

Industrialized Housing: The Japanese Experience

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Abstract

There is increasing evidence of industrialization within the housing industry, not just in the sense of factory produced housing, but including the application of industrial production procedures to a myriad of products that the consumer now assembles to create an appropriate living environment. Japan's prefabricated housing industry best exemplifies this potential. This study attempts to convey what is happening in the "prefab" housing sector in Japan, the reasons for its apparent successes and finally, how this experience may influence our own changing housing industry.

Industrialized housing in Japan reflects a concerted effort that dates back some thirty years. In 1983, prefab housing accounted for some 174 000 housing units, 80% of which were produced by just five companies and 53% of which were single detached units. Prefab housing is a product that sells well in densely populated urban centers where individual designs are required to suit particular lot configurations. Over 65% of these units utilize a light gauge steel frame and the remainder utilize a pre-stressed wood panel system. This is an industry that now markets total living environments, not just buildings, and including appliances, furniture, fixtures and equipment. These prefab housing companies offer services and products that approach "one-stop" shopping.

Industrialized housing in Japan represents not just a product but a way of thinking about the housing industry that will hopefully precipitate a review of the role of industrialization as an essential ingredient in our own housing industry, perhaps along the lines a global competitor may wish to think.

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EXECUTIVE SUMMARY

At least in North America, the home building industry is currently undergoing major structural changes in marked contrast to the cyclical trends that have wrought modest adjustments to the industry since it first appeared in its present form, post World War II. These changes reflect, among other things: how we now choose to live and the kinds of homes and home products we consume; how we finance these purchases; our proclivity to renovate and remodel our current premises; and, how we cope with the increasing costs of homeownership. These changes are now of a magnitude to significantly influence the process by which we produce and deliver housing to the market place.

One aspect of such change is increasing evidence of industrialization within the housing industry, not just in the sense of factory produced housing, but including the application of industrial production procedures to a myriad of products that the consumer now assembles to create an appropriate living environment. Not surprisingly, those who are sensitive to such changes are being directed toward a country that has already changed our thinking about technology in the home, namely Japan. It is in Japan today that we can glimpse an enviable future for the housing industry and already see tangible results of industrialized housing production directed specifically at the single family detached house. The study attempts to convey what is happening in the "prefab" housing sector, as the Japanese prefer to call it, the reasons for apparent successes and finally, what this experience may provide for our own changing industry.

The study is primarily based upon extensive field work in Japan including site visits to factories and show homes and interviews with industry people, government officials and spokesmen for various housing organizations. Relevant literature on the subject is scant, usually outdated and often seriously misleading. Background readings on the social, cultural and economic factors in Japan are essential to coping with the results of the field investigations but there is always a hazard in speculating on the very limited resources that this study has touched upon. The actual synthesis was greatly assisted by subsequent discussions with colleagues in industry and government and the Japanese propensity to generate all kinds of data was invaluable in corroborating the findings.

Industrialized housing in Japan is not a new phenomenon and today's results are the fruits of a concerted effort that dates back some thirty years. The market share for prefab housing stood at 15.3% of total housing starts in 1983 and this effort is primarily the work of just five companies that accounted for 80.5% of all prefab starts. Of the approximately 174 000 prefab units produced in 1983, 53% were single family detached, 32% were two storey walk-up apartments and only 15% were high use buildings. The remainder of the home building industry is surprisingly similar to that found in North America; some 100 000 small builders, building traditional houses and struggling with declining housing starts and a declining share of those starts. This trend is in marked contrast to the recent trend amongst the top five prefab

housing companies.

A number of factors have contributed to the relative longevity of the prefab housing industry in Japan and its more recent successes. These reasons go well beyond geographic and market factors and touch upon the relationship between government and large industry in Japan, the commercial banking system and preferable loan rates, the sub-contracting system and a business structure indicative of large organizations in Japan that is foreign, if not alien, to both government and industry in North America.

Industrialized housing in Japan is a product that sells well in densely populated urban centers, particularly the single family detached house in a situation whereby a sub-standard unit is being replaced. This situation requires individual designs to fit a particular lot, site erection with a minimum of on-site labour due to lack of space for storage of materials and the enforcement of rigorous earthquake and fire protection standards. Over 65% of such prefab units utilize a light gauge steel framing system and some form of composite, non-load bearing wall panel. A pre-stressed wood panel system shares the remainder of the market. These are home builders who extol the virtues of custom designed detached housing, the "free-style" plan, one-of-a-kind products and design features and materials of the highest quality. If the mobile home is the trademark of industrialized housing in North America, the large, somewhat expensive, custom-designed urban home is rapidly assuming the comparable trademark for this industry in Japan.

The prefab housing industry in Japan is now oriented toward marketing total living environments, not just buildings, and including appliances, furniture, fixtures and equipment. It views itself as having a continuing involvement with its customers in changing, modifying and adapting the home following its initial sale - these prefab housing companies have realized that the initial sale is only the beginning of a long and profitable relationship between producer and consumer. Obviously this approach requires an organizational structure that extends far beyond what we normally deem to be a housing company and represents an integration of functions and services that approaches "one-stop" shopping.

The Japanese have achieved notable market success with prefab housing and of course this prompts the obvious question "What does this mean for us?". It is highly unlikely that the Japanese prefab companies will begin to unload houses at North American ports along with cars, appliances and electronic goods. However, while we may not see the actual products of Japan's prefab housing companies arrive on our shores, we could well see the products of its research and development spending, which is considerable, through licensing agreements with off-shore companies. More significantly, we may well see adoption of Japanese software before the hardware systems that seem to lure the current housing expeditions to that country.

It is in the area of management, sales and organizational skills where new opportunities abound. The influence could well

be felt in the way that North American home builders choose to do business in the future. The integration or "rationalization" of the industry in Japan and its vision of housing as a consumer product, extending far beyond the building itself, could impact our domestic companies. Franchising, after-sales follow-up, ventures into renovation markets, alliances with appliance or furniture companies, show home parks downtown, interior design services and increasing factory production of value-added components may begin to emerge in some form, but not likely within as comprehensive a framework as we now see in Japan.

The recent and very strong interest in 2 X 4 wood frame housing construction by the two largest industrial conglomerates in Japan could have a major impact both in Japan and North America. If one combines the standard 2 X 4 wood frame building system with the overall approach to the housing industry developed by these prefab housing companies, as is the case with Mitsubishi and Mitsui, then perhaps we have a glimpse of the future, at least in North America and possibly in foreign markets as well.

The impending threat from the Japanese housing industry, if such a threat even exists, is not so much one of increased domestic competition but lost opportunity for a building system that North American's have successfully utilized since World War II, namely 2 X 4 wood frame construction. Competition from Japan could well be felt in foreign markets such as Pacific Rim countries and it would indeed be ironical if they gained the competitive edge with our very own housing system.

Japanese industrialized housing represents, on one hand, a set of products and, on the other hand, a very different way of thinking about the housing industry, perhaps along the lines a global competitor may wish to think. Hopefully, this work will encourage some new thinking about the housing industry per se, and precipitate an interest in reviewing the role of industrialization as an essential ingredient of this industry.

CHAPTER ONE

INTRODUCTION

At least in North America, the home building industry is currently undergoing major structural changes in marked contrast to the cyclical trends that wrought modest adjustments to the industry since it first appeared in its preset form, post World War II. These changes are not endemic to this particular industry as John Naisbett in his book Megatrends would have us believe, we as a society are at the end of one era and on the threshold of another -- a "time of parenthesis" as he would call it. In the housing industry these structural changes reflect basic changes in how we live and the kinds of home products we consume; how we finance these purchases; our proclivity to renovate, change or modify our present premises; or the difficulty in coping with the increasing cost of homeownership. These changes are of a magnitude sufficient to change the process by which we now produce and deliver housing products to the market place.

The "new look" in housing may not originate in North America, or in Europe for that matter. In North America the housing industry remains essentially a "reactive" industry, with cautious interest in charting new territory. Not surprisingly, those who raise questions of change are being directed toward the country that has already changed so much of our thinking about consumer products and has continued to lead in industrialization throughout the last two decades, namely Japan.

In 1983, five Japanese companies factory produced 73 485 detached units of housing, some 80% of which were custom designed. The largest of these five companies more than doubled the annual production of the largest home builder in the United States in 1983. Industrialized or manufactured housing now accounts for 15% of all housing starts in Japan and this market share could rapidly increase. These industrialized home builders are massive corporations by North American standards, distinguished by their vertically integrated structure combining factory production, advertising and marketing, research and development, financing, sales, construction and servicing, all within a single entity.

This work provides some insight into these companies and Japan's recent successes with industrialized housing. Curiosity was first prompted by a series of news articles that appeared in North American journals in 1983, the thrust of which was to extol the virtues of the instant factory house soon to arrive upon our shores from Japan, along with cars, cameras and appliances. Fortunately, there was more than sufficient substance behind the misleading headlines to justify a critical look at just what the Japanese were doing in these housing factories.

Due to the paucity of written material available in English, the work has relied almost exclusively on field work in Japan and the good will of industry and government spokesmen who gave such unexpected support during the course of my visit to Japan. Con-

stant dialogue with colleagues at MIT and Harvard and with my sponsors in Alberta and Ottawa served to focus and refine my findings and conclusions as the work progressed. One must recognize the limitations imposed by the language and culture of Japan on such field work and my own biases in first structuring the interviews and then interpreting the results will no doubt be evident. Surprisingly, my hosts did provide excellent material and data, in English, to corroborate statements and seldom, if ever, did proprietary interests or confidentiality inhibit my investigation.

The report is organized into five main sections: Chapter Two provides an overview of the current housing situation in Japan, and sets the context; Chapter Three follows with an examination of the government's involvement in promoting industrialized housing; Chapter Four focuses on the prefabricated housing industry and conditions for its success; Chapter Five describes the major companies involved and their products; and finally, Chapter Six concludes with observations on the implications of the Japanese experience, nationally and internationally.

This foray into a most complex topic will no doubt be critically examined and challenged by those who also seek to better understand our own housing industry and its future prospects. I would hope these critics can share my preoccupation with a set of questions that initiated this investigation, namely: what changes might we expect in the way we build houses?; what do these changes imply for the increased role of industrialization in housing pro-

duction?, and, what might be their impact on the housing industry itself and the consumers of the products of this industry?

CHAPTER TWO AN OVERVIEW OF THE HOUSING SITUATION IN JAPAN

2.1 A Profile of the Housing Market

An overview of the housing situation in Japan, post World War II, provides evidence of the latent potential for success of industrialized housing in this country. When the war ended in 1945, 4.2 million dwelling units were required throughout Japan to replace those devastated by the war and this figure was further exacerbated by the rapid migration of rural dwellers to the cities following the war. This migration to the cities increased urban dwellers from 37.8% of the population in 1950 to 76.2% in 1980 (Table 2.1.1.). The monumental task of rehousing the nation following World War II imparted a sense of urgency for housing production that lasted well into the 1970's and maintained an awareness of both the demand and supply side of housing on the part of government and industry that continues even today.

Fundamental changes in post-war housing policy did not occur until the mid 1960's and was to coincide with the remarks of a sharp-tongued Common Market official named Sir Roy Denham who scornfully referred to post-war Japanese housing as "rabbit hutches". These remarks were seen as being as influential as the potent impacts of the oil shocks of the 1970's and had a certain bitter currency among Japanese households who were just beginning to realize that housing quality and not quantity was now the notable housing problem.

Table 2.1.1

Changes in Urban and Rural Population

	Urban (%)	Rural (%)
1920	18.0	82.0
1930	24.0	76.0
1940	37.7	62.3
1950	37.3	62.7
1960	63.3	36.7
1970	72.1	27.9
1980	76.2	23.8

Source: Bureau of Statistics, Prime Minister's Office, Japan, 1980.

The actual shortage of housing was redressed as early as 1968 when the number of dwelling units on a national basis exceeded that of households (Table 2.1.2). Regional disparities disappeared by 1973 when the number of dwelling units exceeded that of households in every prefecture and, in the governments' estimates, original housing objectives had been achieved. But solutions to mass housing problems were not without social and environmental costs. The general housing theme of the past twenty-five years brought with it new problems pertaining to housing quality and the quality of residential environments themselves. Sir Roy Denham's comment reflected what officials had already suspected; Japan's housing problem for the 70's and 80's became one of addressing issues of space, overcrowding, sunlight and the like. However, the Japanese government was quick to recognize the issue of housing quality and realized that if it were to gain recognition as a world economic power it must set about to create a housing industry that would parallel its predecessors in the automobile and electronics industries.

Housing in Japan, as with any country, is influenced by such factors as climate, natural resources and social structure. In the case of Japan, these have led to a very distinctive and traditional housing form and method of construction with deep historical roots. The traditional Japanese house stands in marked contrast to the "danchi", the high concrete apartment blocks built in the 1960's and 1970's that surround major urban centres and now serve as a constant reminder to government of the dysfunction

Table 2.1.2

Changes in the Number of Housing Units and Households

Year	1958	1968	1978
Total households (1000)	18 647	25 320	32 835
Total dwelling units (1000)	17 934	25 591	35 451
Dwelling units per household (%)	0.96	1.01	1.08
Vacancy (%)	2.0	4.0	7.6

Source: Housing Survey of Japan, Bureau of Statistics, Prime Minister's Office, 1978.

between housing demand and supply. It is the traditional penchant for the detached house and not the high rise apartment that is guiding today's search for housing quality.

The influence of moderate climates in central and southern Japan and the abundance of good quality wood shaped an open style post and beam detached house form in marked contrast to the closed style western house utilizing a brick or stone bearing wall to defend against harsh winter climates. But recent social changes have done much to transform the traditional Japanese open model to that resembling the western style closed model. We now see a contemporary Japanese home that varies little in appearance both inside and outside from its Western counterpart, save for the "tatami" room now reserved for ceremonial occasions and the comfort of elders in the home.

The Japanese household today aspires to own a home that at first glance would appeal to Europeans and North Americans alike. This aspiration perhaps symbolizes the changing nature of a highly sophisticated urban population who have cast themselves amidst an international matrix of consumer labels, many of which they now produce. Political awareness has certainly ensured that the detached single family home is the backbone of government housing policy and a primary focus of the housing industry today. That is not to imply that qualitative improvements are not being sought in other housing forms, particularly the low rise or walk-up apartment. But annual surveys have underscored the heightened desire of Japanese households to become home-owners. Amongst households living in rental accommodation, an incredibly

high 89% (1978) see the way to improving their present housing situation as through ownership of their own detached dwelling.

Against a backdrop of high level economic growth and an overwhelming demand for housing in the early 1970's, the number of new housing starts in Japan soared to a record high of 1.86 million in 1972. This compares to a high of 2.38 million in the United States (with almost twice the population) set in the same year and a Canadian record of 269 000 starts set one year later in 1973 (Table 2.1.3). However, the peak was short-lived and the first oil crisis in the fall of 1973 led to a sharp slump that did not show signs of recovery until 1975. Starts in the 1980's have now begun to stabilize in the 1.1 million range although some forecasts see a further drop into the 700 000 unit range in the later part of the decade. In 1983, Japan had 1.14 million housing starts versus 2.01 million in the United States. This still represents a significant edge for Japan in terms of units constructed versus population -- 9.52 new housing units per 1000 persons in Japan versus 7.29 units per 1000 in the United States. In comparison, Canada's rate of new starts falls far below these two leaders, providing only 5.18 new starts per 1000 persons in 1983.

Concomitant with a significant drop in starts from earlier record years and a movement toward a more stabilized annual production, there has been a steady expansion in the size of dwellings constructed in Japan. This is indicative of the search for improved housing quality through increased living area and a response to the most frequently voiced complaint in annual hous-

Table 2.1.3

Total Housing Starts - Japan, U.S.A., Canada (1000)

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Japan ¹	1532	1856	1763	1261	1428	1530	1532	1498	1487	1214	1143	1157	1137
U.S.A. ²	2085	2379	2058	1353	1171	1548	990	2023	2046	1529	1329	1312	2007
Canada ³	234	250	269	222	231	273	246	228	197	159	178	126	163

Source:

1. Housing Survey of Japan.
2. Department of Housing and Urban Development (includes HUD code mobile homes).
3. Canadian Housing Statistics, 1984, Canada Mortgage and Housing Corporation.

 Highest annual housing starts

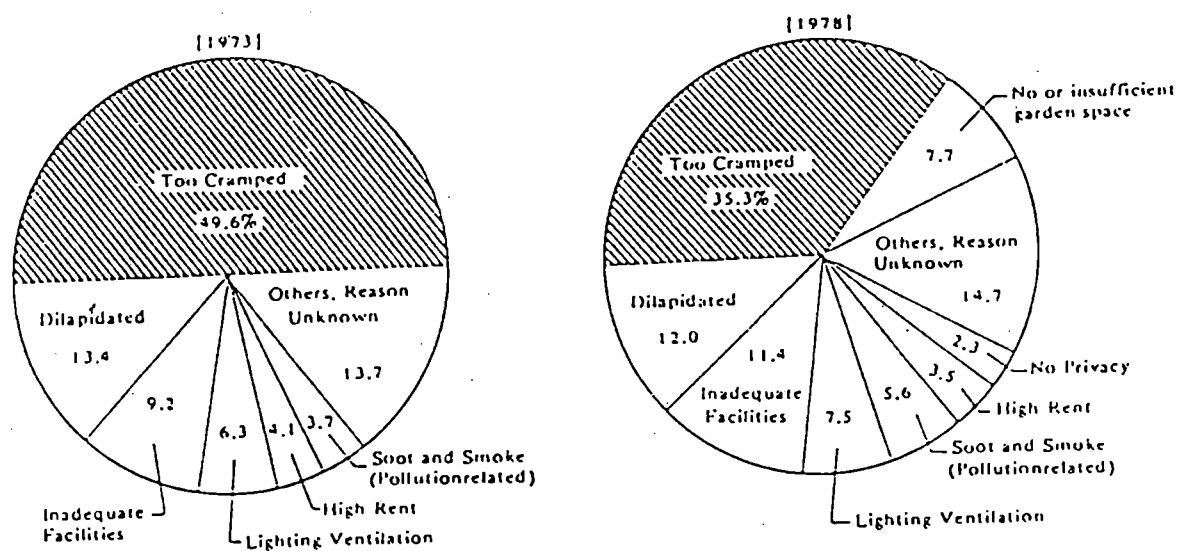
ing surveys, that being that existing housing is too cramped (35.3% of all respondents in 1978) (Figure 2.1.1). In the period 1968 through 1978, the floor space per dwelling constructed increased from 73.86 m² to 80.28 m² for all unit types, and increased from 97.42 m² to 106.16 m² for owned occupied homes (Table 2.1.4).

As far as tenure is concerned, the percentage of owned homes reversed a downward trend that followed a 1958 high of 71.2% and stood at 60.4% in 1978 (Table 2.1.5). In 1982, 69.3% of all starts were owner occupied presold units or units for sale. The reversal can be attributed to the increase in the percentage of owned homes constructed in large metropolitan areas either as replacement units or condominiums.

With a homeownership ratio similar to that found in North America (in 1982, 63% of Canadian households were homeowners) it is not, therefore, surprising to find that 65.1% (1978) of all housing starts were single family detached, with 9.6% in "tenements" (two or more attached units each with independent entry to the street) and 24.7% in apartments (two or more stacked units with shared stairways and halls) (Table 2.1.6). The high proportion of single family and tenement units accounts for the predominance of wood construction. In 1978 81.6% of all starts utilized a wood structure of which 25.4% utilized fireproof wooden construction. The proportion of wooden structures in 1978 is down from 91.5% in 1968 (Table 2.1.7). In 1982, 50.3% of all housing starts (1.16 million) were publicly financed with the remainder being privately financed (Table 2.1.8). This

Figure 2.1.1

Primary Reason for Being Dissatisfied with Present Housing (Nationwide)



Source: Housing Demand Survey (Housing Bureau, Ministry of Construction), 1978

Table 2.1.4

Changes in Average Unit Size (m²)

Year	Total Size	Owner Occupied Units	Rental Units	Breakdown of Rental Units		
				Public Rental	Private Rental	Issued ¹ Housing
1968	73.86	97.42	38.05	37.78	43.94	53.56
1978	80.28	106.16	40.64	42.05	40.67	55.33

Source: Housing Survey of Japan, 1978

1. Company housing rented to employees

Table 2.1.5

Ownership of Housing, 1000 Units, (%)

Year	No. of Dwelling Units	Owner Occupied Housing	Total Rental Housing	Breakdown of Rental Units		
				Public Rental Housing	Private Rental	Issued Housing
1958	17,432	12,419	5,013	614	3,233	1,166
	(100.0)	(71.2)	(28.8)	(3.5)	(18.5)	(6.7)
1968	24,198	14,594	9,604	1,403	6,527	1,674
	(100.0)	(60.3)	(39.7)	(5.8)	(27.0)	(6.9)
1978	32,189	19,428	12,689	2,442	8,409	1,839
	(100.0)	(60.4)	(39.4)	(7.6)	(26.1)	(5.7)

Source: Housing Survey of Japan, Bureau of Statistics, Prime Minister's Office, 1978

1. Company housing rented to employees

Table 2.1.6

Housing Units By Type, 1000 Units, (%)

Year	No. of Dwelling Units	Detached Units	Tenement ¹ Units	Apartment ² Units	Others
1968	24,198 (100.0)	16,102 (66.5)	3,564 (14.7)	4,449 (18.4)	83 (0.3)
1978	32,189 (100.0)	20,962 (65.1)	3,103 (9.6)	7,963 (24.7)	161 (0.5)

1. Low-rise, walk-up units, 2-3 storeys

2. High-rise units

Source: Housing Survey of Japan (Bureau of Statistics, Prime Minister's Office, 1978)

Table 2.1.7

Housing Units By Structure, 1000 Units, (%)

Year	No. of Dwelling Units	[Others
		Wooden Structures	Fireproof Wooden	
1968	24,198	18,614	3,537	2,047
	(100.0)	(76.9)	(14.6)	(8.5)
1978	32,189	18,104	8,184	5,576
	(100.0)	(56.2)	(25.4)	(17.3)

Source: Housing Survey of Japan, Bureau of Statistics, Prime Minister's Office,
1978

Table 2.1.8

Housing Starts By Type of Financing, 1000 units, (%)

	1973	1975	1979	1980	1981	1982
Publicly Financed	386 (21.9)	428 (30.0)	612 (41.1)	544 (44.8)	539 (47.1)	582 (50.3)
Privately Financed	1378 (78.1)	1000 (70.0)	875 (58.9)	670 (55.2)	604 (52.9)	576 (49.7)

Source: Statistics on Housing Starts, Ministry of Construction, 1982

represents a long trend of increased public financing from a low of 21.9% in 1973 and a rather rapid increase over the past five years. Of total starts in 1982, 49.6% were owner occupied units, 30.7% were rental or issued units and the remainder, 19.6%, were units built for sale (table 2.1.9).

The housing problem is far from being solved and in 1978 there were still 4.75 million households in accommodation that failed to meet "minimum housing standards" as defined by the Ministry of Construction [1] (14.8% of total households) and 18.75 million households occupying housing that fell below "average housing standards" (58.3% of total households) (Figure 2.1.2).

The current level of approximately 1.1 million housing starts can roughly be broken down into 600 000 single family detached units (55%) and 500 000 attached units (45%), which compares to 65% single family detached and 35% attached units in the United States. Of the 600 000 detached units, approximately 400 000 are replacement units for existing stock (36% of total starts) and 200 000 are detached houses built on new lots. The 500 000 attached units are broken down into 200 000 low rise units (predominately 2 stories) and 300 000 high rise units (27% of total starts).

A figure that certainly reinforces this nation's commitment to a strong housing industry is actual housing investment as a percentage of the nominal GNP. Japan has the world's highest rate at 7.6% (1978), versus 4.8% for the United States (1979),

[1] See Figures 3.12 and 3.13, Chapter Three.

Table 2.1.9

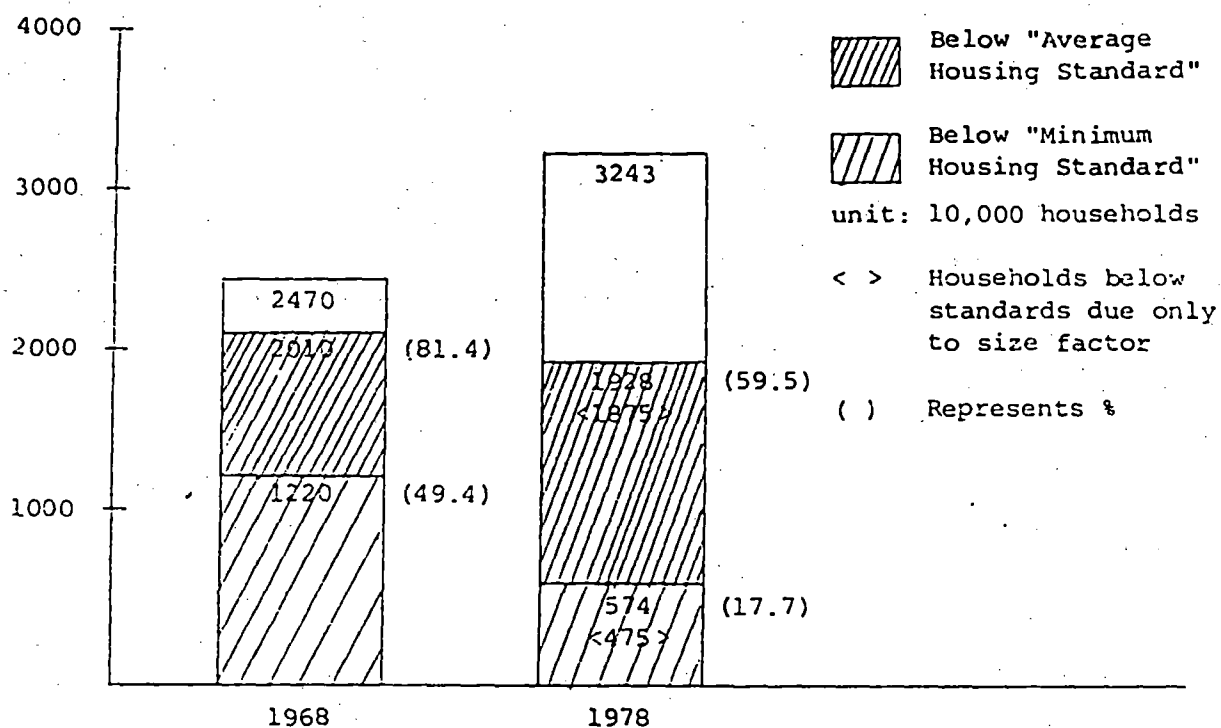
Housing Starts By Tenure, 1000 units, (%)

	1973	1975	1979	1980	1981	1982
Owner	756	730	714	583	557	574
Occupied	(42.9)	(51.1)	(48.1)	(48.0)	(48.7)	(49.6)
Rental and	658	446	426	320	329	356
Issued	(37.3)	(31.3)	(28.6)	(26.4)	(28.8)	(30.7)
For Sale	349	251	346	311	257	227
	(19.8)	(17.6)	(23.3)	(25.6)	(22.5)	(19.6)
Total						
Starts	1,763	1,428	1,487	1,214	1,143	1,157

Source: Statistics on Housing Starts, Ministry of Construction,
1982

Figure 2.1.2

Changes in the Housing Situation - Nation-Wide, 1000 units, (%)



Estimates by Ministry of Construction based on Housing Survey of Japan, 1978.

Notes

1. "Average Housing Standard" and "Minimum Housing Standard" are defined by the Ministry of Construction, see Figures 3.1.2, and 3.1.3.
2. Households below housing standards are determined not only by size, but also by other factors such as presence of boarders (or sharing), shared facilities, old and/or delapidated housing, and whether the unit was originally built for residential use. The 1978 figures in < > are based on the number of households below housing standards due to only size factor.

and has averaged over 8% for the past decade, almost double the U.S. average.

2.2 Distinguishing Features of the Japanese Housing Problem

While the Japanese family aspires to own a single family house, there are significant constraints that make the current rate of single family purchase in Japan all the more surprising. The most formidable constraint is the lack of land for building and the existing high densities to be found in the metropolitan areas. It is in spite of these densities that government housing policy still attempts to respond to the overwhelming wish of urban dwellers to own their own home and vacate the rental apartment or "danchi". In a 1983 government survey of the aspirations of large city dwellers, 89% aspired to own their own single family home and 51% of these same dwellers were prepared to commute 45-60 minutes to do so.

Japan is not only a narrow land mass but the greater part of it is covered with mountains and forest. Less than 18% of the total area is suitable for habitation (Table 2.2.1) and, as a result, dwellings occupy only 3.8% of the total land area (Table 2.2.2). With an overall population density of 316 persons per square kilometre (1983) compared with 25 for the U.S. and 2 for Canada, the impact of land scarcity is always foremost among government concerns. A further consequence of this lack of habitable land is the concentration of population in the Tokyo, Osaka and Nagoya corridor^(Figure 2.2.3). These three regions account for approximately 6% of the total land area of Japan but accommodate

Table 2.2.1

Population, Area and Population Density (1983)

	Population (millions)			Area (% of Total)			Population Density (persons/km ²)
	Mid-year Estimate	Forecast for 2000	Annual Rate of Increase 1975-82	Agriculture	Forest and Woodland	Other	
Japan	119.26	129.28	0.9 %	14.8	66.8	18.4	316
U.S.A.	233.70	263.83	1.0 %	45.7	30.4	23.9	25
Canada	24.91	31.50	1.1 %	7.0	32.7	60.3	2

Source: Japan 1984, An International Comparison, Japan Institute for Social and Economic Affairs, 1984.

Table 2.2.2

Residential Land Use in Japan (1981)

	Nation-wide	3-Metropolitan Regions
Residential Land	3.8%	11.2%
Housing Use ¹	2.9	8.4
Industrial Use ¹	0.4	1.3
Offices, Stores ²	0.5	1.5

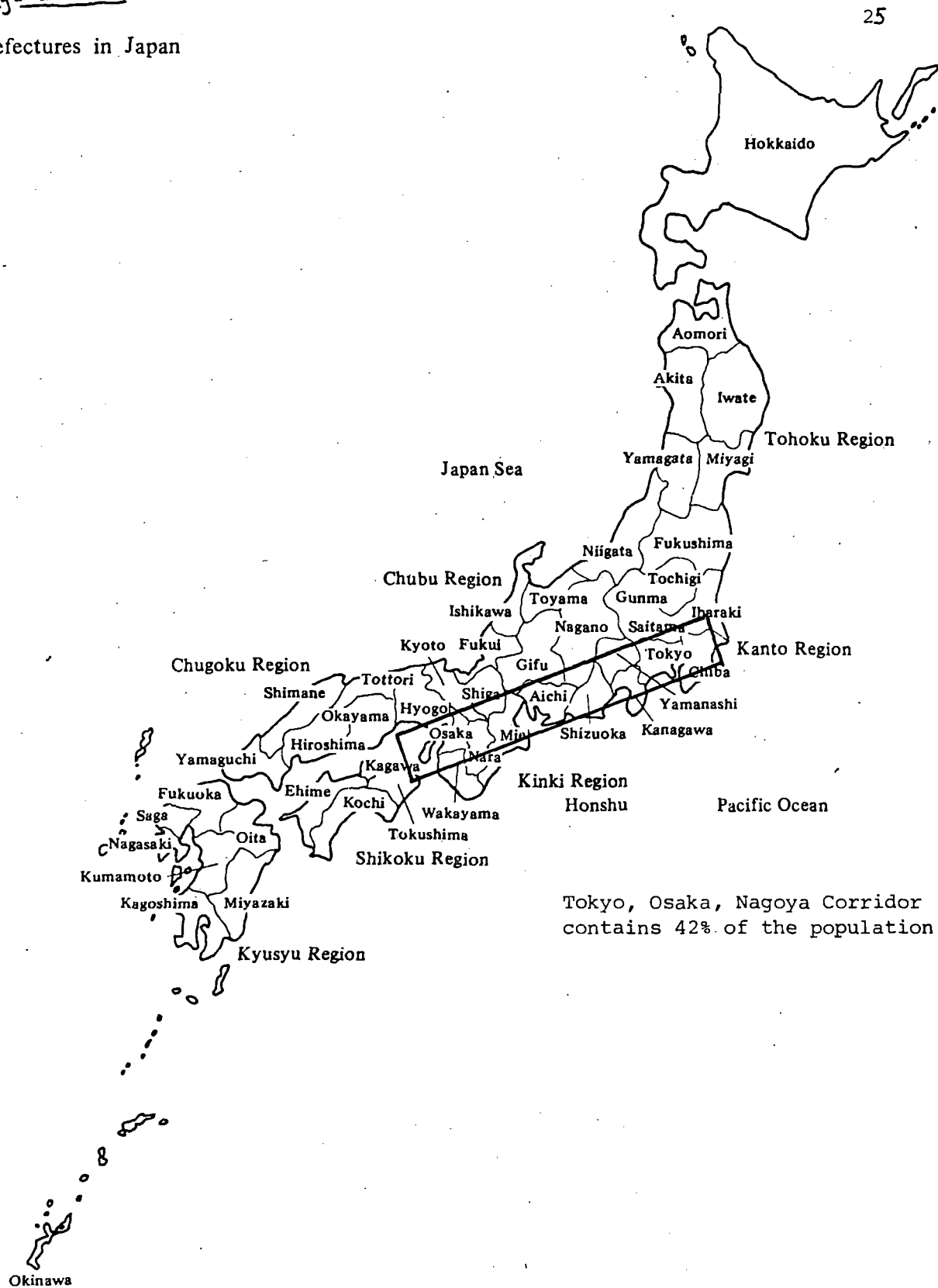
Source: National Land Agency, 1981

Notes:

1. Land zoned residential and occupied by housing.
2. Land zoned residential and occupied by industrial or commercial uses.

Figure 2.2.3

Prefectures in Japan



42% of the country's population. Population density in a 50 kilometre radius of Tokyo, for example, rises to 3 254 persons per square kilometre. Fortunately, population growth is no longer compounding the density problem. The national birth rate has shown a constant drop, except for one upsurge in the "baby boom" period immediately after the war. However, one factor that has affected housing demand is the increasing age of the population. Japan's annual rate of population increase for the period 1974-1982 was 0.9% as compared to 1.0% for the U.S. and 1.1% for Canada during the same period. Life expectancy for males has risen from 65.32 to 74.20 in the period 1960 to 1983 and the Japanese now enjoy the longest life expectancy in the world today.

Population density in Japan is a severe constraint to achieving consumer expectations and inevitably results in small building lots, cramped and crowded housing conditions within cities and extraordinary land values throughout the metropolitan regions. These are factors that distinguish the Japanese housing problem and directly influence the housing industry in comparison to its Western counterpart. On the other hand, Japanese housing consumers are surprisingly similar to Westerners in their expectations and preferences for housing.

The annual gross earnings of a typical worker in Japan (1982) defined as male, manufacturing sector worker with a two child family where the wife is not working, is \$17 099 U.S. com-

pared with \$17 887 U.S. in Canada and \$17 136 in the U.S. [2] The household income (1983) of a salaried worker household is \$20 484 U.S. (4 865 359 yen) or \$1707 monthly, of which \$1449 (85%) is disposable income (Table 2.2.3). Living expenditures consume 79% of this disposable income; housing represents 10.1% and food and drink 30.0%. Comparable figures for housing and food and drink in the United States are 24.5% and 20.9%, respectively.

There is one particular feature that certainly distinguishes the Japanese household -- their propensity to save, for which they maintain first ranking in the world. This propensity to save stands at 20.9% and net savings realized is averaging more than 17% of after tax income (1984). In comparison, a U.S. household's net savings realized is now averaging 6% of after tax income. [3] However, even with the acumen for saving, the Japanese household still finds the home purchase to be a formidable task. According to a survey by the Economic Planning Agency, the purchase price of a house was 7.17 times larger than the annual disposable income of an average worker's household in a large city in 1975. This figure dropped slightly in 1977 but increased to reach 11.1 times in 1982 (approximately \$185 000 U.S.). Since housing loans are dependent on the household income, it is becoming increasingly difficult for the average household to obtain a house even with mortgage loans.

[2] Source: OECD, The 1982 Tax/Benefit Position of a Typical Worker in OECD Member Countries.

[3] Asian Wall Street Journal, July 31, 1985.

Table 2.2.3

Japanese Household Accounts (1983)

	Per Month (Yen)	(US\$ = 237.52 yen, 1983)
Income ^a	405,517	1707
Regular ^b	263,155	1108
Temporary and bonuses ^b	74,239	313
Disposable Income	344,113	1449
Living Expenditures	272,199	1146
Food	72,099	304
Housing, fuel, light	28,703	121
Clothing, footwear	18,910	80
Medical care	6,436	27
Education	10,414	44
Reading and recreation	23,462	99
Propensity to Save ^c	20.9%	

a) Salaried worker household (3.79 persons).

b) Household head only.

c) Propensity to save is defined as the percentage remaining of disposable income after living expenses.

Source: Japan 1984, An International Comparison, Japan Institute for Social and Economic Affairs, 1984

2.3 Consumer Profiles and Preferences

Who is the typical customer for a single family house? The level of generalization that this question implies could be misleading, however, there are certain characteristics that begin to emerge on a relatively consistent basis. Even more important are the trends that are now emerging among home buyers so profiles should not be viewed independent of emerging trends. One must first distinguish between the urban versus rural customer. The cities of Tokyo, Osaka and Nagoya make up the majority of the consumer market in Japan, and it is this market to which reference is made. This concentrated market area is situated at about 35 degrees north latitude, which is much farther south than London, Paris or Berlin (50° Latitude) or even New York, Madrid or Rome (42° Latitude).

A typical single family purchaser in the urban market is likely to have a combined household income in the range of \$22 000 U.S. to \$25 000 U.S. (55 to 62.5 million yen) and the head of the household will be 35 to 40 years old. The median age of the Japanese home buyer is 37.5 years versus 29 years in the U.S. The family is likely occupying a rental apartment or house and has been saving diligently for the past 10 to 15 years. The move is precipitated by the fact that their two teenage children now require more private space, particularly a quiet place for studying, and the father's parents have decided that they can no longer maintain their house and will now move in with the eldest son. The family is fortunate in that they will not have to contend with purchasing a lot (likely some 60-90 minutes commuting

distance from Tokyo). They will be demolishing the original home occupied by the grandparents and replacing it with a new home. The new home will then accommodate the three generations. This will be a once in a lifetime purchase for the family -- it will certainly not be viewed as a starter home with expectations of moving up in the housing market in three or four years, as one would expect to find in North America. Most important, the new house will maintain the family's historic ties to the family plot.

The home itself will be quite different from that of the grandparents and will contain a number of features attractive to the two teenage children. Most discernible will be evidence of the trend toward Westernization that will have already affected every aspect of the family, including their dress, their eating habits and their living patterns.

This trend is indicative of a belief among Japanese consumers that Westernization is equivalent to modernization and an international image. No doubt the steady rise in the number of Japanese who travel abroad and gain experience as residents in foreign countries has further influenced this trend.

The house is a consumer good and the family will likely approach this purchase as it has the abundance of other material goods it has already acquired. The house must first of all be an original product of top quality and with long service life. Second, it must satisfy individual tastes, not so much in terms of quality or durability, but in terms of its capacity to satisfy the personal sentiments of family members spanning three

generations.

Already the family will have enjoyed the use of a refrigerator, electric washing machine, vacuum cleaner, color TV, stereo phonograph and tape deck and a sewing machine (Table 2.3.1). They might have a car and even use an air conditioner in the summer months. These purchases have already conditioned the expectations of the family and the house is no longer just a shelter item; it is the very foundation for an economically stable, healthy and harmonious family life and a symbol of a rising standard of living.

The western influence that the family seeks to emulate will be evident from the exterior appearance of the house through to furniture, fixtures and appliances. The layout will emphasize a family living room and dining area, provide a bright functional kitchen for the wife and private bedrooms for each child. Room sizes will be considerably larger than the grandparents are accustomed to but they will still be laid out in a familiar functional manner utilizing built-in storage and furniture wall units to free up floor space. The open-air system of the traditional house will be replaced with closed-house features such as sash windows and a sealed exterior enclosure. Unfortunately, this system will not provide the same level of natural ventilation during the hot humid summers and condensation and mold in and on the exterior walls could be a problem during the cold winter months, especially in Hokkaido.

Table 2.3.1

Ownership of Consumer Durables by Japanese Households (1984)

	Ownership ¹ Ratio (%)	No. per 100 homes
Color T.V. sets	99.2	163.8
Refrigerators	98.7	116.1
Washing machines	98.4	105.5
Vacuum cleaners	96.7	115.7
Cameras	85.7	128.2
Kerosene heaters	85.6	160.6
Sewing machines	80.2	90.0
Passenger cars	64.8	79.2
Stereos	58.0	62.3
Air Conditioners	49.3	75.2
Microwave ovens	40.8	41.2
Golf sets	23.7	27.5
Video recorders	18.7	19.5
Pianos	17.6	17.9

Source: Economic Planning Agency, Japan, 1984

Notes:

1. Percentage of homes possessing the item.

There will be few rooms, if any, with the traditional tatami mats on the floor but more rooms with carpets or wood floors upon which are placed chairs, desks and other Western furniture. Even the traditional futon will be replaced with beds and the shoji (sliding partitions) will give way to hinged doors.

Some traditional customs will not disappear but will be adapted to this new Western style. Family members will still remove their shoes at the door and the carpet will be viewed not as part of the floor but as an extension of the tatami mat. While bathroom fixtures may look familiar to a Westerner, the method of bathing in Japan will remain distinctively Japanese and preclude the use of shower stalls; bathing shall always remain a perplexing procedure to foreigners arriving in Japan for the first time. Western style flush toilets, while gradually replacing the traditional Japanese squatting toilets, will never occupy the same room where bathing takes place. However, there is now a Japanese version of the French bidet that combines functions in a rather technical looking contraption.

Structural changes in life style are rapidly taking place and facts and figures could not convey the impact that these are now having on housing as a consumer good. What is certain is that the Japanese family, in spite of severe restrictions on their ability to replicate the home buying habits of their North American counterparts, are exhibiting tendencies which significantly diminish the cultural distinctions that once prevailed between the two cultures.

2.4 Land and Location

The land question in Japan is very complex and deserving of its own study. It is sufficient to say here that the cost of residential land, a building lot, is horrendous by Western standards and presents an almost insurmountable constraint to homeownership in large metropolitan areas. If Japan has earned an exemplary reputation for improving the quality of the house, its reputation for coping with land cost is diametrically the opposite. In all discussions on housing cost with government and industry, price refers exclusively to the house, not the lot, perhaps reflecting a sense of embarrassment in even discussing the issue of land. This omission is somewhat ironical when discussing means to further reduce production costs of the housing unit with housing producers. Any such reductions seem insignificant in comparison to the record of increasing land costs. For example, average residential land costs in 1982 rose 19.4% over the previous year in Tokyo and 16.6% and 24.1% in Osaka and Nagoya, respectively.

With average residential land costs in 1980 in the order of \$811 U.S./m² (183,900 yen) in the Tokyo region, \$688 U.S./m² (156,000 yen) in the Osaka region and \$408 U.S./m² (92,500 yen) in the Nagoya region (US\$ = 226.74 yen, 1980), it is not difficult to comprehend the hurdle of purchasing land and building a new house even with the availability of low interest loans (Table 2.4.1). As a result, applicants for loans to the Housing Loan Corporation are usually persons who have obtained land through donation or succession usually from the family plot, i.e.,

Table 2.4.1

Residential Land Price by Region (Yen/m²)

City	Radius	1982	1983	% Change
Tokyo	60 km.	154,400	183,900	+19.1
Osaka	50 km.	133,900	156,000	+16.5
Nagoya	40 km.	73,000	92,500	+26.7

Publicized Land Price: National Land Agency, Japan Institute of Real Estate, 1978

purchasers not exposed to substantial debt for land acquisition. It should also be noted that the above figures are averages computed over a 60 kilometre radius from downtown Tokyo, 50 kilometres for Osaka and 40 kilometres for Nagoya. Residential land values for single family lots in Tokyo can approach \$3000 U.S./m² (680 220 Yen) within 30 minutes travelling time from Tokyo Station (1980 figures).

As an overall trend, land prices for the six large cities based on a 1955 index of 100, rose to an index level of 7 412 in 1984, versus a Consumer Price Index of 498 on the same basis (Figure 2.4.1). After a relative slackening of land prices following the consequences of the first oil shock in 1973, land prices have continued to rise and from 1979 onward the annual rate of increase in large cities has been particularly conspicuous, continually reaching double digit percentages.

The influence of land availability and land cost can be seen on commuting times (Figure 2.4.2). In Tokyo (1980), 40% of households commute an average of 60-90 minutes to work and 16.6% commute 90-120 minutes. In Osaka, 50% commute 30-60 minutes and 36% commute 60-90 minutes. The comparable figures for Nagoya are 44% and 37%, respectively.

Whereas the average lot size per detached unit was 299 m² (1978) nationwide, this figure drops to 176 m² in Tokyo and 152 m² in Osaka (Table 2.4.2). This translates into an average cost of approximately \$142 736 U.S. (32 363 960 yen) in the Tokyo region and \$104 576 U.S. (23 711 562 yen) in the Osaka region given 1980 figures. It must be remembered, however, that there

Figure 2.4.1

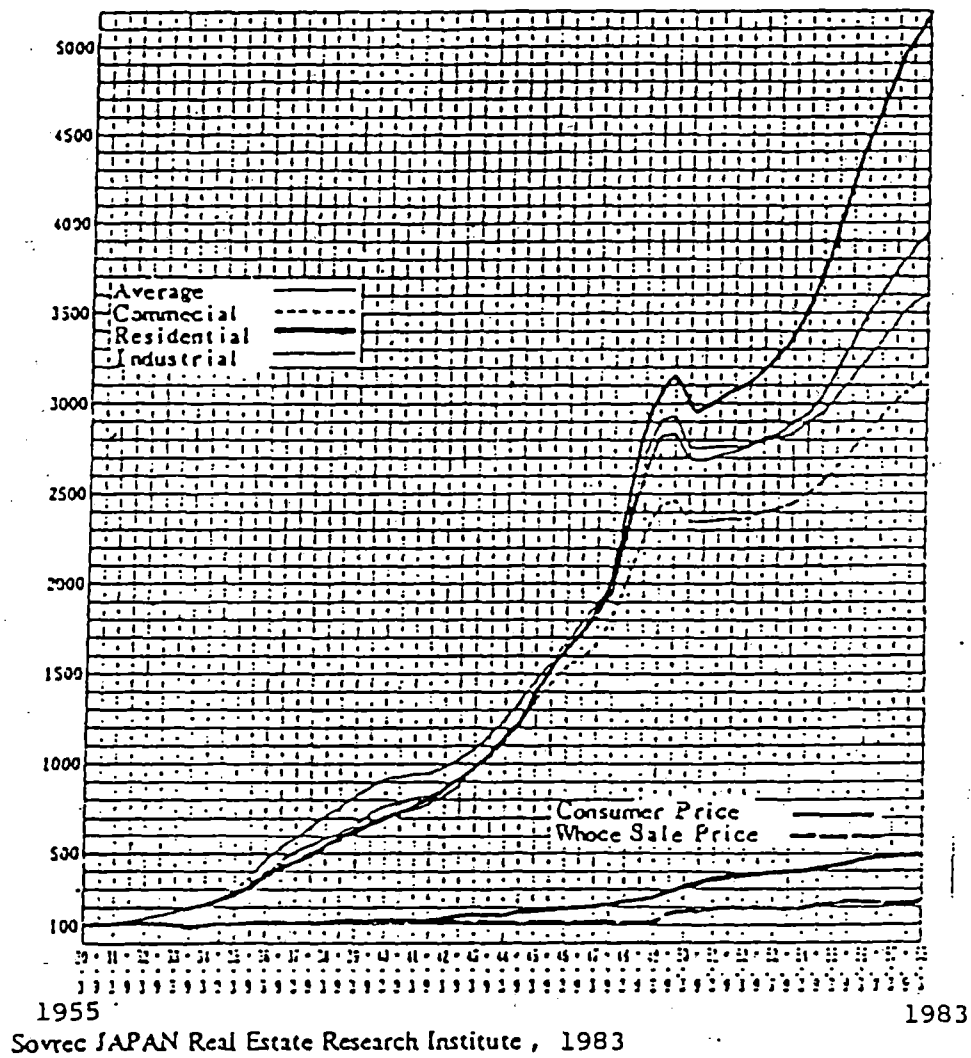
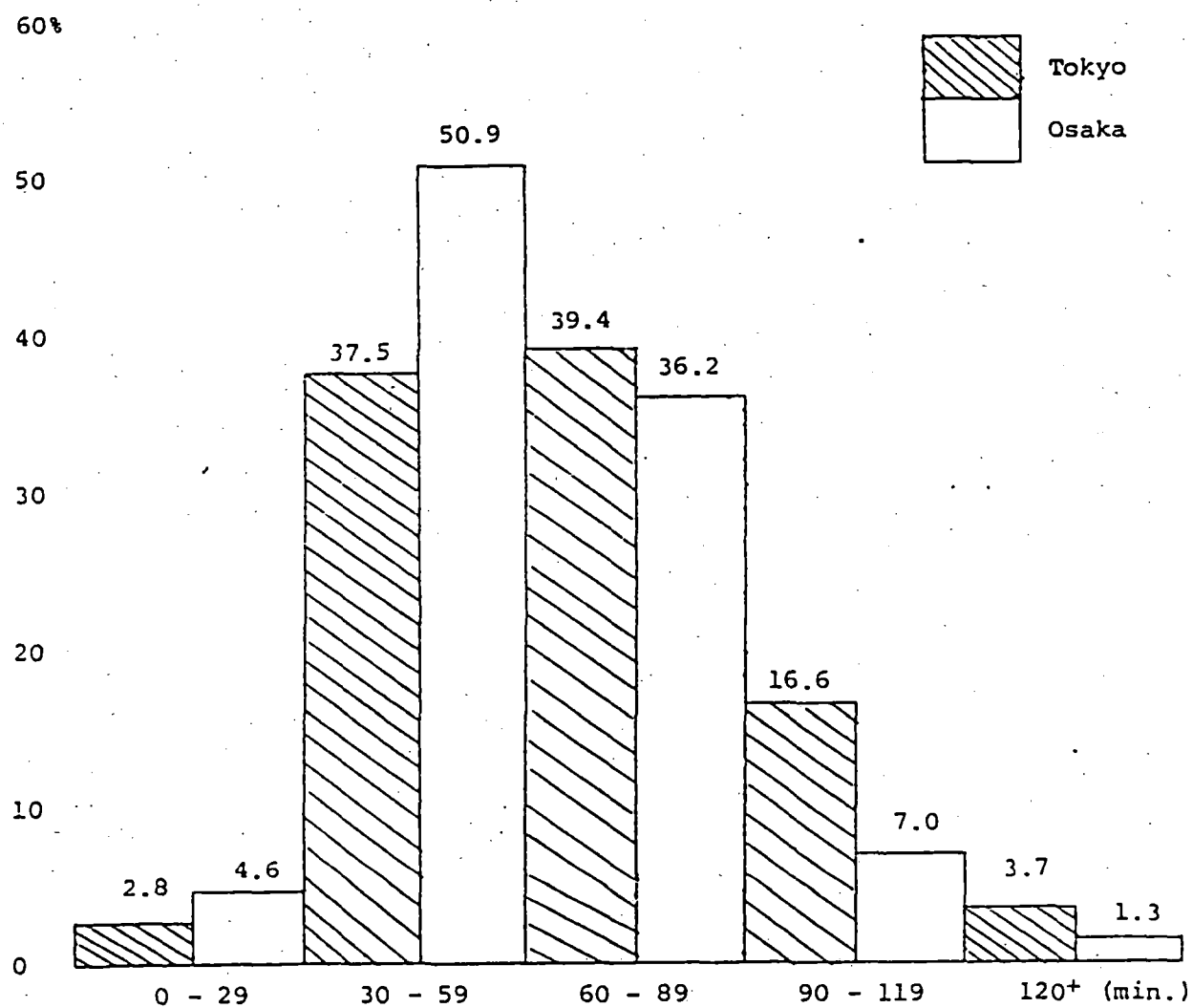
Change in the Land Price Index

Figure 2.4.2

Average Commuting Time for Tokyo and Osaka (1980)

Source: OECD Report, 1984 (unpublished)

Table 2.4.2

Standard of Housing

	Year	No. of rooms per house	Average size per house m ²	Average occupancy per house	Average lot size per detached house m ²
Nation-wide	1958	8.6	---	---	---
	1968	8.8	78.9	3.96	290
	1978	4.5	80.3	3.47	299
Tokyo	1958	2.9	---	---	---
	1968	2.9	50.2	3.48	182
	1978	3.3	54.5	2.94	176
Osaka	1958	3.4	---	---	---
	1968	3.4	54.1	3.61	157
	1978	3.9	60.3	3.23	152

Source: Housing Survey of Japan, Bureau of Statistics, Prime Minister's Office, 1978

has been substantial inflation of land since 1980 and even at \$142 736 U.S. the lot may well be 90 minutes from downtown Tokyo.

Home building in Japan, unlike North America, does not rely on new subdivisions for the supply of lots. There is the initial difficulty in obtaining land for development and this is further compounded by the difficulty in converting productive agricultural land to urban use, the extremely high price of any land, the financial burden of servicing new land and the caution of local public bodies to accept new development and the associated costs. As a result, some 85% of new single family homes in urban areas are constructed on scattered infill lots and 80% of these are owner occupied sites. Home builders are most hesitant to inventory land or serviced lots and, therefore, speculative housing is minimal.

2.5 Patterns of Residential Investment

In comparing elasticity of residential investment as a function of household income, house price and mortgage interest rates between Japan and the United States, the elasticity of residential investment in the U.S. is higher on all counts. This suggests that the U.S. housing market is more sensitive to changing conditions of the economy and this may be attributed to the following factors:

- a. with the per capita housing stock of the United States being considerably higher than that of Japan, the priority of the house as a basic necessity is assumed to be lower for Americans than it is for Japanese;

- b. given the previously high rate of inflation in North America, homeownership appeals to Americans more as an investment to hedge against inflation rather than as a means to satisfy a housing need per se;
- c. sales of housing in the U.S. have become increasingly sensitive to the erratic movement of mortgage interest rates; and
- d. the ratio of house prices (including land cost) to the average income is lower in the U.S.

In Japan, the ratio of house prices (commercially supplied units plus land - 1979) to the average income (per household disposable income) is 16.0. This compares with the ratio of 10.3 in the United States (1979). On the other hand, the ratio of housing loans to the purchase price of a housing unit is higher in the United States (73.9%) than in Japan (60.4%), while the ratio of income to the housing loan is higher in Japan (9.7 times) than in the United States (7.4 times). Since the ceiling amount of housing loans is determined on the basis of the ratio of annual repayments to income, the elasticity of interest rates to the amount of loans is relatively low in Japan.

Although sensitivity of residential investment to changing economic conditions is lower in Japan than in the U.S., over the long and medium run this is expected to rise. The qualitative level of the housing stock has risen and the ratio of debt financing of residential construction has increased, both of which will contribute to increased elasticity in residential investment.

There are also significant differences in the behaviour of residential investment in Japan versus the United States and Canada. The differences only began to emerge in the 1970's but will have longer term effects. One difference is the pattern of increase in the number of households. As households in Japan formed in the late 1960's and advanced in age to a generation requiring -- and financially capable of acquiring -- their own home, they helped bring about a boom in the construction of owner-occupied and supplied housing units in the second half of the 1970's. Judging from the present composition of the population, the number of household formations is likely to level off or decline.

On the other hand, the reverse seems to be true in the U.S. where marriages were on the increase toward the end of the 1970's. This explains the recent increase in residential construction in the 1980's, and given the current composition of the population, the potential demand for single family housing is expected to remain strong for some time to come in the U.S.

Both countries have exhibited an increasing consumer preference for owner-occupied housing. In Japan, the demand may be divided into two categories; those households living in rental units wanting to buy an owner-occupied house and those households already living in an owner-occupied house but wanting to rebuild the existing unit or take the sale proceeds and purchase a unit in another location. Over the medium and long run, the number of households in rental units planning to purchase has remained vir-

tually unchanged. However, as the ratio of owner-occupied housing has increased there has been a corresponding drop in the ratio of non-owner-occupied housing. This, in turn, implies a relative increase in the ratio of renters planning to acquire a new owner-occupied unit.

Over the long run, residential investment in Japan will enter a stage where there is no longer a prospect of a rapid upsurge in building activity such as was witnessed during the period of rapid economic expansion of the early 1970's, if only because of a slowdown in the growth of population and household formation. However, given the increasing age of the existing housing stock, demand for rebuilding is projected to grow in a cyclical pattern. Factors conducive to a steady rate of residential investment are appearing, including a settling down of residential construction costs, a slowdown in the rise of land prices and improvement in real household income. In addition, stabilization of interest rates should also have a positive effect.

2.6 Financing the New Home Purchase

It is evident that publicly financed house sales have gradually increased their share of new housing construction starts over the decades. This was caused mainly by the increase in construction of new houses financed by the Housing Loan Corporation (HLC). This trend has become even more visible since 1978 when increased financing by this public corporation was introduced as a measure to stimulate the economy. From 1972 through 1983, the

percentage of publicly financed housing has increased from 28.7% to 50.3% of total starts.

Public funding to increase housing supply can be divided into two categories: first, by direct public undertakings such as the construction of public housing supplied by the Housing and Urban Development Corporation; and second, indirectly through financial assistance to the prospective occupant. The latter includes owner-occupied houses financed by the Housing Loan Corporation and other public organizations. The number of owner-occupied houses financed by the HLC on which construction was started in 1982 reached 340 000. This represents more than half of all owner-occupied houses started in that year. Houses for sale by the Housing and Urban Development Corporation and the Local Housing Supply Corporation also encourage an increase in owner-occupied houses.

The Housing and Urban Development Corporation was established in 1981 as a result of a merger of the Japan Housing Corporation and the Housing Land Development Corporation. The Corporation started to construct houses in 1955 and through fiscal 1982 had supplied 430 000 houses for sale. For example, the Corporation planned to construct 15 000 houses for sale in 1982. These houses are eligible for long-term repayment schemes involving monthly payments on the principal and interest amortized over a period of 35 years. In this case, the term of the loan is for an initial 10 years at 5.5% for a value equivalent to 50 m² or less of the total housing unit floor area. The remaining area is funded for the same term at a rate equivalent to the interest

rate on the borrowings from the Treasury Loans and Investments Program Funds. This same rate also applies for the remaining 25 years of the Corporation's long-term special housing loan.

The Housing Loan Corporation was established in 1950 in response to the severe shortage of houses. It was intended to extend long-term, low interest housing loans which banks and other institutions were reluctant to provide (Figure 2.6.1). The long-term, low interest loans were to be coordinated with private housing loans to facilitate self-assisted acquisition of houses and promote improvement in overall housing quality. For the construction of private detached housing by individuals in 1982, the HLC maximum loan was 6.2 million yen (\$24 895 U.S.) for up to 110 m² and 6.5 million yen (\$26 099 U.S.) for between 110 m² and 165 m² (U.S.\$ = 249.05 yen). The maximum loan for land was 5.0 million yen (\$20 076 U.S.). For units built by local housing supply corporations for sale the loan amount was 80% of the total construction cost with a maximum size of 165 m². In both cases, houses built by individuals and houses built for sale by local housing supply corporations, the interest rate was 5.5% for houses less than 110 m² and 6.5% for 110-135 m²; 7.3% for units 135-165 m² or for those with an income per year of more than 10 million yen (\$40 152 U.S.). In each case, the rate went up to 7.3% after 11 years. Amortization was 25 years for wooden houses, 30 years for semi-durable construction and 35 years for fireproof construction. Principal and interest were required in the repayment schedule and at the end of 10 years there was the option of "stepping" up and/or taking over the loan privately.

Figure 2.6.1

Outline of the Housing Loan Corporation's Housing Loans

(for private individual's housing, rental housing and improvement of housing)

Types of loans		Objects for which loans are to be made	Loan limits/covered by loan		Interest rates	Term of repayment	Method of repayment
Private individual's housing	Construction	House built by individuals	Construction cost		Less than 110m ² 5.5% (7.3%)	Wooden within 25 yrs.	Principal and interests equally (optional: "step" repayment and/or take-over of loans.)
			Less than 110m ² 16.7 million		110 - 135m ² 6.5% (7.3%)		
	For purchase	Over-occupied housing	More than 110m ² but less than 165m ²	16.5 mil.	135-165m ² or for those with income per year of more than ¥10 million 7.3%	Semi-durable w/l 30 yrs.	
			Cost of land	¥5.0 mil.	Funds to build units to be parcelled out (sold)	Fire-proof w/l 35 yrs.	
			Units built by local housing supply corp.	Less than 165m ² --- 80% of total construction cost	Public housing corp. 5.5% (7.3%)		
			Units built by private developers with approval by Housing Loan Corp.	Less than 110m ² ¥11.7 mil. From 110 - 165m ² ¥12.7 mil.	Private 8.5%		
			Units to be sold by private developers in 3 metropolitan areas, etc.	Less than 110m ² ¥11.7 mil. From 110 - 135m ² ¥11.8 mil.	Less than 110m ² 5.5% (7.3%) 110 - 135m ² 6.5% (7.3%)	Fire-proof w/l 35 yrs.	
Rental housing	Ready-built houses for sale	Housing development of less than ten units (ready-built houses)	Less than 110m ² ¥10.1 mil. 110 - 135m ² ¥10.7 mil.		For those with income per year of more than 10 million yen, 7.3%	Wooden within 25 yrs. Semi-durable within 30 yrs. Fire-proof w/l 35 yrs.	
	Pre-existing houses	Pre-existing houses in 3 metropolitan areas, etc.	Less than 135m ² ¥7.9 mil.		Less than 135m ² 6.5% (7.3%) For those with income per year of more than 10 million yen, 7.3%	w/l 20 yrs.	
							Principal and interests equally
Improvement of housing	Local housing supply corp.	Rental units supplied by local housing supply corp.	80% of total construction cost		Less than 120m ² 5.5%	Semi-durable within 30 yrs. Low-rise fire-proof w/l 35 yrs. Medium and high-rise fire-proof w/l 50 yrs.	Principal and interests equally
	Rental units with land as collateral	Medium and high-rise rental units provided by individuals, etc.	70-85% of the total construction cost		Less than 120m ² general 5.5% (7.3%) Special 4.5%	Fire-proof w/l 35 yrs.	
	Model rental housing	Low-rise rental units in specific areas provided by individuals, etc.	80% of the total construction cost		Less than 120m ² 5.5% (7.3%)	Semi-durable w/l 30 yrs. Fire-proof w/l 35 yrs.	
Improvement of housing		Extensions, renovation or improvements of houses, etc.	80% of the cost or ¥3.5 mil.		5.5%	w/l 10 yrs.	Principal and interests equally (optional: can take over of loans)

Notes: Interest rates in () are rates after 11 years if this step-interest method is used.

(From Oct. 1981, detached wooden houses was included.)

Source: OECD Report, 1984 (unpublished)

More recently the HLC has set upper limits on the housing unit floor space and the value for which a house for sale is purchased. The Corporation has also employed an interest rate differential to be applied to loans depending upon income, size of house, etc. The HLC is currently involved in about 40% of all annual housing construction in Japan.

Private financing is available from various financial institutions including banks, mutual banks, credit unions and agricultural cooperative associations. Financial companies specializing in housing finance first appeared in Japan in 1971. Conditions of loans vary by institution. For example, city banks offer housing loans with the longest term (20 years), an interest rate of 8.10% and an annual repayment amount falling within 30-40% of the gross annual income. The size of the loan is restricted to 80% of value.

Government also promotes a savings incentive system and a special tax incentive system for housing that has no North American counterparts. Interest on a housing loan, unlike in the U.S.A. but similar to Canada, is not a tax deductible expense.

There are two kinds of savings systems. In one system, a person can receive a special public housing loan if a certain amount of money has been saved, i.e., The Worker's Property Accumulation Savings System and the Housing Deposit in the Postal Savings System. In the other system, a person is given priority when purchasing a house being sold by a public corporation, i.e., the Housing and Housing Lot Bond System of the HLC, the Acquisi-

tion of Housing for Sale by Reserve Fund System of the Local Housing Supply Corporation and the Special Housing Bond System of the Housing and Urban Development Corporation.

Companies and businesses may also extend housing loans to their employees at reduced rates of 4% to 5% and these also fall under a provision of the special tax system on housing. The tax system offers various reduction and deduction measures applied to income tax, corporate tax, registration and license taxes, as well as local taxes (Figure 2.6.2). These incentives are to facilitate the acquisition of good quality owner-occupied housing and, together with other financial systems for housing, the tax system is a key factor in Japanese housing policy. [4]

2.7 The Home Building Industry

In spite of major government involvement in the construction of housing in Japan that can trace its lineage back to the temporary emergency houses of the war-ravaged cities immediately after the Second World War, the private sector has remained the dominant force in housing supply and government has never diminished its resolve to strengthen the role of the industry. However, it was only in the late 1950's, after the economy had recovered from the confusion of the prior decade and future growth in the economy was imminent, that the importance of modernizing housing production within the private sector was fully recognized. The background to the subsequent changes within the

[4] OECD Report, 1984, unpublished.

Outline of Special Measures of Tax System for
Owner-occupied and Rental Houses

Types of taxes	Special measures	Owner-occupied houses	Rental houses
Registration and license tax	Reduction of tax for ownership preservation registration for new houses	o	
	Reduction of tax for ownership preservation or transfer registration for new houses	o	
	Reduction of tax for establishing and registering collateral rights related to housing loans	o	
	Tax reduction for transfer registration of ownership rights of pre-existing houses	o	
	Reduction of tax for establishing and registering collateral rights related to loans for pre-existing houses	o	
Real estate acquisition tax	Special precedents and regulations on tax levels regarding new homes and newly acquired pre-existing houses	o	o
	Tax reduction on land used for new houses and pre-existing houses	o	o
Income tax	Exemption for house acquisition	o	
	Special precedents and regulations on loans at low interest rates provided by employers for their employees	o	
Income tax, corporate tax	Increased (or accelerated) repayments for newly built rental homes		o
Fixed property tax	Special precedents/regulations on tax levels regarding residential land (land intended for housing)	o	o
	Tax reduction for new houses	o	o
Income tax	Special tax deduction on transfer income of residential properties	o	
	Special precedents/regulations regarding tax for buying one house and selling another	o	
	Special tax precedents/regulations regarding buying land for construction of medium- and high-rise fire-proof apartments, in a pre-existing urban area, etc.	o	o

housing industry may be viewed from both the demand and the supply side.

The traditional Japanese house and the trades associated with its construction have important historical as well as cultural roots that are every bit as influential today in shaping housing policy as are those factors promoting modernizing of this industry. The traditional open-style construction may give way to the closed style of housing indicative of western countries but government and labour are not about to forfeit centuries of building skills that have honed carpentry to a fine art and refined post and beam construction to the level of cabinet making. It must be remembered that while prefabricated housing is enjoying recent success in expanding from 10% to 15% of the total market, some 100 000 small builders continue to enjoy a major portion of the remaining 85%, many of whom, like their North American counterparts, are building four or five units per year.

On the demand side, the desire for better housing grew with the economic recovery through the 1960's and 1970's and increasing stabilization through economic security began to aggregate demand in new markets. Furthermore, these new markets reflected demographic changes as the population continued to concentrate in urban areas and household size decreased. There was evident demand, both qualitative and quantitative, for housing in urban areas. But the traditional home tradesman did not necessarily follow this migration to the urban areas since his product was ill-suited to the dense and constricted conditions of the city. Wooden houses are a fire problem and the open style of design

which places emphasis on controlling the severe heat and humidity of summer weather can not cope with the severity of other environmental conditions within cities.

On the supply side, technical innovations led to the mass production of new materials and the development of new construction methods of which much was expected. These new materials and methods could cope better with earthquake and fire problems, offer increased quality control, diminish reliance on wood imports, lower costs and offer new amenities within the home. These innovations in turn led to changes in the structure of industry and employment patterns. The immediate consequence was severe shortages of skilled labour in the housing industry amidst fast growing markets for its products and a startling increase in annual housing starts. This was not a situation that the traditional house builder could cope with, neither now nor in the foreseeable future.

These factors led government to examine housing supply and their own posture with respect to the housing industry and its future capability. The initial focus was upon building materials and components and the introduction of production procedures to increase the proportion of labour in the factory, versus on-site, and improvements in the productivity of these procedures to increase quantity and quality at lower cost. This was seen as an opportunity to promote modernization and rationalization of housing production generally and led to the technical development and sales of prefabricated houses by private enterprise by the early 1960's. Efforts by the private sector were complemented by

actions in publicly managed housing to promote economies of scale through standardization and mass production of parts. These efforts included systematized designs and uniform standards as well as a standard parts system. This movement to industrialization was given further impetus by preferential financing to private enterprise by both the Housing Loan Corporation and the Japan Development Bank to promote industrialization of housing production.

Two major problems arose, each of which were to significantly influence consumer acceptance of industrialized housing and could, in the long run, offset any advantages to be gained on the supply side. First, there was an inclination to make public housing the main market of medium-rise industrially produced housing and, of course, these projects were carried out on limited budgets. These early examples were not the best demonstrations of new technology and thus industrialized housing acquired the proverbial stigma. Second, there was a problem with the industrial production of detached houses by private enterprise. The ratio of on-site versus factory work tended to increase, not decrease, as a result of attempts to assure high production volumes but meet consumer demands for individuality and diversity. Factory produced products were being hand tailored at the site in the tradition of the conventional house. For these reasons, the success of industrialized housing through the 1970's was not what was hoped for and in spite of industry predictions of a market share of 20-30% the figure fluctuated around 10% right up to 1979.

It became clear by the 1970's that the expectations by both government and industry for industrializing and modernization of housing production were not justified in terms of consumer demands. They had failed to realize that rapid economic growth had upgraded demands for housing beyond mere quantitative sufficiency to higher quality and diversity. Each family now sought their own "home" -- an expression of individual identity and with enough diversity to reflect differing family composition and customs. This level of expectation was not readily achievable, however, as housing cost increases were occasioned by rising labour costs and prices for construction materials. Consumer dissatisfaction was further exacerbated by an insufficiently stable supply of quality housing and the consequent housing deficiency problem. Promotion of industrialized housing production or the so-called prefab housing industry was not enough. It was necessary to promote the modernization and rationalization of the industry as a whole by such means as developing a system that incorporated the total housing supply structure and affording adequate consumer choice. This realization led to a whole host of policies and programs starting in the early 1970's to promote technical developments in everything from parts to production organizations; to introduce various types of authorization and certification systems; to create facilities for the education and training of construction engineers; and to establish various public service corporations to effect these measures.

The effectiveness of even these changes were brought into question by the end of the 1970's and it was further recognized that policies which promote industrial production of housing, while effective for large-scale concentrated demand like that for public housing, were not sufficiently effective for the rationalization and modernization of housing production to meet the general demand for housing which is individualized and scattered. Even today more than half of housing construction is done by small-scale businesses, i.e., carpenters and building contractors, using traditional Japanese construction methods and time honored distribution processes.

Deficiencies in the supply system were attributed to such factors as low technical standards, an insufficient labour force and the unsystematic adoption of new materials and parts. Thus, simple mass production and an expanded role for prefabricated housing were not enough to meet this strengthened demand for individualized housing on scattered urban sites. New technologies to meet real versus perceived demands was required, the labour force who will use these technologies needed *to be trained* and the social, economic and organizational environments to support these technologies was required. Rationalization of the industry had to account for new technologies which could be used with an individualized and scattered demand and by small business enterprises such as local contractors.

Such measures are now being reflected in a number of new programs including introduction of 2 x 4 construction (certified in 1979) and rationalization of traditional wood frame housing. The introduction of 2 x 4 construction is not a technical development as such; rather it is the adoption of the North American wood frame system as one means of modernizing conventional wood frame construction. Since its introduction and subsequent certification in 1979, 2 x 4 construction has enjoyed a steady growth, increasing some 10-15% per year. In 1983, 18 300 detached units were constructed utilizing 2 x 4 platform construction for a 1.7% market share. Its importance is perhaps underscored by the interests of Mitsui and Mitsubishi, perhaps the two most prominent names in Japanese industry, who have launched exclusively into 2 x 4 residential construction.

In the midst of modernization and industrialization on the supply side and diversification and individualization on the demand side, the desire of many Japanese for traditional wood frame construction housing remains strong. For this reason, technical development to rationalize traditional wood frame housing and to promote research and training institutes for carpenters and building contractors is as high a priority with government as the prefab housing industry. Whereas housing is definitely not the priority of government that it was in the 1960's and 1970's, preservation of traditional wood frame construction is a key government objective for a host of political reasons. Accordingly, new policy measures could well be taken in

the later part of the 1980's, if the recent growth in the market share of prefab housing and 2 x 4 construction, the two competitors, were to seriously threaten long term viability of the traditional home builder.

CHAPTER THREE GOVERNMENT POSTURE IN HOUSING

3.1 Five Year Housing Programs

Modern housing policy in Japan originates with "The Housing Construction Program Law" enacted in June 1966. This Law specified that the Minister of Construction draw up a five year housing construction program starting in fiscal 1966, based on a report submitted by the Housing and Building Land Council. The plan must be approved by the national Cabinet.

The Law specified that goals for all types of houses including entirely private funded and owned houses be set for the nation as a whole. Each prefecture must also draw up its own supplement to the national five-year program to reflect local conditions and special housing requirements. Since the Law's inception, four five-year programs have been implemented (Table 3.1.1). The first-five year program, between 1966 and 1970, provided 6.74 million houses in order to achieve the stated goal of "one house per household". The general goal of the second five-year program, 1971-1975, was to construct houses with "one room per person" and 8.28 million houses were built. In the third five-year program, 1976-1980, two important housing standards were established: the "minimum housing standards" (Table 3.1.2) and the "average housing standards" (Table 3.1.3). The program set about to enable every citizen to secure for themselves the minimum housing standards within ten years, or by 1985. At least half of the Japanese households were to achieve the minimum

Table 3.1.1

Comparison of the Four 5-Year Programs (from OECD Report, 1984, unpublished)

	1st Program FY 1966-70	2nd Program FY 1971-74	3rd Program FY 1976-80	4th Program FY 1981-85
Overall Direction	1) Solutions to existing housing problems, particularly living-space problem. 2) Meet new demand caused by urban migration and rapid economic growth.	1) Continue to eliminate living-space problem. 2) Meet demand caused by post-war "baby boom".	1) Upgrade housing quality from a long-range perspective.	1) Continue to upgrade quality. 2) Meet need of post-war "baby boom" for owner-occupied homes.
Goals	Solve living-space problem. "One house per household."	Solve living-space problem. "One room per person."	"Minimum housing standards" to be secured for every person by 1985. (3.1.2) Half of households below standards to be eliminated. "Average housing standards" to be secured for every average household by 1985. (3.1.3)	Continue with minimum and average housing standards. "Residential Environmental Standards."
Total Units to be Constructed (1000)				
Forecast Total	6700	9576	8600	7700
Publicly Financed	2700 (40.3)	3838 (40.0)	3500 (40.7)	3500 (45.5)
Actual Total	6739.3	8280	7697.5	
Publicly Financed	2565.3 (38.1)	3108 (37.5)	3648.5 (47.4)	

Table 3.1.2

Minimum Housing Standards

Number of household members	Rooms composing the dwelling unit	Floor space of dwelling rooms	Net floor space per dwelling	Gross floor space per dwelling (including space for common use, etc)
1	1 K	7.5m ² (4.5 <i>tatami</i>)	16 m ²	(21m ²)
2	1 D K	17.5m ² (10.5 <i>tatami</i>)	29 m ²	(36m ²)
3	2 D K	25.0m ² (15.0 <i>tatami</i>)	39 m ²	(47m ²)
4	3 D K	32.5m ² (19.5 <i>tatami</i>)	50 m ²	(59m ²)
5	3 D K	37.5m ² (22.5 <i>tatami</i>)	56 m ²	(65m ²)
6	4 D K	45.0m ² (27.0 <i>tatami</i>)	66 m ²	(76m ²)
7	5 D K	52.5m ² (31.5 <i>tatami</i>)	76 m ²	(87m ²)

- Notes :
1. "A standard household here refers to a family consisting of the husband, wife and a child or children who sleep separately from other family members. In a family of 5 members or more, however, it is assumed that 2 of the children share one bed room.
 2. "Floor space of dwelling rooms" includes only bedroom or bedrooms and dining room combined with kitchen.
 3. "Net floor space per dwelling" includes bedroom or bedrooms, dining room combined with kitchen, toilet, bathroom, storage room, etc., but does not include the space for common use nor the balcony in an apartment house.
 4. The numeral in the codes in the column of "Rooms composing the dwelling unit" indicates the number of bedrooms, "K" the kitchen, and "DK" the combined dining room-kitchen.
 5. "Gross floor space per dwelling" includes the space for common use in a stair-hall type medium storied house and the space for the balcony. (However, only 1/2 of the balcony space is included.)

Source: Housing in Japan, Housing Bureau, Ministry of Construction, 1980

Table 3.1.3

Average Housing Standards

Number of household members	Rooms composing the dwelling unit	Floor space of dwelling rooms	Net floor space per dwelling	Gross floor space per dwelling (including space for common use, etc)
1	1DK	17.5m ² (10.5 <i>tatami</i>)	29 m ²	(36m ²)
2	1 LDK	33.0m ² (20.0 <i>tatami</i>)	50 m ²	(60m ²)
3	2 LDK	43.5m ² (26.5 <i>tatami</i>)	69 m ²	(81m ²)
4	3 LDK	57.0m ² (34.5 <i>tatami</i>)	86 m ²	(100m ²)
5	4 LDK	64.5m ² (39.0 <i>tatami</i>)	97 m ²	(111m ²)
6	4 LDK	69.5m ² (43.5 <i>tatami</i>)	107 m ²	(122m ²)
7	5 LDK	79.5m ² (48.0 <i>tatami</i>)	116 m ²	(132m ²)

- Notes :
1. "A standard household" here refers to a family consisting of the husband, wife and a child or children who sleep separately from other family members. In a family of 5 members or more, however, it is assumed that 2 of the children share one bed room.
 2. "Floor space of dwelling rooms" includes only bedroom or bedrooms and dining room, kitchen (or combined dining room-kitchen) and a living room.
 3. "Net floor space per dwelling" includes bedroom or bedrooms, dining room, kitchen (or combined dining room-kitchen), toilet, bathroom, storage room, etc., but does not include the space for common use nor the balcony in an apartment house.
 4. The numeral in the codes in the column of "Rooms composing the dwelling unit" indicates the number of bedrooms, "L" the living room, "D" the dining room, "K" the kitchen (in the case of single persons, however "DK" shall indicate a combined dining room-kitchen).
 5. "Gross floor space per dwelling" includes the space for common use in a stair-hall type medium storied house and the space for the balcony. (However, only 1/2 of the balcony space is included.)

Source: Housing in Japan, Housing Bureau, Ministry of Construction, 1980

housing standards by the end of the third five-year program.

The program also sought to secure the average housing standards by 1985 for half of Japanese households and both standards were again included in the fourth five-year program. A total of 7.7 million houses were constructed during the third five-year program, a fall from the projected figure of 8.6 million units.

The fourth five-year program, approved by Cabinet in March 1981, is almost complete and represents not only a continuation of programs started in the third and fourth plans, notably to improve residential standards, but also seeks to stimulate the supply of owner-occupied housing and the overall level of residential construction activity. The fourth program contemplates construction of 7.7 million units of which 5.5 million units or 71.4% will be owner-occupied housing, the remainder being rental units. The public sector will finance 3.5 million of these units, or 45.5%, continuing an almost even split between publicly financed versus privately financed units.

Features of the fourth five-year plan include: increased aid for housing acquisition through an increase in the HLC loan amount; expansion of the eligible floor space for HLC loans; and increased incentives through the tax system. New emphasis is placed upon utilization of existing stock and programs to expand or remodel this stock through essentially the application of the same HLC loan features and tax incentive systems to existing houses. An emphasis is being placed upon increasing housing supply in urban built-up areas to repopulate urban areas and reduce commuting times (this applies principally to medium and high rise

housing) and to upgrade wooden rental houses in these same areas.

Modernization of housing construction is a particular feature of the fourth five-year program and this policy has had a measurable impact on the recent successes of industrialized housing in the 1980's. The following measures were sought by government through various programs and incentives available to the industry:

- a. introduction of factory production methods to increase factory versus on-site labour;
- b. development of new construction methods, such as represented by "House 55"; [5]
- c. introduction of approval systems to recognize excellence in the quality of housing products and houses constructed by factory production methods;
- d. rationalization of traditional wooden house construction;
- e. popularization of the 2 x 4 method of wood frame construction; and
- f. standardization of housing designs.

It became evident to the government during the fourth plan that housing related industries had been put under extremely severe financial hardship due to the downturn in residential construction in the early 1980's. Government realized its immediate task to support these industries and introduce new programs to

[5] See 3.2, Promoting Industrialization in Housing, page 43, for information on House 55.

implement this policy. Problems related to the industry that they sought to redress included:

- a. lowering construction costs through a reduction in material production costs and more efficient distribution systems for housing products;
- b. offering better protection to the house purchaser by supplying more precise information on quality, modernizing the house-related markets, and strengthening the post-sales service system for the consumer;
- c. introducing rigid guidance for the industry to eliminate "defective housing" due to mistakes in design and construction;
- d. promoting measures for the increased restraint in the use of resources and energy including more effective and efficient use of land;
- e. upgrading of the functional aspects of the house in order to meet new demands for increased space, better arrangement of rooms, improved equipment standards, soundproofing and durability and the needs of the aged; and
- f. developing renovation methods as well as reorganization of the housing industry to properly satisfy new demands for extension, rebuilding and remodeling of existing houses.

The Japanese government recognized the necessity to stimulate and improve the capacity of the housing industry, i.e., the supply side, through direct action as a complement to various indirect means to increase demand. The fourth program clearly stated that "in order to secure a stable and smooth supply of good and properly priced houses which meet the needs of people, it is necessary for the government to positively direct and

develop the housing industry as a part of the housing policy of the government." Specific objectives emanating from such a policy provided strong implications to industrialized housing, namely:

[6]

- a. "For producers of factory-made houses and housing parts, standardization of parts and quality of houses is to be further encouraged and thus the rationalization of production is to be made with the use of the approval system on the quality of factory-made houses and good housing parts."
- b. "In order to meet the advanced and diversified needs of people for houses under the new social and economic conditions, it is essential to develop new techniques for the design and construction of houses. It is also necessary to guide and direct the housing-related industry toward the development of these techniques. For this purpose it is important to make guidelines indicating the direction of the development, and guide the industry for the development of high technology which has a large spreading effect and urgency for application, thus raising the living standard and stimulating the housing-related industry."
- c. "It is important to organize a housing-related market and stimulate the housing industry by providing appropriate information on the quality and on the post-sales service system of houses and housing parts for purchasers and residents of houses. For this purpose, approval systems on the quality of housing parts and factory-made houses are to be expanded and strengthened; more precise information is to be provided for consumers; a quality guarantee system to be strengthened and a quality indicating system for medium and high rise apartment buildings to be established. By spreading the guarantee system of the house quality, long-term guarantee systems of houses are to be reorganized; protection of consumers is to be strengthened; and the development of housing-related industries is to be stimulated."

Present housing policy not only addresses new housing but also recognizes the need to maintain, manage and improve existing housing stock. The search for improved housing quality amongst existing stock covers extension, remodelling and renovation along with improvement of the used housing distribution market. Government measures in this regard have furthered the role of industrialized housing producers and include:

- o expansion of loans through the HLC for renovation and remodelling;
- o development of the potential demand for renovation and remodelling through advertising that will inform homeowners of the significance, methods and procedures for upgrading their current homes;
- o training and education of specialists who can serve as renovation consultants to consumers;
- o promote new technologies related to renovation and remodelling, establish a rational system for execution of the work and standardize methods of calculating costs for such work;
- o establish an information supply system for used houses and a consolidation of the market for such houses; and
- o expand public loans for the acquisition of used houses.

3.2 Promoting Industrialization in Housing

No doubt government has played a key role in rationalizing housing production and supply and this has involved two distinctly different Ministries: the Ministry of Construction (MOC) and the Ministry of International Trade and Industry (MITI). Technological advancements in housing production and supply have been promoted by both MOC and MITI through such programs as: [7]

- o "The New House Supply System (House 55) Development Project" was jointly sponsored by MOC and MITI and actually began in the third five year plan, fiscal 1976. "House 55" was designed to supply houses starting in 1980 (or year 55 of the Shawa era) having a total floor space of 100 m² and selling for 5 million yen (1975) or twice the average household income in 1975. The objective was to meet the demand for "good-quality, low-cost housing". The first units reached the market in 1982 and 10 000 units of House 55 were produced by May 1984.
- o "The Technology Development Project of New Materials and Facility Systems for Apartments" started in fiscal 1984.
- o "The Housing project 85" was started in fiscal 1983 to establish a system of production and supply of good-quality, low-cost wooden houses constructed by conventional methods.
- o "The Wooden Housing Promotion Model Project" has been carved out since fiscal 1980 for the purpose of supplying good-quality wooden houses appropriate to the different regions of Japan.
- o "The Project for Promoting the Advancement of Housing Functions", started in fiscal 1980 to guide and promote the development of urgently needed housing-related technologies. For example, a highly durable housing

[7] OECD Report, 1984, unpublished.

system called "The Century Housing System" was developed in this project and promoted through favourable loan conditions from the HLC.

- o "The New Housing Technology Development Project" was also started in fiscal 1980 to promote the development of housing-related technologies.
- o A system called "The Industrialized Housing Performance Approval System" has been implemented since 1973. In this system MOC approves the performance of various types of industrialized houses. About 60 types of houses have been approved thus far.
- o For the same purpose, another system called "The Excellent Housing Parts Approval System" has been implemented since 1974. MOC approves housing components (27 items including kitchen units, hygiene facilities, bath units, aluminum sashes, etc.) which excel in quality, performance, and after-sale service and durability (1200 types of housing parts have been approved thus far).
- o "The Warranted Houses System" aimed at consumer protection, assurance of quality and post-occupancy service through special long-term warranty is now being introduced throughout the country.
- o "The Performance Specification System", a new system stipulating performance standards for condominiums is now being studied.
- o "The Acknowledgement System of Factories with Good Quality Control for Prefabricated Houses and Other Articles" was started by MITI in fiscal 1972. In this case, MITI approves the factories with good quality control systems and 73 factories have been approved thus far.

Three projects are now underway to encourage energy conservation in housing: [8]

- o "The Development of Energy-Efficient Housing Systems", a comprehensive technological development project for research and development of housing structures and facilities that exhibit energy conservation.
- o "The Development of Passive Systems for Energy Conservation", based on the use of solar heat.
- o "The Development of Energy-Efficient Multi-dwelling-House-Design Plan System" is presently underway to implement comprehensive energy conservation measures in multi-dwelling houses.

[8] OECD Report, 1984, unpublished.

3.3 Ministry of Construction (MOC)

The Ministry of Construction (MOC) covers a vast territory, of which housing is only one part. It has a hand in almost every sector and location in the country where construction is involved. MOC's budget accounts for 68% of the national budget for total public works and 39% of its budget is allocated to housing. Responsibilities range from administration of the land and housing supply, urban planning functions, river, road, government building administration through to supervision of the construction industry and promotion of international cooperation through provision of technical and financial aid. A key role is its responsibility for preparing the Five-Year Housing Construction Program, as well as exercising supervision over such public authorities as the Housing and Urban Development Corporation and Local Housing Supply Public Corporations. It also enforces the necessary regulations in controlling private real estate agents and building contractors. Auxiliary organs include the Building Research Institute, the Construction College and various Building Councils and Construction Bureaus.

The omniscience in all facets of the construction industry in Japan has not only provided MOC with a comprehensive view of the housing industry, both from a demand and supply perspective, but has allowed it to forge strong bonds with industry and move into programs in direct support of industry initiatives. That is not to say, however, that such bodies always work in close har-

mony toward a single, well understood objective. Neither do the Japanese believe in bureaucratic miracles.

It is the centralization of the responsibility to formulate housing policy and the means and resources to implement such policy through an omnibus agency such as MOC that distinguishes the Japanese style of government intervention from its western counterparts. In comparison, both Canada and the United States must deal with a host of fragmented ministries, departments, agencies and quasi-public corporations when dealing with the housing problem and our governments would be alarmed at the vesting of such powers within a single body, irrespective of their political adversity to specifying national policy programs with a five year life span.

3.4 Ministry of International Trade and Industry (MITI)

Any focus on economic direction and control in Japan will be upon the Ministry of Finance and the Ministry of International Trade and Industry. Finance is the budget-making agency; it has extensive powers over macroeconomic policy, and it is the coordinating ministry for those other agencies with economic responsibility. It shares with MITI numerous responsibilities for microeconomic policy and many of the major instruments of economic decision-making are lodged in part, or in whole, in these two ministries. The other ministries and agencies are charged with administering economic policy as is the case with the Ministry of Construction.

The role of MITI in guiding Japan's economic and industrial growth, particularly over the past several decades, is now legendary. The mystique of MITI has been debated in numerous books and it is clear that the United States, for example, could never have a comparable agency freed from the constraints imposed by Congress, the courts and special interest groups. MITI is one of those comparatively rare service institutions that has achieved effectiveness in whatever it does and not just in implemented "programs". The housing industry, as with almost every other industrial sector, has not escaped its influence and MITI's role in improving the quality and effectiveness of housing production in Japan has no equivalent in any other advanced industrial democracy.

The key characteristics of MITI are its small size (the smallest of any of the economic ministries), its indirect control of government funds (thereby freeing it of subservience to the Finance Ministry's Bureau of the Budget), its "think tank" functions, its vertical bureaus for the implementation of industrial policy at the micro level, and its internal democracy. To find comparable achievements by governmental bureaucracies in other nations, one would have to look to cases like the wartime Manhattan Project in the U.S. or to NASA's achievements in sending a manned craft to the moon. Therefore, it is not surprising to discover that Japan's industrialized housing success has a great deal to do with MITI, or vice versa, since MITI first entered the housing field in 1969.

It was some 15 years ago, when the U.S. was beginning to recognize the demise of Operation Breakthrough, that [9] MITI established a small section with responsibility for the housing industry. Prior to this date it had conducted policy on housing related industries in a fragmented fashion, looking at bathroom fixtures, new materials or housing components. This new division was prompted by the dramatic increase in housing starts throughout the 1960's and the expectations of even greater growth of housing demand in the 1970's. (The peak in residential starts occurred in 1972.) It was obvious to government that the existing housing industry, comprised of fragmented building trades and a preponderance of small companies could not meet the escalating demand, if it should continue.

MITI's response was to apply industrial methods to housing production. It was decided that the housing industry, or at least a segment of the industry, should follow in the footsteps of the automobile and electronics industries. This was the necessary impetus to secure for government a direct role in promoting industrialized housing and the application of new technologies to improve overall housing quality. The first evidence of MITI's involvement was "The Acknowledgement System of Factories with Good Quality Control for Prefabricated Houses and other Articles", started in fiscal 1972 (1971).

[9] See 6.1, A Paradigm for Success, page 133 for information on Operation Breakthrough.

This was followed shortly thereafter by a joint effort of MITI and MOC to promote a lower cost house through the advancement of new technologies. The results of "The New House Supply System (House 55) Development Project" launched in fiscal 1976 (1975) represented the first comprehensive technological development policy in housing production in Japan. Following House 55, MITI launched its own housing research projects, independent of MOC, and in 1980 embarked on a five year program of research and development in five areas:

- a. a basement system for detached houses in response to the land cost problem and as a means of achieving greater gross floor area on a restricted lot size;
- b. facilities to increase the mobility and functioning of the handicapped and elderly in the home in response to the aging of the population;
- c. systems of passive solar energy to reduce dependency on fossil fuels in response to the oil shocks that had threatened the Japanese economy in the 1970's;
- d. the expandable house based on a concept of adaptability that could accommodate changing family composition and living styles; and
- e. chemical treatment of wood to increase durability and longevity in response to the distinct preference of Japanese house purchasers for wood construction.

These projects are scheduled for completion in 1985 and the first evaluation of the results is contemplated in March 1986. The second set of research topics is now underway with the emphasis on new technical developments that could redress a number of problems with existing buildings, particularly problems with the large apartment blocks or "mansions" built in the 1960's and 1970's that now exhibit severe structural deterioration as well as the commonly expressed environmental problems. The following projects were started in 1984:

1. systems and devices to examine the present structural integrity of high rise buildings without damaging the structure. This is in response to perceived problems of durability in these buildings and the differential rates of deterioration among various building components that is making rehabilitation efforts difficult and costly;
2. new insulation materials to prevent moisture problems and noise transmission problems in these buildings;
3. efficient use of water involving the separation of potable water from "grey water systems" and the recycling of the latter in large apartment blocks; and
4. efficient generation of energy, particularly from sunlight through development of a fuel cell. This project is being carried out in cooperation with Energy and Natural Resources.

This is research promoted and funded by government but carried out by industry. Government's role in funding research in Japan is still far below that found in western nations and, in fact, the percentage financed by public funds is the lowest of

any large industrial country in the world. The lack of expenditures in military research may well account for this figure but, on the other hand, it may give evidence of the quality and direct applicability of Japan's research and development in comparison to countries with substantial military research spending. In 1982, 23.6% of Japan's research was publicly funded and total research expenditures represented 2.78% of National Income. Government funding of research was double this figure in the United States, 46.7%, and total research expenditures were 2.86% of National Income.

While the centralization of powers in both MOC and MITI may be unique to Japan, coordination among public agencies and government ministries in Japan is no less difficult than in our own countries. It is clear that the experience with House 55 did little to forge a close working relationship between MOC and MITI and it now appears each would prefer to go their own way in subsequent research endeavours. Loyalties within each ministry often lead to sectionalism of perhaps a more rigid kind than normally found within western bureaucracies and there is evidence of not only competing claims and interests among these two ministries but a jealous guarding of their respective prerogatives in the housing field.

3.5 Japan Development Bank (JDB)

Government support for housing producers can be seen in the level of funding provided by the Japan Development Bank for equipment and factory loans (Table 3.5.1). This Bank's loan program to the housing industry started in 1968 (the JDB was incorporated in 1951). The loan program was in response to the need for new equipment and machinery to meet the forecasted demand in the first five-year program (fiscal 1966) and was not restricted to prefabricated companies. The heavy demand as evidenced by residential construction starts in the late 1960's and early 1970's seemed to justify the loans. In turn, government was pleased with its new initiatives in support of the housing industry and the Japan Development Bank continued to act accordingly.

In the period 1968-69 actual loans for equipment and machinery to the prefabricated housing industry were 370 billion yen. There was a dramatic increase in the period 1970-72 to 5 480 billion yen and this was matched again in 1973-75 with 5 390 billion yen. For the periods 1976-78, 1979-81 and 1982-84, loan amounts rose and then fell substantially to 470 million, 590 million and 500 million, respectively. Total loans from the JDB to the prefabricated industry totalled 12 800 billion yen from 1968 through 1984.

After 1975, the reduction in loan amounts reflected, in part, the first oil shock but to some extent the slowdown in starts was inevitable; demand could not justify the continued high rate of funding through the 1970's and 80's. Loans made in the early 1970's may have been sufficient to provide an appropriate capacity for the prefabricated industry and this capacity, even

Table 3.5.1

Loans by the Japan Development Bank (billion Yen)¹

	1968-69	1970-72	1973-75	1976-78	1979-81	1982-85	Total
Concrete prefab	370	3,880	1,720	200	0	0	6,170
Wood prefab	0	180	640	0	0	0	820
Steel prefab	0	1,420	3,030	270	590	500	5,810
Totals	370	5,480	5,390	470	590	500	12,800

1. For plant and equipment to prefab housing companies.

Source: Japan Development Bank, 1984

today, may be sufficient to meet future demand.

3.6 Current Posture on Housing

Housing problems in Japan today do not receive the high profile that they once enjoyed in the 1960's and 1970's and the government's housing budget has been decreasing both in real value and as a percentage share of total government expenditures. Annual housing starts are well within the production capacity of the housing industry and if any action by government is required, it will likely be to stimulate demand as annual housing starts show a possibility of further decline.

There is a shift in government housing policy away from the house per se toward problems associated with the environmental setting for the house and specifically the perceived deterioration of living environments within the metropolitan regions. There is a genuine concern that, if the present situation continues to be aggravated, these urban districts will lose their attractiveness as residential environments and cause an accelerated migration to new outlying areas with attendant costs of roads, sewers and services. Programs are being launched for the comprehensive improvement of specific residential areas by local governments and incentives are being offered to the private sector to increase both the supply and quality of housing in these inner areas. These programs are being combined with a major emphasis on the reuse of existing housing stock of all types and replenishing of deteriorated housing stock.

New technical developments are being focused on problems with the massive residential apartment blocks or "danchi" that were built as government sponsored rental housing on the periphery of metropolitan centers. Although these buildings are not old, they have not aged well and solutions to technical failures, as well as upgrading of the environmental quality of these complexes, will be a key focus of government and, in particular, the research programs under the auspices of MITI.

CHAPTER FOUR INDUSTRIALIZATION IN THE HOUSING INDUSTRY

4.1 Prefabricated Housing in Japan

Industrialized housing in Japan is referred to as "prefabricated housing" or, more commonly, "prefab housing". The term is somewhat broad and covers all components manufactured in a factory for on-site assembly including the structural members of wood framed houses, reinforced concrete and concrete block reinforced structures, steel frame structures and reinforced concrete and steel frame concrete structures. The term "prefab housing" in the single detached field is used to distinguish factory built housing from traditional on-site Japanese wood construction and 2 x 4 construction. The term "prefab" now applies to some 15% of total housing starts.

Prefabricated houses have a long tradition in Japan and although the idea was first introduced in Europe, there is a record of experimentation in Japan dating back some 50 years. In 1919, materials using precast concrete were exhibited in the Ueno Peace Exposition. It was not until after the war, when faced with the formidable task of rebuilding Japan, that prefabrication became a serious endeavour. In 1946, a wood panel assembly house was put on the market (Premose) and 1000 units were constructed that same year. In 1948, Nihon Precon started the construction of public houses with precast concrete components and this was followed in 1953 with the production of aluminum window sash. Interest continued to flourish both within industry and within

government. As with so many of Japan's industrial accomplishments, government had a direct and continuous hand in promoting prefab housing, dating as far back as the earliest attempts to get established.

It took only until 1955 for Japan to recover its prewar industrial production levels and perhaps this rapid rate of recovery should have been a portent of things to come. Certainly the demands of the Korean War accelerated this process and the rate of recovery provided industry and government alike with a new found confidence with which to confront the high growth period that lay ahead. In 1955, ten million tons of crude steel were produced and light weight steel frames came on the market for housing application for the first time. In the same year, the Japan Housing Corporation was established and became the client for widespread use of the tilt-up method for large precast concrete panels developed jointly by the Construction Research Center of the Ministry of Construction and Taisei Construction, a private firm. This method was used for public housing under the sponsorship of the Japan Housing Corporation and was given further impetus from favourable loan programs offered through the Housing Loan Corporation.

In 1955, Daiwa House Industrial was established and produced a small pipe-frame unit for outdoor storage. This was followed in 1959 with a small house called the "Mizet" manufactured from light gauge steel that could be added to the rear of the existing house as a study room for children or an extension for the grandparents. Other companies soon followed including Sekisui,

Matsushita Denko (National), Yawata Ekon, and NK Prefab. These companies also relied on relatively low cost light gauge steel produced by such companies as Yawata Seitetsu and Nippon Kokan to develop steel-type prefabricated houses.

In 1962, a lumber company developed and put on sale a prefabricated house with modular wooden panels under the name "Misawa Homes". One year later, in 1963, the Japan Prefabricated Construction Supplies and Manufacturers Association was founded by manufacturers of prefabricated houses and construction materials. Founding membership included 38 regular members (manufacturers) and 26 associated companies (suppliers).

Strong policy guidance for the prefab industry in its formative years came from the Ministry of Construction through three major instruments:

1. the Housing Loan Corporation established in 1950 to provide long-term low-interest loans from the national treasury at a time when housing construction was in a state of decline due to lack of private loans;
2. the Publicly Operated Housing Law which was enacted in 1951 provided subsidies by the national government to local public bodies and public corporations for the construction of low cost rental accommodation; and
3. the Japan Housing Corporation established in 1955 to meet the extensive demand for housing within the metropolitan areas. This Corporation was later combined with the Housing Land Development Corporation in 1981 and renamed "The Housing and Urban Development Corporation".

This government support was first directed at increasing the overall housing supply and not just through prefab housing. But it became readily apparent that required annual production rates could not be achieved by traditional building methods and prefabrication was sought as a means to increase these levels. However, consumer resistance to prefab was a major barrier due to lack of familiarity with the product and particularly with the quality of prefab construction in comparison to the long established methods of traditional wood construction with its exquisite carpentry. The Housing Loan Corporation went as far as to offer special incentives in the form of increased loan support for the purchase of privately built prefab houses to show open support for the prefab industry.

The rapid rise in housing starts in the late 1960's and early 1970's brought with it numerous new entries into the prefab field and there seemed to be an unfounded rush to construct new factories by firms not previously associated with housing construction. No doubt this was fueled by government policies that reflected a general concern with the ability of the existing housing industry to meet the rate of housing starts that was evident right up to the first oil shock. Many, if not most, of these fledgling companies are now out of business and their remnants absorbed by those who were fortunate to survive.

As one example, a major dairy producer in Japan, flushed with the success of its new yogurt product, ventured into the prefab business in the early 1970's. Success in dairy products

was seen as an opportunity upon which to diversify into housing and cosmetics and a license agreement was entered into for production of a modular unit developed in the United States. The venture failed and the company joined a general retreat from the field of prefab housing. Toyota was also an early entry and has endured although its expectations for diversification into housing in the 1970's were never fully realized. Fearing that the automobile market had matured, the company looked at more promising areas for its manufacturing expertise. After a lengthy period of adjustment Toyota has renewed its push in prefab housing but at a production level far below that of the top-five. The prefab industry today is relatively stable and it is unlikely that new entries will challenge the current survivors and their dominant market shares.

During the high growth period, and in spite of the optimism of government and industry alike, the prefab industry was unable to gain much more than 10% of all housing starts through the 1970's. This was far short of their initial predictions of a 20-30% share by 1978. It was not until the subsidence of direct government support for the industry and the consolidation of the industry in the hands of the top-five companies that the prefab housing industry seems to have flourished (table 4.1.1). What made this success more significant was its coincidence with a reduction in housing starts. In its infancy, during the period 1962-65, prefab housing represented only 2.3% of total starts. This rose to 10.60% in the period 1971-75 but never got above 11% in the last half of the 1970's. However, the next four years

Table 4.1.1

Prefab Production By Unit Type (%)

	1971	1975	1979	1980	1981	1982	1983
Detached	73,130 (53.8)	91,011 (55.5)	87,291 (54.4)	90,275 (59.2)	87,572 (56.3)	96,599 (58.1)	91,303 (52.5)
Low-Rise Apartment	10,941 (8.0)	23,063 (14.1)	44,555 (27.8)	35,942 (23.6)	38,299 (24.6)	43,112 (25.9)	55,688 (32.0)
Middle/High Rise Apt.	51,768 (38.1)	50,055 (30.5)	28,651 (17.8)	25,766 (17.2)	29,570 19.1)	26,637 (16.0)	26,948 (15.5)
Total Production	135,857	164,052	160,497	152,433	155,441	166,348	173,939 (100.00)
Market Share (%)	8.4	10.9	10.75	12.6	13.6	14.4	15.3

Source: Building Center of Japan, 1984

were critical growth years that perhaps signified a new trend. The market share for prefab housing stood at 15.3% in 1983, 173 939 starts of a total of 1 134 867. Some industry projections see this increasing up to 30% in the next decade.

4.2 Current Status of the Industry

The prefab housing industry in Japan is dominated by a handful of companies to an extent that is seldom found in industrial sectors outside of the automobile industry. Major success in the industry now rests with just five producers. In 1983 these five companies accounted for 80.5% of all prefab starts in detached housing units (73 485 starts) and the top ten prefab companies garnered 93.7% of detached prefab starts (85 536 starts) (Table 4.2.1). In direct contrast to the traditional home building industry which has some 100 000 contracting companies building homes, prefab housing construction seems to be a segment where only a few very big companies can survive. This concentration in the hands of the top-five is solidly ensconced and there is little likelihood of displacement from one of the remaining companies in the top-ten list. The top-five have retained their same ranking for a number of years although there has been considerable adjustment in ranking amongst the next five companies on the list.

The ranking of the top-five for detached housing units differs from the ranking for overall production of prefab units due to the variations in production of low rise multi-family units across the five companies (Table 4.2.2). Over the past

Table 4.2.1

Prefab Production of Detached Units By Company

	1978	1979	1980	1981	1982	1983	
1. Misawa	20,797	21,284	23,669	21,312	25,039	26,289	Misawa
2. Sekisui House	18,678	21,211	20,766	20,004	20,662	18,143	Sekisui
3. Daiwa	9,568	9,381	11,223	11,624	12,145	10,127	Daiwa
4. National	8,493	8,338	9,196	8,745	9,969	9,772	National
5. Sekisui Chemical	7,412	8,300	8,719	8,335	8,876	9,154	Sekisui
6. Toshiba	2,484	2,933	3,744	4,520	4,929	4,883	Asahi Chemical
7. Tessei	2,451	2,104	3,493	3,001	3,069	2,721	Taisei Const.
8. Asahi Chemical	1,954	1,569	1,483	1,743	1,757	1,604	Taisei
9. Kubota	1,478	1,510	1,353	1,516	1,589	1,431	Kubota
10. Nisseki	1,358	1,016	1,181	1,123	1,586	1,412	Kobori
	64,948	68,514	73,573	70,029	76,691	73,485	TOP 5
	(77.0)	(78.5)	(81.1)	(80.0)	(79.3)	(80.5)	
	74,673	77,646	84,827	81,932	89,621	85,536	TOP 10
	(88.3)	(89.0)	(94.2)	(93.6)	(92.6)	(93.7)	
	84,375	87,291	90,725	87,572	96,599	91,303	OVERALL
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	% OF SFD STARTS

Source: Building Center of Japan, 1984

Table 4.2.2

Prefab Production of Low-Rise Apartments By Company - 1983

Rank	Units	% Share
1. Sekisui House	22,293	40.0
2. National House	10,672	19.2
3. Daiwa House	10,667	19.2
4. Misawa Homes	4,361	7.8
5. Sekisui Chemical	3,083	5.5
Top-Five Producers	51,076	91.7
Total Produced	55,688	100.0

Source: Building Center of Japan, 1984

five years there has been a slight decline in detached starts and a corresponding increase in low rise multi-family starts. There has also been a decline in high rise prefab starts but this has a negligible effect on the top-five producers. Sekisui House has traditionally been the most aggressive of the top-five in the low-rise apartment market and is the only prefab producer with production of apartment units (27 293 units) now exceeding detached units (18 143 units) (*Table 4.2.3*). Misawa, the largest producer of detached units (26 289 units) has the second lowest ranking in apartment units (4 361 units) among the top-five.

Three of the top-five prefab producers are affiliates of large, diversified industrial organizations; one is an affiliate of a large general construction company; and only Misawa is exclusive to the housing industry (*Table 4.2.4*). Sekisui House and Sekisui Chemical, through their Sekisui Heim division, have a combined production accounting for 35.8% of all prefab detached and low rise apartment starts. In turn, the major shareholder of Sekisui Chemical is Asahi Chemical Industry with 16.2% of the shares of Sekisui Chemical. Asahi Chemical, through its Hebel House division, is the sixth largest prefab housing company with 4 883 detached starts and 3 083 low rise apartment starts in 1983 for a combined total of 7 966 prefab starts.

The Sekisui group of companies was founded in 1947 and is comprised of four key companies: Sekisui Chemical Co., Sekisui House Ltd., Sekisui Plastics Co. and Sekisui Jushi Co. The group accounts for some 209 domestic companies, 25 overseas companies,

Table 4.2.3

Total Production of the Top-Five Prefab Companies - 1983

Rank	Detached Units	Low-Rise Apartment Units	Total Units	% Share
1. Sekisui House	18,143	22,293	40,436	27.5
2. Misawa Homes	26,289	4,361	30,650	20.9
3. Daiwa House	10,127	10,667	20,794	14.1
4. National House	9,772	10,672	20,444	13.9
5. Sekisui Chemical	9,154	3,083	12,237	8.3
Top-Five Producers	73,485	51,076	124,561	84.7%
Total Detached and Low-Rise Apartments	91,303	55,688	146,911	100.0%

Source: Building Center of Japan, 1984

Table 4.2.4

Comparison of the Top-Five Prefab Housing Companies - 1983

Rank by Production	1. Sekisui House	2. Misawa Homes	3. Daiwa House	4. National House	5. Sekisui Chemical
Total Production (83)	40,436	30,650	20,794	20,444	12,237
Year Founded	1960	1962	1955	1963	1947
Factories Producing Housing	4	22	12	4	6
Total Employees	8,014	1,105	5,672	2,010	6,038
Total Assets (million yen)	597,497	138,208	289,198	69,346	290,937
Equity Ratio	26.7	20.0	34.0	25.2	18.0
Major Shareholder	Sekisui Chem. (20.3)	Misawa Co. (9.6)	--	Matsushita (48.0)	Asahi Chem. (16.2)
Ownership by Japanese Banks (%)	13.4	10.4	14.9	6.7	8.6
Foreign Ownership	12.8	11.3	15.8	6.0	10.3
Sales Breakdown (%)					
Building Materials		69	87	63	
Housing Const.	79			27	38
Other Const.		13			
Housing Lots				10	
Real Estate	21		13		
Other Activities		18			68
Sales - March 84 (million yen)	443,742 (Jan. 84)	126,216	285,689	97,924	324,018

Source: Japan Company Handbook, First Section Firms, First Hall 1984,
The Oriental Economist

17 000 employees, with an aggregate annual sales turnover amounting to 1 170 billion yen for fiscal 1983. The products of the group range from raw materials to end-use products, including basic chemicals, intermediate industrial materials and household and consumer products. Sekisui House Ltd. was established as an independent company in 1960 and 20.3% of its shares are still owned by Sekisui Chemical. Sekisui Heim, the Housing Division of Sekisui Chemical, accounts for about one-third of total domestic sales.

Asahi Chemical Industry Co. Ltd., the sister company to Sekisui Chemical, and its largest shareholder, is one of Japan's largest companies, ranking 22 in the Fortune Ranking of 25 Japanese Manufacturing Companies (1983) and ranking 130 overall in Fortune's international list. Total assets in 1984 were 722 669 million yen; it employed some 16 000 persons and had sales in the order of 760 000 million yen. Building materials and housing accounted for approximately 17% of total sales.

National House Industrial, fourth ranked in production of prefab detached units and fourth overall with a 1983 production level of 20 444 units, is controlled by the Matsushita group with a 48.0% interest (1984). Matsushita is best known in North America under the name "Panasonic" and throughout Japan for its "National" product name. Matsushita is ranked second in size among all Japanese companies by Fortune magazine, after Toyota, and is the number one producer in Japan of Home VCR/UTR systems, color TV sets and industrial robots. It also ranks second in research and development expenditures among all Japanese com-

panies with R & D expenditures for 1983 in the order of 195 000 million yen and first in overseas production.

The affiliations and ownership patterns of three of the top-five prefab companies, Sekisui House, Sekisui Chemical and National, give some sense of the economic and industrial strength upon which prefab companies are founded. All three companies are linked to parent companies that have an interest in building materials and household consumer goods, established records of growth in assets, investment in research and development, direct contact with Japanese consumers, and an international perspective for their products.

Daiwa House Industry Co. Ltd. belongs to another genre, the large scale general construction company. Daiwa has divisions in detached prefab housing, multi-family prefab housing, general contracting, prefab commercial buildings and real estate development. Housing activities account for over 65% of total sales and the detached housing division accounts for almost 65% of the employees. While certainly not on a level with Asahi, Sekisui or Matsushita, Daiwa has pursued diversification characteristic of these large construction companies and has broad interests, but at a reduced scale, not unlike its larger competitors.

Misawa Homes is the maverick and seems to enjoy if not flaunt this reputation. The company parts with the traditions of its competitors in many ways, -- most notably in its use of structural wood products, its independence from a large parent company, and its exclusive use of the franchise sales system. The high profile that its President, Chiyoji Misawa, enjoys

nationally and, more recently, internationally is also a distinguishing feature of the company. This is a firm with a distinctive recipe for success that sets it well apart from Sekisui House with whom it is constantly vying for top spot in the prefab rankings. Misawa Homes has maintained its position for a number of years as the number one producer of prefab detached homes and even Sekisui House is far behind in this particular category.

Of the five companies, three produce a metal frame unit with a composite exterior wall panel (Sekisui House, Daiwa House and National House), one produces a modular wood panel system (Misawa Homes) and one produces a modular steel box system (Sekisui Chemical). Misawa, as part of its House 55 program, has launched a modular steel box system utilizing light weight autoclaved concrete similar to the material utilized by Asahi Chemical in its Hebel House.

Steel frame systems account for 64.0% of all prefab detached units and this share has been somewhat constant over the past five years (Table 4.2.5). Wood panel systems account for 30.4% and precast concrete has 5.6% of the market. Whereas Sekisui House dominates the field in steel frame construction (31.0% versus 17.2% for its closest competitor, Daiwa), Misawa has virtually no competition in wood panel construction (90.1% of the market) with Kobori Jugen a very distant second at 5.8% (Table 4.2.6).

Table 4.2.5

Prefab Production of Detached Units By Type of Construction (%)

	1979	1980	1981	1982	1983
Steel Frame	58,061 (66.5)	58,939 (65.3)	59,435 (67.9)	63,615 (65.9)	58,404 (64.0)
Wood Panel	23,422 (26.8)	25,436 (28.2)	22,336 (25.5)	26,980 (27.9)	27,736 (30.4)
Precast Concrete	5,808 (6.7)	6,355 (6.5)	5,801 (6.6)	6,004 (6.2)	5,163 (5.6)
Total Detached	87,291	90,275	87,572	96,599	91,303 (100.0)

Source: Building Center of Japan, 1984

Table 4.2.6

Prefab Production of Detached Units by Unit Type and Company - 1983STEEL FRAME & PANEL

1. Sekisui	18,143	31.1
2. Daiwa	10,025	17.2
3. National	9,692	16.6
4. Sekisui Heim	9,154	15.7
5. Asahi Chemical	4,883	8.4
6. Nessiki	1,431	2.5
Top 6	53,328	91.3
Overall	58,404	100.0

WOOD PANEL SYSTEM

1. Misawa	25,208	90.1
2. Kobori	1,604	5.8
3. Dai-Ei	444	1.6
Top 3	27,256	98.3
Overall	27,736	100.0

PRECAST CONCRETE SYSTEM

1. Tessei	2,721	52.7
2. Dai-Jugen	592	11.5
3. Kokudo	539	10.4
Top 3	3,852	74.6
Overall	5,163	100.0

Source: Building Center of Japan, 1984

4.3 The Technical Appraisal System

All prefabricated housing systems in Japan are subject to rigorous government standards and must be certified through a technical appraisal program that has no counterpart in North America. This appraisal program, in fact, applies to all new materials and construction methods, not just industrialized systems, and was instituted by the Ministry of Construction in 1965 as a means of administering the Building Standards Law (1950), a nation-wide building code.

The technical appraisal system, since its inception, has been administered by the Building Center of Japan (BCJ) and its specific application to prefabricated housing systems was initiated in 1973 with "The Industrialized Housing Performance Approval System". This legislation gave the Ministry of Construction the authority to approve the performance of various types of industrialized housing systems and since 1973 the BCJ has been assigned this responsibility on behalf of MOC (Table 4.3.1).

The Building Center of Japan was established in 1965 and although it was to be jointly funded by industry and government, it proceeded without government appropriation and has since received its funding exclusively from industry. The BCJ was established as a public service corporation to administer MOC's activities under the Building Standards Law and its duties as the "technical appraiser" for MOC forms the basis for all its other activities including research and development, information services and the promotion of dialogue between government, private

Table 4.3.1

Prefab Housing Systems By Type Approved by MOC, 1980

Classification	Structure	Units sold	%	Number of companies approved by the Minister of Construction
Detached house	Wooden type	27,736	16.7	4
	Steel type	58,404	38.7	13
	Concrete type	5,163	4.2	11
	Subtotal	91,303	(59.6)	28
Multi-family housing low rise, 2-3 storeys	Wooden type	3,634	2.4	(4)
	Steel type	26,827	17.6	(13)
	Concrete type	5,481	3.6	(11)
	Subtotal	35,942	(23.6)	(28)
middle and high rise	PC	19,229	12.6	
	HPC	4,982	3.2	4
	Other construction method	1,555	1.0	
	Subtotal	25,766	(16.8)	4
Total		152,433	100	32

Source: Building Center of Japan, 1984

industry and the academic sector.

The technical appraisal service applies to any new material or technology a manufacturer or builder wishes to introduce to the market. Before MOC can authorize its use or application, BCJ issues an appraisal with respect to such factors as safety, conformance to regulations and strength and durability of materials.

The appraisal service is also performed at the suggestion of government offices other than the MOC and results may be used by the relevant administrative offices to confirm whether or not construction plans conform to relevant laws and regulations. For this purpose the BCJ has 18 permanent technical evaluation committees comprised of experts, including university professors and industry representatives, and covering such areas as high-rise buildings, structures, foundations, fire-protection performance, fire resistance performance, emergency alarm systems, septic tanks, elevators, game facilities, sound insulation, computer programming silos, material durability and industrialized housing.

This technical appraisal system is supplemented by two other government programs that affect the quality and performance of industrialized housing systems and components. "The Acknowledgment System of Factories with Good Quality Control for Prefabricated Houses and Other Articles" was started in 1972 by MITI and 73 factories had been approved through 1983 for their production methods and quality control. In 1974, MOC implemented "The Excellent Housing Parts Approval System" pertaining to housing components including kitchen systems, bathroom fixtures, windows,

etc.

4.4 Marketing the Product

Marketing must attempt to maintain that crucial balance between optimum production capacity and customer demand if a company is to be successful and prosper, particularly in view of the magnitude of plant capacity represented by some of the prefabricated housing companies. As a result, marketing is every bit as sophisticated, if not more so, than the automated production lines, CAD/CAM systems and robotic assemblies seen within the Japanese factories. To view prefabricated housing production facilities without understanding the equal investment in marketing and sales can be misleading and a distortion of the role of industrialization in the Japanese housing industry.

Unlike large North American home builders who are still regionally based, the Japanese prefabricated home builders all operate as national companies with the ability to offer products throughout the country. On the other hand, they are patently aware of regional differences in consumer preferences and, while coordinating marketing at the national level, will ensure that products are sensitive to these regional differences. However, this task is tempered somewhat by the fact that almost 90% of all prefabricated sales are within the metropolitan areas and it is these markets that basically dictate current product lines and consumer trends. For example, the trend to "westernization" in Japanese housing is a reflection of a sophisticated urban market characterized by purchasers who are aware of Western style housing

either through travelling or the mass media.

Investment in factories and equipment in the production end may well be matched at the marketing end by investment in show homes, advertising and sales staff. Using 1980 figures as a basis of comparison, Misawa Homes that year sold 13 000 detached units through its franchise dealers which involved some 1700 salesmen for a ratio of 7.6 units per salesman. This sales staff operated from 163 branch offices and utilized 223 show homes (some of which were branch offices) for a ratio of 58.3 units per show home. Sekisui House had sales of 18 500 detached units in the same year using direct sales with 2250 salesmen for a sales ratio of 10.7 units per salesman. This sales staff represented 38% of total employees and utilized 250 branch offices and 273 show homes for a ratio of 69 units per show home. Sekisui Chemical, the smallest of the top five producers, had sales of 7600 units the same year, using a direct franchise system with 650 salesmen for a sales ratio of 11.7 units per salesman. Sekisui Chemical had 42 branch offices and 175 show homes for a ratio of 43.4 sales per show home.

While it is difficult to draw actual sales comparisons or measure sales effectiveness between prefab housing companies since sales methods differ considerably, surprisingly their sales ratios are somewhat comparable. As a general rule salesmen operate at a level of approximately ten sales per year and show homes generate in the order to 45-60 sales per year. But such comparisons do not do justice to the intense competition among the top five producers and their staunch defense of the advan-

tages of their respective sales systems.

The sales system alters according to the prefab company's background and capital, the district or region in which sales are occurring, structure and construction process of the supply house and the overall philosophy of the company. Sekisui House and Misawa Homes are exclusively committed to two very different systems while the others use a combination or modifications of these systems.

Sekisui House operates all facets of its enterprise with its own employees and attributes to this direct system a high level of quality control since production and delivery is always in the hands of employees. Misawa, on the other hand, franchises every aspect of its operation to independent operators from its factories through its sales offices and now its interior design or "Home-ing" service. It claims to maintain an equal penchant for quality control through comprehensive training programs for its franchise operators. National House also relies on a franchising system similar to Misawa but only for its dealerships and not its production facilities, and maintains control over this network through a 50% interest in each dealership and extensive training programs for its sales staff. Both Daiwa and Sekisui Chemical operate with a combination of direct sales and wholly owned dealerships, the difference with dealerships being that site contractors are employees of the dealership and not the parent firm. Ninety percent of Daiwa sales are through these wholly owned dealerships.

Sales offices, whether dealerships or direct sales, vary in size depending upon location and the organization of the company's delivery functions. In the case of Sekisui Chemical, the smallest of the top five producers, the smallest dealership sells 30 units per year and the largest dealer 500 units per year, with a staff of 80 including salesmen, architects and engineers, construction managers and supervisors, service personnel and administrative staff. Sekisui Chemical, in spite of its relatively small size, currently maintains 230 display homes.

Misawa Homes, the largest producer of detached homes, adopted its franchise system from the automobile industry and sought people from the automobile industry to set up the system in its early years. Today Misawa has 160 franchised dealers in Japan, each of which is responsible for sales, construction and servicing. These dealers can tailor their product to local markets and are responsible for local and regional advertising at their own cost and for bearing the costs of providing and maintaining show homes. A dealership operates on the same basis as the auto dealer, purchasing products at a discounted price from the factory, usually 15% below list price, and extracting overhead costs and profits from the sales margin. Misawa dealers average between 20 and 30 employees with the largest in the system, Tokyo Misawa Homes, having 200 employees. Misawa maintains 300 show homes throughout Japan.

Promotion and sales utilize various techniques the most productive of which, by general consensus among all five producers, is the show home park. These show home parks represent a formidable investment in buildings, land rent, advertising and labour costs but their value as retail outlets for the housing industry is well proven. Referrals from previous customers are another important source of new customers in addition to more selective means such as local media and newspaper advertising, inserts in monthly or quarterly housing catalogues, direct and mail solicitation of apartment and rental dwellers, and presentations at large companies or to social gatherings. The sheer quantity and extent of advertising is most noticeable throughout the metropolitan areas including subways and buses, billboards, television commercials and transit and railway stations.

There are some 70 show home parks in the Tokyo metropolitan area spread out along the major transit routes and it is inevitable that one will find at least one show park within walking distance of a transit or rail station. These displays may range in size from three homes to upwards of 40 homes. The Sendai Show Home Park, on a portion of land vacated by the Osaka World Fair, has 48 show homes and is currently the largest in Japan; Tokyo Housing Fair in Shinjuku, with 19 display units, is perhaps one of the most popular, certainly with tourists.

Unlike their North American counterpart, these show home displays are downtown in commercial cores, as near as possible to the proverbial 100% sales corner, readily accessible by transit

or train and are not permanent installations. The show home park, depending on location, will combine traditional home builders, prefab companies and now 2 x 4 builders and within the inner core areas, such as at Shinjuku, these parks will be dominated by the big names in the industry.

The more prominent show home displays are operated by major communications companies who will rent a vacant site and operate the entire display including an advertising and promotions package. Both the Sendai and Shinjuku displays are operated by Asahi Broadcasting Company (ABC), the largest of such operators. The show homes themselves have an effective life span of between two to three years and pay a monthly fee to the operator. In the case of Sendai this fee is 1.5 million yen per month including the land and management fee, and advertising for the display park. Newspaper and periodical advertising costs are extremely high in Japan but in turn this printed material can reach very large market areas in comparison to North America. A single page advertisement in a monthly housing catalogue, requiring a standard format, will cost one million yen and, therefore, it is not unusual for a company to spend upwards of 3% of income on advertising.

Marketing is not just seen as sales and promotion but is an integral part of the entire delivery process of which the salesman is the key actor. To understand the significance of his or her role, it is necessary to examine a typical sales scenario. It is likely that the salesman has met the potential customer, a housewife and her mother, in a display home on a weekday. Week-

end visits to show homes are a social occasion and generally preclude the serious buyer. Therefore, the best salesman occupies the show home on weekdays and makes house calls on weekends. It is not unusual for a salesman to have compiled a list of potential customers three years in advance of purchase and these families will keep him busy on weekends.

After the initial contact, the salesman may visit the customer at their residence to gain an overview of the situation covering such aspects as the site, particularly if it is a rebuild situation, ideas and expectations for the house, and financial arrangements. This may be followed by a visit to a particular show home with the customer or another visit to the site with technical personnel, or the architect, to assess site conditions and constraints. The salesman will explain the company product, begin to draw out the customer's requirements and prepare rough sketches of the layout. The customer will be encouraged, on the basis of a sales brochure, to pursue particular product line and the depiction of various options and arrangements within the brochure assists them "design" their custom home.

Through interaction between the customer and the salesman a set of working drawings and a schedule of costs will be prepared and presented and eventually, upon acceptance, these will constitute the sales agreement between the parties. In the course of preparing these documents the salesman will have utilized the technical expertise available within his dealership including the architect and interior designer who will have prepared the final drawings and costs, likely utilizing a CAD/CAM system. Upon exe-

cution of the agreement the salesman will then move on to coordinate and eventually handle all service and after sales activities.

This salesman is the customer's contact with the company through the entire process and as such he is a valued, experienced and well trained individual, and perhaps the company's greatest asset. His worth to the company will be reflected in the proportion of salary versus commission; good performance being rewarded with a higher ratio of salary to commission.

4.5 Trends in Research and Development

The fact that between 1976-1980, the top five prefab housing companies spent some \$76 million (U.S.) of their own funds on R & D gives indication of the importance of this activity within the prefab industry and certainly sets this industry apart from anything comparable in the United States. Today Sekisui Chemical, the smallest of the top five, spends \$2.5 million (U.S.) annually on R & D and Misawa budgeted 1.5% of sales [or \$7.5 million (U.S.)] in 1984. But these are levels of expenditures quite common among Japanese industries and not for purposes of national prestige. The basic mechanism for the allocation of R & D funds in Japanese industry has been the market, and the guiding incentive, private profitability.

A major characteristic of this R & D has been the comparatively low level of spending on high risk, long-term research in favour of modifying and improving existing products. Product improvement often using imported technology as a base, has tradi-

tionally been given priority because the returns are regarded as more certain. The claim might be made that development far outweighs research and what might be deemed R & D in Japanese industry would not qualify for such a title in North America. Allocations for low risk and short term projects also reflect the preference of Japanese researchers for the esteem gained within the company from immediate technical success versus accreditation or recognition among peers.

These characteristics may explain, in part, why private industry seemingly pays for a larger share of the R & D effort in Japan than in other industrialized countries. In 1982, Japan spent 2.78% of its national income on R & D of which 23.6% was publicly funded. In the same year it is estimated that the U.S. spent 2.86% of its national income on R & D but 46.7% was publicly funded.

Today's surveys may still be indicative of trends through the 1960's and 1970's where economic growth was the requisite objective. As with so many forecasts in Japan, the recent past may not portend well for predicting the near future. Whereas so much of Japan's technological resources have in the past been directed toward economic revival, there is now increasing evidence that recent thrusts are attempting to use technology to achieve social goals -- particularly those concerning the environment. What remains uncertain is how great a sacrifice will be made in the use of R & D for purely economic growth toward achieving quality-of-life goals.

The move toward quality is evident within the current posture of the major prefab companies who now stress the importance of the total living environment and not just new materials or the performance requirements of the housing envelope. The emphasis on new materials and assemblies is giving way to a new emphasis on residential amenities such as bathrooms, kitchens, appliances and electronic systems. Many of these products could be viewed as luxuries and not necessities of the home.

Perhaps House 55, launched in 1975, symbolizes the ultimate fulfillment of research program ranging from basic building materials, through composite wall systems, fabrication and erection that characterized the R & D programs of the prefab housing companies in the 1970's. Each of the top-five producers still operates a research institute, complete with an environmental test chamber capable of submitting an entire house to simulated earthquakes, and virtually any type of weather condition from snow accumulation to rain, solar radiation and typhoons. The results of these efforts not only produced new products such as Misawa's precast autoclaved lightweight concrete panels (PALC), Sekisui Chemical's composite cement/wood chip particle board panel (Synsilite) and Sekisui House's aluminum faced exterior sandwich panel, but led to vast improvements in quality control and material performance while lowering production costs.

There is now a perceived shift away from research into housing as shelter and toward ideas that reinforce the notion of housing as a consumer commodity amidst an increasingly affluent

and discriminating society. While technical research has by no means subsided, it is being complemented by researchers in various housing related fields such as psychology, human engineering, geriatrics, industrial design and acoustical engineering.

In 1982, the Industrial Structure Council of MITI, attended by both government and industry, discussed a long-term vision of the Japanese housing industry. This discussion established a new context for the housing "problem": housing should be viewed in the context of education, regional culture, family and community life -- the emphasis should be placed upon improving Japan's own "residential culture". As part of the strategy to create a better cultural environment, the notion of adaptability and flexibility was introduced whereby integrated or compatible components could be grouped for each unit of living space and distinctions could be drawn between the life expectancy of different groupings ranging from the structural frame, with perhaps a 100 year life span, down to kitchen appliances with a five year effective life.

New developments are still appearing on the assembly line to reduce inventory, increase choice of product, reduce costs and no doubt, increase profitability. Computer-aided design and drafting systems are now commonly used from point of sale through product design and production. Energy efficiency is still a major preoccupation and the prefab companies are realizing the full potential of the renovation and after-sales market for new products, materials and components.

Research and development is still a healthy activity as measured by investment among the major prefab housing companies and, combined with the initiatives of government through MOC and MITI, it is not likely to subside in the near future. What one can expect is a basic shift in R & D activity away from technical improvements on the supply side, most notably product improvement, toward greater research efforts on the demand side, specifically into consumer preferences, and behaviour and emerging lifestyles. The R & D thrust is toward bolstering and expanding the demand for products for which the manufacturing capacity is already in place and for which a greater market share is expected by the producers.

4.6 2 x 4 Construction -- A New Competitor

A discussion on the Japanese housing industry today must inevitably touch upon the most recent competitor in the field -- North American "2 x 4" wood frame construction. There appears to be an increasing interest among both prefab housing companies and traditional home builders with the potential competitiveness of this new building system, particularly with two of the largest names in Japanese industry, Mitsubishi and Mitsui, associated exclusively with 2 x 4 construction. There are some potent reasons for the recent success of 2 x 4 construction in Japan and it may be argued that North American 2 x 4 construction offers all the advantages of the prefab house without the concomitant capital investment in plant and machinery. If nothing else, the introduction of 2 x 4 construction in Japan provides a basis of comparison upon which to judge the effectiveness of both traditional and prefab housing, in providing North American housing styles to Japanese consumers.

Given the traditional Japanese house with its emphasis on wood, it would seem that 2 x 4 construction could be a logical alternative to traditional Japanese home building methods. Yet 2 x 4 construction has struggled since its introduction in 1972 and it is only now emerging as a serious competitor. Wood 2 x 4 construction was not able to keep pace with the emergence of the prefab housing companies for a variety of reasons and it will likely continue to run a very distant third to traditional and

prefab building methods with less than a 2% market share.

If it is the intention of government to stabilize and maintain a market share for the traditional home builder and the intention of the prefab housing companies to increase their share from 15% to say 30%, then what is the future for 2 x 4 construction? Growth in 2 x 4 construction, if it occurs, will likely be at the expense of first, the traditional home builder and second, the prefab housing market.

The incentive to consider 2 x 4 construction dates back to the early 1970's when Canada and the United States passed legislation forbidding the export of timber logs. However, the legislation in the U.S. was never enacted and subsequently applied only to logs from publicly owned forests. Canada did enact this legislation. If enacted by both countries, this legislation would have virtually eliminated a prime source of much of the timber stock from which the sizes required for traditional Japanese post and beam construction are milled. This reduction in supply, combined with the relative ease in purchasing milled lumber from North America in nominal dimensions during periods of peak housing demand, led to consideration of actual 2 x 4 construction methods utilizing nominal lumber sizes.

From a cost and technical performance standpoint, 2 x 4 construction outperformed traditional Japanese wood construction methods, particularly in view of the change from the historic "open-style" Japanese house to the western style "closed" house. But the Ministry of Construction did not certify the system for a variety of unknown reasons and 2 x 4 houses required special

permits until August 1979. There was certainly little, if any, government encouragement up to 1979. In 1983, there were 18 300 detached 2 x 4 housing starts for a 1.7% market share and a 10-15% growth rate over the past several years.

In 1976, the Japan 2 x 4 Home Building Association was founded. The intent was to promote 2 x 4 construction among traditional house builders and improve their competitive edge over the prefab housing companies in view of a declining housing market. Government viewed 2 x 4 construction as one means of modernizing and strengthening the practices of the small builder but quite the opposite occurred. Large builders now control the overwhelming share of 2 x 4 starts and, whereas the traditional Japanese home builders operate at a level of 12-13 units per year (as compared to 17-18 units per year in the United States), the average Japanese 2 x 4 builder is at a figure of 90 units per year. The 2 x 4 Association estimates that the break even point today for a 2 x 4 builder is 50 units per year compared with 4-5 units per year for the traditional builder. What has caused this aberration?

First, and perhaps foremost, consumers have not adjusted to this new product. While intellectually they can understand the advantages, they hesitate when it comes to make the investment in something unfamiliar and inevitably return to the traditional home builder. For example, they are not convinced that a house can have structural strength without columns and beams. Large companies can overcome this resistance with name recognition and past performance in the consumer market but the small builder

suffers, even with an improved product at competitive prices. Second, suppliers and materials are not readily available at local supply houses and the traditional trades are unfamiliar with the nominal lumber sizes, specifications and different building materials. Even the nails for 2 x 4 framing are very different. The larger firms, through advanced purchasing and direct contact with overseas suppliers, can again better cope with the situation. Both Mitsui and Mitsubishi are trading houses and can control the entire purchasing and supply network right back to timber sources in North America.

Third, the financing of home construction in Japan precludes access to a builder's loan and instead the builder relies on credit from his suppliers or advances from the purchaser during construction. The Japan House Corporation, for example, only releases mortgage funds upon completion of the house and there is no provision for interim financing. If 2 x 4 lumber is hard to find locally, credit on such purchases is virtually impossible to secure or at best is limited to one house at any time. Major financial barriers continue to exist that no small builder can cope with alone.

Finally, 2 x 4 framing skills are not readily found nor easily acquired among small builders. There is marked resistance to forfeit the traditional carpentry skills that have been handed down family to family for a new set of skills, less sophisticated and still unproven. Large companies can organize training sessions, attract and train new work crews and have access to overseas technical expertise when required.

Like the prefab housing companies, 2 x 4 construction is going through a consolidation with the likely outcome being the domination of a relatively few large companies. In the tradition of the big prefab housing companies, the big names in 2 x 4 construction will also be part of a larger industrial conglomerate, i.e., Mitsubishi and Mitsui, accompanied by several well capitalized home builders who will successfully make the switch from traditional to 2 x 4 construction. The 2 x 4 industry is not yet as settled as is the prefab industry but has the advantage of having had the prefab companies lead the way in competing with the traditional home builder. These lessons are by no means falling on deaf ears and the similarities in consumerism between Mitsui and Mitsubishi and the top five prefab housing companies is not coincidental.

Mitsui Home Co. Ltd. was established in 1974 through joint investments by Mitsui Real Estate Development Co. Ltd., Mitsui & Co. Ltd., and the Mitsui Norin Company, as a home builder specializing exclusively in 2 x 4 construction.¹ The company operates as a fully integrated housing company in the same vein as the major prefab companies with the emphasis upon custom-designed housing and sold through both direct sales and franchised dealers. Sales of detached houses in 1983 was 1 645 units and this was exceeded by condominium sales of 2 838 units in the same year.

¹ See Figures 4.6.1, 4.6.2 and 4.6.3.

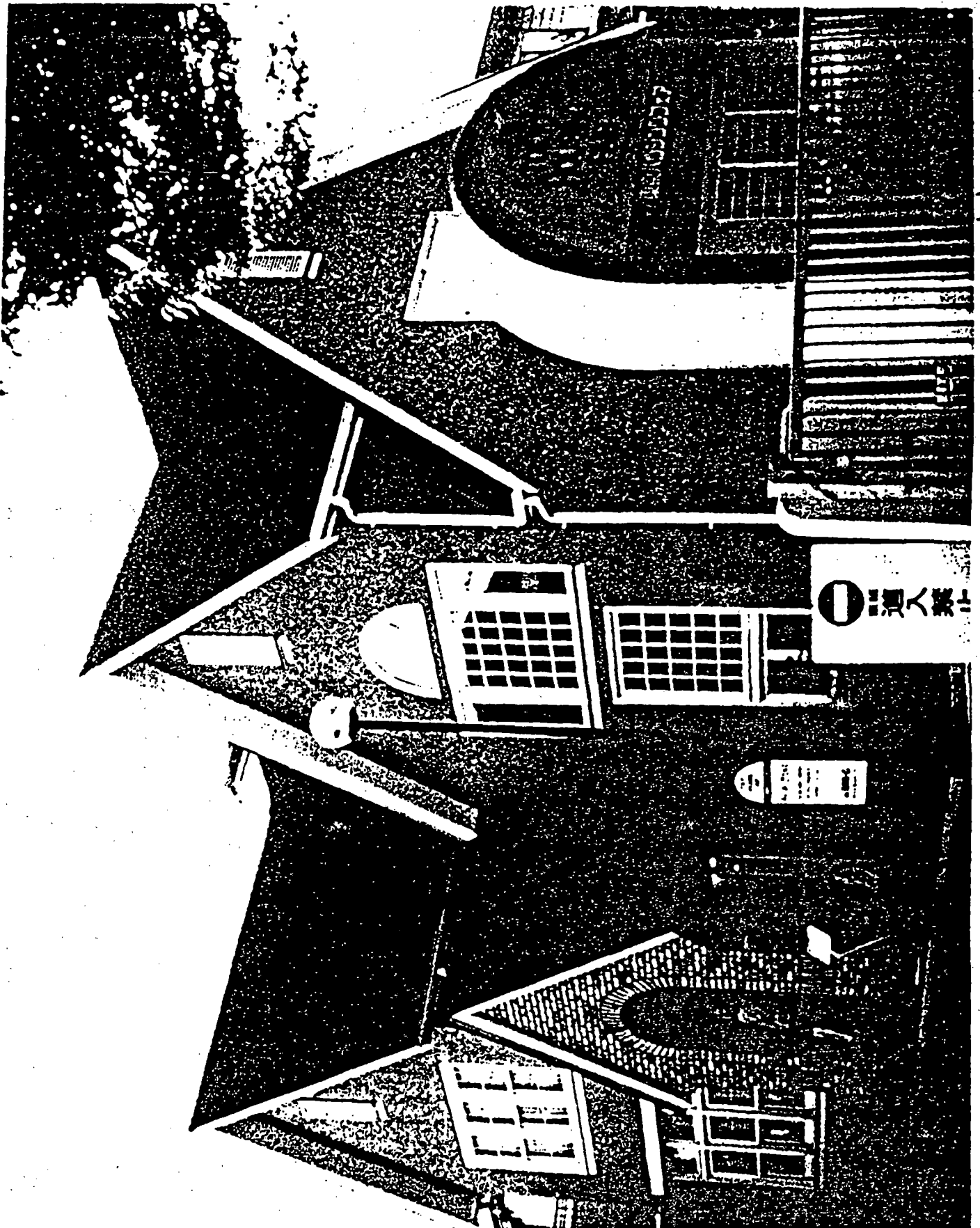
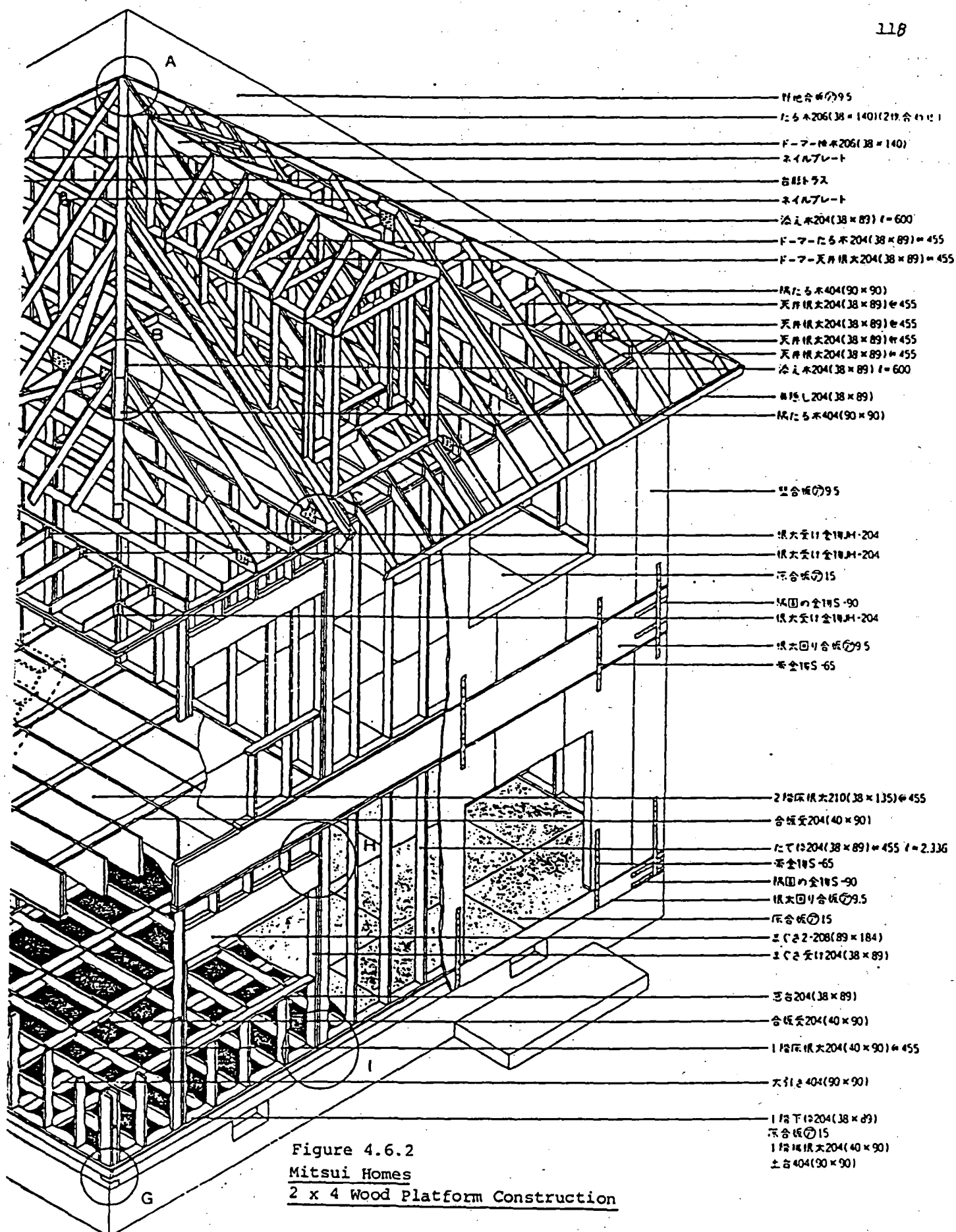
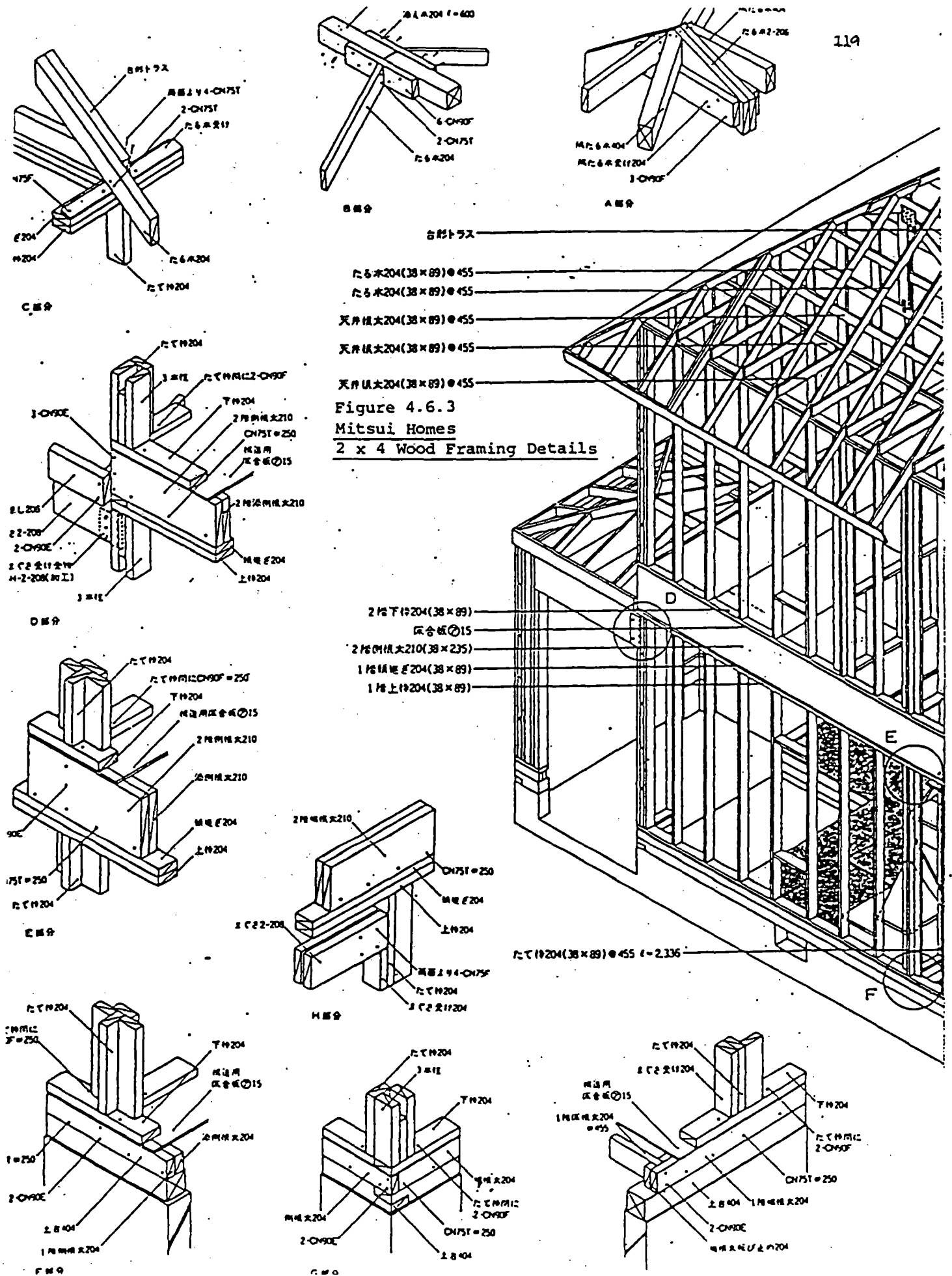


Figure 4.6.1: Mitsui Show Home, 1984





Mitsui Homes has 1100 employees involved in various facets of its main company and its subsidiary organizations. Mitsui operates with twelve branch sales offices that average sales in the order of 120-140 units per year and 100 show homes, some of which operate as sales offices. In addition to direct sales through the branches, there are four franchised dealers with 50% ownership by Mitsui, similar to National House. Three subsidiary organizations operate in the areas of material supply, interior consulting and after-sales service.

Mitsui Home Components Co. Ltd. is a joint investment of Mitsui Home Co. Ltd. (70%), Mitsui Real Estate Development Co. Ltd. (20%), and Mitsui Lumber Co. Ltd. (10%). This subsidiary is responsible for housing component processing, lumber regrading, pre-cutting, truss making and assembly and delivery of house packages. It is also engaged in the stocking and delivery of windows, doors, and all other accessories and appliances and acts as a materials distribution centre. Both plants are conveniently located on dock-side piers at Chiba City on the outskirts of Tokyo.

Mitsui Homes Interiors has now some 120 branches and as well as complementing new sales this subsidiary is following the same route as Misawa's "Homeing" service and actively pursuing the home renovation market. Mitsui Homes Service was established as a subsidiary for after-sales service, to operate the ten year home warranty program offered by Mitsui. All on-site construction is subcontracted but Mitsui is every bit as advanced in con-

trolling the entire process as the prefab companies and offers a totally integrated approach to its customers in direct competition with the prefab housing companies.

Mitsubishi Estate Housing Components Co. Ltd. was established in October 1983 and commenced operations in April 1984 as supplier of 2 x 4 housing components for Mitsubishi Estate. Mitsubishi Estate Home Co. is the newest entry into 2 x 4 housing construction and commenced operations in October 1983, also as a wholly owned subsidiary of Mitsubishi Estate. The parent company, Mitsubishi Estate Co. Ltd. is Japan's largest office leasing company with interests in residential land and construction and architectural services.

Both Mitsui and Mitsubishi have access to new subdivisions in outlying areas through their respective parent organization and although they do undertake some housing construction on new land as subcontractors to their parent companies, the major proportion of their activity is within the Tokyo metropolitan area. They are in direct competition with prefab housing companies for the custom designed home in the rebuild market.

These two companies have essentially followed in the footsteps of the major prefab housing companies but with one major difference -- they have avoided the investment in manufacturing facilities and substituted the distribution centre for the factory. They are relying on an existing building technology and a secure prospect for the continued importation of lumber products. While their annual production levels are well below that of the top five prefab companies, there is every evidence of con-

sumer acceptance for the product and strong growth is predicted. In recognition of this potential competition, some of the prefab companies have begun to experiment with 2 x 4 construction in limited situations.

It is not an unlikely prospect that the competition amongst traditional builders, prefab companies and now 2 x 4 companies, could lead to government intervention in the form of "industrial rationalization". Such rationalization is practised widely by MITI and implies the creation of a framework for all enterprises in a particular industry in which each can cooperate to achieve a particular market share in a cartel-like arrangement of mutual assistance. For example, government has already placed members of prefab housing companies as representatives on government sponsored committees to improve upon and promote traditional wooden houses. This interaction among seemingly competitive sectors of an industry is but one way of rationalizing the involvement of all three sources of housing production over the long run.

4.7 Conditions for Success

A number of factors have contributed to the relative longevity of the prefab housing industry in Japan and its more recent successes. Certainly the high population density concentrated in and around the major metropolitan areas satisfies one of industry's key criteria, namely access to large markets. But there are other factors, not as readily discernible, that might lead one to conclude that if the long search to establish a pre-

fabricated housing industry were to finally succeed, Japan would be the logical place.

Not only is Japan's population situated in a very limited area but this concentration is located within relatively moderate climates with the exception of Hokkaido to the north. A manufacturing plant can survive with shipping distances in the range of 200-250 kilometres and may reach production levels of 1000 houses per month based on its own catchment area. The rigid requirements for earthquake design and fireproof construction make steel an appropriate framing material and the relatively moderate climate alleviates the problems associated with the use of metal in colder climates. It must also be remembered that Japan's highly efficient steel production has kept steel prices far below those of North America. Houses generally do not require heavy insulation and, therefore, various lightweight composite wall panels can be utilized in conjunction with steel framing. The performance requirements for the building enclosure are not severe, with the exception of moisture control within the outer wall, and where severity is encountered such as Hokkaido, the achievements of the prefab house have been less than notable. Prefab housing is a product whose success has been exclusive to high density urban area, particularly the Tokyo, Nagoya and Osaka regions, and its impact on rural housing and in Hokkaido has been negligible to date.

With four of the five top prefab producers using a steel frame and requiring four to seven tons of steel per house much of the automated equipment and factory assembly processes are

directed at forming, shaping, welding, assembling and storing steel parts. This requires large factories, enormous economies of scale and massive capital investment in manufacturing facilities. It also requires a wage structure in which factory workers are either paid the same or lower hourly rates than on-site workers such that there are no additional costs in transferring manpower from the field to the factory.

These large factories can only be built through access to capital markets, favourable financial terms, long term stability in demand and by companies with a proven record in manufacturing and the consumer goods business. It is not a coincidence that the prefab housing industry in Japan is dominated by very large companies with diverse interests and experience in the production of construction materials and chemicals. Access to capital markets by these firms is not based solely on their performance in housing or construction related activities. Sekisui Chemical, for example, which had total assets of \$1 497 billion in 1984, was involved in the production of raw materials to end-use products including basic chemicals, intermediate industrial materials and a range of household and consumer products.

The financial structure of these companies gives a sense of their borrowing capacity and, in addition to a very low equity to debt ratio by North American standards, banks are active business partners and in it for the long term. Commercial loan rates have been traditionally well below North American counterparts and the role of the Japan Development Bank in providing long term, low interest loans to the prefab housing industry in the 1970's for

new plants and equipment cannot be underestimated. The banking and financial system in Japan is an integral part of the success of these large corporations and the subject would be deserving of its own study. Suffice to say, government claims that it has offered its corporations a higher return on capital, has taxed them more lightly while nevertheless obtaining more revenue, and has promoted high rates of savings, investment, and growth in the corporate sector. It seems that the whole financial structure of these prefab housing companies would be foreign, if not alien, to both government and the housing industry in North America.

The influence of government policy must also be recognized and, in particular, the effect of the five-year housing programs that provide stability as well as insight and direction for the industry and some measure of insulation from the vagaries of political decision-making. These programs give evidence of a government willing to subsidize the supply as well as the demand side of the equation and government can also accept a portion of the credit for nursing the prefab housing industry through its formative years. But the reasons for success in the early years are now quite different than for recent successes and it is a tribute to the industry that it has adapted so well to recent consumer trends within the marketplace.

Success today can be attributed to a number of factors. First, the prefab housing industry has concentrated in those markets where it does best, namely the metropolitan areas. Ninety percent of all sales of prefab houses are in urban areas and, therefore, the industry is now capitalizing upon its exist-

ing capacity and avoiding costly ventures into new areas. It is estimated that the industry could double production with existing manufacturing facilities. Second, the industry is taking advantage of the market for scattered site replacement housing within the urban areas. This is the market where prefab housing can be most cost competitive with traditional building methods, offer better quality control, shorter on-site construction times (important when the family is displaced after demolishing the existing family house) and alleviate the need to organize a sequence of building trades at a remote site. Third, the industry has overcome the stigma of mass production by emphasizing the "free style" plan whereby each house can be tailored to individual preferences. Industrialization has now become synonymous with customization and prefabrication now offers more flexibility than that found in the traditional wood frame house. Finally, the industry has concentrated on housing and, after initial flirtations, seems to have successfully cast aside the inevitable appeal of land development. Land and lot inventories have been the demise of so many home builders even in Japan. Although several of the top five prefab companies can point to recent substantial losses in the land business, they have all redirected their efforts to housing production and to reestablishing housing as a profitable venture with gross margins reportedly approaching 25%.

CHAPTER FIVE

THE MAJOR PREFAB COMPANIES

5.1 The Top-Five Producers

Sekisui House

Sekisui House Ltd. was established in 1960 by the Sekisui Chemical Company Ltd. and the parent company is still the largest single shareholder with a 20.4% interest. Other major shareholders include:

Sanwa Bank	4.6%
Daiwa Bank	4.0%
Dai-ichi Mutual Life Insurance	3.4%
Sumitomo Bank	3.2%
Nippon Life Insurance	2.0%
Lloyds Bank International	1.6%
Foreign Ownership	15.5%

The firm has maintained its ranking as first among Japan's prefab house builders for a number of years and performance is equally strong in the detached and low-rise apartment market. Business activities of the company include the construction, sale purchase and lease of buildings; development, sale, purchase and administration of residential land; design, execution, contracting and supervision of construction projects; brokerage and sales agent for the purchase and sale of real estate; cultivation, sale and purchase of plant material and landscape design and construction of gardens; nonlife insurance; and, the administration of welfare facilities of the company and its affiliates (some 58 domestic affiliates).

The company employed 8750 persons (as of April 1984) including 440 authorized first class architects, 1135 second class architects and 1560 licensed real estate dealers. Approximately 38% of the company's work force is involved in sales, reflecting Sekisui's reliance exclusively on direct sales for all its products. The company now has over 600 sales offices throughout Japan including some 275 show homes. Products are manufactured at four factories located in Ibaragi, Shizuoka, Shiga and Yamauchi Prefectures. The Shizuoka factory is the location of the company's housing research and development facilities.

Although Sekisui House promotes a steel frame and modular panel industrialized system its products include all types of residential buildings and commercial and institutional structures in steel frame, ferro-concrete, wooden and even 2 x 4 construction. One factory still produces products for the traditional house although in very limited quantity. Housing products account for 79% of sales, with 21% in real estate although the company has recently reduced its involvement in land development through reduction of the land inventory.

Only 20% of the company's house sales now include a land component and only 2% of sales are speculative. Eighty percent of housing sales involve only the house and in almost every case these units are custom designed to fit a particular site and a set of individual preferences and requirements.

Sekisui House prides itself in its ability to control the entire process from sales through production, erection and after-sales servicing through direct employees at every stage. It does not utilize franchising or dealerships and depends exclusively on direct sales. This approach is taken to their production lines where, for example, they will manufacture many of their own housing components from raw materials whether of wood, steel or synthetic origin. This direct control is a key feature of their claim to consistent high quality, reliable performance and flexibility of product.

A Sekisui house is constructed on a light gauge steel frame including wall members, floor members and roof trusses, set upon a poured-in-place concrete footing and clad with modular composite exterior panels.¹ The factory production system can be broken into four major processes.

1. Steel Frame Process

Light gauge steel sections and structural components are shaped from roll and flat stock, cut and assembled and subsequently treated and painted through an electrodeposition process to prevent corrosion and rust. After baking, steel components, accessories and frames are stored in automated vertical warehouses. The entire steel frame process is highly automated utilizing similar procedures to that widely used in automobile and electric appliance manufacturing.

¹ See Figures 5.1.1, 5.1.2, and 5.1.5.

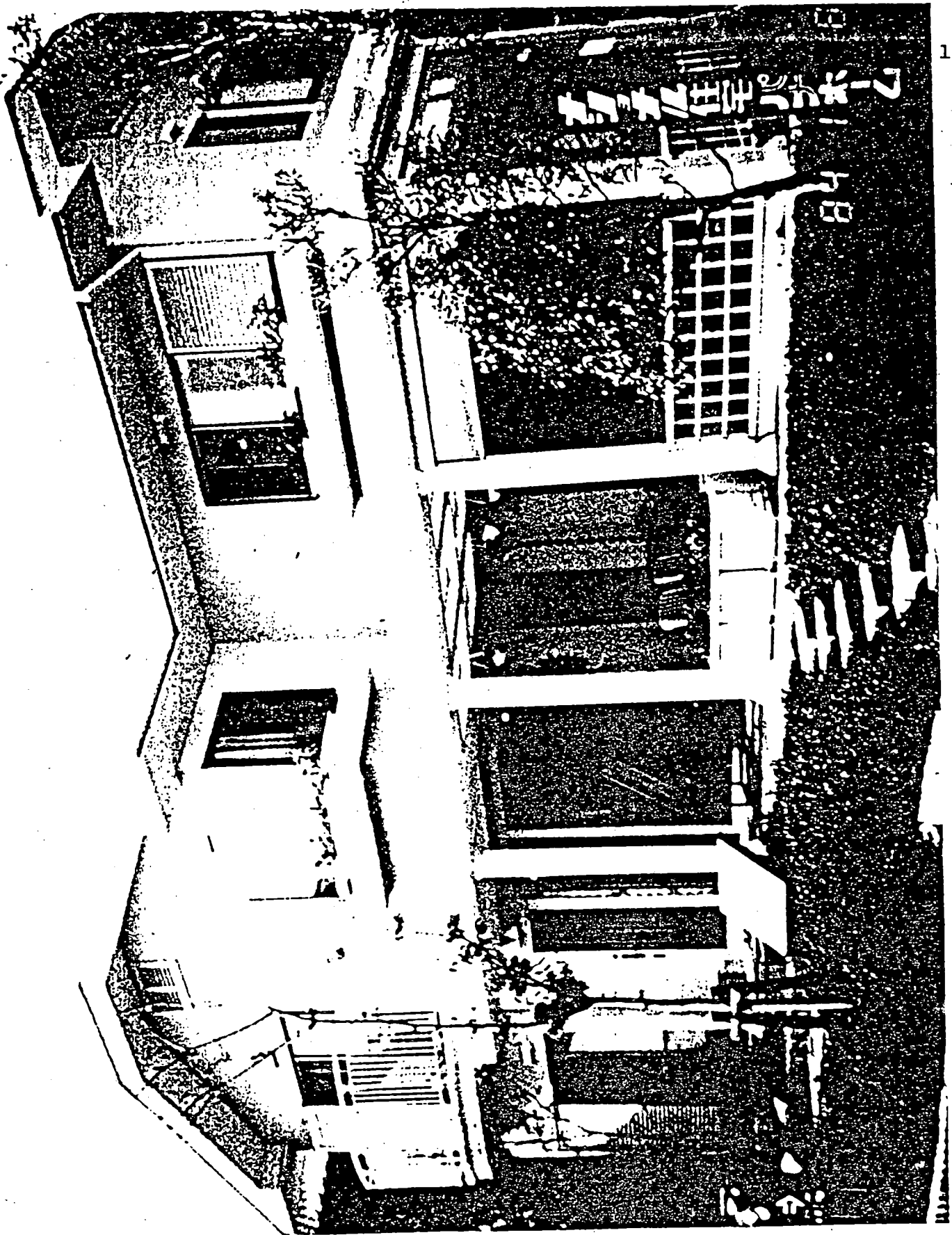


Figure 5.1.1: Sekisui House - 1984 Show Home

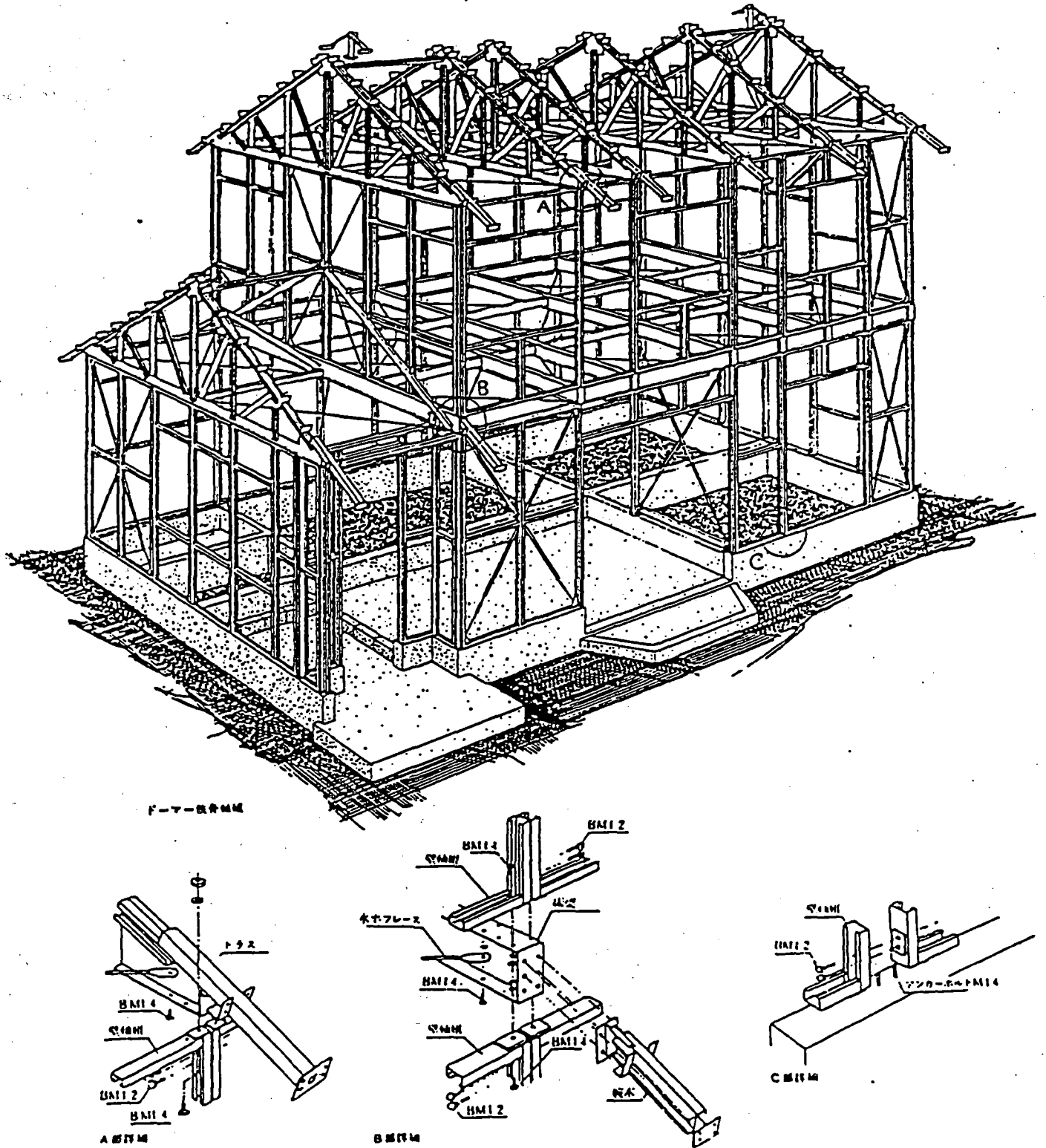


Figure 5.1.2
 Sekisui House
 Light Gauge Steel Framing System

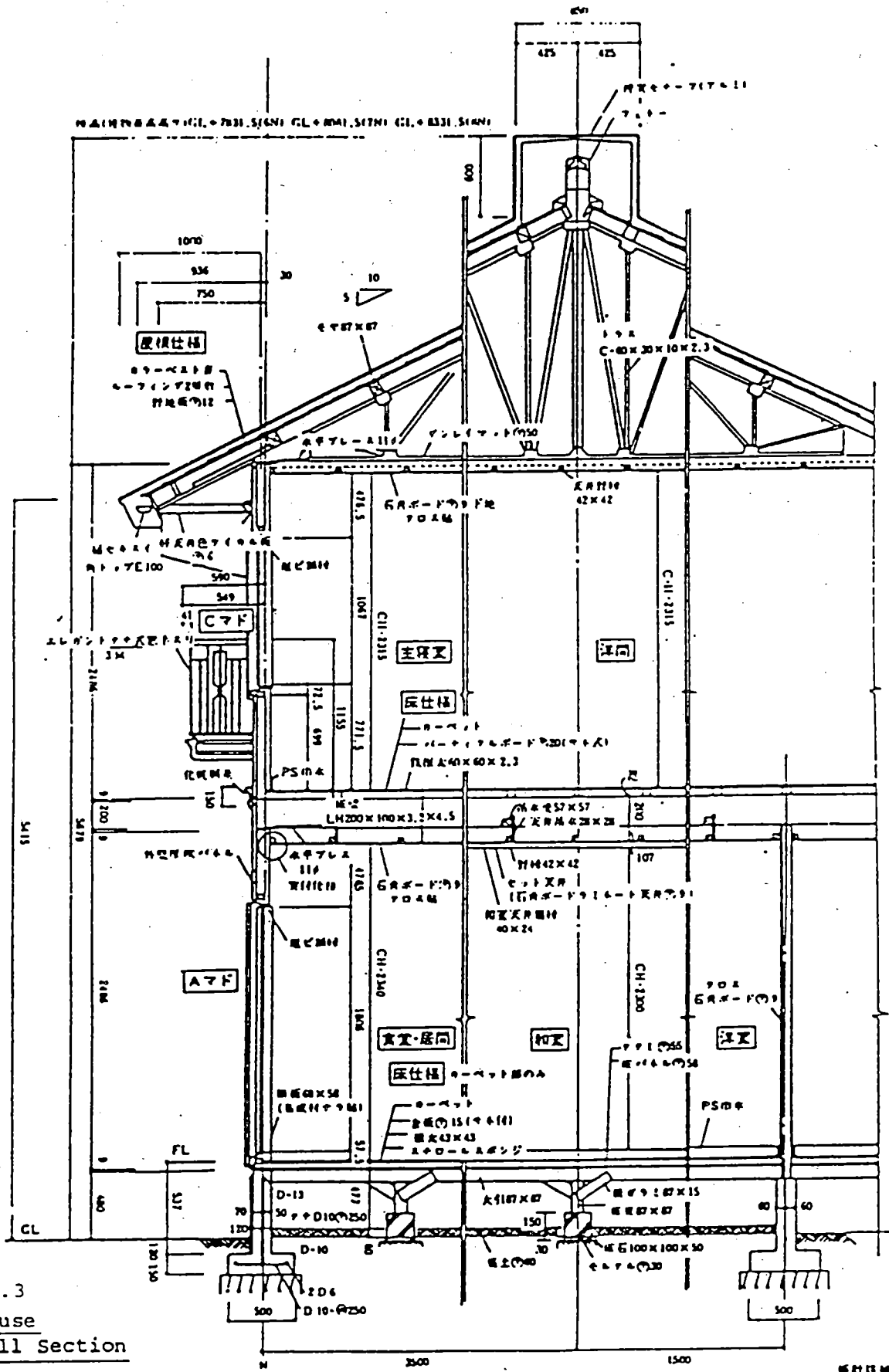


Figure 5.1.3
Sekisui House
Typical Wall Section

2. Panel Process

Exterior composite wall panels, of seven layer construction, are composed of an aluminum plate exterior skin cemented to a hardboard backing; steel framing members; foam insulation, either polystyrene or preferably a phenol based foam with greater fire resistance; an intermediate air space; and, gypsum board interior paneling. The exterior aluminum surface is painted with special acrylic resin in preparation for a uniform coating to be applied on-site after erection. The interior surface is finished on-site with vinyl roll material. As with the steel frame members, these panels are also stored in automated vertical warehouses until their recall for shipment.

3. Woodwork Process

All lumber is purchased kiln-dried to strict moisture content specifications. The lumber shop performs mitre processing of door frames, framing members for wooden houses, roof purlins, exterior jumbo modular wood panels for apartment houses, and truss and wall panels for platform wood construction. In addition, inner fixtures such as sill, head jamb, window frame and other trim features are manufactured by a computer control system that automatically positions and dimensions wood components, performs all cuts at the desired angles, drills nail holes and processes all connecting joints.

4. Warehousing Process

Sekisui House looks upon its factories as a veritable "department store" of housing components and the company has devised an automatic vertical warehouse system capable of storing and controlling all component parts for quick recall in response to customer requests. The entire warehouse is computer controlled and a single operator can perform all operations from receiving and shipping of members to storage and inventory control of those items. In the case of the Shiga Factory, the warehouse measures 30 m (100 ft) in width, 70 m (230 ft) in depth and 24 m (80 ft) in height and is equipped with a total storage area of 8000 m² (86 000 ft²). The storage capacity is equivalent to 500 complete housing units.

Based on a unit size of 100 m², the Kanto factory averages a production level of 500 units per month, with a maximum capacity of 800 units per month. This level is maintained with one work shift of 400 employees working six days per week with two Saturdays per month off. The standard work week is 45 hours and overtime may run to 30-40 hours per month. The storage system is capable of handling one month of production although inventory is usually at the 200 unit level, or 10-15 days of production. The loading yard has the capacity for shipping at the rate of 66 units per day using three shifts and the average shipping distance is in the order of 300 km. Exterior components require two to three, ten-ton flat bed trucks and interior components require one or two, four-ton trucks.

Sekisui's average house size is now 120 m², with an estimated retail price of \$52,000 U.S. (13 million yen) including delivery and on-site assembly and furnishing, but excluding furniture, utility hook-ups and landscaping. The entire process from initiation of work in the factory, following confirmation of the sale, to completion on-site takes approximately 50-60 days.

Misawa Homes

Misawa Homes was established in 1967 but can trace its history back to a family business, Misawa Lumber Company, established at the turn of the century in Matsumoto. Origins in the lumber business gave rise to Misawa's domination of the prefab wood housing market today. Founder and current President, Chiyoji Misawa, controls 9.6% of the shares. Other major stockholders include:

Tokai Bank	5.8%
Nippon Life Insurance	5.5%
Chiyoda Mutual Life Insurance	3.0%
Dai-Ichi Kangyo Bank	2.5%
Jiro Misawa	2.3%
Dai-Ichi Mutual Life Insurance	2.3%
Toyo Minka	2.2%
Sanwa Bank	2.1%

Foreign Ownership	11.3%
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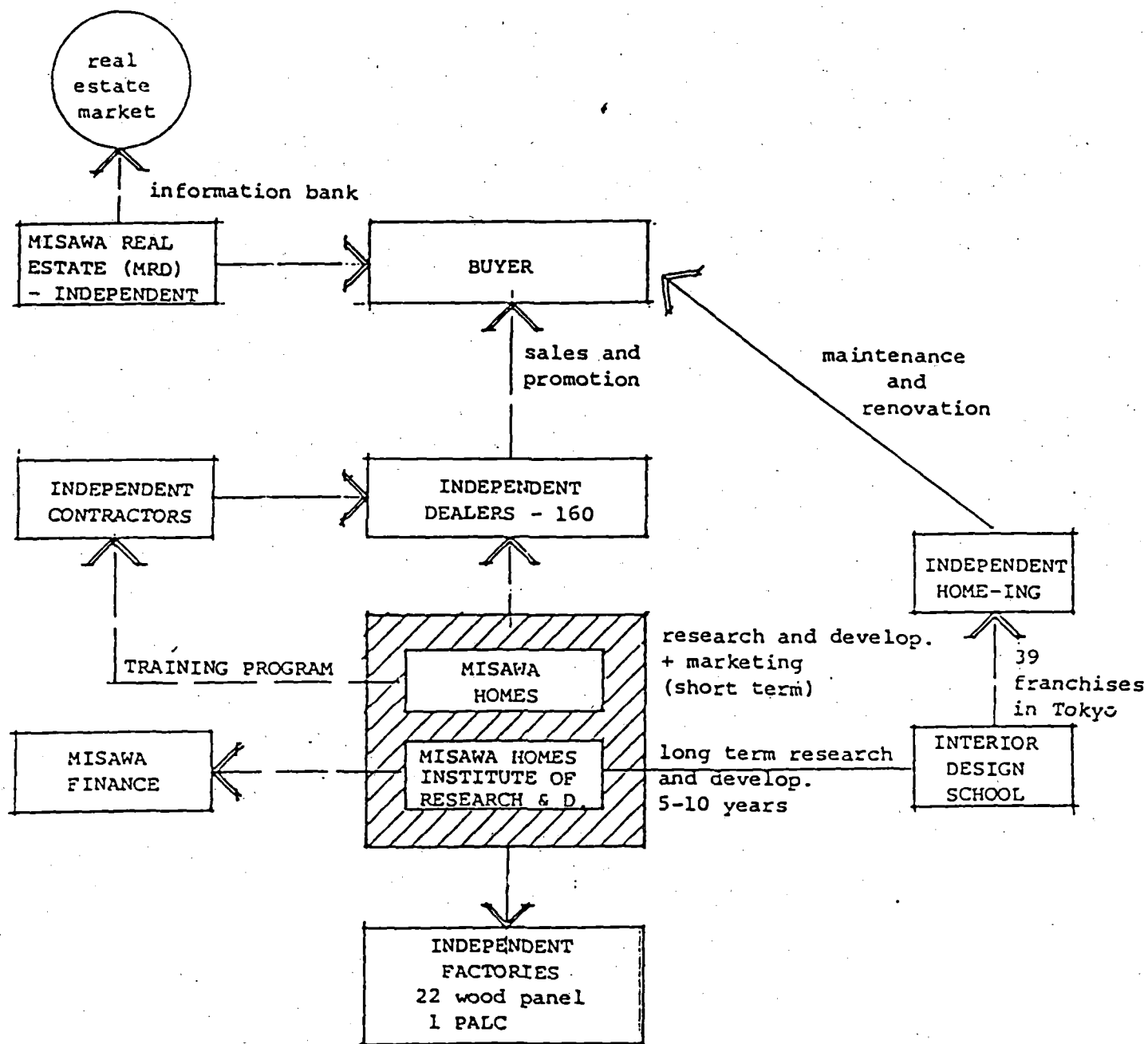
Misawa Homes ranks second among the top-five prefab housing companies and has an established reputation as Japan's leading manufacturer of prefab detached housing. However, the Company has not matched this record in apartment construction and its position in the apartment field with a steel frame and wood panel unit and now with their PALC system is yet to be established.

Misawa has virtually no competition in the wood panel system and has secured 90% of this market with its nearest competitor, Kobori Jugen, having only 6%.

Misawa might be termed a maverick among the major prefab housing companies in that its major product grew out of and still relies upon the lumber industry and yet, on the other hand, it is recognized as an innovator in almost every aspect of its approach to the housing industry. From its inception, the Company has emphasized research and development as a foundation to its growth and prosperity and has sought to control, but not necessarily own, all facets of the housing supply system from raw materials through after-sales service and renovation work. Misawa employs only 1 100 persons. This figure gives indication of its reliance on a franchising system that is now becoming more popular among others in the industry.

The "Misawa Total System" is predicated on an organizational structure that relies on Misawa Homes as the coordinating body for a host of independent companies that operate as franchises under the Misawa name.¹ Misawa Homes is responsible for overall administration and personnel training activities; its affiliate, Misawa Homes Institute of Research and Development, handles product development, research and information gathering; independent manufacturing plants produce the components and a dealer-contractor network promotes sales and delivers the product to the consumer.

¹ See Figure 5.1.4.



1983 30,650 Units
 1,105 Employees

Figure 5.1.4

MISAWA HOMES

ORGANIZATIONAL STRUCTURE

Source: Misawa Homes (adapted)

Misawa's major product has been the wood panel system but through its House 55 it has launched the PALC (precast autoclaved lightweight concrete) system on a light gauge steel unit frame.¹ Housing products are manufactured in 23 factories, 22 of which produce stressed skin wood panels. The new factory at Nagoya was built exclusively for the PALC system and opened in 1982.

Misawa's stressed skin panel system utilizes a range of panel types and sizes for exterior walls, floors, partitions and roofing and panels are classified by structure, by sheathing, by connection, by insulation and by size and configuration. The Matsumoto Panel Plant is the largest and the oldest of Misawa's production centers and serves the Tokyo and Nagano regions. The plant employs 120 persons and specializes in large size prestressed panels and historically has concentrated on production of various "fixed" housing plans versus "free style" plans.

The factory has undergone three major changes since it first started operations in 1970 and these changes are perhaps indicative of trends within the prefab industry. First was the introduction of a large panel system (up to 3 x 4 metres) in lieu of the standard small panels; second was the conversion to the exclusive production of large panels to reduce on-site labour; and now the recent conversion program to produce a range of panel sizes, in sequence and in small runs, to increase "free style" options and reduce inventories.

¹ See Figures 5.1.5, 5.1.6, and 5.1.7.



Figure 5.1.5 Misawa Homes - House 55 Utilizing PALC

The Matsumoto Plant previously operated with 120 panel sizes and types that combined to produce three basic housing models with 50 available options for each model. With the recent conversion to a production line that adjusts to varying panel sizes, these three house types now come with up to 300 options, requiring upward of 400 panel sizes per model. Panel sizes have increased from 120 to 400 and two panel types are offered -- normal and fireproof. The sequential production of differing panel sizes on a demand basis also reduces the need for on-site inventory which had previously been sustained at a level of approximately 8 000 panels and consumed about 60% of the total factory area. Further work is now being done to increase the ratio of factory finishing of components.

The production capacity at the Matsumoto Plant is 9 000 panels per month, equivalent to 250 completed units. Current production objectives for the plant are:

1. to increase production efficiency and reduce the time between placement of orders and delivery date;
2. increase the variety of panel sizes in short production runs;
3. increase the level of finishing in the factory versus on-site; and
4. reduce all inventory at the plant.

In June 1984, Misawa launched the Misawa Production System (MPS) with the objective of reducing inventory by 50% by year end. This implied changes throughout the production process and a change-over to a demand system. Lead times are reduced for ordering new materials and the inventory of materials at any given time is minimized. With an anticipated freeing up of former storage areas for both raw material and finished components, the plant is now looking to new products and finishing processes to utilize excess space and manpower.

This move into related products is exemplified by Misawa's finishing plant opened in May 1983 at Matsumoto, the location of Misawa's first wood panel factory. The plant specializes in the production of finger-joint stock from scrap materials to be used in the manufacture of staircases, furniture, trim features and other finished wood products. Rather than produce the finished articles the plant is concentrating on developing new exterior and interior finishes as well as finger joint stock and supplying these to manufacturing subcontractors.

Misawa's House 55 represents a radical departure from the wood based components upon which the company's reputation is based. Misawa introduced a new patented "ceramic" product as an alternate to wood for its House 55 and its production of PALC culminated 13 years of research and costs of some \$35 million U.S. (8 billion yen) [10] of which \$6.6 million U.S. (1.5 bil-

[10] Estimated on 1980 exchange rate of \$U.S. = 226.74 yen.

lion yen) was subsidized by the Japanese government.

The manufacturing process begins with a slurry of water, silica, cement and additives into which minute air bubbles are blown. The bubble-filled slurry, which is poured into moulds, sets after thirty minutes and then is autoclaved cured at a high temperature and pressure, 180°C and 10 Atmospheres. The result is a porous, lightweight material suitable for a range of applications with properties that resemble concrete.

Misawa has adopted the unit capsule for House 55 in which PALC wall panels are hung on a rigid steel box frame. The standard module is 4.5 x 2.75 x 2.3 metres complete with doors, windows and interior finishings and services. A standard house requires 10 modules which are transported to the site, two per truck, and erected on a poured-in-place concrete footing.

Chiyoji Misawa's enthusiasm and energy seems to be a very large part of the success of Misawa Homes and his entrepreneurial style has no doubt contributed to the success of the company over the years. He firmly believes that there is still much room for cost reduction in housing and sees three areas for improvement: 1) technical innovations through new materials and new types of technologies -- a further 30% cost reduction; 2) rationalization of distribution -- a further 10% cost reduction; and 3) mass production -- a further 10% cost reduction.

Historically, the housing industry has examined technical innovations and rationalization of distribution and Misawa in particular, through its Research Institute, has examined category (1). However, Misawa is now changing its focus to categories (2)

and (3), although technical innovation will always remain a preoccupation of the company.

Research is a main activity within Misawa Homes and current programs of the Misawa Institute of Research and Development include material handling and delivery methods, material development and promotion of research and development activities with outside interests. The company currently has some 120 persons, including members of the Institute and outside interests, involved in this research and budgets 1.5% of its sales revenue on research and development.

Reflecting this commitment to new ideas is Chiyoji Misawa's requirement that employees meet an annual quota for new ideas. He also professes to meet 10 new people each day and his search for information is compulsive, if not legendary, within the company. Misawa cites the U.S. Apollo Program as a key source of personal inspiration and claims that this program has become a model for organizing and coordinating the actions of various disparate companies towards common objectives under the Misawa banner. From NASA's approach, Misawa learned that no single company could send a man to the moon but through a network of companies the challenge could be met. This resolve to apply and coordinate new technological systems pervades much of Misawa's activities and shapes the philosophy of the company today.

New long term developments being pursued by Misawa represent a shift from technical innovation, as applied to the means of production, to a broader concern for the overall well-being of the user. This new research thrust falls into three board

categories, as described by Misawa:

1. Mechatronics

Mechatronics is the current Misawa "star-player" and involves innovation in three areas referred to as the "three innovations" -- factory automation, office automation and home automation. Lately, a fourth innovation has been added: sales automation. In the case of factory automation, Misawa claims to have improved plant productivity by a factor of 7.5 over the past 10 years and cites a reduction in labour time required to construct a house from 200 000 minutes for a typical Japanese post and beam down to 60 000 minutes per unit for the prefab prestressed wooden panel system. Today he claims that the PALC system has further reduced this time to 10 000 minutes per unit.

In office automation the emphasis is placed upon a "data bank" in which data on successes and failures of the company can be compiled at a rate of 100 cases per year. This data bank then becomes a reference source for engineers engaged in product development as well as a training resource for new employees. In home automation Misawa specifies five items -- security, cleaning, washing, cooking and sewing. Assuming that the house life is 100 years, the household appliances will be replaced every 10 years and the interiors every 5 years. It is the company's policy to market houses complete with electrical appliances which ensure the realization of these five items rather than rely on others to supply these items. Subsequent maintenance and after-sales service and renovation of this living environment also falls within Misawa's purview.

Sales automation is being pursued through the application of television in marketing activities. A sales attache case is equipped with tape recorder, transmitter and receiver to allow the salesman to describe the features of a Misawa home merely by selecting a TV channel. Also, through an on-line hook-up between the customer's telephone set and Misawa's equipment, the customer is furnished with real estate information and house market information including availability and prices of housing lots.

2. New Materials

Chiyoji Misawa believes that the 1990's will be the age of clay and inorganic compounds, also called "new ceramics", in the housing industry. These are materials that provide performance advantages over wood in terms of cost, heat-insulating qualities, freedom from corrosion, durability and dimensional stability but, most important, they are produced from materials readily available in Japan. In the case of House 55, it is claimed by Mr. Misawa that comparable traditional costs have been reduced to 1/40 in raw materials, 1/40 in transportation and 1/20 in on-site construction labour, all by virtue of the technical innovations represented by PALC. Through future declines in the cost of silicone solar cells, Misawa sees the possibility of freeing the homeowner from the need to procure electric power from a utility company and views the possibility of eventually freeing the home entirely from purchasing gas, water and other services and utilities from outside sources.

3. Biotechnology

Misawa is already spending a considerable portion of its research budget on what it calls "biotechnology" or the relationship between the house and the well-being of its occupants. Areas of investigation range from hydroponics in the home to the effect of colour and building forms on the growth and development of children. The company has been researching some 20 medical relationships between the house and the occupants including such topics as the effect of airtightness on asthmatics.

Misawa Homes is in an era of transition, moving from its historic roots as a wood panel prefab company toward a much broader concept of providing not just shelter but a home environment predicated upon a very high amenity level. The firm is now adapting its philosophy, as represented by its franchising system, to include many more home products and sees its future as the NASA of the Japanese housing industry.

Daiwa House Industry Co. Ltd.

Daiwa House was established in 1955 and has maintained a strong presence in prefab housing from its inception. It is still guided by its founders, the Ishishashi brothers, and Nobuo Ishibashi, Chairman of the Board, retains a 2.1% interest. Other major stockholders include:

Tokai Bank	4.9%
Sumitomo Bank	4.9%
Dai-ichi Mutual Life Insurance	4.5%
Nippon Steel	4.0%
Mitsui Trust and Banking	3.0%
Nippon Life Insurance	2.2%
Foreign Ownership	15.8%

Daiwa has consistently ranked third among the top five prefab companies. It ranks second behind Sekisui House in production of steel frame prefabricated detached units, third behind Sekisui House and Misawa in overall production of detached units and is a close third to National in production of prefab apartment units. In 1983, sales in apartment units exceeded sales of detached units for Daiwa and apartment sales are viewed as a strong growth area with the introduction of three-storey prefab apartment units.

Daiwa launched its first product in 1955, a pipe-frame house that was sold to Japan National Railways and subsequently to various government agencies that had cause to house employees at branch locations throughout Japan. This was followed shortly after by the production of the "Mizet" or "Midget" House offered to the public in 1959. The Mizet was conceived in response to

the growing shortage of space for children in post-war housing and intended to provide a study space that could be installed in the rear of the existing house. Its design had to meet three criteria: be inexpensive, not exceed three hours for construction time and be lightweight but durable. The actual product measured only 2.72 m x 3.63 m and was constructed of lightweight steel with hardboard wall panelling.

The initial pipe-frame house for the JNR and subsequently the Mizet House forged two directions for Daiwa's growth: the pipe-frame house led to general contracting activities involving steel fabrication and erection and the Mizet House was the start of prefab housing operations.

Daiwa employs some 5 670 persons (as of March 1984) of which approximately 65% are involved in prefab housing operations. This large employment force, reflects the company's greater reliance on direct sales versus dealerships. Almost 90% of all house sales are through company salesmen with the remainder through a limited franchised operation.

The company has recently reorganized along four major product lines: single family detached prefab housing, multi-family prefab housing, general contracting and commercial prefab buildings. Various smaller divisions cover such activities as the home centre business, urban development, resort hotel and recreational facilities, and research and development. Daiwa has also ventured into the foreign market as well as being an active participant in housing and urban development schemes in South America, Africa, the Middle East, Southeast Asia and China. It

currently operates four subsidiary companies in the United States, principally involving 2 x 4 housing construction in California and Texas.

Daiwa House has twelve manufacturing plants, nine of which produce prefab housing components. The Ryugasaki Plant, near Tokyo, has the highest production level of the nine plants with approximately 300 units per month.

Daiwa's lightweight steel framing system is essentially a post and beam system (Rhamen system) with modular wood panels for walls and flooring.¹ Exterior wall panels combine a light gauge steel frame with a cement-asbestos exterior skin, wood studs, batt insulation and a reflective mylar vapour barrier. Exterior and interior finishing, windows and doors, and all electrical, mechanical and plumbing is done on-site. Floors are constructed with a stressed skin wood panel spanning between steel beams.

Daiwa operates with 57 sales offices, each of which may encompass three separate field divisions, i.e., three show homes, and 150 show homes throughout Japan. Approximately 30% of sales are "fixed" plans and 70% are "free-style" plans although this ratio is now changing and "fixed" models have again gained in popularity over the past five years.

¹ See Figures 5.1.8, 5.1.9, and 5.1.10.

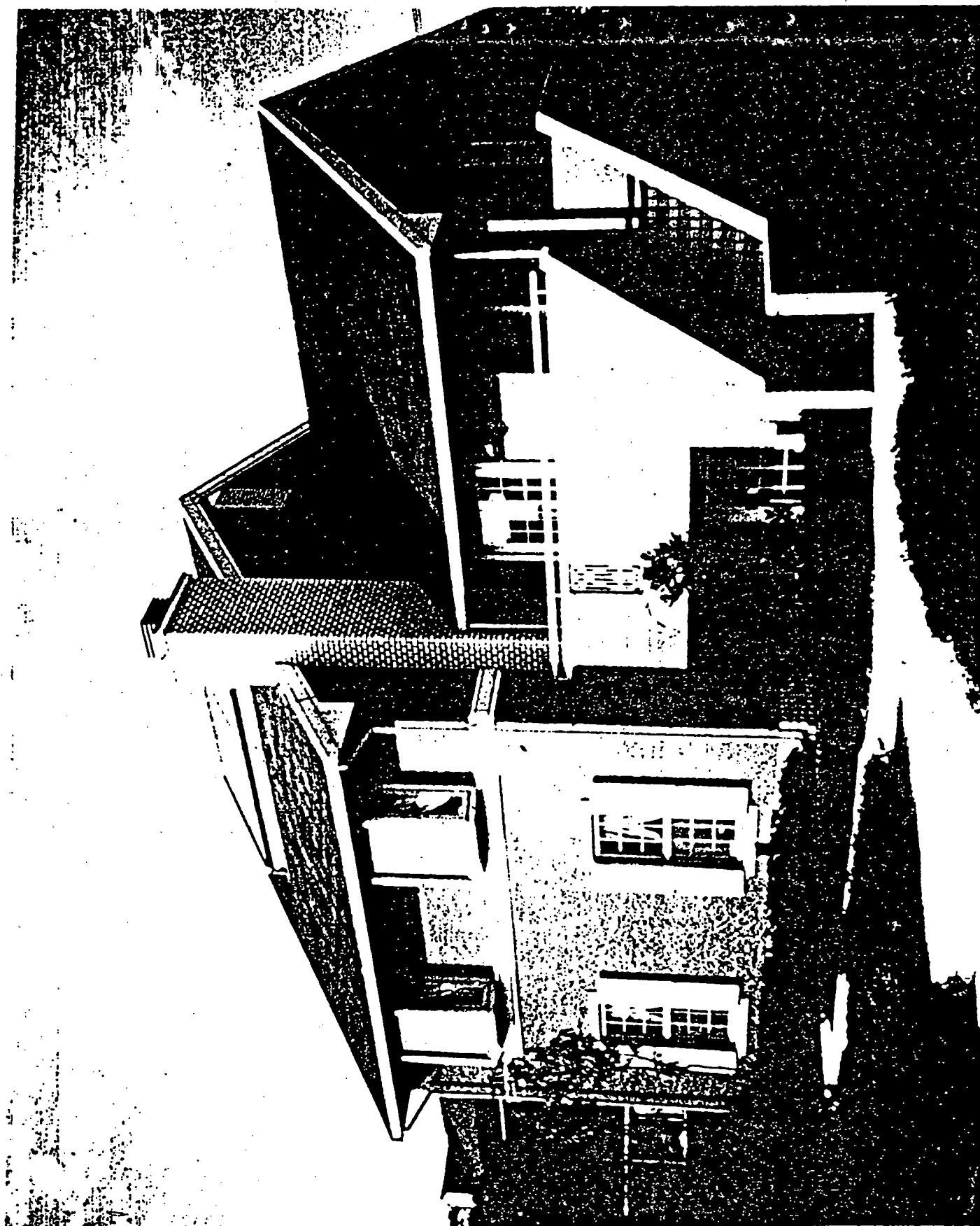


Figure 5.1.8: Daiwa House - 1984 Show Home

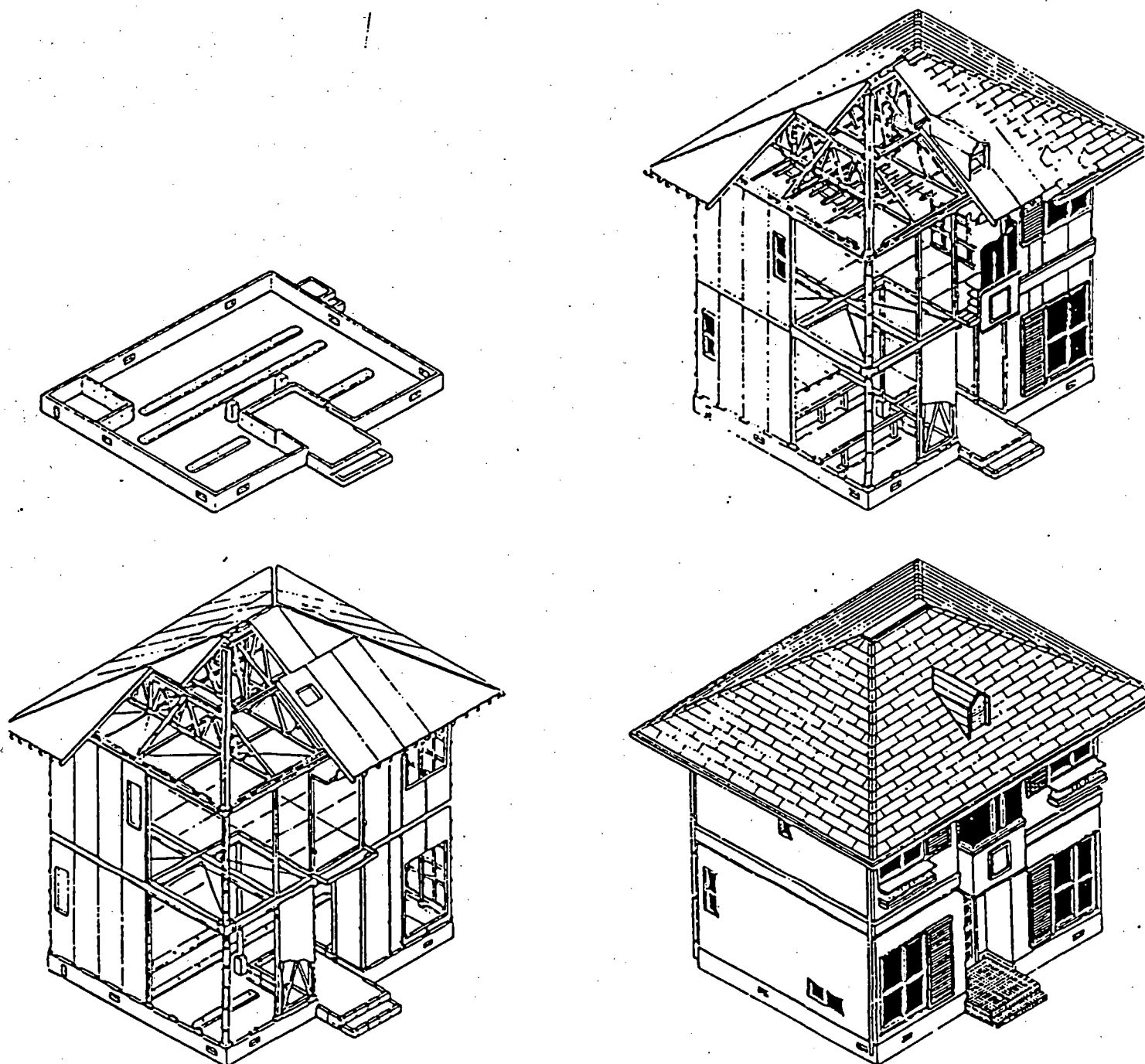


Figure 5.1.9
Daiwa House
Steel Framing System



Figure 5.1.10
Daiwa House
Typical Wall Section

National House Industrial

National House Industrial Co. Ltd. was established in 1963 through the investment of Matsushita Electric Co. Ltd. and Matsushita Electric Works Ltd., each of which still retain a 29.3% ownership. Other major shareholders include:

Sumitomo	2.6%
Kyowa Bank	1.8%
Hench and Co.	1.6%
Nippon Life Insurance	1.5%
Konosuke Matsushita	1.4%
Foreign Ownership	6.0%

National House has consistently ranked fourth among the top-five prefab companies. It ranks third behind Sekisui House and Daiwa House in production of steel frame prefab detached units, fourth overall in production of detached units and second behind Sekisui House in prefab apartments. In 1983, sales in apartments exceeded sales of detached units and this is seen as an important market area with the recent popularity of three-storey, low-rise units. The company is also placing increasing emphasis on House 55, now in its second year of sales.¹

National House views its role in the housing industry as an extension of its extensive involvement world-wide in the supply of household appliances, home entertainment systems and a variety of products relating to the home and the needs of daily life. Its products are best known in North America under the brand name "Panasonic". The company now seeks to integrate appliances and its other home products with its production of building materials to create a model of good living. However, these products are not directed exclusively to National's own house building opera-

¹ See Figure 5.1.11.



Figure 5.1.11: National House - House 55

tions and National products are used extensively by other prefabricated builders including Sekisui House and Daiwa House.

National House employs some 2 150 persons (as of April 1984) including 70 authorized first-class architects and 130 second-class architects. The small number of employees in comparison to Sekisui House or Daiwa House is a result of National's reliance on dealership for sales and its role as product supplier to these dealerships. Of the 2 000 employees, approximately 600 are factory workers, 350 are professional staff including architects and engineers, 150 are head office staff and the remaining 1 000 are involved in sales throughout the various branch offices. Of these 1 000 in sales, 700 are in branch sales offices and dealerships and 300 are involved in direct sales, the majority of which are to local public housing corporations. National operates show homes at 270 locations throughout Japan and has 80 branch offices and 240 dealerships.

Products are manufactured at three factories: Koto serving the Osaka/Kyoto region; Tsukuba serving the Tokyo region; and Kyushu serving the southern region. There is also a small distribution centre in Hokkaido. Although National offers a number of building types including the large panel construction method utilizing light gauge steel reinforcing frames, the Rhamen construction method utilizing light gauge steel posts and beams, and 2 x 4 construction, it is the steel frame system that is the mainstay of their detached prefabricated housing system. This places National in direct competition with Sekisui House and Daiwa House among the top-five prefabricated companies.

Selection of the light gauge steel frame system was initially predicated on two objectives: first, reducing reliance on wood and wood products which, it was assumed, would be subject to increasing scarcity and increasing cost; and second, the ability to seek improvement in quality through mass production of steel components. The automated production systems now used by National have been some ten years in the making. However, with this increased production capacity through automation has come the concomitant commitment to secure high levels of constant demand for these products. Production levels of 700 units per month at the Koto plant, with a maximum capacity of 1 000 units per month, represent a substantial advancement over the first plant at Osara which provided 500 units per year, all handmade.

National's steel frame system for detached housing utilizes the Rhamen construction method of assembling light steel posts and beams on-site to create a rigid box construction.¹ The first floor is constructed from modular wood panels supported on intermediate wood joists; wood panels on the second floor bear on a system of intermediate wood joists spanning between lightweight open web steel joists; and the hipped roof is framed in steel with wood purlins supporting sheathing panels. Exterior cladding is a large modular wood panel system with integral steel frame, cement asbestos exterior cladding, batt insulation and gypsum board interior. A final exterior finish is applied on-site, typically sprayed stucco, and, similarly, interior walls and ceiling surfaces are finished on-site with vinyl wall covering. All win-

¹See Figure's 5.1.12, 5.1.13, and 5.1.14.

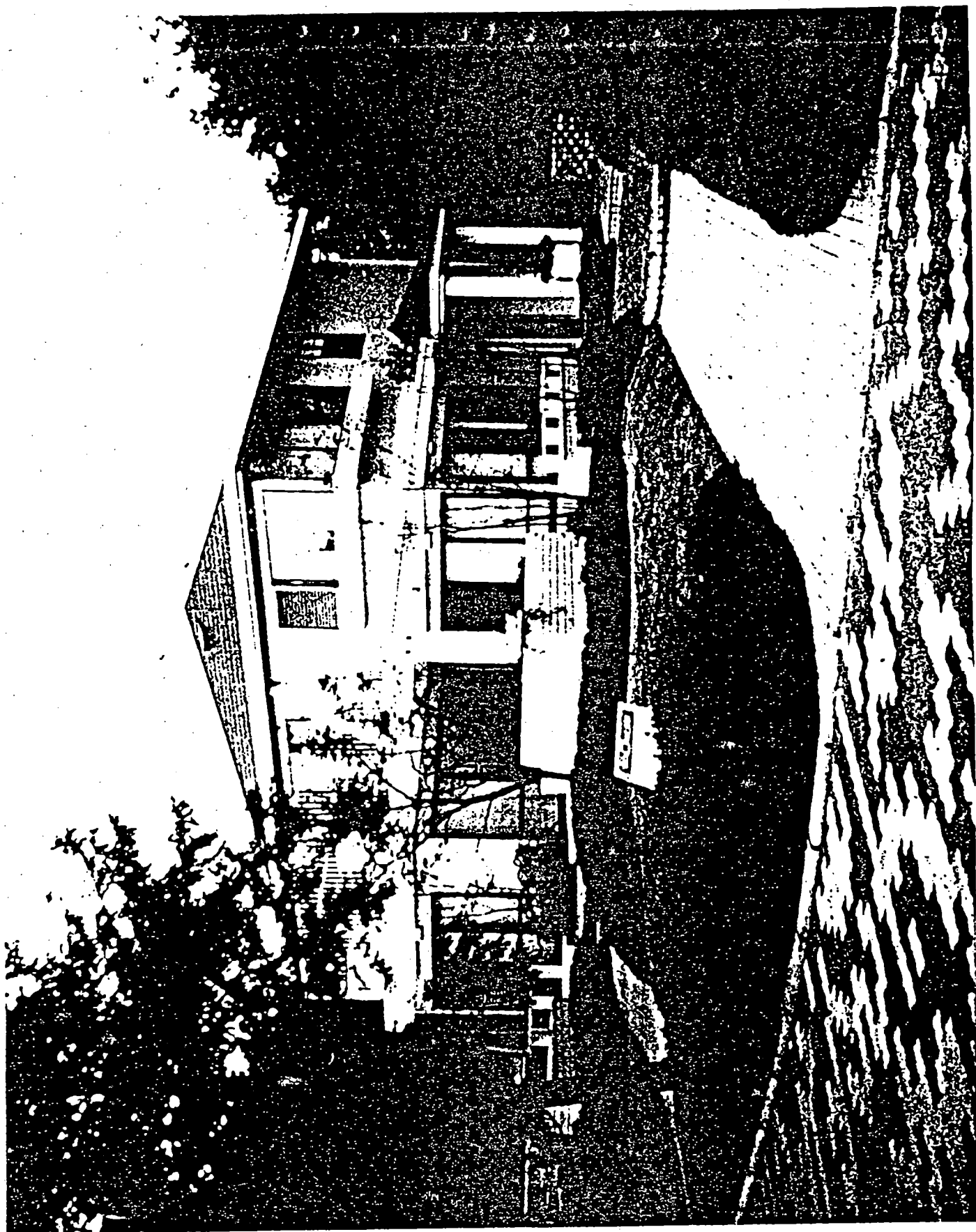


Figure 5.1.12: National House - 1984 Show Home

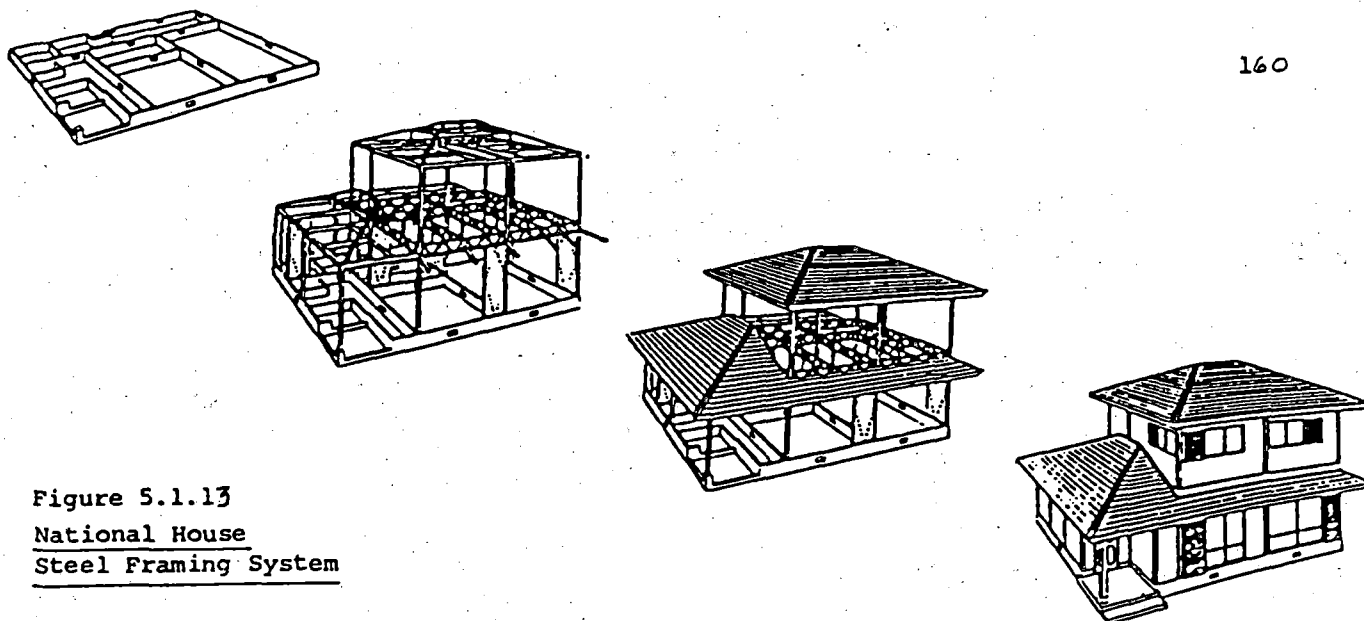
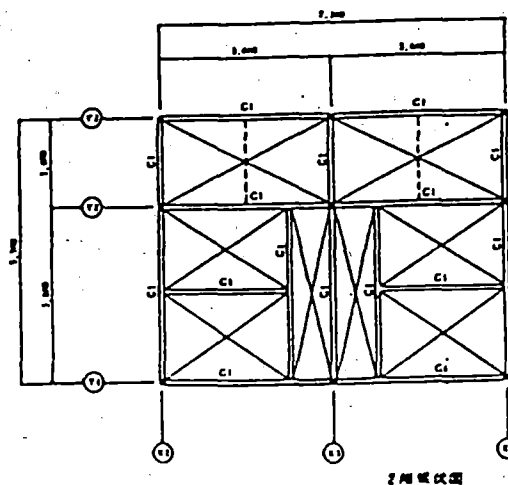
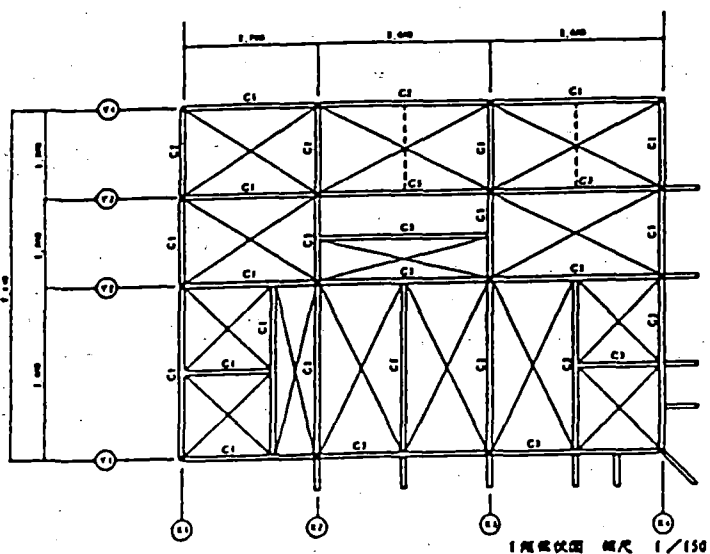
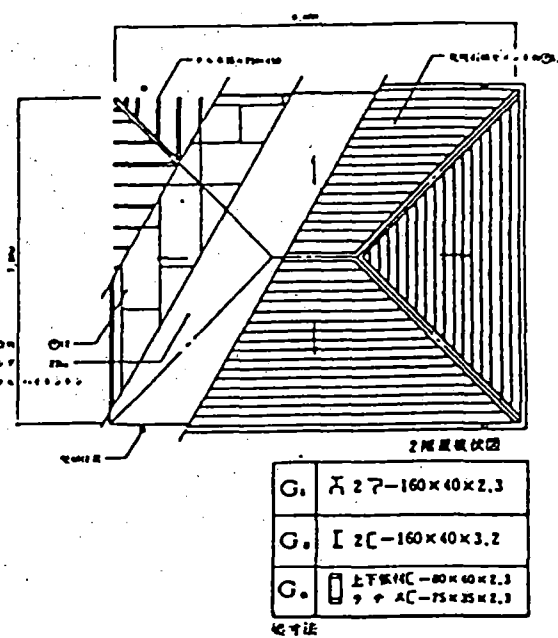
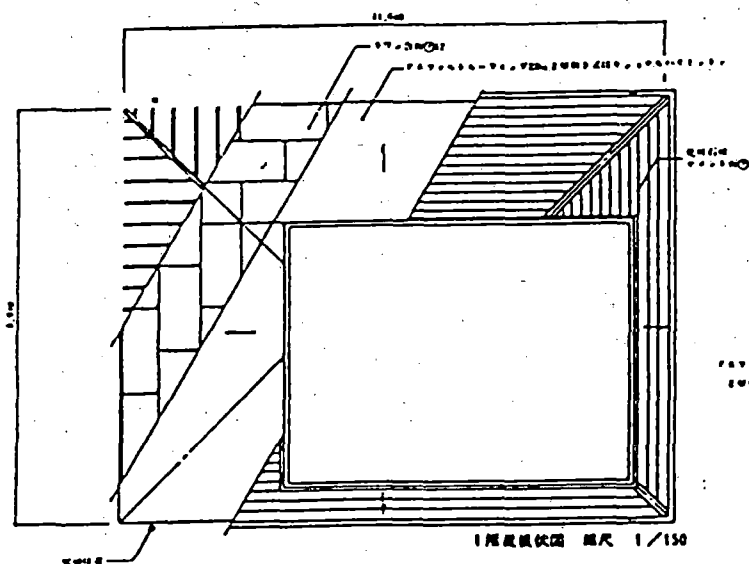


Figure 5.1.13
National House
Steel Framing System



dows and doors are factory installed in the panelling process. Electrical, mechanical and plumbing is done on-site.

As a member of the Matsushita group and Japan's largest manufacturer of robotics, National's production facilities can boast some of the most up-to-date automated systems in the industry. Since starting their own steel rolling mill at the Koto factory four years ago (previously steel frames were purchased from sub-suppliers) the mill has been automated to the extent that a single worker can now control an entire production line 80 metres in length. Quality control throughout the factory is achieved through use of microprocessors and all machinery in the large panel production line is controlled through a central computer.

Each of National's factories is self-sufficient in that each has the capacity to provide a full line of products, with the exception of windows and doors that are supplied exclusively from the Koto factory. Production levels for each factory are based on sales in their respective catchment area covering approximately a 250 Km. radius. The Koto factory, the largest of the three, employs 180 factory workers with a total complement of 250 employees including administration, training centre staff and production design and engineering staff. The plant operates with one daily shift from 8:00-16:45 hours, five days per week with up to two hours of overtime per day.

Of National's total sales, 63% are building materials (housing components to dealers), 27% are direct sales of housing and 10% are sales of housing lots. Ninety-eight percent of all sales

are in the Honshu area of Japan and sales in Hokkaido area have averaged only 10-20 units per month.

National House is not in the land business. It will purchase serviced lots from other real estate companies for resale to customers and this now seems to be the prevalent practice among most prefab housing companies. The firm emphasizes pre-sales and the "free style" plan and its involvement in speculative housing is negligible. Recent sales have indicated a trend to larger, high quality units employing free-style design. National House hopes to achieve a break even point of 2000 units with its sales of House 55, an increase of 65% from the current level of sales.

National utilizes the dealership program for sales of its products but maintains a direct interest in these dealerships through 50% ownership. The company also runs an extensive training program for its dealers and on-site assemblers at its training centre at the Koto factory.

House sales fall into three categories: houses on subdivided lots, replacement houses involving demolition of an existing house, and replacement houses whereby an owner sells an existing property and moves to another site (the last category is very limited). The most effective means of sales and promotion is the show home in show parks and National has up to 260 show homes throughout Japan. Existing customers are also a prime source of new sales and National estimates that 35% of sales originate from referrals from existing National customers.

In addition to National's strong commitment to House 55, continued research into new products and processes is an important function of the overall operations and is promoted at each factory. This research falls into three main categories:

1. development of improved shelter with concern for safety in the home, durability of materials and components, heat and fire resistance standards and new hardware systems;
2. improvements of facilities that promote comfort and convenience in the home including heating, kitchen and bathroom appliances and fixtures; and,
3. increased understanding of user needs and consumer preferences.

This research reflects a basic philosophy of the company that new materials must be sought to increase quality and reduced cost on the supply side and a constant demand must be sought on the demand side to justify the large capital outlay for production facilities.

Sekisui Heim (Sekisui Chemical)

Sekisui Chemical founded Sekisui House in 1960 as an independent company specializing in prefab housing based on lightweight steel framing and composite wall panel systems. On the basis of this experience, and in response to the remarkable economic growth throughout Japan that appeared in the mid 1960's, Sekisui Chemical launched its second effort in the prefab housing field and started developmental work on its prefab unit house in

1969. Unlike Sekisui House Ltd. which is an independent company, Sekisui Heim was established as a division within Sekisui Chemical Co. Ltd. This division now accounts for 38% of total sales of Sekisui Chemical and building materials and housing equipment accounts for another 11.4% of total sales.

The largest shareholder of the parent company Sekisui Chemical is Asahi Chemical Industries which in turn is the sixth largest producer of prefab housing through its "Hebel House" division. Major shareholders of Sekisui Chemical include:

Asahi Chemical Industries	16.2%
Dai-Ichi Mutual Life Insurance	6.5%
Sanwa Bank	4.5%
Daiwa Bank	4.1%
Tokio M & F Insurance	3.3%
Sekisui House	2.1%
Foreign Ownership	10.3%

Sekisui Heim ranks fifth among the top five prefab housing companies and fifth in the production of detached units although annual sales of detached units are not far off those of Daiwa and National. Sekisui Heim has not been strong in the apartment field but sees advancement in this area with the introduction of a new three storey prefab apartment unit.

From the outset, Sekisui Heim pursued a prefab system that would reduce cost by minimizing on-site labour, increase quality control through industrialization of not only components but the entire house, and capitalize upon its experience in manufacturing various housing related products. Sekisui Chemical already had broad experience in manufacturing housing components such as buckets, garbage containers, PVC pipe joints, solar water heaters, septic tanks and electric water heaters, and this

provided invaluable insight into systematized plant production.

The welded box frame was selected to take advantage of lightweight steel and promote unit construction with the objective of "manufacturing" up to 90% of the house at the plant production stage.¹ The dimensions of the unit are 2.5 x 5.4 x 2.7 metres with a weight in the order of two tons. Each unit is so designed to be independently constructed and a high degree of flexibility and adaptability has been given to connection and opening portions. Panelling parts comprise four sub-systems: side wall units, outer wall panels, floor panels and roof panels. Interior systems consist of side closet, sanitary section, kitchen section and stairway section. The production line is organized to produce these units in sequence at about five minute intervals.²

Sekisui Heim sees its unit house concept as representing the third stage of the prefab housing industry in Japan. The first stage of industrialization began with factory production of parts and materials, facilities and equipment and was followed by the second stage with "semi-finished" products, as represented by pre-cut and processed exterior wall panels and floor panels. The unit module represents this third stage as it allows complete assembly and finishing of bathrooms, kitchens, living rooms, entrances and bedrooms in the factory and reduces on-site work solely to assembly of these building blocks.

Of a total of 6000 employees in Sekisui Chemical, 1200 are involved in the prefab housing division of which 400 are sales staff. The company has direct sales in the Tokyo, Osaka and Nara

¹ See Figures 5.1.15, 5.1.16, and 5.1.17.

² See Figure 5.1.18.

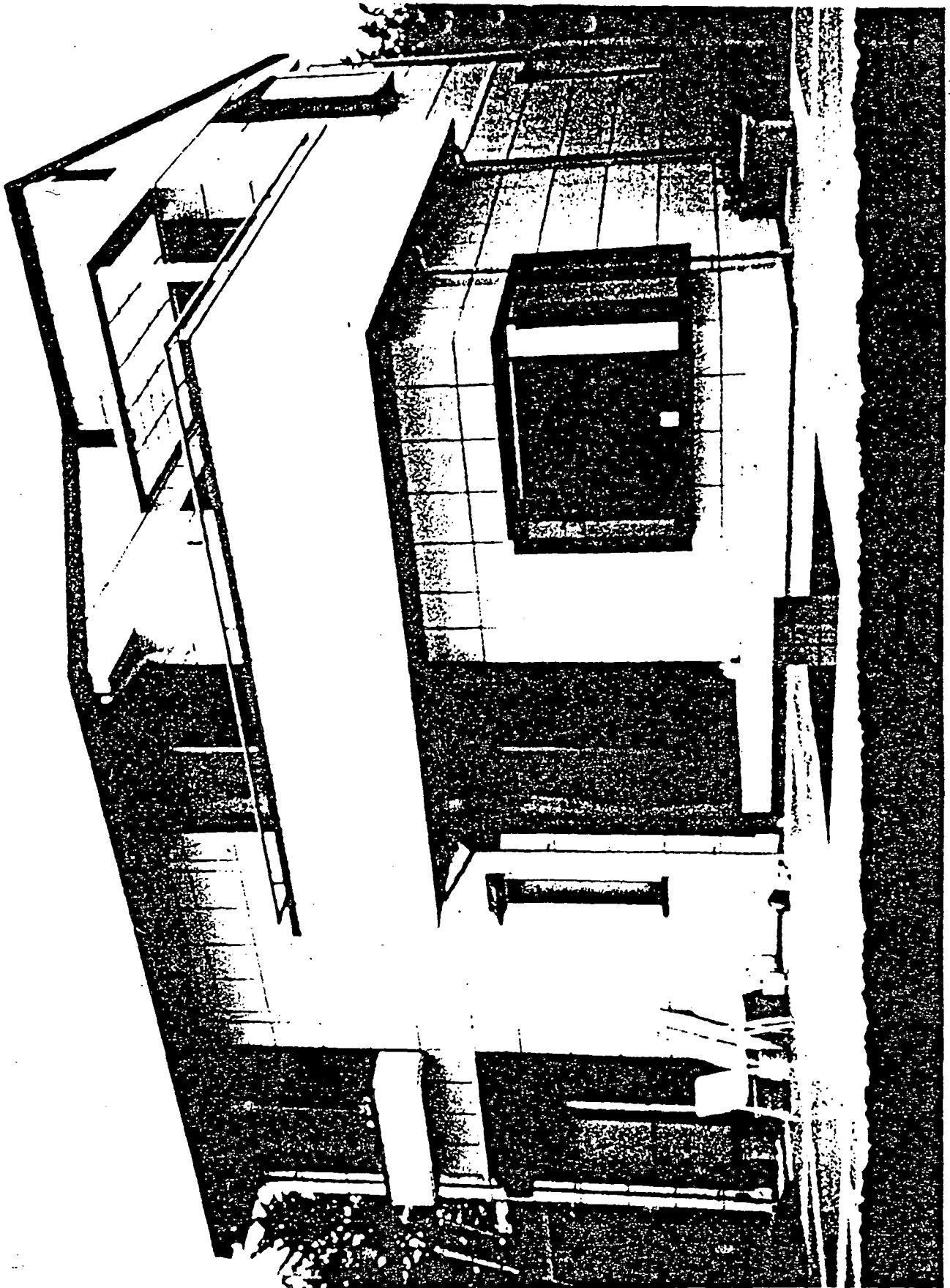


Figure 5.1.15: Sekisui Heim - 1984 Show Home

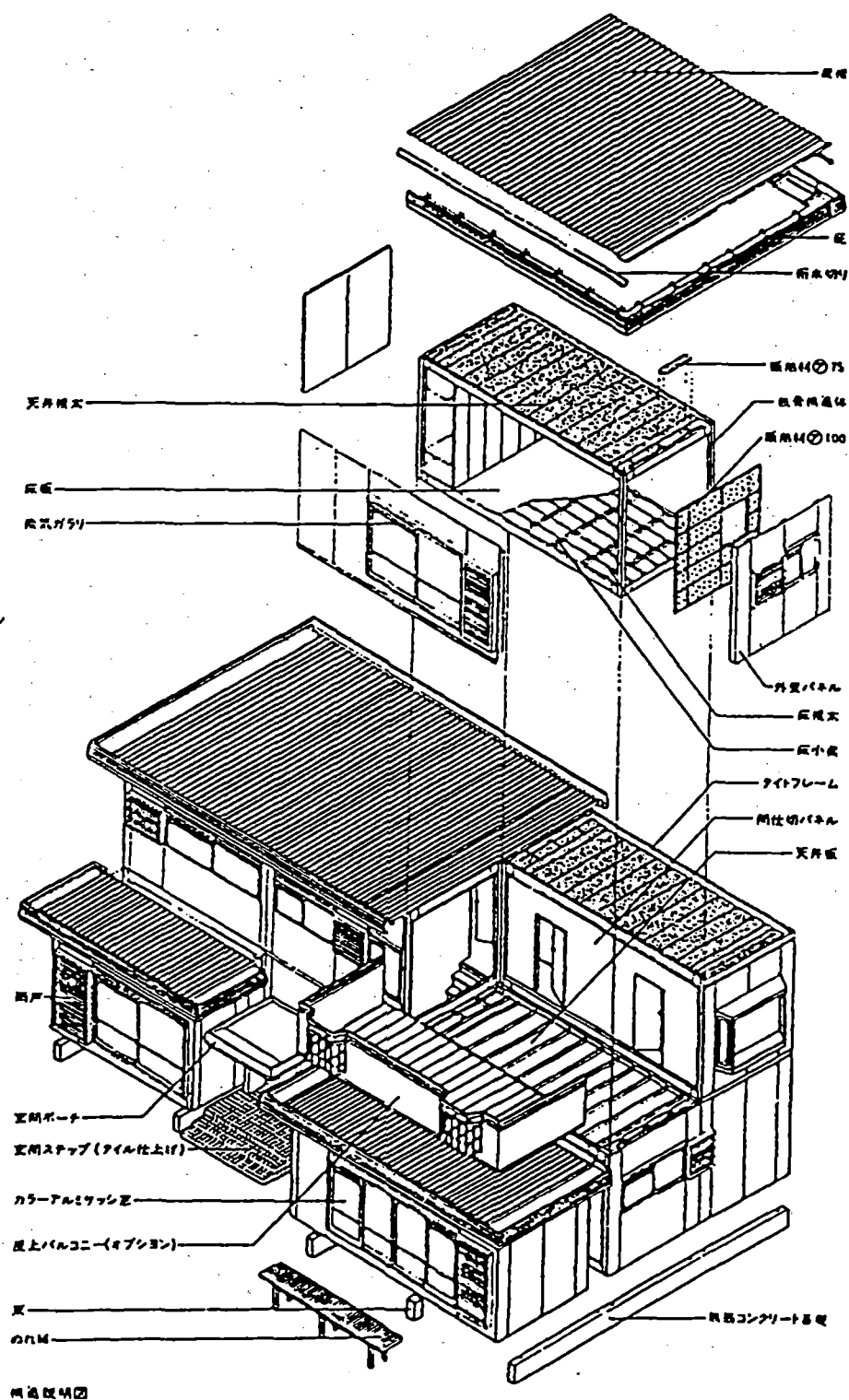


Figure 5.1.16

Sekisui Chemical - Sekisui Heim
General Construction

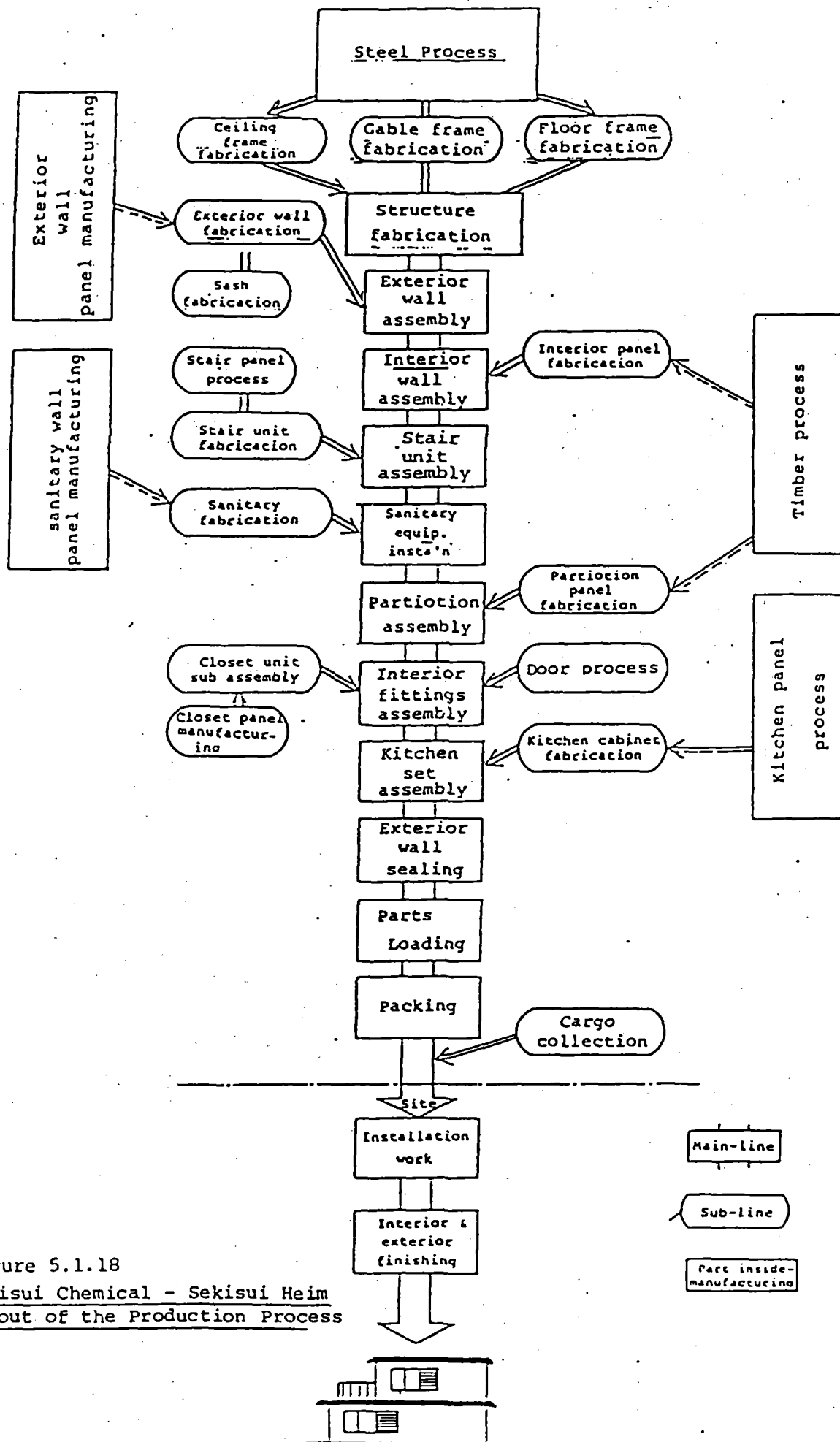


Figure 5.1.18
Sekisui Chemical - Sekisui Heim
Layout of the Production Process

regions and dealerships throughout the other prefectures, with a combined sales force of approximately 1000 spread across 44 sales offices. All dealerships are owned outright by Sekisui Chemical. The largest dealer handles 500 units per year and has 80 employees and the smallest handles 30 units per year. In the case of direct sales, on-site work and after-sales service is undertaken by employees of the company; dealerships utilize their own employees for this work and in both situations subtrades are retained, as required. Sekisui Chemical has recently established two new divisions for renovation and after-sales products.

Housing is manufactured at six locations with a combined production capacity of 1000 units per month. The largest factory at Musashi has been in operation for over ten years and now accounts for almost 30% of total production capacity. This plant employs 430 persons in the housing division with a production level of 4200 unit components per month, equivalent to 880 houses per month or 4500 houses per year. Production is order-based and takes place on two production lines, each approximately 400 metres long and moving at a rate of 1.3 metres per minute. The completion rate is one unit component every four minutes. These production lines involve some 30 000 different parts and 180 material or component suppliers.

Construction Time on the Site

Unit modules are manufactured in the factory, transported to the site and installed by crane on a foundation that has been previously prepared. The construction time on site will depend upon the extent of interior and exterior finishing, optional and accessory equipment, site conditions and the skill of local workers. Standard delivery time to the customer is 40 days after installation of the units on the foundation. The breakdown of construction time for a typical 120 m² Sekisui Heim house is shown below.

<u>Process</u>	<u>Man days</u>	<u>Remarks</u>
Foundation	10	
Installation	9	Operator of crane truck is not included
Carpentering	13	Including interior carpentering, floor finishing
Interior	14	Papering, carpet fitting
Bricking	5	Entrance step, tile finishing
Indoor plumbing	4	Indoor water supply/drainage
Indoor electricity	2	Indoor electric wiring (between units)
Clearance & cleaning	2	Site, inside house
Total	60 man days	

Outdoor installations of water and gas supply, electricity, site drainage and other utilities and services as well as landscaping are not included in the above table.

The standard domestic price of Sekisui Heim's M3 PARFAIT model¹, based on the plan shown in Figure 5.1.1, is shown below. This price could vary depending upon grade of equipment and interior fittings, but prices below are average for the Japanese market.

	Per House
Factory manufactured material cost (including unit assembling, transport fees)	Y13 000 000
Site work costs (including material cost of foundation, materials of indoor water supply/drainage)	Y 3 200 000
Total	Y16 200 000

Outdoor installations of water and gas supply, electricity, site drainage and landscaping are not included in the above costs.

Sekisui Heim is now moving into the renovation market with its trade-in program now getting underway. The company guarantees trade-ins and buy-backs of the modular units that comprise a house. The old house is removed from the site, stripped down at the factory and returned to the production line to be assembled into a different model. The reclaimed house is either sold to the original customer, after deduction of the trade-in allowance,

¹ See Figure 5.1.19.

Figure 5.1.19 SIKISUI HEIM - Floor Plans, M3 PARFAIT

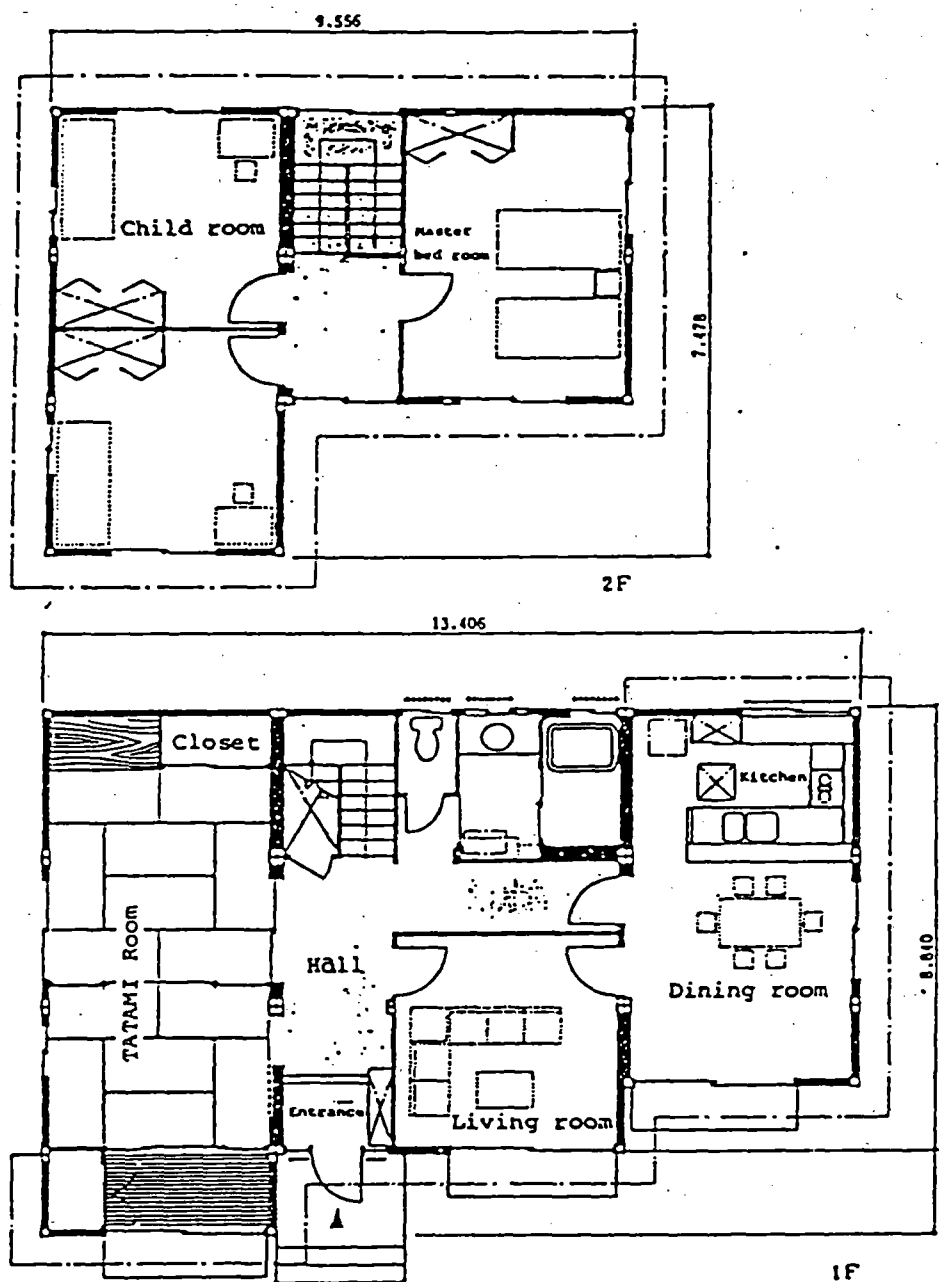


Fig. 9 Total floor space 152.29 m²
 Ground floor 97.61 m²
 1st floor 54.68 m²

or turned over to the company's recycled home division which foresees an increasing market for used homes.

5.2 Other Competitors in the Field

The top five prefab housing companies have a secure hold on 80% of detached prefab housing production and there is no eminent threat from other known competitors in the field. These other competitors are primarily the remaining five companies in the top ten list and account for an additional 13.7% of all detached prefab production. Unlike the top five producers, the ranking amongst the next five has changed considerably over the past seven years with some companies disappearing entirely from the list in lieu of new entries.

Of the remaining five prefab producers on the list, three companies, Asahi, Nissei and Kubota, use a steel frame and panel assembly while Tessei is the sole precast concrete system among the top ten and Kobori joins Misawa with a large wood panel system. Asahi and Nissei rank fifth and sixth respectively in production of steel frame detached units; Kobori ranks a very distant second behind Misawa in wood panel production, and Tessei dominates the precast concrete market.

Both Asahi and Kobori deserve mention due to their recent successes, Asahi with the Hebel House and Kobori with House 55.

Asahi Chemical

Asahi Chemical stands out from the rest in this category by virtue of its strong growth and current production levels and perhaps it should be included in the list of top producers. Since 1978 Asahi has climbed above both Tessei and Toshiba to rank sixth overall; in this same period its production of detached units has grown by 150%. No other company in the top ten list can match this record with the next nearest growth record for the same period in the order of 26% by Misawa Homes.

Asahi Chemical Industry Company Ltd. ranks 130 in the Fortune ranking of International Companies and is one of Japan's largest chemical companies with operations in fibres and textiles, chemicals, plastics and synthetic rubber, food products and medical supplies, and construction materials and housing. Asahi Chemical is also the largest single shareholder in Sekisui Chemical. In 1984 construction materials and housing accounted for 17.0% of total sales and Asahi Chemical has enjoyed continued growth of its Hebel House and other autoclaved lightweight concrete building products.

Asahi Chemical first began work with autoclaved concrete in 1961 and in 1966 concluded a technical agreement with Hebel Gastbetonwerk GmbH of West Germany for the production of Hebel products in Japan. In 1972 an independent housing division was set up within the company, along the lines of Sekisui Heim, with its own accounting and financial responsibilities under the divisional system. This housing materials division now accounts for five factories producing autoclaved products, each of which pro-

duce both housing components and building materials. Steel frames, windows, doors and other components are subcontracted out but in turn these factories also produce materials and products for other than housing and purchase materials from other divisions within Asahi Chemical.

The housing materials division has some 1500 employees including branch office staff with 400 architects, engineers and technical production staff, 800 in sales including show home hostesses and the remainder in administration. There are some 100 show homes throughout Japan and 18 sales offices of varying size. The company has concentrated on sales within the denser urban areas where the combination of steel frame with autoclaved concrete provides excellent earthquake and fire protection. Total sales in 1983 were 4730 units and the sales system is exclusively direct sales with all staff being company employees.

The Hebel House has been characterized by its flat roof and somewhat European appearance.¹ The company has consciously pursued the 2 and 3 generation large house and in the higher end housing market. Therefore a typical unit has been both larger in size and more costly than its prefab competitors. The average unit size has grown from an initial 99 m² up to 116 m² in 1978 and now is in the 132 m² range. These larger and more costly units have in fact given the Hebel House a much higher sales volume than would be apparent when comparing only unit production.

¹ See Figures 5.2.1, 5.2.2, and 5.2.3.

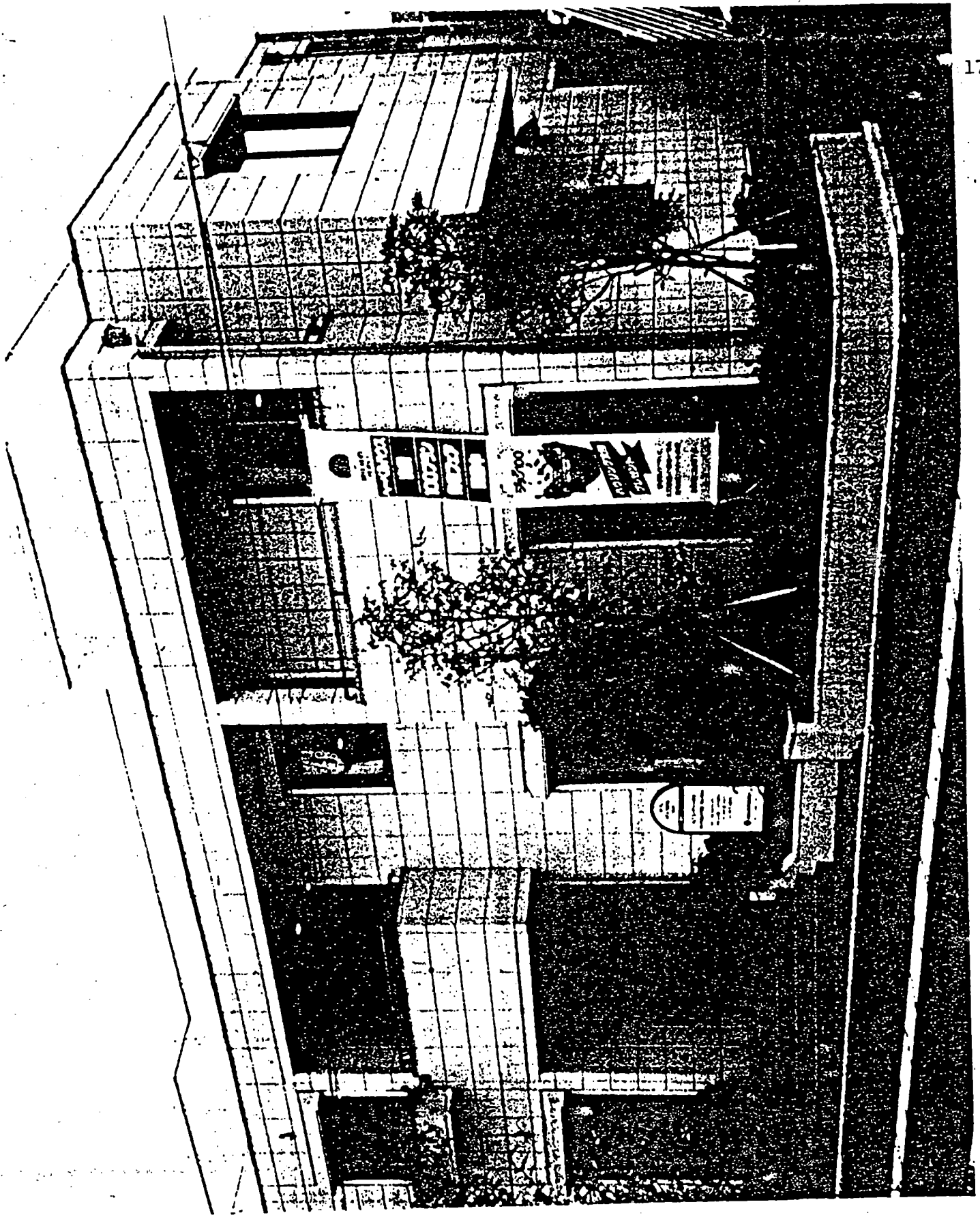


Figure 5.2.1: Asahi Chemical - 1984 Show Home

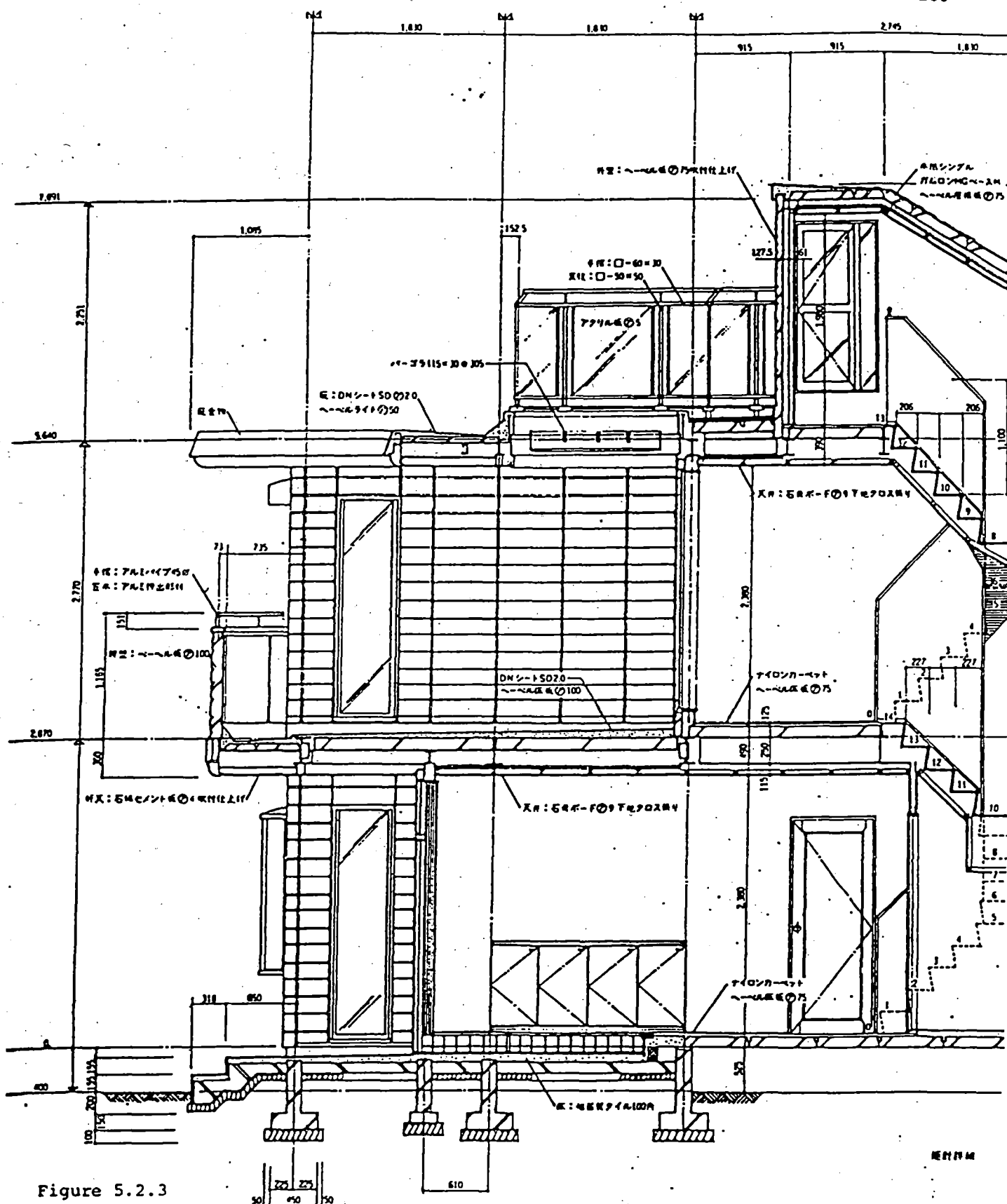


Figure 5.2.3

Asahi Chemical - Hebel House
Typical Section

Two recent changes have modified the standard product and increased sales in urban areas. First was the introduction of the sloped roof, in lieu of the flat roof, in 1979. There is now a distinct preference among higher income purchasers for the sloped roof, whereas the flat roof design has been retained for the lower cost lines. Second is the introduction of three storey houses to gain better utilization from expensive urban land. Along with the addition of a third floor have come modifications to the steel frame itself to remove diagonal bracing and minimize internal columns in an effort to promote commercial uses on the ground floor and larger wall openings.

The Hebel House is constructed on a steel frame supported on a continuous reinforced concrete footing. The frame is comprised of I-section columns, girders and beams with diagonal bracing both vertically and horizontally. Decking for floors and roofing is autoclaved lightweight concrete (ALC) with a light concrete topping poured on-site over all floors. The outer walls utilize a 75 mm thick ALC panel with a 110 mm air space and a 9 mm gypsum board interior finish. Panels come in a range of sizes and with the emphasis on the "free-style" plan, modules are now based on a 30 cm width (12 inches). The heating system utilizes a floor plate installed below the carpet with hot water veins.

This prefabricated system has had increasing appeal within dense urban areas due to its durability of construction and exterior finishing, excellent soundproofing qualities and high rating in earthquake and fire resistance. However, it is not well

suited for apartment use and apartments account for less than 5% of total sales. On the other hand, Asahi Chemical is enjoying a significant market share in terms of total sales as compared to unit production figures.

Kobori Juken

Kobori was founded in 1951 and has operated exclusively in housing and real estate sales since that time. In 1984, 87% of its sales were order-built houses, 11% were ready-built houses and 2% were ready-built condominiums and apartments. Kobori has clearly established itself as a leading builder of order-built or "free-style" homes utilizing the large prefabricated prestressed wood panel and now hopes to expand sales of ready-built or "fixed-plan" homes through its involvement with House 55, also using its wood panel system.¹

Kobori started with a traditional wood house and sold the house and the land using a limited number of fixed plans. In 1967 they ventured into the prefab wood panel system and opened their first panel factory in 1971, but through 1977 continued to offer both a prefab and a traditional wood house. Today Kobori has two wood panel factories with a total of 588 employees and a production of 1604 detached units (1983). These factories are established as independent companies although 100% owned by Kobori. In addition, the company operated nine branch offices and seven sales offices throughout the country.

¹See Figures 5.2.4, 5.2.5, and 5.2.6.

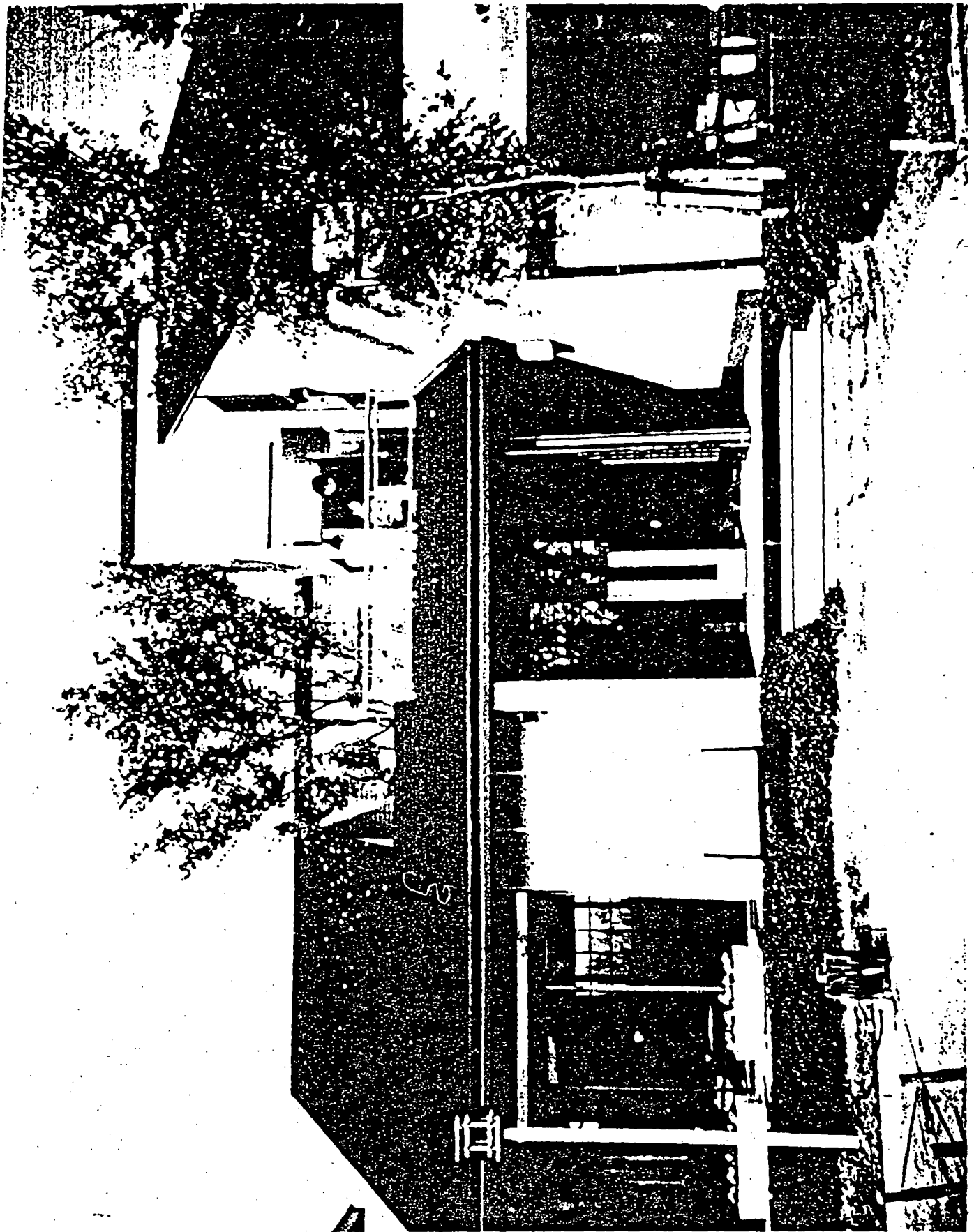


Figure 5.2.4: Kobori Jugen - 1984 Show Home

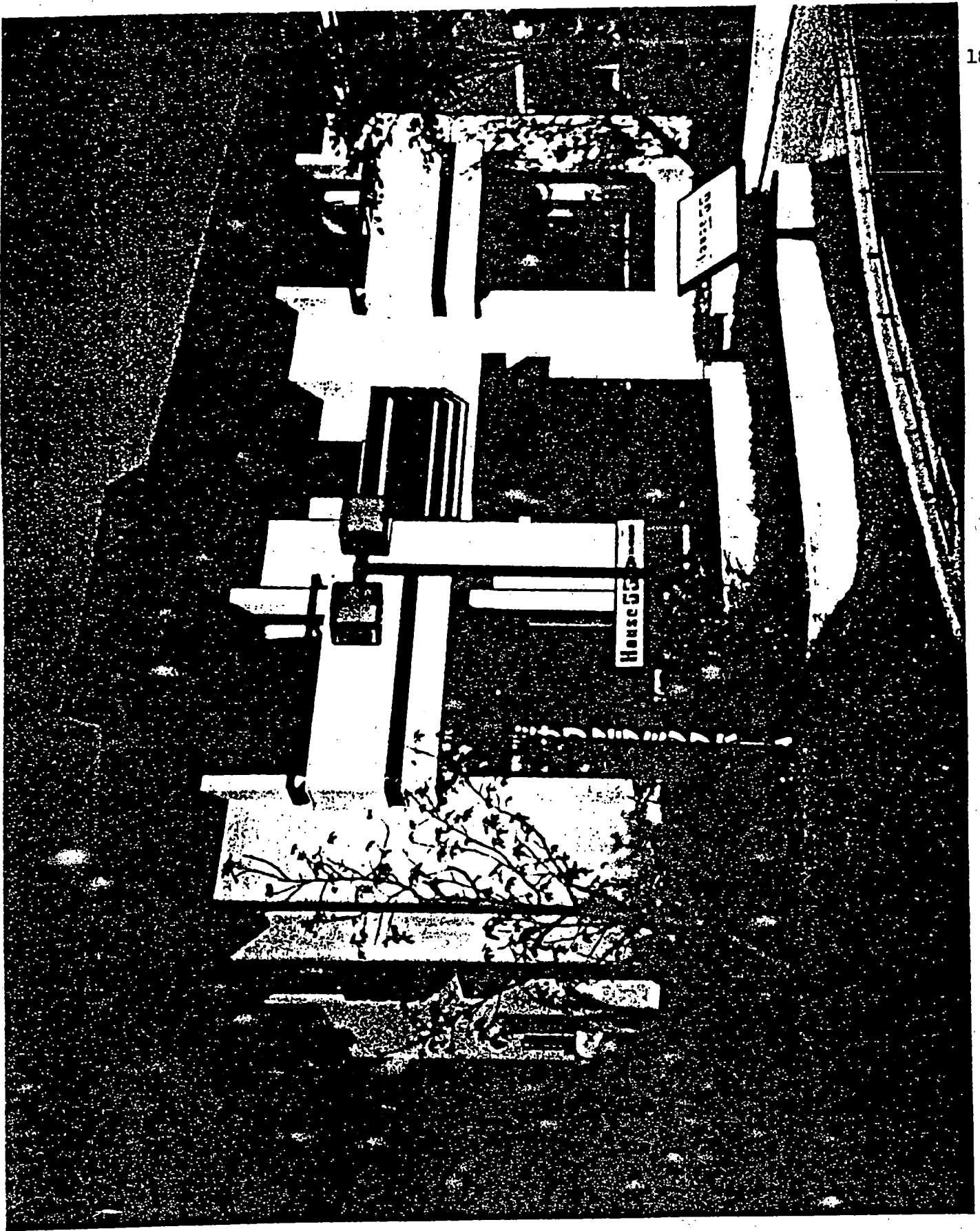


Figure 5.2.5: Kobori Jugen - House 55

Of a total of 500 employees, approximately 250 are in sales, Kobori relies exclusively on a direct sales system, 80 are in engineering, architecture and product design, 80 are technical staff, 20 are involved in research and development, 100 are factory workers and the remaining 60 are administrative staff. The company operates 48 display homes which provide the main source of sales -- some 60%, with 20% arising from customer referral and 20% from media advertising. The free-style plan is still the most popular product and although it accounts for only 50% of unit sales it provides 65% of sales income. House 55 represents 35% of sales income although it has risen in unit sales and expects to achieve a level of 100 units per month. On a square metre basis the free-style plan is 37% more costly than House 55.

Approximately 90% of sales are the house only and Kobori has reduced its speculative product, including sale of the house and the lot, to less than 10%. Over half of all sales are to couples in the range of 30-35 years old. Current factory production averages 150 units per month (1800 annually) but this could be increased to 200 per month or 2400 annually. Factory inventory is maintained at a two week supply of panels, equivalent to 75 units. Each house require 130-140 panels from amongst some 140 varieties by size and type. Shipping normally requires two, 8-10 ton flat bed trucks and covers a 500 km radius.

It is estimated that the in-factory labour content of the Kobori system is in the order of 20%, in contrast to Sekisui Heim which has the highest ratio at 80%. The prestressed wood panel

is essentially the only prefab component in the Kobori system with all other work being carried out on site. The system utilizes a series of large, two storey prestressed wood panels for the exterior walls; prestressed panels bearing on open web steel joists for the first floor and second floors; and wood rafters for the hipped roof.

An air space is maintained between the insulation and the exterior skin by the installation of a patented "egg-carton" grid and continuous air movement is maintained throughout this air space by vents along the perimeter of the foundation and along the ridge of the roof. This air circulation system distinguishes Kobori's panel construction and provides an effective means to cope with the moisture problems that have plagued a number of other exterior wall panel systems.

5.3 Foreign Activities and Overseas Subsidiaries

Post-war Japan has always oriented its domestic manufacturing mix with a specific orientation to the global patterns of trade and foreign investment. Even though exports comprise one of the lowest percentages of GNP of any major western nation (10-11% of GNP, compared to 8-9% in the U.S., 25% in Canada and Britain, 40% in West Germany), in manufacturing alone, the Japanese rate is about 50%. Why should the products of the pre-fab housing companies not follow the same trends we have seen with so many other products of Japanese industry?

In spite of the obvious levels of comparative achievement within the Japanese prefabricated housing industry, there is little if any evidence of an ability to move beyond their own shores and challenge housing markets in other countries. Daiwa House has set up subsidiaries in California and Texas but only to produce 2 x 4 houses in a manner identical to an American builder, and reportedly without the profit margins Daiwa are accustomed to. Daiwa is now actively pursuing the Chinese market but this venture is still in its infancy. Sekisui House established a subsidiary in West Germany but after substantial losses entirely abandoned the venture. Misawa has sold rights to its PALC system to South Korea and now China and foresees increased overseas sales of its patents through licensing agreements. On one hand, Chiyoji Misawa is most optimistic that he can increase foreign sales but on the other, Masaru Tanabe, President of Sekisui House, clearly feels that it would be difficult to compete internationally against 2 x 4 construction.

There would appear to be four significant deterrents to increasing foreign activities for the major prefabricated housing companies. First, and perhaps foremost, it would be virtually impossible to duplicate the market conditions enjoyed in Japan. Where else might one find a similar geographic concentration of people at such high densities and centrally located in the country? This is a market for housing independent of land in the majority of cases, with a heavy component of rebuild units and subject to severe earthquake and fire hazards. Second, the heavy

reliance on steel components by the majority of prefab housing systems would be a significant disadvantage in cost and shipping weight in most other countries that do not enjoy Japan's edge in steel production. Steel, for a variety of reasons, is not a suitable residential building material in North America and Europe.

Third, the capital investment in factories and equipment is substantial and it is unlikely that foreign countries would be prepared to offer comparable financial incentives such as the loan arrangements through the Japan Development Bank. Certainly the North American market would not offer anything close to the level of government support enjoyed by these companies on their home territory.

Finally, it has yet to be proven, even in Japan, if prefab housing systems can compete head-on with 2 x 4 construction. Until the prefab housing companies get a better understanding of the prospects for 2 x 4 construction in their own country they are likely not going to face this competition in its home territory. Perhaps Mitsui and Mitsubishi could soon be in a better position to exploit foreign housing markets than the prefab housing companies.

What Japan may export is not the products of their Japanese assembly lines but the knowledge they have gained in refining these products and selling them in their market place. In addition to licensing agreements for particular procedures and products, the Japanese could explore the transfer of their franchising operations, after-sales service programs, approaches to home

renovation or even the managerial or organizational systems. Hopefully we will learn to look at more than the welding robots and nailing machines for these will not likely constitute the major export items if the top five prefab companies explore off-shore possibilities.

At this stage the Japanese prefab companies are exclusively a domestic industry with great prospects for growth at home and perhaps abroad. But at present the prospects are best on the home front and foreign markets are not as attractive as some first thought.

CHAPTER SIX

A COMPETITIVE FUTURE FOR INDUSTRIALIZED HOUSING

6.1 A Paradigm for Success

It is impossible to view but a small part of Japanese industry and, in a decidedly short time period, profess to understand what is universally recognized as a complicated and complex industrial system. This is a system that is competitively developing new products, services, and technologies equal to the best available anywhere in the world, not to mention the plethora of books that offer insights into their business world from every conceivable perspective. The focus of this work has not attempted to draw conclusions as to the relative merits or demerits of the Japanese system of industrialized housing as compared to others. The intent is to observe that enormous capacity to develop skills and capabilities in the field of housing and to examine the Japanese successes with industrialized housing. Hopefully something can be learned that will be applicable or relevant to the way that western society may improve the quality of its living environments.

While consumer preferences in Japan have a marked tendency toward North American trends, certainly in the field of housing, very different market conditions do exist and, therefore, the context for the housing industry in Japan shares little in common with its counterparts in America or Europe. While there are the obvious reasons for such differences including the land scarcity, high urban densities, social structure of the family and

other cultural factors, one could also mention some of the more typical reasons that the industrial analyst may cite including the Japanese banking system, the relationship between government and industry, consultative decision-making or even small business subcontracting. What is surprising, in fact, is that in spite of such disparity there is a striking resemblance between the operations of the small residential contractor that has been the backbone of the housing industry both in Japan and North America.

Industrialized housing in Japan was not a logical extension of, nor did it emanate from, the traditional home building industry in that country. In fact, its present strengths lie not in its ability to compete with the traditional home builder but to satisfy a unique set of market conditions that have emerged since the war and that the traditional house builder could not or would not satisfy.

Prior to discussing the discernible characteristics of the Japanese industrialized housing sector, two points should be kept in mind for they exemplify conditions that may apply only to Japan. First, any discussion of industrialized housing in Japan deals almost exclusively with the efforts of only five very large corporations who have amassed, by North American standards, great financial, human, technical and organizational resources in an almost "cartel-like" fashion. These five companies are not typical of the some 100 000 small companies that still dominate the house building industry in Japan.

Second, the notion of profitability within these companies is difficult to measure by North American standards and may be somewhat illusory. On one hand, there is strong and sustained government support for industrialized housing and the extent and scope of this support is difficult if not impossible to discern. On the other hand, the companies operate in an apparently competitive battlefield so typical of Japan's domestic industries and lay claim to profitability in the market place as the reason for their survival. It is virtually impossible to reconcile the notion of profitability in industry amidst the levels of government support and subsidy, irrespective of the other factors that may distort the profit picture in Japan. What is clear is that industrialized housing is big business in Japan and begins to mirror the same arrangements that we have come to expect with other consumer goods that Japan has offered to its world markets.

Industrialized housing in Japan is a product that sells well in densely populated urban centres in two forms, the detached house and the small two or three storey walk-up apartment. Success in rural areas, small towns or remote locations is notable by its absence. In almost every case with detached houses, the unit is replacing a substandard traditional house on an awkward and confined lot that has remained in the family and is passed on with the generations. Industrialized housing has virtually nothing to do with the land development business and almost every purchaser of a house or apartment has the land in hand. The need is for a house that can be tailor-made for a particular lot con-

figuration, placed on the lot with a minimum of on-site labour since there is no space for storage of materials, and be built of materials that can meet rigorous earthquake and fire protection standards. There is seldom sufficient developable land to assemble these houses on single sites to facilitate the sequencing of on-site trades. It therefore makes more sense to aggregate and maximize factory labour and thus minimize on-site costs on these widely scattered sites.

Coupled with these advantages has been the penchant for quality required by the Japanese customer and achieved through in-factory quality control circles; the move toward custom designs via the latest achievements in "one-of-a-kind" assembly lines and production techniques; reduction in costs through such "as-required" inventory control systems as Kanban; [11] and, short-term product development and improvement through research activities. Not surprisingly, the housing products from these prefab housing companies are gravitating to the higher price ranges and these producers have long overcome the stigma that Japanese home buyers first associated with mass-produced housing and North American's still do. Success is now upon their doorstep and sales figures are a testament to a proactive industrial policy that has reshaped this industry over the past two decades.

[11] Kanban is a inventory, parts delivery approach which combines just-in-time delivery to a rigid scheduling flow to reduce waste and inventory costs.

The contrast in Japan with the experience with industrialized housing in North America is profound. Surely the differences in market conditions and government posture alone cannot account for the seeming disparities in the experiences between the two continents.

Historically, the North American housing industry, and perhaps more so government, has sought to introduce technology or so-called "industrialization" into housing production as a panacea for various problems, most of which have to do with housing quantity and lowering housing cost. Operation Breakthrough, launched in early 1969 by the Secretary of Housing and Urban Development in the United States, stands as the most noticeable failure. This program's objectives were described as follows:

"This program has as its primary objective the establishment of self-sustaining mechanisms for rapid volume production of marketable housing at progressively lower costs for people of all income levels, with particular emphasis on those groups and individuals who have had difficulty in obtaining satisfactory housing in the past... ."

Inherent in the Operation Breakthrough approach is an undeniable faith that technology can "push" and that somehow with new hardware the same industry can achieve the necessary "breakthrough" in housing expected of a highly industrialized nation. The Japanese, on the other hand, have long since recognized that, whether dealing with domestic or foreign markets, demand must also "pull"; technology alone cannot "push". Demand must first be created for products which can then be manufactured with improved quality and at competitive prices through the applica-

tion of new technologies and industrial processes. Coupled with this admission that new gadgets or quick fixes cannot do the job alone, is the recognition that both hardware and software technologies must be combined at both the micro and macro levels to meet any new challenge. Sales and marketing, after-sales service programs, employee training or other personnel programs are every bit as strategic as the welding robots that may accompany new production lines.

The many foreign visitors to the Japanese prefab housing companies are seemingly missing the point. Nor are the Japanese making it easy when they direct these tours to particular factories with assembly lines that are clearly set up to impress the visitor, complete with painted route markers on the floor, display panels in English and audio-visual presentations. Seldom is it mentioned that while an entire assembly line may be computer controlled by a single employee, that more than 35% of the staff may be involved in the field in sales and marketing; this facet of operations is every bit as sophisticated as the technical production methods on display. The visitor is not directly encouraged to discuss the organizational structure of the company, investment in sales and advertising, marketing strategies or even the cost of operating a show home in a Tokyo home park. No doubt the Japanese, gracious hosts as they are, have responded to what the foreign visitor asks to see and this has only reinforced this myth of Japanese technology and skewed the North American perception of the industrialized housing sector in Japan, as recently reported by our various trade and business

journals.

The prefab housing companies have certainly given their customers the right story and have convinced Japanese consumers, as recalcitrant as they first were, that industrialized housing means better quality and increased durability at reduced costs. They have placed the first priority on the demand side and allowed this to pull the supply side into the desired position. These five companies have demonstrated an exacting skill in determining what to sell, as well as how to sell it. As the domestic market for industrialized housing evolves, it may well set a standard for quality, price and reliability such that traditional Japanese housing producers and hopefully foreign companies alike will face new ground rules and challenges from housing consumers in the years ahead.

This changing perception in Japan of mass produced housing is not unrelated to a fundamental change in production methods that is already far advanced in Japan and barely accepted in North America. Attempts at mass production in North America are still predicated upon the foundations of the American manufacturing system that is well suited to the sequential production of relatively simple, imitative, and not very capital intensive products which can be assembled from man-made and largely interchangeable parts. Product lines are standardized, variety is minimal and demand must be somewhat constant. Within this context merely relying on new product technologies like ceramics or replacing human resources with new process equipment such as robots will not suffice. The Japanese are moving rapidly towards

an industrial production system that is demand fed, capable of producing one-of-a-kind products in a sequential process and with real efficiencies that do not penalize but reward human resources.

Industrialized housing in so many parts of the world has relied on "look-alike" products, espousing high volume at low cost that had little to do with real or private market demand and a great deal to do with solving production levels for publicly sponsored housing. Even the mobile home, in spite of serious attempts to camouflage its appearance, has not overcome widespread community resistance in this country. Experiments with other forms of industrialized housing in North America always seem to be geared to the low end of the market, various forms of multi-family housing or some government sponsored incentive program. On the other hand, the Japanese prefab housing industry extols the virtues of custom designed detached housing, the "free-style" plan, and, in fact, can offer greater flexibility in layout, design features and use of materials than the traditional Japanese hand-crafted builder. If the mobile home is the standard trademark of industrialized housing in North America, the large custom-designed urban home is rapidly assuming the comparable trademark for this industry in Japan.

An emphasis on particular production techniques or technologies already developed and refined by the Japanese is both misleading and short term in effect. It would not be sufficient to adopt new technological production methods and their commensurate management systems simply to advance the art of industri-

alized housing on this continent. The Japanese now operate on the basis of vision and self-confidence. Unless our housing industry is prepared to share this vision and address its implications, all the hardware and software that the Japanese could make available will not match the task.

The real message from Japan is the shift in the way that they now think about housing. This is a recent development and attributable, if not directly to the prefab housing industry, to the large corporations that in turn control these housing companies and themselves manufacture a host of consumer goods geared to the home from garbage cans to video display units. The prefab housing industry in Japan is now oriented to marketing total living environments, not just buildings, and including appliances, furniture, fixtures and equipment. It views itself as having a continuing involvement with its customers in changing, modifying and adapting the home following its initial sale. After-sales activity is now an important part of the industry and these prefab housing companies have shrewdly realized that the initial sale is only the beginning of a long and profitable relationship between producer and consumer.

Arising from this vision is the concept of differential rates of obsolescence whereby the structure, interior partitions, kitchens and bathrooms, furniture, floor and wall coverings, and appliances all have different life cycles, for a variety of reasons, ranging from style to actual product deterioration. With some 30 years of experience behind it, the prefab housing industry in Japan is now equipped to move well beyond providing four

walls and a roof and has positioned itself to take full advantage of the house as a consumer product, inclusive of all the equipment and facilities that a consumer requires to shape a house to individual tastes and preferences.

Obviously this approach requires an organizational structure that extends far beyond what we normally deem to be a housing company. The totally integrated approach, indicative of the five prefabricated housing companies is perhaps far more startling than the industrialized production process found within their factories and is reminiscent of what consumers expect when they buy an automobile. The comparison is not coincidental. Sales and marketing techniques were first borrowed from the automobile industry; direct and indirect franchising systems are every bit as sophisticated as those found in the fast-food industry; and training of sales staff and service personnel is likely equivalent to that we expect of IBM and Xerox. This integration, or we could call it "rationalization" of the supply side, is geared toward satisfying as many of the consumer's expectations for the home as possible -- veritable "one-stop" shopping. This reflects a level of progress within a housing industry that we, in North America, may still only dream of amidst our historically fragmented and disjointed means of housing production and delivery.

Without diminishing the achievements of these five companies and their lesser colleagues, recognition must be given to the positive alliance that has been forged between government and industry to secure such achievements. Government has defined a

role for the prefab housing industry, reflected this potential in its five-year housing programs, and no doubt saw it as a complement to, and not a replacement for, the traditional home builder. This commitment was backed up with a series of programs through MOC and MITI and related funding through the Japan Development Bank to secure and strengthen the position of the companies in the prefab housing market. However, this policy was also viewed as a way of indirectly strengthening the traditional housing industry which even today remains the first priority of government.

The wide fluctuations in annual housing starts, characteristic of both Japan and North America, has placed great stress on the small builder in both countries, particularly during times of excessive peaks and declines. In the late 1960's, it became increasingly evident that such variations could threaten the long-term viability of these traditional builders whose fortunes were at the mercy of the economic cycles that dictated housing trends. With government funding, the prefab housing companies secured an industrial capacity well beyond immediate requirements and it was felt that upward demand pressures could be borne by the prefab sector with minimal cost and labour impact and thus provide the traditional builder with a measure of production stability. This policy has yet to be tested and may never be in view of the overall downturn in housing starts that will likely continue well into the 1980's. However, it does represent a line of thinking quite contrary to what one might expect in North America where industrialization would imply somewhat constant

production levels and certainly not the degree of flexibility sought in the Japanese prefab industry.

Government also viewed the prefab housing industry as a convenient vehicle to promote privately sponsored research and development in a sector not capable nor known for its research productivity. The traditional home builder could not be expected to fulfill such a function. There is a distinct misconception that Japanese government provides an inordinate amount of direct research funding for new technologies that other governments either cannot afford or do not provide in principle. The actual funding figures do not substantiate this claim. Government participation in research and development spending in Japan is lower than any other western country, partially as a result of limited military spending. What is different in Japan is how government bureaucracies can marry public investment in new technology to commercial market needs, which in turn can be targeted to particular market sectors. Such is the case in the prefab housing industry, for example, House 55.

These prefab housing companies are now promoting enormous research budgets in comparison to the traditional housing industry. It is estimated that the top five producers spent \$76 million on research between 1976-80. All of these funds are essentially directed at product development with relatively short-term results. There is now growing evidence that this investment in research and development will become the backbone of foreign ventures whereby patents and royalties will become future income generators. Furthermore, management and organizational skills --

not materials and capital -- will be the key to developing comparative advantages in offshore markets.

The recent success of the prefab housing industry in Japan is not a "flash-in-the-pan. It represents the maturing of an industry after almost 30 years of patient but nurtured evolution. The industry has combined innovation at all levels and its competitive advantage stems not only from skill in production but also in marketing, sales and after-sales service. What one sees today is not so much a refinement of past experiences but a totally revamped industry that has come to terms with changes in people's perception of what they will expect from a house purchase in the very near future. These five companies have indeed defined the terms of competition in the future and these terms may well be those upon which we shall have to judge our own fortunes in what are still domestic and even regional markets.

6.2 Some Things to Think About

There is uncommon unity on one subject -- Japanese economic success. No matter what Japanese products one chooses to investigate, the question is roughly the same, "but how do the Japanese do it?" Of course, the next question is "what does this mean for us?" Their competition in foreign markets has shaken many industries, been the demise of others, and has provoked fear and protection throughout western industrial economies. What then might be in store for our own housing industry as a result of the Japanese experience with industrialized housing?

Four things come to mind. These are speculative at best but deserving of future thought and consideration. First, even if the Japanese housing industry does not enter the global housing market directly, and there may be good reasons why it should not, its influence is bound to be felt in the way that North American home builders choose to do business in the future. For the first time in decades, and in spite of diminishing markets, success is blessing the efforts of the large housing companies in the United States and they are now reaching a scale of operation where national marketing and the application of industrial processes begin to make economic sense. The integration or "rationalization" of the industry in Japan and its vision of housing as a consumer product, extending far beyond the building itself, will have an impact on these domestic companies. Franchising, after-sales follow-up, ventures into the renovation market, alliances with appliance or furniture companies, show parks downtown, custom design services, and increasing factory production of value-added components may all begin to emerge in some form but are not likely in as comprehensive a framework as we now see in Japan.

We may well see adoption of Japanese software before the hardware systems that are currently the lure of the housing expeditions to that country. It is in the area of management and organizational skills where early opportunities abound. Such opportunities could well open up new markets for domestic producers and replace falling starts in new residential construction with new profit centers that arise from this vision of housing

that the Japanese have so carefully and meticulously cultivated at home.

Second, it is highly unlikely that the Japanese prefab housing companies will begin to unload housing parts or components at North American ports. North America is just not a likely market for their housing products in the foreseeable future. The prefab housing companies still have a great market potential within Japan and will aggressively seek to increase their present market share, particularly in the replacement market, much of which can be done with little additional capital investment in factories and machinery. On the other hand, that is not to say that they will not look offshore and capitalize upon the perception of foreign consumers that has clearly become one of favouring Japan as better producers of quality goods.

Japan's immediate offshore market for the prefab housing industry could be "EastAsia" and, in particular, the smaller EastAsian states (which the Japanese call "little Japans") that are distinguished not by size but by their wealth. These include Singapore, Hong Kong and Taiwan. Also, Korea and the prospect of a maturing China cannot be overlooked and both India and Pakistan are longer term projects.

Third, while we may not see the actual products of Japan's prefab housing companies arrive on our shores, we could well see the products of its research and development spending through licensing agreements with North American firms. Technological developments in Japan are increasingly being directed at two levels: daily living needs and specific industries. Japanese cor-

porations expect to pioneer new products based around biotechnology, macroelectronics and microcircuitry, and social innovation directed toward human needs as a top priority. The three areas considered to have the greatest social significance are in education, housing, and health and welfare.

In reversal of past roles Japan sees itself as a future exporter of technological innovation through sale of patent agreements, licensing agreements and joint ventures with foreign firms. We may benefit, at a price, from some of MITI's current research such as developing a prefabricated basement system, chemically treating wood for durability and fire resistance or developing mechanical devices to accommodate the handicapped in the home. Japan now registers more than two and a half times the number of patents as the U.S., and eight times the rate of Britain. The seeds of Japan's technological future lie in these patent investments and the prefab housing industry is well aware of this prospect.

The final point is an important but somewhat indirect revelation of the work to date. It could have a most significant impact on the North American housing industry, at least in the near future. If one combines the standard 2 x 4 wood frame building system with the approach to the housing industry developed by the prefab housing companies, then perhaps we have a glimpse of the future, at least in North America and possibly in foreign markets as well. It will likely take the actions of Mitsui and Mitsubishi to make us realize that we have in our possession a most sophisticated building system. We have simply

lacked either the interest or the commitment and resources, both public and private, to develop and refine the capabilities and market potential of 2 x 4 construction overseas. That is not to demean the efforts of the lumber industry to increase foreign exports of wood, but it does point to the limitations of this approach, as compared to what one would expect from one of the great "sogo-shasha" or general trading companies of Japan.

It would indeed be ironical if Japan were to return to our shores with our own building system, thanks to a Mitsui or a Mitsubishi. This need not be the case and, if it should ever come to fruition, then it would signify not only lost opportunity at home but abdication of a responsibility to pursue the same foreign markets that Japan so eagerly awaits. The impending threat from the Japanese housing industry is not so much one of domestic competition but lost opportunity in an area in which North America has sustained domination since World War II, namely 2 x 4 wood frame construction. This implies the need for immediate action and a research agenda that can place our own industry at the same competitive edge.

As limited as this initial foray into Japanese industrialized housing has been, it has attempted to construct a general way of thinking about the future of the housing industry, perhaps more along the lines a global competitor may wish to think.

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