U.S. CONSTRUCTION AS A POTENTIAL MARKET FOR KOREAN INTERNATIONAL CONSTRUCTION INDUSTRY

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ABSTRACT

Korean international construction industry is recently experiencing difficulty due to the reduced demand especially from the Middle East which has been the most important market for Korean contractors. Furthermore, the nature of international construction is shifting to high technology content projects while Koreans are not fully equipped to switch their market to the projects of that nature.

The reduced demand from the market in the developing countries resulted in the excess of construction capacity in many developed countries spilling over each other's already saturated market. Along with this move, Koreans have to look for the markets in the developed countries to sustain their level of operation. Among the markets in the developed countries, that in the U.S. offers unique opportunities for international contractors because it is a huge, stable and still growing market.

This thesis reviews: Korean construction industry with respect to the general background, status, structure and present issues; U.S. construction industry in the areas of economical, structural and operational characteristics, contractual system and labor relations.

To be successful in the U.S. market, Koreans are recommended to achieve a cost leadership through the effective utilization of the engineering and managerial manpower in the market focused to a particular geographical area or field of specialization. As a long term proactive strategy, the rigorous R&D effort for the development of new materials, new construction technology and innovative management system is recommended to establish differentiated products and services of Korean construction and related industries.

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

CHAPTER 1

INTRODUCTION

Korea has been quite successful in international construction since the middle of 1970s due to their competitive advantage in labor intensive construction and enormous demand from the oil rich countries in the Middle East. However, the recent drop in oil price has reduced revenues of oil exporting countries and this reduced the demand of the international construction significantly. This event has significantly impacted Korean contractors, as their international activities are heavily concentrated in the Middle East and they have not found alternative market to compensate the reduced demand from the Middle East. With the reduction of the demand, the nature of construction demand is shifted to more technology intensive projects at least for international construction areas which a few Korean contractors have improved their capability in this field. However, most of the other Korean contractors are not competitive in this field as compared to the firms in the other developed countries. Coupled with the challenge from the other Third World countries in the ever decreasing labor intensive construction area, Korea has to restructure its strategy to sustain the once high level and share of the international construction market.

Accepting the decreased demand from the Middle East and the

structural changes in current international construction market calling for high technology content projects and changed nature of financing scheme, various studies have been conducted by Korean construction related organizations to find the way to sustain the level of Korean international costruction activities. However, their studies have invariably focused to the market in the developing countries so called traditional international construction market outside the Middle East. Although the market in those areas is certainly the first choice consideration to develop further, the construction markets in the developed countries seems to have been grossly overlooked or have not been seriously considered by Korean firms as a potential market. Among the markets in the developed countries, North America especially the United States provides a unique potential market as the demand is expected to grow significantly unlike the other regions of the market.

At the beginning, Korea's competitive advantage in theinternational construction was mostly in labor intensive construction where they could establish the cost leadership. Since the Middle East market offered the type of work which Koreans were competitive, their activities were extremely concentrated in this area for the past ten years and they achieved international significance in the international construction market. However, their compeittive advantage brought limited success

in other regional market as different factors require different strategy. Because of geographical proximity, cultural background and size of the market, Asia is considered to be the number one alternative market to compensate reduced orders from the Middle Eastand Korea has had some sizable projects in this region. But Korea's traditional cost leadership based on relatively cheap and disciplined manpower appeares to be diminishing as much cheaper local laborers are now available and coupled with increasing restrictions to the entry of foreign labor. This market generally requires competitive financing packages with technical assistance to local establishments where the Japanese have a decisive advantage considering their superior financing and technological capability.

The market in the developed countries, especially in North America is not only large and diverse, but also stable. In the U.S. alone the market is over $340 billion a year and all indications are that it will grow to over 10 percent of the U.S. GNP in the next few years. However, this market apparently requires a different approach to other regional markets as the characteristics of the market are different and offer different problems. Furthermore, the contracting, subcontracting and procurement policies and procedures in the U.S. market are in many respects different from those commonly practiced in the international market. However, those are not insurmountable, and recently several European and Japanese

companies have been successful in penetrating this market. This market may also offer some other features which may allow others such as Koreans competitive advantages. Furthermore, this market provides stable demand free from the political and financial risks which often are the characteristics of the market in the developing countries. In any case, it is clear that Koreans have to seek competitive strategies far different from what they established and succeeded in the other regional markets to be successful in the U.S. market. One thing obvious from the beginning is that Koreans have to free themselves from the perception that Korea's only competitive advantage is labor. Based on the above, the purpose of this study is to examine the following areas, find implications and draw conclusive suggestions for the Korean and U.S. construction industry:-

-General characteristics of Korean construction industry, reviewing the general background of Korean construction enabled industry to reach present level, the structure of the industry and issues presently facing the industry.

-General characteristics of U.S. construction industry. The points to be reviewed are mostly the structure of industry, the contracting systems and labor relation which Koreans have little experience to deal with.

-Comparison between U.S. and Korean construction industry, possibly with that of other developed region of the world.

There are also marked differences between the characteristics of the markets in the developing and developed countries.

-Based on those differences and unique characteristics of the industry in both countries, the possibility of U.S. construction industry as a potential market for Korean contractors will be examined. Penetrating into the U.S. construction market may require Korean contractors to change their perception of the construction industry and its market. This study will discuss the reorientation required for Korean contractors with regard to working in the construction market in developed countries. Since this study cannot cover all the issues and strategies for the subject, some outstanding issues are mentioned but left for further indepth research.

CHAPTER 2
KOREAN CONSTRUCTION INDUSTRY

2.1 General Background

During the past twenty years, Korea has shown the most impressive economic growth among developing and newly industrialized countries. The accomplishment of high economic growth is mainly attributable to the rapid industrialization and growth of export resulting from the Government's emphatic implementation of a series of economic development plans. Until the early 1960s, the Korean economy was agriculture based and underdeveloped. The cornerstone of Korea's success has been a state commitment to outward looking trade and industrial policies. The growth of the Korean construction industry has followed its overall economy. In this regard, this chapter will look into Korea's industrialization process and structure. Based on the context of the industrialization process, the process of evolution of Korean construction industry will be discussed.

2.1.1 Industrialization Process

The industrialization process of the Korean economy can be conveniently examined by dividing it into several periods, each characterized by distinctive features; the rehabilitat-

ion period (1954-61), high growth and implementation of the economic development plans (1962-71), the development of the heavy and chemical industries (1972-78), and structural adjustment to strengthen the industrial foundations (1979 onward).

In the 1954-61 period, industrial policies emphasized the rehabilitation of the major industrial facilities destroyed in the Korean War (1950-1953) and the stabilization of living. With the rehabilitation of such key industries as electric power and cement, some consumer goods industries were developed. Industrial progress in the 1950s, however, was minimal.

From 1962 to 1971 corresponding to the first and second five year economic development plans were implemented for the first time in the nation's history and the economic foundation for industrial development commenced. The emphasis of industrial policies moved to the development of strategic key industries for import substitution and export and, to support it, the expansion of social overhead capital. Large scale investment on these areas was undertaken. The ratio of gross investment to GNP, which was average of 12.2 percent during 1954-61 period, increased to 17.0 percent during 1962-66 and 26.0 percent during 1967-71 period (see table 2.1.1). During 1962-71 period about 21.7 percent of GNP was used for capital formation. Of this, 9 [illegible].7 percent was allocated to mining and manufacturing, and social overhead capital and other services

(see table 2.1.2). Average annual production growth rates of these two sectors recorded 17.1 percent and 10.6 percent, respectively over the period, much higher than that of 1950s (see table 2.1.3). During this period chemical industries, including various intermediary chemical goods industries, achieved a remarkable development. In the first half of the 1960s the chemical fertilizer and oil refining industries were developed to the extent of meeting domestic demand. Consumer durable goods such as TV, refrigerators, and automobiles began to be produced. The industrial activities in these industries stimulated the development of related industries such as iron and steel, petrochemical, etc. Large scale investments for the construction of highways, railways and electric power facilities, were also undertaken, strengthening the infrastructure and industrialization.

In the 1970s, greater emphasis was given on the development of the heavy and chemical industries to promote import substitution of intermediate and capital goods and to make those industries new strategic export industries. Large scale investments were made in shipbuilding, automobile, machinery and chemical industries. As a result of the intensive development, the heavy and chemical industry became a leading sector in economic growth. In the late 1970s most of the industries became export industries, shifting industrial activities from the domestic to international area. Economies

of scale were pursued to achieve international competitiveness, as industrial activities became international market oriented. The intensive development of the heavy and chemical industries in the 1970s, contributed greatly to the advancement of industrialization, but brought about a structural problem of unbalanced sectoral investment. Due to the industrial policies, investments during the 1970s, especially in the latter half of the decade, were heavily concentrated in the heavy and chemical industries, resulting in overcapacity of production facilities. Investment for technological innovation in the light industries was overlooked, reducing the comparative advantage of these sectors. Many industries, which had been internationalized could not successfully compete in the international markets. The worldwide economic recession mainly due to the second oil shock in 1979 combined with the nationalism of natural resources aggravated the problem of excess capacity and misallocation of investment resources. The international competitiveness of strategic key industries such as rion and steel, nonferrous metals and petrochemicals was affected. Indusrial output was substantially reduced and GNP growth rate recorded minus 5.2 percent in 1980 for the first time since economic development plans started (see table 2.1.4).

In 1979, to stabilize economic growth and overcome the above problems, the government introduced a number of economic

adjustment policies designed to improve the industrial structure and to strengthen international competitiveness. Investment in the heavy and chemical industries was substantially adjusted. Taking into account Korea's limited natural resources, industries using relatively little energy and raw materials were stratigically promoted such as consumer electronics goods, machinery and the fine chemical industries. Recently the development of high technology industries such as semiconductors, computers, bioengineering and new materials industries is being accelerated. Attention has been drawn to the balanced development among related component industries plus small and medium enterprises. Since the late 1970s Korea has intensified its efforts towards structural adjustments so as to strengthen the industrial foundation for stable growth.

2.1.2 Structure of Industry

Industrialization is generally characterized by the expansion of the nonagricultural sectors in the field of production, employment and exports. Up to the early 1960s the agriculture, forestry and fisheries sector dominated the Korean economy, accounting for 45 percent of GNP. The mining and manufacturing sector was below the 12 percent level. Rapid industrialization, however, reshaped the industrial structure and reversed those ratios. In 1976, the mining and manufacturing sector for the first time surpassed the agriculture, forestry and fisheries sector. The expanding trend of the

nonagricultural sector has accelerated along with the progressive industrialization. The ratios of mining and manufacturing sector and other service sector reached 32.3 percent and 52.6 percent respectively in 1984 (see table 2.1.4).

The employment by sector also indicated a similar trend. The employment ratios of the mining and manufacturing sector, and the social overhead capital and other services sector increased to 24.2 percent and 48.7 percent in 1983 from 9.1 percent and 28.6 percent in 1963 respectively. The employment ratio of the agriculture, forestry and fisheries sector, on the other hand, decreased from 62.3 percent to 27.1 percent in 1984 (see table 2.1.5).

A substantial structural change also took place within the manufacturing industries. Before 1962 when the first five year economic development plan started, the light industries were leading manufacturing industries accounted for 69.3 percent of the total manufacturing products while the heavy and chemical industries stood at only 30.7 percent in 1961 (see table 2.1.6). The structure of manufacturing changed rapidly with the implementation of the economic development plans. leading growth industries have changed from labor intensive industries to capital intensive, and now onto technology intensive industries. In parallel, industries diversified

themselves from consumer goods to interemdiate goods and then further to high technology products (see table 2.1.6). However, this change of industrial structure also means change of industrial structuee from labor intensive to capital intensive one and this resulted in steady decline in employment elasticity in manufacturing (see table 2.1.7). The growth of heavy and chemical industry brought change in industrial pattern. The number of large firms was greatly increased and expansion within firms was predominant increasing the role of large firms in the nation's industrial activity. In the manufacturing industries, the number of large firms (employing more than 500 persons) increased from 72 in 1963 to 575 in 1982. The contribution by large scale firms total production increased from 27.9 percent in 1963 to 56.9 percent in 1982 (see table 2.1.8). The increasing number of large firms contributed greatly to productivity enhancement, product standardization and the improvement of quality and international competitiveness. The pursuit of economy of scale brought about cost reductions through mass production and increased productivity. However, their great contribution resulted in excessive concentration in some industry.

Korea's total commodity export reached 29.4 billion dollars in 1984 and the ratio of export to GNP accounted for 36.3 percent (see table 2.1.9). Before the early 1960s, Korea's principal exports consisted of primary products. But now

more than 90 percent of all merchandise export goods is manufactured goods. The major export of the early seventies - clothing, plywood, silk, toys, fresh fish and teansisters - having been largely outclassed by foreign competitors, the leading sectors of export during the eighties are machinery, transport equipment, chemicals and steel. Exports were considerably diversified and the structure of merchandise export had been changed dramatically toward heavy and chemical industry (see table 2.1.10 and figure 2.1.1). Diversification was also evident in the geographical area. The U.S. and Japan which had bought three-fourths of Korean exports, took less than half while European economies and the oil producers absorbed close to 20 percent (see table 2.1.11). The steady growth of export is accompanied by the similar growth of import. The rising share in GNP of the industrial sector, particularly of export activity, contributed the expansion of the import bill. This is because of Korean industry's high dependence of raw materials and capital goods on imports. Table 2.1.12 shows the steady increase in Korea's import of raw materials for both export use and domestic use.

The Korean economy has been built up on the heavy dependence on the foreign capital, and the stockpiling of foreign debts is a critical concern. The annual growth of urban labor force is expected to be growing to about 3 percent per annum for next few years while the employment elasticity of manufact-

uring sector has been on the steady decrease. These factors necessitate Korea the high growth of economy (more than 6 percent per annum) and higher growth of export with the growth of import no faster than that of GNP to improve the balance of payment. An analysis of past trading patterns suggests that as labor rich, export oriented countries progress towards industrial maturity, exports of raw materials and light manufactures give way to exports of standardized intermediate goods which in turn are later joined by exports of differentiated manufactures. Evidently Korea is now moving to challenge the advanced countries in products such as consumer electronics, where the technology is still evolving. Behind this strategy, was the realization that rising unit labor costs in thelight industries were placing Korean producers at a disadvantage in international markets. A continuation of high export growth called for a change in the mix of manufactures, as did the desire to deepen the industrial base and raise domestic value added. In expanding the exports of standardized commodities such as steel, chemicals, transport equipment, machinery, consumer durables and electronics, Korean firms have been aided by a number of factors:

-Government support, which included subsidized credit, reduced some of the risks of establishing large capital intensive production units in the absence of assured markets.

-A labor force well endowed with the necessary industrial skills shortened the learning period.

-Fifteen years of intensive trading in light manufactures had created links with foreign markets, established the reputations of Korean firms and concentrated within large trading corporations a wealth of experience which could be harnessed to the scale of new products.

However, there are a number of disadvantages in such departure from traditional trading and industrial patterns. These include:

-The smallness of the economy militated against the realization of scale economies. If optimally sized plants were constructed, they had from the outset to depend upon their ability to sell abroad.

-The limited sophistication of the domestic market has not allowed producers the lattitude to launch, test and refine differentiated manufactures, in a protected environment, before venturing overseas.

-Korea is only now beginning to accumulate sufficient reserves of scientific manpower to develop the research infrastructure neede to sustain competitiveness in quality and technology conscious, differentiated product markets.

-Whereas exports of light manufactures moved relatively unhindered into niches created by the decline of such production in the West, the sale of machinery, durables and electronics must compete head on with the still vigorous industries of the importing nations.

Table 2.1.1 Trend of Gross Domestic Investment and Saving
(percent of GNP)

Year	Gross domestic investment	Gross domestic saving
1954-1961	12.2	3.2
1962-1966	17.0	8.8
1967-1971	26.0	16.0
1972-1976	27.1	20.8
1977-1981	30.9	22.8
1982	27.0	22.4
1983	27.8	24.8
1984	29.9	27.4

Source: Bank of Korea

Table 2.1.2 Composition of Fixed Capital Formation by Industrial Use
(percent)

Sector	1954-1961	1962-1970	1971-1978	1979-1983
Total	100.0	100.0	100.0	100.0
Agriculture, forestry and fisheries	12.6	8.3	8.9	7.8
Mining and manufacturing	22.9	23.7	22.1	15.6
(Manufacturing)	(21.6)	(22.9)	(21.2)	(15.3)
Social overhead capital	2.8	38.2	33.8	34.5
Other services	61.7	29.8	35.2	42.1

Source: National Income Accounts, Bank of Korea
Note: 1954-1961 and 1962-1970 numbers are based on 1975 price, and 1971-1978 and 1979-1983 are based on 1980 price.

Table 2.1.3 Annual Growth Rates by Industrial Sectors
(percent)

Sector	1954-1961	1962-1970	1971-1978	1979-1980
Agriculture, forestry and fisheries	3.4	3.5	3.3	2.9
Mining and manufacturing	11.1	17.1	17.7	5.9
Social overhead capital and other services	3.3	10.6	9.8	4.1
GNP	3.9	8.7	9.9	4.4

Source: National Income Account, Bank of Korea

Table 2.1.4 Trend of GNP, Growth Rate and Composition
(in billions of 1980 won)

	GNP					Composition		
Year	GNP	Gr.	Primary	Secondary	Tertiary	1st	2nd	3rd
1971	18,797.4	8.8	5,122.0	3,288.8	10,386.6	27.2	17.5	55.3
1972	19,868.7	5.7	5,271.6	3,711.8	10,885.3	26.5	18.7	54.8
1973	22,677.8	14.1	5,598.7	4,776.1	12,303.0	24.7	21.1	54.2
1974	24,425.2	7.7	6,013.2	5,476.4	12,935.6	24.6	22.4	53.0
1975	26,113.5	6.9	6,308.0	6,143.8	13,661.7	24.2	23.5	52.3
1976	29,803.8	14.1	6,900.3	7,493.2	15,410.3	23.2	25.1	51.7
1977	33,590.0	12.7	7,077.3	8,670.9	17,842.0	21.1	25.8	53.1
1978	36,851.6	9.7	6,429.4	10,426.2	19,996.0	17.4	28.3	54.3
1979	39,249.2	6.5	6,862.1	11,393.7	20,993.5	17.5	29.0	53.5
1980	37,205.0	-5.2	5,372.5	11,226.5	20,606.0	14.4	30.2	55.4
1981	39,509.1	6.2	6,687.7	12,083.3	20,738.1	16.9	30.6	52.5
1982	41,736.7	5.6	6,962.5	12,514.1	22,260.1	16.3	30.0	53.3
1983	45,634.6	9.5	7,400.0	13,868.6	24,449.4	16.2	30.3	53.5
1984	49,179.7	7.6	7,431.3	15,864.6	25,883.8	15.1	32.3	52.6

Source: Korean Economic Yearbook, Federation of Korean Industries, 1985

Table 2.1.5 Trend of Employment by Sector
(in millions)

Year	Total	Agr., forestry & fisheries	Mining & manufacturing	Social overhead & other services
1963	7.7	4.8	0.7	2.2
1965	8.2	4.8	0.8	2.5
1967	8.7	4.8	1.1	2.8
1969	9.4	4.8	1.3	3.2
1972	10.6	5.3	1.5	3.7
1974	11.6	5.6	2.1	3.9
1976	12.6	5.6	2.7	4.2
1978	13.5	5.2	3.0	5.3
1979	13.7	4.9	3.1	5.7
1980	13.7	4.7	3.1	6.0
1981	14.0	4.8	3.0	6.2
1982	14.4	4.6	3.2	6.6
1983	14.5	4.3	3.4	6.8
1984	14.4	3.9	3.5	7.0

Source: Korean Economic Yearbook, Federation of Korean Industries, 1985
Economic Statistics Yearbook, Bank of Korea, 1976

Table 2.1.6 Structural Changes in Manufacturing
(percent)

Industry	1954	1961	1966	1971	1976	1981	1983
Heavy & chemical ind.	25.8	30.7	36.3	42.5	53.1	60.0	60.6
Industrial chemical	0.4	1.4	2.6	4.8	7.0	7.7	7.3
Petroleum product	-	-	8.3	16.4	10.3	9.4	8.9
Iron & steel	0.3	2.5	3.8	4.2	7.4	10.7	10.8
Machinery	2.3	2.8	2.0	1.4	2.3	3.0	3.4
Electrical machinery	0.5	1.0	2.3	2.6	5.3	8.5	8.6
Transportation equip.	2.5	3.2	4.1	2.8	4.2	4.3	5.1
Other	19.8	19.8	13.2	10.3	16.6	16.4	16.5
Light industry	74.2	69.3	63.7	57.5	46.9	40.0	39.4
Food & beverage	33.3	33.0	24.4	19.3	14.7	12.3	12.8
Textile	21.1	17.6	13.7	12.7	14.5	12.8	11.9
Wearing apparel	6.6	7.1	5.4	4.4	5.6	4.6	4.2
Other	13.2	11.6	20.2	21.1	12.1	10.3	10.5

Source: National Account, Bank of Korea
Note: 1954, 1963, 1966 numbers are based on 1975 constant market price
1971, 1976, 1981, 1983 numbers are based on 1980 constant price.

Table 2.1.7 Manufacturing Employment Elasticities

1970-1982	1.057
1970-1975	1.394
1973-1978	1.077
1975-1980	0.790

Source: Korea, Development in a Global Context, The World Bank, 1984
Note: Calculated by least squares regression with respect to real GNP

Table 2.1.8 Ratio of Output by Firm Size in Manufacturing

Year	5-49	50-199	200-499	500-	Total
1963	34.9	23.6	13.6	27.9	100.0
	(93.1)	(5.6)	(0.9)	(0.4)	(100.0)
1972	12.4	16.1	20.6	50.9	100.0
	(88.2)	(8.3)	(2.2)	(1.3)	(100.0)
1976	7.0	14.9	20.2	57.3	100.0
	(79.5)	(14.5)	(3.8)	(2.2)	(100.0)
1982	9.2	17.1	16.8	56.9	100.0
	(81.1)	(14.1)	(3.2)	(1.6)	(100.0)

Source: Manufacturing Survey, Economic Planning Board of Korea
Note: The numbers in the Parentheses denote the ratio of the number of firms

Table 2.1.9 Ratios of Export and Import to GNP (in billions of dollars, percent)

	1961	1971	1973	1981	1982	1983	1984
GNP (A)	2.1	9.4	13.5	67.2	70.8	75.1	81.1
Total export(B)	0.04	1.1	3.2	21.3	21.9	24.9	29.3
Total import(C)	0.3	2.4	4.2	26.1	24.3	26.2	30.6
B/A	1.9	11.4	23.9	31.6	30.9	32.6	36.3
C/A	15.0	25.6	31.4	38.9	34.3	34.9	37.7
(B+C)/A	16.9	37.0	55.3	70.5	65.2	67.5	74.0

Source: Economic Statistics Yearbook, Bank of Korea

Figure 2.1.1 Composition of Merchandise Exports

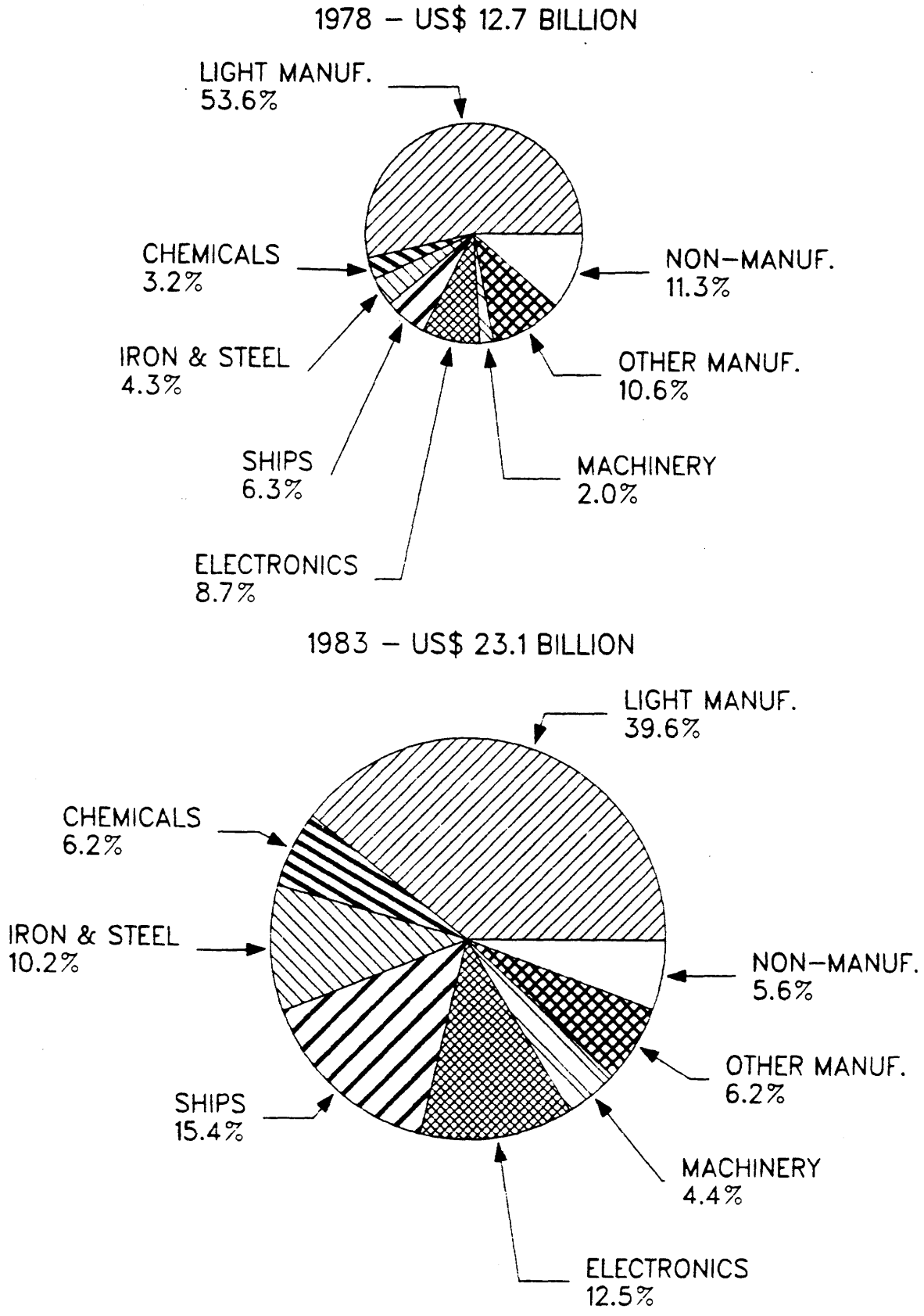


Table 2.1.10 Korea's Major Export Ranked by Size (in U.S.$ million)

1970			1975			1978			1981			Growth rate
SITC	Item	Value	SITC	Item	Value	SITC	Item	Value	SITC	Item	Value	1975-81 (%)
841	Clothing	213.4	841	Clothing	1,131.6	841	Clothing	2,523.2	841	Clothing	3,732.2	18.6
899	Other mfg. goods	104.2	031	Fresh fish	321.9	735	Ships	800.2	735	Ships	1,405.5	35.8
631	Plywood	92.2	653	Woven textiles	271.7	653	Woven textiles	775.0	653	Woven textiles	1,267.6	28.1
261	Silk	38.5	729	Elec. mach. NES	242.2	851	Footwear	686.2	724	Telecomm. eqpt.	1,118.0	39.5
031	Fresh fish	37.7	631	Plywood	208.1	724	Telecomm. eqpt.	611.5	851	Footwear	1,023.6	28.5
729	Elec. mach.	32.9	651	Textile yarn	205.0	031	Fresh fish	562.5	031	Fresh fish	765.6	17.3
653	Woven textiles	27.5	851	Footwear	191.2	729	Elec. mach. NES	486.6	729	Elec. mach. NES	706.3	18.3
652	Cotton fabrics	26.4	724	Telecomm. eqpt.	138.0	631	Plywood	414.7	651	Textile yarn	568.2	20.0
283	Nonfer. base metal ore	24.7	735	Ships & boats	137.8	651	Textile yarn	337.6	674	Iron, steel plate, sheet	564.4	40.8
851	Footwear	17.2	061	Sugar & honey	116.7	674	Iron, steel plate, sheet	298.2	678	Iron, steel tubes, pipes	514.9	44.6
292	Crude veg. materials	14.6	899	Other mfg. goods	105.1	831	Travel goods	277.1	629	Rubber articles	482.3	34.7
054	Fresh veg.	14.5	332	Petroleum prod.	95.0	894	Toys, sporting goods	261.1	631	Plywood	395.2	8.0
651	Textile yarn	13.6	629	Rubber articles NES	90.3	629	Rubber articles	225.1	672	Iron, steel primary forms	390.3	53.8
121	Tobacco unmfg.	13.4	893	Articles of plastics	86.6	891	Sound recorders	204.2	661	Cement	379.5	26.4
276	Other crude minerals	8.5	891	Sound recorders	83.2	678	Iron, steel tubes, pipes	172.7	894	Toys, sporting goods	365.2	29.9
655	Special textile products	7.7	831	Travel goods	79.4	661	Cement	167.6	831	Travel goods	344.3	23.6
674	Iron, steel plate, sheet	7.6	674	Iron, steel plate, sheet	74.3	561	Fertilizers	162.1	691	Structure & parts NES	328.4	82.3
561	Fertilizers	6.3	661	Cement	73.1	899	Other mfg. goods	143.2	731	Railway vehicles	319.2	83.2
724	Telecomm. eqpt.	5.8	894	Toys, sporting goods	69.0	734	Aircraft	133.3	673	Iron, steel shapes	290.4	47.1
734	Aircraft	5.2	121	Tobacco unmfg.	66.3	691	Structure & parts NES	113.2	891	Sound recorders	273.8	17.7
	Total Exports	835.2		Total Exports	5,081.0		Total Exports	12,710.6		Total Exports	21,253.8	34.2

Notes: (1) Growth rate 1975-81 = annual compound growth rates between 1975 and 1981 for the items listed in 1981.
(2) SITC 629 Rubber articles NES mainly consists of rubber tires.
(3) SITC 724 Telecommunications equipment = TV, radios and electronic components.
(4) SITC 729 Electric machinery NES mainly consists of transistors, batteries.

Source: UN Trade Data (World Bank Trade System).

Table 2.1.11 Total Exports by Country of Destination
(top five destinations, in millions of dollar)

Rank	1979	1980	1981	1982	1983	1984
1	U.S.A.	U.S.A.	U.S.A.	U.S.A.	U.S.A.	U.S.A.
	4,373.9	4,606.6	5,660.6	6,243.2	8,245.4	10,478.8
	(29.0)	(26.3)	(26.6)	(28.5)	(33.7)	(35.8)
2	Japan	Japan	Japan	Japan	Japan	Japan
	3,353.0	3,039.4	3,502.8	3,388.1	3,403.5	4,602.2
	(22.2)	(17.4)	(16.4)	(15.5)	(13.9)	(15.7)
3	W. Germany	Saudi	Africa	Saudi	Saudi	Hong Kong
	845.3	946.1	1,286.6	1,125.4	1,436.5	1,281.2
	(5.6)	(5.4)	(6.1)	(5.1)	(5.8)	(4.4)
4	Saudi	W. Germany	Hong Kong	Africa	U.K.	India
	740.2	875.5	1,154.7	1,096.5	1,005.2	1,048.6
	(4.7)	(5.0)	(5.4)	(5.0)	(4.1)	(3.6)
5	U.K.	Hong Kong	Saudi	U.K.	Hong Kong	Saudi
	541.6	823.3	1,136.2	1,102.6	817.7	990.3
	(3.6)	(4.7)	(5.3)	(5.0)	(3.3)	(3.4)

Source: Monthly Review, Korea Exchange Bank

Table 2.1.12 Korea's Imports, 1963-1983
(million U.S.$, current prices)

Year	Total	Capital goods	Crude oil	Raw materials for export use	Raw mat'ls for domestic use & other imports
1963	560.3	115.6	32.2	-	412.5
1964	404.4	69.5	25.9	6.9	302.1
1965	463.4	60.0	28.9	10.4	364.1
1966	716.4	171.7	40.6	101.1	403.0
1967	996.2	310.2	59.4	135.2	491.4
1968	1,462.9	533.2	72.8	213.0	643.9
1969	1,823.6	593.2	107.6	297.2	825.6
1970	1,984.0	589.5	125.0	386.3	883.2
1971	2,394.3	685.4	174.0	506.0	1,028.9
1972	2,522.0	762.0	206.0	687.6	886.4
1973	4,240.3	1,156.8	277.0	1,555.5	1,251.0
1974	6,851.8	1,848.6	966.0	2,039.3	1,997.0
1975	7,274.4	1,909.2	1,271.2	1,452.0	2,642.0
1976	8,773.6	2,427.4	1,607.0	2,144.0	2,595.2
1977	10,810.5	3,008.1	1,926.0	2,427.0	3,449.4
1978	14,971.9	5,080.1	2,187.0	2,948.0	4,756.6
1979	20,338.6	6,314.0	3,100.0	3,444.0	7,480.6
1980	22,291.7	5,125.0	5,633.0	3,799.0	7,735.0
1981	26,131.4	6,158.2	7,375.7	4,587.3	9,010.2
1982	24,250.8	6,232.7	6,102.8	4,644.5	7,270.8
1983	26,192.2	7,814.7	5,576.7	4,801.7	7,999.1

Source: Major Statistics of Korean Economy, Economic Planning Board, 1983

2.1.3 Development of Construction Industry

The construction industry is a major sector of the economy, and reflects to a very large extent both how well the economy is doing in terms of growth, stability, and employment, and in which direction the national economy is growing. The annual volume of construction activity accounts for a significant portion of the private and public sector investment. To the extent that investment today is a prime determinant of the future productive capability of the nation, its contribution to GDP and the composition is of major concern. The contribution of construction to GDP has grown from 2.5 percent in 1962 to 6.4 percent in 1972 and 9.9 percent in 1983, with the expansion of infrastructure and the industrial base as well as the mass supply of housing. It is interesting to observe the difference in growth rate between GDP and construction has been fluctuating intensively. However, construction has grown faster than GDP in general (see table 2.1.13). The construction industry employed 903,000 persons in 1984 which accounted for 6.3 percent of total employed manpower (see table 2.1.14). The total volume of construction output in 1984 was 16.2 trillion won (about $19.6 billion), of which 8.8 trillion won (about $10.6 billion) was in the domestic market and remaining 7.4 trillion won overseas. Approximately 51 percent of the domestic activity is engaged in public construction. The remaining 49 percent is for

private owners and more than half of that is engaged in the building construction. Table 2.1.16 shows the percentage distribution in 1984 of total construction by type and ownership. Korean contractors' international activities were started in 1965 in Southeast Asia. In 1973, they had first contract in the Middle East. Since then, Korean contractors have shown remarkable performance in the international construction market. These performance were attributed to the acquisition of required capabilities through the domestic activities.

Korean construction industry gained its strength through the reconstruction after Korean War, and grew rapidly by the increased construction demand for construction of industrial bases and infrastructures during the first and second economic development plans in the 1960s. Some 42-44 percent of industrial facilities, 40 percent of housing, 47 percent of railways, 500 km of roads, 40 km of bridges and 80 percent of the power generating facilities were destroyed by the war. The rehabilitation and reconstruction efforts were made largely based on U.S. aid. Korea received $3.2 billion economic aid from U.S. from 1945 to 1961 and about $2.3 billion was given from 1953 to 1961 period for rehabilitation and reconstruction efforts. Korean construction industry could grow rapidly with the demand created by this situation, and the construction of U.S. military facilities. As a result,

they also accumulated a significant capital, experience and construction technologies. Especially, U.S. military build-up in Korea produced many large scale construction projects since 1957. By 1960, construction's contribution to GNP increased to 2.1 percent from 1.5 percent in 1953.

Korean contractors participation to U.S. military projects provided unique opportunities to the construction industry. U.S. military projects were mostly building and civil engineering project and not new for Korean contractors, but offered many different characteristics largely unfamiliar to Korean contractors. The following are a few different points observed in carrying out the U.S. military projects:

-U.S. military projects were relatively more profitable than other projects (especially with the aid of continuous devaluation of the Korean currency against the dollar) and many contractors participated in these projects were later grown to pioneer the development of international construction markets in 1960s and 1970s.

-These projects required the preparation of formal bidding documents and these requirements provided Korean contractors the skills and experiences in estimation and bidding which were necessary to enter international construction market.

-Standard project specifications were almost nonexistent or usually ignored if existed due to urgency of rehabilitation in local projects. However, these specifications were strictly adhered for U.S. military projects and this helped

Korean contractors acquire the knowledge and experience of international standard specification and international standard practices of the project execution and quality control. This experience greatly helped Korean contractors to enter international construction markets.

-Generally U.S military projects required Korean contractors to use more sophisticated equipment in project execution. This requirement forced Korean contractors to acquire and operate new construction equipments. This helped and expedited the modernization of the industry.

U.S military projects were drastically reduced from 1965 when U.S. forces in Korea was reduced and the Buy American policy was strictly enforced. U.S. military projects contributed a significant portion of total Korean construction as reached $15.3 million dollars in 1964 which was equivalent to 17 percent of Korea's total construction that year (see table 2.1.17). Moreover, the U.S. military construction project is more significant in terms of providing the opportunities for Korean contractors to expose themselves to the international standard specifications and practices in the areas of building, contracting, project execution and procurement which are vital for international construction operations.

In 1962, Korea started a series of ambitious economic development plans. The first 5 year plan for economic development (1962-1966) was characterized as achieving outward and export

oriented economic development through establishing the industrial bases and infrastructures mostly by the foreign financing. During this period, construction played major role and grew an average of 17.4 percent per year by constructing social overhead capitals and upstream industrial facilities such as refineries, fertilizer and cement plants etc.

The latter part of 1960s is characterized by the Korea's involvement in Vietnam War, the second 5 year economic development plan (1967-1971), and the rapid expansion of construction demand and construction of larger scale projects such as the construction of Seoul-Busan highway and several multipurpose dams. And it was this period that Korea's first overseas construction started. During this period, large investments were made to the establishment of social overhead capitals such as irrigation, reclamation, roads, port facilities, electric power and communication facilities. Private investment to the plant facilities and buildings were actively made as well as government investment. The investment in construction during this second 5 year economic development plan period accounted for 34.3 percent of total investment of 980 billion won and 72.4 percent of total construction investment were made for the social overhead capital. One ot the most important project constructed during this period was the Seoul-Busan highway -- the first part of 10 year highway construction plan which included the construction of

1,593 km of highway. Together with highway construction, several of multipurpose dams were constructed during this period and 10 year plan for 4 river basin development (1972-1981) which included the construction od 12 multipurpose dams was announced in 1971. In 1970, the task force project team was formed in Seoul city to construct the subway system in Seoul.

The large scale construction projects in the 1960s were mostly financed by foreign loans and the constant increase of foreign financing furtherfueled the demand for construction. During the first and second economic development plan period, the amount of foreign financing reached to $2,456 million and $2,170 was made during the second plan period (see table 2.1.18). These foreign financed projects caused a lot of changes in Korean construction in both quantity and quality. Although the owners of the projectswere mostly the government or parastatal organizations, those investments were thoroughly examined by the foreign organizations who provided financing. Those foreign financed projects provided Korean contractors the momentum to improve the capabilities in design, construction, procurement, management and all the related fields.

Through the post-war reconstruction and two 5 year economic development plans, Korean construction industry accumulated substantial experience and technology. At the same time, the

U.S. military projects in Korea and foreign financed large scale domestic projects in 1960s provided the necessary experence and knowledge to carry out international construction activities.

Table 2.1.13 GDP and Construction Statistics, 1972-1983

Year	GDP 1980 Bi. won	Constr. 1980 Bi. won	Constr./ GDP Percent	GDP Index 1980=100	Constr. Index 1980=100	GDP Growth Rate	Constr. Growth Rate	Difference Gr. Rates GDP-Const.
1972	18124	1152	6.4	54.1	38.5	5.5	0.9	4.6
1973	20615	1468	7.1	61.6	49.0	13.7	27.4	-13.7
1974	22194	1508	6.8	66.3	50.4	7.7	2.7	4.9
1975	23835	1716	7.2	71.2	57.3	7.4	13.8	-6.4
1976	26736	1894	7.1	79.8	63.3	12.2	10.4	1.8
1977	29553	2395	8.1	88.3	80.0	10.5	26.5	-15.9
1978	32303	2948	9.1	96.5	98.5	9.3	23.1	-13.8
1979	34622	3036	8.8	103.4	101.4	7.2	3.0	4.2
1980	33484	2994	8.9	100.0	100.0	-3.3	-1.4	-1.9
1981	35872	2832	7.9	107.1	94.6	7.1	-5.4	12.5
1982	37880	3399	9.0	113.1	113.5	5.6	20.0	-14.4
1983	41424	4119	9.9	123.7	137.6	9.4	21.2	-11.8

Source: Korean Economic Yearbook, The Federation of Korean Industries, 1985

Table 2.1.14 Employed Persons by Industry
thousand employees (percent)

Year	Total employed	Agriculture etc.	Manufacturing & mining	Construction	Others
1972	10,559	5,383	1,478	422	3,273
	(100.0)	(51.0)	(14.0)	(4.0)	(31.0)
1973	11,139	5,570	1,782	334	3,453
	(100.0)	(50.0)	(16.0)	(3.0)	(31.0)
1974	11,586	5,561	1,970	463	3,592
	(100.0)	(48.0)	(17.0)	(4.0)	(31.0)
1975	11,830	5,442	2,248	473	3,667
	(100.0)	(46.0)	(19.0)	(4.0)	(31.0)
1976	12,556	5,650	2,637	502	3,767
	(100.0)	(45.0)	(21.0)	(4.0)	(30.0)
1977	12,929	5,430	2,844	646	4,008
	(100.0)	(42.0)	(22.0)	(5.0)	(31.0)
1978	13,490	5,126	2,968	809	4,587
	(100.0)	(38.0)	(22.0)	(6.0)	(34.0)
1979	13,664	4,919	3,143	820	4,782
	(100.0)	(36.0)	(23.0)	(6.0)	(35.0)
1980	13,705	4,658	3,095	841	5,111
	(100.0)	(33.3)	(22.6)	(6.1)	(37.3)
1981	14,048	4,806	2,996	875	5,372
	(100.0)	(34.2)	(21.3)	(6.2)	(38.3)
1982	14,424	4,623	3,157	831	5,813
	(100.0)	(32.0)	(21.9)	(5.8)	(40.3)
1983	14,515	4,314	3,383	816	6,002
	(100.0)	(29.7)	(23.3)	(5.6)	(41.4)
1984	14,417	3,909	3,493	903	6,112
	(100.0)	(27.1)	(24.2)	(6.3)	(42.4)

Source: Major Statistics of Korean Economy, Economic Planning Board, 1980
Korean Economic Yearbook, The Federation of Korean Industries, 1985

Table 2.1.15 Total Value of Construction in Korea, 1984
(10 millions of won)

Industry	Total value of construction	
Private construction		
Residential building	95,708.459	(10.9 %)
Nonresidential building	149,280.945	(17.0)
Civil work	38,782.447	(4.4)
Other	127,951.672	(14.6)
Total private construction	411,723.523	(46.9)
Public construction		
Residential building	32,902.919	(3.7)
Nonresidential building	87,415.460	(10.0)
Civil work	249,849.243	(28.5)
Other	80,875.924	(9.2)
Total public construction	451,043.546	(51.4)
Foreign organizations in Korea	14,979.708	(1.7)
Total value of construction	877,746.777	(100.0)

Source: Report on Construction Work Survey, Economic Planning Board, 1985

Table 2.1.16 Percent Distribution of Value of Construction by Ownership

	Public						
Type	Central gov't.	Local gov't.	Other	Total Public	Private	Foreign org.	Total
Residential building	0.2 %	0.8	2.7	3.7	10.9	0.1	14.7
Nonresidential building	2.5	4.6	2.9	10.0	17.0	1.0	28.0
Civil work	5.5	12.1	10.9	28.5	4.4	0.4	33.3
Other	1.8	2.7	4.7	9.2	14.6	0.2	24.0
Total	10.0	20.2	21.2	51.4	46.9	1.7	100.0

Source: 1984 Report on Construction Work Survey, Economic Planning Board

Table 2.1.17 Trend of U.S. Military Construction in Korea

Year	Value of U.S. military projects ($ million)	Percent of total construction
1962	14.1	12.6
1963	5.4	4.8
1964	15.3	17.0
1965	13.4	15.3

Source: Construction Association of Korea

Table 2.1.18 Foreign Financing During the First and Second Economic Development Plans (in millions of dollar)

		Loans					Foreign invest.	
Year	Total	Sub total	Official	Percent	Commerc.	Percent	Amount	Percent
1962-66	307.9	291.2	115.6	35.7	175.6	57.0	16.7	5.4
1967-71	2,261.9	2,165.5	810.8	35.4	1,354.7	59.9	96.4	4.3

Source: Economic Planning Board of Korea, 1979

2.2 International Construction Operation

Koreans started their international construction operation in 1965 when Hyundai Engineering and Construction Company contracted highway construction project in Thailand. Since then, Korean overseas construction activiteie were mostly in Southeast Asia and the Pacific region until 1972. This period is characterized as Korean involvement in Vietnam war. By that, many Korean contractors could get contracts for the projects related to the military operation or rehabilitation of war destructed facilities. During this period, Korean contractors also developed many other areas of the market. When the Vietnam war was ended in 1972, Korean contractors had to find alternative market elsewhere. In 1973, Samwhan Corporation opened the Middle East market by contracting highway construction project in Saudi Arabia. By 1973, Korean contractors coverage of international market became substantial but their total contract amount during 1965 to 1973 period was only about $423 million (see table 2.2.1).

From 1974, Korean international construction activity expanded rapidly until 1981 when the slow decline started. The 1974-1981 period is characterized as rapid expansion of Korean international construction. This period is also concurrent with the third (1972-1976) and fourth (1977-1981) economic development plans. In this period, the economic development

plans gave emphasis on the development of ehavy industry and export promotion resulting in rapid internationalization of Korean economy. Internationally, this period experienced two oil shocks which caused worldwide economic recession while oil exporting countries in the Middle East realized enormous oil revenue. These oil dollars created the Middle East construction boom. Although the countries in the Middle East had more than enough financial resources for the development, they lacked many other resources such as manpowers, technology and management capability which all are vital for the development. At the same time, Korean contractors could offer experiences they accumulated in the domestic market as well as in the Southeast Asia, well disciplined manpowers backed up by efficient support from the government policies. On the other hand, the stockpiling foreign debts due to chronic current account deficit which was aggravated by the oil shock became a heavy burden for Korean economy in the 1970s. The biggest immediate task for Korean economy at that time was earning the foreign currency to make its economy going. Brisk performance of Korean contractors in the Middle East greatly helped their national economy out of trouble during that period. Until 1984, the total Korean international contract amount was on the order of $80 billion; considering that the total accumulated figure for overseas contract totaled approximately $423 million by 1973, it can be readily seen that the Korean overseas construction activity increased

rapidly since 1974 (see tables 2.2.2 and 2.2.3). International work expanded slowly until 1974, then rapidly from 1974 to 1981. From 1982, Korean international contracts started to decline considerably. In 1984, its total overseas contract amount was reduced to $6.6 billion from $14.3 billion in 1981. Since 1976 until 1983, Korean international contracts accounted for more than 50 percent of its combined domestic and international contracts (see table 2.2.4); however this seems to be unevenly distributed. Koreans have heavily concentrated their efforts in the Middle East market. Of the 35 to 45 percent of its interantional contracts, the Middle East provided Korea with more than 70 percent of its international contracts and if North Africa is included in the Middle East, this number will go well over 80 percent.

Table 2.2.5 illustrates the rapid growth of migrant Korean labor, mostly in support of and in parallel with the construction activities of the Middle East. By 1982, overseas construction related employment accounted for 20.6 percent of total construction employment; about 68 percent was in the Middle East and more than 50 percent in Saudi Arabia. Well trained but cheap manpower was a major reason for Korean competitiveness. Beginning in 1962, Korea implemented five consecutive 5 year economic development plans successfully. Throughout the 1960s it maintained a reasonable infrastructure and industrial base which resulted in surplus trained manpower and construction equipments which they then utilized in South

east Asia (Vietnam, Malaysia, Guam etc.) to meet increased construction demand. By the end of the Vietnam war, Korean contractors had to find other markets for their manpower. It was the first oil shock that ignited Middle East construction boom providing the Koreans with their largest market. They were able to carry out their Middle Eastern projects economically and efficiently through the experience they had gained in Southeast Asia.

Export oriented government policies and incentives have aided the development of Korea's competitiveness in the international construction market. The Korean construction industry is allowed an accelerated depreciation for its construction equipment; and in order to increase earnings of foreign exchange, domestic construction firms (as well as other exporters) are exempted from business tax and are given a 50 percent tax credit against income and corporate taxes from all foreign currency earned. This has been an enormous help in developing the country's construction industry and has led to Korea's success in exporting its services. Another aid has been the continuous devaluation of Korean currency.

As of 1983, 99 companies were licensed to carry out overseas construction projects. As a result of the high concentration of Korean contractors in a limited area thereby creating excessive internal competition, prices began to decrease

significantly. However more than 80 percent of the contracts have been awarded to the ten largest companies (see figure 2.2.1). From 1978 to 1983, the five largest companies accounted for 42 to 67 percent, and top ten accounted for 61 to 83 percent, and top twenty for 85 to 94 percent of the total overseas orders received by Korean contractors. The contribution of the top five is increasing significantly since 1980 and this trend becomes more significant as the market conditions deteriorate. In 1983 the top five accounted for 67 percent, top ten for 82.9 percent and top twenty accounted for 93.8 percent of total order received while 44 of total 99 licensed companies had received no orders at all. This illustrates that the bigger companies are generally more competitive in the international construction market. Based on this fact, the Korean government has encouraged the formation of large and more competitive units. Since 1983 the amount of new orders has dropped sharply as has awards to Korean contractors. Terms of payment have become more rigid. Many Korean contractors faced severe financial problems and the Korean government has had to step in to curtail the activities of several ailing contractors.

Table 2.2.1 Number of Firms Doing Overseas Construction (1965-1981)

Year	Middle East	South-East Asia	Pacific area	Latin America	Africa	North America
1965		3				
1966		5				
1967		12	1			
1968		11	1			
1969		10	2			1
1970		10	3			2
1971		12	4	1		
1972		13	7			
1973	1	14	7	1		
1974	7	15	9	3	1	
1975	20	12	9		2	
1976	38	8	4	2	1	
1977	51	13	5	1	1	
1978	74	11	3	1	4	
1979	60	15	3		3	
1980	64	23	1		2	
1981	72	22	2		4	

Source: Nongovernmental White Paper on Overseas Construction, Overseas construction Association of Korea, 1984

Table 2.2.2 Market Share of International Construction by 250 Largest Firms in billions of dollar (percent)

	1980	1981	1982	1983	1984	1980-1984
U.S.A.	48.3	44.1	44.9	29.4	30.7	197.4
	(44.5)	(33.9)	(36.5)	(31.4)	(38.1)	(36.8)
Korea	9.9	14.3	13.8	10.4	6.6	55.0
	(9.1)	(11.0)	(11.2)	(11.1)	(8.2)	(10.3)
Japan	4.1	8.2	9.3	8.7	7.3	37.6
	(3.8)	(6.3)	(7.6)	(9.3)	(9.1)	(7.0)
Europe	38.0	51.9	46.5	38.1	29.9	204.4
	(35.0)	(39.9)	(37.7)	(40.7)	(37.7)	(38.2)
-France	8.7	12.5	11.4	10.0	5.3	47.9
	(8.0)	(9.6)	(9.3)	(10.7)	(6.6)	(8.9)
-W. Germany	8.6	10.0	9.5	5.4	4.8	38.3
	(7.9)	(7.7)	(7.7)	(5.8)	(6.0)	(7.2)
-Italy	6.2	8.2	7.8	7.2	6.8	36.2
	(5.7)	(6.3)	(6.3)	(7.7)	(8.4)	(6.8)
-U.K.	4.9	7.9	7.5	6.4	5.6	32.3
	(4.5)	(6.1)	(6.1)	(6.8)	(7.0)	(6.0)
-Netherland	3.7	4.0	2.0	2.5	1.2	13.4
	(3.4)	(3.1)	(1.6)	(2.7)	(1.5)	(2.5)
-Yugoslavia	-	-	1.3	1.3	1.3	3.9
	(-)	(-)	(1.0)	(1.4)	(1.6)	(0.7)
-Other	5.9	9.3	7.0	5.3	4.9	32.4
	(5.4)	(7.1)	(5.7)	(5.6)	(6.1)	(6.0)
Turkey	-	2.7	2.7	3.4	1.9	10.7
	(-)	(2.1)	(2.2)	(3.6)	(2.4)	(2.0)
Other	8.3	8.7	5.9	3.6	4.2	31.1
	(8.0)	(6.8)	(4.8)	(3.9)	(5.2)	(5.8)
Total	108.6	129.9	123.1	93.6	80.5	535.7
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

Source: Various issues of Engineering News Records

Table 2.2.3 Market Share of Middle Eastern Construction by 250 Largest Firms in billions of dollar (percent)

	1980	1981	1982	1983	1984	1980-1984
U.S.A.	8.9	10.4	18.5	12.7	10.7	61.2
	(25.2)	(22.4)	(36.1)	(38.5)	(40.2)	(31.8)
Korea	7.6	10.5	10.7	4.8	4.9	38.5
	(21.5)	(22.6)	(20.9)	(14.5)	(18.4)	(20.0)
Japan	2.3	3.9	2.5	2.5	1.2	12.4
	(6.5)	(8.4)	(4.9)	(7.6)	(4.5)	(6.4)
Europe	11.7	17.2	15.4	9.4	6.8	60.5
	(33.0)	(37.0)	(30.1)	(28.5)	(25.6)	(31.4)
-France	2.5	4.2	3.7	2.3	1.6	14.3
	(7.2)	(9.0)	(7.2)	(7.0)	(6.0)	(7.4)
-W. Germany	3.1	3.0	2.4	1.3	0.9	10.7
	(8.8)	(6.5)	(4.7)	(3.9)	(3.4)	(5.6)
-Italy	2.3	2.3	2.8	1.1	1.1	9.6
	(3.5)	(4.9)	(5.5)	(3.3)	(4.1)	(5.0)
-U.K.	0.9	1.4	3.0	1.4	1.2	7.9
	(2.4)	(3.0)	(5.8)	(4.3)	(4.5)	(4.1)
-Netherland	0.9	2.1	0.4	1.3	0.3	5.0
	(2.6)	(4.5)	(0.8)	(3.9)	(1.1)	(2.6)
-Yugoslavia	-	-	0.6	0.5	0.2	1.3
	(-)	(-)	(1.2)	(1.5)	(0.8)	(0.7)
-Other	2.0	4.2	2.5	1.5	1.5	11.7
	(5.6)	(9.1)	(4.9)	(4.6)	(5.6)	(6.1)
Turkey	-	0.9	1.9	2.1	1.2	6.1
	(-)	(1.9)	(3.7)	(6.4)	(4.5)	(3.2)
Other	4.8	3.6	2.2	1.5	1.8	13.9
	(13.6)	(7.7)	(4.3)	(4.5)	(6.8)	(7.2)
Total	35.3	46.5	51.2	33.0	26.6	192.6
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

Source: Engineering News Records

Table 2.2.4 The Evolution of Korean International Construction Activity
Domestic versus Overseas Contract Amount
(millions of dollar)

	Contract amount			Percentage		
Year	Domestic	Overseas	Total	Domestic	Overseas	Total
1970	513	50	563	91	9	100
1971	467	113	563	81	19	100
1972	535	175	710	75	25	100
1973	681	238	919	74	26	100
1974	913	300	1,213	75	25	100
1975	1,056	800	1,856	57	43	100
1976	1,526	2,500	4,026	38	62	100
1977	2,608	3,516	6,124	43	57	100
1978	4,792	8,145	12,937	37	63	100
1979	5,963	6,351	12,314	48	52	100
1980	4,795	8,095	12,889	37	63	100
1981	6,056	13,536	19,592	31	69	100
1982	7,142	13,828	20,970	34	66	100
1983	7,358	10,786	18,144	41	59	100
1984	7,883	6,502	14,385	55	45	100
1985	9,545	4,500	14,045	68	32	100

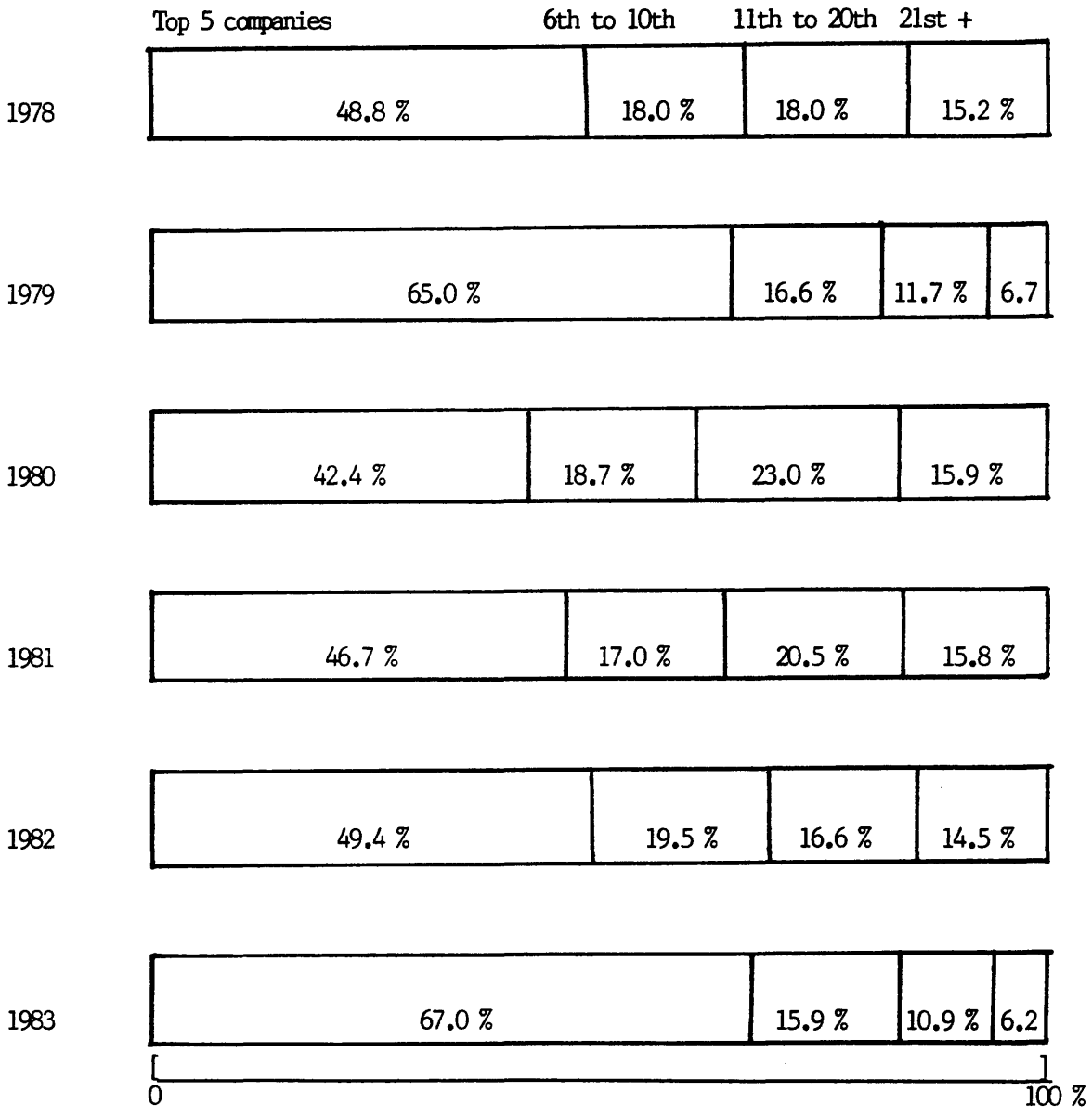
Source: Economic Statistics Yearbook 1985
Statistics Yearbook of Construction Industry 1985
Korean Institute of Construction Technology 1984
Note: Discrepancy may exist in exchange rate

Table 2.2.5 Effect on Employment by Overseas Construction

	1977	1978	1979	1980	1981	1982
1. Overseas employment (person)	45,725	84,964	105,696	131,137	163,088	171,170
2. Employment opportunity (")	30,000	114,000	99,000	102,000	125,000	132,000
3. Overseas construction employment opportunity (")	75,725	198,964	204,696	233,137	288,088	303,170
4. Available manpower (thousand person)	13,440	13,932	14,206	14,454	14,710	15,080
5. Employed manpower (")	12,929	13,490	13,664	13,706	14,048	14,424
6. Construction employment (")	626	821	836	841	875	831
7. Unemployed (")	511	442	542	749	661	656
8. 3/5 (percent)	0.58	1.47	1.49	1.70	2.05	2.10
9. 1/6 (")	7.31	10.34	12.64	15.59	18.63	20.60
10. 6/5 (")	4.84	6.09	6.12	6.14	6.23	5.76
11. Unemployment rate (")	3.80	3.17	3.81	5.20	4.49	4.35
12. Increase in employment (thousand person)	373	561	174	42	342	376
13. Increase in overseas construction employment opportunity (person)	73,682	123,239	5,732	28,441	54,951	15,082
14. Rate of increase in total employment (percent)	2.97	4.34	1.29	0.30	2.49	2.67
15. Rate of increase in overseas construction employment opportunity (percent)	320.35	162.74	2.80	13.89	23.57	5.23
16. Contribution of 13 to increase in total employment (percent)	19.75	21.96	3.29	67.71	16.06	4.01

Source: Ministry of Construction
Bank of Korea

Figure 2.2.1
Trend of Overseas Orders by the Size of the Firms (1978-1983)



Source: Nongovernmental White Paper on Overseas Construction, Overseas Constrcution Association of Korea, 1984

2.3 Structural Characteristics

Construction industry consists of Two major categories namely the general contractors and the specialty trade contractors. Out of 10,602 construction establishments, there were 1,821 general contractors and 8,781 specialty trade contractors in 1984. If the specialization of contractors is used to categorize them, the resulting major classifications are general builders, civil engineering contractors and specialty trade contractors (see table 2.3.1). A large number of small firms and small number of large firms make up the construction industry. In 1984, 47 percent of all construction establishments had tital receipts of less than 50 million won (approx. $60,000), and 1.1 percent of all construction concerns reported total receipts of 10 billion won (approx. $12 million) or more which accounted for 73 percent of total receipts of nation's construction industry that year (see table 2.3.2). Another way to look at the size of construction firms is to consider the number of employees each firm has. Of the 10,602 construction industry establishments in 1984, 5,731 (54.1 percent) had less than 10 employees. These establishments had receipts of 165 billion won, which was only one percent of total industry receipts of 16.2 trillion won (see table 2.3.3).

In 1984, there were 1,821 general contractors that accounted

for only 17.2 percent in number but 75.5 percent in number of employees and 87.6 percent in total value of construction. In a sense, these general contractors almost represent the Korean construction industry. This leaves only 24.5 percent of employees and 12.4 percent of construction receipts to specialty trade contractors although the number of the specialty trade contractors is 8,781 or 82.8 percent of total establishments. Among the general contractors, the general buildersnumber only 403 (3.8 percent), but account for 58.8 percent of the total value of construction and 45.9 percent of employees. The average number of employees per establishment varied widely by categories; general builders have average of about 965 employees and 23,641 million won (approx. $29 million) receipts in year 1984 while specialty trade contractors averaged 23.6 employees and 229 million won (approx. $280 thousand) per firm. These numbers for civil engineering firms were 176.5 employees and 3,287 million won (approx. $4 million) per firm (see table 2.3.1). These numbers lead us to characterize Korean construction industry as dominated by the small number of large general builders. The area of specialty trade contractors is relatively weak. About 91 percent of all establishments had less than 100 employees on average monthly basis. These establishments accounted for 18.4 percent of the industry's total employment, 9.5 percent of total construction receipts and 10.6 percent of total construction industry value added. At the other end of the size

scale, only 0.8 percent of all establishments employed 1,000 or more employees, and these accounted for 45.5 percent of all industry employees, 66.8 percent of construction receipts and 63.3 percent of total value added. Medium sized firms, having 100 to 1,000 employees, accounted for 8.3 percent of the establishments, 36.1 percent of employees, 33.7 percent of construction receipts and 26.1 percent of the industry's total value added (see table 2.3.3).

The large establishments predominate the general builders while the small establishments with less than 100 employees play negligible roles even in number of establishments. The negligible role of small builders suggests that either there is not much single family housing construction or some of single family housing may not have been recorded in construction statistics. The reason is that there exists some diseconomy of scale in single family housing construction and many of single family housing in rural area of the developing countries is done by informal sector of the construction and Korea can be one of them. Recently the greater portion of Korea's urban housing is developed and provided in the form of multiple family housing and mostly in large scale apartment complexes constructed by large scale general contractors. This may be the reason that small general builders do exist but take only negligible proportion accounting for 8 percent of the total number of establishments, 0.5 percent of empl-

oyees, 0.3 percent of the value added of total general builders (see table 2.3.4). On the contrary, the small establishments with less than 100 employees dominate the specialty trade contractors accounting for 95.6 percent of establishments, 56.3 percent of employees, 57.3 percent of the receipts and 53.1 percent of value added. This may reflect the characteristics of the specialty trade contractors' business and unlike the general contractors diseconomy of scale exists in this group of contractors.

Approximately one-eighth of the total domestic construction receipts were in the form of subcontracting (see table 2.3.5). However, the portion subcontracted varied widely wihtin the three major contracting geoups. Among three major contracting groups, only 0.7 percent of general builders and 5.2 percent of civil engineering contractors receipts were in the form of subcontracts while the comparable number of the specialty trade contractors was 51.3 percent. This suggests that the subcontracting is the major source of revenue of the specialty trade contractors.

There are two major forms of organization for construction firms; the individual proprietorships and the company corporations. Other less common legal forms of organization such as partnerships may also be used. According to 1984 Report on Construction Work Survey, there were 6,496 individual proprietorships accounting for 61.3 percent of all construction

establishments. These individual proprietorships accounted for construction value of 569 billion won, or 3.5 percent of total value of construction. Establishments classified as corporations accounted for 38.5 percent of all establishments and 96.5 percent of total business receipts. Although there are a large number of individual proprietorships, their contribution to the number of employees and value of construction is negligible in construction as a whole and this feature is more significant in general builders as they are mmostly bigger companies. The specialty trade contractors are more or less the smaller companies and naturally the proportion of individual proprietorship is higher accounting for 69 percent of establishments, 24.6 percent of total employees and 21.8 percent of total value of construction (see table 2.3.6).

Table 2.3.1 Summary Statistics for Construction Establishments, 1984
in millions of won

Industry	No. of establishments		Number of employees			Total value of construction		
	Number	Percent	Number	Percent	Av./firm	Amount	Percent	Av./firm
Construction as a whole	10,602	100.0	846,318	100.0	79.8	16,201,852	100.0	1,528
General contractors	1,821	17.2	639,062	75.5	350.9	14,188,638	87.6	7,792
-General builders	403	3.8	388,809	45.9	964.8	9,527,516	58.8	23,641
-Civil engineering	1,418	13.4	250,253	29.6	176.5	4,661,123	28.8	3,287
Specialty trade contractors	8,781	82.8	207,256	24.5	23.6	2,013,214	12.4	229

Source: 1984 Report on Construction Work Survey, Economic Planning Board, 1985

Table 2.3.2 Summary Statistics of Establishments by Receipts Size Class, 1984
in millions of won

Receipts size	Number of establishments		Number of employees		Total value of construction	
Construction as a whole	10,602	100.0	846,318	100.0	16,201,852	100.0
Less than 5 mil. won	241	2.3	294	0.0	796	0.0
5-9.9 mil. won	684	6.5	1,482	0.2	5,177	0.0
10-49.9 mil.	4,043	38.1	17,642	2.1	97,165	0.6
50-99.9 mil.	1,219	11.5	11,798	1.4	87,081	0.6
100-499.9 mil.	2,608	24.6	73,536	8.7	645,000	4.0
500-999.9 mil.	811	7.6	56,265	6.6	570,003	3.5
1,000-4,999.9 mil.	691	6.5	155,911	18.4	1,651,725	10.2
5,000-9,999.9 mil.	185	1.8	119,348	14.1	1,322,460	8.2
10,000 mil. or more	120	1.1	410,042	48.5	11,822,445	73.0

Source: !984 Report on Construction Work Survey, Economic Planning Board, 1985

Table 2.3.3 Summary Statistics of Establishments by Employment Size Class, 1984
Amount: millions of won

Employment size class	Number of establishments		Number of employees		Total value of construction		Value added	
	Number	Percent	Number	Percent	Amount	Percent	Amount	Percent
Less than 10	5,731	54.1	24,867	3.0	165,324	1.0	80,681	1.1
10-19	1,423	13.4	19,808	2.3	199,355	1.2	95,174	1.3
20-49	1,618	15.3	51,014	6.0	561,511	3.5	272,311	3.8
50-99	856	8.1	59,588	7.1	607,945	3.8	311,225	4.3
100-199	358	3.4	50,641	6.0	573,758	3.5	299,394	4.2
200-499	344	3.2	116,283	13.7	1,402,268	8.7	698,162	9.7
500-999	184	1.7	138,938	16.4	1,865,220	11.5	883,163	12.3
1,000 or more	88	0.8	385,179	45.5	10,826,472	66.8	4,552,127	63.3
Total	10,602	100.0	846,318	100.0	16,201,852	100.0	7,192,287	100.0

Source: 1984 Report on Construction Work Survey, Economic Planning Board, 1985

Table 2.3.4 Distribution of Major Contracting Groups by Employment Size Class, 1984
Amount: millions of won

Employment size class	Number of establishments		Number of employees		Total value of construction		Value added	
	Number	Percent	Number	Percent	Amount	Percent	Amount	Percent
General Builders								
Less than 100	32	8.0	1,940	0.5	26,535	0.3	10,995	0.3
100-999	312	77.4	145,537	37.4	2,002,068	21.0	891,000	21.8
1,000 or more	59	14.6	241,331	62.1	7,498,912	78.7	3,187,697	77.9
Civil engineering contractors								
Less than 100	1,192	84.1	36,792	14.7	353,423	7.6	188,309	9.2
100-999	200	14.1	73,197	29.3	997,181	21.4	510,389	24.9
1,000 or more	26	1.8	140,264	56.0	3,310,519	71.0	1,349,353	65.9
Specialty trade contractors								
Less than 100	8,392	95.6	116,545	56.3	1,154,174	57.3	560,088	53.1
100-999	386	4.4	87,128	42.0	841,999	41.8	479,379	45.5
1,000 or more	3	0.0	3,583	1.7	17,041	0.9	15,126	1.4

Source: 1984 Report on Construction Work Survey, Economic Planning Board, 1985

Table 2.3.5 Percentage of Subcontracting Within Major Contracting Groups

Industry	Percentage of total construction receipts		Percent of industry receipts subcontracted	
General contractors	87.6	(77.7)	2.1	(2.4)
-General builders	58.8	(47.3)	1.5	(0.7)
-Civil engineering	28.8	(30.4)	3.3	(5.2)
Specialty trade contractors	12.4	(22.3)	50.3	(51.3)
Construction as a whole	100.0	(100.0)	8.1	(12.9)

Source: 1984 Report on Construction Work Survey, Economic Planning Board, 1985
Note: Numbers in the parentheses denotes domestic construction.

Table 2.3.6 Summary Statistics of Establishments by Legal Form of Organization, 1984
millions of won (percent)

	Number of establishments		Number of employees		Total value of construction	
Construction as a whole	10,602	(100.0)	846,318	(100.0)	16,201,852	(100.0)
Company corporation	4,080	(38.5)	780,470	(92.2)	15,625,013	(96.5)
Other corporation	26	(0.2)	784	(0.1)	7,122	(0.0)
Individual	6,496	(61.3)	65,064	(7.7)	569,718	(3.5)
General contractors	1,821		639,062		14,188,638	
General builders	403		388,809		9,527,516	
Company corporation	395	(98.0)	388,579	(99.9)	9,525,378	(100.0)
Individual	8	(2.0)	230	(0.1)	2,137	(0.0)
Civil engineering	1,418		250,253		4,661,123	
Company corporation	985	(69.5)	235,983	(94.3)	4,529,803	(97.2)
Other corporation	5	(0.3)	452	(0.2)	3,484	(0.1)
Individual	428	(30.2)	13,818	(5.5)	127,835	(2.7)
Specialty trade contractors	8,781		207,256		2,013,214	
Company corporation	2,700	(30.8)	155,908	(75.2)	1,569,832	(78.0)
Other corporation	21	(0.2)	332	(0.2)	3,638	(0.2)
Individual	6,060	(69.0)	51,016	(24.6)	439,745	(21.8)

Source: 1984 Report on Construction Work Survey, Economic Planning Board, 1985

2.4 Development of Engineering Consultancy and Design Capability

Before 1961 almost no investment on engineering services took place in Korea. During the first five year economic development plan (1962-1967), plants for fertilizer production and petroleum refining were built on a turnkey basis, which resulted in little impact on indigenous engineering capability. Some pioneering efforts to establish integrated engineering firms by technical entrepreneurs in the 1960s were not successful due to restricted domestic demand and lack of technical capability. Only construction and architectural design services maintained their operations. In late 1960s, a partial localization of engineering services was accomplished in the construction of several chemical plants by a fertilizer company's technical team. In the early 1970s, the first integrated engineering firm, Korea Engineering Co., Ltd. was created under the auspices of the Korean government, as a joint venture with Lummus Co. of U.S. The company participated in a few engineering projects, but Lummus withdrew due to the lack of a market for engineering services, being replaced in the partnership by Toyo Engineering of Japan. The government influenced the engineering industry through the Professional Engineer's Law before 1973 and, thereafter through the Engineering Service Promotion Law. The latter stipulated that a domestic engineering company should be the

prime contractor for engineering services except when not feasible, and it required registration of engineering firms and an annual report of their activities.

The value of engineering services was estimated at about 1 billion won (about $3.6 million) in the late 1960s, 2.1 billion won (about $4.3 million) for 632 projects in 1973, 25.6 billion won (about $50.7 million) for 3,031 projects in 1977 and 233.1 billion won (about $280 million) for 6,334 projects in 1984 domestically (see table 2.4.1). Contract amounts have increased sharply since 1976 due to plant export as well as the localization of thermal power plants. Korean engineering services have passed through three developmental stages. The first stage was a period of foreign dependence in the 1960s, with package type foreign investment and engineering services; local participation was restricted to some construction activities. The second stage in the early 1970s was characterized by the birth of domestic engineering services, helped by an accumulation of technical experience, the enactment of a promotion law, and increase in plant construction. Some development was achieved in the areas of detailed engineering, procurement, supervision of construction, and project management. Construction technology was enhanced significantly. During the second half of the 1970s the foreign construction boom (especially in the Middle East) spurred the further development of domestic engineering services. Turn-

key engineering services and plant construction by domestic firms became feasible, and some plant export were achieved. Government intervention caused the localization of most engineering services, especially for plant construction. A remarkable upgrading of domestic engineering services was , therefore, achieved except for basic engineering, start-up, and operation guarantee. Korean engineering companies started to get contracts from abroad since 1977 and their foreign contract amount reached $109 million in 1982 then started to decline as the overseas construction activities declined (see table 2.4.2).

Since the middle of the 1970s, Korean engineering services have grown remarkably. As of 1985, there were 269 engineering firms in Korea. Among them, 14 are plant engineering companies, 7 integrated construction engineering firms, 193 specialized engineering service companies and 55 individual engineering services firms (see table 2.4.3). They employed 25,950 employees and 2,659 of them were high level engineers which equivalent to the Professional Engineer by the Korean standard (see table 2.4.4). 14 plant engineering companies and 7 integrated engineering companies represent the larger and diversified engineering companies in Korea. However, the majority of these companies are more or less captive and not truly independently operated. 12 out of 14 plant engineering companies are either subsidiary of large integrated constru-

ction companies or part of the construction companies. This means, at least in plant engineering, that engineering companies alone have limited capability to secure the market. From the engineering company's standpoint, they have had problems in securing their workload without firm forward linkage with large construction companies or plant equipment fabricators. Possible explanation to this could be that the plant construction demand is particularly unstable compared to other kind of construction such as building and civil works, and the projects are usually come in the form of turnkey contract. At the same time, the construction companies needed to have their own engineering arms to qualify themselves for turnkey projects. By having their own engineering company and sometimes general trading company, the construction company (usually a part of large business conglomerate) could achieve vertical and horizontal integration. In addition, construction companies have developed a close cooperation with sectors of the heavy industries. The larger companies have developed heavy industry divisions with international connections for cooperation in overseas and domestic plant construction.

Although Korean engineering services have grown remarkably during last 10 years, their growth lies more on quantity than quality. They have achieved some capacity in basic design especially in thermal power plant but their activities are still mostly in detailed design. Still they have to rely the

most of the basic design on the foreign engineering companies. This is partly because the engineering workloads were acquired through the construction companies. Table 2.4.5 shows that about 80 percent of the engineering contracts acquired abroad is in the form of subcontract. This dependency of engineering companies to construction companies is more significant in plant construction area. So far the strategy of Korean construction companies for engineering services has not been based on long term development of engineering capabilities. They tried to get the turnkey project for plant construction and mobilized the engineering organization around them. The construction companies being a leader of the turnkey project organization determine the capacity of domestic engineering company and find foreign engineering company for basic design and engineering if necessary. The leader of the turnkey project is generally conservative and risk averse in selecting engineering organization as engineering gives very vital impact on the whole project but its cost is only a fraction of the total project cost. Furthermore, engaging less qualified engineering company may risk whole project.

Table 2.4.1 Trend of Domestic Engineering Contract by Type
(millions of won)

Year	Total		Plant engineering			Integrated construction			Special engineering			Individual engineering		
	No. of proj.	Contr. amount	Number	Amount	Pct.	Number	Amount	Pct.	Number	Amount	Pct.	Number	Amount	Pct.
1973	632	2,134	134	994	46.6				108	454	21.3	390	686	32.1
1974	1,071	4,931	223	2,371	48.1				246	972	19.7	602	1,588	32.2
1975	1,738	8,629	243	3,246	37.6				430	2,462	28.5	1,065	2,920	33.9
1976	2,403	19,160	171	6,055	31.6				584	8,333	43.4	1,648	4,772	25.0
1977	3,031	24,608	375	9,801	39.8				2,619	14,687	59.7	37	119	0.5
1978	3,416	36,827	341	9,374	25.4				3,051	27,440	74.5	24	13	0.1
1979	3,838	79,032	566	48,282	61.1	68	1,385	1.8	3,204	29,365	37.1	-	-	-
1980	3,329	72,099	380	21,810	30.3	85	1,460	2.0	2,864	48,829	67.7	-	-	-
1981	3,981	105,913	314	39,409	37.2	119	1,746	1.6	3,667	66,304	61.2	-	-	-
1982	4,419	125,343	362	47,446	37.9	134	20,705	16.5	3,866	57,016	45.5	57	177	0.1
1983	4,825	177,769	526	83,550	47.0	686	37,655	21.2	3,472	55,944	31.5	141	620	0.3
1984	6,334	233,132	497	109,763	47.1	741	43,159	18.5	4,484	79,398	34.1	612	812	0.3

Source: Korean Engineering Service Association

Table 2.4.2 Trend of Foreign Engineering Contract by Type
(thousand of dollar)

Year	Total		Plant engineering			Integrated engr'g			Individual engineering		
	No. pjt.	Contract amount	No.	Amount	Percent	No.	Amt.	Pct.	No.	Amt	Pct.
1977	38	55,103	11	20,889	37.9	-	-	-	27	34,214	62.1
1978	33	20,326	17	10,399	51.2	-	-	-	16	9,927	48.8
1979	84	95,712	21	29,323	30.6	-	-	-	63	66,389	69.4
1980	66	93,194	34	30,347	32.6	-	-	-	29	62,847	67.4
1981	110	51,028	56	39,896	78.2	-	-	-	54	11,131	21.8
1982	129	109,040	62	83,303	76.4	1	362	0.2	66	25,475	23.4
1983	105	108,133	62	69,258	64.0	3	550	0.5	40	38,325	35.5
1984	136	62,990	52	48,373	76.8	3	365	0.6	81	14,252	22.6

Source: Korean Engineering Service Association

Table 2.4.3 Number of Engineering Firms by Type, 1985

Type	Number of firms
Plant engineering	14 (25)
Plant engineering	13 (10)
Integrated environmental engineering	0 (10)
Nuclear industrial engineering	1 (1)
Integrated construction engineering	7 (9)
Specialized engineering services	193 (193)
Individual engineering services	55 (55)
Total	269 (282)

Source: Korean Engineering Service Association
Note: () denotes the number of licenses.

2.4.5 Trend of Foreign Contract by Type of Contract (thousand of dollar)

	Total		Prime contract		Subcontract	
Year	Amount	Percent	Amount	Percent	Amount	Percent
1980	93,194	100.0	21,897	23.5	71,297	76.5
1981	51,028	100.0	7,790	15.3	43,238	84.7
1982	109,040	100.0	34,166	31.3	74,874	68.7
1983	108,133	100.0	19,208	17.8	88,925	82.2

Source: Korean Engineering Service Association

Table 2.4.4 Status of Manpower in Engineering Service Industry in Korea, 1984

	Total		Plant eng.		Int. const.		Special eng.		Indiv. eng.	
Qualification	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Total	25,950	100.0	8,899	100.0	2,512	100.0	14,332	100.0	207	100.0
High level engineer	2,659	10.2	1,137	12.8	358	14.2	1,127	7.9	37	17.9
P.E.*	829	3.2	330	3.7	125	5.0	349	2.5	25	12.1
Other	1,830	7.0	807	9.1	233	9.2	778	5.4	12	5.8
Engineer	9,169	35.4	3,517	39.5	1,074	42.8	4,502	31.4	76	36.7
Engr. 1st class*	3,160	12.2	1,425	16.0	376	15.0	1,336	9.3	23	11.1
Other	6,009	23.2	2,092	23.5	698	27.8	3,166	22.1	53	25.6
Other	14,122	54.4	4,245	47.7	1,080	43.0	8,703	60.7	94	45.4
Technician*	7,781	30.0	2,493	28.0	556	22.1	4,687	32.7	45	21.7
Other	6,341	24.4	1,752	19.7	524	20.9	4,016	28.0	49	23.7

Source: Korean Engineering Service Association
Note: * denote the qualification officiated by the Ministry of Science and Technology

2.5 Research and Development

The total factor productivity is influenced by a number of changes in the characteristics of inputs. The growth of output is generally ascribable to increases in the input of capital per man-hour and that which is contributed by technical change. There have been many studies to estimate the contribution of increased capital and technological change to growth of output. The results invariably indicate the technological change as a predominant source of the growth of output. Technological change or improvement can be made by various means. While the process can commence through technology transfer from abroad, it must be supplemented by indigenous efforts both in assimilating foreign technology and innovating. In this section, Korea's industrial policies for technological changes, and research and developmentactivities particularly in construction industry will be briefly reviewed.

2.5.1 Industrial Policies for Technological Changes

The source of technologies used in the development of Korean products in the 1970s has been foreign adopted and assimilated in the traditional sectors and foreign in modern industries. Foreign suppliers and buyers, staffed with foreign experience and license and technical agreements have been cited as important sources of foreign technologies primarily in modern and

to a less degree in traditional industries. In addition, technological cooperation has enabled the Koreans to survey and study technologies unknown to them which are complementary to their own traditional capabilities. However, the acquisition of know-how is endangered by increasing unwillingness by other countries to share technological knowledge. In addition, high technology projects offer few opportunities to unbundle new from traditionally familiar technologies and resources. Moreover, the policies aiming at this acquisition of know-how through international partnerships have resulted in the absence of substantial domestic research and development efforts which Korea is trying to develop now.

In the 1960s and early 1970s, the existing technologies reflected the increased capacity and concentration in production rather than investment capabilities. Investment focused more in industries with long history and less in modern industries. Only in the mid-1970s government policies have attemted to deal with this lack of investment in modern industries. The new policies were incorporated in the Technological Development Promotion and Engineering Service Promotion Acts. These, among others, provide a framework for the assimilation of imported technologies, development of local research and and development and integration of engineering, construction and managerial services in international projects.

Marketing has not been a high priority for most internationally involved sectors and products. Overall, the Korean construction and related industries' marketing strategy have been more on the reactive rather than proactive side. In short term, reactive strategy helps maintain the current market share. Under this category, we can include the defence of building and simple infrastructure categories against international competitors and the imitation of foreign technologies. These have proved successful policies to penetrate existing market with existing products; i.e., in the building and simple infrastructure areas. The difficulties facing the Korean construction and related industries today are selling their products and services both in the existing and new markets. A proactive marketing strategy is required to successfully attract future buyers of construction and related services. This approach needs to focus on finding the customers needs to focus on finding the customers' needs and putting together packages that satisfy them before other international competitors. The indepth organization of research and development is also a proactive strategy that often places innovators way ahead of their competitors when a new technology is developed and gives them the time to capture and then maintain their market share based on the name they established.

2.5.2 Research and Development

By comparison to resources devoted to research and development by industrial countries, the developing countries devoted modest amounts--both absolutely and relatively. In 1973 the developing countries accounted for less than 3 percent of world total expenditures on research and development, and their ratio of expenditures to GNP averaged about 0.35, whereas the ratio was more than 2 in industrial countries (UNIDO 1979). Until mid-1970s, Korea's expenditures on R&D were less than 0.5 percent of GNP (see table 2.5.1). Korea's ratio of expenditures on R&D to GNP at this time represented that of typical developing countries. Despite its importance, any significant investments for technology development were not undertaken. With the active development of the heavy and chemical industries, however, investment for technology development were substantially boosted. The ratio of investment for technology development to GNP increased to 1.06 percent in 1983, exceeding the level of 1.0 percent which the UNESCO suggests to the developing countries as a guideline for technological development. The economic planners in Korea now see technology as the touchstone of industrial maturity and fundamental to the continuing of export-led economic growth. The government objective is to raise R&D spending to 2 percent of GNP by 1986 when the fifth economic development plan is finished (1982-1986) bringing Korea almost abreast of Japan

which invest 2.2 percent in R&D and U.S. which devotes 2.3 percent of GNP to research. The R&D spending is planned to be increased further to 2.5 percent of GNP by 1991 the final year of the sixth economic development plan (1987-1991).

Until recently the pattern of allocation of R&D expenditures favored the government institutions and non-profit organizations working on basic research rather than industrial firms, which tended to concentrate on product development and engineering. This is not particularly desirable as the government institutes normally cannot respond effectively to actual needs and opportunities in industry. However, this tendency has been reversed by 1983 when 60.6 percent of R&D expenditure was allocated to the industry research organizations (see table 2.5.2). The concentration of R&D activity in government institutes and related organizations reflects two conditions: First, the government is the source of the majority of funds for R&D and normal practice is to support government related organizations rather than to contract with private industry. Second, industry does not have the incentives or funds to undertake much work of its own. However, this tendency has been gradually corrected as industry's appreciation of the needs of R&D and increased incentives on R&D by the government policies. By 1983, the private sector financing on nation's total R&D expenditures reached to 72.5 percent (see table 2.5.3)

723 research organizations with 12,586 researchers in Korean industry spent 375.8 billion won in 1983 which was equivalent to 0.66 percent of total sales (see tables 2.5.4 and 2.5.5). These are in fact negligible numbers compared to U.S. and Japan and other advanced countries. 505,000 researchers were working for U.S. industry and they spent $55.7 billion in 1982. In Japan, industry running 17,646 research organizations with 201,137 researchers spent $19.2 billion in 1983. Korean construction industry keeping 19 research organizations (2.6 percent) with 315 researchers (2.5 percent) spent 12 billion won (3.2 percent) for research and development. This is equivalent to 0.14 percent of total sales in 1983 and this is one of the lowest level of expenditures spent on R&D among all the industries. However, the figures mentioned are an average and does not represent the situation comprehensively. As there are only 19 research institutes in the construction industry run mostly by high ranking construction companies. This means the companies running the research institutes are spending the money for the R&D activities to the level substantially higher than the 0.14 percent of the sales. The research operations can be classified into four categories based on the purpose as follow:-

- -To provide solutions for the problems encountered during project execution
- -The research originated by the researchers and conducted with the approval of the management

-The research based on the company's long term technology development plan

-The research for the outside clients

Presently the activities of the research institutes in construction industry are more or less confined to the first two categories. However, the third categories should be vigorously persued as R&D should be looked at and judged by its long term contribution. This is particularly so because the industry is already convinced that the Korean construction industry should move from the low-technology end to high technology construction, as their competitive advantage in the low technology area is now being challenged by the competitors from the other third world countries which can offer much lower wages. The formation of the Korea Institute of Construction Technology (KICT) that has its goal to improve quality and productivity of construction through development of new technologies and materials or improvement of existing ones shows the recognition of the need of the R&D by the construction industry and the government for Korean construction industry to stay competitive. In January 1986, the Ministry of Construction announced the recommendation on R&D to the nation's large scale construction companies of annual sales exceeding 10 billion won as follow:-

-94 construction companies with annual sales more than 10 billion won are recommended to invest at least 0.15 percent of annual sales for R&D

-Among them, 44 companies with annual sales exceeding 50 billion won are recommended to establish research institutes with not less than 10 researchers

This recommendation could be a good start considering the present level of R&D expenditures in construction industry which is one of the lowest among the various industries. The fragmented nature of the industry makes it more difficult to make a concerted effort for R&D and the Ministry of Construction's recommendation can be a very effective and relevant initiative. However, R&D effort must not be regarded as equivalent to establishing special institutes and organizations. Care must be taken to prevent a proliferation of research institutes that are too weak to be effective. Technological capability resides in human and institutional capital. The development of research manpower which is presently in short supply is very important. The present educational system seems not fully serving its purpose in providing capable research personnels and some reform in this area may be needed to counter the present and future necessity on research manpowers. Additionally, the government's initiative of providing the research infrastructure support on a common-use or special-use basis would help eliminate the redundant investment and waste of research resources.

Table 2.5.1 R&D Expenditures as a Percentage of GNP

Year	A. R&D Expenditures (current won in mill.)	B. GNP (current won in mill.)	A/B (%)
1970	10,547.75	2,735.93	0.39
1971	10,666.71	3,375.93	0.32
1972	12,028.15	4,154.02	0.29
1973	15,628.48	5,378.46	0.29
1974	38,182.08	7,503.10	0.51
1975	42,663.73	10,092.23	0.42
1976	60,900.04	13,881.11	0.44
1977	108,285.66	18,115.41	0.60
1978	152,418.34	24,225.30	0.63
1979	174,038.63	31,248.72	0.56
1980	211,726.65	37,204.98	0.57
1981	293,131.47	45,725.09	0.64
1982	457,688.49	51,786.60	0.88
1983	621,749.31	58,428.40	1.06

Source: Ministry of Science and Technology, Technology Annual, 1984
Note: Excluding Military and Defence R&D and Social Science and Humanities

Table 2.5.2 Allocation of R&D Expenditures by Sector
(current won in million)

Year	Total expenditures	Research institutes	Universities & colleges	Industry
1975	42,663.7	28,139.2 (66.0)	2,181.8 (5.1)	12,342.7 (28.9)
1976	60,900.0	43,780.1 (71.9)	1,978.7 (3.2)	15,141.2 (24.9)
1977	108,285.7	61,088.5 (56.4)	5,482.2 (5.1)	41,714.9 (38.5)
1978	152,418.3	78,072.9 (51.2)	20,548.4 (13.5)	53,802.0 (35.3)
1979	174,038.6	98,207.6 (56.4)	16,536.3 (9.5)	59,294.8 (34.1)
1980	211,726.7	104,472.6 (49.3)	25,902.1 (12.2)	81,351.9 (38.4)
1981	293,131.5	145,309.2 (49.6)	27,168.4 (9.4)	120,653.9 (41.9)
1982	457,688.5	186,076.5 (40.7)	66,610.0 (14.6)	205,002.0 (44.8)
1983	621,749.3	180,556.5 (29.1)	64,251.2 (10.3)	375,810.0 (60.6)

Source: Science & Technology Annual, Ministry of Science and Technology, 1984
Note: () denotes percentage

Table 2.5.3 R&D Expenditures by Source of Funds, 1983
(millions of current won)

Sector	Total	Public	Private	Foreign
Total	621,749.3	187,897.9 (27.3)	268,747.0 (72.5)	1,043.5 (0.2)
Research inst.	180,556.5	140,188.3 (77.6)	39,653.8 (22.0)	714.4 (0.4)
Univ. & colleges	64,251.2	25,870.6 (40.3)	38,008.3 (59.2)	372.3 (0.5)
Industry	375,810.0	2,385.5 (0.6)	373,363.0 (99.3)	61.5 (0.1)

Source; Science & Technology Annual, Ministry of Science and Technology, 1984
Note: () denotes percentage

Table 2.5.4 Intramural R&D Expenditures in Industry as a Percent of Total Sales by Field, 1983

Classification	A. Intramural R&D Exp. (millions)	B. Total sales (billions)	A/B (percent)
Industry total	375,810.0	56,530.2	0.66
Agriculture and fishing	2,647.2	157.8	1.67
Mining	1,938.8	207.2	0.93
Manufacturing	342,840.8	42,381.9	0.80
Food & beverages	23,449.5	3,305.5	0.70
Textile & leather	21,118.3	2,870.3	0.73
Wood (prod.), furnitures	1,828.8	274.0	0.66
Paper (prod.), printing	4,151.9	7,860.3	0.05
Chemicals, petroleum, etc.	75,513.4	13,405.3	0.56
Non-metalic mineral products	9,335.0	1,198.5	0.77
Basic metal industries	13,034.6	3,916.1	0.33
Fabricated metal	192,549.9	9,409.5	2.04
Other manufacturing	1,859.3	142.3	1.30
Electricity, gas and water	2,355.0	2,959.7	0.07
Construction	12,004.6	8,029.9	0.14
Transport, communication, etc.	2,115.4	2,078.5	0.10
Financing, insurance, etc	7,591.6	110.1	6.89
Other industries	4,316.6	605.1	0.71

Source: Science and Technology Annual, Ministry of Science and Technology, 1984

Table 2.5.5 Industry's R&D Expenditures and Number of Researchers, 1983

Classification	No. of R&D institutes	Total expenditure (million won)	Number of researchers (person)	R&D expense per researcher (million won)
Industry total	723	375,810.0	12,586	29.9
Agriculture and fishing	4	2,647.2	123	21.5
Mining	3	1,938.8	49	39.6
Manufacturing	671	342,840.8	11,224	30.5
Food & beverages	62	23,449.5	864	27.2
Textile & leather	82	21,118.3	684	30.9
Wood (prod.), furnitures	12	1,828.8	62	29.5
Paper (prod.), printing	24	4,151.9	153	27.1
Chemicals, petroleum, etc.	139	75,513.4	2,185	34.6
Non-metalic mineral prod.	42	9,335.0	329	28.4
Basic metal industries	27	13,034.6	402	32.4
Fabricated metal	258	192,549.9	6,437	29.9
Other manufacturing	25	1,859.3	322	5.8
Electricity, gas & water	2	2,355.0	131	7.5
Construction	19	12,004.6	315	38.1
Transport, communication, etc.	3	2,115.4	89	23.8
Financing, insurance, etc.	15	7,591.6	429	17.7
Other industries	6	4,316.6	226	19.1

Source: Science and Technology Annual, Ministry of Science and Technology, 1984

2.6 Construction Materials and Equipments

Among the factors contributing to the international competitiveness of construction industry is the ability to provide the integrated packages of work including construction materials and equipments as construction industry is one of the industries which dependent heavily on the inputs from the other sectors. The construction materials and equipments industries in Korea were developed partly to support domestic social overhead capital investments, primarily housing and infrastructure projects in the 1960s. At present, most of the construction materials are now produced enough to meet the domestic need except for a few high quality materials. However, the growth of the export of construction materials and equipments has not kept up with that of the overseas construction. Furthermore, the construction equipments manufacturers are now suffering from very low operating rates of the plants while the size and the production capacity are by far larger than what the domestic market can bear. In this regard, we will look into the status and the problems which Korean construction materials and equipments industries are facing.

2.6.1 Construction Materials

As mentioned earlier, Korea is now selfsufficient in most of the construction materials for domestic use (see tables 2.6.1

and 2.6.2). However, the local input in overseas construction is very low and even decreasing. From 1966 to 1983, the cost of materials has constituted average of about 40 percent of the total cost of overseas construction and that of equipment accounted for about 8 percent. However, only less than 14 percent of the materials and 8 percent of the equipments used for the overseas construction during 1983 and 1984 were Korean made (see table 2.6.3). Table 2.6.4 shows the growth pattern of Korean construction materials production in comparison with that of overall producer goods and gross domestic product of construction. The growth rate of the construction materials production has been slower than that of the producer goods but faster than that of domestic construction (see figures 2.6.1, 2.6.2 and 2.6.3). However, the production of construction materials is slow in terms of growth compared to the growth of total, domestic and overseas, construction (see table 2.6.5). This suggests that the Korean construction materials industry has mostly dependent on the demand from the domestic construction activities although there has been a tremendous increase in the overseas construction. The reasons that Korean construction materials are not sold as much as Korean international construction can be explained in two ways. First, the demand for domestic construction has been increased very fast. Second, the quality of Korean produced construction materials does not meet the internationally accepted standard quality or the quality standard has been

met but not fully appreciated by the foreign clients. The example of the first category is the cement, which Korea consumes more than 80 percent of its domestically produced cement although its production capacity expanded very rapidly (see table 2.6.6).

Although the construction materials industry is closely related to the construction industry, it can be understood better by comparing with other manufacturing industry in general as the construction materials industry is a sector of manufacturing. Korea's commodity export recently accounted for about 1.5 percent of the world trade. This is a result of remarkable growth of the Korean economy. But this number is not very impressive if we compare this with that of Korea's overseas construction which accounted for about 10 percent of the total international construction for last few years. This may mean that Korean international construction has grown disproportionately compared to the size of the economy backed up by the various manufacturing industries. Expanded international construction activities of Korean contractors provided excellent opportunities for construction materials industry to expand its market to match their construction materials export to that of construction. To be successful in international market, they have to produce differentiated products as the owners or engineers who determine and approve the materials incorporatedinto the project are mostly conser-

vative and risk averse in selecting the materials. It is especially difficult for new comers like Koreans to penetrate through the invisible barriers of this kind without having support from design and engineering personnel of the project. Like other manufacturing industries, the smallness and the limited sophistication of the Korea's domestic market is a big disadvantage as economy of scale is difficult to achieve and the market gives no lattitude to launch, test and refine differentiated manufactures in the protected environment.

Export of the home produced construction materials and equipments has been decreasing since 1981 when the actual exports reached record $1billion. If Korean construction materials industry is only to satisfy the demand from the local market and local construction companies, there is not much room for further growth except for some moderate growth as the level of sophistication of the local construction demand and size of domestic market increase in line with the growth of the national economy. Naturally, if they want to grow further, the construction materials industry has to look beyond the demand from the Korean contractors. If we compare the construction materials export by Japanese and Korean manufactures to Saudi Arabia, the suggestion is clearer. In 1980, Japan exported $1.1 billion worth of construction materials to Saudi Arabia while Korean export was only $0.5 billion/ The difference is more significant if we consider that Korea had

contracted $7.6 billion worth of international construction in the Middle East that year while Japanese did only $2.7 billion (see table 2.6.7). This example shows the potential of the construction materials export beyond the Korean contractors' activities abroad. Following are some of the problems observed explaining the reasons of inactive construction material export for overseas construction:-

-Preference placed on the products of the developed countries by the technical services companies and owners. And lack of understanding on the Koreanproducts.

-preference of Korean contractors on foreign produced goods, because of financing as well as technical reasons. Quite often foreign producers offer better financial terms while Korean producers often lack in providing technical data and experts needed to obtain approval for the usage of the certain materials for the project.

-Weak promotional activities of the manufactures and inflexible delivery terms.

-Low international competitiveness in quality and standard.

-Import restrictions in favor of locally produced materials.

The causes of the problems encountered in the international market are often found in the domestic operational characteristics. Following are some of the reasons found in the practices of the manufacturing in Korea:-

-Manufacturers' technological lag.

-Excessive price competition ignoring the quality.

-Limited quality control capability.

2.6.2 Construction Equipments

The construction equipment manufacturing has several different characteristics from other machinery manufacturing. First, there are numerous kinds of construction equipments but the production facility of each type requires large investment and relatively long time for the return on investment. In most cases, it is characterized as assembling the various parts and depend heavily on the skill of the technicians in contrast to its capital intensive nature. Third, it involves many different parts and consequently depend largely on the industry's part supplying capacity. Fourth, unless the size of the firm is to cover worldwide market, planned production is difficult as the demand is not large enough. Korean construction equipment manufacturing industry started as a repair shops but expanded rapidly with the growth of the construction industry. In the latter part of the 1970s, with the emphasis placed on the heavy and chemical industries, the construction equipment manufacturing plants have grown to the integrated machinery manufacturing plants. However, the investments were proved to be excessive. This excessive investment coupled with the reduced demand due to the worldwide economic recession, the operating rate of this industry is extremely low. Although the local industries for the parts manufacturing are not fully established, the investment for the construction equipment manufacturing has been concentrated to the final assembly plants. This made Korean construction

equipment manufacturing industry dependent on the imported parts. The localization of the parts currently imported is considered not economical as the size of the domestic demand is not large enough to reach the economical scale of production whereas the prospect for the export of large number of construction equipments is not probable in the near future.

The differentiated quality is particularly important to be successful in the construction equipment market as the contribution of the construction equipments is critical to the success of the construction operation. However, Korean construction equipment industry's technological level is not as high as it should be to produce the differentiated quality. This is because ;-

- -Insufficient accumulation of the capital and technology due to relatively short history of the industry.
- -Investment for the construction equipment industry was concentrated to the production facilities and that to the R&D and accumulation of technology was largely neglected.
- -In itroducing the foreign technology, the emphasis was given to the manufacturing technology resulting in the lack of design capability made the development of own model difficult.

Since the situation of the Korean parts industry is improving rapidly with the fast growth of the automobil industry, it may be easier now to expect support from the parts industry

for construction equipment manufacturing. For the market to reach the economy of scale in manufacturing construction equipments, the cooperation with the U.S. or other European manufacturers is suggested to be made. The cooperation with foreign technology and Korean labor productivity and relatively modern facilities in Korea may result in the winning combination in this area. In any case, the size of Korean domestic market makes it impossible to be competitive staying only in the domestic market.

Table 2.6.1 Self-Sufficiency Rate of Construction Materials
(percent)

Item	1980	1981
Cement	100.0	100.0
Slate	-	99.9
Reinforcing bar	100.0	100.0
Steel section	63.6	55.1
Steel plate	93.0	94.9
Steel wire	66.8	72.4
Steel pipe	85.6	83.3
Plywood	100.0	100.0
Tile	98.3	98.3
PVC	74.0	95.0
Coating	96.9	95.2
Plate glass	88.2	94.7
Ceramic sanitary	98.7	99.1
Electric wire	91.2	86.4
Bulbs	97.9	99.6

Source: KICT, Construction, Construction MAterials and Machinery Industry in Korea, For UNIDO Special Industrial Services, April, 1985
Note: Self-sufficiency rate = 1 - amount imported/domestic demand

Table 2.6.2 Self-Sufficiency Rate of Construction Equipments
(percent)

Item	1980	1981
Buldozer	30.4	40.8
Loader	28.9	40.2
Motor Grader	12.5	41.9
Excavator	96.4	92.9
Crane	-100.0	-168.0
Fork lift	75.5	93.0

Source and Note, same as table 2.6.2

Table 2.6.3 Composition of Construction Materials and Equipments Used in Overseas Construction by the Origin
(percent)

		1979	1980	1981	1982	1983	1984
Materials	Domestic	30.9	25.0	23.9	18.7	13.8	13.6
	Foreign	69.1	75.0	76.1	81.3	86.2	86.4
Equipment	Domestic	26.3	26.0	13.8	14.8	8.1	8.2
	Foreign	73.7	74.0	86.2	85.2	91.9	91.8
Total	Domestic	29.9	24.3	22.1	18.0	13.7	13.2
	Foreign	70.1	75.7	77.9	82.0	86.3	86.8

Source: KICT, Construction, Construction Materials and Machinery Industry in Korea, For UNIDO Special Industrial Services, April, 1985

Table 2.6.4 Production of Construction Materials versus Producer Goods and Construction in GDP (based on 1975 constant price)

	Producer goods			Construction materials			Construction in GDP		
Year	Index 1975=100	Growth rate	Cumu. growth	Index 1975=100	Growth rate	Cum. growth	Index 1975=100	Growth rate	Cum. growth
1966	15.2			25.5			28.9		
1967	17.9	18	18	34.3	35	35	34.5	19	19
1968	28.1	57	85	47.2	38	85	47.8	39	65
1969	35.0	25	130	55.9	18	119	65.7	38	127
1970	33.9	-3	123	56.2	1	120	69.0	5	139
1971	38.2	13	151	63.8	14	150	67.5	-2	133
1972	43.2	13	184	66.9	5	162	66.8	-1	131
1973	60.9	41	301	89.1	33	249	85.6	28	196
1974	83.2	37	447	91.7	3	260	87.8	3	204
1975	100.0	20	558	100.0	9	292	100.0	14	246
1976	131.0	31	762	128.0	28	402	122.3	12	288
1977	158.4	21	942	166.4	30	553	140.6	25	386
1978	198.8	26	1,208	204.5	23	702	176.2	25	509
1979	224.8	13	1,379	213.0	4	735	179.2	2	520
1980	224.0	0	1,374	203.2	-5	697	177.7	1	515
1981	251.4	12	1,554	214.9	6	743	168.8	-5	484

Source: Major Statistics of Korean Economy, The Bank of Korea, 1982

Figure 2.6.1 Production Indexes (1970-1981)

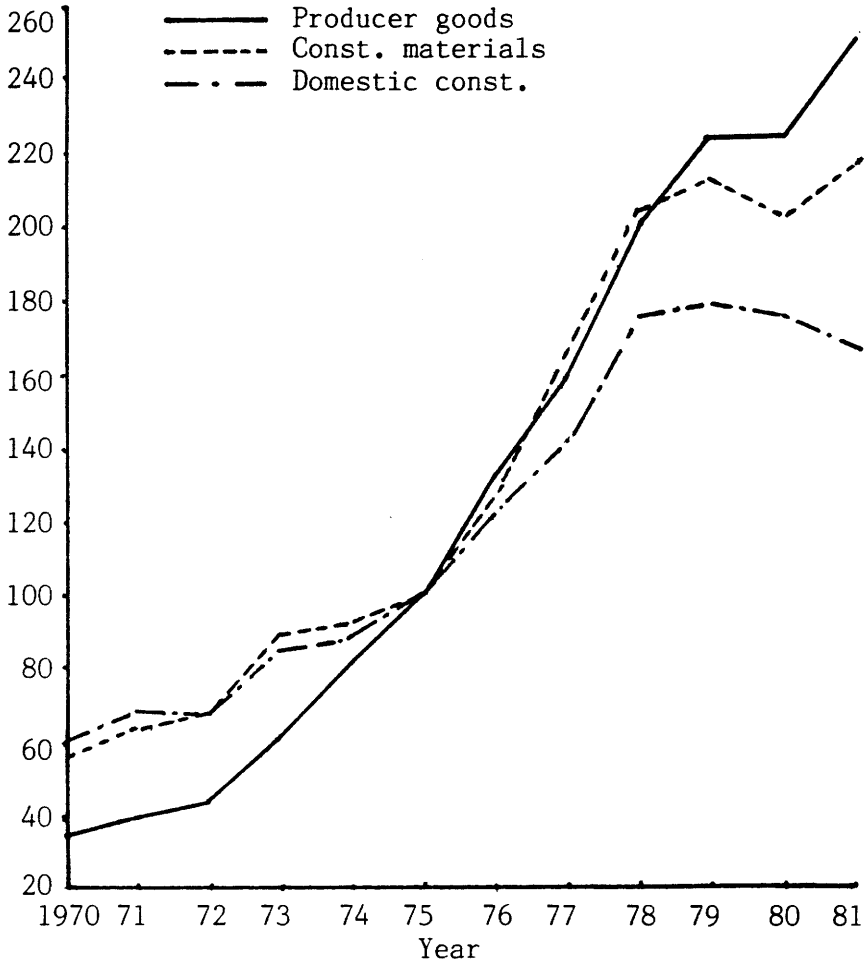


Figure 2.6.2 Growth Rates (1970-1981)

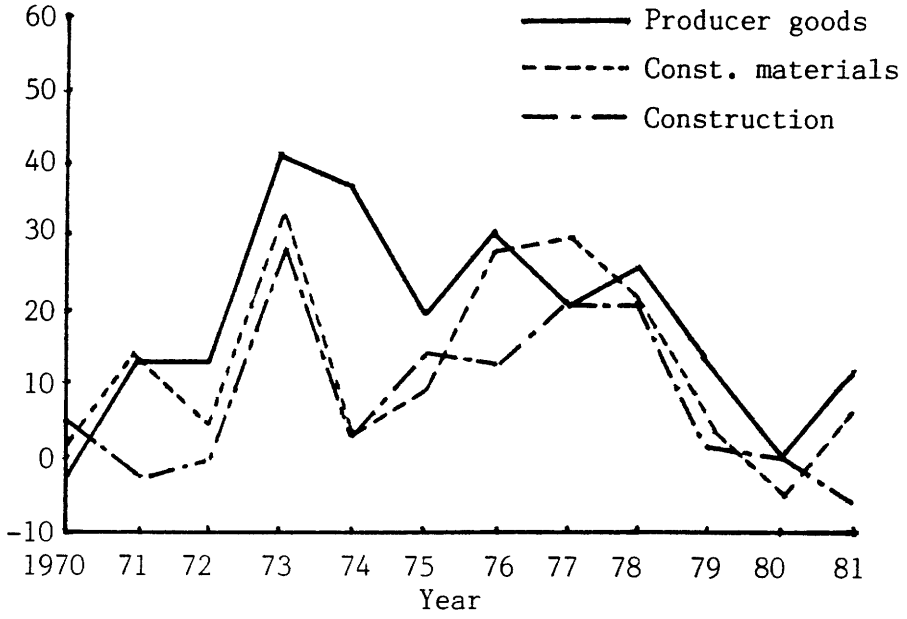


Figure 2.6.3 Cumulative Growth Rates (1970-1981)

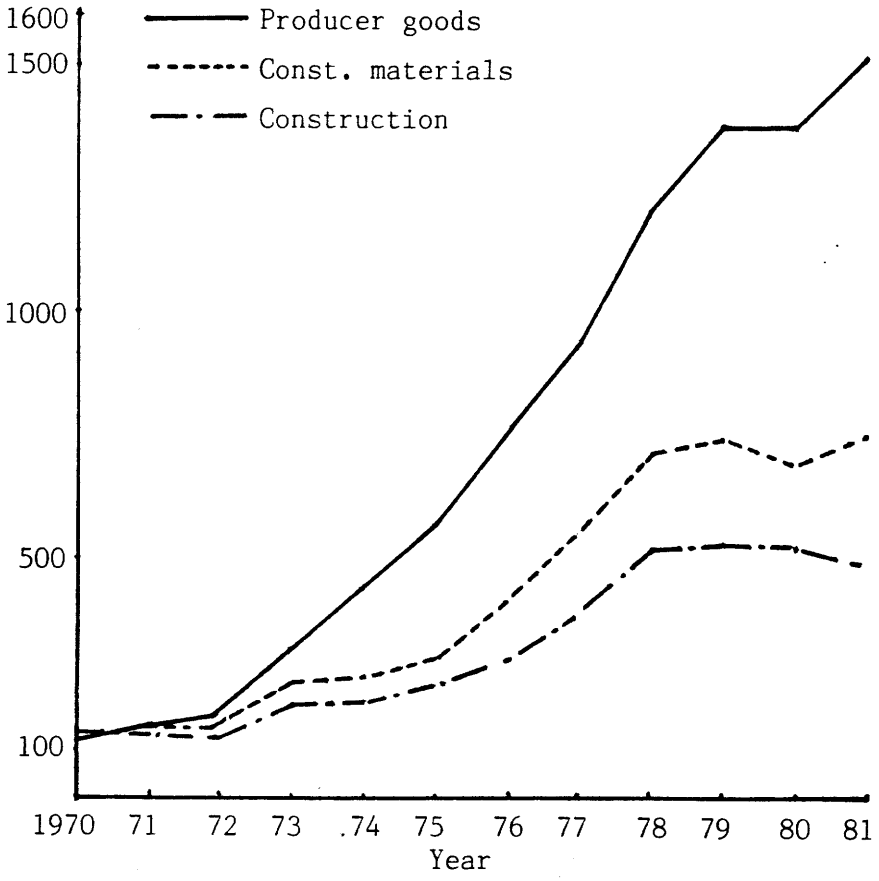


Table 2.6.5 Total Construction Contracts and Production of Construction Materials Indexes (1970-1983)

Year	Domestic + Overseas contracts	Construction materials
1970	42	56
1971	49	64
1972	53	67
1973	69	89
1974	64	92
1975	100	100
1976	194	128
1977	270	166
1978	511	205
1979	409	213
1980	395	203
1981	547	220
1982	596	237
1983	548	292

Source: Moavenzadeh, A Brief Overview of the South Korean Construction and Construction Materials Industries, 1985

Table 2.6.6 Supply and Demand of Major Construction Materials

Item	Unit	Year	Production capacity	Production	Domestic demand	Export	Import
Steel (All products)	1,000 M/T	1980	-	8,397	5,636	4,818	2,162
		1981	-	10,244	6,880	5,618	2,152
		1982	-	11,262	6,969	6,094	1,387
		1983	-	12,557	8,248	6,319	2,180
Re-bar	1,000 M/T	1980	-	1,991	1,419	567	0
		1981	2,859	1,795	1,277	537	0
		1982	-	2,285	1,793	-	-
		1983	-	2,774	-	-	-
Cement	1,000 M/T	1980	22,185	15,574	13,172	2,300	0
		1981	23,825	15,600	12,489	3,243	0
		1982	23,450	17,913	14,301	3,561	0
		1983	23,450	21,282	17,649	3,602	0
Plywood	Million Sq. Ft.	1980	6,300	4,239	1,797	2,564	0
		1981	6,134	4,303	1,563	2,701	0
		1982	5,198	3,291	1,845	1,588	0
		1983	5,106	3,298	2,405	889	0
Glass (Plate)	1,000 Case	1980	4,550	3,168	3,430	146	323
		1981	6,620	3,888	3,500	579	32
		1982	6,620	4,229	3,580	846	68
		1983	6,620	5,081	4,609	612	169

Source: Moavenzadeh, A Brief Overview of the South Korean Construction and Construction Materials Industries, 1985

Table 2.6.7 Comparison Between Korean and Japanese Construction Materials and Equipments to Saudi Arabia (in millions of dollar)

	1978	1979	1980
A. Korea			
Materials	244.5	331.3	502.7
Equipments	12.3	41.7	12.9
Sub total	256.8	373.0	515.6
B. Japan			
Materials	685.6	924.2	1,093.4
Equipments	82.4	105.4	115.5
Sub total	768.0	1,029.6	1,208.9
A/B: Percent			
Materials	35.7 (16.8)	35.8 (20.4)	46.0 (30.4)
Equipments	14.9 (4.4)	39.6 (15.2)	11.2 (6.4)
Sub total	33.4 (15.1)	36.2 (19.7)	42.7 (27.3)

Source: Korea Institute for Industrial Economics & Technology, Strategy to Promote Construction Materials and Equipments to Middle East.

Note: Numbers in Parenthesis are for the Total of the Middle East.

2.7 Issues Presently Facing the Korean Construction Industry

As previously noted, Korean international construction contracts rose sharply until 1981 and then started to decline. By 1984 total overseas contracts had decreased to $6.6 billion from the 1981 figure of $14.3 billion. To date the common priority of Korean contractors seems to have been the expansion and growth of its market, regardless of the side effects caused from this fast-track growth. During the period of rapid growth, these problems can be ignored but not so in a period of recession. Considering the current international market condition, it seems very hard to expect to realize the rapid growth of 1970s. Instead, it has to resolve many problems created and overlooked during the rapid expansion and consolidate itself to regain the momentum of the growth. In a sense, the difficulties presently experienced by many Korean contractors should be considered as an opportunity to enhance the fitness of overgrown company structure. Within this context some of the issues facing the Korean construction industry are highlighted below.

2.7.1 Issues Related to Activities in the Middle East

Demand for the international construction has decreased significantly. It reached its peak in 1981 when total international contracts amounted to $129.9 billion. By 1984 this

figure was reduced to $80.5 billion (see table 2.7.1). This decrease is mainly due to the decrease in construction demand from the Middle Eastern oil-exporting countries which accounted for about 35 to 45 percent of international construction. This lessened demand is due primarily to the decline in oil prices. The curtailing of overseas awards by the Middle Eastern countries severely impacted the Korean international construction market due to its heavy concentration in this area (see table 2.7.2). Korea's concentration in the Middle East is much more significant if we compare this with that of the U.S. and Japan. The U.S. has markets all over the world and their share is more or less balanced and Japan has a larger market in Asia than Middle East (see tables 2.7.3 and 2.7.4).

Since 1973 oil-exporting countries in the Middle East have carried out ambitious economic development plans using enormous oil revenues. A major portion of this investment has been in infrastructure, housing and urban development. These are mostly labor intensive or are projects requiring the lower end of technology; areas in which the Korean contractors are competitive; in fact, more than 80 percent of the Korean contracts in this region are civil work and building construction (see table 2.7.5). However the need for infrastructure building is nearly completed in the many of the Middle Eastern countries. The nature of future projects will be

shifting to the so called "high technology content", with a very strong demand for innovative engineering and design components. Moreover, we will witness more reliance on new financing scheme, such as counter-trade barter systems, and equity participation which will require a bidding practice involving knowledge of economics as well as determining financial risk. Firms participating in this new market will have to provide highly sophisticated, up-to-date engineering and design capabilities as well as financial packaging capabilities. Innovative financing and turnkey capabilities are essential to this market. A major element of the turnkey operation is a strong, well-qualified engineering and design component capable of providing the conceptual as well as detailed design needed for the sophisticated construction projects of this market. Having in the past executed projects in collaboration with foreign companies who provided all of the design and engineering services, the Koreans have little opportunity to develop their own expertise in this area. This is a major handicap for the Korean international contractors.

The fact that many countries that were traditionally buyers of construction services and products from the international marketplace now focus on the development of their own indigenous construction capabilities which are preferred to those of the international firm, has changed the picture entirely.

The percentage of contracts being awarded domestically in the Middle East has grown from 2.3 percent in 1975 to 27.9 percent in 1984. Among them, Saudi Arabia is the most remarkable, showing a percentage rate of 43.8 in 1984 (see table 2.7.6). The indigenous construction capability is seen mostly in the area of civil engineering works and building construction; areas in which Korean contractors relied heavily. The least significant area of domestic concentration is in plant plant construction. Along with this preference by Arab governments for their own construction companies, the entry of Turkish, Indian, Pakistani and other firms with lower labor cost than that of Korea, means more intense competition. This trend is particularly so in the low end of technology and at this point in time the Koreans are not fully equipped to switch their market to the high end of technology. In addition due to an increase in the standard of livings in Korea, construction firms are faced with higher labor costs, not necessarily accompanied by an increase in productivity (see table 2.7.7).

The Korean domestic construction market has increased steadily over the past 20 years; however after 21.2 percent growth during 1983, domestic construction market remained relatively static during 1984. Government construction expanded 9.5 percent, led by new town developments but private construction grew by only 3.3 percent, due mostly to tight credit conditions that discouraged residential construction. In spite

of active investment in government construction and factories (including subway projects) overall construction investment in 1984 was up by only 0.3 percent. This was due primarily to the sharp decline in housing construction. Since 1976 domestic construction has been exceeded by overseas construction which implies certain limitations in the domestic marketplace rendering it incapable of countering the sluggish overseas market. This seems evident that from 1982 to 1985, total contract amount has been decreasing although there has been hefty growth in domestic construction. This excessive dependency on international construction means that Korean construction industry is very much vulnerable to change in international market condition. The share of international construction in Korea's total construction has been reduced to below 50 percent since 1984 when Korea's international construction was reduced sharply.

2.5.2 Issues Related to Activities in the Traditional International Construction Market

Looking at the traditional international construction projects, outside of the oil-rich countries, we seethat these projects of the Third World capital-poor countries are financed through international agencies, bilateral and soft-loan programs and through international financial institutions such as commercial banks. A major component of such a project is a detailed

and in-depth feasibility study which is normally prepared by an international consulting firms, whose primary concern is to identify the benefits of the project and to assure its financial viability. It is at this stage of project development that the level of technological sophistication and labor, material and equipment requirements are determined. In order for Korean firms to compete in this market, Korea has to develop and strengthen its international consulting capabilities. Presently, this capability is at its very early stages of development and no concerted effort is apparently being made to expedite its development. As long as these types of services are not being offered, the Korean engineering, design, contracting and supplying firms may not be able to participate in this market very easily.

As stated earlier, developing countries or owners may require contractors to participate in equity sharing. This is highly desirable for developing countries. They can reduce the level of risk attached to external capital inflow and secure the benefits of technology and expertise by expanding the amount of direct investment in total external financing. As an invester, this kind of investment could be made as a defensive measure against local protectionism for certain commodity exports. Contractors, by and large, are not familiar with the nature of economic risk involved in such participation and have shied away from projects that require equity

participation. Korean contractors, at least the major ones, are in a better position to take advantage of this opportunity. They are mostly members of very large conglomerates which have in-house capabilities in barter trade, commodity exchange, and in several cases financial and banking institutions. Generally speaking, however, Korean contractors have limited experience in working with international agencies and have limited capability required by these international agencies. Furthermore, they are inexperienced in financial management. There are a few conglomerates in Korea who have had limited experience in international financing, but their knowledge is very limited and not transferable to the cntracting arm. In as much as Korean capital is limited and the very nature of financial management is new, the government is not likely to provide substantial funds for this end.

The international construction market for the remainder of the century is going to concentrate mainly on high technology projects. Turnkey projects and integration of various financing schemes, such as barter agreements, counter trade and equity participation will be predominant characteristics. It seems that Korean contractors have reached a point where their traditional method of acquiring technology know-how has reached its limit. Participation in joint ventures with sophisticated technological partners is becoming more difficult. This is due in part to the reluctance on the part of

the international owner of technology to share it with the Korean counterpart and partly due to the fact that advanced technology require a major technological base. This leads us to the conclusion that the Korean construction industry must revise its strategy with regard to the acquisition of new technological know-how. At the same time it must recognize the importance of indigenously developed advanced technologies through research and development programs both for existing and new markets.

2.5.3 Markets in the Developed Countries

Finally, Koreanfirms have not seriously considered the markets in developed countries. Although international construction demand is on the decreasing side, the importance of the markets of the developed countries in the international construction market is actually increasing. According to "Historical Statistics of OECD", total size of the construction market of OECD countries is about $924 billion in 1983. Among them, the U.S. accounted for $307 billion (33.3 %), Japan for $215 billion (23.3 %), total of EEC countries for $249 billion (26.9 %) and the rest of OECD countries accounted for $152 billion. No exact statistics of the size of the construction market for the rest of the free world is available but it is generally estimated to about $300 billion. The size of the construction market in the developed region

is overwhelmingly larger than that of the developing countries. This market, especially in North America, is not only large and diverse, but also is undergoing certain change. In the U.S. alone, the market is over $300 billion and all indications are that it will grow to over 10 percent of U.S. GNP in the next few years. This large and almost unexplored market requires new materials, equipment, engineering and design, as well as new management and financing. Although contracting, subcontracting, and procurement policies and procedures in the U.S. are in many respects different from those commonly practiced in the international market place, they are, however, not insurmountable, and recently several European and Japanese companies have been successful in penetrating this market.

Table 2.7.1 Regional Distribution of New Orders Contracted Abroad with 250 Largest Firms (billions of dollar)

	1980	1981	1982	1983	1984	1980-1984
Middle East	35.3	46.5	51.2	33.0	26.6	192.6
	(32.5)	(35.8)	(41.6)	(35.3)	(33.0)	(36.0)
Asia	15.9	21.4	23.5	15.4	18.3	94.5
	(14.6)	(16.5)	(19.1)	(16.5)	(22.7)	(17.6)
Africa	18.7	23.9	17.7	21.4	12.5	94.2
	(17.2)	(18.4)	(14.4)	(22.9)	(15.5)	(17.6)
Latin America	15.8	17.4	10.3	6.3	5.4	55.2
	(14.5)	(13.4)	(8.4)	(6.7)	(6.7)	(10.3)
Europe	12.3	9.8	11.1	9.5	9.2	51.9
	(11.3)	(7.5)	(9.0)	(10.1)	(11.4)	(9.7)
Canada	7.7	6.4	4.5	4.4	2.9	25.9
	(7.1)	(4.9)	(3.7)	(4.7)	(3.6)	(4.8)
U.S.A.	2.9	4.5	4.8	3.6	5.6	21.4
	(2.7)	(3.5)	(3.9)	(3.8)	(7.0)	(4.0)
Total	108.6	129.9	123.1	93.6	80.5	535.7
	(100.0)	(100.0)	(100.0)	(100.0)	(100.)	(100.0)

Source: Engineering News Records
Note: Numbers in the parentheses denote percentage

Table 2.7.2 Trend of Korean Overseas Construction Contracts by Region
billions of dollar (percentage)

	1980	1981	1982	1983	1984	1980-1984
Middle East	7.6	10.5	10.7	4.8	4.9	38.5
	(76.8)	(73.8)	(77.5)	(46.2)	(74.2)	(70.0)
Asia	0.7	1.4	2.4	1.2	0.8	6.5
	(7.1)	(9.8)	(17.4)	(11.5)	(12.1)	(11.8)
Africa	1.6	2.4	0.6	4.4	0.9	9.9
	(16.2)	(16.8)	(4.3)	(42.3)	(13.6)	(18.0)
Latin America	-	-	*	*	*	0.1
	(-)	(-)	(-)	(-)	(-)	(0.2)
Europe	-	-	-	-	-	-
	(-)	(-)	(-)	(-)	(-)	(-)
Canada	*	-	-	-	-	*
	(-)	(-)	(-)	(-)	(-)	(-)
U.S.A.	-	-	-	-	-	-
	(-)	(-)	(-)	(-)	(-)	(-)
Total	9.9	14.3	13.8	10.4	6.6	55.0
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

Source: Engineering News Records
Note: * denote the amount less than 50 million dollars.

Table 2.7.3 Trend of U.S. Overseas Construction Contracts by Region
billions of dollar (percentage)

	1980	1981	1982	1983	1984	1980-1984
Middle East	8.9	10.4	18.5	12.7	10.7	61.2
	(18.4)	(23.6)	(41.2)	(43.2)	(34.9)	(31.0)
Asia	10.5	9.4	9.4	4.8	8.8	42.9
	(21.7)	(21.3)	(20.9)	(16.3)	(28.7)	(21.7)
Africa	4.0	3.2	2.8	2.4	1.6	14.0
	(8.3)	(7.3)	(6.2)	(8.2)	(5.2)	(7.1)
Latin America	9.8	9.1	3.9	1.7	1.6	26.1
	(20.3)	(20.6)	(8.7)	(5.8)	(5.2)	(13.2)
Europe	8.0	6.5	6.8	4.7	5.5	31.5
	(16.6)	(14.7)	(15.1)	(16.0)	(17.9)	(16.0)
Canada	7.1	5.5	3.6	3.1	2.5	21.8
	(14.7)	(12.5)	(8.0)	(10.5)	(8.1)	(11.0)
Total	48.3	44.1	44.9	29.4	30.7	197.4
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

Source: Engineering News Records

Table 2.7.4 Trend of Japanese Overseas Construction by Region
billions of dollar (percentage)

	1980	1981	1982	1983	1984	1980-1984
Middle East	2.3	3.9	2.5	2.5	1.2	12.4
	(56.1)	(47.6)	(26.9)	(28.7)	(16.4)	(33.0)
Asia	1.4	2.4	5.6	4.8	4.4	18.6
	(34.1)	(29.3)	(60.2)	(55.2)	(60.3)	(49.5)
Africa	0.3	0.9	0.8	0.4	0.6	3.0
	(7.3)	(11.0)	(8.6)	(4.6)	(8.2)	(8.0)
Latin America	0.1	0.8	0.1	0.2	0.2	1.4
	(2.4)	(9.8)	(1.1)	(2.3)	(2.7)	(3.7)
Europe	*	0.2	0.2	0.4	0.1	0.9
	(-)	(2.4)	(2.2)	(4.6)	(1.4)	(2.4)
Canada	*	*	*	-		
	(-)	(-)	(-)	(-)	0.8	1.3
U.S.A.	-	*	0.1	0.4	(11.0)	(3.5)
	(-)	(-)	(1.1)	(4.6)		
Total	4.1	8.2	9.3	8.7	7.3	37.6
	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)	(100.0)

Source: Engineering News Records
Note: *denote the amounts less than 50 million dollar

Table 2.7.5 Korean Overseas Construction Record by Type of Work
millions of dollar

Type of work	1966-1975	1976	1977	1978	1979	1980	1981	1982	1983	Total	Perceny
Civil	1,112	1,448	1,571	2,019	1,679	3,739	5,023	4,876	5,494	26,961	39.8
Road	443	94	254	286	210	1,087	2,317	752	324	5,767	8.5
Harbor	479	1,325	727	313	170	496	129	476	-	4,115	6.1
Other	190	29	590	1,420	1,299	2,156	2,577	3,648	5,170	17,079	25.2
Building	263	590	1,022	4,979	2,979	3,852	7,608	6,238	3,958	31,489	46.5
Mechanical	98	381	677	469	1,219	392	692	1,677	439	6,044	8.9
Electrical and communication	24	66	219	621	470	271	295	580	501	3,047	4.5
Engineering	2	17	27	57	4	5	63	12	52	239	0.3

Source: Overseas Construction Association of Korea, Nongovernmental White Paper on Overseas Construction

Table 2.7.6 Trend of Localization in Middle East by Contract Amount
amount in millions of dollar

Year	A. Amount localized	B. Total Contract	$\frac{A}{B}$ x 100	C. No of projects-localized	D. Total No. of projects	$\frac{C}{D}$ x 100
1975	609.5	26,917.8	2.3	39	394	9.9
1976	2,366.2	37,485.4	6.3	46	428	10.7
1977	2,998.7	49,205.8	6.1	85	546	15.6
1978	2,336.1	31,751.8	7.4	83	560	14.8
1979	3,339.0	30,574.4	10.9	99	516	19.2
1980	6,540.1	38,800.9	16.9	254	783	32.4
1981	6,444.7	62,589.4	10.3	263	912	28.8
1982	8,794.8	45,667.5	19.3	291	868	33.5
1983	5,174.6	33,494.3	15.4	228	647	35.2
1984	6,419.3	22,979.5	27.9	315	720	43.8

Source: Middle East Economic Digests

Table 2.7.7 Comparison of Manpower Productivity between Korea and Other Developping Countries (1982)

	Productivity	Wage
Korea	100	100
Other developping countries	78	56

Source: The Korean Embassy at Saudi Arabia
Note: The developping countries mean the average of Thailand, Bangladesh, India, Pakistan, Philippine and Sri Lanka.

CHAPTER 3

U.S. CONSTRUCTION INDUSTRY

3.1 Economical Characteristics

Construction is one of the most important parts of the American economy and often referred to as an industry but is more like a sector of the economy, such as manufacturing, transportation, or services. It is not a single activity but a group of activities loosely related to one another by the nature of their products, technologies, and institutional settings. Were construction viewed as an industry, it would be considered one of the largest in the economy. As a sector, it is one of the smallest, whether measured in terms of the value of output, or number of persons employed in its activities.

3.1.1 Measures of Construction Activity

Construction involves both new construction and maintenance and repair work. New construction is the larger part, but maintenance and repair are significant. The value of new construction in 1977 amounted to 72 percent of all construction. Maintenance and repair accounted for remaining 28 percent. These percentages differ from those in 1972, when the value of new construction accounted for 78 percent and maint-

enance and repair construction for 22 percent. Maintenance and repair work fluctuate in volume and perhaps expand most rapidly when new construction is low. Building owners probably stretch out the life of structures by means of maintenance and repair when new construction seems inadvisable.

New construction activity has accounted for about 11 percent of the nation's GNP on average since World War II. This figure fluctuates, however, because construction follows business cycles of its own. Recently, the constructionactivity accounts for about 9 percent of GNP. Construction is Known to be one of the most cyclical industries. Since 1967, there have been three cyclical peaks: in 1968, 1973, and 1978. Increase in the cost and reduction in the availability of credit have been the chief causes of the downturns. The trend in new construction put in place - adjusted for inflation - has apparently been downward since 1973. The output in 1980 was lower than any year since 1975. Table 3.1.1 also shows that new construction has not kept up with the growth of GNP, especially if both are measured in constant dollars. From 1967 to 1980, new construction in constant dollars declined by 5 percent, while real GNP increased by 47 percent. As a result, new construction dropped from 12 percent to 7 percent of real GNP. In current dollar terms, however, new construction maintained a 9 to 11 percent share of GNP. The construction industry employs 4.3 million people, about 5

percent of the nation's labor force. Work in the construction industry is seasonal, so that the percentage of persons employed in construction rises to more than 6 percent in summer and fall to less than 4 percent in winter. The portion of total employment in construction is less than the portion of GNP because the GNP measurement is based on the final use of products, not their intermediary stages. Construction involves the installation of materials and components produced in manufacturing industry. The income originating in construction which excludes the value of input is about 6 percent of the GNP, about same portion of the GNP as construction employment is of total employment. The total volume of U.S. construction output in 1984 reached #344 billion, of which $313 billion was in the domestic market and $31 billion overseas. Approximately 18 percent of the domestic activity is engaged in the public construction. The remaining 82 percent of the domestic market is for private construction and more than half of that is engaged in residential building (see table 3.1.2). Table 3.1.3 shows the percentage distribution in 1982 of total new construction and addition and alteration by type of structure and by ownership. Several interesting points are observable.

-The relative role of public versus private ownership varies greatly among the type of construction. Government agencies are major purchasers of such items as highways, streets, military facilities, and the like, but minor buyers of resid-

ential construction. The government role as an owner is large one, consisting in 1982 of 21.5 percent of all construction expenditures (public construction is keep decreasing as compared with increasing private construction). Most of these expenditures came from state and local government, but much of the money spent by the states and localities was provided by the federal government. Federal construction expenditures finance virtually all federally owned construction. Thus, the value of federal construction related expenditures is much greater than the value of federally owned new construction put in place. In fiscal year 1984, only 25 percent of new construction expenditures were for federally owned construction, while 55 percent were for structure owned by state and local governments, and 20 percent were privately owned structures (see table 3.1.4). State and local governments are the largest recipiants of federal construction-related expenditures. Most of these federal disbursements to states and local governments consists of grant-in-aid, although there are several loan programs. State and local governments rely heavily on federal assistance to finance their construction projects (see table 3.1.5).

-There are thousands of government agencies in the U.S., and hundreds of thousands of private organizations. None individually constitutes a large factor in the purchase of construction. The federal government is the largest single buyer of construction but accounted only 2.2 percent of all

purchase in 1982. The producers of construction sell to a very large and diverse group of buyers. The construction industry is highly cyclical in nature, and its cyclicality tends to vary by branch of the industry. The market demand characteristics are quite different for the major branches of the industry, and even for the specialized firms within the industry. The construction industry is, in a sense, a whole set of sub-industries, each with its own subset of economic characteristics. The nonresidential general building branch, for example, is quite different from the heavy construction branch, in terms of market demand, labor force composition, sensitivity to national economic policy, and the production elements of the actual construction process. One very basic division of the industry in this regard can be made between the residential and nonresidential sectors. Private nonresidential construction tends to rise during booms and fall during recessions and thus moves with the business cycle, while private residential construction exhibit a countercyclical pattern and thus help stabilize the economy (see table 3.1.6).

3.1.2 Construction Cost

Costs are among the most difficult to measure of all economic statistics, and there are more pitfalls associated with construction costs than most because the output of construction

is so heterogeneous. However, because of the importance of changes in construction costs, several government and private agencies have undertaken the risky task of developing construction cost indexes. Table 3.1.7 shows trends in the Department of Commerce composite cost index, construction workers' average hourly earnings, the producer price index for all construction materials, and interest rates on short-term business loans. It should be noted that the composite cost index is based on the costs of the various inputs used to produce a great output, while the other three series reflect prices of individual categories of inputs. This is not simply a theoretical distinction, since costs have increased much faster than prices in the construction industry.

Interest rates have increased faster than material prices and average hourly earnings although have fluctuated widely. The composite cost index has increased faster than any of the three price series. There are at least three explanations for this development. First, unit labor costs have risen faster than average hourly earnings because of declining productivity. Second, financing costs have risen faster than interest rates, because the interest rate is a multiplier which is applied to the loan amount. Third, there are additional cost factors besides those listed in table 3.1.7, such as taxes, rental costs, return on equity capital, overhead costs, capital goods costs, and purchased services. Trends

in unit labor costs are summarized in table 3.1.8. The rise in average hourly earnings of construction workers has been slightly slower than the rate for manufacturing workers. However, there is an additional determinant of unit labor costs: Productivity. The poor productivity record in recent years has resulted in a serious rise in unit labor costs, which exceeds even the increase in the Department of Commerce composite cost index.

3.1.3 Productivity

Since the mid 1060s, average output has declined significantly in the construction industry. In fact, the decline in construction productivity has been among the most serious in the U.S. economy (see table 3.1.9). From 1965 to 1975, productivity declined by 20 percent, an average annual rate of minus 1.6 percent. There are several conventional ways to measure changes in productivity other than the method used in table 3.1.9. In this series, labor productivity is measured as the real gross product originating (GPO) per hour; in rough terms, it is the output of the construction industry less the material inputs (all adjusted for inflation), divided by the input labor hours. The decline in construction productivity is of major concerns because of the importance of the construction industry and the magnitude of the decline. To date, no study has fully explained the cause of the problem. There

are, however, two general types of explanations for the situation. The first is that the statistics are inacurate. The second is that productivity is declining because of a number of things that have happened to construction since the early 1960s. The accuracy of productivity statistics have been examined and there are three possible reasons of the errors in measuring productivity. 1) The construction subsectors with lower rates of productivity may have grown proportionally greater in last two decades while the necessary changes in statistical weight were not made. 2) Maintenance and repair activities - which account for about 30 percent of the total - may not have been properly measured. 3) Some of the deflators used to adjust current dollar output are based on input costs rather than output prices. If these deflators overstate inflation, then real output and productivity of the construction industry are understated. Although errors and weakness have been found, it is unlikely that they could fully explain the large drop in productivity.

Assuming that construction productivity has in fact declined sharply since the mid 1960s, some of the possible explanations are:-

-A change in the mix of construction toward maintenance and repair work; It is very likely that productivity is lower in maintenance and repair than new construction since it tends to be smaller scale, less capital intensive, less standardized,

and loses more time in start-up and clean-up.

-Regulation and regulatory delay; It is widely agreed that regulations and regulatory delays have hurt construction productivity, although the extent is not known. Construction is one of the most regulated of all industries.

-Substitution of labor for capital and energy; A situation that may be developing in construction is the substitution of labor for capital and energy. Wage rates have not increased as rapidly as capital and energy costs. Since businesses are interested in minimizing total costs rather than simply labor costs, it is often economical to take actions that reduce labor productivity.

-Fast tracking of construction projects; A practice that is becoming common is fast tracking, which utilizes a number of less efficient construction practices in order to build the structure as quickly as possible. In an era of high financing costs, this is often the most economical strategy, but it reduces labor productivity.

-Demographic characteristics of the labor force; There was a shift in the age composition of the labor force toward younger workers. In 1967, 13 percent of construction employees were under 25; by 1977 the proportion was 21 percent. Most labor analyst agree that this development has had a negative effect on productivity, although the impact should not be severe.

-Increased reliance on rented equipment; The industry has

increasingly tended to rent construction equipment rather than own it. This practice is economically efficient, but reduces measured productivity in two ways. First, it reduces productivity by limiting access to equipment. Second, equipment rental is considered an expense, and is therefore not included in the product of the construction industry.

3.1.4 Economic Conditions and Financial Performance

The economic conditions of the construction industry and the financial performance of firms in the industry is to a significant extent dependent upon factors external to both the industry itself and to the construction process. Monetary policy, which involves the expansion and contraction of the money supply by the Federal Reserve and the subsequent effect of those changes on the interest rate, has had its greatest impact on the housing sector. Its impact falls in two areas, on the potential owner of housing stock and on the residential contractors. The level of investment in residential construction (and to a less degree in other types of construction) is highly sensitive to conditions in the capital markets and to fluctuations in the interest rate. The most prevalent method for owners to finance the purchase of residential property has been through the mortgage, a long term credit instrument generally covering in the range of 70 to 80 percent of the purchase price. In last twenty years, three cyclical

peaks of interest rates on short-term business loans can be identified, that are 1970, 1974 and 1981. Those three cyclical peaks coincide exactly with three cyclical troughs of the private residential construction (see tables 3.1.6 and 3.1.7). The same trend can be observed in the number of new housing starts. Fiscal policy, on the other hand, has its greatest impact on the aggregate level of nonresidential construction. The government exercises fiscal policy basically through changes in the level of taxes and federal expenditures. The effect on the construction industry is felt primarily through the response of the private sector to the general economic climate and is manifeted in the decision of industry to invest or not to invest in capital facilities. A second influence is felt through the government's purchase of construction, which accounts for about 20 percent of total construction activity. There has been substantial decline in public sector construction relative to private construction. However, the size of public construction is still large enough to give a considerable impact on the industry.

The wide fluctuation in market demand exist for a number of economic reasons; variety of demand composition, conditions in the capital markets, the state of the national economy, the seasonal nature of construction, and the local nature of the markets. These facts, coupled with the impact of the government, in its role as economic policy maker, purchaser,

and financier of construction, create a climate of economic instability in all sector of the industry.

Table 3.1.1 Gross National Product and New Construction, 1965-1980

Year	Gross national product (billions of current $)	New construction (billions of current $)	New construction as a percent of GNP	Gross national product (billions of 1972 $)	New construction (billions of 1972 $)	New construction as a percent of GNP
1965	688.1	73.7	10.7	925.9	109.7	11.8
1966	753.0	76.4	10.2	918.0	109.5	11.9
1967	796.3	78.1	9.8	1,007.7	107.8	10.7
1968	868.5	87.1	10.0	1,051.8	114.4	10.9
1969	935.5	93.9	10.4	1,078.8	113.5	10.5
1970	982.4	94.9	9.7	1,085.6	107.0	9.9
1971	1,063.4	110.0	10.3	1,122.4	116.0	10.3
1972	1,171.1	124.1	10.6	1,185.9	123.9	10.4
1973	1,306.3	137.9	10.6	1,255.0	126.9	10.1
1974	1,412.9	128.5	9.8	1,248.0	109.1	8.7
1975	1,528.8	134.5	8.8	1,233.9	97.2	7.9
1976	1,702.2	151.1	8.9	1,300.4	105.0	8.1
1977	1,899.5	174.0	10.9	1,371.7	113.3	8.3
1978	2,127.6	205.5	9.7	1,436.9	116.9	8.1
1979	2,413.9	229.0	9.5	1,483.0	114.7	7.7
1980	2,628.8	227.8	8.7	1,480.7	102.8	6.9
			percent change			
1965-80	+282	+209		+60	-6	
1967-80	+230	+192		+47	-5	
1970-80	+168	+140		+36	-4	

Source: Construction Review, May/June, 1981

Table 3.1.2 New Construction Put in Place in the U.S., 1983-1984
billions of dollar

Industry	1983	1984
Private construction		
Residential building	111.7	145.1 (46.4%)
Nonresidential building		
Industrial	12.9	13.7
Commercial	35.8	48.1
Hospital and institutional	6.6	6.3
Other	5.0	6.0
Total	60.3	74.1 (23.1%)
Farm construction	4.4	2.9 (0.9%)
Public utilities		
Telephone and telegraph	6.5	7.2
Electric light and power	21.9	19.5
Other	5.1	7.1
Total	33.5	33.8 (10.8%)
All other private	1.5	1.9 (0.6%)
Total private construction	211.4	257.8 (82.4%)
Public construction		
Buildings		
Educational	5.4	5.6
Other	11.9	12.3
Total	17.3	17.9 (5.7%)
Highways and streets	14.2	16.3 (5.2%)
Military facilities	2.6	2.8 (0.9%)
Conservation and development	4.8	4.7 (1.5%)
Other public construction		
Sewer systems	5.3	6.2
Water supply	2.1	2.6
Miscellaneous	4.5	4.7
Total	11.9	13.5 (4.3%)
Total public construction	50.8	55.2 (17.6%)
Total new construction	262.2	313.0 (100.0%)

Source: Construction Review, September/October, 1985

Table 3.1.3 Percent Distribution of Value of Total New Constrcution and Addition and Alteration by Ownership

Type	Public			Private	Total public & private
	Federal	State & local	Total public	Total private	
Residential	0.1 %	0.6 %	0.7 %	34.0 %[a]	34.7 %
Nonresidential building	1.1	5.4	6.5[b]	29.1[d]	35.6
Public works & utilities	1.0	13.3	14.3[c]	14.9[e]	29.2
Other	-	-	-	0.5	0.5
Total	2.2	19.3	21.5	78.5	100.0

Source: U.S., Department of Commerce, Bureau of Census, 1982 Census of Construction

Note:

a; includes nonhousekeeping buildings

b; industrial, educational, hospital, and other buildings

c; highways, streets, military facilities, conservation and development, sewer systems, water supply facilities, and miscellaneous public construction

d; includes nonresidential farm buildings

e; telephone and telegraph, railroad, electric light and power, petroleum pipeline.

Table 3.1.4 Federal Construction-Related Expenditures by Ownership Category (millions of dollar)

Ownership category	1980	1981	1982	1983	1984	1985
Government-owned	36,381	38,566	36,156	36,075	35,171	40,700
Federal	10,300	10,813	10,871	11,317	11,029	13,051
State & local	26,081	27,753	15,285	24,758	24,142	27,649
Privately-owned	12,629	13,877	11,652	11,377	8,593	9.809
Residential	7,539	8,321	8,115	8,437	6,044	6,264
Nonresidential	5,090	5,556	3,537	2,940	2,549	3,545
Total construction expenditure	49,010	52,443	47,808	47,452	43,764	50,509

Source: Construction Review, March/April, 1985

Table 3.1.5 Federal Construction-Related Expenditures As a percentage of the Value of New Construction Put in Place for Fiscal Years 1980-1984 (percent)

Category	1980	1981	1982	1983	1984
Government-owned	67	71	72	70	65
Federal	106*	107*	112*	107*	101*
State & local	58	63	62	61	56
Privately-owned	7	7	7	6	4
Residential	8	9	11	8	5
Nonresidential	6	6	3	3	2
Total	21	22	21	19	15

Source: Construction Review, March/April, 1985

Note: * Expenditures for federally-owned construction exceed the value of federally-owned construction put in place primarily because of the inclusion of overseas construction, some maintenance and repair construction, and costs other than construction, such as land, installed equipment, and supervision.

Table 3.1.6 Indexes of New Private Residential and Nonresidential Construction Activities and Public Construction Activities (1975 = 100, billions of 1977 dollar)

	New private resid.		New private nonres.		New public const.	
Year	Amount	Index	Amount	Index	Amount	Index
1970	57.581	102.7	35.692	127.4	17.922	108.4
1971	73.935	131.9	34.706	123.9	17.789	107.6
1972	86.701	154.6	35.294	126.0	16.992	102.8
1973	87.033	155.2	37.510	133.9	17.798	107.7
1974	66.393	118.4	33.379	119.2	17.101	103.5
1975	56.074	100.0	28.011	100.0	16.530	100.0
1976	67.737	120.8	27.642	98.7	14.630	88.5
1977	80.689	143.9	28.640	102.2	12.788	77.4
1978	81.226	144.9	32.224	115.0	13.550	82.0
1979	75.958	135.5	36.064	128.7	11.895	72.0
1980	60.911	108.6	35.444	126.5	12.540	75.9
1981	55.893	99.7	39.356	140.5	11.515	69.7
1982	50.900	90.8	41.856	149.4	10.904	66.0
1983	74.973	133.7	38.322	136.8	10.951	66.2
1984	85.681	152.8	45.396	162.1	10.917	66.0

Source: Construction Review, July/August, 1983, September/October, 1985

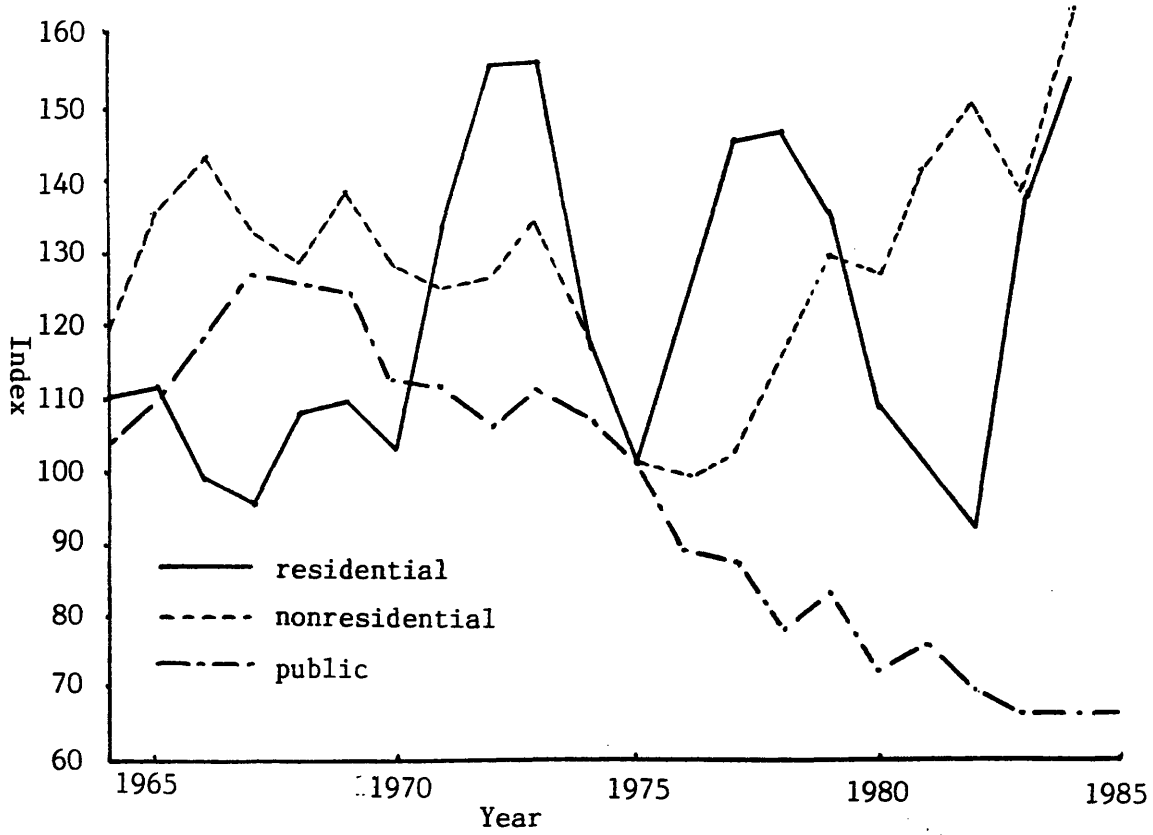


Table 3.1.7 Trends of Construction Costs and Input Prices

Year	Deaprtment of Commerce Composite Cost Index (1977=100)	Construction workers average hourly earnings ($/hr.)	Producer price index for all construction materials(1977=100)	Interest rates on short-term business loans(percent)
1970	56.8	5.24	54.9	8.48
1971	60.5	5.69	58.3	6.32
1972	64.1	6.06	61.8	5.82
1973	69.6	6.41	67.6	8.30
1974	81.8	6.81	78.5	11.28
1975	89.3	7.31	84.9	8.65
1976	92.4	7.71	91.6	7.52
1977	100.3	8.10	100.0	7.84
1978	113.0	8.66	111.4	9.80
1979	128.8	9.27	122.7	13.18
1980	143.2	9.94	130.0	15.17
1981	151.9	10.82	138.1	19.58
1982	154.1	11.63	140.5	14.69
1983	157.3	11.94	145.3	10.64
1984	163.7	12.12	149.5	12.02

Source: Construction Review, July/August, 1983, September/October, 1985

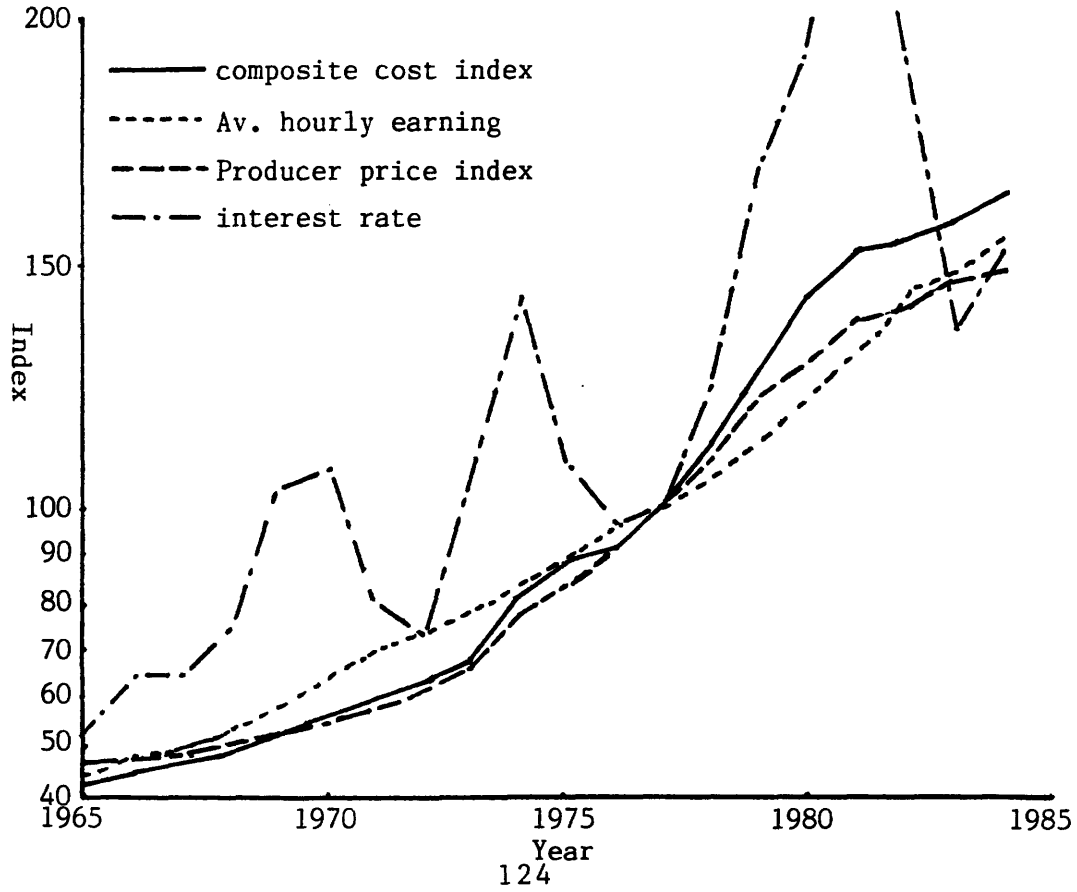


Table 3.1.8 Average Earnings of Workers in Various Industries

Year	Total nonfarm private ind.			Construction			Manufacturing		
	Hrs/week	$/hour	$/week	Hrs/week	$/hour	$/week	Hrs/week	$/hour	$/week
1970	37.1	3.23	119.83	37.3	5.24	195.45	39.8	3.35	133.33
1971	36.9	3.45	127.31	37.2	5.69	211.67	39.9	3.57	142.44
1972	37.0	3.70	136.90	36.5	6.06	221.19	40.5	3.82	154.71
1973	36.9	3.94	145.39	36.8	6.41	235.89	40.7	4.09	166.46
1974	36.5	4.24	154.76	36.6	6.81	249.25	40.0	4.42	176.80
1975	36.1	4.53	163.53	36.4	7.31	266.08	39.5	4.83	190.79
1976	36.1	4.86	175.45	36.8	7.71	283.73	40.1	5.22	209.32
1977	36.0	5.25	189.0	36.5	8.10	295.65	40.3	5.68	228.90
1978	35.8	5.69	203.70	36.8	8.66	318.69	40.4	6.17	249.27
1979	35.7	6.16	219.91	37.0	9.27	342.99	40.2	6.70	269.34
1980	35.3	6.66	235.10	37.0	9.94	367.78	39.7	7.27	288.62
1981	35.2	7.25	255.20	36.9	10.82	399.26	39.8	7.99	318.00
1982	34.8	7.68	267.26	36.7	11.63	426.82	38.9	8.49	330.26
1983	35.0	8.02	280.70	37.1	11.94	442.97	40.1	8.83	354.08
1984	35.3	8.33	294.05	37.7	12.12	456.92	40.3	9.18	373.63
1985	35.1	8.58	301.16	37.7	12.26	462.20	40.5	9.52	385.56

Source: U.S. Department of Labor, Bureau of Labor Statistics, Employment and Earnings, Feb., 1986

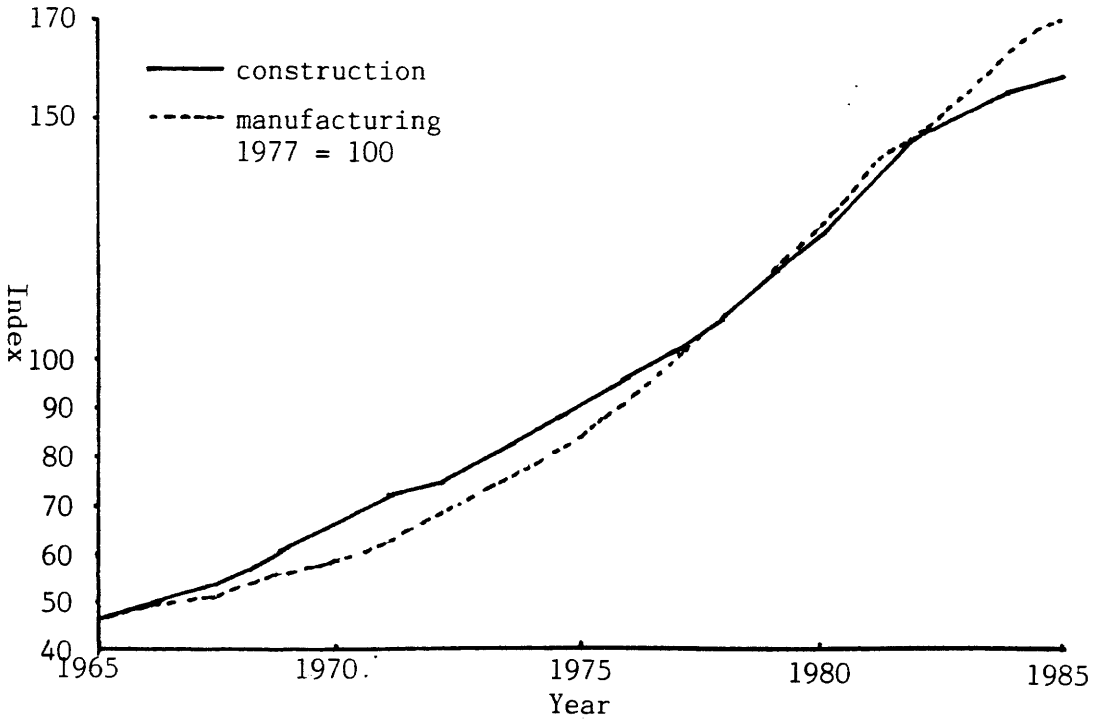
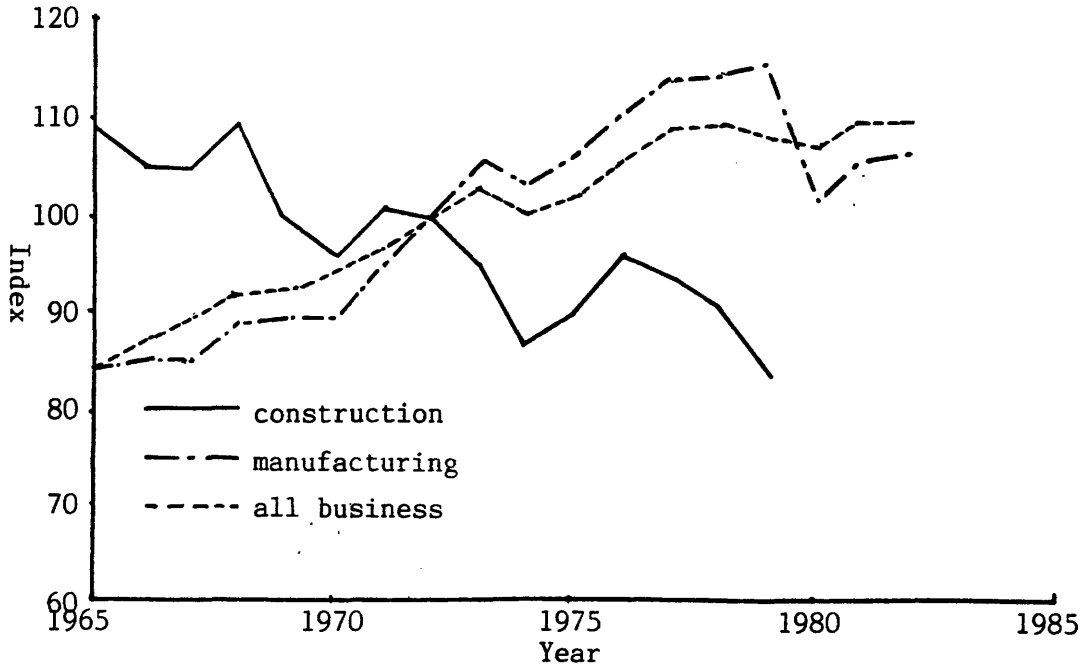


Table 3.1.9 Productivity Index* for Construction and Manufacturing Industry (1972 = 100)

Year	Construction	Manufacturing	All business
1965	108.2	84.5	84.7
1966	105.3	85.4	87.3
1968	109.3	88.4	92.3
1969	99.1	89.9	92.5
1970	95.8	89.7	93.3
1971	100.8	95.1	96.5
1972	100.0	100.0	100.0
1973	95.5	105.4	102.5
1974	86.5	102.9	100.1
1975	89.6	105.9	102.3
1976	95.6	110.5	105.6
1977	93.7	113.4	108.2
1978	90.2	114.3	108.9
1979	83.9	115.1	107.6
1980		115.3	107.0
1981		105.3	109.6
1982		106.5	109.5

Source: J. E. Cremeans, Productivity in Construction Industry, Construction Review, May/June, 1981
U.S. Department of Labor, Bureau of Labor Statistics, Handbook of Labor Statistics, 1983

Note: *Derived from BEA Gross Product Originating data and BLS hours data from establishment survey



3.2 Structural Characteristics

3.2.1 General

There are a vast number of construction firms, and they range greatly in size. General contractors take responsibility for an entire project but subcontract most of the actual construction. Most firms operate in a particular locality or region, but some are national in scope. Those that are national are generally specialized to a branch of sector or a type of work. The major branches of construction by type of product include residential buildings, nonresidential buildings, highways, dams and other civil engineering projects, pipelines, electric transmission lines, and industrial and power plants. If the specilaization of contractors is used to categorize them, the resulting major classifications are general contractors, heavy and highway contractors and specialty trade contractors (see table 3.2.1).

A large number of relatively small firms make up the construction industry. In 1982, 51 percent of all costruction establishments had total receipts of less than $25,000, while less than 1 percent of all construction firms reported total receipts of $5,000,000 or more, though these establishments did accounted for 47 percent of total receipts of construction industry that year (see table 3.2.2). In 1982, Stearn-

Catalytic Corp. was reported as the contractor doing the largest domestic volume of business, but its total domestic awards of $3.7 billiob gave it only 1.2 percent of the U.S. construction market. Another way to look at the size of construction firms is to consider the number of employees each firm has. Of the 1.4 million construction industry establishments in 1982, 933,000 (67 percent) had no employees. These establishments had receipts of $40.9 billions, which was only about 11 percent of total industry receipts of $365.4 billion. About 46 percent of the contractors without employees had receipts less than $10,000, strongly suggesting that these are part-time business run by person who do not rely on their small contracting business for their sole support. All but 16 percent of the establishments without payroll had receipts under $50,000 in 1982. Over three fourth of the non-employee firms were specialty trade contractors, i.e., htose engaged in activities such as plumbing, heating, and air-conditioning, and electrical work. These non-employee firms comprised 70 percent of all trade contractors, but received only 12.3 percent of all psecial trade contractors' receipts (see table 3.2.3).

In 1982, the 457,000 costruction establishments with paid employees accounted for 89 percent of all industry receipts. Special trade contractors comprised the largest of the three major groups in 1982 as measured by number of establishments

(66.4 percent of total), by employees (about 56.4 percent), ro by net construction receipts (51.7 percent). The second largest group consisted of the general building contractors and operative builders, which accounted for 27.3 percent of the establishments, 23.5 percent of the employees, and 24.7 percent of net construction receipts. Heavy construction contractors accounted for only 6.3 percent of the establishments in 1982, but ebcause of relatively large average workforce of those establishments they accounted for over one fifth of all employees and nearly one fourth of net construction receipts.

The construction industry is fragmented. The total work force (and total amount of construction activity) is divided among a large number of diverse contractor establishments that vary widely with respect to the average number of employees per establishment, average annual payment per construction worker, value added per employee, and share of total construction receipts subcontracted to others. Although the top 10 contractor classification groups accounted for 70.3 percent of total construction employment in 1982, no single group accounted for more than 12.1 percent of all construction employees. Each of the sixth through tenth ranking categoies accounted for 5 percent or less of total industry employment (see table 3.2.4). Within the 10 contractor groupings presented in the table 3.2.4, the average number of employees per

establishment varied from a high of about 54.2 for heavy construction n.e.c., to 4.3 for general contractors of single family houses.

3.2.2 Scale of Operation

98 percent of establishments with payroll had less than 50 employees on an average annual basis. These establishments accounted for 60 percent of total industry employment, 54 per cent of net construction receipts and 52 percent of total construction industry value added. At the other end of the size scale, less than one tenth of one percent of all establishments employed 500 or more employees, and these accounted for about 12.1 percent of all industry employees, 13.2 percent of net construction receipts, and 14.8 percent of total value added. Medium-sized firms, having 50 to 499 employees, accounted for 2 percent of the establishments, 28 percent of employees, 32 percent of construction receipts, and 33 percent of the industry's total value added (see table 3.2.5).

The small establishments predominate the general building contractors building single family houses. The predominance of small establishments in single-family houses suggests that any economies of scale that exist in building single-family houses are counterbalanced by the superior ability of small firms, which often have knowledge of local zoning practices,

local building codes and inspection procedures, and consumer tastes. It also suggests that the subcontracting system work well in giving small contractors who may have large amount of capital invested in specialized machonery and equipment access to the services of other contractors on a when needed basis. However, if single-family house contractors are excluded from general building contractors and operative builders, composition becomes different. Small firms coexist with medium and large establishments, but do not have a large share of the business. Establishments with fewer than five employees had only 11 percent of the total number of employees, those with fewer than 10, only 23 percent, and fewer than 50 accounted for 57 percent. At the other end of the scale, establishments with 50 to 249 workers employed 22 percent and those with 250 or more workers accounted for 17 percent of the workers.

The coexistence of large and small firms reflects the general building contractors' practice of subcontracting operation requiring highly skilled workers or expensive equipments to the special trade contractors. It also reflects the relative ease of entry because of low capital requirements for some contracting business (e.g., single-family houses), and high capital requirements for others (e.g., heavy construction general contractors). The failure of large firms to dominate construction as they do in the manufacturing sector has been

attributed to a lack of economies of scale for most types of contractors, and relative importance of the management function in creating a nonstandardized, custom-built product under unpredictable weather and labor market conditions.

3.2.3 Subcontractors and Other Participants

Approximately one fourth of total construction receipts were subcontracted to other construction establishments (see table 3.2.6). However, the portion subcontracted varied widely both within the 3 major contracting groups and within 10 largest industry categories which accounted about 70 percent of all industry employees. Among the 3 major contracting groups, subcontracting to others by general building contractors and operative builders accounted for 70.8 percent of all work subcontracted to others; heavy construction contractors accounted for 16 percent and special trade contractors 12.2 percent. General contractors, nonresidential builders other than industrial builders and warehouse had the highest share among the 10 largest industry categories of work subcontracted to others. Within the general building contractors and operative builders' category, there was a tendency for the share of work subcontracted to others increase with the size of the establishment. Establishments with fewer than 5 employees subcontracted about 34 percent of their total construction receiptsto others; the percentage of work subcontracted grad-

ually increases to 58 percent for the firms employing 250 or more persons (see table 3.2.7).

Together with the construction phase, there are many other steps to a projects, including assessment of need, preliminary planning, design, and operation and maintenance among others. Each project requires the participation of many different people, such as architects, engineers, contractors, subcontractors, and suppliers from many different organizations. In most case, these participants are independent of one another, and for each project a group of participants is brought together as an ad hoc team, usually for the first time under temporary contract. These independent participants engage in the project only when their particular expertise is needed, and have few opprotunities to establish working relationships which can be extended to other projects. The outcome is the dispersion of the management function of single project among these many independent participants, and this, along with the naturally occurring lack of continuous working relationships, result in the cordination, organization, and operation of projects being considerably less efficient than might be possible if these participants were more closely tied together in a vertically integrated firms. There is, however, an increasing tendency toward some vertical integration, such as architecture-engineer design firms and design-ocnstrut firms, especially in the alrger corporations.

3.2.4 Specialization and Fragmetnation

Many contractors specialize in a particular kind of construction work. General contractors tend to specialize more than specialty trade contractors, and their most frequent specialization is residential building. The BUreau of Census defines specialization as having over half of the firm's receipts from a given type of construction. By this definition, about 90 percent of them concentrated their efforts on one type of project to the exclusion of others. Firms that specialize in residential building, especially the construction of single-family homes, are most likely to do that type of work exclusively, while firms specializing in other kinds of construction tend more often to have some receipts from outside of their area of specialty.

The structural characteristics of the construction industry have arison in response to the demand placed upon the industry. The specialization is necessitated by many of the product characteristics, usch as complexity, continuously changing technology, custom-built nature and the great variety of product types. The fragmentation gives firms much greater flexibility and makes regrouping of participants reasonably feasible. This, in turn, helps lessen the necessity for contraction and expansion of individual firms as they adjust to the frequent changes in the type and level of construction

demand. Other features, such as a relatively low level of capital investment (see table 3.2.8) and floating labor force, enable firms to contract and expand to a limited extent if necessary. It should be noted, however, that a small number of general contracting firms, primarily the larger one, generally tend to be diversified within the industry. It is nat uncommon for a general costruction firm with gross revenues of $100 million or more to be engaged in a variety of construction work, which may include general (nonresidential), highway and street, and heavy construction. The larger the firm, the greater is the tendency for this kind of diversification within the industry. The fluctuating demand, along with the fact that constructed products are immobile, requires that a firm must be small if it plans to exist in local business only, and this is still the most common situation, although larger national firms which are capable of necessary mobility are increased in number. Many of the features discussed above help explain the rather limited mass production in the industry, with the fluctuating demand playing a particularly important role.

3.2.5 Geographical Scope of Market

The overwhelming majority of the value of construction put-in-place by contractors is performed by contractors working close to the home base in their home city, region, or state

(see table 3.2.9). For the industry as a whole in 1982, 84 percent of the construction work was done by establishments located in the home state. Groups reporting a high percentage of construction receipts coming from their home state include general building contractors specializing in single-family houses (94 percent), operative builders (95 percent), and glass and glazing contractors (90 percent). Among the factors contributing to the geographic concentration of work are the variations in building codes and lack of reciprocity among jurisdictions with respect to licensing requirements for both contractors and some of the skilled trades (e.g., plumbers and electricians). In addition, the small firms might not want to bid on jobs at a distance as long as some work is available locally, since this would involve spreading limited management and supervisory resources over too wide a geographic area. Also, out-of-area small establishments would ordinarily be at disadvantage competing with local firms which have better local business contacts and better knowledge of local construction labor market. Significant differences do appear, however, between the primary industry branches, most notably in the heavy construction contractors. In that group, a lower portion of the construction receipts was derived from work in the home state. This is no doubt due to a variety of reasons. Their market opportunities tend to be geographically more diversified, in that a large proportion of the types of projects performed by heavy construction contractors,

such as power plants, dams, and marine facilities, are large dollar volume but are built much less frequently than "general" construction. Those segments of the industry with higher than average capital investment per construction worker operate over a wider geographical area in order to minimize the adverse effects associated with idle machinery and equipment.

3.2.6 Discontinuity of Firms

Another significant feature of the construction industry is tis ease of entry and exit. The rate of entry to and exit from the construction industry is generally much higher than htose of other industries (see tables 3.2.10 and 3.2.11). The many features of the industry that were discussed above, along with high growth rate of the industry, the high rate of exit of firms from the industry, and the fact that established firms have little in the way of an absolute cost or product differentiation advantage over potential entrant firms, make entry to the industry quite feasible and easy.

One more contribution to the high rate of discontinuance of firms in the construction industry is the industry's high rate of business failure (see tables 3.2.12 and 3.2.13). In 1976, over 18 percent of all business failures were construction business, accounting for 14 percent of the liabilities of all failing business. A Dun and Bradstreet study came up

with a list of what seems to be the major underlying cause of business failures in construction industry (see table 3.2. 14). The study shows that, in 1976 in 92.1 percent of the cases, management, due to lack of managerial experience, or incompetence, was the underlying cause of the failure. These findings are not surprising since managers in the construction industry, especially in the smaller firms, are often just men who have risen from the ranks of workers. However, with the trend toward larger firms and the emphasis on the management, there is strong trend toward more professional management in the industry today.

3.2.7 Legal Form of Organization

There are three major forms of organization for construction firms: the individual proprietorships, the partnerships, and the corporations. Other less common legal forms of organization such as limited partnership and subpartnership, may also be used, and on very large and complex projects, several construction firms may pool their resources in a joint venture which will be desolved once the project is completed and the proceeds have been properly distributed. According to the 1982 Census, there were 988,480 individual partnerships, accounting for 71 percent of all construction establishments. These individual proprietorships accounted for total business receipts of $39.6 billion, or 11 percent of total business

receipts of all establishments. Establishments classified as corporations accounted for 25 percent of all establishments and 84 percent of total business receipts. Partnerships accounted for 4 percent of all establishments and 5 percent of all total business receipts (see table 3.2.15). Moreover, conglomerates have become more common in the industry. In the area of residential construction, several large nonbuilding corporations have acquired established building, design and real estate development firms as subsidiaries. Total constrcution receipts for all construction establishments with payroll in 1982 amounted to $312 billion. Establishments of multiunit companies accounted for 31 percent of the total construction receipts. On the other hand, establishments of single unit companies accounted for 97 percent of the number of employer establishments and 69 percent of the total construction receipts (see table 3.2.16).

Table 3.2.1 Summary Statistics for Establishments With and Without Payroll: 1982 and 1977

Industry	All establishments				Establishments without payroll			Establishments with payroll			
	Number	Proprietors and working partners	All employees**	All business receipts	Number	Proprietors and working partners	All business receipts	Number	Proprietors and working partners	All employees**	All business receipts
	A	B	C	D	E	F	G	H	I	J	K
1982											
Construction industries and subdividers and developers	1 389 309	1 089 667	4 275 070	365 420 747	932 608	930 114	40 908 315	456 701	159 553	4 275 070	324 512 432
Construction industries[1]	1 363 228	1 068 575	4 234 887	356 049 302	912 452	909 754	34 961 402	450 776	158 821	4 234 887	321 087 900
General building contractors and operative builders	384 428	211 178	993 629	131 060 477	181 248	174 480	13 960 706	123 180	36 698	993 629	117 099 771
Heavy construction general contractors	58 558	36 652	852 065	73 321 457	30 371	30 367	2 297 883	28 187	6 285	852 065	71 023 574
Special trade contractors	1 609 241	820 744	2 389 193	151 667 367	700 833	704 907	16 702 813	299 408	115 837	2 389 193	132 964 554
Plumbing, heating, and air conditioning	122 733	82 310	512 004	36 001 797	62 490	62 549	2 480 358	60 243	19 761	512 004	33 521 439
Electrical work	89 619	61 571	434 764	28 060 308	50 056	49 779	1 619 223	39 563	11 792	434 764	26 441 085
Subdividers and developers, n.e.c.[2]	26 081	21 092	40 183	9 371 444	20 156	20 360	5 946 913	5 925	732	40 183	3 424 531
1977											
Construction industries and subdividers and developers	1 200 407	1 013 961	4 272 659	244 815 908	720 393	734 652	20 150 970	480 014	279 309	4 272 659	224 654 938
Construction industries[1]	1 183 221	996 942	4 233 658	239 426 850	708 285	719 381	17 804 427	474 936	277 561	4 233 658	221 622 423
General building contractors and operative builders	286 320	219 077	1 180 747	98 116 714	130 349	130 596	8 330 156	155 971	88 481	1 180 747	89 786 558
Heavy construction general contractors	55 210	37 449	917 083	51 674 514	23 915	24 366	946 739	31 295	13 083	917 083	50 727 775
Special trade contractors	841 691	740 416	2 135 828	89 635 622	554 021	564 419	8 527 532	287 670	175 997	2 135 828	81 108 090
Plumbing, heating, and air conditioning	106 603	79 806	458 687	22 650 620	50 168	51 108	1 219 435	56 435	28 698	458 687	21 431 185
Electrical work	75 958	58 230	356 591	15 213 602	39 194	39 656	731 760	36 764	18 574	356 591	14 481 842
Subdividers and developers, n.e.c.[2]	17 186	17 019	39 001	5 389 058	12 108	15 271	2 346 543	5 078	1 748	39 001	3 042 515

Source: U.S. Department of Commerce, Bureau of Census, 1982 Census of Construction Industry

Table 3.2.2 Summary Statistics for Establishments With and Witout Payroll by Receipts Size Class: 1982
(thousands of dollar)

Industry	All establishments				Establishments without payroll			Establishments with payroll			
	Number	Proprietors and working partners	All employees**	All business receipts	Number	Proprietors and working partners	All business receipts	Number	Proprietors and working partners	All employees**	All business receipts
	A	B	C	D	E	F	G	H	I	J	K
Construction industries and subdividers and developers	1 389 309	1 089 667	4 275 070	365 420 747	932 608	930 114	40 908 315	456 701	159 553	4 275 070	324 512 432
$10,000,000 or more	4 233	456	1 078 780	132 186 488	150	163	4 465 874	4 083	293	1 078 780	127 720 614
$5,000,000 to $9,999,999	5 558	509	384 138	38 357 518	234	289	1 594 514	5 324	220	384 138	36 763 004
$2,500,000 to $4,999,999	11 344	1 072	449 481	39 457 225	598	691	2 038 368	10 746	381	449 451	37 418 857
$1,000,000 to $2,499,999	31 533	4 143	635 884	48 536 868	2 194	2 361	3 298 986	29 339	1 782	635 884	45 237 882
$500,000 to $999,999	45 860	9 655	489 250	31 983 041	4 643	4 227	3 181 710	41 217	5 428	489 250	28 801 331
$250,000 to $499,999	74 151	25 587	439 204	25 964 624	11 696	10 636	3 992 491	62 455	14 951	439 204	21 972 133
$100,000 to $249,999	159 189	90 829	453 311	25 038 233	45 278	44 611	6 774 319	113 911	46 218	453 311	18 263 914
$50,000 to $99,999	162 283	122 968	187 553	11 488 056	82 646	84 216	5 694 559	79 637	38 752	187 553	5 793 497
$25,000 to $49,999	183 722	158 387	86 261	6 495 566	133 890	134 902	4 667 585	49 832	23 485	86 261	1 827 981
Less than $25,000	711 435	676 058	71 206	5 913 125	651 279	648 018	5 199 909	60 156	28 040	71 206	713 216
$10,000 to $24,999	(NA)	(NA)	(NA)	(NA)	225 580	224 895	3 544 747	(NA)	(NA)	(NA)	(NA)
$5,000 to $9,999	(NA)	(NA)	(NA)	(NA)	160 930	160 100	1 093 333	(NA)	(NA)	(NA)	(NA)
$2,000 to $4,999	(NA)	(NA)	(NA)	(NA)	157 018	156 197	454 078	(NA)	(NA)	(NA)	(NA)
Less than $2,000	(NA)	(NA)	(NA)	(NA)	107 751	106 826	107 751	(NA)	(NA)	(NA)	(NA)

Source: 1982 Census of Construction Industry

Table 3.2.3 Distribution of Establishments Without Payroll Among Major Group of classification

Industry	Establishments without payroll: Percent of total establishments	Establishments without payroll: Percent of all business receipts
General buliding contractor and operative builders	19.4	34.2
Heavy construction general contractors	3.3	5.6
Specialty trade contractors	75.1	45.7
Subdividers and developers, n.e.c.	2.2	14.5

Source: Construction Review, September/October, 1985

Table 3.2.4 Distribution of Employees Among the Top 10 Contractor Classification

Industry	Number of employees	Rank	Percent of all employees
Plumbing, heating and air conditioning	512,004	1	12.1
Electric work	434,764	2	10.3
Heavy construction, n.e.c	415,199	3	9.8
General contractors, nonresidential buildings, n.e.c.	359,856	4	8.5
General contractors, single family houses	309,614	5	7.3
Highways and street construction	212,610	6	5.0
Plastering, drywall and insulation work	199,790	7	4.7
Roofing and sheet metal work	191,489	8	4.5
Heavy construction, water, sewer and utility lines	186,674	9	4.4
Concrete work	157,241	10	3.7
Total	2,979,241		70.3
All other construction industries	1,255,646		29.7
Total employment in construction industries with payroll	4,234,887		100.0

Source: Construction Review, September/October, 1985

Table 3.2.5 Selected Statistics for Establishments With Payroll by Industry Group and Employment Size Class: 1982

Selected statistics	Total	Establishments with an average of— 1 to 4 employees	5 to 9 employees	10 to 19 employees	20 to 49 employees	50 to 99 employees	100 to 249 employees	250 to 499 employees	500 to 999 employees	1,000 employees or more
CONSTRUCTION INDUSTRIES AND SUBDIVIDERS AND DEVELOPERS										
Number of establishments	456 701	284 825	85 449	47 954	27 207	7 090	3 126	694	234	121
All employees**	4 275 070	566 895	559 039	641 525	810 300	482 731	462 999	232 220	157 945	361 415
Payroll, all employees	78 665 661	5 905 956	7 598 384	10 426 802	15 338 967	10 376 185	10 375 793	5 373 963	3 743 507	9 526 103
Construction worker hours (thousands)	5 568 012	672 411	648 808	768 058	1 045 029	677 229	669 864	337 147	237 866	511 596
All business receipts	324 512 432	30 713 287	31 654 781	41 608 127	63 174 062	44 255 187	43 526 164	23 541 687	16 908 665	29 130 469
Total construction receipts	312 178 494	29 727 617	30 590 120	40 258 518	61 070 900	42 717 237	42 104 088	22 578 633	16 294 739	26 836 641
Net construction receipts†	233 267 426	24 307 330	25 057 740	31 808 732	45 734 268	30 776 108	29 264 863	15 318 093	10 802 769	19 027 522
Value added††	145 985 137	13 996 728	14 937 173	19 412 520	28 106 006	19 509 658	18 482 858	9 940 551	6 957 507	14 622 133
Payments for materials, components, supplies, and fuels	96 355 074	10 870 772	10 782 629	13 356 767	19 052 745	12 408 506	11 886 215	10 505 373	(D)	7 492 064
Payments for construction work subcontracted to others	78 911 067	5 330 287	5 532 380	8 359 785	15 336 632	11 941 128	12 839 225	7 260 540	5 401 970	6 909 119
Rental payments for machinery, equipment, and structures	4 511 827	329 433	428 850	590 435	910 392	700 358	700 576	338 342	188 987	324 451
Capital expenditures, other than land	5 222 516	559 279	596 375	729 714	1 040 742	761 777	761 089	389 776	156 520	227 242
End-of-year gross book value of depreciable assets	56 742 668	7 324 985	6 778 633	8 003 272	10 980 396	7 158 798	7 448 517	4 096 217	1 686 822	3 265 024

Source: U.S. Department of Commerce, Bureau of Census, 1982 Census of Construction Industry

Table 3.2.6 Percentage of Subcontracting Within Major Contracting Groups

Industry	Percent of total construction receipts	Percent of industry receipts subcontracted to other firms
General building contractors and operative builders	36.3	49.3
Heavy construction general contractors	21.6	18.8
Specialty trade contractors	41.5	7.5
Subdividers and developers, n.e.c.	0.6	37.2
Constrcution industries, and subdividers and developers	100.0	25.3

Source: Construction Review, September/October, 1985

Table 3.2.7 Percentage of Subcontracting for General Building Contractors and Operative Builders by Employment Size Class (thousands of dollars)

Size class	Total construction receipts	Payments to subcontractors	Percentage of subcontract
1-4	11,831	4,049	34.2
5-9	11,189	4,120	36.8
10-19	14,337	6,115	42.7
20-49	22,854	11,454	50.1
50-99	16,662	8,948	53.7
100-249	15,696	9,225	58.8
250 or more	20,670	11,961	57.9
Total	113,239	55,872	49.3

Source: Construction Review, September/October, 1985

Table 3.2.8 Assets of Corporate Firms in Contract Constrcution and Various Other Industries: 1965

Industry	Number of firms	Total assets (in millions)	Assets per firm
All industries	1,427,606	$1,736,349	$1,316,000
Agriculture	27,582	6,765	245,000
Mining	13,326	19,560	1,468,000
Construction	113,403	26,794	236,000
Manufacturing	186,613	372,583	1,997,000
Transportation and utilities	59,846	187,390	3,131,000
Trade	441,538	126,945	2,875,000
Finance, insurance and real estate	389,634	965,042	2,477,000
Services	188,284	33,727	179,000

Source: Economics of Construction Industry

Table 3.2.9 Construction Receipts for Establishments With Payroll by Location of Construction Work

1982 Total construction receipts	$312,178,494
Construction work done by establishments in the home states	
Number	446,389
Construction receipts	262,458,787
Construction work done by establishments in other states	
Number	78,355
Construction receipts	49,719,707
1977 Total construction receipts	214,844,319

Source: 1982 Census of Construction Industry
Note: in thousands of dollar

Table 3.2.10 Rates of Entry of Firms in Contract Construction and Other Industries

Industry	1946	1951	1957	1962
All industries	190.0	80.4	97.6	90.6
Construction	478.0	143.0	122.0	127.0
Manufacturing	238.0	87.0	75.0	79.0
Services	190.0	72.7	87.6	99.2
Retail trade	152.0	67.5	86.2	83.1
Wholesale trade	216.5	77.1	75.8	76.5
All other	127.4	88.7	88.5	87.4

Source: Economics of Construction Industry

Table 3.2.11 Rates of Discontinuance of Firms in Contract Construction and Various Other Industries

Industry	1946	1951	1957	1962
All industries	64.3	68.0	82.2	81.5
Construction	130.5	116.4	122.4	133.2
Manufacturing	92.0	70.5	87.3	91.5
Services	71.5	63.6	65.4	73.0
Retail trade	49.9	62.0	71.1	78.1
Wholesale trade	54.6	50.3	56.1	61.1
All other	75.5	67.0	67.9	71.6

Source: Economics of Construction Industry
Note:
Discontinuance rate = Number of firms leaving the industry per 1,000 firms in operation

Table 3.2.12 Number and Size of Contractor Failures

	U.S. total		Type of contractors						Const. total	
			Gen. contractor		Bldg. subcon.		Other			
Year	Number	Liab.	Number	Liab.	Number	Liab.	Number	Liab.	Number	Liab.
1976	9,628	3,011	716	262	940	137	114	30	1,770	429
1974	9,915	3,053	714	368	1,023	126	103	33	1,840	527
1972	9,566	2,000	513	92	777	86	85	16	1,375	194
1969	9,154	1,142	626	95	860	59	104	18	1,590	172
1967	12,364	1,265	867	239	1,243	71	151	13	2,261	324

Source: Quarterly Failure Report, Dun & Bradstreet Inc.

Table 3.2.13 Number of Business Failures and Value of Liabilities

	Number of Failures			Liabilities ($ millions)		
Industry	1967	1972	1976	1967	1972	1976
All industries	12,364	9,566	9,628	1,265	2,000	3,011
Mining & manufacturing	1,832	1,576	1,360	326	767	1,122
Const. contractors	2,261	1,375	1,770	324	194	429
Wholesale trade	1,246	965	1,028	136	250	414
Retail trade	5,696	4,398	4,139	333	558	557
Commercial services	1,329	1,252	1,331	145	232	490

Source: Quarterly Failure Report, Dun & Bradstreet Inc.

Table 3.2.14 Causes of 1,770 Construction Failures in 1976

Underlying causes	Percent		Apparent causes	Percent
Neglect	1.0	Due to	Bad habbits	0.2
			Poor health	0.6
			Marital difficulties	0.1
			Other	0.1
Fraud	0.3	On the part of the principals as reflected by	Misleading name	-
			False financial statement	0.2
			Premediated overbuy	-
			Irregular disposal of assets	-
			Other	0.1
Lack of experience in the line	10.9	As evidenced by**	Inadequate sales	43.2
			Heavy operating expenses	15.9
Lack of managerial experience	13.4		Receivables difficulties	15.1
			Inventory difficulties	0.8
Unbalanced experience*	23.4		Excessive fixed assets	2.6
Incompetence	44.4		Poor location	0.6
			Competitive weakness	30.7
			Other	0.8
Disaster	0.9	Such as	Fire	0.1
			Flood	-
			Burglary	-
			Employee's fraud	0.1
			Strike	-
			Other	0.7
Reason unknown	5.7			
Total	100.0			

Source: The Business failure Record 1976, Dun & Bradstreet Inc.

*Experience not well rounded in sales, finance, purchasing, and production on the part of the individual in case of a proprietorship, or of two or more partners or officers constituting a management unit.

**Because some failures are attributed to a combination of apparent causes, the total of these apparent causes exceed the total of the corresponding percent column on the left.

Table 3.2.15 Summary Statistics for Establishments With and Without Payroll by Legal Form of Organization for Industry Groups and Industries: 1982

Industry group, industry, and legal form of organization	All establishments				Establishments without payroll			Establishments with payroll			
	Number[1]	Proprietors and working partners	All employees**	All business receipts	Number	Proprietors and working partners	All business receipts	Number	Proprietors and working partners	All employees**	All business receipts
	A	B	C	D	E	F	G	H	I	J	K
CONSTRUCTION INDUSTRIES AND SUBDIVIDERS AND DEVELOPERS											
All establishments	1 389 309	1 089 667	4 275 070	365 420 747	932 608	930 114	40 908 315	456 701	159 553	4 275 070	324 512 432
Corporations	349 779	-	3 754 159	306 994 011	34 771	-	8 109 488	315 008	-	3 754 159	298 884 523
Individual proprietorships	988 480	988 480	389 284	39 624 579	865 560	865 560	24 040 812	122 920	122 920	389 284	15 583 767
Partnerships	50 593	101 187	124 310	18 369 025	32 277	64 554	8 758 015	18 316	36 633	124 310	9 611 010
Other[2]	466	-	7 416	433 132	-	-	-	466	-	7 416	433 132

Table 3.2.16 Selected Statistics for Establishments With Payroll by Industry, Legal Form of Organization, and Type of Operation: 1982

Item	Number of establishments[1]	All employees**	Payroll, all employees	Total construction receipts	Payments for construction work subcontracted to others	Net construction receipts*	Value added**
	A	B	C	D	E	F	G
CONSTRUCTION INDUSTRIES AND SUBDIVIDERS AND DEVELOPERS							
Legal form of organization and type of operation:							
All establishments	456 701	4 275 070	78 665 861	312 178 494	78 911 061	233 267 428	145 965 137
Corporations	315 008	3 754 068	73 112 458	287 090 189	74 392 970	212 697 236	133 801 900
Individual proprietorships	122 920	389 284	3 519 296	15 307 222	1 724 960	13 582 262	7 921 321
Partnerships	18 316	124 310	1 913 309	9 358 281	2 697 878	6 660 403	4 051 761
Other[2]	466	7 416	120 680	422 802	95 277	327 525	190 155
Establishments of multiunit companies	11 627	1 009 619	25 111 875	97 949 114	29 543 157	68 405 956	45 342 566
Establishments of single-unit companies	445 084	3 265 460	53 553 867	214 229 380	49 367 928	164 861 470	100 622 571

Source: U.S. Department of Commerce, Bureau of Census, 1982 Census of Construction Industry
Note: Amounts in thousands of dollar

3.3 Operational Characteristics

It may be helpful to look at the operational characteristics of the companies in construction industry to better understand industry. By reviewing and comparing the operational characteristics of the companies, some logical grouping of firms by subsectors of the industry is necessary, even though all of the firms do not necessarily fall easily into such neat grouping as many of them (especially the bigger companies) offer services in diverse areas. The five types of firms which will be examined include:-

- -general (residential and nonresidential) building contractors
- -general heavy and highway contractors
- -general process-plant contractors
- -builder-developers
- -electrical and mechanical subcontractors

These five groups do not precisely follow the SIC format for contract construction. However, the categories were modified to more closely reflect the typology actually existing in the industry. We will examine the general operational characteristics of each of five groups and review how these characteristics are reflected to the ENR's Top 400 contractors'listing as this survey also include the list of top 50 design-constructors, top 75 program and construction managers, top 50 general building contractors and top 50 heavy contractors.

3.3.1 The Heavy-Process Plant-Design Contractors

This group of firms engages in the construction of industrial projects for manufacturing industries and electrical utilities. Projects built by firms in this group typically include large and highly technical process plant complexes, such as amnufacturing plants, both fossil-fuel and nuclear power plants and chemical process plants. Probably the most firms do this type of work are design constructors. That is, they do both the engineering and design for the facility, and also perform the construction.

The engineering and design would include economic feasibility studies,master planning and site location studies, construction cost estimates and analyses, and engineering and design. In the construction phase, they may act as the prime contractors for the project, performing a significant percentage of the on-site work with their own forces, or they may act as a construction manager, managing the major prime contractors, in addition to performing the purchasing, inspecting, and expediting fucntions, and assisting the owner through start-up and initial operations.

Most firms in this group consider themselves to be both professional organizations, by virtue of their capability and responsibility in the area of design and engineering, and

construction organizations, in that they perform either the construction or construction management functions. Projects are often undertaken on a turnkey basis, whereby the firm is given total responsibility over both the design and construction phases. Firms in this group will seldom take construction responsibility on a project for which they have not also had design responsibility. In general, this is the only sector of the construction industry in which design-build is clearly the dominant mode.

Projects undertaken by firms in this group tend to be longer in duration, higher in cost, and geographically more diversified than in any other sector of the construction industry. geographical diversification tends to be much more prevalent for firms in this group. Many of them are multi-national operations, and have operating subsidiaries or principal offices in foreign countries. Their multi-national activities account for a significant proportion of their total revenue. Companies in this group take a large portion of ENR Top 400 listing and larger portion in the higher rank group such as top 50.

3.3.2 The General Heavy Constructors

The firms included in this group generally preform very wide range of construction activities as compared to other groups

of firms. The greatest proportion of their work by volume is concentrated in engineering construction, which is a very broad category covering constructed facilities that are not primarily architectural in nature but that involve predominantly engineering projects. Typical project categories built by these firms include highways, bridges, tunnels, pipelines and other types of transmission lines, sewage and water treatment facilities, marine structures and dams and associated hydroelectric work.

Although most large firms in this category have in-house engineering capability, they are not design-constructors. Most of the construction work performed by this group is designed by professional consultants - architectural and engineering firms - retained by the owner or agency responsible to the owner. Firms in this group have traditionally generated the greater proportion of their workload through the competitive bidding system, both in the public and private sectors. As compared to any other group of firms in the construction industry, firms engaged in engineering construction tend to perform a larger percentage of their work for public sector clients, since projects such as dams, hydroelectric facilities, airports, highways, and other facilities of this nature are planned, financed, and owned by governmental agencies.

3.3.3 The General Building Contractors

This category includes those firms that are primarily general building contractors. Projects constructed by this group of firms are for commercial, educational, institutional, light industrial, recreational, residential and public sector clients. Total aggregate dollar volume of work in this category, when the volume of work performed by specialty trade contractor is included, makes it the largest sector in the industry. As a consequence, this category of contract construction is generally considered to be the mainstay of the building industry.

General building construction tends to be the most localized in nature. The geographical market of even some of the largest building constructors is concentrated in a particular region, or a few large metropolitan areas.

The delivery system for general building project follows most closely to what is considered the traditional or normative mode. For the bulk of both private and public sector projects, the work is designed by professional architectural and engineering firms. These firms, under contract to the owner, plan and design the configuration of the project. They then prepare the contract documents - the detailed plans and specifications - which specify the construction materials to be

incorporated into the facility, and frequently the construction methods to be used. For the general building projects, the architect is considered the lead professional, and then either subcontracts with, or uses in-house consultants to design the structural, mechanical, and electrical phases of the project.

It is usually only after the design phases of a proejct is complete that the contractor enters into the picture. Either through competitive bidding, or some form of negotiation, a contractor is selected by an owner, often in consultation with the architect or engineer. Once selected, the contractor, under contract to the owner, then becomes responsible for all activities related to the physical execution of the project: purchasing, subcontracting, overall control of the on-site work, and actual performance of the work by his own forces. In comparison to the other groups of general contracting firms in the industry, therefore, it is the general building contractors who have had the most limited role in terms of their involvement in other than the construction phase. Even during the period of construction activity, the owner more often than not still retain architect or engineer to perform periodic inspection of the work to insure compliance with the contract documents and public regulations, and to verify progress payments.

During the actual construction, most general building contractors subcontract the majority of their work. They normally perform only the concrete work - foundation and superstructures - masonly, and carpentry by their own forces. All of the other work, including the exterior and interior architectural, other types of structural, special foundation, and site work, and mechanical and electrical, is usually performed by specialty subcontractors.

3.3.4 The Builder-Developers

This group of firms, classified as operative builders, builder-developers, or owner-builders, are distinguished not by the types of projects they construct, but by their equity investment in them. By building for their own account, they serve as their own clients, at least for the construction phase and in some cases, throughout the operational life of the structure. These companies, then, fall somewhere between the general contractor on the one hand, and the real estate developer on the other. They are differentiated from the general building contractors, for their equity investment in the project they build, and from the pure real estate developer, by virtue of their construction capability. The building types constructed by these firms generally fall into two areas: all types of residential buildings, from single-family houses to large scale housing development, and nonresid-

ential structures, primarily commercial and light industrial buildings.

3.3.5 Electric and Mechanical Subcontractors

These firms comprise the only category which perform the majority of their work under contract to other contractors, rather than under contract to the owner. However, these two groups of contractors employ 22.4 percent of total construction employment in 1982 (12.1 percent by mechanical and 10.3 percent by electrical contractors), and rated as top two categories among top 10 contractor classification. Since electrical and mechanical work in general building construction can range anywhere from 25 to 40 percent of the total value of the facility, their contribution to the end result is of obvious importance and greater than any other specialty subcontractors. In recent years, with the advent of more sophisticated systems of environmental control, and greater demand for electricity, the value of their work has been closer to the higher end of that ratio. These firms do contract directly with the owner, under certain circumstances. A number of states have statutes which require that separate mechanical and electrical contracts be awarded on publicly financed projects.

Their work cuts across almost every type of general and heavy construction. As specialty subcontractors, they face a diff-

erent set of managerial problems in most of their work, as compared to prime contractors. For one, they do not generally have the responsibility for the general coordination and dtrection of the work among the different trades on a job site, and their work only involves a very few trades. On the other hand, they must work through the prime contractors for such essentials as approvals of shop drawings, changes to work, and the resolution of technical or contractual problems as they contract generally with prime contractors.

As with the case of the general building contractors, very few firms in this group have design-build capabilities. Due to the highly specialized nature of this type of work, however, most firms do possess a reasonable level of technical design competence. This is due to a number of reasons, the most prominant being the lack of detail in the drawings and specifications prepared by professional consultants. Whereas architectural and structural phases of the work, all aspects of the design are generally quite detailed and specific, this is not as often the case with mechanical and electrical phases. More and more often, especially on private work, performance type specifications are written for the mechanical and electrical work, thereby putting some degree of technical design responsibility on this group of subcontractors.

3.3.6 Comparison of the Groups

The similarities and differences in the operational characteristics of these five groups of construction companies have been discussed in the preceeding sections. However, it is interesting to compare another aspect of their operations - the geographic dispersion of the market for each of the group.

Most of the process plant design-constructors derive a significant portion of their business from their multi-national operations. More than any of the other four groups, the business activities of this group are conducted throughout the world, in highly industrialized, semi-industrialized, and developing countries. This is in large measure due to the highly technical nature of their work, the high level of expertise required, and the large number of trained and experienced personnel needed to design and build these large and complex facilities. In contrast, general building construction, which covers a much wider range of types of facilities, can be and is designed and built by architects, engineers, and contractors indigenous to the locality. The only other group in which firms with a significant amount of multi-national operations are found is the heavy-highway group. The market opportunity for these firms is more closely confined to the less developed countries. There are very few companies in the other three groups which can be called a multi-national.

Although some of them had undertaken foreign construction projects on a very limited basis, almost all of their revenues flowed from projects built in the U.S.

ENR's annual survey of Top 400 listing also reports the top 50 in design-construct, top 75 program and construction managers, top 50 general building contractors and top 50 heavy contractors. The constituents of these four groups of companies are considerably different. If we divide the top 400 contractors into 10 groups each consisting of 40 companies by the order of the size of annual contracts, the first 40 (group 1) accounts for 64.4 percent of total contracts of $131 billion by the top 400 contractors in 1984. However, the contribution of group 1 to domestic contracts of 54.7 percent (out of $100.3 billion) is considerably lower than that to total contracts while their share of foreign contract was 96.1 percent of total $30.9 billion international contracts (see table 3.3.1). The larger companies' dependency on foreign work is more conspicuous if we compare the companies within the group 1. The top 10 companies contracted $26.3 billion foreign contracts in 1984 which is 85.1 percent of total international contracts by U.S. contractors. Their dependency on foreign contracts accounted average 48.1 percent in 1984 while that of next 10 largest companies averaged only 9.8 percent. The design-construct market is by and large dominated by large interantional industrial and process plant

builders. This is more visible if we look at the U.S. top 10 contractors. They are all design constructors and they also perform design and construction management services(see tables 3.3.2 and 3.3.3). As the larger companies tend to diversify their services, some of top 10 contractors are also listed in the top 10 general building contractors and heavy contractors (Fluor Corp. is number 2 in general building contracts and number 8 in heavy construction while Bechtel Group, Inc. is number 2 in heavy construction in 1984). However, general building construction and heavy construction are mostly performed by the companies ranked below top 10 (see tables 3.3.4 and 3.3.5).

Table 3.3.1 Distribution of Contracts by Size Groups of Firms (1984)

	Total contracts		Domestic contracts		Foreign contracts		Design-construct contracts [2]		Management contracts [3]	
Group [1]	$ million	Pct.	$ million	Pct	$ million	Pct.	$ million	Pct.	$ million	Pct.
Total	131,227.5	100.0	100,328.4	100.0	30,899.1	100.0	27,317.8	100.0	34,268.8	100.0
1	84,521.8	64.4	54,832.9	54.7	29,688.9	96.1	21,450.5	78.5	25,871.0	75.5
2	13,458.6	10.3	13,112.0	13.1	346.6	1.1	1,896.4	6.9	3,520.2	10.3
3	8,723.9	6.6	7,733.9	7.7	99.0	0.3	1,302.8	4.8	1,435.4	4.2
4	5,892.6	4.5	5,738.7	5.7	153.9	0.5	564.7	2.1	891.9	2.6
5	4,623.6	3.5	4,524.8	4.5	98.8	0.3	525.2	1.9	587.9	1.7
6	3,831.6	2.9	3,830.2	3.8	1.4	0.0	503.3	1.8	741.0	2.2
7	3,230.2	3.2	3,203.2	3.2	27.0	0.1	156.1	0.6	358.4	1.0
8	2,807.5	2.1	2,807.5	2.8	0.0	0.0	337.9	1.2	112.1	0.3
9	2,465.0	1.9	2,431.7	2.4	33.0	0.1	250.8	0.9	494.1	1.4
10	2,122.2	1.6	2,113.5	2.1	8.7	0.0	330.1	1.2	255.8	0.7

Source: ENR/April 18, 1985
Note: 1. Group 1 is top 40 firms; group 2, second 40 firms, etc.
2. Design-construct shows domestic market only.
3. Estimated erected value of CM contracts.

Table 3.3.2 Top U.S. DesignConstructors: 1984

		Design construct (in million dollar)				Top 400	
Rank	Firms	Total	Foreign	Desgn-only	Desgn-CM	rank	Remarks
1	Kellog Rust, Inc.	9,065.0	7,085.0	910.0	6,510.0	1	XXX
2	Fluor Corp.	6,746.6	1,726.5	682.1	5,180.5	2	XXX
3	Stearns Catalytic Corp.	6,084.9	223.8	2,271.6	2,524.2	5	XXX
4	Bechtel Group, Inc.	5,625.0	2,415.0	722.0	3,131.0	3	XXX
5	The Parsons Corp.	5,553.7	1,546.5	4,340.1	1,058.9	4	XXX
6	Raymond Int'l, Inc.	4,515.2	1,717.0	4,324.9	43.2	10	XXX
7	Brown & Root, Inc.	3,323.4	1,251.1	2,664.8	203.0	6	XXX
8	Lummus Crest, Inc.	3,200.0	2,300.0	0.0	0.0	7	XXX
9	Forster Wheeler Corp.	2,649.0	2,120.0	236.0	316.0	9	XXX
10	Stone & Webster Engrg. Corp.	2,280.3	262.6	1,364.0	288.8	8	XXX

Source: ENR/April 18, 1985
Note: Based on design-construct, design-construction management and design only contracts valued at estimated cost of project.
XXX; First X for manufacturing plants, second X for power plants and third X for chemical and process plants.

Table 3.3.3 Top U.S. Program and Construction Managers: 1984
(management contract in millions of dollar)

Rank	Firms	Total	Foreign	Top 400 rank
1	The Parsons Corp.	6,210.0	2,920.5	4
2	Bechtel Corp.	2,845.0	2,627.0	3
3	Kellog Rust, Inc.	2,700.0	2,200.0	1
4	Stone and Webster Eng. Corp.	2,000.0	2,000.0	8
5	Raymond Int'l., Inc.	1,789.3	17.6	10
6	HRH Const. Corp.	1,606.0	0.0	-
7	Gilbane Building Co.	1,598.6	0.0	18
8	Dillingham Const. Corp.	1,260.0	0.0	25
9	Barton-Malow Co.	1,149.5	0.0	20
10	Tishman Realty & Const. Co.	1,011.2	0.0	-

Source: ENR/April 18, 1985
Note: Based on the erected value of construction management contracts for fee only plus contracts where the firm is exposed to financial liability similar to a general contractor.

Table 3.3.4 Top U.S. General Building Contractors
(1984 contracts in millions of dollar)

Rank	Firms	Total	Top 400 rank
1	Turner Corp.	2,120.5	11
2.	Fluor Corp.	1,231.9	2
3.	Jones Group, Inc.	1,011.3	14
4	Perini Corp.	883.3	19
5	Centex-Bateson-Rooney-Golden	861.9	23
6	BE & K, Inc.	773.5	16
7	HCB Contractors	671.0	31
8	CEI Const., Inc.	663.1	28
9	Blount Int'l., Ltd.	624.4	24
10	McDevit & Street Co.	612.8	37

Source: ENR/April 18, 1985
Note: Ranked by value of domestic contracts, excluding construction management contracts, for general building and manufacturing plants. Excludes process plants.

Table 3.3.5 Top U.S. Heavy Contractors
(1984 contracts in millions of dollar)

rank	Firms	Total	Top 400 rank
1	Guy F. Atkins Co.	702.4	15
2	Bechtel Group, Inc.	650.4	3
3	S. J. Groves & Sons Co.	527.0	40
4	Peter Kiewit Sons, Inc.	487.2	27
5	Koppers Co., Inc.	337.8	50
6	Jones Group, Inc.	321.8	14
7	Morrison-Knudsen Co., Inc.	316.9	12
8	Fluor Corp.	308.0	2
9	Granite Const. Co.	292.4	-
10	Dillingham Const. Corp.	274.7	25

Source: ENR/April 18, 1985
Note: Ranked by value of domestic contracts, excluding construction management contracts, for heavy and highway projects. Excludes powerplants.

3.4 Cotractual Arrangements

3.4.1 Type of Cotract

There are three general types of contracts in current use in the construction industry. Although each has its own varients, the types of contracts are:-

-Cost plus fixed fee contracts, which provide for a percentage or flat fee to the contractor over the actual cost of construction. This provides greater safety for the contractor from a financial standpoint; on the other hand, it limits profits.

-Lump sum and unit price contracts, by which the contractor agrees to do work for a fixed lump sum or for fixed unit prices. These methods place substantial risks on the contractor, but offer opportunity under favorable circumstances for greater profits.

-Guaranteed upset price or upper fixed limit of construction contracts, which combine the main features of the lump sum, unit price, and cost plus fixed fee contracts. Under this form of contracts, the contractor agrees to perform the work for a price which includes a stated amount of fee. If the costs of construction exceeds the guaranteed price, the contractor usually absorbs the overrun, but if such cost plus fee is less than the guaranteed price, the savings are shared on a predetermined basis between the contractor and owner.

These contracts place risks on the contractor but permit him an opportunity for greater profits than cost plus fixed fee contracts.

The cost plus fee contract in its simplest form is the antithesis of the lump sum contract because the owner takes very little, whereas in the lump sum contract the reverse is true. In fact, these two kinds of contracts - the lump sum and the cost plus fee - may be seen as the two ends of a scale of risk distribution between owner and contractor as parties to a construction contract (see figure 3.4.1). The three types of contract mentioned above represent the conventional contracting methods. In recent years, however, the relatively high cost of short term financing, run away inflation of costs and other such factors have intensified the need to compress the construction time involved in the traditional methods of contract. To meet these need, new approaches have been developed, some of which are variation of old approaches or application of old approaches to enw situations. The most widely utilized new forms of construction agreements are fast track, design build, and construction management.

-In fast track approach, the relationships among owner, architect and contractor are mostly unchanged from the more traditional approaches. The primary difference is that incomplete construction and specifications are used for the purpose of selecting and contracting with general contractor.

The owner outlines for the architect of his selection of the criteria for the project and architect prepares, in varying degrees of detail, basic design documents, schematics, or outline drawings for various building components. From these incomplete drawings, the contractor attempts to estimate the cost of construction for those items which are detailed as well as for those which are not detailed but indicated. The advantage of this approach is that the design and construction phases are overlapped which greatly reduces the total time from conception to completion but it is only possible by the genuine cooperation among the architect, the general contractor and the owner.

-The design build concept is not new, but its wide spread application to projects of various kinds is relatively new. The basic idea of the design build arrangement is that a single party or group of parties obligates itself to the owner to produce the finished product from beginning to end. Although there are a myriad of variations, the two basic approaches to design build are a design build team by joint venture or design build by sole contractor.

-The construction manager is usually employed as an agent of an owner to work in conjunction with the owner's other agent, the designer, in designing and constructing the work required by the owner. The primary function of a construction manager is to manage construction work for an owner; that is to perform the management function previously performed

by a general contractor. But a competent construction manager can and usually does provide other services during the design phase, and for this reason he should be appointed by an owner at about the same time or before the designer is employed.

3.4.2 Contractual Arrangements

Prices in the construction industry are usually set by competitive bidding or negotiated contract. In the public sector, prices for the majority of construction projects are reached by competitive bidding because of government procurement statutes. These regualtions are designed to prevent political favoritism and corruption in awarding of contracts. Although reliable statistics are not available for the private sector, it is generally acknowledged that most construction is priced by means of a form of competitivebidding. In recent years, however, a growing proportion of private nonresidential construction has been awarded by negotiation between owners and contractors, utilizing several forms of cost plus fee arrangements. Most private residential construction is performed by speculative builders, who build housing units on their own account for resale. Finally, certain types of repair and maintenance work and simple construction tasks are accomplished by force account, that is, with the owner acting as contractor and directly employing the labor. Many features

of pricing process are representative of particular construction submarkets. Following are general contracting practices.

1) Competitive Bidding

Many construction contracts are awarded by means of competitive bidding. In the public sector, the steps are carefully delineated and strictly adhered to, while in the private sector the owner has considerable latitude in setting the rules. Neverthless, the basic features of the bidding process remain the same in both. Detailed plans and specifications are formulated, which are then distributed to interested contractors. In the public sector, statutes usually require that all qualified contractors be allowed to compete for the work on an equal footing, though they may undergo prequalification by the agency securing the bids. In the private sector, the owner can do as he wishes, with the options ranging from an open competition for all interested parties to the restriction of the bidders to a few favored firms. The contractor's activities during the bidding stage are comparable for both public and private buildings of similar complexity. A quantity estimate of the type and amount of materials must be made based on the plans and specifications. The final bids are normally submitted on a lump sum or unit price basis, with the former being used for most projects. Usually, unit

price bidding is called for on projects where the uncertainty about the quantity of materials needed or the labor involved in certain key tasks is particularly pronounced.

A public awarding authority must generally award the contract to the lowest responsible bidder. In contrast, a private owner has autonomy, being bound only by the common law of contracts. However, it is the usual practise for an owner who has restricted a bid list to award the contract to the low bidder. In both the private and public sector, once the award has been made, the contract documents may be completed quickly or may take a few months to finish. In the interim, the owner or awarding authority will usually send the general contractor a letter of intent, giving him notice to proceed. The general contractor must then award the subcontracts as soon as possible, to ensure that the subcontractors will hold to their quoted prices. In several government jurisdictions, statutes require the general contractor to award subcontracts to those specialty contractors that were quoted in the winning bid, but in most states and in the private sector, the general contractor is under no legal obligation to do so.

Virtually all construction projects entail owner initiated changes and extras that occur during the construction period. Once the contracts have been signed, subsequent price changes are the subject of negotiation between the owner and the

general contractor. Design changes often require the reorganization of production tasks, and thus they entail additional costs. In the post award price negotiations, the contractor and owner find themselves in a situation with many characteristics of bilateral monopoly bargaining. Contractor often view design modification as an opportunity to increase profits.

2) Negotiated Contracts

Given the latitude of private owners to adopt any pricing methods, many of them choose to award construction contracts by means of negotiation with one or several contractors. There are three major reasons for this:-

-An owner may contemplate building a project of large size and great complexity. In such a case, he will prefer to hire an experienced contracting firm that possesses a high degree of managerial and technical expertise. Because of the project's complexity and the fact that technology may be changing during the several years of construction, it may be difficult to describe the structure precisely in the plans and specifications at the outset of the project, making the calculation of a lump sum price very difficult.

-An owner may place great weight on the quality of the workmanship that will go into his proposed structure. He may therefore decide to engage the services of a contractor with an excellent reputation for technical competence.

-An owner may be both price conscious and knowledgeable and wish to construct a building that is well defined and simple in design.

Negotiated contracts generally fall into the cost plus category, although occasionally a contractor will negotiate a lump sum price. In most cost plus arrangements, only the general contractor is hired on a fee basis. Subcontract awards are made through the use of a competitive bidding system, with the subcontracting firms bidding at the invitation of general contractor, subject to the approval of owner.

3) Speculative Building

Another exception to the general rule of competitive bidding in private construction is the speculative building. The speculative builders are firms primarily engaged in the construction of single family houses and other building on their own account, for sale to others, rather than as contractors. Typically, a speculative builder will build a few houses at a time and set a price on each house according to what he believes the market will bear. In contrast to many owners who award project to a general contractor on a cost plus fee absis and then rely on competitive bidding for subcontracts, most speculative builders negotiate the prices directly with their specialty trade subcontractors. The fairly standard

and repititive nature of the tasks performed by the specialty contractors appears to be responsible for the lack of a bidding system in the letting of subcontracts by speculative builders.

4) Force Account Construction

The last important category of private construction that does not use a competitive bidding process is a force account work. A substantial amount of construction is performed by an owner with his own forces and not by contract with outside workers. Force account work is ordinarily limited to repairs, maintenance, and simple construction tasks. More complex work involving several specialty trades and/or specialized manpower is usually accomplished by securing the services of specialty contractors, with either the owner or a hired firm acting as general contractors.

3.4.3 Some Legal Aspects in Public Construction

Government at all levels transact most of their procurement business on a competitive bidding basis regulated by statutory requirements. These bidding statutes have several objectives, including: the prevention of collusion among firms and wrongdoing by public official; the placing of all businesses desiring to sell goods and services to the government on an equal

footing; and the securing of goods and services at the lowest possible price consistent with acceptable quality. Since large amounts of public funds are controlled by officials of public agencies, sound public policy dictates that safeguards be instituted to avoid favoritism and fraud. These consideration apply generally to all governmnets activities, but because of the high dollar value of public construction, the application of competitive bidding procedures to public construction projects is particularly important in its impact on the disbursement of public funds.

In awarding of public contracts, government agencies must make certain that their procedures coincide with the broad social policies promulgated by the legislatures. One example of the implementation of such a government policy in the awarding of construction project is the :prevailing wage" requirements that appear as a condition of project awards in federal and in many state contracts. These requirements are in keeping with the dictates of the federal Davis-Bacon Act and the state statutes modeled after it. The Davis-Bacon Act requires that the minimum wages of workmen on a government construction project shall be based on the wages that will be determined by the secretary of labor to be prevailing for corresponding classes of workmen employed for similar work on similar projects in the area in which the work is to be performed. Since prevailing wage rates are heavily influenced by union wage scales in most metropolitan areas, the Davis-

Bacon Act and similar state laws have the effect of underwriting the payment of union wage levels on government projects.

In the same way, public awarding authorities can attempt to exercise leverage in the guarantee of equal employment opportunity on government construction projects. Effecting this goal is considerably less amenable to administrative fiat than the setting of prevailing wage rates since the issue involves the availability of sufficient numbers of qualified minority craftman. Consequently, any attempt to attain equal employment opportunity in construction requires the cooperation of employers, unions, and government, and several different approaches to the problems are being pursued. While it is not ordinarily the responsibility of awarding authorities to formulate or enforce such plans, they can exert considerable influence in encouraging contractor compliance. In this respect, public awarding authorities differ from private owners, who are not constrained to further the goals fo public policy in awarding contracts despite governmental and community pressure to do so.

Filed Subbid Law

Since the most construction projects involve the work of several specialty contractors in addition to the general contractor, the question arises whether government procurement

agencies should try to ensure equal access to public construction work for specialty contractors as well as general contractors. Most statutes at all government levels provide only for single contracts - the awarding of construction contracts to general contracting firms. In the case of single contracts, the general contractor can hold the subcontractors on whom he relied in preparing his bid to their quoted prices while the subcontractors cannot force the winning general contractor to use them on the project. The asymmetry of this structure leads to the practices known as bid shopping and bid peddling. Although single contract awards are the rule in most governmental jurisdictions, several state governments have taken a different approach. Ten states require the submission of filed subcontractor bids. A major intent of filed subbid laws is the prevention of bid shopping by general contractors as a means of increasing their share of the profits at the expense of subcontractors. The filed subbid laws differ in their provisions, permitting varying degrees of latitude on the part of the general contractor in choosing his subcontractors. Three distinctively different statutory bidding procedures can be identified. These alternatives may be represented by the bidding laws in the state of Massachusetts, California and Rhode Island.

Massachusetts has the most complex law, a two tiered system requiring separate competitions for general contractors and

specialty subcontractors. The statutes lists eighteen different categories of subcontract work. The subbidders must submit their bids to the awarding authority approximately one week prior to the closing date of general contractor bids. The sealed subbids are opened publicly immediately after the announced deadline, and a list of the subbidders and their bids is furnished to the general contractors competing for the work. A general contractor must choose one of the subcontractors on the list in each specialty category and carry him at the listed price. There are two additional statutory rpovisions to permit some freedom of choice in this process. First, a subbidder is allowed to restrict his bid from use by a particular general contractor, or alternatively, to stipulate that his bid may be used only by the specific general contractors which he enumerates. Second, a general contractor can refuse to carry a particular subcontractor in his bid, simply because he does not wish to work with the firm even though that firm may be the low bidder. The provision that allows the restricting of a subcontractors' bid to a particular contractor also permits a general contractor to submit a bid in the subcontractor competition if he wants to use his own forces for the work in a specific subcontractor category.

California's filed subbid law is somewhat simpler. Only one bidding competition is jeld, for general contractors. Each

general contractor must list the subcontractors that are to perform work amounting to more than 0.5 percent of his total bid. If the general contractor wishes to perform work in a subcontractor specialty, it must be listed in the appropriate category. As in Massachusetts, the winning general firms must use the listed subcontractors, unless it can be demonstrated to the awarding authority that subcontractor has subsequently become unwilling or unable to perform the work for the price listed in the general contractor's bid.

Rhode Island's filed subbid statute requires only that the general contractor submit a list of his subcontractors after he has received a contract award.

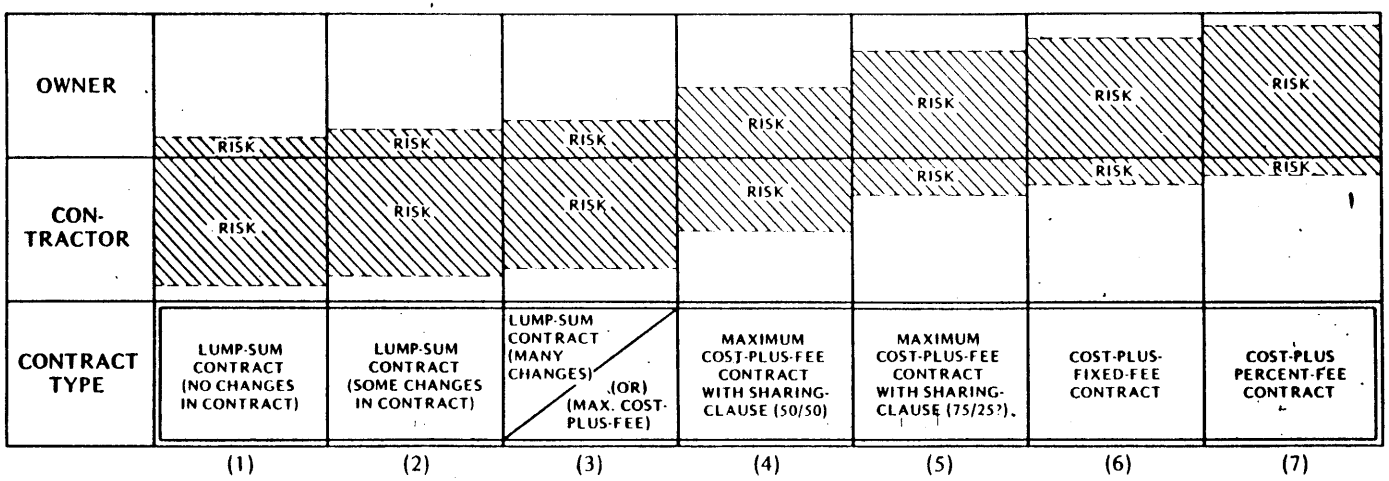
The Separate Contract Statutes

Nine states require the awarding of separate contracts to a general contractor and several specialty contractors - usually including specialties such as plumbing, heating, and electrical work. The separate contract statutes protect a few categories of specialty contractors against bid shopping and bid peddling by granting them prime contractor status, but allow the practices to continue with respect to all other specialty contractors. These laws vary in the particular specialty trades that are protected and in the categories of projects to which they apply.

New York's competitive bidding statutes is illustrative of such laws. It requires four separate bidding competition for building projects whose estimated cost exceeds $50,000. In addition to the general contractor's portion of the work, separate sealed bids are required for plumbing and gas fitting; heating, ventilating , and air conditioning; and electrical work.

New Jersey's bidding statutes permit the awarding authority to accept bids both the single and separate contract systems. The bids are then compared, and the decision to award a single contract or separate contracts depends upon which method result in the lowest overall project bid price.

Figure 3.4.1 A Scale of Contractual Risk Distribution



NOTES

(1) Only slight risk to owner.
(2) Some changes in contract change nature of lump-sum contract and introduce more risk of loss for owner.
(3) Many changes in contract may alter nature of contract and risk distribution considerably.
(4) Theoretical (not practical) distribution of risk about equal (50/50).
(5) Variation in risk distribution depends on many things, including level of maximum cost, distribution in sharing of savings/losses, etc.
(6) Some risk to contractor. (i.e. is fixed fee adequate if scope of contract increases?)
(7) Only slight risk to contractor. (i.e. is percent fee adequate?)

3.5 Labor Relations

3.5.1 Collective Bargaining

The peculiar characteristics of the product, of its pricing, andof firms have major effects on the characteristics of employment in construction. Table 3.5.1 lists several aspects of costruction employment that taken as a whole, cause the construction industry to have a unique place in the U.S. economy. Especially important is the assembling of contractors and subcontractors with various specializations for the building of a aprticular project, with the resulting specialization of the work force and intermixing of the employees fo different employers.

1) The Employers

Most firms hire employees in only one or two trades, although general contractors may hire in as many as five or six trades. The average firm in construction has fewer than 10 employees, and of these most are temporary in that they do not work for a simgle employer for a full year, but move from employer to employer as the availability of work dictates. In order to deal with the union that represents the wirkers in a trade, the employers ordinarily join together in an association. The association is governed by its bylaws and ordinarily

negotiates an agreement with a local union. The associations are not limited to labor relation activities, but also lobby with governmental agencies on behalf of their members, provide legal services, promote constructio, and handle public relations and similar functions. Local employer associations are often affiliated with national bodies.

Because of peculiar economic conditions and characteristics of employment in construction, employers and unions are placed in a much more intimate relationship thqn what is usually found in other industries. Contractors and unions must negotiate not only wages and working conditions, but also hiring and training practices. A special provisions of the National Labor Relation Act permits unions and contractors to sign prehire agreements, by which an employer agrees to recognize a union to represent its employees before it hires employees. Also, in an unstable industry, the development and retention of skilled labor force require that employers and unions agree to practices to preserve the job opportunities of craftmen.

2) Open Shop Segment

Not all crafts, branches of construction, or geographic area are unionized at all or same degree. But all contractors, union or nonunion, are influenced by the labor relations

policies of the others. Wages in the union segment influence what nonunion contractors must pay. Frequently, nonunion wage scales are below union scales, but union workers are often considered better mechanics. The segment of consrtuction industry that is not governed by collective bargaining agreement has usually been pictured as a fringe arround the unioized segment of the industry. However, the segment of the industry outside of collectivebargaining has apparent been growing rapidly relative to a whole industry. Furthermore, significant parts of this segment are becoming structured and its industrial relations formalized - not under labor agreements, but under policies adopted by nonunion employer aasociations. The industrial relations arrangements of construction now operate in three forms, which are in competition for dominance in the future:-

-The system under collective bargaining agreements

-Open shop arrangwments under national or local policies of contractor associations (the merit shop)

-The sector of individual enterprises pursuing policies apart from either collective bargaining or a formal organization of contractors (the truly unorganized sector)

In a sense, the merit shop associations have adopted many of the substantive industrial relations policies and procedures of collective bargaining (such as apprenticeship programs, health and welfare programs, etc.). But decision making is under the control of a local or national employers' associat-

ion without union involvement or praticipation.

The exact proportion of open shop construction activity is not known. There are no reliable statistics on the degree of organization in construction, although superficial surveys are sometimes taken. A relatively larger proportion of contractors than employees is in the nomunion sector (i.e., the average number of workers employed by nonunion contractors is smaller than the average number employed by union contractors). For example, in the housing industry, a major employer association estimates that more than half of the employers are nonunion and some 70 percent or so of all housing is constructed by nonunion builders. Nontheless, many large metropolitan areas have a majority of housing done by union builders. Much industrial and power plant construction are unionized while commercial and office building is more often nonunion. In any cases, less than half of construction employees are represented by unions.

3) The Unionized Segment

The building and construction labor force comprises more than 20 crafts and many more specialties. In the union sectors, a group of 18 or 20 national unions represent workers. Contractors who operate in the unionized segment of the industry are ordinary a party to legally binding collective bargaining

agreements with one or more of the unions of the building and construction trades. These agreements obligate the union contractor to observe in one way or another the work jurisdictions of the various unions. In some branches of the industry, arrangements also obligate an employer to hire employees through a union operated referral system. These two aspects of the unionized sector are absent in the unorganized sector, and constitute major differences between the two. Referral wechanism operated by labor organizations in the construction industry differ widely. In extreme cases, many locals operate no referral system at all, while others maintain an exclusive hiring hall. An exclusive hiring arrangement obligates the contractor, by virtue of his collective bargaining agreement, to hire journeymen only through the union hiring hall, unless the union has been unable to furnish journeymen in 24 or 48 hours depends on the agreements. In any cases, contractor may contact the union as a central source of job applicants, even when no hiring provision exists in the collective bargaining agreement. Regardless of the formal nature of the hiring hall, the union is often a rapid and dependable source of mechanics for the contractor when he moves from the territory of one local into another, and where his labor requirements on a project vary from day to day.

4) The Building Trade Union

In the organized building trades sector of the construction labor force, the primary unit of organization is the interantional union, which is an association of local American and Canadian unions. Groups of locals in various trades participated in the foundation of internationals in order that the standards of the organized portions of the trade not be undercut by unorganized areas. The internationals were founded with the power to issue charters, to organize locals, to combine locals (under normal provisions), and to remove charters. An international labor organization is headed by a general president and a general executive board. Regional vice presidents are elected by the convention of the labor organization which meets at periods of two to five years. The international organization is governed by a constitution adopted and amended by the convention (which is the supreme body of the international union). The general president is normally in charge of the work jurisdiction of the union. The general president rarely takes part in collective bargaining apart from his participation in developing national agreements, and he rarely intervene in the operation of local unions except where matters of general policy are in question. In many international unions, an intermediate structure exists between the international union and local union. Normally, there are regional vice presidents, and perhaps regional

councils, and district councils in metropolitan areas, which may exercise authority in the affairs of the local unions. Representatives of the international unions are stationed in the regions to represent the national officers and to assist locals in collective bargaining and other functions.

Local unions, closest to the rank-and -file membership, owe their existence to charters from the international union, despite the fact that many local unions were formed before international union was formed. The charter of the local union defines both a geographic and work jurisdiction for local. Local unions in the building trades have preserved, for the most part, a considerable degree of autonomy in the conduct of their affairs. The negotiation of collective bargaining agreements, their provisions, and the enforcement of the segments are largely matters of local authority, subject only to general supervision from the international union. The local union usually elects a president and vice president and others, some of whom are salaried, and business agent, who is almost always a fulltime salaried representative of the local union. The roles of the president and the vice president of the local union are generally restricted to internal parliamentary matters. Their roles are less important to industrial relations than that of the business agent, who has perhaps the most critical administrative role at any level of the building trades union organization. The business

agent is a full time salaried official of the local union and elected in every one, two, or three years, depending on the local union. The business agent, along with other officers or an elected committee, represents the labor organization in negotiations with employers and their representatives. He handles grievances on the job site, representing the views of his membership and the interests of the labor organization. He directs strikes, boycotts, or whatever concerted activities are undertaken by the local union; he watches and defend the jurisdiction of the local union from encroachment by other labor organizations or by employers. Business agents attend the international union convention and are to a large extent the constituency of the general president and executive board of the international union. In many respect, the most important function of both business agents and international union officials and representatives is what may be called policing the trade.

5) Structure of Collective Bargaining

The structure of collective bargaining in construction is extraordinarily complex. There is a considerable variation by branch of the industry, geographic location, and craft. There are some 5,000 to 7,000 collective bargaining agreements in the industry, most engotiated between local unions and employer associations. The agreements run for 1 to 5 years

generally include something on training and hiring procedure as well as more usual topics of wages, fringes, and other working conditions. These additional provisions are necessary in construction because the worker is tied to his occupation rather than employer, and thus both contractors and unions often participate in training (e.g., apprenticeship programs), and union refers workers at contractors' request (e.g., through the hiring hall). Even so, these contracts are generally shorter than those in manufacturing, since they can not possibly go into the detail on working conditions that a single company agreement can.

Table 3.5.2 summarizes bargaining structures in various branches of the industry. The only branch in which all trades are involved in negotiations is building construction, and this branch is described in detail in table 3.5.3. In the pipeline construction, each of four trades listed negotiates a national agreement with the pipeline contractors association, and four unions and association maintain a policy committee to resolve disputes. In the industrial construction, the individual companies and an association (The National Contractors Association) negotiate national agreements with the union listed, but the companies also apply, in most instances, many terms of the building agreements generally in effect where a project is located. Table 3.5.3 lists the major national employer associations in the building constr-

uction, the principal unions which they deal, and the usual geographic coverage of agreements. The five trades with the Associated General Contractors (AGC) negotiate are called the basic trades. Electricians, pipefitters, and sheet metal workers are members of the mechanical trades.

6) Jurisdictional Disputes and Problems in Collective Bargaining

Jurisdictional disputes are unavoidable element of an industry in which wage rates and other work conditions are different by occupation and workers are organized into labor unions and craft lines, and production processes and materials are keep changing. The objective of contractors and industry has been to adopt means of handling these disputes and mechanisms for dispute resolution that minimize the disruption fo production and efficiency caused by jurisdictional disputes. Jurisdictional strikes are an unfair labor practice under Labor Management Relation Acts and procedures for handling of such cases by the National Labor Relation Board (NLRB) are spelled out in the act. In adjusting a jurisdictional disputes, the NLRB is required to make a positive assignments of work to a particular craft. But NLRB has little expertise in dealing with jurisdictional disputes and its procedures are lengthy and cumbersome. As a result, contractors and unions have sought to establish a voluntary mechanism within

the industry to adjust these disputes. Federal law always allows the NLRB to dismiss charges of an unfair labor practice when voluntary adjustment is attempted. The most important mechanism for voluntary adjustment currently existing is the Impartial Board for Settlement of Jurisdictional Disputes. Most collective bargaining contracts in construction specify that disputes over work assignment are to be submitted for resolution to the Impartial Board, which is composed of three neutral members and is located in Washington D.C.

There are many problems in the collective bargaining structure and the various reform proposals are being discussed in the industry. The following are the problems in present collective bargaining system identified during the observation presented above:-

-In many localities and branches of the construction industry the geographical scope of bargaining is too narrow. Workers and contractors operate over wider area than before because of modern transportation system and more widespread business competition.

-It could be beneficial to all parties, and be in the public interest to provide separate wages for different branches of the construction industry in some localities and branches of the industry. Such differences prevail in some localities and not in others.

-The machinery for the settlement of collective bargaining disputes in the industry is inadequate. It cannot meet the

requirements of the decentralized and localized structure of bargaining, nor resolve the complex issues that bargaining confronts today.

-The succession of contract termination dates, coupled with traditional rivalries among the crafts, has created a pattern of leapfrogging settlements. Each craft may seek to better the settlements achieved by the other.

-The information available to negotiating parties and their national leaders is often inadequate to the needs of effective problem solving through collective bargaining. Accurate information about manpower availability and future needs is often nonexistent. In the absence of information, collective bargaining may become no more than an argument over the matters that could largely be resolved by the presentation of factual evidence.

3.5.2 Comparison between Union and Nonunion Wages and Labor Management Practices

Managers of construction firms have the right, under U.S. labor law, to unilaterally decide whether they will operate a union or open shop. In contrast to their peer in large manufacturing industries, construction managers may sign prehire agreements with building trade unions to represent their workers, or alternatively, they may hire workers directly and negotiate wages and working conditions individually. Accord-

ing to the survey by Raymond Levitt on union and nonunion construction in 8 metropolitan areas for U.S. Department of Housing and Urban Development in 1976, some interesting points can be identified. In all 8 areas, most of the union firms that responded identified themselves as doing a majority of their work in either commercial/industrial or heavy and highway construction. In contrast, the open shop firms were primarily engaged in residential or commercial/industrial owrk, or both (see table 3.5.4). In all areas surveyed, open shop firms were found to be considerably smaller than union firms doing similar types of constrcution, although there are a few very large open shop firms, both general and subcontractors, in most of the areas surveyed.

Unions tend to dominate the medium-sized projects, whereas nonunion firms are strong in very small and very large-scale construction. The rationale for this is that the small-scale projects are more efficiently performed by broadly trained and utilized workers. The union occupational structure, which breaks all construction tasks down into more than 20 trades is too narrowly specialized for small-scale projects. The union jurisdictional boundaries, if enforced on small projects resulted in standby labor or constant turnover of workers within each craft as their work is completed. Nonetheless, nonunion firms enjoy more flexibility to use and train journeymen on small-scale consrtuction projects - especially on

multicraft tasks such as pouring foundations - with attendants increases in efficiency. At the other end of the size spectrum, multi-billion dollar industrial projects employing thousands of onsite workers permit the economical use of highly specialized workers without standby inefficiencies. In the intermediate size project range - large buildings and heavy construction projects - the union jurisdictions define an occupational breadth that is appropriate to the scale and technological complexity of projects. Union firms are, therefore, able to use their journeymen efficiently. In addition, hiring halls permit union contractors to quickly assemble work crews for individual projects. The combination of these two factors results in a domination of this sector of this sector of the industry by union construction firms, even in parts of the country that have relatively low levels of unionization (see table 3.5.5).

There are considerable variation in skills and productivity of individual journeymen, even though employers were required to pay all the same minimum hourly rate. Contractors respond to this by keeping the most productive journeymen and firing the least productive; despite the myths of the "restrictive hiring hall", union hiring and referral practices are generally described as being flexible enough to permit this. In contrast, open shop contractors vary wage levels on the basis of individual differences in worker characteristics. They

feel this provides a better incentive for workers to become and remain productive. In fact, these two approaches may result in equivalent incentives for workers to become and remain productive, i.e., union firms adjust the worker to the wage, whereas nonunion firms adjust the wage to the worker. The average open shop wage is substantially lower than the union rate in all cases. However, the distribution of open shop wage is generally so wide that the wage level of nonunion leadman or foreman is higher than union journeymen rate for that trade. The substantial differences between union and average nonunion rates may be partially explained by the different types of work performed by union and open shop firms - the former concentrating for the most part on larger commercial/industrial and heavy and highway projects and the latter on residential and smaller commercial work - as well as by union bargaining power. The construction performed by open shop segment of industry is apparently increasing rapidly and this phenomenon can be understood by focusing on various short term and long term conditions and changes in the industry.

In most cases, both types of firms hire through a network of informal contacts maintained by their foremen and key journey men. Open shop firms supplement this by use of various other sources such as newspaper advertisements or local public employment services; union firms rely on the hiring hall,

especially for assembling large crews quickly. As open shop firms have grown in size and activity in various areas, they have come to see the need for a central referral system, both as a means of hiring new workers and in placing those laid off, and local associations of ABC and AGC are operating some referral centers for nonunion workers and member firms.

Table 3.5.1 Characteristics of Employment in Construction

Considerable shift of employees between work sites.
Considerable shifting of employees between employers.
Identification by employee with a craft or occupation, not with an employer.
A relatively large portion of skilled workers.
Much self-supervision.
Very unstable employment opportunities.
Dangerous and often difficult work conditions.
Intermixing of employees of different employers at a single project site.
Construction of nonstandard (i.e., custom-designed) products.
Intermixing of members of different unions at a single project site.

Source: Daniel Quinn Mills, Labor Management Relations, McGraw-Hill, 1986

Table 3.5.2 Branches of Construction Industry, Principal Unions, and Geographic Coverage of Agreements

Branch	Principal unions	Geographic coverage of agreements
Highway construction	Carpenters Laborers Operating engineers Cement masons Teamsters	Local
Pipeline construction	Pipefitters Operating engineers Laborers Teamsters	National
Electrical transmission lines	Electricians (IBEW)	Local
Industrial and power plant construction	Pipefitters Ironworkers Electricians (IBEW) Boilermakers Millwrights (United Brotherhood of Carpenters) Carpenters Laborers	National and local

Source: Daniel Quinn Mills, Labor Management Relations, McGraw-Hill, 1986
Note: For building contractors, see table 3.5.3

Table 3.5.3 Bargaining Structure in Building Construction: Major Employer Associations and Unions

Employer association	Principal unions	Geographic coverage
Associated General Contractors (AGC)	Carpenters Laborers Operating engineers Teamsters Ironworkers (rod workers)	Local or state
National Association of Homebuilders (NAHB)	Carpenters Laborers Bricklayers	Local or state
Mason Contractors Association of America (MCAA)	Bricklayers	Local
National Electrical Contractors Association (NECA)	Electricians (IBEW)	Local
Elevator Constructors Employers Association	Elevator constructors	National (except New York City)
Mechanical Constructors of America (MCA)	Pipefitters	Local
Sheet Metal and Air Conditioning Contractors National Association (SMACNA)	Sheet metal workers	Local
National Erectors Association	Ironworkers (Structural)	Local
International Association of Ball and Ceiling Contractors (IAWCC)	Plasters	Local
National Insulation Contractors Association (NICA)	Asbestos workers	Local
Painting and Decorating Contractors Association (PDCA)	Painters	Local
National Roofing Contractors Association (NRCA)	Roofers	Local
Plumbing, heating, and Cooling Contractors National Association (PHCCNA)	Plumbers	Local

Source: DAniel Quinn Mills, Labor Management Relations, McGraw-Hill, 1986

Table 3.5.4 Percentage of Union and Openshop Employment by Product Market

Area	Union as a percentage			Openshop as a percentage		
	Residential	Commercial/ industrial	Heavy & highway	Residential	Commercial/ industrial	Heavy & highway
Boston	11.0	72.0	17.0	55.0	41.0	4.0
Baltimore	2.0	63.0	35.0	49.0	46.0	5.0
Atlanta	0.6	91.0	8.4	26.0	65.0	9.0
New Orleans	0.5	92.0	7.5	16.0	82.0	2.0
Grand Rapid	1.0	48.0	51.0	48.0	49.0	3.0
Kansas City	7.0	61.0	32.0	68.0	32.0	0.0
Denver	6.0	73.0	21.0	68.0	29.0	3.0
Portland	11.0	72.0	17.0	67.0	24.0	9.0

Source: Raymond Levitt, Union versus Nonunion Construction in the U.S., ASCE Journal of the Construction Division, Vol. 105, C04, December, 1979

Note: Based on the survey of 2560 companies in 8 metropolitan areas

Table 3.5.5 Map of Industry with Rough Assessment of Openshop Activity

Sector	Size		
	Small -$2 mill.	Medium $2-10 mill.	Large +$10 mill.
Residential			
Single family	N	M	M
Garden apartment	N	M	U
High rise	M	M	U
Commercial			
Stores/shopping centers	N	M	U
Offices	N	M	U
Manufacturing	M	U	M
Educational	M	U	U
Medical	U	U	U
Heavy			
Utilities	M	U	U
Transportation	M	U	U
Water/sewage	M	M	U

Source: Raymond Levitt, Union versus Nonunion Construction In the U.S.

Note: U; union N; nonunion M; mixed

CHAPTER 4

COMPARISON BETWEEN U.S. AND KOREAN CONSTRUCTION INDUSTRY

In the preceeding chapters, various aspects of the construction industry in both U.S. and Korea were reviewed. Before jumping into the conclusion, it may be worthwhile to compare a few outstanding characteristics of the industry in both countries. In this chapter, the characteristics of the two countries' construction industry will be compared in the areas of scale and economic characteristics, structure of the industry, mode of operation, market sectors and others.

It is well known that the U.S. construction market is the largest and the most advanced in the world. Although Korea has shown remarkable performance in the international construction market especially in the Middle East, it is still a developing country and the size of the local market is very small compared to that of the many developed countries particularly to U.S. The size of Korean domestic construction market is a little more than $10 billion, and about $20 billion including its overseas construction. As the size of the markets in two countries are dufferent in scale, there should be some generic differences which cannot be compared only by the statistical numbers. However, the comparison based on the statistics may also reveal some meaningful indicative characteristics of the construction industries in both coun-

tries.

Since the U.S. construction market is one of the few promishing markets in the developed region of the world for Korean contractors, it may be helpful if we could compare the statistics of the U.S. as well as other developed countries' construction industry as available. In general, Korean industries have been influenced greatly by the Japanese industries -- the construction industry is not an exception. In the course of comparing Korean construction industry with that of U.S., it may be beneficial to look at the Japanese construction industry as well since Japan has been active in the U.S. construction market for the last few years. In fact, the U.S. has become the largest Japanese international construction market in 1984.

4.1 Scale and Economic Characteristics

According to "Historical Statistics of OECD", the total size of the construction market of OECD countries is about $924 billion in 1983. Among them, the U.S. accounted for $307 billion (33.1 percent), Japan for $215 billion (23.3 percent), total of EEC countries for $249 billion (26.9 percent) and the rest of the OECD countries accounted for $152 billion (16.5 percent). No exact statistics of the size of the construction market for the rest of the world is available but

it is generally estimated to be about $300 billion. The size of construction market in the developed region is overwhelmingly larger than that of the developing countries. Unlike the developing region, however, the market in the developed countries did not attract much attention of international contractors because their demands have largely been satisfied by their own construction capacity.

The contribution of construction industry to nation's GDP is similar in both U.S. and Korea as U.S. construction accounted for 9.4 percent whereas Korea reached 9.9 percent in 1983. However, these numbers are much lower than the average of all OECD or EEC countries. The Japanese construction industry's contribution to GDP is especially high as their number reached to 18.6 percent in 1983 and they used to be higher than 20 percent for the last decade or so (see figure 4.1). The proportion of Japanese construction in their national economy is much larger than that of other countries. Indeed the growth of Japanese construction industry has been sustained by the growth of its economy since World War II. This may explain why Japanese construction firms did not enter the overseas market until recently and still their dependency to overseas market compared to domestic market is much lower than that of other countries.

Construction industry is known to be the one of the most

cyclical in nature among many industries. The housing sector is generally recognized as countercyclical, as this sector is greatly influenced by the government monetary policy. However, the construction industry in general follows the the cycle of overall economy although its amplitude of fluctuation is significantly larger than that of overall economy. In Korea, construction has played major role in their economic development. If we compare the growth rates of GNP and construction in Korea, the growth differentials between these two areas have been fluctuating widely but construction has been growing faster than GNP in general. In the case of the U.S., construction has not kept up with the growth of GNP (see figure 4.2). While the growth of construction industry is behind that of overall economy, the composite cost index of construction industry has been growing faster than that of producer price index and average hourly earning of construction workers.

In 1984, the total volume of U.S. construction was $344 billion of which $313 billion was in the domestic market and $31 billion overseas. This means U.S. construction industry's dependency on international market is about 9 percent although they are number one in international construction. In the case of Japan, their dependency rate is even lower than that. The total value of construction in Korea reached about 16.2 trillion won in 1984 of which 7.4 trillion won was achieved

by overseas construction activities. This means Korean construction depends about 45 percent of their total construction on overseas activities. This percentage is much lower than that of the last 10 years, as their overseas activities have been reduced significantly while the domestic activities have been increased constantly. Korea's heavy dependency on overseas construction may mean that the Korean construction industry has expanded disproportionately over the size of its overall economy. In another point of view, the smallness of Korean domestic market compared to the size of construction industry has made the industry vulnerable to the international market condition.

The U.S. construction industry employs about 5.2 million people which is about 5 percent of the nation's total labor force whereas the Korean construction industry employs 903,000 people in 1984, about 6.3 percent of its total 14 million labor force. The Japanese construction industry employs about same number of people as U.S. Considering the large difference in the value of construction between U.S. and Korea (U.S. construction is more than 15 times larger than Korea's total construction including overseas activity), the number of employed persons of 5.2 million in U.S. is less than 6 times that of Korea. Korea's construction industry is much more labor intensive than that of U.S. and Japan. Aside from the differences in productivity, this might have

caused the fundamental differences in the perception of the industrial pattern.

4.2 Structure of Construction Industry

The construction industry in general is fragmented, being made of a large number of small and specilaized firms. The fragmentation of U.S. construction industry seems to be more noticeable. One distinctive aspect of the fragmentation of the U.S. construction industry is the establishments without employees which accounted for 67.1 percent of all 1.4 million construction establishments in the U.S. in 1982. As a result, 93.8 percent of all the U.S. construction establishments are being operated with less than 10 employees. If the establishments without payroll are excluded from the U.S. statistics, 81.1 percent of all 456,701 establishments with payroll still employ less than 10 employees. These numbers are much higher than comparable numbers of Japan and Korea. Only 54.1 percent of all Korea's 10,602 firms and 50.6 percent of all Japanese establishments of half a million are operated with less than 10 employees (see figure 4.3).

The large number of small firms perform a disproportionately small value of construction. In 1982, establishments in the U.S. with less than 10 employees accounted for 28.2 percent of all business receipts that year. If we count only the

establishments with payroll, the percentage is reduced to 19.2. In case of Japan, firms with less than 10 employees performed 4.3 percent of total Japanese construction. The comparable number of the Korean construction establishments is only 1.0 percent (see figure 4.4). Most of Korea's small firms are basically involved in specialty trade contractors whereas the U.S. and Japanese small firms are either specialty trade contractors or small scale general building contractors. The difference may be due to the presence of the large number of single family housing contractors in the U.S. and Japan. Those numbers are counted in the U.S. and Japanese statistics, but not in Korea as significant portion of the single family housing construction in Korea has been covered by the informal sector of construction (see figures 4.5 and 4.6). The large portion of informal construction sector is a typical characteristic of the construction industry in the developing countries.

On the other end of size scale, a very small number of large firms dominate a considerable portion of construction market of each country. The degree of domination is different by country. In 1982, 4,175 firms with more than 100 employees (0.3 percent of all establishments) accounted for 31 percent of all business receipts in the U.S. The equivalent numbers in Japan were 3,516 firms (0.7 percent of all establishments) and 39.5 percent of all business receipts in 1983. The dom-

ination of large firms in Korea is the most remarkable as 904 companies with more than 100 employees (8.5 percent) accounted for 90.5 percent of all business receipts and 88 companies with more than 1,000 employees (0.8 percent) were responsible for 66.8 percent of business in 1984. In the U.S., the construction market is shared by five different size groups of establishments i.e. the establishments with no employees, with less than 10 employees, with 10 to 49 employees, with 50 to 99 employees and with more than 100 employees as presently sharing 11.1, 17.1, 28.7, 12.1 and 31.0 percent of the market respectively. The Japanese construction industry is represented by two distinctive groups, one with 10 to 49 employees which may be called as medium size firms and the firms with more than 100 employees, and each group shares 49.3 percent and 39.5 percent of 1983 Japanese construction market. In Korea, however, there is no real competition among the different size group of companies as 88 companies with more than 1,000 employees accounted for 66.8 percent of the market and companies with more than 100 employees represented for 90.5 percent of the market. As in other industries, the number and market share of small and medium size companies' in the Korean construction industry is less than what it should be by the standard of other countries. This unbalanced distribution of market share may have been the result of Korea's extraordinarily fast growth of overseas construction. The growth of the large companies have been mostly due to their

overseasconstruction activities. This is a kind of oligopoly and might have helped Korean construction industry competitive in the international construction market as compared to the size of its own construction industry as a whole but this can also mean that Korean construction industry lacks the support from the broad base of small and medium firms.

4.3 Mode of Operation

The top U.S. contractors, especially the top 10 contractors, are the design constructors with expertise in design and construction of process plant and other industrial facilities. As the only sector of the construction industry in which design -build is the dominant mode is process and industrial plant construction, the design constructors (especially for the top 10 contractors) naturally mean the the process and industrial plant builders. Typical characteristics of these firms are geographical diversification. Most of them are multi-national operations, and have operating subsidiaries or principal offices in foreign countries. Naturally they rely large portion of business on foreign markets. Their business activities are conducted throughout the world, in highly industrialized, semi-industrialized, and developing countries. This is in large measure due to the highly technical nature of their work, the high level of expertise required, and the large number of trained and experienced per-

sonnel needed to design and build these complex facilities. The top 10 companies contracted $26.3 billion foreign projects in 1984 which was 85.1 percent of the total international contracts by U.S. firms. Their dependency on foreign contracts averaged 48.1 percent in 1984 (see table 4.1). The top 10 contractor's dependency on foreign contract is now decreasing due to the decrease of international construction and increase of U.S. domestic costruction.

General building construction tends to be the most localized in nature. The geographical market of even some of the largest building contractors is concentrated in a particular region or a few metropolitan areas. Some of high ranking heavy contractors tend to have multinational operations generally in the developing countries. However, they have to compete fiercely with the contractors from developing countries like Korea. A large portion of the top contractors next to the top 10 is composed of the general building contractors and heavy contractors. As mentioned before, these companies are doing most of the business in the domestic market. The dependency on foreign contracts of the second 10 largest companies accounted for only 9.8 percent and the third largest 10 largest companies for 14.8 percent.

The Japanese top ranking contractors are generally specializing in building or civil engineering work or both but few

general contractors do plant construction works except for building or civil engineering portion of the plant construction as there are some companies specilizing this area. The size of the Japanese top 10 contractors are somewhat smaller than U.S. top 10 but larger than the second 10 largest companies (see table 4.2). Since the top 10 U.S. companies are mostly plant constructors, Japanese top 10 contractors and U.S. contractors below top 10 are comparable in terms of type of construction they specialize. In this regard, the Japanese top 10 contractors are bigger in size and somewhat more diversified as they are more vertically integrated.

Except for a few, Korea's top 10 contractors are much smaller in size than their U.S. or Japanese counterparts (see table 4.3). Because the Korean domestic market is small, smaller companies (compare to U.S. and Japanese top contractors) had to go abroad whereas the companies of similar sizes in U.S. and Japan stay in the domestic market unless they can offer some differentiated services. Although they were not equipped with high level expertise and experiences, they could be competitive in infrastructure construction which they had accumulated substantial experiences through the domestic construction. Since the mid 1970s, there was plenty of demand for infrastructure work in the Middle East and they could also bring their own inexpensive and well disciplined labor force there which was not normal in other international construct-

ion market. As a result, more than 80 percent of Korea's overseas construction was achieved by the building and civil engineering projects. Although Korea's top contractors have constructed some sizable plant facilities and accumulated considerable experiences in the plant construction, they are primarily the general building and heavy contractors and their strength is in the construction of buildings and civil engineering projects. This means the characteristics of top Korean contractors are similar to that of Japan although Korean companies are more flexible in scope of services. However, the size of the top Korean contractors are smaller than comparable U.S. top contractors unlike the case of Japan. However, the size of business receipts alone can not fully explain the strength of the contractors as general building contractor's localized nature. There are many general building contractors of smaller size in terms of total business receipts than top class Japanese or Korean general contractors, who can provide much more efficient and comprehensive services as the concentration of their business in the certain locality.

As mentioned in the previous chapters, Korean contractors tend to be maintaining more self-contained structures as they lack the support from the broad base of small and medium firms, and other related industries due to lack of research and industrial substructures. Whether the vertical and hor-

izontal diversification caused by this industry's structural deficiency will work favorably in the U.S. market remains to be seen.

4.4 Labor Relations

Labor union activity in the Korean construction industry, like most of the other industries, is virtually not existent. There is no concept of trade unions in Korean consrtuction industry. The prevalent types of union is a union of all trades in the company. However, the union activity, if it exists, is only nominal and severely limited. They cannot go on strike under present labor regulations. Instead of labor unions, there are some alternative mechanisms called labor-management committees that are being operated, but their activity is very limited. In this regard, there are not enough mechanisms in the Korean construction industry (industry in general) for resolution of workers grievances. In other words, Korea's management, instead of its workers, are working in a very protected environment. This environment provides the managements great flexibility in business operation. The operational characteristics of the Korean construction companies, though not a union, are much different from that of open shop companies in the U.S. Although open shop companies in the U.S. are being operated without unions they are significantly influenced by the union shop.

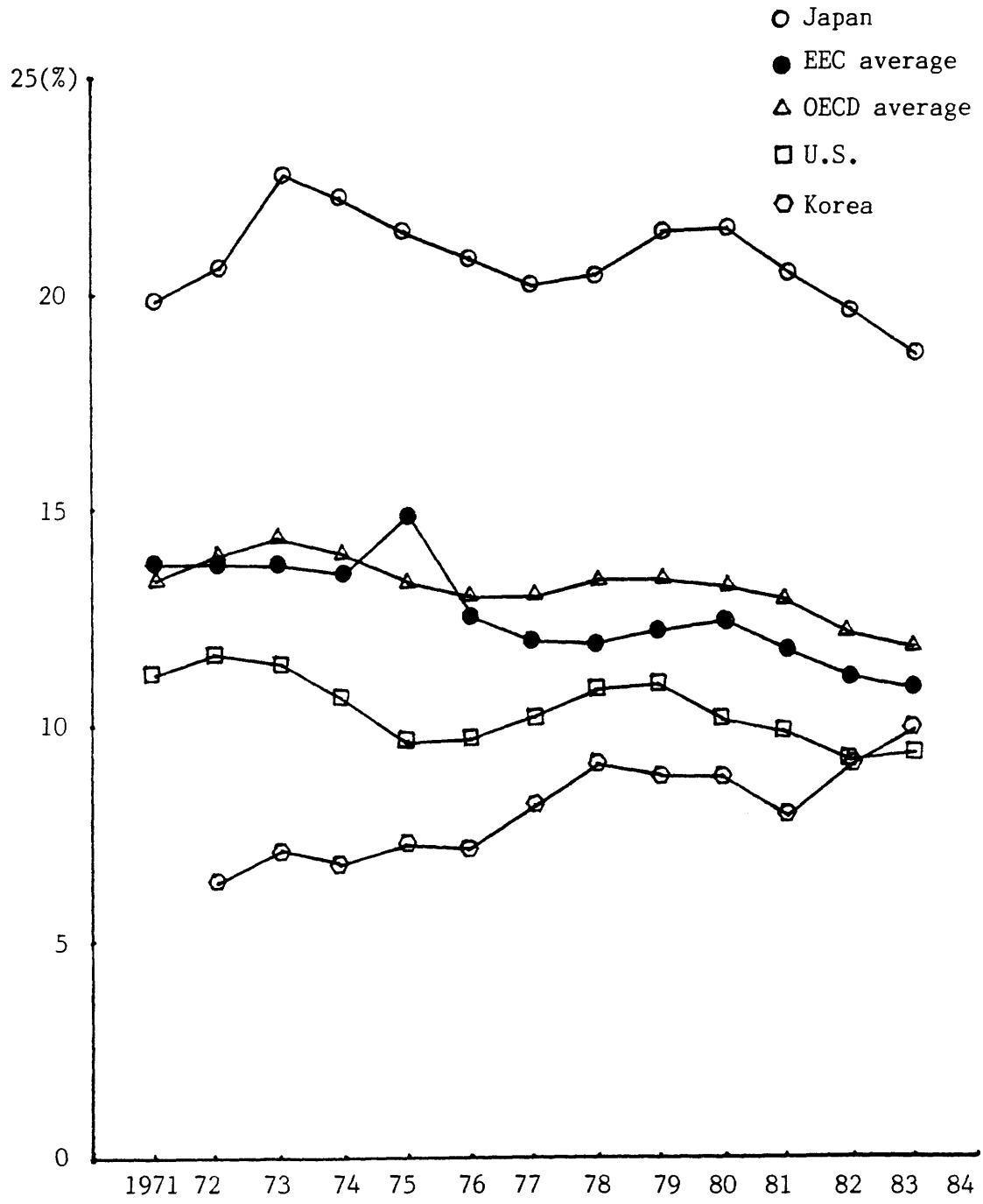
In many ways, they are in competition with each other. The presence of both union and open shops provides an ideal check and balance for the operation of construction industry in general. As this mechanism does not exist in the Korean construction industry, there is some room for unacceptable labor practice of Korean construction industry by the American standard. Nonetheless, the absence of union activities in Korea has contributed, to some extent, the competitiveness of KOrean contractors in the international construction market. By this reason, Korean management is, by and large, not familiar with the concept of the collective bargaining. This can be one of the important disadvantages for Korean contractors in managing the projects in the U.S. if they get the projects.

4.5 Market by Sectors

In the U.S., the share of private construction is increasing constantly while that of the public construction is decreasing. In 1984, only 17.6 percent of total new construction was for public sector while the remaining 82.4 percent was for private sector construction. The size of U.S. private residential construction market is impressive as it accounted for 46.4 percent of total construction. In Japan, the portion of the public construction is larger than that of U.S. accounting for 39.7 percent of the market but the private

sector is still the dominant market. In Japan, the public sector's contribution to civil works is remarkable as it accounted for 30.6 percent of the total construction in 1980 whereas the public sector's contribution to the residential buildings was negligeable. The domination of private sector construction is typical in construction market of industrial market economy. As the private residential construction's share of the market is significant and the mortgage is the primary source of financing in this sector, the government monetary policy can impact greatly on the market mechanism. Unlike the U.S. and Japan, the larger portion of the construction market is taken by the public sector in Korea. In 1984, the public sector construction accounted for 51.4 percent of total value of construction. Among the public sector, the share of the public corporation is significant accounting for 17.9 percent of total construction. Instead of market mechanism, the government's direct leverage in construction market is greater in Korea (see figure 4.7).

Figure 4.1 Construction as a Percentage of GDP for Various Countries



Source: OECD, Historical Statistics, Paris, 1985
The Federation of Korean Industries, Korean Economic Yearbook, 1985

Figure 4.2 Annual Growth Rates of GNP and Construction

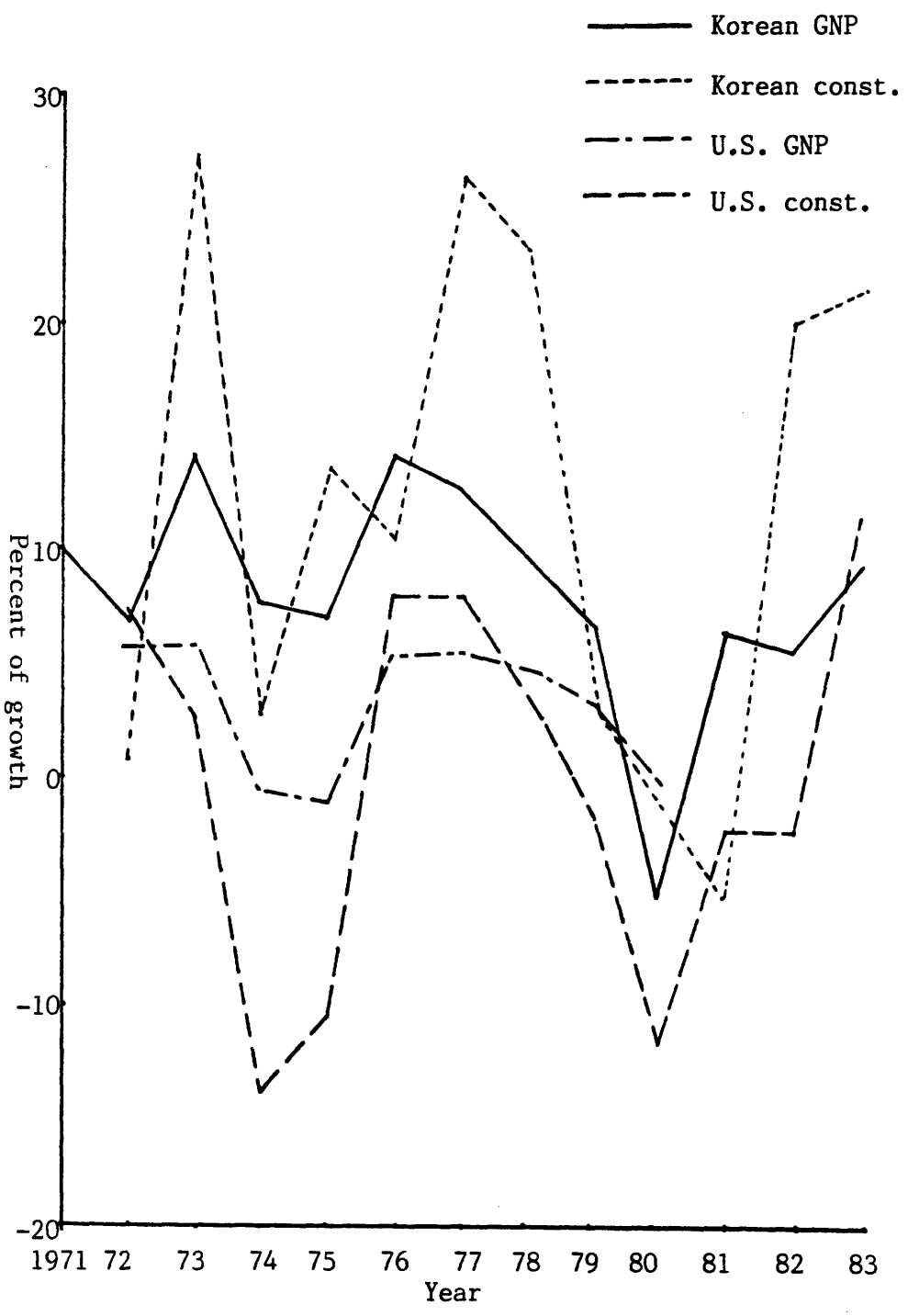
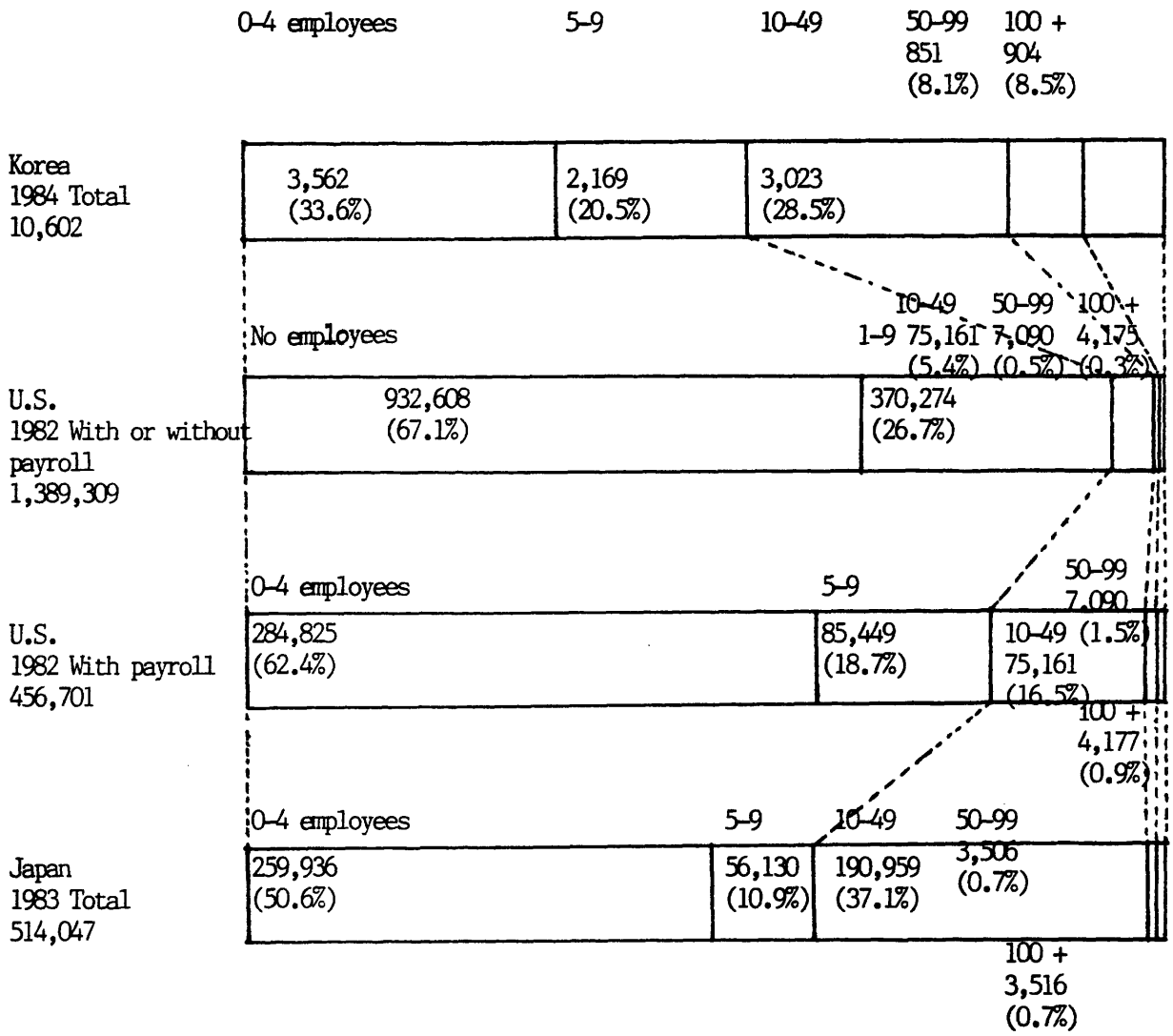
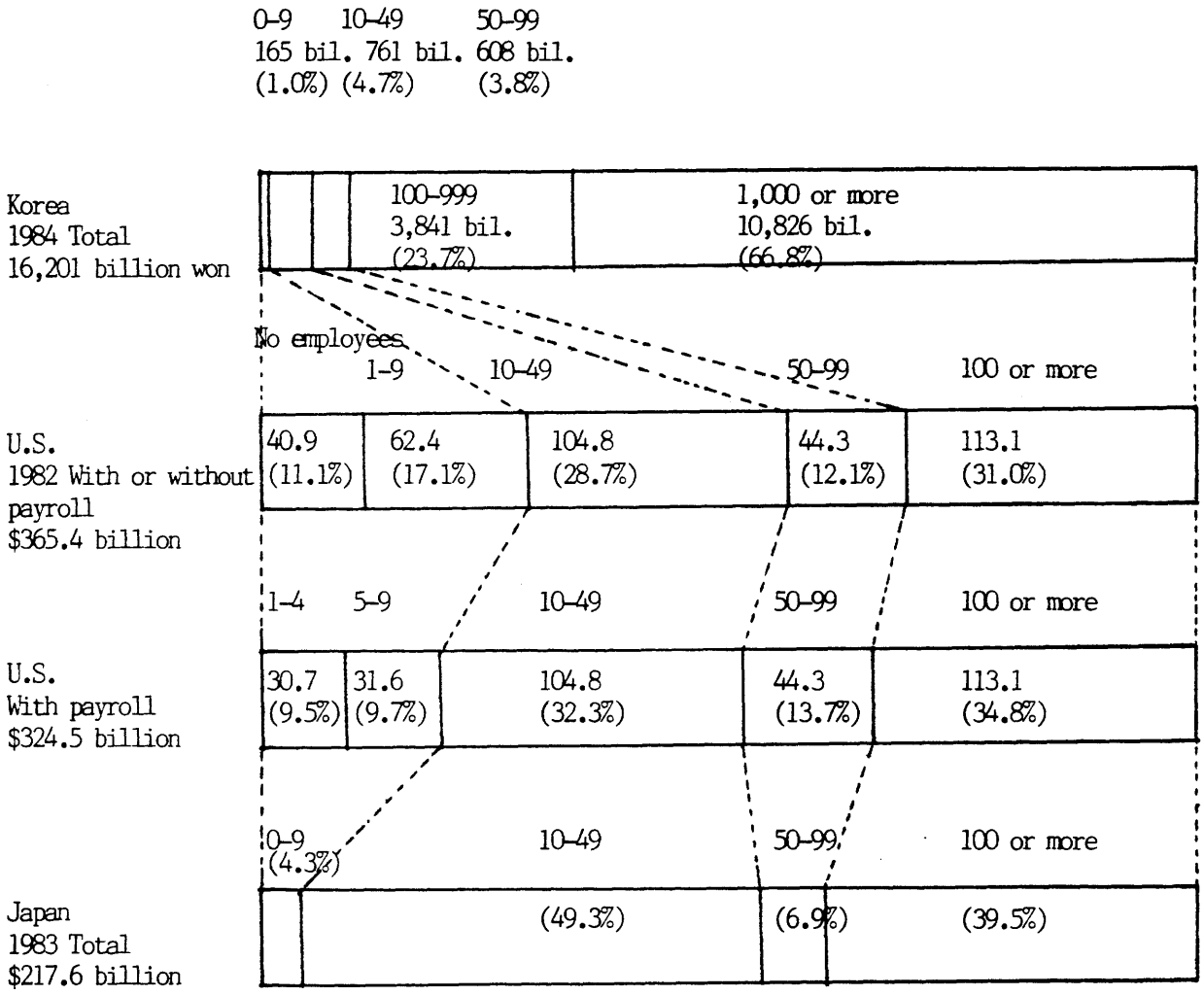


Figure 4.3 Number of Establishments by Employment Size Class



Source:Source: 1984 Report on Construction Work Survey, EPB of Korea, 1985
1982 Census of Construction Industry, DOC of U.S.,1985
Survey of Construction Statistics, Ministry of Construction Japan, 1985

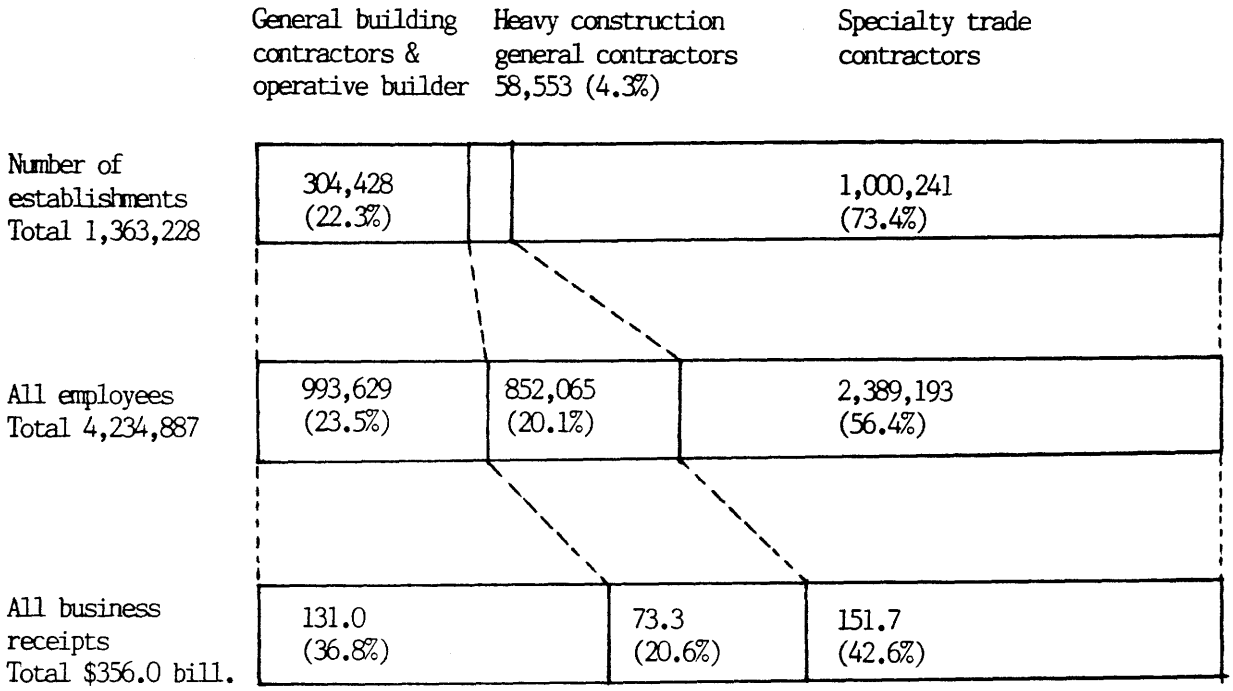
Figure 4.4 All Business Receipts by Employment Size Class



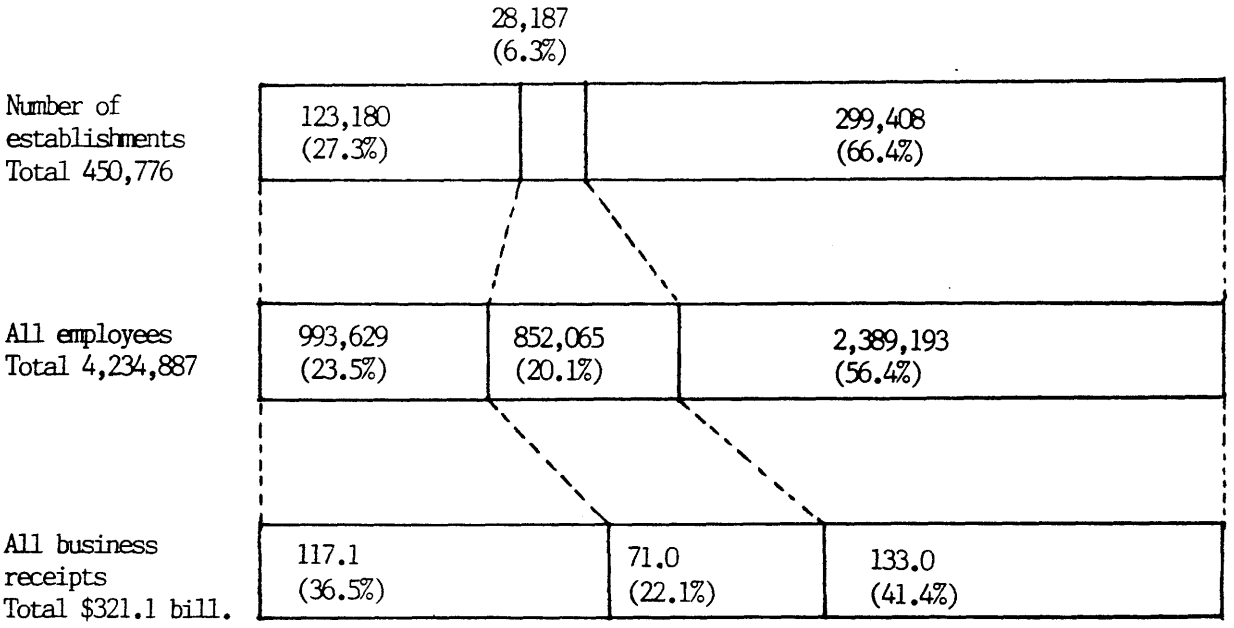
Source: 1984 Report on Construction Work Survey, EPB of Korea, 1985
1982 Census of Construction Industry, DOC of U.S.,1985
Survey of Construction Statistics,MOC of Japan

Figure 4.5 Establishments by Type of Works in the U.S.(1982)

Establishments with or without payroll



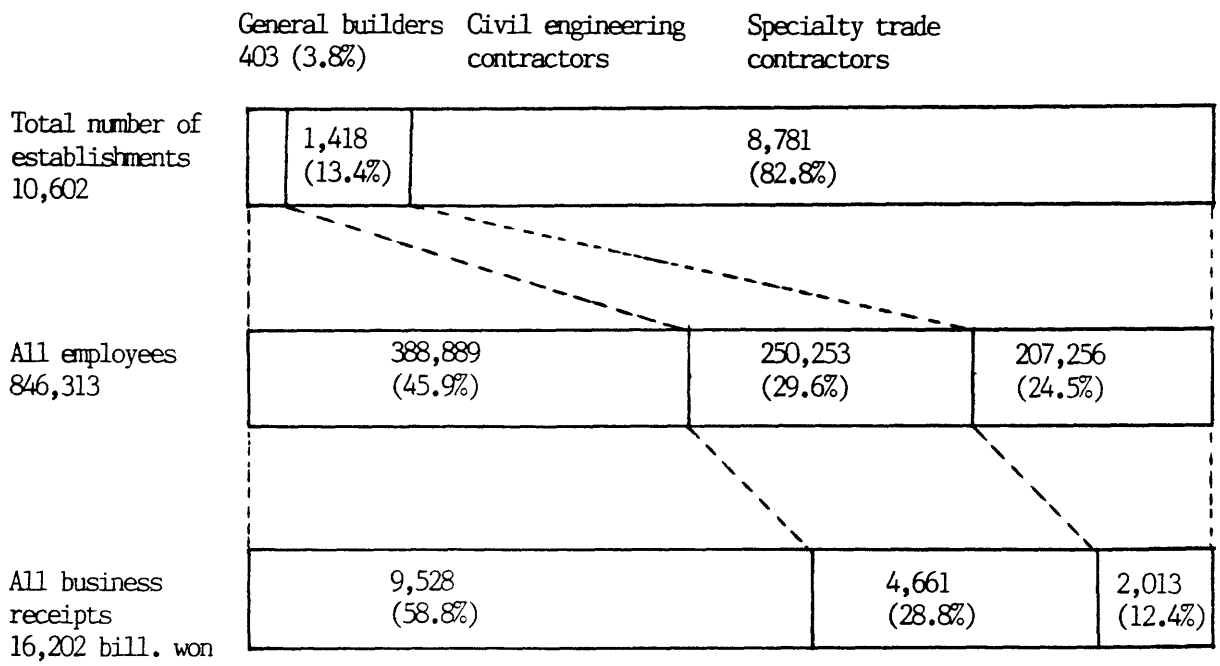
Establishments with payroll



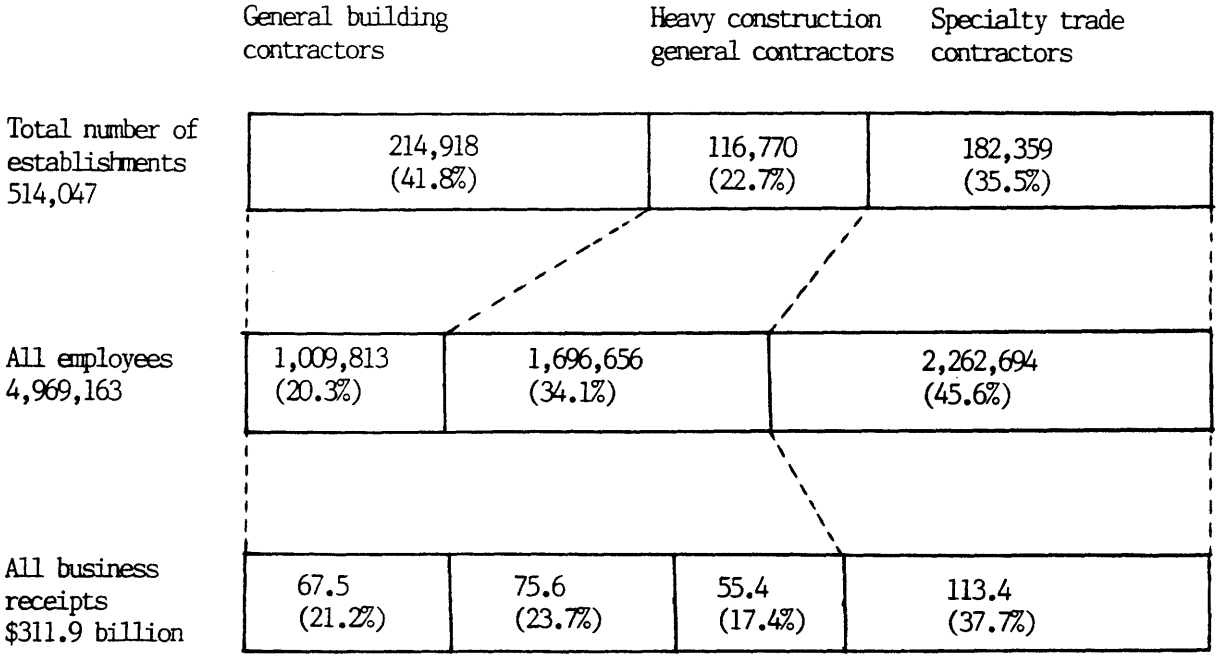
Source: 1982 Census of Construction Industry, U.S. Department of Commerce, 1985

Figure 4.6 Establishments by Type of Works in Korea and Japan

Korea(1984)



Japan (1983)



Source: 1984 Report on Construction Work Survey, EPB of Korea,1985
Survey of Construction Statistics, Ministry of Construction of Japan

Table 4.1 Top U.S. Contractors: 1984
(millions of dollars)

Rank	Firms	Total contract	Percent of foreign
1	Kellog Rust Inc.	10,855.0	79.5
2	Fluor Corp.	8,353.3	18.3
3	Bechtel Group Inc.	8,220.0	59.7
4	The Parsons Corp.	7,514.7	40.1
5	Stearn Catalytic Corp.	4,932.3	11.1
6	Brown & Root Inc.	3,883.9	33.2
7	Lummus Crest Inc.	3,200.0	71.9
8	Stone & Webster Engineering Corp.	2,923.2	69.0
9	Foster Wheeler Corp.	2,413.0	80.1
10	Raymond International Inc.	2,347.3	6.0
11	Turner Corp.	2,154.0	1.5
12	Morrisson-Knudsen Co., Inc.	2,086.7	22.2
13	Ebasco Service Inc.	1,580.5	8.5
14	Jones Group Inc.	1,535.4	0.2
15	Guy F. Atkinson Co. of California	1,498.7	25.6
16	BE & K Inc.	1,255.0	0.0
17	Dravo Corp.	1,231.7	30.6
18	Gilbane Building Co.	1,149.1	0.0
19	Perini Corp.	1,139.3	43.4
20	Barton-Malow co.	1,126.2	0.0
21	Walbridge Aldinger Co.	1,021.6	36.8
22	George A. Fuller Co.	1,021.6	27.8
23	Centex-Bateson-Rooney-Golden	1,014.0	0.0
24	Blount International Ltd.	1,006.3	1.5
25	Dillingham Construction Corp.	860.9	33.5
26	McCarthy	805.0	1.7
27	Peter Keiwit & Sons' Inc.	776.2	14.0
28	CEI Construction Inc.	753.5	0.0
29	Hubber, Hunt & Nichols Inc.	748.4	0.0
30	Ford, Bacon & Davis Inc.	729.0	25.5

Source: ENR/April 18, 1985

Table 4.2 Top Japanese Contractors: 1985
(millions of dollar)

Rank	Firms	Total contract	Percent of foreign
1	Taisei Construction	4,191.9	6.8
2	Kajima Construction	4,034.9	6.9
3	Shimizu Construction	3,998.0	8.9
4	Ohbayashi-Gumi	3,317.4	5.3
5	Takenaka Komuten	2,971.7	7.4
6	Kumagai-Gumi	2,660.1	21.0
7	Fujita-Kogyo	1,893.6	5.1
8	Hazama-Gumi	1,540.0	17.2
9	Toda Construction	1,488.5	2.8
10	Tobishima Construction	1,362.3	4.3
11	Maeda Construction	1,360.2	4.2
12	Nishimatsu Construction	1,228.1	13.6
13	Goyo Construction	1,186.4	32.1
14	Tokyu Construction	1,170.5	4.7
15	Sato-Kogyo	1,167.1	11.0
16	Mitsui Construction	1,064.5	2.0
17	Kohnoike-Gumi	990.7	1.8
18	Okumura-Gumi	981.8	1.3
19	Sumitomo Construction	837.6	2.9
20	Hasegawa Komuten	837.1	0.0
Top Japanese Design-Constructors; 1985			
	Chiyoda Chemical Const.	1,321.6	82.0
	Nikki (JGC Corp.)	1,313.6	58.0
	Toyo Engineering Co.	747.9	86.0

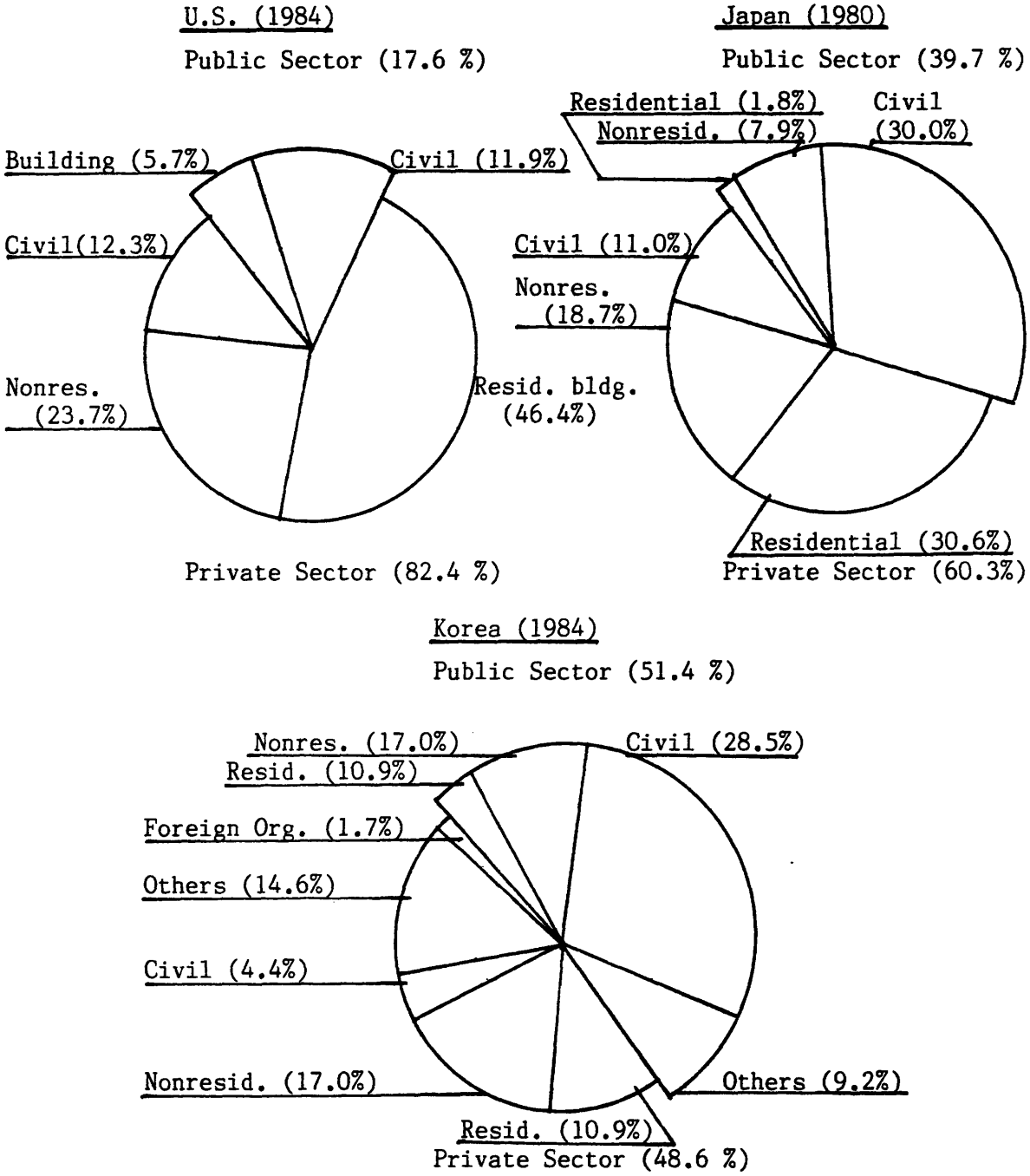
Source: Yoshimitsu Nakamura, Construction Industry, Kyoiku-sha, Tokyo, 1985
Japan Company Handbook, Toyo Keizai Shipo Sha Ltd., Tokyo, 1985
Kensetsu-Kogyo Shinbun, June 28, 1985
Note: Exchange rate; $1 = 231.0 yen (average in 1985)

Table 4.3 Top Korean Contractors: 1984
(millions of dollar)

Rank	Firms	Total contract	Percent of foreign
1	Hyundai Engineering & Construction	3,016.8	82.6
2	Daewoo Corp.	1,056.0	64.1
3	Daelim Industrial	924.0	80.3
4	Hanyang Corp.	856.4	51.0
5	Samsung Construction	445.0	52.6
6	Samwhan Corp.	392.4	49.5
7	Lucky Development	367.7	54.0
8	Korea Development Corp.	322.2	58.9
9	Hanil Development Corp.	296.9	58.7
10	Samho International	295.6	49.5

Engineering News Record, July 18, 1985

Figore 4.7 Structure of Construction Market



Source: 1984 Report on Construction Work Survey, EPB of Korea, 1985
Construction Review, Sept/Oct. 1985, U.S. Dept. of Commerce
Survey of Construction, Ministry of Construction of Japan, 1985

CHAPTER 5

SUMMARY, STRATEGY IMPLICATION AND RECOMMENDATIONS FOR FURTHER RESEARCH

The construction industry in developed countries has grown relatively fast since World War II with the demand created as a result of war and rapid modernization of industry as well as society. The construction capacity developed during this period became greater than the demand during the past 20 years. This excess in capacity has been mostly absorbed by the developing countries where the demand has largely exceeded the capacity of the local construction industry in both physically and technologically. The excess demand came from the economic development of the developing countries and this demand was further accelerated by the oil shock which enabled the countries in the Middle East accumulate a large amount of investment resources. For the past few years, however, the demand from the developing countries especially from the Middle East has been reduced significantly. This decrease is mainly due to the decrease in construction demand from the Middle Eastern oil exporting countries which accounted for more than one-third of the international construction market. This lessened demand is due primarily to in oil prices. The large excess capacity of construction in the developed countries which cannot be absorbed fully by the market in the developing countries is bound to spill over

each others market of the developed countries. To sell the products or services to the saturated market, seller must have comparative advantages backed up by the differentiated services or products with competitive price. Higher productivity and differentiated products can be achieved by the development of new materials, innovative management or technology.

The U.S. market is not viewed as an easy pickings by any means, with its confusing array of building codes, government regulations, labor laws and traditions. But because it is viewed as a huge, and stable market, many international contractors tried this market and succeeded. In 1984, 66 of the international contractors performed $5.9 billion worth of work in the U.S. It is a significant increase from 1983's $3.6 billion by 35 contractors. Europeans by far the greatest share of the U.S. work going to overseas firms but the performance of Japanese firms was also impressive as contracting $0.8 billion which made U.S. the largest Japanese overseas construction market.

Throughout the previous chapters, a number of issues and characteristics of construction industry in both U.S. and Korea have been reviewed and compared. Many differences as well as similarities have been observed. In this chapter, what what have been observed and discussed will be summarized.

Then the conclusive implications on how the Korean international construction industry should do to participate and contribute in the markets of the developed countries especially that of U.S. will be presented. Since all the aspects of the related subjects cannot be accommodated in this thesis, some of the interesting areas are left for the further researches.

5.1 Summary of Construction Industry in Korea and U.S.

5.1.1 Korean Construction Industry

Korean construction industry has grown and contributed much to its national economy with the help of the factors unique to Korea such as: rehabilitation from the war destruction; construction of U.S. military projects in Korea; large construction demand for the economic development mostly financed by the foreign agencies. These factors contributed to the growth of Korean industry greatly. The growth of construction industry in turn contributed much to its national economy. These strengths of Korean construction industry grown domestically worked well in the Middle Eastern market as:-

-The unprecedented magnitude of demand for building and infrastructure construction which Koreans are familiar with

-Middle Eastern countries, though rich in financial resources, were largely in short supply of resources such as skilled manpower, technology and management capability for cons-

truction

-On the other hand, Koreans were able to provide their surplus resources which could ideally supplement what Middle Eastern countries needed such as, labor force, technical and managerial capability in very economical term.

This was a very unusual setting in favor of Korean construction industry. The Korea's competitive advantages in this market was further backed up by the Korean government which needed foreign currency to ease the current account deficit. However, their competitive advantage brought limited success in other regional market as the characteristics of the markets were different from that of unique Middle Eastern market, such as:-

-There existed a cheaper labor and many restrictions to the entry of foreign labor

-Unlike Middle Eastern countries, they are mostly capital poor developing countries requiring competitive financing packages as well as technical assistance to local establishments

-More technology intensive projects are offered for the international contractors

As oil price started to decline, so did the demand for international construction particularly from the Middle East. Koreans were one of the hardest hit from this reduced demand from the Middle East as:-

-Excessive concentration of the overseas construction activities in the Middle East.

-Excessive dependency on the low technology content project, such as building and infrastructure works while the infrastructure constructions were nearly complete in some countries in the Middle East.

-Excessive dependency on overseas construction as international construction accounted more than a half of Korea's construction. Furthermore, the following factors have worsened the performance of Korean international construction:-

-Increasing localization of the construction activities by the ordering countries.

-Challenge from other developing countries with the lower wage levels than that of Korea.

These challenges are mostly in the building and infrastructure construction area which Koreans are considered competitive. Moreover, the nature of international construction is shifting to high technology content projects but Koreans are not well equipped to switch their market to the construction of the high technology content projects. Other issues presently facing the Korean construction industry include:-

-Lack of basic engineerig skills although the capacity to do detailed engineering has increased substantially.

-Lack of financing capability.

-Lack of backward linkages with domestic suppliers of materials and equipments in international construction.

However we can still identify several demonstrated strengths of the Korean construction industry which include following:-

-Although Koreans are not particularly competitive in the plant construction, they are still maintaining the strength in the building and infrastructure construction.

-Their basic design capability still remains in the earlier stage of development but they have established a substantial strength in the detailed engineering area.

-Compared to the engineering and management in the developed countries, the wage levels for technicians, engineers and managements are much lower in Korea - even after adjusting for skills and productivity differences.

5.1.2 U.S. Construction Industry

U.S. is the largest construction market in the world. The new domestic construction put in place amounted to $314 billion in 1984 and probably reached close to $400 billion if the maintenance and repair constructions were included. However, the U.S. construction market is different in many ways from other regional markets and those differences include:-

-Unlike other regions, it is the most developed country and itself is the leader of the international construction.

-Its construction technology is the most advanced.

-U.S. is the dominant force in engineering and construction management in international construction market although its

leadership in technology seems to be deteriorating in recent years.

-Although the local labor is expensive, bringing in the low wage labor from foreign countries is not permissible under present immigration regulation.

-The existence of labor union and its influence on nonunion sector.

-Numerous and confusing building codes and regulations.

U.S. construction seems to have grown fast in recent few years since 1982, but has grown slower than GNP in constant price for the past 20 years. However, the construction cost has grown faster than the construction material price and wage. Although the average earning of construction workers hasgrown slower than that of manufacturing, unit labor cost has increased probably due to the declining productivity. There are some questions, however, about whether the productivity is realy as low as reputed because of the difficulty of measuring this index with accuracy. Even though we accept the most of the arguments about the reliability of productivity indexes, still those arguments cannot fully account for the decrease in productivity. The economic conditions of the construction industry and the financial performance of firms in the industry are to a large extent depend upon the factors external to both industry itself and to construction process. The wide fluctuation in market demand exists for a number of

economic reasons; variety of demand composition, conditions in the capital markets, the states of the national economy, the seasonal nature of construction and the local nature of the markets. This coupled with the impact of the government, in its role as economic policy maker, purchaser, and financier of construction, creates a climate of economic in all sectors of the industry.

The fragmented nature of construction industry is the most visible in the U.S. More than 90 percent of 1.4 million establishments in construction industry is operating with less than 10 employees. However, this figure can be misleading as this number include 930,000 establishments without employees which is equivalent to 67 percent of total number of the construction establishments. This is one of the unique features of the U.S. construction industry and should be considered specially if we compare the U.S. construction industry to that of other countries. With the fragmented nature of the industry, the small number of large firms account for the considerable portion of the market. However, the market is distributed in a more balanced manner as compared to that of Korea as U.S. market is shared by the five different size groups of establishments.

Contractors are generally classified into three categories such as the general contractors, heavy and highway contract-

ors, and specialty trade contractors by specialization. We have divided the general contractors further to the general building contractors and general process plant contractors for the convenience of comparison. The general process plant construction is the only sector of construction industry in which design-build is the dominant mode. Most of the large process plant design-constructors derive significant portion of their revenues from their multi-national operations. A large proportion of the business activities of this group are conducted throughout the world, in industrialized and developing countries. This is a large measure due to the highly technical nature of their work, the high level of expertise required, and the large number of trained and experienced personnel needed to design and build those large and complex facilities. U.S. is a dominant force in this field in international construction market and the top 10 U.S. construction companies are all in this category. In contrast, the general building contractors, which covers a much wider range of types of facilities, can be and is designed and built by architects, engineers and contractors indigenous to the locality. The general building contractors subcontract the majority of their work. The share of work subcontracted to others tend to increase with the size of the establishments. In this group, the locality of the contractors play a significant factor to the competitiveness as local contractors have better local business contacts and better knowledge of

local construction labor market. Furthermore, the variations in building codes and lack of reciprocity among jurisdictions in licencing requirements help the geographic concentration of the general building contractors. A large portion of heavy construction work by nature is for public sector construction. Firms in this group have traditionally generated the greater proportion of their workload through the competitive bidding system, both in the public and private sectors. Although most large firms in this category have in-house engineering capacity, they are not design-constructors as the design works of heavy construction projects are mostly done by the professional engineering firms retained by the project owners. They do some international construction but mostly in the developing countries.

There are three general types of contracts in use, i.e., cost plus fixed fee contracts; lump sum and unit price contracts; guaranteed upset price or fixed limit of construction contracts. However, the relatively high cost of short term financing, inflation etc. intensified the need to compress the construction time and as a result, the new approaches have been developed, some of which are variation of old approach or application of old approaches to new situation such as the fast track approach, wider application of the design-build contracts and construction management. Four types of contractual arrangements can be identified each depend upon the

type of project and operational characteristics, and those are; competitive bidding; negotiated contracts; direct negotiation between the owners and the subcontractors in speculative building construction; force account construction for repairs and maintenance or simple construction tasks. Governments at all level transact most of their procurement business on a competitive bidding basis regulated by statutory requirements. But in the private sector, the owner can exercise a substantial degree of his own discretion in awarding the contracts. In public sector construction, there are several additional requirements the contractors should follow such as the prevailing wage requirements and the equal employment opportunity provision. To avoid bid shopping and bid peddling, ten states including Massachusetts, California and Rhode Island require the submission of filed subcontractor bids. However, the filed subbid laws differ in their provisions, permitting varying degrees of lattitude on the part of the general contractor in choosing his subcontractors. Aside from ten states with the filed subbid laws, nine states including New York and New Jersey require the awarding of separate contracts to a general contractors and several specialty contractors to ensure equall access to public construction.

Because of peculiar economic conditions and characteristics of employment in construction, employers and unions are in a

much more intimate relationship than what is usually found in other industries. Contractors and unions must negotiate not only wages and working conditions, but also hiring and training practices. However, not all crafts, branches of construction, or geographic areas are unionized at all or same degree. But all contractors, union or nonunion, are influenced by the labor relations policies of the others. The industrial relations arrangements of construction now operate in three forms, which are in competition for dominance :-

-The system under collective bargaining agreements.

-Open shop arrangements under policies ofcontractor associations (the merit shop).

-Unorganized sector.

In a sense, the merit shop associations have adopted many of the substantial industrial relations policies and procedures of collective bargaining. No reliable statistics are available but it is estimated that about 65 percent or more of the construction in U.S. is done by the nonunion sector. But there are more union builders around the metropolitan areas. In metropolitan areas, most of the union firms are said to be doing a majority of their work in either commercial/industrial or heavy construction while the open shop firms are primarily engaged in residential or commercial/industrial work or both. Union tend to dominate the medium-sized projects, whereas nonunion firms are strong in very small and very large scale construction. The rationale for this is

that the small-scale projects are more efficiently performed by broadly trained and utilized workers whereas the union jurisdictions define an occupational breadth that is very appropriate to the scale of technological complexity of projects.

5.2 Strategy Implications

5.2.1 Generic Competitive Strategies

Michael E. Porter, in his book "Competitive Strategy", delineated three potentially successful generic strategic approaches to outperforming others in an industry:-

- -Overall cost leadership
- -Differentiation
- -Focus

Korea's traditional competitive advantage in international construction, like in other industries, has been largely a cost leadership based on a cheap but highly productive labor. This advantage is not attainable in the U.S. market as they cannot be brought into the U.S. market. This is not a problem Koreans have encountered only in the U.S. market. Nowadays, Korean can bring only limited labor forces to most of the international construction markets except for the Middle East where the restriction to the foreign labor is also

starting to become tight. In this context, Koreans cannot enjoy the labor based competitive advantage any more even in other traditional international construction markets. Furthermore, the wage rate of Korean labor is already higher than that of many other developing countries while the higher labor cost does not necessarily accompanied by the same degree of increase in productivity. Although the contribution of efficient labor force has been cited significantly as the basis of the growth of Korean construction industry, the contribution ion of the engineers and management staffs have largely been ignored. This is partly because their level of experiences and expertise is not comparable to their counterparts in the developed countries. However, their wage level has been far less than that of their counterparts in the developed countries even after adjusting for the differences of skills and productivity. Aside from these factors, it is logical to consider the change of competitive strategical basis from the physical labor to the manpower with higher qualifications such as engineers and management personnel as Korean industry develops. By using inexpensive engineering and management manpowers effectively in the U.S. market, Korean contractors may be able to save the cost of the projects to some extent.

Since the Korea's traditional competitive strength has been the cost, they have not established a differentiated image of the Korean products and services in the international

market. Recently Korean industry has grown to produce and sell a number of differentiated and high quality goods but buyers of Korean goods do not yet appreciate those changes as the image of Korean made goods have long been associated with the cheaper price and moderate quality. This is due primarily to the fact that Korea has long been a recipient of technology. Their marketing strategy has been to penetrate existing market with existing products and this strategy has been proved successful. However, Korea has now reached to the point that they have to develop indigenous technology to compete with the advanced countries in the areas where the technology is still evolving. Based on the present level of technology, it looks unlikely that Koreans are able to provide dufferentiated services in the U.S. construction market. At present, it seems to be more appropriate to try to provide undifferentiated services in this market. At the same time, Koreans have to pursue rigorously to achieve differentiation through R&D and innovative management etc. It may be appropriate to quote the requirement to produce differentiated goods which Porter summarized in his book "Competitive Strategy". The requirements to produce differentiated goods can be viewed in two categories, i.e., skills and resources requirements and organizational requirements. The commonly required skills and resources include:-

-Strong marketing abilities

-Production engineering

-Creative flair

-Strong capability in basic research

-Corporate reputation for quality or technological leadership

-Long tradition in the industry or unique combination of skills drawn from other business

-Strong cooperation from channels

The common organizational requirements are:-

-Strong coordination among functions in R&D, product development and marketing

-Subjective measurement and incentive instead of quantitive measure

-Amenities to attract highly skilled labor, scientists, or creative people

The low cost and differentiation strategies are usually aimed at achieving their objectives industry-wide. The focus strategy is built around serving a particular target very well and each functional policy is developed with this in mind. The focused target can be a particular buyer group, segment of product line, or geographical amrket. The strategy rests on the premise that the firm is thus able to serve its anrrow strategic target more effectively than competitors who are competing more broadly. As a result, the firm achieves either differentiation from better meeting the needs of the particular target, or lower costs in serving this target or both. Even though the focus strategy does not achieve low

or differentiation from the perspective of the market as a whole, it does achieve one or both of those positions vis-a-vis its narrow market target. The focus strategy is particularly recommended for Korean contractors to compete in the U.S. market which is very large and diverse.

5.2.2 Strategy by the Category of Construction Specialty

As discussed before, the major classifications of construction firms based on the specialization of the contractors are general contractors, heavy and highway contractors, and specialty trade contractors. As the general contractors cover very large area of the specialization, we further divided this into two categories, the general building contractors and the general plant design-constructors. As the most of the Korea's international contractors are the general contractors specializing in the buildings, civil engineering and some plant facilities construction, we will concentrate in these three categories in discussing Korean contractors business in the U.S. construction market.

1) Plant Construction

U.S. is a dominant force in design and construction of the process and industrial plants in the international construction market. U.S. leadership in construction technology has

contributed in large part by this segment of industry. Korean construction companies, in numerous occasions, cooperated with the U.S. firms in this area to supplement their capability in design and construction of the plant facilities in the international construction market. Moreover, a large portion of plant facilities in Korea had been built by the U.S. contractors. This category of construction is in large part performed by the top ranking contractors in the U.S. equipped with high level expertise, and a large number of trained and experienced personnel. In this context, it seems unlikely that Korean contractors be competitive in this segment of the U.S. market. The competition in this category of work is particularly intensive because of the large scale of the proejcts and the scarcity of the projects. Implementation of these projects is very sensitive to the external economic conditions. The large scale contractors in this category depend a large portion of their workload on international market and the reduced international market in these days intensified the competition in the U.S. domestic market further.

Design and engineering which account for a significant portion of the project cost require a lot of high level engineering expertise but the basic design and engineering work requiring high level expertise and creative engineering efforts accounts only for 20 to 40 percent of the total engineering

efforts. Remaining 60 to 40 percent of the work is routine design. This is an area which may offer a good opportunity for Korean engineering and design firms or integrated construction companies with design capability to penetrate the U.S. market. Currently, a man-hour of an experienced design engineer in the U.S. costs $50-60 (including overhead and profit). The comparable figure in Korea is around $12-15 per hour. Given such a high cost differential, it makes utilization of Korean engineering capability economically attractive to U.S. engineering and design firms. The mechanism that seems to emerge is for U.S. firms to receive the contract, and then to farm out the detailed engineering and design portion of the project to its Korean design counterpart firm. Considering the proportion of the routine design, in total design and engineering work, this will provide a substantial incentive for the American firms to acquire this service at a low cost. This will free the American firms of having an expensive permanent design staff. While this will allow them to concentrate on sophisticated high-end technology, the Korean firms will also benefit in several ways; they provide a steady job for their staff; it makes them familiar with more advanced design technology; and it will give them opportunity to familiarize themselves with the American market. Existence ofmodern communications and data transmissions almost eliminates any need for physical presence of Korean personnel in the U.S. As the plant construction capability

especially the design area is strategically important for Korean international construction, this arrangement may be used as a stepping stone to enhance Korea's competitiveness in plant construction in the international construction market outside the U.S.

2) Heavy Construction

As compare to any other groups of firms in the construction industry, firms engaged in heavy construction, by nature, tend to perform a larger percentage of their work for public sector clients. These firms have traditionally generated the greater portion of their workload through the competitive bidding system, both in the public and private sectors. Although there are a few additional regulatory or statutory requirements, the public sector bidding may be easier for Korean contractors to deal with as the rule of game in the bidding is more visible. Korean international construction industry's strength has been mostly in the heavy construction area as their performance record has indicated. The technologies engaged for this category of work are mostly conventional which Korean contractors have already mastered and there are not much technological gap between U.S. and Korean contractors. The heavy contractor's market opportunities in the U.S. tend to be geographically diversified, in that a large proportion of the types of the projects performed by

contractors are large in dollar volume but are built much less frequently than "general" construction. Those segment of the industry with higher than average capital investment per construction worker operate over a wider geographic area in order to minimize the adverse effects associated with idle machinery and equipment. As this category of construction need more commitment in resources, Korean contractors, if they want to get the work, must seek some kind of cooperation with the U.S. contractors to reduce the risks involved in the operation covering wider geographical area. Although Koreans have demonstrated their strength in heavy construction in other international construction markets, they do not have any decisive competitive advantage over U.S. counterpart as the most of the technologies Koreans mastered are conventional and in fact mostly acquired through the companies in the U.S. To be successful in this market, Koreans have to come up with new technology or method which can save time and cost substantially without sacrificing the quality. Hereagain, the R&D efforts basedon the long term objective is recommended for Korean construction companies. The cases of the Japanese company Ohbayashi-Gumi's San Fransisco sewage tunnel project and Austrian company Il Bau Ag's Washington Metropolitan Area Transit Authority project can be good examples of success in the U.S. by using innovative construction method and equipment.

3) Building Construction

Total dollar volume of general building contractors, especially when the volume of work performed by the specialty trade contractors is included, makes it the largest sector in the construction industry. The building construction tends to be the most fragmented and localized in nature. The geographic market of even some of the largest building contractors is concentrated in a particular region or a few large metropolitan areas. This geographically concentrated nature of building construction makes out-of-area establishments disadvantaged competing with local firms which have better local business contacts and better knowledges of local construction labor market. Considering the localized nature and high percentage of subcontracts, there seems to be not much room for foreign contractors being competitive in this segment of the market. In this respect, what the Japanese construction companies are doing in this segment of U.S. construction market can be a good reference for Korean contractors inplanning to enter into this market. Japanese construction companies are mostly doing the construction of speculative buildings either in the form of the real estate development or doing a real estate development teaming up with the local real estate developers. This seems to be based on the premise that building construction activity alone can not be profitable for foreign contractors as a number of factors

exists in favor of the local construction establishments. Foreign companies like Japanese provide a tital package including financing and design to the actual construction. By doing that, they can eliminate large amount of the margins involved in engaging the large number of outside participants and make the project profitable as a whole.

When we discuss interantional construction, the subject of single family housing is usually excluded from the discussion as this is the area mostly covered by the small establishments of the local area and the economy of scale in this segment of the market is hard to achieve. However, it is also true that the number of the single family house construction is so large that the total volume of this segment of the market is one of the largest in the industry. This market can be seen as one of the potential market with the help of innovative material or building technology. The case of Misawa Home of Japan can be a good example. They developed the new material called PALC (Precastable Autoclaved Lightweight Slab) made of wastes from factories but has all the advantages of the convential materials such as wood. Houses built of PALC are several times stronger than their U.S. counterpart, yet no more expensive expensive per square foot. With this kind of innovative material or patented technology, this largely untouched market by the foreign contractors can be transformed into one of the largest markets ever because of the large

number of the single family housing like automobile.

5.2.3 Marketing Policy Implications

Korean international construction industry is now in deep trouble because of the decreased orders and serious losses due to many underbid projects and tight payment conditions. To make the matters worse, many projects in the Middle East were contracted to the barter trade arrangement for oil. With the plummeting oil price due to the excess supply of world oil, it is not easy to sell the oil to the international spot market without loss. Although many larger construction companies in Korea have their own trading companies, Koreans are not known to be an expert in selling oil than buying not to mention present upheaval of world oil market.

Although the contribution of Korean international construction to the overall economy during the 1970s and early 1980s had been tremendous, it has become a big burden to the national economy especially to the Korean financial institution who guaranteed the contractors for the payment nowadays. As already mentioned before, reduced demand of international construction and Korea's limited capacity in financing make any tangible growth of Korea's international construction unlikely in near future, twoseanrios for Korean interantional construction industry can be envisioned. The first is to

curtail the international construction activity to a minimum level and shift the emphasis to the domestic market and other industries. The second is to maintain the emphasis on the role of international construction industry as there still exists a great potential of Korean construction industry. Although international construction market is not as active as it used to be, still we can identify many large potential markets in the nearfuture, those potential markets include:-

-China, which is thought unlikely to be opened to Korean contractors, but considering the size of the market, it should be worth trying and we may be able to find some alternative ways to exploit the potentials in this market.

-Middle East, which is now sluggish but there will be a great amount of demand for reconstruction when the war between Iran and Iraq is ended.

-Southeast Asia, nowadays the size of this market is comparable to that of Middle East.

Aside from these three traditional international construction markets, there also exists some potential in the markets of the developed countries which include:-

-U.S.

-European market, which Koreans have not seriously considered but size of this market is approximately a quarter of the total of the world construction market. U.S. and Japan have substantial amount of construction activities going on

in the European market while Koreans have never even tried.

-Japanese market, which seems to be so closed but this market may not be as closed as it used to be. Although very close geographically to Korea, this market was not seriously considered as a potential market. Once opened, Koreans may have better opportunity than other countries because of the proximity and cultural background. Furthermore the issue of the balance of trade may be one of the useful bargaining tools to open the Japanese construction market to Korean contractors.

It is understandable that many Korean contractors are reluctant or even afraid of going into the markets in the developed countries as they are not familiar to this market and this market may requires the technologies of higher level than what Koreans can offer now. HOwever, Koreans should not characterize the international construction as similar to the that of the MiddleEast. Middle East construction market is very unusual market in comparison to the traditional construction markets. In most of the traditional international markets, the required services to be imported are financial and technological resources not labors as they have plenty although the quality of the labor can be arguable whereas the Middle Eastern markets needed the foreign labor as well. In this respect, Koreans have to free themselves from the perception that the international construction as inseparable

from the Korean labor. Compare to the situations of construction industry in 10 or 20 years before, Korea has accumulated a tremendous experiences and expertises in construction through their activities in international as well as domestic construction markets. Waste of all these valuable experiences and expertises is a tremendous loss. And the potential markets in the developed countries cannot be just given up only by the fact that the present level of technology is not sufficient. It is more so as considering the size of the market which is almost a trillion dollar cash market. Korea is now exporting many electronics goods, automobiles etc. which usually considered that only the advanced countries can do. But because of the vigorous R&D and marketing efforts as well as international cooperation, higher technology contents products are expected to be developed and exported. Exporting the construction services to the advanced countries is not more difficult and does not require more investment in R&D than that for the electronics, automobiles and other high technology goods. In this regards, the long term development strategy for the construction technology and materials through concerted efforts in the fields of R&D and educational system to produce relevant talent in R&D seems to be the most important tasks which Korean construction industry must start to pursue.

5.3 Recommendations for Further Research

This thesis has reviewed many aspects of the U.S. and Korean construction industry. What have been discussed are:-

-Korean construction industry with respect to the ; national economy and background of growth to present level; structure, status and present issues facing the industry.

-U.S. construction industry with respect to the; economic, structural and operational characteristics; introduction to the contractual system and labor relations.

However, the analysis of U.S. construction as a potential market for Korean construction industry has mostly concentrated to the areas of the structural and operational characteristics. Further in-depth and comprehensive analysis is recommended in the areas of:-

-the economic characteristics and behavior of the industry

-contractual system and regulations focusing the variations existed in the different localities

-practice of mobilization and utilization of labor and differences of practices between union and nonunion sectors.

Based on the further research on the abovementioned areas together with what have been discussed inthis thesis, the more comprehensive and practical strategies for Korean contractors planning to enter into the U.S. market can be established.

Two ways of entry into the foreign market can be identified from an economists' perspective. First, exporting theproducts to the target country from a production based outside that country. Second, transferring its resources in technology, capital, human skills, and enterprises to the foreign country where they may be sold directly to users or combined with local resources to manufacture products for sale in local markets. From a management/operations perspective, these two forms of entry modes, which offer different benefits and costs to the international company. Following are the classification of entry modes:-

1. Export entry modes
   - Indirect
   - Direct/distributor
   - Direct branch/subsidiary
   - Other
2. Contractual entry modes
   - Licensing
   - Franchising
   - Technical agreements
   - Service contracts
   - Management contracts
   - Construction/turnkey contracts
   - Contract manufacture
   - Coproduction agreements
   - Other

3. Investment entry modes

   Sole venture: new establishment

   Sole venture: acquisition

   Joint venture: new establishment/acquisition

   Other

Above classifications are not specifically for the construction industry but for all the industries. However, it is recommended to study all three categories of entry modes as relevant as the possibility of exporting the construction materials together with the construction itself is worth investigating. It is also recommended to compare the cases of the European and Japanese companies already get into the U.S. market with the case of Korea.

APPENDIX A

LIST OF TABLES AND FIGURES

A.1 List of Tables

2.2.2 Market share of international construction by 250 largest firms

2.2.3 Market share of Middle Eastern construction by 250 largest firms

2.2.4 The evolution of Korean international construction activity, domestic versus overseas contract amount

2.2.5 Effect on employment by overseas construction

2.3.1 Summary statistics for construction establishments, 1984

2.3.2 Summary statistics for construction establishments by receipts size class, 1984

2.3.3 Summary statistics for establishments by employment size class, 1984

2.3.4 Distribution of major contracting groups by employment size class, 1984

2.3.5 Percentage of subcontracting within major contracting groups

2.3.6 Summary statistics of establishments by legal form of organization, 1984

2.4.1 Trend of domestic engineering contracts by type

2.4.2 Trend of foreign engineering contract by type

2.4.3 Number of engineering firms by type, 1985

2.4.4 Status of manpower in engineering service industry in Korea, 1984

2.4.5 Trend of foreign contract by type of contract

2.5.1 R&D expenditures as a percentage of GNP

2.5.2 Allocation of R&D expenditures by sector

2.5.3 R&D expenditures by sources of funds, 1983

2.5.4 Intramural R&D expenditures in industry as a percent of total sales by field, 1983

2.5.5 Industry's R&D expenditures and number of researchers, 1983

2.6.1 Self-sufficiency rate of construction materials

2.6.2 Self-sufficiency rate of construction equipments

2.6.3 Composition of construction materials and equipments used in overseas construction by origin

2.6.4 Production of construction materials versus producer goods goods and consrtuction in GDP

2.6.5 Total construction contracts and production of construction materials indexes: 1970-1980

2.6.6 Supply and demand of major construction materials

2.6.7 Comparison between Korean and Japanese construction materials and equipments to Saudi Arabia

2.7.1 Regional distribution of new orders contracted abroad with 250 largest firms

2.7.2 Trend ofKorean overseas construction contracts by region

2.7.3 Trend of U.S. overseas construction contracts by region

2.7.4 Trend of Japanese overseas construction contracts by region

2.7.5 Korean overseas construction record by type of work

2.7.6 Trend of localization in Middle East by contract amount

2.7.7 Comparison of manpower productivity between Korea and other developing countries

3.1.1 GNP and new construction, 1965-1980

3.1.2 New construction put in place in the U.S., 1983-1984

3.1.3 Percent distribution of calue of total new construction and addition and alteration by ownership

3.1.4 Federal construction-related expenditures by ownership category

3.1.5 Federal construction-related expenditures as a percentage of the value of new construction put in place for fiscal years 1980-1984

3.1.6 Indexes of new private residential and nonresidential construction activities and public construction activities

3.1.7 Trends of construction costs and input prices

3.1.8 Average earnings of workers in various industries

3.1.9 Productivity index for construction and manufacturing industry

3.2.1 Summary statistics for establishments with and without payroll: 1982 and 1977

3.2.2 Summary statistics for establishments with and without payroll by receipts size class, 1982

3.2.3 Distribution of establishments without payroll among major group of classification

3.2.4 Distribution of employees among the top 10 contractor classification

3.2.5 Selected statistics for establishments with payroll by industry group and employment size class: 1982

3.2.6 Percentage of subcontracting within major contracting groups

3.2.7 Percentage of subcontracting for general building contractors and operative builders by employment size class

3.2.8 Assets of corporate firms in contract construction and various other industries: 1965

3.2.9 Construction receipts for establishments with payroll by location of construction work

3.2.10 Rates of entry of firms in contract construction and other industries

3.2.11 Rates of discontinuance of firms in contract construction and various other industries

3.2.12 Number and size of contractor failures

3.2.13 Number of business failures and value of liabilities

3.2.14 Causes of 1,770 construction failures in 1976

3.2.15 Summary statistics for establishments with and without payroll by legal form of organization for industry groups and industries, 1982

3.2.16 Selected statistics for establishments with payroll by industry, legal form of organization, and type of operation, 1982

3.3.1 Distribution of contracts by size groups of firms (1984)

3.3.2 Top U.S. design-constructors: 1984

3.3.3 Top U.S. program and construction managers: 1984

3.3.4 Top U.S. general building contractors

3.3.5 Top U.S. heavy contractors

3.5.1 Characteristics of employment in construction

3.5.2 Branches of construction industry, principal unions, and geographic coverage of agreements

3.5.3 Bargaining structure in building construction: major employer associations and unions

3.5.4 Percentage of union and open shop employment by product market

3.5.5 Map of industry with rough assessment of open shop activity

4.1 Top U.S. contractors: 1984

4.2 Top Japanese contractors: 1985

4.3 Top Korean contractors: 1984

A.2 List of Figures

APPENDIX B

LIST OF REFERENCES

B.1 Reference for Chapter 2

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