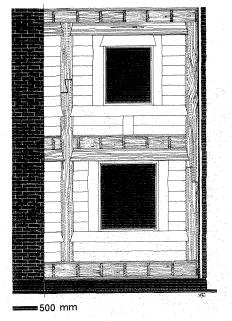


Figure 169

POST AND RAIL CONSTRUCTION

The only people to have used this method of house construction were the Acadians. The techniques made use of a heavy frame similar to those already described. There was an infilling between the posts of a mixture of clay and straw, reinforced with rails, or riven laths. These were fitted into holes cut into the posts, as shown in Figure 170. This

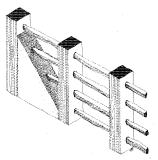


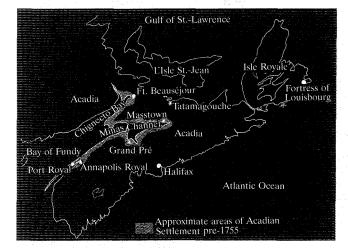
Figure 170

use of clay should not be confused with wattle and daub construction. In that technique, the clay is only daubed onto one side of the wattling to provide an exterior finish. The infilling used in the post and rail construction, in time will set as hard as brickwork. The exterior application of boarding or wood shingles employed in Canada was only used because of the severity of the weather. Such a finish was not required where the technique originated in southwest France. Because this method of house construction is a part of the Acadian craft heritage, a brief outline of their early history follows.

It is generally accepted that the first attempt by France to colonize this particular part of the New World was made in 1603. At that time, Acadia encompassed present day Nova Scotia, New Brunswick, Prince Edward Island, and parts of Quebec and the State of Maine. The expedition was led by Sieur de Monts accompanied by Sammuel de Champlain. A base was established on an island at the mouth of the St. Croix River on the northwest side of the Bay of Fundy. During the following year of 1604, the small settlement was moved across the Bay and Port Royal was founded. The name changed to Annapolis Royal in 1710.1 In spite of a less than tranquil existence, caused by both the bickering of their own leaders

as well as the nearby presence of the British, the Acadians prospered and gradually expanded their farmlands along the southeast shore of the Bay of Fundy and into Chignecto Bay and the Minas Basin. Including the small groups scattered throughout Acadia, by the middle of the 18th century there were a total of about 12 000 Acadians.²

But in 1755 tragedy struck and they became pawns in the continuous and worldwide strife between France and Britain. In the fight for Canada, to end only four vears later in Quebec, the Acadians were isolated between the French in Ouebec and the British in Nova Scotia. They declared to be neutral but the British refused to acknowledge such a claim and deported about 8 000 people to the British colonies. The remainder of the population fled to territories still under French control. The subse-



Map 30

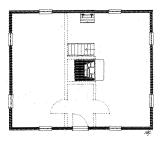


Figure 171

quent burning of all farms. crops, and other structures effectively erased 150 years of this aspect of Acadian culture. The area involved is shown in Map 30. After the Treaty of Paris in 1763, which virtually ended French sovereignty in North America, some Acadians began to filter back. They did not go to the Bay of Fundy, but mainly to New Brunswick (Map 31), with small groups going to other parts of Maritime Canada. Today, the Acadian people make up 37 per cent of the population of New Brunswick. 10 per cent of that of Nova Scotia and 13 per cent of those in Prince Edward Island 3

The house to be described is based on the construction of the original portions of two houses: La Maison Célestin Borque, built in 1810, and La Maison Hélène et Roma Bourgeois, built in 1840. They are located in Eastern New Brunswick.⁴

A medium sized house of this period was about 7.3 m by 11 m (24 ft. by 36 ft.). The ground floor plan, shown in Figure 171 could have different arrangements of internal walls. This was especially apparent when changes were made over the years. A central fireplace was used and was common with most early house designs where heating efficiency was of paramount importance. The framing of the front wall is shown in Figure 172 and the gable end in Figure 173. Spacing of the study or posts was anywhere from 300 mm (1 ft.) up to 500 mm (1 ft. 8 in.). A cross section of the house is shown in Figure 174. In this particular example, the lower part of the basement is cut into soft sandstone. Liners, or wooden surrounds were always fixed in the rough openings before doors, win-

dows, and so forth were installed.

Roofs had a layer of birchbark applied under the wood shingles. Joints in the wall construction were also covered with bark before the shingling was done. There was a widespread use of birchbark because it was the only type of sheet material available. The use of birchbark was undoubtedly learnt from the Indian. A constant problem with the pioneer home and with most homes up to the last century, was the difficulty in preventing wind penetration as well as the periodic invasions of vermin. This bark was useful in

alleviating such problems. It also had the added advantage of being relatively impervious to rot, however it had the tremendous disadvantage of being highly flammable. The likelihood of fire was an ever present concern, not only for one particular structure, but also for the surrounding ones. It was important to prevent fires from spreading to other structures.

Examples of other methods of construction used by the Acadians after their exile may be seen at the Historic

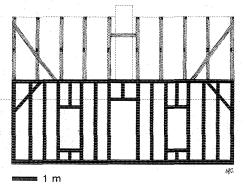


Figure 172

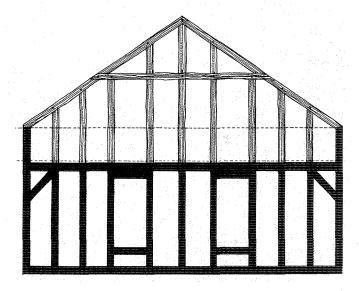


Figure 173

Acadian Village at Caraquet in New Brunswick.

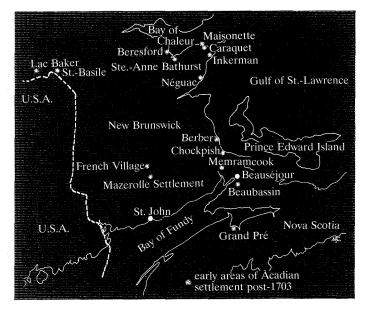
It has been customary to dismiss the use of post and rail construction before 1755 on the basis that it had been learnt in places to which the Acadians had been deported. There is no evidence to substantiate such a view. The technique was not used in the

British colonies nor was it used in Britain. It is true there was an occasional use of something similar, one such example is the Giddings-Burnham House built at Ipswich, Massachusetts c. AD 1680, but this is related more to wattle and daub rather than Post and Rail construction. If the Acadian carpenters had not learnt of the technique from other societies, where did they acquire such knowledge?

The Adams-Ritchie House in Annapolis Royal built in 1712, has been recently restored. Its occupants have played significant roles in Canadian history. John Adams had been a merchant in Boston and came north to Acadia in 1710, bought land from Guillaume Bourgeois, and in 1712 built his house. There is little doubt he engaged Acadian carpenters for the undertaking. A part of the original structure remains and is of the Post and Rail method of building. A doorway is shown in Plate 49. The view is from the interior and although the photograph is indistinct the rails are about

200 mm (8 in.) apart vertically. The clay and straw infill now has the consistency of brick and is impossible to dislodge by hand. Plate 50 is a close-up view of one of the rails set into the adjoining post. The house was bought by John Hamilton, an officer in the British 40th Regiment of Foot, in 1745. In 1781 the house passed into the ownership of the Ritchie family.6

The next question is whether the Acadians were prosperous enough to engage carpenters to build frame houses using the skills passed on by succeeding generations. After the deportation, the British reported finding about 60 000 cattle on all Acadian's land. This is a fairly high number. While counting, the British could have included livestock, which refers to both sheep and pigs. The Acadians maintained orchards



Map 31

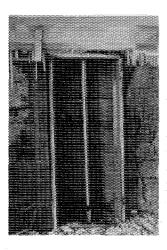


Plate 49

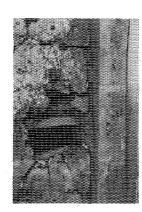


Plate 50

and traded meat, grains and fruit to New England, to other parts of the Maritimes, and for a time, to the Fortress of Louisbourg. They required some form of coastal transportation for their trading business. None was available so they built it. The joint effort of draining the marshes at the head of the Bay of Fundy in order to grow wheat and feed for their cattle, shows a highly developed sense of communal action.

The majority of Acadians came from Western France, the ancient Provinces of Aunis, Poitou, Saintonge, and Gascogne. Champlain came from Brouage, a short distance south of La Rochelle. In those days the village was on the coast but the sea has now receded. The mouth of

the Gironde River, a little farther South, is one of the regions in which the dyking of marshlands is still done, much as it was in Champlain's day. This is also know as sauniers. Craftsmen skilled in this kind of drainage, came to Acadia in the period under discussion, to practice, and undoubtedly to teach.

In this part of France lies the village of Sabres, the centre of the Parc Naturel, which has already been described under the poteaux en coulisse technique. There, the farmhouses all use Post and Rail construction, the only place of France to do so. Plate 51 shows a farmhouse built c.1780.

In light of the foregoing evidence, I believe it is reasonable to assume that Acadian carpenters knew of the post and rail method of construction. They brought it from France, and had used it in the New World before Le Grand Dérangement of 1755.

- J.A. Deveau, Two Beginnings: A Brief Acadian History: Yarmouth ... (Les Éditions Lescarbot Press, 1980).
- A.H. Clark, Acadia: The Geography of Early Nova Scotia to 1760 (Madison: University of Wisconsin Press, 1968).
- 3. The Canadian Encyclopedia (Edmonton: 1985).
- À la découverte de l'habitation : La Maison Hélène et Roma Bourgeois and La Maison Célestin Bourque (Moncton: Acadienne Inc., 1977).
- A.L. Cummings, The Framed Houses of Massachusetts Bay (Cambridge and London: Harvard University Press, 1979).
- 6. B. Moody, The Adams-Ritchie House: A Social Document (Annapolis: 1981).
- A.H. Clark, Acadia (Madison: University of Wisconsin Press, 1968).



Plate 51

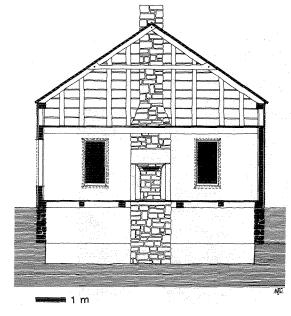


Figure 174

31 FORTRESS OF LOUISBOURG

The Fortress of Louisbourg was made of a precious stone from France set in a raw and lonely environment on the edge of North America. It was located on the northern tip of Cape Breton and was the hub of the French defences in North America from 1713 to 1758 when it was taken by the British. The Fortress was unique and the only one of its kind built in North America. A fortress differs from a fort in that the fortifications encompass not

only a military presence to support them, but also a town.¹

The British founded Halifax in 1749 and later systematically destroyed Louisburg to deny present residents from using it. The destruction was so complete that when it was decided to reconstruct a part of it, the only available data lay in archeological findings and archival records (Plate 52). Reconstruction began in 1961. The period of 1740 was used as a base when 3 500 troops and 2 000 civilians were living there. Although Louisbourg was isolated, the harbour was the base for the French fishing

fleet that worked the nearby Grand Banks, southeast of Newfoundland. Moreover, the port was a thriving mercantile centre for shipping, a fact that belies the view of Louisbourg as a constant drain on the offers of Louis XIV.

The Fortress was divided into public and private sectors. The military lived in the public sector, although the more important officials lived in the private sector. The private sector was where the greatest part of the housing was located, (Plate 53). The restored houses are only representative of the houses in the first town because the reconstruction only covers about one quarter of the original.

The first builders tried to reproduce a microcosm of urban France, and probably would have chosen stone as the material for most of the construction. However, the climate from the sea played havoc with the mortar and forced them to use wood. The Fortress was relatively isolated from construction techniques in Quebec, so historians have chosen to work with the descriptive names used in the original documents such as piquet charpente and others. Piquet refers to the vertical use of logs, and charpente refers to the heavy wood framing of the day. The French brought piquet construction with them whey they moved from Placentia Bay. Newfoundland, to Louisbourg in 1713.

The logs were round in section and about 150 mm (6 in.) in diameter. They were secured in trenches

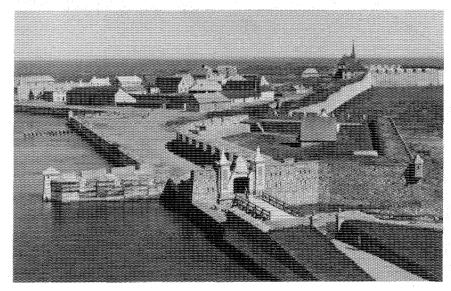


Plate 52

about 600 mm (2 in.) deep. The earth and rock was replaced and rammed down in stages to stabilize the wall. At the top, squared timber plates were attached in various ways to enable the separate logs to act together. The vertical space between them was chinked and covered with a roughcast coat of lime mortar. The average size of a house built in Piquet construction was about 6 m by 12 m (20 ft. by 40 ft.). Structurally, cross walls, or similar devices must have been provided as part of the overall design. A wall of this length could not have taken the roof load without additional support. Houses using this technique were one-storey structures with the attic space used for storage.

Charpente construction used squared heavy wood frames. They were uncomplicated and consisted of timbers about 150 mm to 200 mm (6 in. to 8 in.) square, all mortised, tenoned and pegged together. The in-

filling could have been horizontal or vertical logs. The horizontal logs were those used in poteaux en coulisse or occasionally the infilling was of brick. Stone was also used as an infill as already described for colombage pierroté. Then, the wood frame would be heavier, about 300 mm to 400 mm (12 in, to 16 in.). The houses were mainly one-and-a-half storevs in height with steep roof pitches allowing the use of two storeys. The consistent use of a strong wood frame ties housing together which, with the different infilling. creates a powerful image of Louisbourg of the era.2

The site was rocky and this together with a high water table meant basements were rarely used. The most com-

mon roofing material for houses was wood shingles. Other material such as bark, slabs of wood, or sod had been used at first, but declined in use as the shingle, nailed to board sheathing, proved to be an impervious covering in the climate.³

With the endless round of warfare and treaties between France and England during this period it comes as a surprise to learn that some pre-cut house frames, windows, doors and siding were shipped into Louisbourg from New England, normally via Boston.

- F. Parkman, Montcalm and Wolfe (Toronto: Ryerson Press, 1964).
- E. Krause, "Private Buildings in Louisbourg, 1713–1758," An Architectural Magazine (Canada: 1974), Vol. 1, No. 4.
- Discussions, Fortress of Louisbourg, Canadian Parks Service.



Plate 53

32

BUTTRESS-FRAME CONSTRUCTION

This method of construction has been used in Canada but only in a marginal role. Its primary use was only for single-storey buildings with a rectangular plan, however, the technique provided great strength without the use of internal supports. The reconstruction of the Faubourg House c. AD 1730 at the Fortress of Louisbourg, Nova Scotia, shows the form (Plate 54). The Spanish also used this technique at Friendly Cove. Nootka Sound on Vancouver Island about 1790, during their ten year occupation (Plate 55). The locations

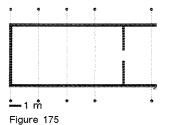
are shown on Map 32.

The technique involved the bay system with the frames from 2.4 m to 3 m (8 ft. to 10 ft.) apart. Since this was a framed structure, the infilling could be of any suitable local material. The Faubourg House used logs in the piquet manner at Louisbourg. 1

Occasionally, it was suggested that the buttress posts were used merely as props for bulging walls, but the regularity of spacing shown in all records belies the notion of random support. The plan in Figure 175 shows that where cross-walls are used they can act as shear walls, and where

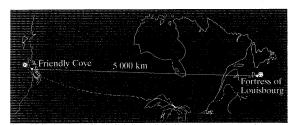
an unobstructed floor space is required, buttresses provide the needed lateral support. For housing, it is unlikely that internal walls were built as structural components and the buttresses were employed to provide total flexibility for the interior. Both French and Spanish records indicate such buildings were near the water and were as long as 18.2 m (60 ft.) long. This could indicate a use for warehousing for which an open floor space would be a distinct advantage.

A front elevation is shown in Figure 176 and an end elevation in Figure 177. A ground sill with vertical logs is used. Sometimes, the corners were reinforced by an added buttress, which was invariably located diagonally



from the corner. The roof would first be boarded over and then covered either by hand-split wood shingles or by turf. The principal use of this technique occurred throughout the northern areas of Europe, stretching from Holland across to northern Poland including Scandinavia

An early use of buttress frame has been discovered at Hedeby, today's West Germany. A thousand years. ago it was under Danish influence. The town was one of the major trading centres of the Viking era and the house excavated is dated as AD 850. The reconstruction in Plate 56. shows the buttresses with a foundation of great wedges. The principle is illustrated in Figure 178. These distributed the load on sandy earth and made it possible to keep the wall plumb by adjusting them whenever unequal settlement occurred. The enormous Viking war barracks at both Fyrkat and Trelleborg each accommodated the crew of a longship, which were also built with exposed external buttresses. A much earlier



Map 32



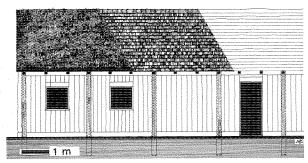


Figure 176

record is suggested by Hewitt when he quoted Adam Bede in England who commented on Aidan's death in AD 651:

"'As he drew his last breath, he was leaning against a post that buttressed the wall on the outside. He passed away on the last day of August, in the seventeenth year of his episcopate....'

The church referred to was twice destroyed by fire after this even, when it was alleged that due to a miracle the post on which Aidan had leant was preserved from the flames: 'for although in a most extraordinary way the flames licked through the very holes of the pins that secured it to the building, they were not permitted to destroy the beam.' Although the translator cannot be excused for confusing a beam with a post, or a buttress with either, this is contemporary evidence for the use of such buttresses as have been excavated (C.A.R. Radford, 1957, 17-38.)."²

Returning to the 18th century, there is ample evidence that the military used the buttress principle below ground to reinforce the sharpened vertical logs of stockade walls. Similar supports were used for

dock construction. The French military might have used this technique, to an extent, for buildings at Placentia Bay c. AD 1708. After moving to Louisbourg in 1714, they could have used it as one form of housing for families of men working in the large French fishing fleet.

The evidence presented here is that of Hedeby in the 9th century and at Louisbourg and Friendly Cove in the 18th century, some 800 years apart. It is a frame type of construction serving a particular need in the past, and therefore should be recorded for future reference purposes. When it was decided to reconstruct the Viking barracks at Trelleborg in Denmark, it was interesting to note from the excavated data that framed building was used. It was assumed that the outer post-holes, those beyond the main frame, were for vertical

posts for a verandah or to support an extended roof to protect the external walls. The great building was reconstructed in this manner. However, when the barracks at Fyrkat was excavated, the angle of inclination of the exterior line of post-holes as taken and it was clear that they were to receive buttress posts, as described above. It was possible to re-examine the angle of inclination at Trelleborg and it was discovered they too were of buttresses.

- Discussion at the Fortress of Louisbourg and data supplied, Canadian Parks Service.
- C.A. Hewitt, English Historic Carpentry (London: Phillimore & Co. Ltd., 1980).





Figure 177

Figure 178

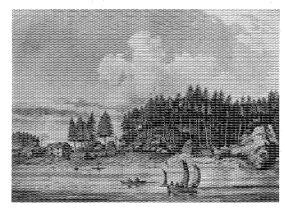


Plate 55



Plate 56

LIGHT-FRAME CONSTRUCTION

Light-frame construction evolved from the mediumand heavy-frame construction once used in North America. As already shown, it is linked back to English house construction of the 16th century. Thus it joins the European history of wood frame going back into antiquity.

The transition from earlier techniques to those of light frame has been shown in Canada to last in some locations for well over 100 years. The significant aspect of this kind of house building is that it stems from our folk engineering tradition, principally

because it is a completely empirical system of construction. Moreover, in the evolutionary process, it moved from one structural principle to another: from frame, to a skin or diaphragm type of construction.

The way in which the parts of a structure perform with light-framing can be seen in Figures 179 and 180. Figure 179 illustrates a stud wall as we know it today. Studs are spaced apart from 400 mm to 600 mm (16 in. to 24 in.) and a lining is provided on either side. The lining can be of any material with a reasonable degree of rigidity. Figure 180 is a cross section

of a piece of corrugated cardboard. Both perform in a similar manner. As used today, our stud walls do not achieve a maximum strength mainly because the empirical nature of site use is more economical than a controlled factory assembly.

This form of construction brings to mind a question. If light framing is different structurally from heavy framing, why is the word frame used for both descriptions? It seems very much a question of semantics. As already described, both heavy and medium framing have pin joints that require stiffening by the use of some form of bracing. Light framing, on the other hand relies on its linings for strength. The description

of European Technology prior to AD 1600 showed that the word frame was not applied to individual pieces of the structure but to the complete side of a house or barn. The frames of the house (or a barn), were the component parts of the assembly. As we shall see, this latter concept was indeed understood during the early use of light framing in North America in the first half of the 19th century. When the technique came into a wider use, the grasp of the difference in the structural concepts was gradually lost and the old terms continued in

The methods of construction to be found in this category are: balloon-frame construction and platform-frame construction.

Braced-frame construction will be discussed briefly.

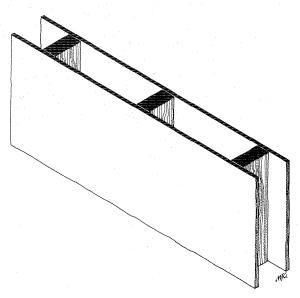


Figure 179

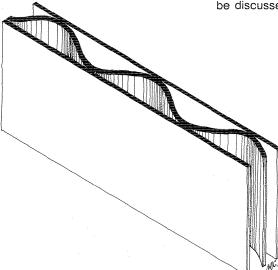


Figure 180

34

BALLOON-FRAME CONSTRUCTION

The first recorded use in North America of balloon frame was in 1833 when it was employed for the construction of St. Mary's Church in Chicago. The principle of the technique is the nailing of thin pieces of sawn lumber together to make the structural joints of a house. This eliminated the need of highly skilled carpenters for the ordinary building. But, as already pointed out the technique acted in quite a different manner than frame buildings. The elimination of complex joints was thought by the builders of the day to verge upon blasphemy. This was a reasonable reaction considering they perceived themselves to be the repository of well over 1 000 years of knowledge in the way houses ought to be built. Thus, 1833 saw the start of a technological revolution in house building, a new process for assembly of components and a new potential for house design.

For many years now the notion of balloon-frame construction is limited to the use of continuous wall studs two storeys high, (Figure 181) and Canadian wood-frame house construction provides the following description:

"... the studs used for exterior and some interior walls are continuous, passing through the floors and ending at the top plates which support the roof framing. Both the studs and the first-floor joists rest on the foundation sill plate ... and the centre beam or bearing wall. Studs are toenailed to these supports; the joists in turn are nailed to the studs. Second-floor joists bear on a 19 mm by 89 mm (1 in. by 4 in.) ribbon that has been let into the studs and the joists are nailed to the studs. The end joists parallel to the exterior walls on both first and second floors are similarly nailed to the studs. As the spaces between the studs are not interrupted by wall plates fire stops are required at floor and ceiling levels to eliminate continuous passages in the

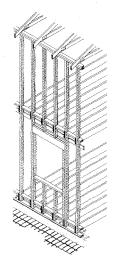


Figure 181

wall and thus resist the spread of fire. Lumber blocking 28 mm (2 in.) thick is commonly used for this purpose."¹

The drawing of the frame incorporates contemporary practices of using prefabricated roof trusses at 610 mm (2 ft.) on centres and not follow the module of 400 mm (16 in.) when rafters are employed.

Up to about the latter part of the 19th century, openings usually fitted within the module of the studs. When lintels came into vogue, along with the jack studs to support them, the detailing of openings became more complicated. The jack stud is blocked out from the adjoining stud to maintain an equal amount of shrinkage of the wood in the support for the lintel. The shrinkage would have not been the same as the opposite side of the opening if the jack stud had been seated on the floor joist next to it.



Map 33

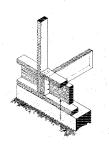


Figure 182

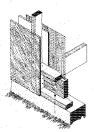


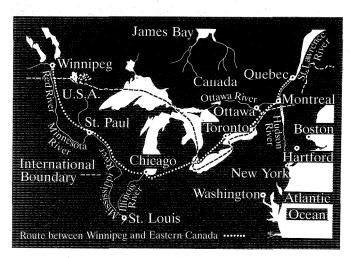
Figure 183

The frame drawing follows the conventional way of illustrating the technique and it presents a simple and straightforward image. However, when the process of putting it all together is considered, it becomes relatively complex compared to our practice today. The sill construction is shown in Figure 182. This is the point where the substructure comes into contact with the superstructure. A 38 mm by 89 mm (2 in. by 4 in.) sill

plate is bolted to the masonry foundation. From the masonry foundation rises 48 mm by 89 mm (2 in. by 4 in.) studs that form the core of the wall. The floor joists rest on the sill plate and are nailed to the studs. The studs and ioists are spaced at the same module. The nailed part of the joist locks the floor and walls together at this level. Figure 183 indicates the exterior and interior linings in place as well as the 19 mm by 139 mm (1 in, by 6 in.) sub-floor. In Figure 184 cross-bridging is shown in-

as mm (2 in. by 4 in.) siii by

Figure 184



Map 34

stalled at mid-span. This, together with the nail and blocking restraint at both ends of each joist, permit the assembly to achieve great rigidity.

The joint between a second-floor joist and a continuous exterior wall stud is ingenious in its simplicity. It serves the dual purpose of transferring loads from the horizontal to the vertical, as well as locking the wall and floor components in position (Figure 185). To construct the joint a rebate is first cut into the stud before erection, its purpose being to take a 19 mm by 89 mm (1 in. by 4 in.) horizontal continuous ribbon (Figure 186). The top of this cut is in line with the underside of the intended floor joist. Figure 187 shows the ribbon in place, face nailed to the stud. Figure 188 illustrates the joist in position, its load being taken by the ribbon and thus transferred to the vertical stud. The nailing of the joist to the stud be-

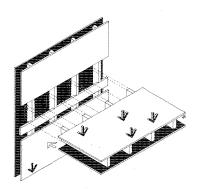


Figure 185

comes the lock as just described. Occasionally, a ioist is illustrated as being notched over the ribbon, but this is an unwise practice since this ribbon is only intended to take a vertical load and it cannot take a horizontal force that could pull the ribbon away from the stud. Blocking needed to support the ends of the sub-floor is shown in Figure 189. It is set over the inner face of the ribbon. This support can be provided by 38 mm by 89 mm (2 in. by 4 in.) blocking but it is not a preferred method. In Figure 190 the fire stop is added and is fixed in position over the joist to provide a base against which the bottom edge of the inner wall lining can be fixed. An alternate method for this is shown in Figure 191 but another piece of blocking is needed for the wall lining. Figure 192 is identical to Figure 193 and shows the 19 mm by 139 mm (1 in. by 6 in.) sub-floor, the inner lining, normally of plaster and/or gypsum board. which is attached to the fire. stop.

A horizontal section through a wall taken at

mid-floor level indicates its construction to about 1960. shown in Figure 193. A separate vapour barrier was not used before that date but by the mid-1960s it had become a common practice. Reliance was placed upon the moisture barrier located on the room side of the paper covering of the mineral wool batts. The flaps on the covering enabled them to be stapled to the studs. The need for a completely air tight wall was not considered important, and so was rarely achieved.

Possibly the latest recorded use of balloon-frame construction in the country, at least to a significant degree, was in the temporary office accommodation built in Ottawa during the early part of the Second World War. This is not housing of course, but the principle of construction remains identical. The continuous stud is maintained above the second floor by scabbing on another directly over the lower. The use of

diagonal boards for sheathing and sub-floors shows that sheet materials were not employed at this date.

The idea that the balloon frame is related exclusively to two-storey height studs is not the view that was held 150 years ago. This difference can be seen when we compare the description given above, with an earlier one by Bell, in 1859. He comments:

"As Balloon-Frames are the simplest of all, they are first to claim our attention....

"Such a frame of one storey in height ... is represented in Plate 4.... (Plate 57)

"Plate 5 is designed to represent a balloon-frame of a storey and a half high.... (Plate 58)

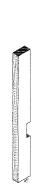
"Plate 6 represents a balloon-frame of a two storey building." ² (Plate 59)

His book on carpentry was republished in 1875 without changes to the Plates shown: some 40 years after the first use of balloon frame in Chicago. From the brief descriptions of sill construction given by Bell, it is clear that details of the technique had not vet become common practice. Figure 194 represents the sill construction used in Plate 57; Figure 195 in Plate 58; and Figure 196 in the two-storey building in Plate 59. It is revealing that the sill construction for the single storey is what might be expected for the new concept of building, whereas the other two retain vestiges of the

earlier medium-frame construction. An isometric drawing of a two storey external wall in c. AD 1875 is shown in Figure 197. Bell's discussion on balloon-frame construction concludes with an important phrase.

"After an experience of 15 years in constructing and repairing balloon-framed buildings...."

This comment inspires confidence that he not only knew how to write about the technique but he also knew





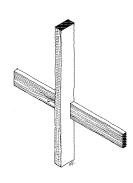


Figure 187

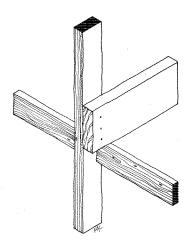


Figure 188

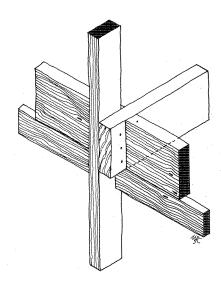


Figure 189

how to build with it. His experience went back to 1843, only ten years after its first recorded use.

During the early part of the 19th century one invention came to the fore that made balloon-frame construction possible. It was the introduction of machinery to produce cut nails. Throughout the 18th century the standard price of hand-wrought nails was about 25 cents a kilogram, which consisted of approximately 100 nails. By

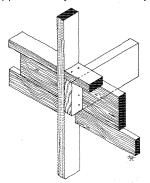


Figure 190

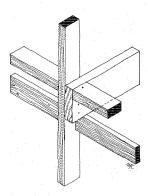


Figure 191

1828, with mass production, the cost was reduced to eight cents, by 1833 it was five cents, and in 1842 the price was down to two cents a kilogram. Another development that made balloon frame an economic proposition universally was that of the steam-driven sawmill. Since the inception of most European colonies in North America, sawmills had been an integral part of the scene. According to Bolles, the earliest in New England was near Portsmouth. New Hampshire, in 1635. The Dutch also had wind driven sawmills in Manhattan as early as 1633. The invention of the steam driven sawmill changed

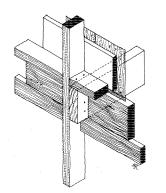


Figure 192

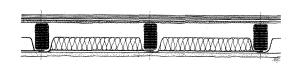


Figure 193

the picture drastically. Construction was no longer an industry dependent on water power. By 1832 the mill had arrived in Chicago and the common use of multiple gang saws led to greater efficiency in output, as well as making it possible to turn out wood of a constant width.³ In spite of these improvements, supply could not keep up with demand and lumber had to be brought in by boat, much of it from Canada.

Chicago at that time was a western frontier settlement and a centre for land distribution and speculation. Settlers streamed in to it, either to partake in its development or to push further west seeking farm lands. The desperate need for housing far outstripped the means to provide it:

"Old residents—those with at least three months in

town—saw the arrival of increased numbers of transients. Unable to find accommodation in the crowded town, many repaired to vast schooner camps."4

"When I add that the population has quintupled last summer, and that but a few mechanics have come in with prodigious increase of residents, you can readily imagine that the influx of strangers far exceeds the means of accommodation..."⁵

Two more quotations from the same source illustrate the effect of balloon-frame:

"A man and a boy can now attain the same results, with ease, that twenty men could do on a old-fashion frame." ⁶

"If a mechanic is employed, the Balloon-Frame can be put up for forty percent less money than the mortise and tenon frame. If you erect a Balloon-Frame yourself ... it costs the price

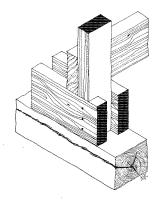


Figure 194

of the materials and whatever value you put upon your own time."7

The great advantage of the new system was its strength. the light weight, and the simplicity of building. A small house once built, could be taken down again if needed and loaded onto a wagon to rejoin the ever westward trek of settlers. In this way balloon-frame construction spread like wildfire across the California and the Oregon Territory on the Pacific. The two main overland routes used are shown in Map 33 and when San Francisco became the terminus of the transcontinental rail link in 1869, the city became a major port.

Most of the settlers at this period had not come directly from Europe but from the established regions of the eastern United States. When American settlers did come north into Western Canada, they brought their skills that had already evolved over generations in North America.

The earliest use of this construction in Canada was

probably in Victoria, British Columbia. This might appear strange at first, but this is not the case after examining the routes by which people, and therefore ideas, travelled at the time. For about 50 years after its founding in 1843 as a Hudson's Bay trading post, Victoria was oriented towards San Francisco simply because there was no overland route to the East until the coming of the railway in 1887. It ended in Vancouver. Growth was sluggish until 1858, the year that saw the start of the gold rushes on the Fraser River. Almost overnight a population of 500 had to accommodate 25 000 people.8 Every type of construction was pressed into service to provide shelter. Most of the people pouring in came by way of San Francisco. There would be little doubt that balloon frame

was brought to Victoria, if not by the first wave of potential miners, then very soon afterwards.

The house-building technique was undoubtedly known by the middle of the century in the area in which Winnipeg, was later established. The fastest and easiest route between Ontario and Quebec lay south of Lake Superior. through Chicago (Map 34).9 Expansion followed the rail link to the south in 1878, and to Montreal in 1885. After these expansions balloon-frame construction began to spread overland, west from Winnipeg. The map also shows the route it took into Ontario, Rempel

dating its use there at about 1880.10

During its early use it was regarded simply as a development coming from the west and often referred to in the last century as simply Chicago construction. 11 The first person to suggest this form of construction was an inventor. Siegfried Giedion, who attributed the discovery to G.W. Snow of Chicago. 12 In 1942, Walker Field, not considering the evidence conclusive enough, investigated the matter in greater depth. 13 He proved, at least to himself,

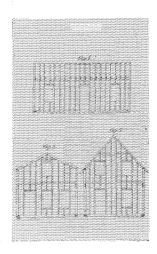


Plate 57

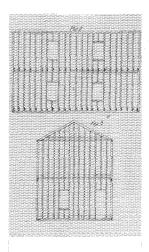


Plate 58

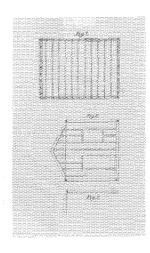


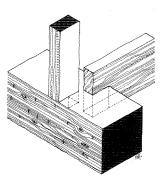
Plate 59

that Augustine Deodat Taylor was the inventor. Field writes that Taylor was educated in Hartford, Connecticut, and was apprenticed to his carpenter father who built churches. He inherited his father's business and soon afterwards began his own

career as a church builder. Accompanied by his brother he left Hartford, and arrived in Chicago in June 1833.14 There is no doubt Taylor would have known of the latest developments in framing both from a practical and theoretical point of view in studying contemporary publications. It is also highly unlikely that Taylor had to go to Chicago to learn of the current price of nails.

It may be deduced from all this, that Taylor would have known everything he needed to know for the development of the balloon frame before setting foot in Chicago. If the dates of these early events in Chicago, as given by Field, are examined, important questions are left unanswered. Such new concepts in building construction do not happen as spontaneously as we are expected to believe, in this case, one month. James Acland, in his book on the origins of the Gothic Vault sums up the situation on this point extremely well:

"To grasp properly the nature of structural evolution we must disabuse ourselves of the notion that one sunny morning an inspired neolithic mason messing around with stones and mortar suddenly invented the arched vault. This heroic or cataclysmic concept of invention does less than justice to the nature of technological process, which is a social and joint effort slowly advancing from the tried-and-true, customary mode of operation by slight adaptations to minor changes. The tentative and halting application of such small variations can lead, in time, to major and revolutionary developments, but it is almost invariably an empirical process moving step by step from the known to the unknown."15



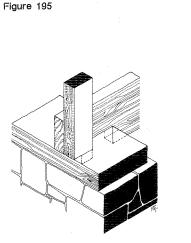


Figure 196

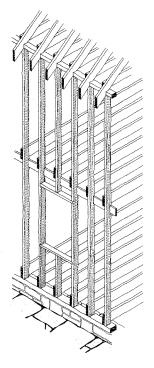
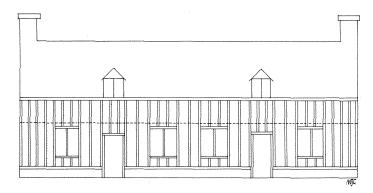


Figure 197



"As the Studds in these Cottages are run quite up to the Wall Plate it is to be observed that a girder sufficient to support the flooring Joists must be laid where the dotted line is drawn and the Joists must be fastened to the Studds."

Figure 198

Taylor arrived in June 1833 and by July was building St. Mary's Church, having been selected over those builders already in Chicago. Father St. Cyr who commissioned the work, was appointed priest of Chicago in April of 1833, and arrived in Chicago from St Louis on the first of May. 16 The following table will clarify events:

- 1 May, 1833: Father St. Cyr arrives in Chicago.
- 1 June, 1833: Taylor arrives in Chicago.
- 1 July, 1833: Taylor starts building St. Mary's.
- 1 October, 1833: First Divine Service held.

Taylor could not have invented a new principle of construction in one month and it is difficult to see him learning it in a month. The

question is, had he brought the theory from a well established, but conservative town in Connecticut, where it had little chance of execution, to a frontier environment where price and speed of construction were of paramount importance? In other words, it is quite possible balloon frame was first used in North America at Hartford. Connecticut, not in Chicago. This could only have a widespread effect in the West where conditions were exactly ripe for its use.

But this has not resolved the question of where the technique actually came from. Available evidence seems to show that balloon frame was a British development and not American, because in 1775 a pattern book was published in England called *Hints to Gentlemen of Landed Property*, written by Nathaniel Kent.¹⁷ A facsimile of the structural elevation is shown in Figure 198. Part of the text accompanying them makes a fascinating social statement:

"All that is requisite is a warm, comfortable, plain room for the poor inhabitants to eat their morsel in, an oven to bake their bread, a little receptacle for their small beer

and provisions and two wholesome lodging apartments, one for the man and his wife and another for his children. It would perhaps be more decent if the boys and girls could be separated, but this would make the building too expensive and besides is not so materially necessary; for the boys find employment in

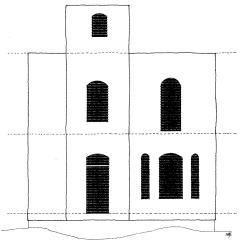


Figure 199

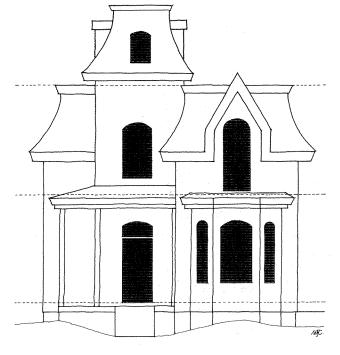


Figure 200

farmhouses at an early age." 18,19

The American Revolution took place soon after the publication of Kent's book and there was an interregnum for a number of years before commerce resumed. It would

have been entirely possible for the Taylor family to obtain a copy of the book just after the turn of the century, since the distance between Hartford and Boston is not far.

The examples of the houses that follow have as their common thread the use of balloon-frame construction. In spite of their apparent diversity, the basic structural

form is often startling in its simplicity.

The next house was a summer home built c. AD 1875 for a Montreal businessman Mr. Gurd (Plate 60). The first impression of this home is one of extreme complexity, however it is not complex if the elements are considered in isolation.

The basic form is shown as cubes in Figure 199. At the next stage other shapes are applied, shown in Figure 200. In the last stage (Figure 201), all the bobbins and lace of the carpenter were tacked on. Surely in this riot of frivolity

the designer must have been aided and abetted by Mrs. Gurd. The society in which she would have circulated would have decreed that inside the house, every table, mantleshelf, bed, dresser, and what not, should have its own prettiness of lace as well.

The storehouse in Plate 61 used the balloon-frame system, and looks more like a building site of the 1970s rather than about 1898 at Dawson in the Yukon.

In the history of wood-house building in North America balloon frame forever changed the historical role of the framing carpenter in housing, moreover, it made a feasible new approach to the construction of houses.



Plate 60

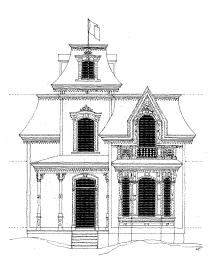


Figure 201

- Canada Mortgage and Housing Corporation, Canadian Wood-Frame House Construction (Ottawa: 1980) p. 46-47.
- 2. W.E. Bell, Carpentry Made Easy (Philadelphia: 1859).
- 3. W. Field, "A Reexamination into the Invention of the Balloon Frame," Journal of the Society of Architectural Historians (October: 1942), Vol 2, No 4.
- 4. Field.
- 5. Field.

- 6. Field.
- 7. Field.
- H. Gregson, A History of Victoria: 1842-1970 (Vancouver: J.J. Douglas Ltd., 1977), p. 2.
- G.F.G. Stanley, Louis Riel (Toronto: Ryerson Press, 1963).
- J.I. Rempel, Building with Wood: and other aspects of nineteenth-century building in Central Canada (Toronto: University of Toronto Press, 1980).
- S. Giedion, Space, Time, and Architecture: The Growth of a New Tradition (Cambridge: Harvard University Press, 1949), p. 351.
- 12. Giebion, p. 352.
- 13. Field, "Invention of Balloon Frames," Journal of the Society of Architectural Historians (October: 1942).
- 14. Field.
- 15. J.H. Acland, Medieval
 Structure: The Gothic Vault
 (Toronto: University of
 Toronto Press, 1972).

- W. Field, "Invention of Balloon Frame," Journal of the Society of Architectural Historians (October: 1942).
- R. Harris, Discovering Timber-Framed Buildings (U.K. Shire Publication Ltd., Aglesbury, Bucks, 1978).
- 18. Harris.
- J. Woodforde, The Truth about Cottages (London: Routledge and Kegan Paul Ltd., 1969).

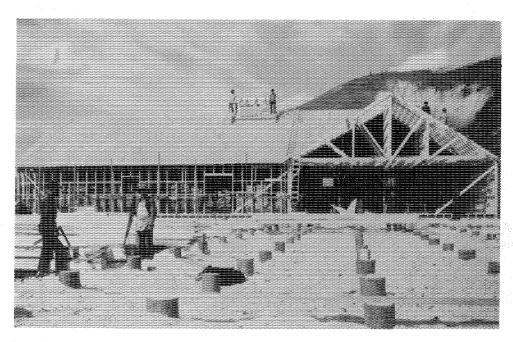


Plate 61

BRACED-FRAME CONSTRUCTION

The principle of this house-building technique is shown in Figure 202. It is different from balloon-frame construction because the studs are only single-storey in height and a girth, or cross beam, has been added at the

second floor level. Another difference lies in the corner braces, which have to be used to stiffen the structure. It can be seen that the studs are set precisely over one another. The joists are nailed to them and there is bearing on the continuous girth unlike a ribbon used in balloon frame.

Specific reference to braced frame begins to appear in literature on North American house-building methods in the latter part of the last century. Chronologically, it is invariably placed between balloon frame and the contemporary technique of platform frame. But the problem with this order is that in regions where balloon frame was introduced in Canada, we do not find braced frame employed afterwards. This is apart from the normal time required for the transition from one technique to another. So why did it come after balloon frame? There are two reasons; first is the tendency to jump to conclusions with inadequate research of hard evidence. and second, is the lack of understanding that the size of Canada with its small population can often mean a common use of concepts, but not necessarily synchronous.

As already noted, balloon frame used full-height wall studs for two- and one-and-a-half-storey housing. We do not know if the full-height stud, (approximately 5 m (17 ft.) in length for a two-storey house), was actually considered a new idea in the mid-19th century. Tradition says it was. Yet the concept was not new, for example, Abbott Lowell Cummings illustrates the use of two-storev studs at the Fairbanks House c. AD 1637 and the Gedney House c. AD 1665, both at Massachusetts Bay. 1 Because use of the full height stud was thought to be original, there had to be a way to explain the return of the single-height stud used in platform frame, our contemporary technique

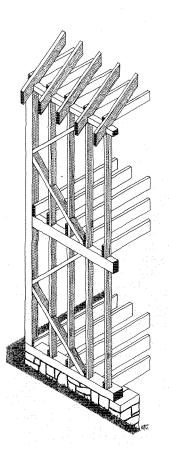


Figure 202

of house building to be discussed later. Braced frame, with its single height stud seemed to provide a logical link. If braced frame is examined in detail it will be seen to have far more in common with the medium-frame type of construction that was described earlier.

Medium frame construction signified the evolution of the heavy- framing technique of the 18th century into one somewhat lighter. Again, as we have seen, a characteristic was the use of sawn lumber together with broad axed timbers in a wall, the studs sawn with the corner posts and hand-cut beams. Both medium frame and braced frame used corner bracing.

William Bell illustrates what we have so far called braced frame, but he describes it as "warehouse construction" and is illustrated in his Plates 9 and 10, shown here as Plates 62 and 63.²

In spite of the pattern of settlement being earlier in Eastern Canada, the West absorbed balloon frame rapidly, because a scarcity of master carpenters could be overcome by the simplicity of assembly. Conversely, we have the situation of balloon frame not in use throughout Ontario until the latter part of the 19th century. Rempel covers the use of timber framing in this part of Canada in some detail.³

Under the circumstances, I believe that braced-frame construction should be deleted

from the usual lexicon of Canadian house-construction method, because medium frame is virtually the same technique. Consequently, the evolution of frame construction in Canada is:

- Heavy-frame construction,
- Medium-frame construction, and
- · Light-frame construction.

- A.L. Cummings, The Framed Houses of Massachusetts Bay (Cambridge and London: Harvard University Press; 1979).
- 2. W.E. Bell, Carpentry Made Easy (Philadelphia: 1859).
- J.I. Rempel, Building with Wood: and other aspects of nineteenth-century building in Central Canada (Toronto: University of Toronto Press, 1980).

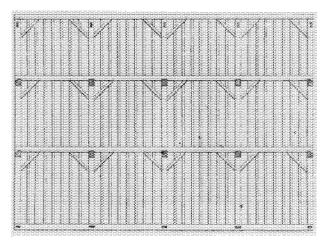


Plate 62

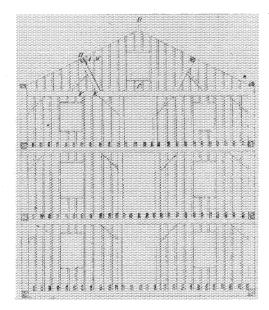


Plate 63

PLATFORM-FRAME CONSTRUCTION

Platform-frame construction is the Canadian contemporary method of house building in wood. It is also the Canadian traditional way of construction. It has been developed empirically from the original form brought to the New World from England in the early part of the 17th century. The relatively unskilled are able to use this technique with minimum assistance, yet the method is sophisticated enough to be used in factory assembly

plants. Moreover, it is the technique mostly used for totally prefabricated housing.

The significant difference between platform frame and balloon frame is that studs for external walls in platform frame are only a single-storey high. Consequently, each floor level, whatever the number, can be erected separately using the installed floor as the working platform for the next level, hence the name. This difference may be seen in Figure 203. Parts of the interior gypsum board shown is applied to the walls and ceilings of the first-and second-floor rooms. Gypsum

board is rarely provided for basement ceilings. The installation of the sub-flooring is also shown.

The date chosen for the description of this technique of house building is c.1974. From about 1950 to 1974, details of construction had remained more or less the same, but the international oil crisis of 1973 triggered changes that are continuing today, and will certainly continue into the next century. Houses up until that period were not energy efficient. The methods used were not particularly scientific. The alarming increases in the price of fuel oil, in a country where heating can often mean the difference between life and death, forced changes to the means of conserving energy. Interestingly, one side

effect has been to establish a climate for more innovative thinking about the building process as a whole.

In the description of platform frame the emphasis is on the principles of the techniques. There are small differences in the detailing of the structure in other parts of the country, but these are covered elsewhere. 1 This method of building is virtually the same as balloon frame and is therefore a diaphragm form of construction. It is perhaps not as precise as it would be if assembly of components were done under controlled conditions, nevertheless, it has a far greater strength than frame construction. To an extent, this was appreciated in 1963, yet building regulations permitted the omission of the sheathing in situations where the final cladding might provide some amount of strength. In most situations, if it was omitted. corner bracing had to be provided. This is still allowed

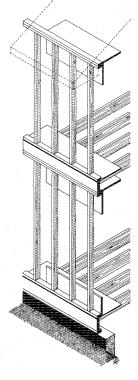


Figure 203

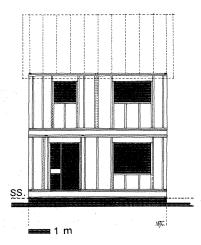


Figure 204

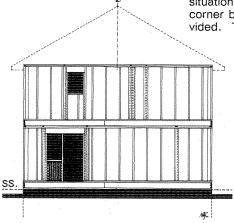


Figure 205

today, but it is a questionable practice, particularly as parts of the country are potential areas for severe damage from earthquakes. Fortunately most home builders in Canada did not accept this aberration in an otherwise eminently sensible code of practice.

The framing for a small house is shown in the following four drawings; Figure 204 is of the front elevation; Figure 205 a side elevation; Figure 206 the plan of the first-floor framing, and Figure 207 shows the framing for the second floor. It can be seen from the elevation of this small house that in only relatively few cases do the modules of 400 mm or 600 mm (16 in. or 24 in.) (both referring to the centre lines of studs), permit the use of 1.2 m (4 ft.) wide panel sheathing, either externally or internally. The practice is to locate studs that are required for specific purposes, for example, those at window or door openings or abutting internal partitions. The

remaining studs are then distributed at the 400 mm to 600 mm (16 in, to 24 in,) modules previously mentioned. This permits the smallest amount of cutting for sheet materials and the simple installation of modular sized insulation. Similar procedures are followed in the construction of the floor framing. For the first floor, strapping is used at the intermediate points on the underside of the joists. In contrast, framing of the second floor, requires cross-bridging (see Balloon-frame Construction) at the intermediate points to improve the stiffening of the floor.

The wall consisted of 12 mm (0.5 in.) gypsum board; a separate polyetherine vapour barrier, and 50 mm to

75 mm (2 in. to 3 in.) of mineral wall batt insulation (other types of insulation were appearing on the market and the change to an insulating factor. as opposed to so many centimeters of thickness had already begun). The 50 mm by 100 mm (2 in. by 4 in.) nominal thickness wall studs also supported the exterior sheathing, which was usually of nominal 6 mm (0.25 in.) plywood. The other panel types of sheathing were beginning to be used at a greater or lesser degree - a layer of building paper was installed and then the exterior sidina.

The principle of the erection of the walls is illustrated

in Figure 208, but precise procedures depended upon the design of each particular house. A practice that makes platform frame especially appealing to the small builder is that all wall components can be limited in size so three or four men can lift it by hand. Cranes are not used with this type of construction.

In situations where the components have been assembled on jig tables,





Figure 206

Figure 207

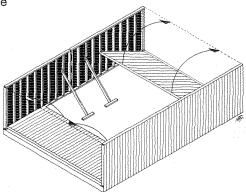


Figure 208



Plate 64

blocking between wall panels, shown in the drawing is not used. Other times it might be employed to overcome slight irregularities in the overall length of the wall. The most important aspect upon completion of erection is the installation of the top plate. The plate already shown on the wall assembly, has to re-

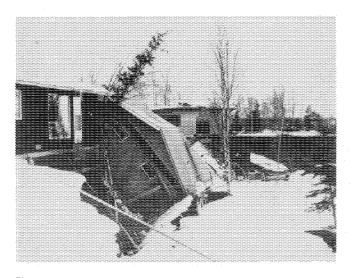
ceive another plate on top of it. The purpose is to lock all the separate components together so they can act as one complete wall. By 1974 most builders were using prefabricated light weight roof trusses spaced at 600 mm (2 ft.) on centres.

The image most people have of platform-frame construction is usually obtained from books, and is invariably of the exposed stud work, as shown in the framing elevation

of a small house. But this view can only be seen on a building site for a very short period, if at all in some cases. Figures 209 and 210 tell the story as it is. Figure 209 shows two storeys being placed together as well as the triangulated roof structure. Figure 210 illustrates the completed superstructure. The strength of such structures are shown in Plates 64 and 65. They show a part of the aftermath of the earthquake of 1964 in Anchorage, Alaska. The construction of these houses were of platform frame using plywood sheathing.2 It is worthy of note that

Japan, with its great potential for severe earthquakes, has in recent years permitted the use of platform-frame construction throughout the country. They based their decision on the calculations of the diaphragm action of the technique.³

There is no recorded first use of platform-frame construction either in the United States, or in Canada. However, there is little doubt it was first used in the western part of North America. In fact, up until the early 1950s it was still referred to as Western framing. Its use seems to have began near the start of the present century and it slowly spread to the east. The principal factor impeding a faster assimilation across the country was undoubtedly the small number of





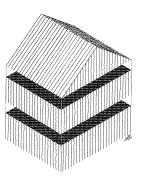


Figure 209

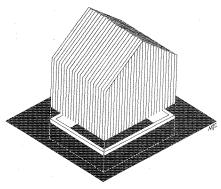


Figure 210

houses built on account of World War I, the Depression, and World War II. However, by the latter part of the 1940s platform frame with few exceptions, was in use across the whole of Canada.

An early use of what may be called platform frame was for the prefabrication of housing, and other types of buildings by the British Columbia Mills Company of Vancouver, British Columbia.4 In 1904, E.C. Mahony had obtained a patent for a system of prefabrication of wood buildings. This may be seen in Plate 66. Drawings from the application are shown in Plate 67. Of particular note is the vertical wall section shown in Plate 67. Apart from houses transported by the trainloads to the Prairies, all the Canadian Banks of Commerce were built of the prefabricated system. Interestingly enough, the patent does not emphasize the simplicity of adding a second floor, rather it concentrates on the wall itself and the means of connecting the panels. However, what is now called the working platform was obviously known of at the turn of this century but when it began to have a consistent use in conventional housing still remains an open question.

The detail of the platform frame is shown in Figure 211 and is still the way conventional housing is constructed today. Apart from the machined quality of the wood, the question that begs to be asked is how far has our wood technology for building houses progressed in the 350

years from the first settlement of the European in North America? It does not seem to have come very far, lulled no doubt by the myth of endless forests of a superb building material. This myth has in fact inhibited far greater amounts of research being carried out, but hopefully, before the end of the millennium we shall wake up to the fact that our forests are not limitless. And species of trees so far regarded as trash may in fact prove to be our salvation.

- Canada Mortgage and Housing Corporation, Canadian Wood-Frame House Construction (Ottawa: 1980).
- U.S. Plywood Association, Report from Anchorage (1964).
- Author member of Canada-Japan Housing Committee, 1981 and 1983.
- 4. Mills and Holdsworth, *British*Columbia Mills Prefabricated
 System (Ottawa: 1975).

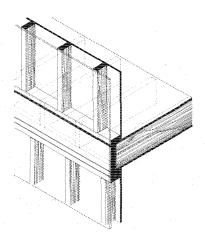


Figure 211

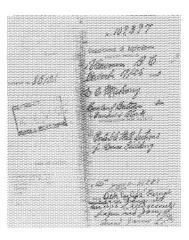


Plate 66

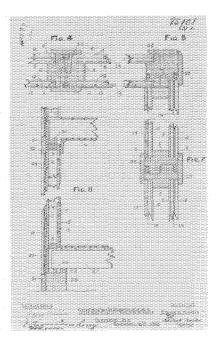


Plate 67

POST, BEAM AND PLANK CONSTRUCTION

This house-building technique flowered briefly in British Columbia from the late 1940s to the 1960s. For the designer, this was a seductive method because western red cedar wood was used. This meant the structure could be left exposed both inside and out. The method demanded a high standard of craftsmanship. This type of construction meant it was not difficult to provide relatively wide spans in external walls for glazing, an advantage with the scenic panoramas to be found on the Coast. All houses were by no means large, nor did all have spectacular views, yet with their wide roof overhangs, large glass areas, and the natural beauty of cedar, a quite distinctive character of the Pacific Coast was achieved. As the cost of both materials and labour increased towards the end of the 1960s, use of the technique began to decline, however, variations of it are still found occasionally.

Post, beam and plank construction in its purest form consists of a skeletal frame with an infilling appropriate to the design of the house (Figure 212).1 In the majority of cases, platform frame construction was incorporated for some parts, either to provide stiffening for the frame or because it was simpler and less expensive to use for long lengths of exterior wall with a limited number of openings. It was common to use 50 mm (2 in.) planks for the roof and sub-floors, although 75 mm (3 in.) planks could be obtained if required by the design of the structure. The planks were supported on beams that could be up to 2.4 m (8 ft.) apart. These beams were supported on posts, but the framework did not use integral joints relying on metal straps, anchors, and beam hangers to hold the members together. The most efficient use of 50 mm (2 in.) planks was attained when they were continuous over more than one span, for example, a

continuous plank over two spans provides two and a half times more stiffening, than a plank over one span only. These planks were tongued and grooved, and nailed to the beam, as well as being spiked horizontally into the next beam. With the ceiling it was customary to leave the beams exposed and to measure the required height to the underside of the planks. Lateral bracing was needed for the exterior walls to provide resistance against wind forces. This was accomplished by installing panels at appropriate intervals that included cross bracing or made use of studs and plywood sheathing. At this period, the 50 mm (2 in.) thickness of wood was considered to provide adequate insulation, but if more was needed on the roof, a vapour barrier was laid over the planks with rigid insulation then bedded in mastic. The finish was usually of tar and gravel to a pitch of 3 in 12 or less. When the attempt was made to reduce the amount of material required to provide an airtight junction between the infill wall panels or glazing. and post or beams for misguided aesthetic reasons, the resulting leaks could be disastrous, and extremely difficult to cure.

The technique began to infiltrate the housing scene of British Columbia just after the Second World War. It came from the United States where

it had been evolving for a number of years. Undoubtedly it began as influences from across the Pacific started to evoke an interest in a simple post and beam system. From the middle of the 19th century there was an interest in Japan, and by 1886 Edward Morse had written his book Japanese Homes and Their Surroundings.² During the early part of the century the Greene brothers in California were building their houses with the wood joints of the structure almost as sculptured forms. Frank Lloyd Wright had an interest in Japanese building, at least from the 1920s. In the 1930s there were architects in the San Francisco region designing post and beam housing. Further to the north in Oregon, Pietro Belluschi was building houses before the Second World War that were clearly precursors of the work to be done in British Columbia some ten years later.

A separate study of this building technique as it pertains to British Columbia does not exist, but since many of the architect's designs are still in use, it would be a pity if this unique and vital episode in Canadian housing was not recorded in detail.

- Canadian Wood Council, Ottawa.
- Morse, Japanese Homes and Their Surroundings (Toronto: 1961).

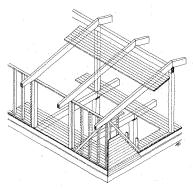


Figure 212

${f 3}{f 8}$ today and tomorrow

Today we are at the start of an evolutionary process in which platform-frame construction is changing into another technique of house building, but it is impossible to predict with any accuracy how long it will last. It is safe to say, however, the change will continue well into the next century. Undoubtedly blind alleys will be explored, because there are no sure paths to the future. Change could come about, not for technological reasons at all, but for economic or social pressures of a kind we cannot possibly foresee today.

There have been some modifications in the house building process since 1974, the date of the international oil crisis, but none could be classified as major. Some modifications include: improvement in waferboards, an increased use of preserved wood foundations, a greater use of synthetic siding, the

continuing improvement and site use of power tools, and so forth. There has also been an increase in the quality of the many fittings that go into houses especially housing at the lower part of the price range. This covers items such as windows, plumbing fixtures, kitchen cabinets, and staircases, which have become important sales features in many parts of the country.

Today, everyone is committed to the cause of energy conservation, and one of the main home modifications to encourage this attitude has been the installation of polyethylene vapour barriers. Books have been written on this subject alone. A concept has been developed, constructed and tested that

accepts the drywall internal finish (gypsum board) as an adequate vapour barrier, providing it too is sealed at all places where warm air could escape into the structure. The tests have proved the soundness of the idea. 1 The purpose here is not to debate the merits of either approach, rather it is to point out that building scientists involved with housing, by no means accept with equanimity the conventional building practices of today. An aspect of energy conservation that has not received sufficient attention is the installation of insulation.

Since medieval days in Europe, the space between wall studs has been stuffed with a variety of materials for one purpose or another. In the age of space travel, is it not strange we continue this archaic custom? Especially when so many imperfections in houses are not observed by scientists. To move the insulation to the outside of the stud wall would at first be



Plate 68



Plate 69

costly, but since the material is already in use for other forms of building, an increased demand would reduce the costs. It would be competitive in price today for housing if its use had begun some decades ago.

Before the Second World War, the efficiency of house design in Canada was in part the measure of its cubic content. After the war, the

practice was abandoned in favour of a square foot measure. This was useful to some, however it was not a good indicator of the volume to be paid for and to be heated. Contrary to advertisements, the upper part of a two-storey living room is not for free, nor is the basement. Of course, in some parts of the country this is not a problem. However, this laissez-faire attitude to measuring the efficiency of the house in terms of space has led in part, to ignoring the fact that there really are different climates across our country.

A curious phenomenon of our housing became apparent in the late 1960s and early 1970s. The six pictures shown in Plates 68, 69, 70, 71, 72 and 73 are from a set of 16. Each picture is from a different Canadian city and taken in the 1970s. Their location is given in the Notes.2 It might be we have a national vernacular here, but regrettably based it is upon style alone. The situation today has improved to an extent but the picture is discouraging. There is nothing wrong with this attitude, but it leads to an ultra conservatism that there is almost nothing else for comparison in the marketplace. What would the effect be if all house sales took place in the depths of winter?

The export of lumber to countries in the world wanting to use the platform-frame system of construction, may not seem to have much to do with the technique in Canada. but it has. This trade in lumber for housing is extensive. Both the United Kingdom and Japan are making significant strides in using platform frame. Neither see it as supplanting their own traditional techniques, but as adjuncts to it. The fascinating aspect of its use in the United Kingdom is that the technique is returning to its origin. These two countries will, in time, modify our practices to their unique situations. We can in turn learn from their techniques as well as from others.

A cardinal quality of our people is their sense of individuality. Indeed, the very reason most came to Canada was to gain independence.

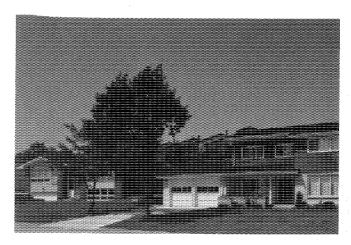


Plate 70



Plate 71

This is why Canadians, when there is a possibility of choice, have rejected regimentation in their housing. It is true that some live in high buildings, but this is a matter of choice. and it is acceptable to the individual. In the 1960s and 1970s, the outcry against the practice of housing for subsidized low-income families in high buildings eventually made the practice both socially and politically unacceptable. When townhouses began to be built, acceptability only came when the image of individual houses being joined together, was adopted.

The most economical way to construct prefabricated housing is to make it all identical. This is one of the reasons why prefabricated houses have not had a greater degree of success in Canada. The efforts to provide the individuality

demanded by the marketplace ultimately makes this kind of house construction uneconomical. There is no doubt that in the future there will be a far greater degree of the pre-assembled house components, which are most probably built away from the site, but it will not come about unless the identity of each house is clear. The fact that such separateness may in fact be largely illusory is irrelevant: it is the perception which is important.

Throughout the past 1 000 years, the common theme of all methods of house construction is largely their degree of empiricism.

Canadian housing today has achieved the distinguished

position it has in the world because designers and builders have always had the freedom of action to make it so: it has not been done by imposed legislation. It is of course essential to have requlations to safeguard public safety, but going much beyond this negates the very empiricism which has enabled our construction techniques to evolve. The challenges facing us today makes freedom of action critical if we are to succeed in the future, as we have done in the past.

Notes to Chapter 38

- Lstiburek, The Airtight Drywall Approach (Alberta Housing, 1985).
- 2. Ottawa, Ontario.

Richmond, British Columbia.

Edmonton, Alberta.

Dartmouth, Nova Scotia.

Victoria. British Columbia.

Trois Rivières, Quebec.

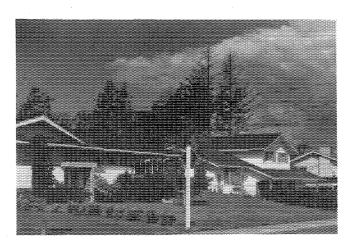


Plate 72

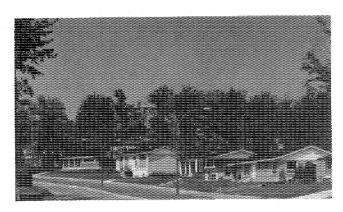


Plate 73

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