Owner, Architect, Builder, Banker: Comparing the Development and Construction of Two Manhattan Skyscrapers -- 1930 and 1990

by

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S.B., Civil Engineering, Tufts University, 1981
M.S., Structural Engineering, Stanford University, 1984

Submitted to the Department of Civil and Environmental Engineering
in partial fulfillment of the requirements for the
Degree of Master of Science in Civil and Environmental Engineering

at the Massachusetts Institute of Technology
February 1996

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ABSTRACT

This thesis examines the development, design, construction, and financing practices that were employed at the Empire State Building and Worldwide Plaza: two high-rise commercial projects that were built sixty years apart. Similarities and differences between the two buildings are explored and analyzed in an attempt to reveal how the process of skyscraper development in New York City is changing. Discussion considers each project's economic context, site parameters, organizational structures, architectural programs, review requirements, construction methods, and schedule constraints. Project costs are dissected, compared, and normalized to year 1994. For added perspective, selected parameters from other Manhattan skyscrapers that were built between 1910 and 1990 have been researched and incorporated into the analysis. This includes a comparison of floor-area-ratios, project costs, and design characteristics among the Woolworth, Equitable, Chrysler, Seagram, Pan Am, and Bertelsmann Buildings.

The thesis indicates that the development of high-rise commercial buildings is growing increasingly elaborate, lengthy, and expensive. This is attributed to several factors, including cumbersome bureaucratic review policies; escalation of "soft" project costs; inattention to long-term fluctuations in the economic cycle; and inefficient curtain wall construction technique. But this does not imply that improvements in the process have not been observed; advancements in construction safety, as well as noted efficiencies in structural design are cited.

The central challenge for the development, design, construction, and financial communities surrounds ways to effectively promote the efficiencies that were instituted at the Empire State Building project, while maintaining the rigorous safety record and lively public involvement discourse that was in evidence at Worldwide Plaza. Conclusions indicate that vigilant control of "hard" construction costs and "soft" project costs are of primary importance if this challenge is to met successfully. Streamlining the formal design review process, as well as improving curtain wall construction technique are two particular aspects of the development process which demonstrate acute need for improvement. Topics of additional research within this arena are suggested.

Thesis Supervisor: Dr. Henry Irwig

Title: Senior Lecturer, Department of Civil and Environmental Engineering

PREFACE

Writing this thesis has been a rewarding experience for a few reasons. Primarily it has given me an opportunity to explore managerial aspects of the construction industry that extend beyond my everyday acquaintance with civil engineering. As a result I appreciate much more the political, financial, and legal considerations that often tend to figure so prominently in the overall development matrix. Second, the report has neatly incorporated so many of the lessons that I have taken away from MIT about strategic planning, information technology, corporate finance, decision-making, business and construction law, negotiations, and systems dynamics. Looking back, it has been a fitting summary to my management studies.

The thesis needed eighteen months of research, writing and discussion to take its current form. This had coincided with my other class work, my assumption of project management responsibilities for the design of a $500 million construction contract, and most happily, becoming a father for the first time. Through this eventful and challenging period I received particular encouragement from individuals whom I would like to recognize. Many thanks to Dr. Henry Irwig, my thesis advisor, whose sound supervision added a shape, texture, and focus to the paper that it may not have otherwise had; to Jennifer Abrahamson of the Cornell University Libraries, whose editing suggestions made the text more readable and seem less like an exercise in technical writing; to Charles Helliwell for his academic guidance throughout my seven semesters at MIT; to Dom D'Eramo, Bill Galbraith, and Charlie Brackett of Sverdrup Civil, Incorporated, for their active sponsorship of my participation in MIT's management program; and especially to my wife Leslie and daughter Emma, whose love and support reinforced me with the resolve to see the thesis to its end.

BIOGRAPHICAL NOTE

Wayne Kalayjian is a civil engineer with fifteen years of structural design, construction, and project management experience. He is professionally licensed in California and Massachusetts, and has participated on a broad variety of commercial, industrial, municipal, and transportation-related projects. These include relocation of an historic lighthouse on Cape Cod, retrofit of a geothermal co-generation plant in Northern California, demolition of a high-rise office building in Dowwntown Boston, and design of a transit tunnel and parking garage beneath Boston's FleetCenter. He is also an avid architectural historian, photographer, and lecturer. The author is a project manager for Sverdrup Civil, Incorporated, and is currently responsible for supervising the design of a $500 million portion of Boston's new Central Artery. Wayne holds a S.B. in civil engineering with distinction from Tufts University and his M.S. in structural and earthquake engineering from Stanford University.

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CHAPTER ONE: THESIS OVERVIEW

1.1 - INTRODUCTION

The skyscraper is a peculiarly American architectural institution. It sprouted during the latter-half of the 19th-century when robust economic growth, large-scale urban development, rising real estate prices, enhanced building technologies, and improved construction practices created an incentive to push buildings ever higher into the sky. This had been a significant departure from more traditional design approaches, which had limited structural heights to five or six floors. Between 1870 and 1900 these new kinds of buildings began to climb fifteen, twenty, even thirty stories, changing the architectural character of cities throughout the United States. Nowhere was the phenomenon more apparent than in Chicago where the Marshall Field Wholesale Store (1884-86), the Monadnock Building (1884-85/1889-92), and the Reliance Building (1894-95), among others, symbolized this marriage of unabashed commercialism and construction ingenuity.

By 1910 the economic tide had slowly shifted and New York City had emerged as the pre-eminent capital of commercial high-rise construction in the country. It was during this era that the sensational Singer, Flatiron, Woolworth, and Equitable Buildings were erected. These structures were set apart from their predecessors not only because they were much larger and much taller, but also because they had become "gathering places in themselves." They constituted "veritable cit[ies], with their varied shops, stores, counters, and sales places, vending most everything desired from fruits, food and candy, to wearing apparel, hardware, and household items."[1] Collectively, these new buildings transformed the shape and scale of the Manhattan skyline, and exhibited an urban vitality that was unparalleled anywhere.

As the century progressed other skyscrapers were built in New York that were equally impressive and influential: the Chrysler Building, Rockefeller Center, Lever House, the Seagram and Pan Am Buildings, Citicorp Plaza, and the World Trade Center. These landmarks turned the city into a living architectural laboratory that has continually inspired lively criticism, debate, and discussion. Surprising, however, is the relatively scant attention that has been paid as to how these projects were actually realized; that is, the mechanics of their design, construction, and financing, as well as the motivation behind their being conceived in the first place. This thesis tries to slightly alter this imbalance, by tracing the histories of two skyscrapers that were built sixty years apart: the Empire State Building and Worldwide Plaza. It aims to examine the issues that faced the participants of each project in an effort to uncover how the development process has changed during this period, if at all. The report also postulates whether its conclusions about the commercial high-rise sector of the architecture, engineering, and construction industry in New York City might also apply to other sectors of the industry in other parts of the country.

There are three primary benefits to this kind of research. First, it encapsulates the development and construction histories of two large and important skyscrapers in 20th-century Manhattan. This is accomplished by compiling the dozens of tasks, milestones and machinations that faced the developers, designers, builders, and bankers at their respective projects. If nothing else, this thesis preserves the legacy of these buildings for future reference by others.

Second, it promotes investigation of how the commercial high-rise building development

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[1] The Skyscraper. Page 8.

process is changing. We intuitively believe that progress in the commercial building industry has made great strides over the last century. After all, building systems have grown more sophisticated; codes of professional practice have been upgraded; safety procedures have become more rigorous; policies of systematic project review have been established; methods of communications have improved; schedules have accelerated; and client expectations have heightened. But whether this kind of progress has made the building design and construction industry more efficient, has improved the quality of the products and services that it renders, and has enhanced its image among the public has not been assessed. Toward this end the report compares the projects in terms of their economic contexts, organizational structures, and designs, and asks whether real progress in the development process is being made.

A third benefit of the research encourages discussion as to how a changing development process might impact other sectors of the American construction industry in the future. For instance, it exposes certain regulatory policies, such as the well-intentioned public involvement process, which have dramatically lengthened project schedules and have thereby unwittingly exposed the industry to heightened competition from foreign suppliers of building materials. These competitors have seized the opportunity to strategic advantage, and as consequence have been able to penetrate the United States' construction market more easily than in times past. The implications of these kinds of impacts on the development process must be disseminated and more thoroughly explored since they affect important issues of national trade and labor policy within the United States.

1.2 - THESIS OUTLINE

Initially, I chose these particular buildings because of the availability of their well-documented, first-hand construction records. The Empire State Building had been tracked diligently and enthusiastically by the New York Press; Worldwide Plaza had been the subject of a 1989 book, that had been accompanied by a popular six-hour television documentary. As research progressed other apt similarities between the two projects began to emerge. Both were huge structures of about 2.5 million square feet of space each; both were speculative ventures; both stipulated extremely rigorous construction schedules; both featured structural steel skeletons and masonry curtain walls; and both were under construction at the economic peak of their respective eras, witnessing the great stock market crashes of 1929 and 1987.

Yet the Empire State Building and Worldwide Plaza were also very ***different*** projects in some important ways. One was conceived by a firm with little experience in the development business; the other by one of the shrewdest real estate men in the country. One was built at a "can't miss" location on Fifth Avenue; the other in "Hell's Kitchen," a once infamous quarter of Manhattan's West Side. One's geometry was tall and slender; the other short and more squat. One was constructed under a "laissez-faire" political environment; the other under the intense scrutiny of local government.

For clarity, the chapters in this thesis are generally arranged into five categories:

- Economic Context
- Site Constraints
- Project Organization
- The Design Process
- The Construction Process

Chapters Two and Three provide a brief overview of the economic contexts that the developers of each project operated under, as well as a description of the general state of the American architecture, engineering, and construction industry during the 1920s and 1980s. Site conditions are described and Floor-Area-Ratio (FAR) analyses are performed for both buildings. Project organization is discussed, including a description of the development teams, the design firms, and the anticipated tenant arrangements. Headings that reference the design process investigate project schedules, the mechanics of construction contract document preparation, and the formal review policies that each project had to contend with. A discussion of the construction process incorporates labor, materials, technology, safety, and supervisory issues that faced the building contractors. Finally, each chapter concludes with an immediate reaction to the design and construction effort from the perspective of the developers, contemporary architectural critics, and the general public.

In Chapter Four the similarities and differences between the two projects are analyzed in detail. Their economic contexts, site parameters, project organizations, tenant structures, design methods, and construction practices are compared. Tables are presented that reveal changing land costs, development costs, and FARs in Manhattan; unit-weights of structural steel are also calculated in an effort to determine trends in design efficiency. For added perspective, related information from the Woolworth Building (1911-13), Equitable Building (1912-15), Chrysler Building (1928-30), Seagram Building (1954-58), Pan Am Building (1960-63), and Bertelsmann Building (1987-90) have also been researched and presented (see Table 1.1 and Figures 1.1 through Figures 1.9). Inclusion of these statistics were essential in order to more accurately assess the direction of various trends within the design and construction industry. Taken together, conclusions about the changing character of the commercial high-rise development process are drawn in Chapter Five.

In writing these histories I tried to avoid leaning on the benefits of hindsight. My aim was to convey a sense of the impending risks and uncertainties that faced project participants ***at the time that they were making their decisions***. I hope that this approach heightens the reader's appreciation of the daring and high stakes that typically accompany these types of projects. Finally, the reader is reminded that in spite of the paper's tidy organization, the actual histories, particularly at Worldwide Plaza, were much more circuitous and rarely as clear-cut as they may appear. Both projects were littered with dozens of interconnected activities, events, and decisions that routinely overlapped throughout the entire development process.

1.3 - RESEARCH METHODS

Much of the research for this thesis took place at the Boston Public Library, the Barker and Rotch Libraries at MIT, and Wessell Library at Tufts University. Primary references are listed in the bibliography in Appendix A. During my research I faced two important challenges. The first related to the surprisingly limited amounts of available construction data that were on record for these buildings. The second revolved around the reliability of this information once I had found it.

Initially I had expected that each skyscraper would be chronicled in detail by several newspapers, books, professional periodicals, and trade journals such as *The New York Times, The New York Daily News, The Architectural Record, The Architectural Forum,* and *The Engineering News Record.* These sources would have differing editorial agendas to be sure: newspapers were written for the general public, which tended to be interested more in the sensational and human interest-related features of the projects rather than the technical aspects of the development process. Books tended to be more comprehensive in scope, but also tended to take the form of promotional histories: commissioned by the project teams whose wish was to have their buildings to be remembered by posterity in a favorble light. Periodicals and journals were expected to be "cheerleaders" for the design and construction industry, and extoll the virtues and impressive feats of the projects while downplaying the problems, errors, and miscalculations that had been encountered in the field. (For instance, I was less impressed by *ENR*'s rousing accounts of the Empire State Building after reading *The Daily News'* account that the project had claimed the lives of fourteen construction workers). Keeping these in mind, I suspected that all in all, I would be compiling rather rosy project histories; consequently, any conclusions that the thesis might draw from the research and analysis would have to factor these potential biases into account.

What actually fell out of the research, however, was that *The New York Times* was among the few contemporary references that could be consistently relied upon. This was because more than any other newspaper, book, or periodical, *The Times* not only reported on construction happenings at the Woolworth, Equitable, Chrysler, Empire State, and Seagram Building sites for their entire duration, but also covered them with surprising editorial balance and technical breadth. Consistently, *The Times* discussed detailed real estate transactions, design complications, construction techniques, and financing arrangements in everyday language, while also featuring several direct, pertinent quotations from key projects participants than any other source.

It was ironic then, when I discovered that *The Times* actually had very little to write concerning Worldwide Plaza and the Bertelsmann Building. As consequence Carl Sabbagh's book and television documentary, "Skyscraper - The Making of a Building" proved invaluable. Jerry Adler's book, "High Rise," was an excellent supplement and described particularly well the detailed intricacies of project financing in the 1980s, along with the political machinations that today's developers must commonly endure to get ***anything*** built in the city of New York. I discovered, however, that these authors' had their distinct biases when discussing development practice in the 1980s. This was very apparent, for example, when comparing Sabbagh's "nice-guy" portrayal of Bill Zeckendorf with the same developer's surly and abrasive behavior that projected quite clearly in the television documentary. While drawing conclusions, it was always important to recall that over the period of Sabbagh's and Adler's lengthy research they were obligated to stay in good standing with some very influential and powerful individuals, and it is quite likely that this inevitably affected these author's objectivity. We are, after all, only human.

Property	Year of Construction	Architects	Contractor
Flatiron Building	1901-03	Daniel H. Burnham & Co.	Thompson-Starrett Co.
Woolworth Building	1911-13	Cass Gilbert	Thompson-Starrett Co.
Equitable Life Building	1912-15	Ernest Graham	Thompson-Starrett Co.
American Radiator Building	1923-24	Raymond Hood	Hegeman-Harris Co.
Chrysler Building	1928-30	William Van Alen	Fred T. Ley & Co.
Empire State Building	1929-31	Shreve, Lamb & Harmon	Starrett Brothers & Eken, Inc.
Lever House	1950-52	Skidmore, Owings & Merrill	George A. Fuller Co.
Seagram Building	1954-58	Mies van der Rohe	George A. Fuller Co.
Pan Am Building	1960-63	Emory Roth & Sons	Diesel Construction Co.
Citicorp Center	1974-77	Hugh Stubbins & Assoc.	Hymowitz, Ravitch & Horowitz
AT&T Building	1979-84	Philip Johnson	Hymowitz, Ravitch & Horowitz
Worldwide Plaza	1986-89	Skidmore, Owings & Merrill	Hymowitz, Ravitch & Horowitz
Bertelsmann Building	1987-90	Skidmore, Owings & Merrill	Turner Construction Co.

Table 1.1 -- Listing of Architects and Builders at Various Manhattan Sites

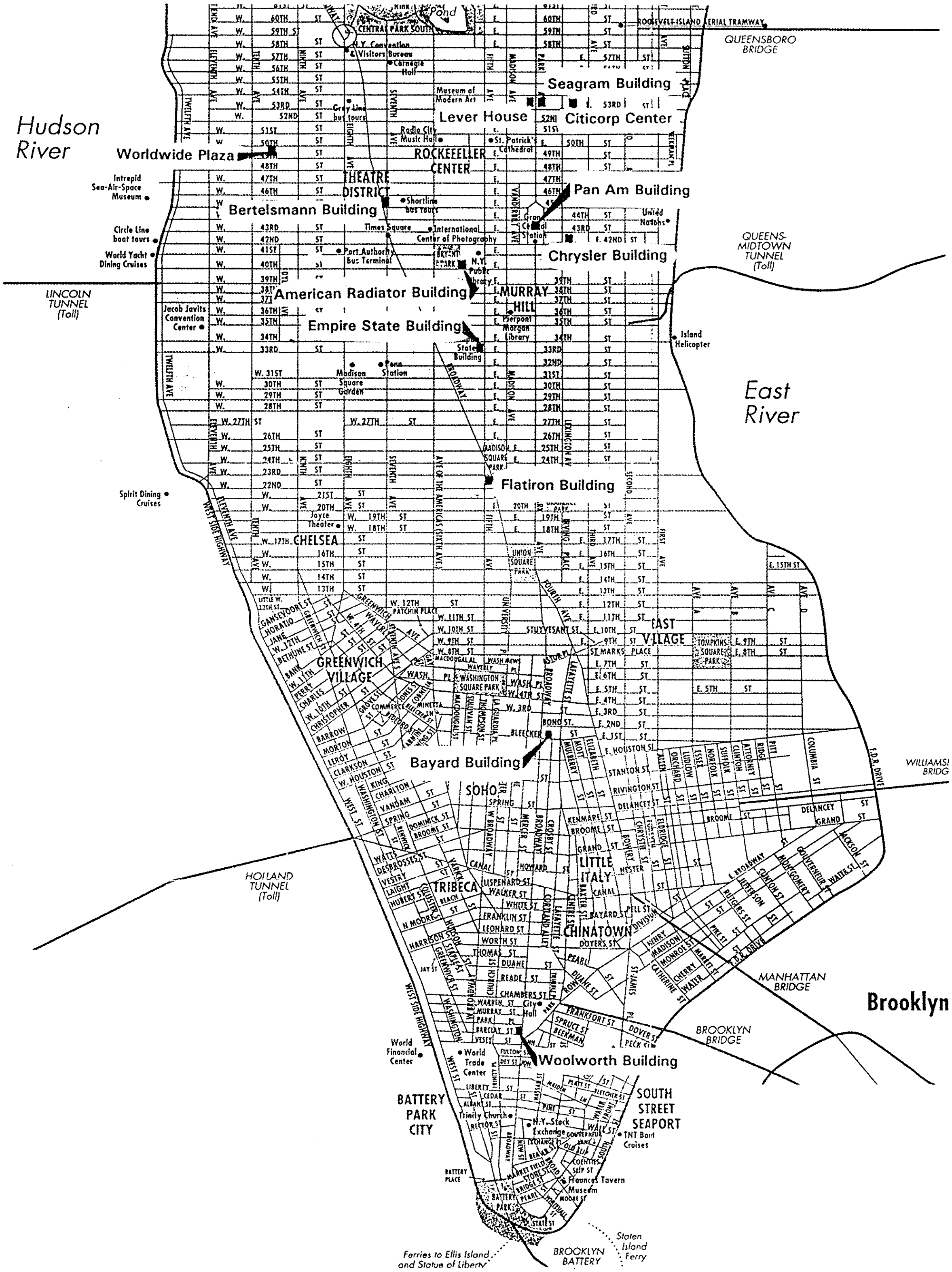


Figure 1.1 -- Map of Manhattan

Figure 1.2 -- The Woolworth Building (1911-1913)
Broadway and Park Street

Figure 1.3 -- The Equitable Building (1912-1915)
Broadway and Pine Street

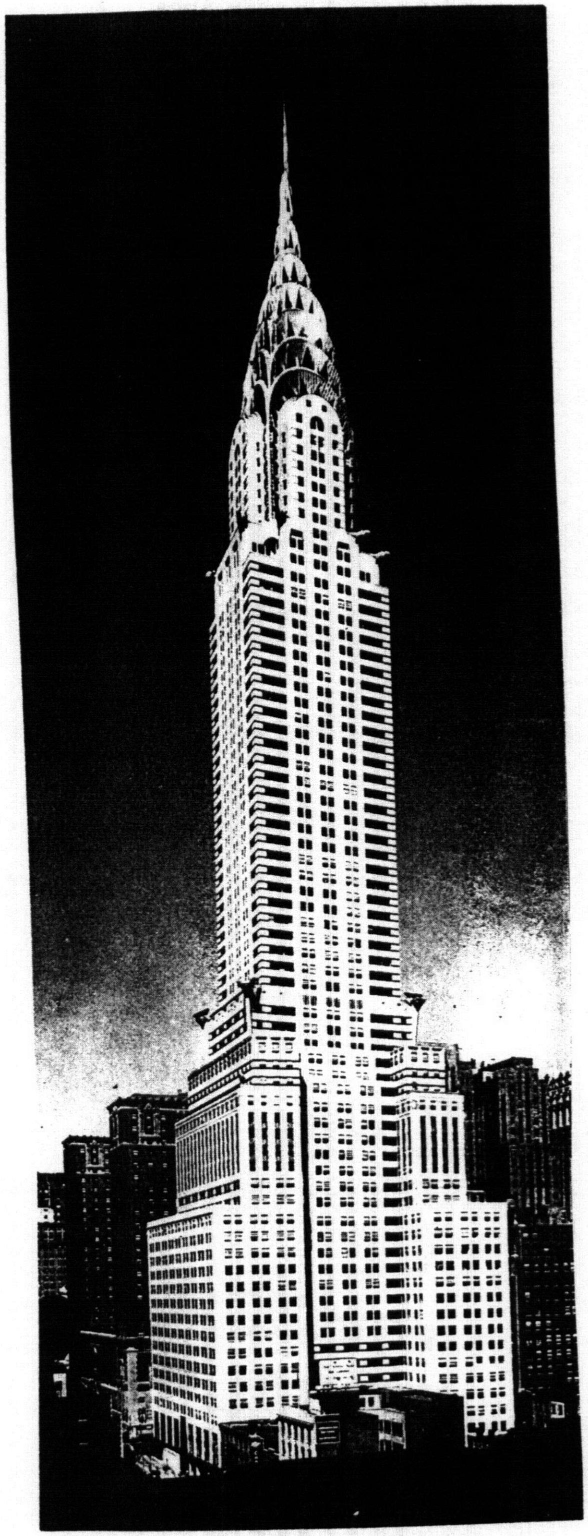


Figure 1.4 -- The Chrysler Building (1928-1930)
Lexington Avenue and 42nd Street

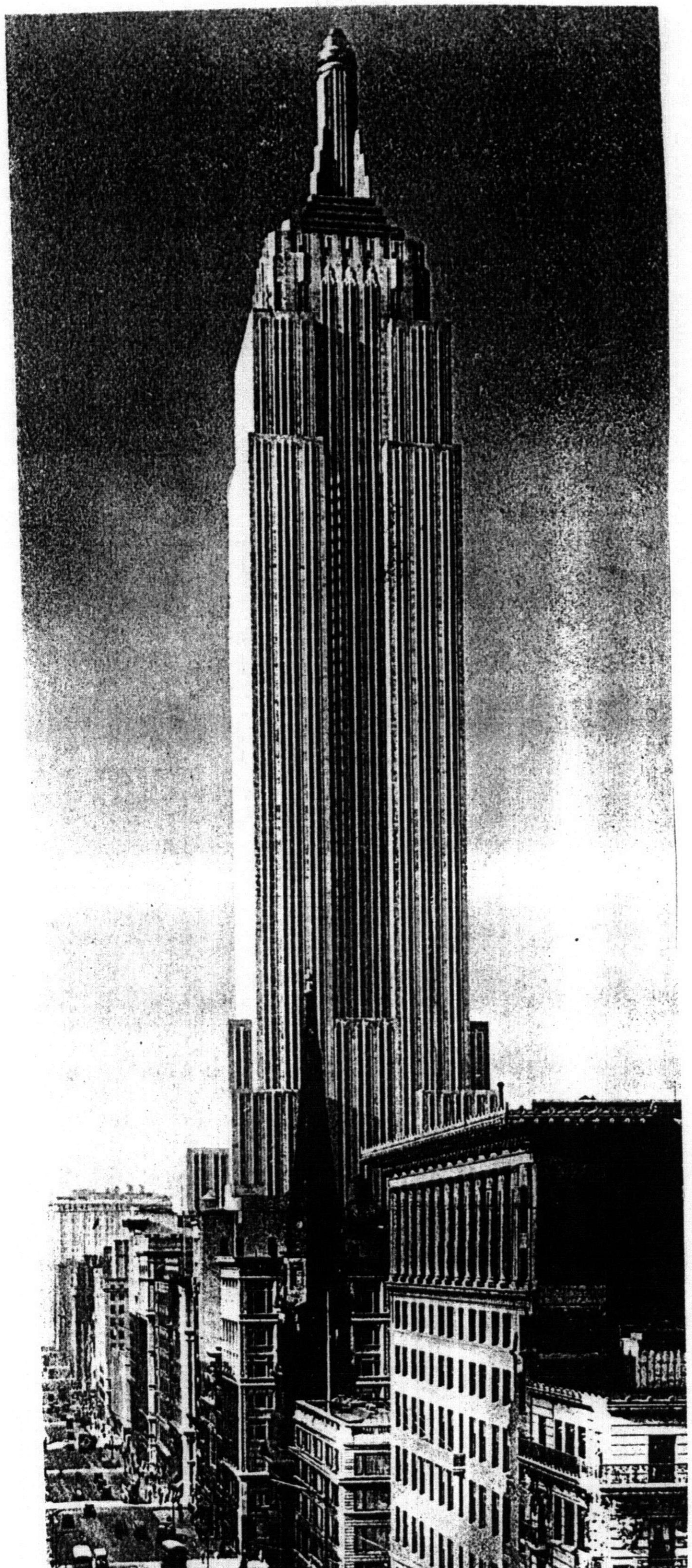


Figure 1.5 -- The Empire State Building (1929-1931)
Fifth Avenue and 34th Street

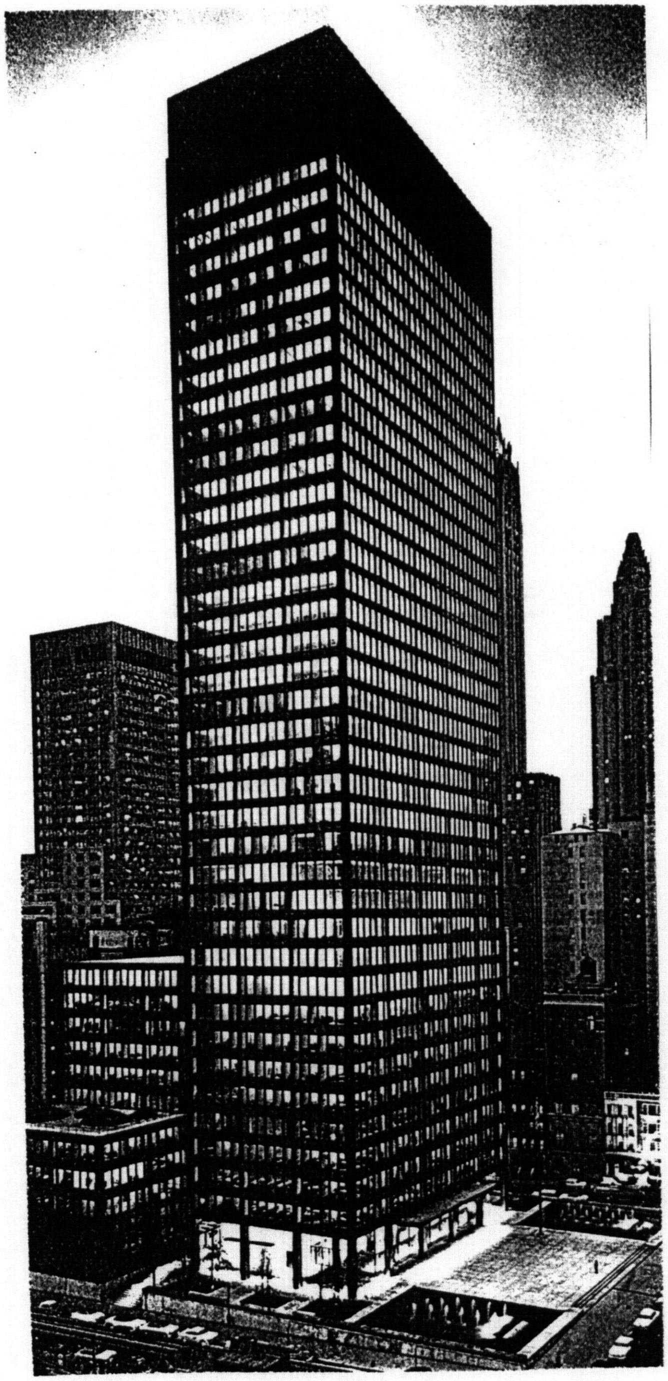


Figure 1.6 -- The Seagram Building (1954-1958)
Madison Avenue and 53rd Street

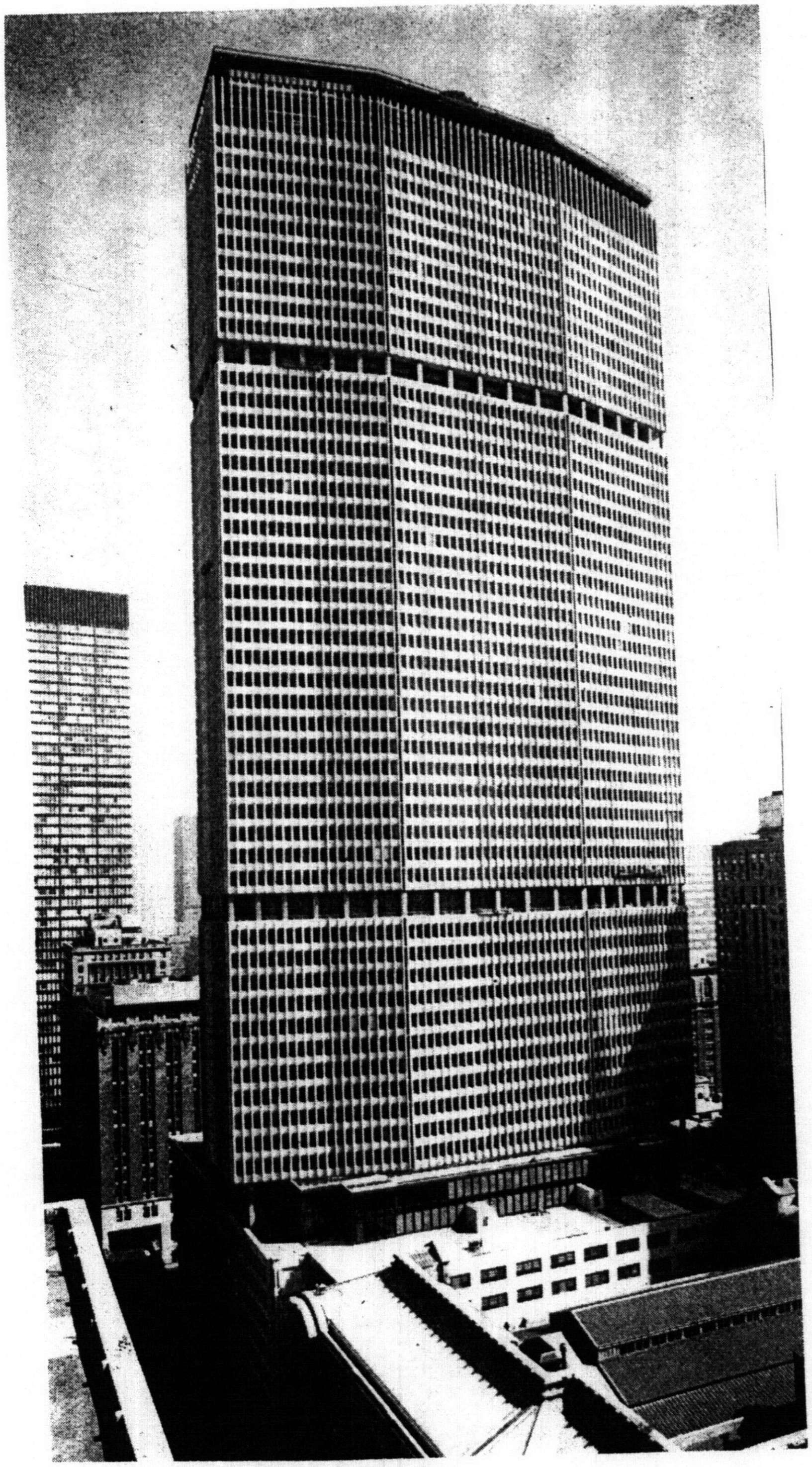


Figure 1.7 -- The Pan Am Building (1960-1963)
Park Avenue and 42nd Street

Figure 1.8 -- Worldwide Plaza (1985-1989)
Eighth Avenue and 49th Street

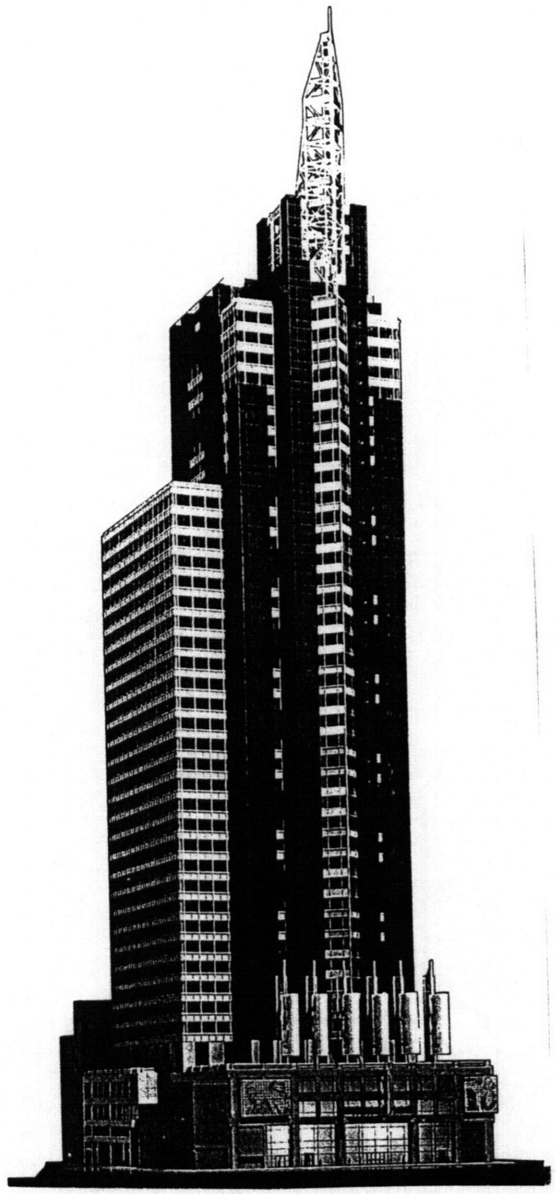
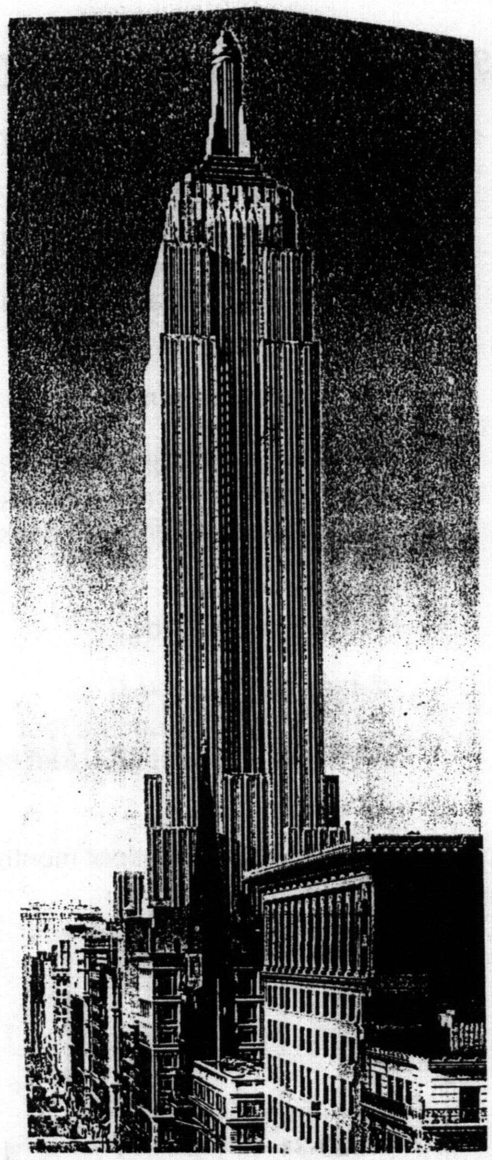


Figure 1.9 -- The Bertelsmann Building (1987-1990)
Seventh Avenue and 45th Street



CHAPTER TWO: THE EMPIRE STATE BUILDING

Constructed October 1929 to May 1931

"To set up properly an income-producing building, the control of its design and construction should be in the hands of a board on which sit owner, banker, builder, architect, engineers and real estate men....The situation of the building and the cost of the land are...vitally important [as to] whether the building is going to pay for itself and earn money on the investment or not."[1]

Robert H. Shreve, Principal
Shreve, Lamb & Harmon, Incorporated
Architects of the Empire State Building

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[1] *The New York Times.* July 27, 1930.

2.1 - SUMMARY STATISTICS: THE EMPIRE STATE BUILDING

Location:	Fifth Avenue between 33rd and 34th Streets
Constructed:	November 1929 to May 1931 (18 months)
Developer:	John Jacob Raskob with Empire State, Incorporated
Architects:	Shreve, Lamb and Harmon, Incorporated
General.Contractors:	Starrett Brothers and Eken, Incorporated
Structural Engineer:	H.G. Balcom
Structural System:	Steel Moment-Frame on Cast-in-Place Concrete Foundation
Height above grade:	1,472 feet to top of television antenna (installed in 1952) 1,250 feet to observation deck at 102nd floor 1,050 feet to observation deck at 86th floor
Depth below grade:	35 feet
Excavate Removed	110,185 cubic yards
Total Floor Area:	2,476,000 square feet
Leasable Area:	2,158,000 million square feet
Lot Size:	83,860 square feet (200 feet by 425 feet)
Floor/Area Ratio:	26
Construction Speed:	138,900 square feet per month
Total Steel:	57,000 Tons
Steel Unit-Weight:	46 psf
% Financed:	67%
% Leased at Opening:	28%

	1929-31 DOLLARS	**1994 EQUIVALENT**
Approx. Dvlpmt. Cost:	$41 Million	$349.5 Million
Construction Cost:	$24.7 Million	$210.6 Million
Land Cost:	$16.2 Million	$138.9 Million
"Soft" Costs:	Unknown	---
Cost per Acre:	$8.4 Million	$72.2 Million

Construction Cost as a percentage of Total Development Cost: Approximately 60%

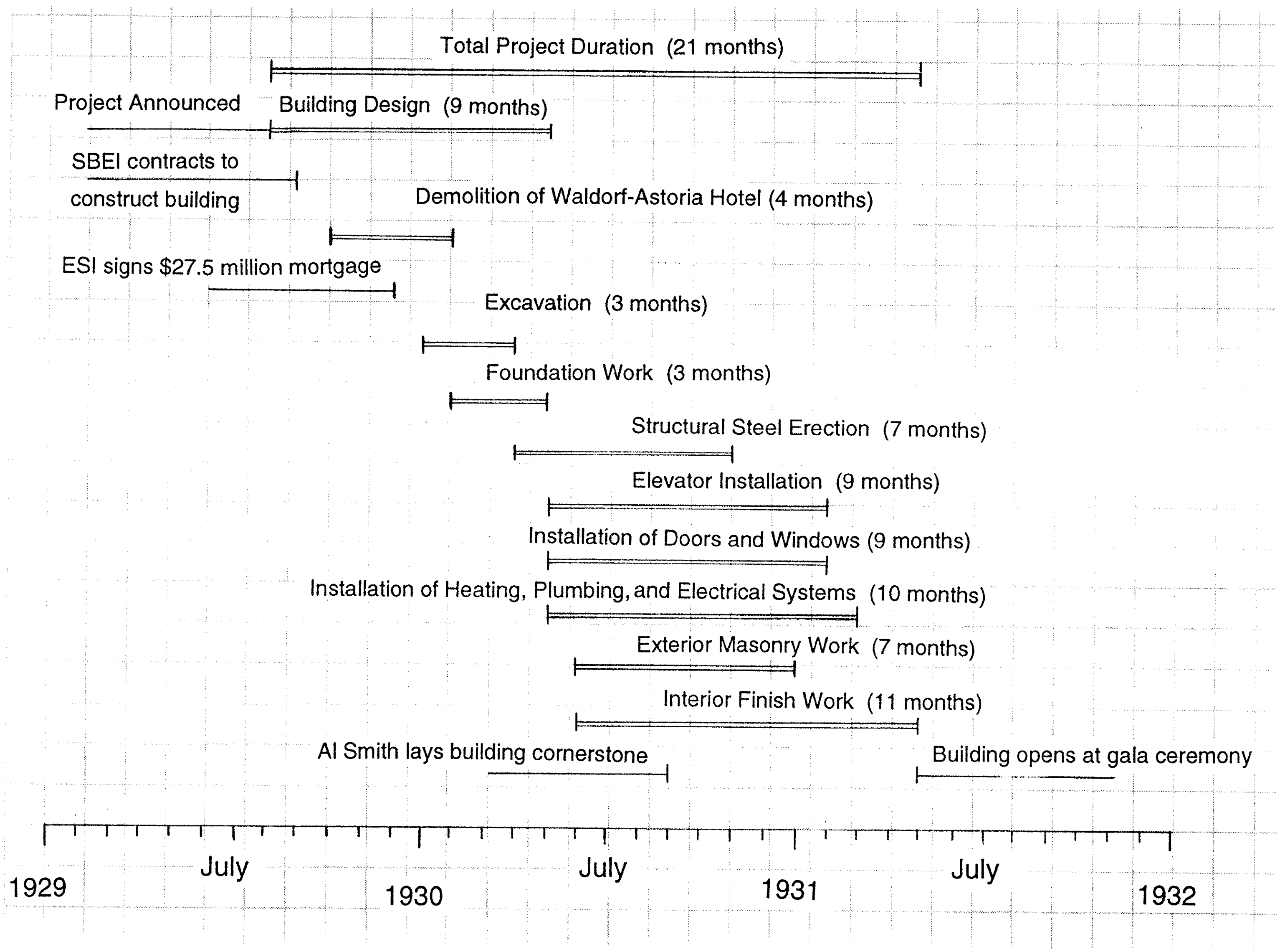

Figure 2.1 -- Project Schedule of the Empire State Building

2.3 SITE CONSTRAINTS

2.3.1 - SITE HISTORY

The Empire State Building would eventually occupy a Midtown site that had figured prominently in the history of New York City. Through much of the 18th-century the area had been farmland in what was known as the Kip's Bay section of Manhattan Island; British and Colonial troops had skirmished here in September 1776 during the American Revolution. After the war, farmer John Thompson purchased for $2,400 some twenty acres bounded between today's Madison and Sixth Avenues, and 32nd to 36th Streets. Six years later, in 1806, Thompson sold the "fertile, partly wooded and well watered" parcel for a 400% profit.[4]

In 1827 William Backhouse Astor, son of business tycoon John Jacob Astor, bought for $20,500 that portion of the property which fronted Fifth Avenue; he maintained it as farmland for several years while metropolitan New York continued to expand relentlessly northward. In 1859 Astor and his brother built two residences at the corners of what had become 33rd and 34th Streets. When William Waldorf Astor, grandson of William Backhouse, inherited the 34th Street mansion thirty years later the property had almost skyrocketed in value. Real estate economics and family feuds prompted demolition of the townhouses, which were replaced in 1893 by William Waldorf's sumptuous hotel. The Waldorf-Astoria established standards of hotel luxury, elegance, and service that were unsurpassed in America. Overnight it became one of the most fashionable social centers in the city.

As the economic expansion of the 1920s unfolded, land values in Manhattan exploded yet again. In 1929 the Waldorf-Astoria's management decided cash in on its prime location and move Uptown to new, more genteel quarters at Park Avenue and 50th Street. This spurred a company by the name of Empire State, Incorporated to purchase the hotel, its furnishings, and the two acres of land on which it sat for $16.2 million.

2.3.2 - SITE PARAMETERS

Empire State, Incorporated (ESI) had purchased a hotel and 83,860 square feet of real estate along Fifth Avenue between 33rd and 34th Streets. This figured to $8.4 million per acre ($72.2 million in 1994) in an area of the city which was facing new economic realities. From the early-1920s the Fifth Avenue thoroughfare between 30th and 42nd Streets had become a bustling commercial district, noted more for its volume of office space than its former fine-dining and lodging amenities. The area had started to be called "midtown," and many predicted that its colony of office buildings would become New York's leading business and shopping center. In fact, with ESI's arrival some were already referring to it as the "Empire State zone."

The site was strategically located in the geographic heart of Manhattan: just as easily reached from Downtown as from Central Park. It was accessible to city residents by subway and to suburbanites by train. The site was also in close proximity to several new fashionable apartment complexes that had been planned for the area. These apartments were intended to appeal to a fast-growing, up-scale, "walk-to-work" segment of New Yorkers. Two of the

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4 Fifth Avenue: A Very Social History. Page 73.

world's busiest railroad terminals, Pennsylvania Station and Grand Central, were each about a mile away; Broadway was a block to the west. Across the street was the well-known James McCreery & Company department store.

2.3.3 - FLOOR-AREA-RATIO

Like everywhere else on Manhattan Island, the site of the future Empire State Building fell under the jurisdiction of New York's Building Zone Resolution of 1916. These regulations had been adopted immediately after completion of the Equitable Building in 1915. In the case of the Equitable the developer, to maximize on his investment, had erected a high-rise tower that featured sheer exterior walls rising from street level to roof over the entire footprint of his site. This had left neighboring buildings, as well as large portions of Broadway, in cavernous shade for much of each day. In swift response to infuriated adjacent businesses, strict controls were subsequently imposed on construction projects throughout the city. This had gradually led to a system of "zoning" that was the first attempt in an American city to consciously shape its skyline by regulating building use, area, and height. Allowable building height, for example, now became a function of the street width in front of the site: a structure located in a "2-times" district and facing a 50-foot wide street could rise 100 feet above grade.

Height and floor area were two key issues confronting the developers of the future Empire State Building. By 1929 the Fifth Avenue site had been legislated as a "2-1/2 times" zone, meaning that exterior walls of any new building would have to step back from the street for each vertical rise of 125 feet. Since ESI had been toying with the idea of constructing a 1,000-foot tall office tower, these setbacks would severely restrict the building's floor area at the upper stories. In other words, although the land parcel measured 83,860 square feet, plate sizes at these top floors would not be allowed to exceed 21,000 square feet, or only one-quarter of the size of the site.

This system of control marked the first stage in the evolution of the Floor-Area-Ratio (FAR) calculation that would prominently appear in later editions of the New York City zoning code. Although it would become one of the most important parameters for real estate developers and city officials alike, FARs per se did not exist in 1929. However, since the Empire State Building's leasable floor area would be 2,158,000 square feet on a site measuring 83,860 square feet, the ratio between the two yielded a 26 FAR.

2.4 PROJECT ORGANIZATION

2.4.1 - THE DEVELOPERS

Empire State, Incorporated was formally chartered on August 4, 1929 with primary intention to construct and manage a first-class office building in the heart of Midtown Manhattan. ESI's membership read like a "*Who's Who*" of corporate America, its directory including:

Ellis P. Earle - President of the Nipissing Mines Company;

Colonel Michael Friedsam - President of B. Altman and Company;

August Heckscher - Capitalist and philanthropist;

Louis G. Kaufman - President of the Chatham Phenix National Bank and Trust Company;

Pierre S. du Pont - Chairman of the E.I. du Pont de Nemours and Company; board member of the Chatham Phenix Bank;

But the principal force behind ESI was John Jacob Raskob. Raskob had grown up in the tenements of the Lower East Side, and who by 1929 had become one of the most influential figures in contemporary American business and politics. He was chairman of the Democratic National Committee, vice-president and co-creator of the General Motors Corporation, and vice-president of the du Pont Company as well as of the Chatham Phenix Bank. He also served as a director on the boards of the Bankers Trust Company, the American Surety Company, and the County Trust Company of New York.

ESI had elected Alfred E. Smith to act as the organization's president and spokesman. Smith was former Governor of New York, and had been the nation's Democratic Presidential candidate in the recent election of 1928. (It had been during the '28 campaign that Smith and Raskob had come to know and trust one another.) Currently Smith was serving as chairman of the board of the County Trust Company of New York. He was an extremely popular figure in New York, with a magnetic personality, a charming sense of humor, and a fondness for brown derbies. He was also a skilled negotiator and mediator, and interestingly, a card-carrying member of the local bricklayers' union. As acting president, Smith, a self-admitted novice in the real estate field, would promote, advertise, supervise, and "manage" construction of ESI's grand new building. For this he would draw an annual salary of $50,000 (equivalent to $429,000 in 1994). Smith's close personal friend, Robert C. Brown, would serve as ESI's vice-president; J. Halloway Tarry was elected as secretary.

ESI's plans were anything but ordinary: it wanted to build the Empire State Building, the largest and tallest skyscraper in New York. Construction costs were estimated at $44 million. ESI would finance one-third of this amount and borrow the rest. From the corporation's perspective, the opportunities associated with the speculative venture were enormous, and the risks minimal: given the demographics of the area, filling the building with tenants would be ambitious but not impossible; in addition, land values in Midtown Manhattan had been appreciating steadily for as long as anyone could remember, and this trend was expected to continue.

In short, developing this kind of project made good economic sense and seemed like a sure bet. J.E. Priddy, president of neighboring McCreery's department store, said it best: "Because the geography of Manhattan will not permit much more of an advance northward...this section [at Fifth Avenue and 34th Street] is firmly fixed as ***the*** great business centre."[5]

2.4.2 - TENANTS

To New Yorkers, the Empire State Building was a source of endless fascination, conversation, and curiosity. When finished it would undoubtedly rank among Manhattan's most prestigious business addresses and command top rental values. The building would contain some 2,158,000 square feet of leasable floor space, and feature a roof observation deck open to the public. When fully occupied it would be a city within a city, housing over 20,000 tenants.

In the Fall of 1930, when all of the building's structural steel and exterior masonry had been completed and its interior finish work was underway, ESI began its leasing campaign in earnest. To coordinate this extensive effort ESI had hired H. Hamilton Weber away from the New York Central Building at 230 Park Avenue, where Raskob himself had once been a tenant. On November 24th ESI opened a rental management office at the corner of Fifth Avenue and 34th Street; before evening of that first day, 114 prospective tenants had inspected the premises. For the next two months this number averaged over 70 each day.

According to Weber, the Empire State Building would rent to "a varied line of business, for executive offices primarily." Some of the firms that signed leases with ESI during the building's pre-opening included Reed Cook, Inc., the Marbleoid Company, Kaufman Brothers & Bondy, the Metropolitan-Columbia Manufacturing Company, the F.H. White Company, and I.J. Ussiker and Girey, Inc. In March 1931, the du Pont Company agreed to lease all of the 9th, 10th, and 11th floors in an effort to consolidate its Manhattan operations. Three bank offices would be located on the lower floors: branches of the County Trust Company of New York, the Chatham Phenix (ESI had heavy representation on the board of directors at both institutions), and the Irving Trust Company.[6]

In spite of the several tenants that had been procured by ESI, Hamilton Weber's role as rental manager was extremely trying. This was due in part to the fierce competition that he faced from New York's other commercial building developers. More significant, however, was that Weber, ESI, and the country were currently facing new economic realities. America had entered the Great Depression (although no one was yet calling it that) and the ensuing slowdown in the economy had started to have tremendous reverberations within the real estate industry. As vacancy rates rose to 17% in Midtown and 40% Uptown, it became painfully clear that there was a glut of office space in Manhattan.[7]

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[5] *The New York Times.* May 1, 1930.

[6] *The New York Times.* July 31, 1930. February 7, and March 24, 1931.

[7] Only Yesterday: An Informal History of the 1920s. Pages 239-240.

The net effect of this unsettling economic climate on the Empire State Building was dramatic. Leasing activity dropped precipitously, and there was open speculation among the general public regarding just how long it would take to fill the skyscraper with tenants. By Opening Day ESI had leased a dismal 28% of its available floor space, giving rise to its dubious title as the "Empty State Building." This did not inhibit sightseers from visiting the skyscraper's observation deck, however. They flocked to the new landmark by the thousands -- 5,100 on Opening Day alone -- generating revenues of over one million dollars ($9 million in 1994) during the building's first year of operations (by comparison, du Pont's lease, the building's largest, was worth $3 million annually to ESI).

2.4.3 - THE DESIGN TEAM

ESI wanted its new skyscraper to stand out and draw public attention. It also wanted the skyscraper to project an image that would appeal to corporate America. Consequently, ESI hired the local architectural firm of Shreve, Lamb & Harmon, Incorporated (SLH) to design the Empire State Building. This was a sensible choice since Robert H. Shreve, William F. Lamb, and Arthur L. Harmon currently enjoyed a visible presence in New York, and were well-known for their efficiently-designed office towers.[8] As an organization, SLH was a partnership which operated out of one Manhattan office. In recent years the firm had designed buildings in New York City for the Lefcourt National Company and the General Motors Corporation (where John Raskob was vice-president), as well as the Reynolds Tobacco Company headquarters in Winston-Salem, North Carolina. The firm had also been awarded the Gold Medal of the Fifth Avenue Association of New York in 1930 for its design of the L.P. Hollander Company.

William Lamb would be lead architect of the Empire State Building. Lamb was a graduate of Williams College, Columbia University's School of Architecture, and the Ecole des Beaux Arts in Paris. According to his wife, he was a rather humble man with a degree of aristocratic bearing. Lamb recognized that "the architect is [but] one of a group of experts upon whom he depends for the success of his work, for the modern large building with its complicated machinery is beyond the capacity of one man to master."[9] The expert engineers that Lamb had assembled for the project included the local firms of H.G. Balcom (structural, who was also the consultant for William Van Alen's Chrysler Building), Henry C. Meyer (heating and ventilation), Frederick Brutschy (plumbing), and Bassett Jones (elevators).

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[8]See Shreve's article, "The Economic Design of Office Buildings," in *The Architectural Record*, April 1930.

[9]*The Architectural Record*. May 1931.

2.5 THE DESIGN PROCESS

2.5.1 - THE SCHEDULE

It was not enough for ESI to merely ***sponsor*** construction of the largest skyscraper in the world. The project was expensive -- $16.2 million for the land, and an estimated $44 million for the structure -- and would need to generate a respectable return on investment. One way to achieve this would be to reduce construction time of the project, which would enable tenants to move in faster and ESI to collect rents sooner.

In early August 1929, Al Smith publicly announced that work on the Empire State Building would start in two months. Design would begin immediately and end in the Spring of 1930; demolition of the Waldorf-Astoria would take place between October 1929 and February 1930; construction of the new skyscraper would follow in March 1930, ***prior*** to completion of the design documents. Unbelievably, Smith stated that May 1, 1931 -- a date when numerous leases had traditionally expired city-wide -- would be the target for opening. This was just twenty months away!

Accommodating the ESI's request would require unprecedented precision and cooperation among the building trades and design disciplines working on the job. Design and construction would have to proceed around the clock whenever possible. "Driven relentlessly by the necessity for speed, the designers [would] make their plans so that work [could] begin on the lower part of the skyscraper before the specifications for the higher sections [had] been completed."[10] Clearly the developers, designers, and builders were adhering to a design-build (otherwise known as "fast track") strategy, although no one was referring to it specifically by name.

2.5.2 - THE DESIGN

The architectural program of the Empire State Building was outlined August 1929. ESI wanted its skyscraper to be big, to stand out, and to be recognized; that it should satisfy the tastes of New York's professional art critics was a much lower priority. In addition to the May 1, 1931 opening, the other key provisions of the program included:

- a construction budget of $44 million, or $18 per square foot ($152 in 1994);
- use of limestone as an exterior wall treatment;
- floor plan configurations that would situate all leasable space within 28 feet of a window.

By November, preparation of preliminary drawings was complete, and the general form of the building had begun to take shape. The skyscraper would rise 85 stories -- eight more than its chief rival, the Chrysler Building -- and stand 1,050 feet tall; at night the upper thirty floors would be illuminated by white floodlights. The building would contain a total of 2,476,000 square feet, 87% of which would be leasable. A typical floor plate would consist of perimeter office space surrounding a utility core of ducts, staircases, corridors, and restrooms. Sixty-six elevators, several offering express service, would also be located within

[10] *The New York Times.* July 27, 1930.

this central core. To optimize rentable space, all heating equipment would be confined within the thickness of the exterior walls; but like any other high-rise tower of the day, technology had not advanced sufficiently to include an air-conditioning system. The building would have five entrances: two on 33rd Street, two on 34th Street, and the main entry on Fifth Avenue. Two levels of basements would extend 35 feet below grade. To fight fires, motors in the sub-basement would pump water to the 85th floor through six vertical miles of pipe, collecting at reservoirs that were located twenty stories apart.

Architecturally, William Lamb and his team had conceived an office tower that was simple yet sophisticated: it was said that the design had been inspired by the clean lines of a common pencil. The lower five stories covered the entire site and served as the pedestal from which the limestone tower would rise. Its streamlined walls were articulated by setbacks and indentations which started above the sixth floor. The combined arrangement of setbacks and concentric floor layout was christened the "Empire State formula" by the developers, providing "light and air protection to neighboring buildings as well as to tenants." "We recognize," said Al Smith, "that the maximum floor space is not always the most desirable space, and we substitute for great unbroken floor areas in the lower floors smaller but better lighted space on the upper floors."[11]

Structurally, the building would have a steel moment frame containing 57,000 tons of steel connected by rivets. This worked out to a unit weight of 46 pounds per square foot. Floors would be supported by concrete slabs on metal deck. Loads at the bottom of most of the 210 columns would average about 4,000 tons; several would carry 4,500 tons; two would support 5,000 tons. All loads would transfer through concrete spread footings to the Manhattan Schist bedrock. Because of its tremendous height plans were also being made to use the Empire State Building as a scientific laboratory related to the study of wind pressures and air current phenomena.

One of the ways that members of the design and construction teams had collaborated was in developing a simplified curtain wall system which would facilitate the accelerated project schedule. Its key component consisted of vertical stainless steel strips that would tie into the perimeter floor beams of the superstructure. These strips, or mullions, were spaced at intervals that varied between four and six feet on center. In elevation, windows would be installed in pairs on either side of these mullions; limestone fascia panels would also frame into the mullions on the outer sides of the windows, like book-ends. This wall detail had three distinct advantages: first, it created a sheer finished wall that complemented its sleek Art-Deco aesthetic. Second, it permitted masonry work and window installation to follow parallel rather than more traditional sequential paths; this enabled stonemasons to work independently of the window "gangs," and speed up construction. Finally, since the limestone panels would frame into the mullions with its edges hidden from view, the need for fine stonesmanship was greatly reduced. As consequence, the stone could be cut to rough dimension at the Indiana quarry without requiring time-consuming and expensive finish work at the Manhattan construction site.

In January 1930, plans for an observation deck at the 1,050-foot level were unveiled. This would open several thousand square feet of the building to the paying public, eager for a panoramic view of New York, New Jersey, and Long Island. One month earlier, ESI had announced that the design would incorporate a 200-foot mooring mast for dirigibles. This

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[11] *The New York Times.* January 8, 1930.

would increase the skyscraper's height to 1,250 feet. To some, this seemed a stroke of creative genius given the future potential of the airship industry; to others it was an extravagant publicity gimmick, a means to garner still more attention for the developers; a third opinion held that -- after learning that the spire of the Chrysler Building would be only four feet shorter than the top floor of the Empire State Building -- it was ESI's way of laying more permanent claim to its title of owning the tallest structure on Earth. Whatever the motives, dirigibles did anchor atop the Empire State Building on two later occasions. Wind hampered the docking both times, and curious onlookers on the ground brought Midtown traffic to a standstill. (Even had dirigible moorings become commonplace at the Empire State Building, they would have been assuredly prohibited after the 1939 docking explosion of the *Hindenberg* airship in Pinehurst, New Jersey).

2.5.3 - THE REVIEW PROCESS

The 1920s left little doubt about the capitalist preferences of the United States Government. "The business of America ***is*** business," were probably President Calvin Coolidge's most memorable words, and he had meant them. His secretary of commerce, Herbert Hoover, believed too that a healthy business climate would make for a stronger America: that it was government's role to facilitate business in ways that would increase business' efficiency and maximize its profits.

In this kind of economic climate, real estate development was a relatively straight-forward process. Land was purchased, plans were drafted, permits were obtained, and construction took place usually in relatively in short order. Frequently there was little, if any, regard for preserving the existing character of the proposed sites. But this does not mean that Government was shirking its regulatory responsibilities. Building codes were taking shape around all corners of the country in an effort to standardize construction quality, absorb changing building technologies, and maintain public safety.

During the design and construction of the Empire State Building this regulatory dichotomy was very much in evidence. The skyscraper was a relatively recent phenomenon, and New York's governing bodies were continually learning new things about the advantages and drawbacks of these kinds of buildings. On the one hand, instances of "laissez-faire" policy included:

- construction activity on the site less than two months after its purchase;
- demolition of the landmark Waldorf-Astoria Hotel, and several adjacent buildings that were "not worth preserving;"[12]
- dumping of construction debris five miles off of the New Jersey shore.

Yet at the same time the Building Zone Resolution of 1916 had been quickly adopted by the city to specifically curtail unmitigated growth. It had addressed problems that skyscraper construction had created, such as inhuman scale, poor lighting, and substandard air quality. It had also addressed the growing recognition that high-rise buildings were a primary source of increased traffic congestion on city streets, and had mandated introduction of below-street delivery and parking facilities (first implemented during construction of the Rockefeller Center

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[12] *The New York Times.* November 23, 1930.

in the early '30s). Public safety, particularly as it concerned vertical transportation systems, was a third parameter that was closely monitored by city officials. For example, elevators at the Empire State Building were required to have multiple braking fail-safes, and would not be permitted to travel at velocities greater than 800 feet per minute (though the cabs were designed to climb at a rate of 1,200 per minute).

2.6 THE CONSTRUCTION PROCESS

2.6.1 - CONSTRUCTION LABOR

It would take one-hundred contractors and some three-thousand men to construct the Empire State Building in eighteen months. The number of workers in each trade broke down by the following percentages:[13]

masonry	22%
foundations	20%
architectural finishes	11%
steel erection	10%
elevator installation	8%
carpentry	7%
plumbing	6%
heating and ventilation	6%
electrical	4%
crane work	4%
inspection	1%
administration	1%
3,000-Man Workforce	100%

Although most of these trades had a strong and vocal union presence, steel erection, one of the most important activities of the job, would be performed using non-union labor. In fact, the project's most contentious labor dispute arose when the steel erection contract was awarded by the general contractor, Starrett Brothers & Eken, to Post & McCord, an "open-shop" organization. Post & McCord had put up the steel for the Chrysler Building in record time, and in the opinion of Starrett management, was the right firm to the same job at the Empire State Building. Unionized ironworkers employed at other Starrett sites objected strenuously, however, and the day before steel erection was scheduled to start, they threatened to take strike action on Starrett projects nationwide. Called in to mediate the dispute was ESI president, Al Smith, who while governor had earned a reputation as an adept negotiator. Smith, who claimed to have held no influence regarding Starrett's hiring of Post & McCord, was apparently successful in his negotiating efforts since the following day Post & McCord began erecting the steel as scheduled, and no strike action was taken against Starrett.

For generations there had been a large supply of readily-available construction labor in Manhattan. This was amplified after the stock market had crashed in the Fall of 1929, as New York's local economy had started to slow, and as work throughout the city had become harder to find. This combination of high-supply and low-demand assured ESI that it would have little difficulty in hiring the Empire State Building workforce, and probably for ***lower*** wages than had been originally estimated in the summer of 1929.

Once the workforce had been assembled, it fell under the watchful eye of the project's official photographer, Lewis W. Hine. Hine had been hired by Starrett Brothers & Eken to compile a pictorial history of the building's construction. By the project's end, however, he had done

[13] *The New York Times*. July 27, 1930.

much more than that: he had created one of the great American photographic essays of the 20th-century. His images, particularly of the steel erection "gangs" taken from hundreds of feet in the air, possessed a heroic and mythical quality which captivated the public. His images of the workers appeared in newspapers and magazines taking on names such as "the poet builders" and "the sky boys"; one photograph that attracted special attention was of an ironworker "swinging out from the building at a terrifying height, to which Mr. Hine has given the poetic title of 'Icarus'."[14] To capture these photographs, of course, Hine often put his own personal safety at greater risk than his subjects, since he carried an ungainly camera which often required both hands to operate.

Due to the project's accelerated schedule, the general contractor would always be looking for ways to shave time. As consequence, crews worked in day shifts and night shifts, whenever possible. Each shift was eight hours long: days began at 8:30 in the morning and ended at 4:30; nights began around four in the afternoon and ended at midnight. Union wages for skilled laborers averaged $2.00 an hour ($17.05 in 1994) with double pay for overtime.[15] Mealtimes at the site were thirty-minutes long, and a concessionaire ran restaurants at selected floors of the building, obviating the need for men to make the long climb down to the street and then back up again. Forty-cents ($3.40 in 1994) would buy two sandwiches, coffee or milk, and a slice of pie.

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[14] *The New York Times.* July 27, 1930.

[15] The Building of Manhattan. Page 61.

Figure 2.2 -- Construction of the Empire State Building
(Photograph by Lewis Hine)

Figure 2.3 -- Construction of the Empire State Building
(Photograph by Lewis Hine)

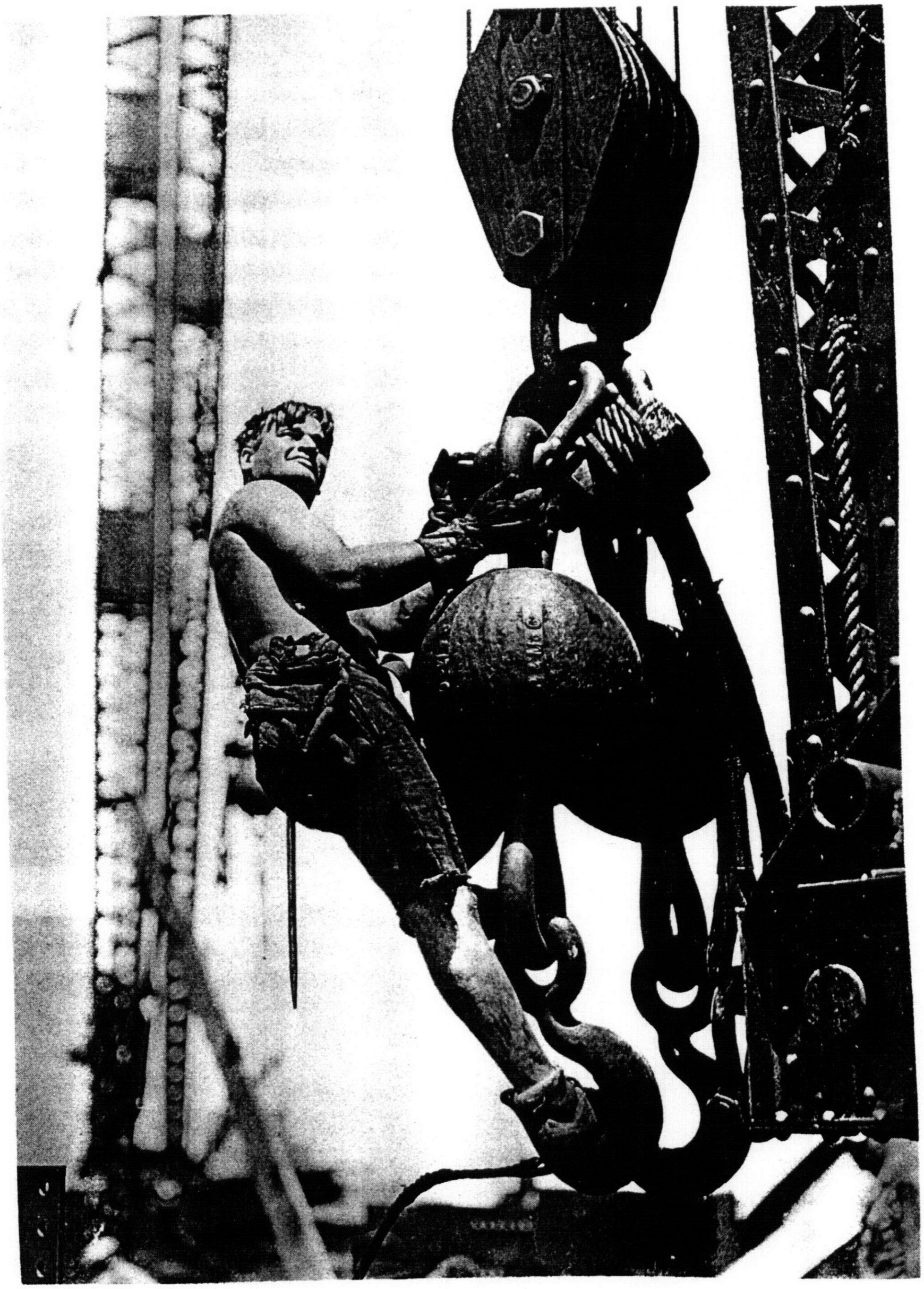

Figure 2.4 -- Construction of the Empire State Building
(Photograph by Lewis Hine)

2.6.2 - BUILDING MATERIALS

Materials and supplies required for construction of the Empire State Building were purchased mostly from sources in the Eastern United States and from Europe. They had to be procured quickly, of course, to accommodate the rigorous construction schedule. One of the primary components was the 57,000 tons of structural steel: it was fabricated in Pittsburgh, sped to a New Jersey supply yard by freight train, barged to Manhattan, and trucked to the site. On average, the steel sections were riveted into their final positions just four days after being cast in the furnace.

Stainless steel had been specified for pilaster and mullion facing and would be fabricated in Elmira, New York. Indiana limestone would sheath the exterior walls, complemented by granites from Sweden and the State of Maine. Polished marble from Italy and the State of Vermont would line interior lobbies, and the building's 6,400 windows would be assembled in Cleveland, Ohio. The ten million bricks required for the project would come from Connecticut, cement from Pennsylvania, timber from North Carolina and Oregon. Since the Empire State Building was one of the few large projects then under construction in the country, demand was low and ESI was able to purchase most of these materials at steep discounts, and with reduced lead times.

2.6.3 - BUILDING TECHNOLOGY

Contrary to contemporary public opinion, there was not a great deal of dramatic technological innovation associated with the planning and construction of the Empire State Building. It would be built in much the same manner as the other skyscrapers of its generation, from derricks to dynamite. Those advances in technology that ***were*** introduced to the project were prompted by the aggressive schedule and any technique that optimized construction speed and productivity was actively promoted.

An improvement in derrick design was perhaps the most significant safety innovation in the construction equipment. Derricks, or hoisting cranes, were the sole means of transporting materials to ever-higher floors, and could lift loads anywhere between 20 and 44 tons. Sixteen derricks would be used at the Empire State Building site (compared to two at Worldwide Plaza). Prior to 1930, the cable-braking mechanisms of the hoists were manually controlled: when an operator lost control of his "line" -- which happened on occasion -- his load could come to a crashing halt at the floors below with uncertain consequences. This changed with the invention of "automatic" hoists, first introduced during erection of the Empire State Building. The electrically-driven mechanisms could be modulated for speed and contained a self-braking feature which could "freeze" the cable in mid-air without required reaction from the operator. This was an especially well-received innovation since few workers on the site wore protective headgear.

The incremental development of high-strength structural steel also played a significant role during design of the Empire State Building. The building would be tall and heavy, requiring an unparalled system of support. Some of its wide-flange columns would measure 42-inches by 30-inches, weigh 2,000 pounds per lineal foot, and carry loads in the range of 5,000 tons.

This kind of efficient steel section had been unthinkable twenty years earlier, and the consequences of its current availability meant that fewer columns would be needed throughout the building. This in turn, accommodated a creative floor plan arrangement (see "Empire State formula," Paragraph 2.5.2) which played a prominent part of the sales pitch to prospective tenants.

Enhancements in construction technology were perhaps most visible at the building's elevator banks. Here sixty-six cabs were designed to travel faster and "smarter" than any that had been assembled before. In fact, the Otis Elevator Company developed an entirely new system of vertical transportation for the Empire State Building. It cost $2.9 million ($24.7 million in 1994) and rated among the most sophisticated in the world, featuring an automatic dispatching system and self-leveling cabs that could travel 1,200 feet per minute (although New York's current building code would not permit velocities in excess of 800 feet per minute).

2.6.4 - SUPERVISING THE WORK

There were only a handful of firms in the world with the expertise and experience necessary to construct the Empire State Building in eighteen months. As consequence, ESI hired the company which had built more skyscrapers than any other: Starrett Brothers & Eken, Incorporated (SBEI). The Starrett brothers -- Paul, Bill, Ted, Ralph, and Goldwin -- had begun their contracting careers in Chicago during the 1880s and had migrated to Park Avenue in Manhattan by the turn of the century. Since then they had constructed some of New York's largest structures, including the Flatiron (1900-01), Woolworth (1910-13), and Equitable (1912-15) Buildings. The firm was headed by the oldest brother, Colonel Paul Starrett. Colonel William A. Starrett was the youngest; as a man in his sixties he would lead the Empire State Building construction effort, which would be the last of his family's prolific career. J.W. Bowser would be Starrett's superintendent overseeing day-to-day operations on the site; David P. Earle would be ESI's on-site representative. To foster good relations and discussion among members of the design, construction, and development teams, ESI established the Empire State Building Club, which would meet on a monthly basis.

SBEI was well-known for its determined approach to construction management. "Building skyscrapers is the nearest peace-time equivalent of war," wrote Colonel Paul:

> "In fact, the analogy is startling, even to the occasional grim reality of a building accident where maimed bodies, and even death, remind us that we are fighting a war of construction against the forces of nature....Even the organization closely parallels ...a combatant army, for the building organization must be led by a fearless leader who knows the fight from the ground up....Ever pressing forward, that leader with his lieutenants and...their sub-lieutenants plan...for the swift completion of the work in hand."[16]

This philosophy was very much in evidence while planning the work for the Empire State Building. SBEI was directing one of the world's most ambitious construction projects,

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[16]Skyscrapers and the Men Who Build Them. Pages 63-65.

coordinating the activities of more than one-hundred subcontractors. In response, the firm monitored the work scrupulously on detailed progress schedules; punch lists of activities and associated responsibilities were posted daily. SBEI oversaw project progress with skillful precision, ensuring that the men and machinery needed to do the job were where they had to be and at the proper time. This frequently required innovative planning which included, for example, installation of miniature railway systems at selected floors, each equipped with cars that would cart material from lay-down areas at the central building core to floor outposts. These cars ran on tracks equipped with turntables to accommodate shifts in the direction of construction. In short, SBEI was among the first firms to formally recognize that the ultimate success of a construction project often lay in how well its construction operations was ***managed***.

2.6.5 - SAFETY

In January 1931 the committee on accident prevention of the Building Trades Employers' Association of the city of New York (BTEA) published its tenth bulletin, entitled "Safety Stories." Enclosed were 25 photographs featuring the safety methods that were being used to protect the workforce and general public alike during construction of the Empire State Building. The publication had been prepared from a report of inspection conducted by an independent BTEA subcommittee, with the consent and cooperation of Starrett Brothers & Eken. That BTEA was distributing the literature to its membership as well as affiliated organizations across the United States indicated that these project safety measures were exemplary models for the rest of the country to follow.

In spite of SBEI's safety-consciousness, however, there were several fatalities associated with construction of the Empire State Building. Part of this stemmed from the lack of safety gear for workmen since in 1929 head, ear, and eye protection were a rarity at ***any*** construction site. By October 1930, and after one year of construction, five workman's deaths had been reported: one during demolition of the Waldorf-Astoria Hotel, one during foundation excavation, and three during steel erection. By April of 1931, six months later, this count had risen to fourteen. (By comparison, there had been but one fatality during construction of the Chrysler Building, completed just a year earlier.) Although no one would openly admit to it, it appeared that in their quest for speed ESI and SBEI had exposed their workers to greater risks than if a less aggressive schedule had been specified.

2.6.6 - CONSTRUCTION MILESTONES

In September 1929, ESI contracted with Starrett Brothers & Eken to construct the Empire State Building. The developers expected SBEI to actively manage an ambitious eighteen-month schedule that would have the building ready for occupancy by May 1, 1931. Preparatory work began in October 1929, when ESI auctioned off the furnishings and architectural fittings of the old Waldorf-Astoria Hotel. This had coincided with the great stock market crash on "Black Friday," October 29th, and was not generally considered as a propitious start for the project. Undeterred, however, ESI and SBEI employed a 700-man crew to demolish the hotel on November first.

By January 1930 enough of the site had been cleared to start excavation work for the foundations; within three months, more than 110,000 cubic yards of dirt were removed, concrete footings poured, and steel erection begun. The raising of the steel skeleton was a construction marvel, averaging four floors per week and taking just 23 weeks to "top out." Exterior masonry walls, windows, elevators, and finish work were all installed with equal efficiency and speed.

It was April 1931 when the Empire State Building's first tenant, the County Trust Company of New York, moved in. Incredibly, this was a full week ***ahead*** of the scheduled target date, and was $19 million ***less*** than ESI's initial cost estimates for the project. The building had met its eighteen-month deadline, and Starrett Brothers & Eken had masterfully managed the work. A chronology of construction milestones follows:

1929	September	ESI contracts with Starrett Brothers & Eken to construct the world's tallest skyscraper
	October	The Waldorf-Astoria fittings and furnishings are sold at auction
	November	Demolition of the former Waldorf-Astoria Hotel begins
	December	ESI signs $27.5 million mortgage/construction loan with the Metropolitan Life Insurance Company of New York
1930	January	Excavation begins to the Manhattan schist bedrock
	February	Hotel demolition completed
	March	Excavation to 35 feet below grade completed
	April	Structural steel erection begins at average rate of four floors per week
	May	Installation of sixty-six elevators begins; Installation of window frames begin; Heating and ventilation work begins
	June	Exterior masonry work begins; Interior partition and architectural finish work begins
	September	Al Smith lays cornerstone in ceremony attended by 5,000 people; Structural steel "tops out" at the 85th floor: 1,050 feet
	November	Structural steel "tops out" at the mooring mast: 1,250 feet
	December	Exterior masonry work completed
1931	April 27	Bottom three floors opened for occupancy; County Trust Company of New York branch office opens for business
	May 1	Ribbon-cutting ceremony led by Al Smith, President Hoover and Governor Roosevelt; Construction costs close out at $24.7 million;

2.7 EPILOGUE

2.7.1 - REACTION

On May 1, 1931 Al Smith and his grandchildren presided over the ribbon-cutting ceremony at the Empire State Building. In an economic landscape that was becoming drearier each day, the opening had been an eagerly anticipated event: over 5,000 people were in attendance, including then-Governor Franklin Roosevelt and Mayor James Walker. Keeping with tradition, President Herbert Hoover had been asked to trip the building's master light switch via remote hook-up from the White House (President Woodrow Wilson had opened the Woolworth Building -- then the world's tallest -- in the same way in 1913).

From the start, the design attracted rave reviews from the public and the critics alike. "The Empire State Building is obviously an artistic creation of high value," wrote the Architectural League of New York. "Its acceptance by the people as a whole is remarkably unanimous and complete, and such expressions of popular approval, when so strikingly universal, are seldom far wrong."[17] In January 1932, the New York chapter of the American Institute of Architects awarded its Medal of Honor to Shreve, Lamb & Harmon for the inspired design. By now the Empire State Building had become ***the emblem*** of the city of New York, overtaking the Chrysler Building, the Brooklyn Bridge, and even the Statue of Liberty for the honor. Films like *King Kong* (1933) had made the building one of the most widely-recognized in the world. By 1955 the American Society of Civil Engineers had added the skyscraper to its list of seven wonders of American engineering. Even fifty years later, *The New York Times* architectural critic, Paul Goldberger, was describing the building as "an immensely skillful piece of massing...restrained and dignified...."[18]

In spite of the marvelous construction effort and the host of design-related accolades, tenant interest in the building lagged significantly during its first fifteen years of operations. By Opening Day 1931 vacancy at the Empire State Building was an astonishing 72%, which was three times the rate of other Midtown commercial blocks. So low was initial rental income, in fact, that if not for the revenue generated by sightseers traveling to the observation decks, rumors were that the building would not have been able to pay its real estate taxes. From ESI's perspective, what had seemed like such a sure investment at the start now seemed much more tenuous, and would actually take much more patience than originally estimated.

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[17] *The Architectural Record.* January, 1932.

[18] The Skyscraper. Page 85.

CHAPTER THREE: WORLDWIDE PLAZA

Constructed November 1986 to June 1989

"What it comes down to is...numbers, internal rate of return, the net present value, discounted cash flows -- that's what it's all about. It's not about...the construction manager....It's not about the architect....What it's about is dollars and cents. Sure, we want to build quality and we want to build something that is going to be a statement, but..I'm not doing it for the fun of it, I don't think Bill [Zeckendorf] is, I don't think the other partners are. And I don't think the lenders...are doing it for the fun of it, so we can cut through all the philosophical stuff of the architects...about enhancing the community life....That's all true, but what it comes down to is whether it's financeable and whether there is a return to the partnership."[1]

Terry Soderberg, Project Manager
ZCWK Associates
Developer of Worldwide Plaza

1 Skyscraper. The Making of a Building. Pages 377-378.

3.1 - SUMMARY STATISTICS: WORLDWIDE PLAZA

Location:	Eighth and Ninth Avenues between 49th and 50th Streets
Constructed:	November 1986 to June 1989 (31 months)
Developer:	William Zeckendorf, Jr. with ZCWK Associates
Architects:	Skidmore, Owings and Merrill
Construction Managers:	Hymowitz, Ravitch and Horowitz
Structural System:	Combined Steel Moment-Frame Perimeter with Braced Frame Core on Cast-in-Place Concrete Foundation
Height above grade:	770 feet (47 stories)
Depth below grade:	30 feet
Excavate Removed	178,000 million cubic yards
Total Floor Area:	2,500,000 square feet
Leasable Tower Area:	1,680,000 square feet
Lot Size:	160,000 square feet (200 feet by 800 feet)
Floor/Area Ratio:	14
Construction Speed:	80,600 square feet per month
Total Steel:	19,000 Tons
Steel Unit-Weight:	17 psf
% Financed:	77% (98% without O&M Letter of Credit)
% Leased at Opening:	55%

	1985-89 DOLLARS	**1994 EQUIVALENT**
Total Development Cost:	$533 Million	$746.2 Million
Construction Cost:	$283 Million	$396.2 Million
Land Cost:	$100 Million	$140.0 Million
"Soft" Costs:	$150 Million	$210.0 Million
Cost per Acre:	$27 Million	$40.9 Million

Construction Cost as a percentage of Total Development Cost: 53%

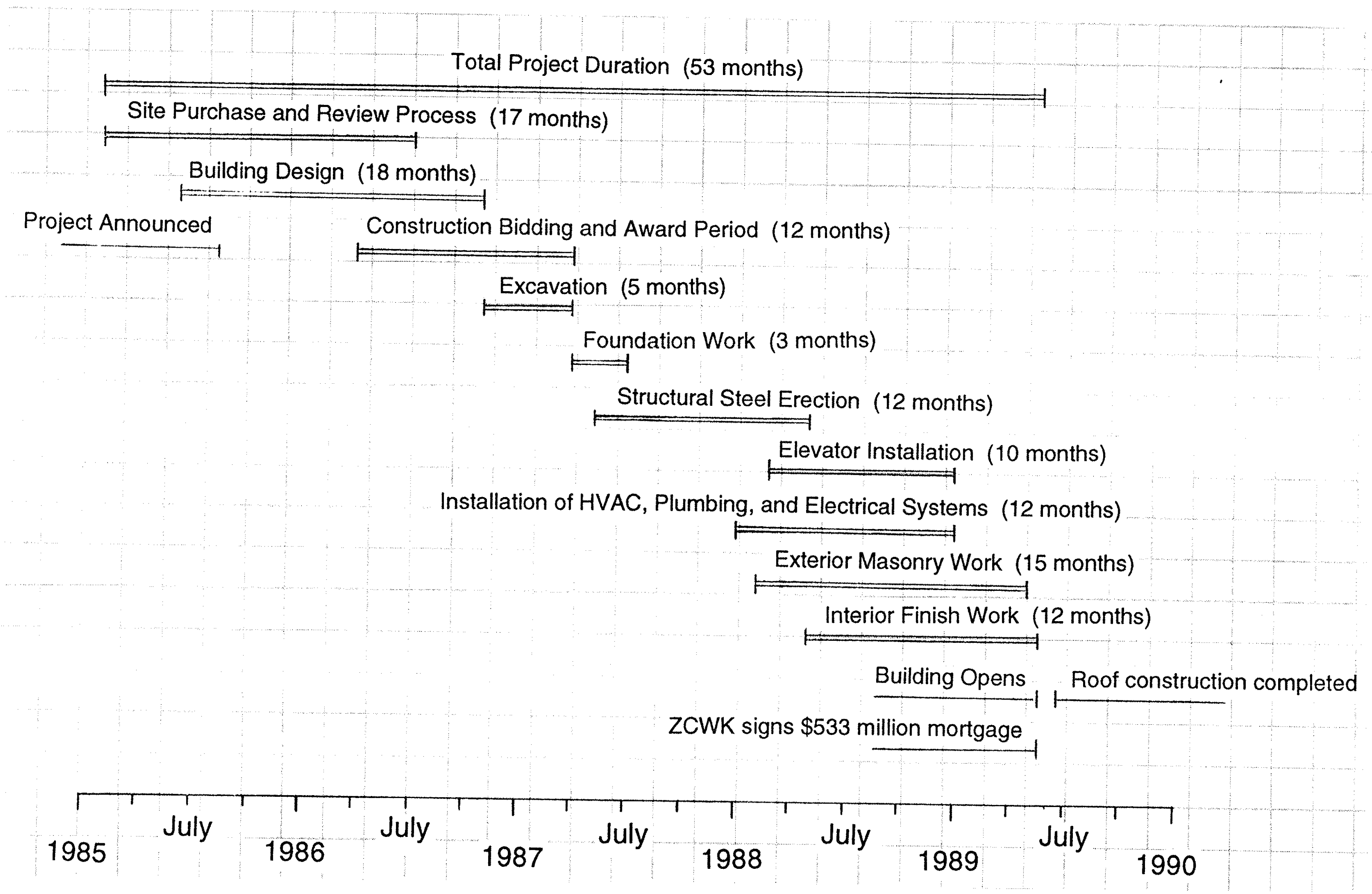

Figure 3.1 -- Project Schedule of Worldwide Plaza

3.2 *PROJECT CONTEXT*

3.2.1 - INTRODUCTION

In 1892 the Madison Square Garden opened its doors at Madison Avenue and 26th Street. It had been designed by the well-known architect Stanford White of the firm McKim, Mead and White, and for the next thirty-three years "The Garden" had played host to scores of prominent civic conventions and public events. By 1925 the decision was made to move this venerable New York institution further uptown, to Eighth Avenue and 49th Street. Here, in the infamous district known as "Hell's Kitchen," stood the second Madison Square Garden for forty-three years until 1968, when it moved again to its present-day site at Seventh Avenue and 31st Street. The owner of the second Garden was the Gulf & Western Corporation (G&W), which had also financed and overseen construction of the new, third Madison Square Garden between 1966 and 1968.

After the successful move, G&W promptly demolished the former (second) Garden facility, with intentions to further develop the large West Side site. Surprisingly, however, the plans took nearly twenty years to develop: and under ownership other than G&W. What follows is a brief history of how that development, design, construction, and financing effort unfolded between the years 1985 and 1989.

3.2.2 - THE ECONOMIC ENVIRONMENT

In the mid-1980s economic conditions in most of America were improving. A recession had passed, rates of interest were falling, inflation had been tamed, and demand was up for ***everything***. Within the construction industry business was brisk. Nearly every sector -- housing, transportation, commercial, industrial, environmental, and the military -- was experiencing significant growth. This stood in stark contrast, particularly in Manhattan, to conditions of the 1970s when an Oil Shock, the New York City fiscal crisis, and a glut of office space inherited from the early '60s, had conspired to depress land values and curtail real estate development.

By 1985, skyscraper construction on Manhattan Island was booming. Post-modern designs such as Citicorp Center, the AT&T Building, and Trump Tower had been recently completed, and plans for many more were on the boards. Due to its relatively "underdeveloped" character, the city's West Side was being targeted for its rich potential. Three areas were particularly attractive to developers: Times Square, Columbus Circle, and the site of the former Madison Square Garden.

3.3 SITE CONSTRAINTS

3.3.1 - SITE HISTORY

After demolition of the former (second) Madison Square Garden in 1968, the parcel's owner, Gulf & Western, had commissioned the architectural firm Skidmore, Owings & Merrill to design a three million square foot master plan for the site. The proposal was staggering in scale. It was a huge building: 25% larger than the colossal Pan Am Building, which had been completed in 1963. The principal difference between the two projects was that the Pan Am stood in the heart of Midtown, while G&W's proposal overlooked the blue-collar residential neighborhood known as Clinton. Because the Historic Preservation movement had just taken hold in New York, it did not take long for concerned Clinton community groups to create enough pressure at the City Planning Office to force G&W to postpone its development plans.[2] Choosing instead to bide its time, G&W opted to pave the four acre site with asphalt and use it as a parking lot. By 1975, seven years later, G&W had altogether abandoned its plans to develop the parcel; and in this uncertain economic climate two businessmen, Victor Elmaleh and Frank Stanton, declined on a $12 million option to purchase the former Garden site. Their small development firm was named the World Wide Company.

It took ten years, but with the more favorable economic conditions of the mid-1980s G&W finally sold at auction its dormant parking lot in 1985. The selling price was $100 million and had netted the Corporation an annualized 8% inflation-adjusted rate of return. The purchaser of the property was ZCWK Associates, a real estate consortium which had outbid its nearest rival by nearly $30 million.

3.3.2 - SITE PARAMETERS

Clinton was a low- and middle-income residential neighborhood with a population of approximately forty-thousand. The area featured apartments, shops, restaurants, churches, and offices, and had easy access to Manhattan's major business districts. There was a seamier element to Clinton as well, vestiges of the crime and vice that had gripped the area through the 1940s when it was known as "Hell's Kitchen." Like most of New York City, zoning regulations in Clinton varied block-by-block in accordance with its mixed-use character.

ZCWK had bought 160,000 square feet between Eighth to Ninth Avenues and 49th to 50th Streets. This worked out to $27 million per acre ($40.9 million in 1994). The site fell across three distinct zoning areas, each with its own limitations regarding building height and floor space. Low-rise apartment blocks lined the streets to the immediate north and south; mid-rise office buildings were to the east; modest commercial shops bordered on the west. The entrance to the New York Transit Authority's 50th Street subway station was located on the northeast corner of the site. Central Park and Grand Central Station were each about a mile away, to the northeast and southeast, respectively. Broadway was about one-half block to

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2 The watershed for the Historic Preservation movement in the United States arrived in 1962. In that year McKim, Mead & White's Pennsylvania Station (1910) was demolished amid public outcry to make way, coincidentally, for G&W's new Madison Square Garden (1966-68).

the east; Times Square four blocks to the south.

Using the former Garden plans as a guide, ZCWK knew precisely where the old concrete foundations were located. From soil borings taken around the site Manhattan Schist bedrock lay at about 20 feet below grade, and had a bearing capacity that varied anywhere between 40 and 60 tons per square foot.

3.3.3 - FLOOR-AREA-RATIO

Establishing a Floor-Area Ratio (FAR)[3] that would satisfy both ZCWK and the City Planning Department was a core component of the preliminary development plans. Zoning restrictions at the Eighth and 49th site were ambiguous, leaving substantial room for negotiation. From ZCWK's perspective the FAR would largely govern the project's revenue stream, structural massing, and architectural aesthetic. From the Planning Department's point of view the FAR was perhaps its most powerful enforcement tool, and was among the few ways that cooperation between developer and City could be ensured.

To start, the City had mandated a 10 FAR at the site, which was an increase above the 8.5 FAR at the former Madison Square Garden. To make its investment pay off, however, ZCWK was seeking a 12 FAR minimum (the proposed Gulf & Western design of 1968 had a 21 FAR.) The City accepted ZCWK's counter-proposal and offered to grant ***another*** 2 FAR to the project, in fact, provided that ZCWK agree to make two concessions. The first would require that the developer, during construction of its new building overhead, also renovate the existing 50th Street subway station below; the stipulation called for improved station lighting, ventilation, and security systems as well as upgrading its platform capacity. The second concession would require inclusion of a landscaped, one acre plaza within the developed site that would be open to the general public. To ensure that ZCWK would live up to its promise the City insisted that it take "hostage floors" in the proposed facility, which would most likely take shape as an office tower: ten middle floors in the building that tenants would not be allowed to occupy until all subway and plaza improvements had been completed. By late-1985 ZCWK had agreed to absorb the costs of these conditions and was subsequently granted its 14 FAR.

3 Floors below grade as well as mechanical rooms are typically excluded from FAR calculations.

3.4 PROJECT ORGANIZATION

3.4.1 - THE DEVELOPERS

Members of ZCWK included Arthur Cohen Realty, the Japanese construction firm Kumagai Gumi, and the World Wide Holding Corporation which was headed by Victor Elmaleh and Frank Stanton. Elmaleh reasoned his change of heart regarding the purchase of the property in this way: "[1975] was the depth of the New York financial crisis and it was virtually impossible to finance any kind of a building project. We had in mind to put in a square block of an amusement park....I think it would have been a terrific project for that area....Oddly enough, it's more usable now, at $100 million, than it was at that time at twelve."[4]

The principal proponent of the deal was William Zeckendorf, Jr. He was the namesake and son of a prominent New York developer who, from the 1940s through the '60s, had been a partner in the real estate brokerage firm of Webb and Knapp. (Webb and Knapp had been a driving force behind the trend toward the "corporatization" of Park Avenue in the 1950s.) By the mid-1980s Zeckendorf Junior had risen to become Manhattan's most active developer, managing twenty projects worth well over a billion dollars. Tall, gruff, honest, and hard-working, Zeckendorf was also known for making quick decisions. He was not a micro-manager nor did he have a reputation for meddling: generally, Zeckendorf subscribed to the idea that when he hired people to do a job, he let them do it.

Among ZCWK's first priorities was to conduct a feasibility study for the project. Using G&W's sore experience as guide, it was clear that ***any*** development of ZCWK's newly acquired site would have to be a delicate balancing act: it would need to generate a cash flow large enough to justify its enormous capital costs, and it would also have to satisfy the vocal concerns of the Clinton Community Board and the New York City Planning Office. Consequently, ZCWK hired a design firm to create an architectural complex of apartments, condominiums, cinemas, shops, and restaurants anchored by an office tower. That firm, by sheer coincidence was Skidmore, Owings & Merrill (SOM).

Since ZCWK had bought the site for speculative development, financing the deal was another core component of the feasibility study. The project would be expensive and money would be tight: ZCWK had leveraged 88% of the $100 million land purchase. Additionally, total development costs based on SOM's preliminary plans were estimated at $550 million, $380 million for the office tower alone. From the start then, it was clear to the developer that it should employ some kind of partnering strategy, whereby ZCWK could swap long-term project equity in exchange for short-term credit collateral, perhaps from prospective tenants.

From ZCWK's perspective, the risks and opportunities associated with its proposal were huge. On one hand the complex would be situated on the West Side, set apart from the much more prestigious corporate addresses of Manhattan. This would make it difficult to attract -- and hold on to -- premier anchor tenants. On the other hand, finding and developing an open site of this size ***anywhere*** in New York City was a rarity, a once-in-a-lifetime chance to reshape an entire neighborhood. A ZCWK employee reinforced this sentiment: "One day people will look back at Zeckendorf and say, 'Look what he did, he

4 Skyscraper. The Making of a Building. Pages 17-18.

created an entire[ly] new area.' We're the forerunners on 8th Avenue."[5] But Zeckendorf himself was more subdued: "When we put up the first $12 million all we had was a parking lot. We had no project, we had no financing, we had nothing. [It] was a real gamble....And to finance a $550 million project on Eighth Avenue and 49th Street was loco, to say the least."[6]

3.4.2 - TENANTS

One of the benefits of renting between Eighth and Ninth Avenues was that it was cheaper than more prestigious Manhattan addresses by about $5 per square foot. Consequently, Worldwide Plaza attracted interest from a number of potential tenants during the building's design and construction. These included the Wall Street law firm Cravath, Swaine and Moore; N.W. Ayer, a public-relations company; the communications giant Viacom; and Polygram Records.

Even more encouraging was that within weeks of purchasing the site ZCWK had successfully wooed one of the world's largest and best-known advertising agencies, Ogilvy & Mather (O&M), to sign a tentative lease within the proposed office tower. O&M would rent 600,000 square feet for $300,000 per week. This accounted for nearly one-third of the tower's leasable floor area and brought immediate respectability to the project. An integral part of the lease agreement stipulated that ZCWK provide twelve months advance notice to O&M prior to its move into Worldwide Plaza. ZCWK was also committed to giving six months notice prior to the date that O&M could begin to customize the space that it would occupy. Just as important, the agreement also brought O&M's letters of credit that were worth $100 million into the project, which would serve as collateral for financing the required short-term construction loans. But there were two conditions: first, that O&M would obtain an equity position that would entitle it to a share of the new building's profits; second, that it would have the opportunity to work early-on with ZCWK's architects to help shape the design of O&M's new world headquarters.

ZCWK discovered that promoting its new skyscraper was a relatively straight-forward process, and had targeted December 1989 as the date for 100% occupancy of the office tower. Aside from O&M, however, the developer found that ***sealing these deals*** was another matter altogether. This became particularly problematic after the 19th of October 1987 when the Dow Jones Industrial Average of the New York Stock Exchange plummeted 500 points, the most precipitous drop since the Great Crash of '29. The net effect of "Black Monday" on ZCWK was significant in that it put ***all*** of corporate America's near-term plans on hold, and thereby placed several of Worldwide Plaza's tentative leasing arrangements in jeopardy. Obviously this diminished ZCWK's bargaining position and meant that prospective tenants could now press for every advantage in terms of the amount of space they would rent, where in the building they would rent it, and how much money it would cost them. Given these new realities and after substantial negotiations, ZCWK ***did*** secure its second major tenant by Christmas 1987: Cravath, Swaine and Moore had agreed to rent thirteen floors, 370,000 square feet in all. In the aggregate, this put 55% of the office tower under lease with almost a full year to go before the building's scheduled opening.

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5 Ibid. Page 134.

6 Skyscraper. The Making of a Building. Page 25.

3.4.3 - THE DESIGN TEAM

From the outset, ZCWK wanted its new project to possess a distinctive and appealing design. Bill Zeckendorf was a man known to care about good architecture; Victor Elmaleh was a sort of architectural aficionado. The firm that ZCWK had consulted to do the work had enjoyed a visible presence in New York and was among the most prestigious in the world. The partnership had been founded in 1936 by Louis Skidmore and Nathaniel Owings.[7] As the American economy expanded in the 1940s, '50s, and '60s, so too did SOM's practice: from a modestly-sized architectural firm that was based in Chicago to a highly-hierarchical organization that at its high-point had employed nearly 1,000 people at several offices around the country. SOM had garnered commissions for scores of buildings that included corporate headquarters, apartment blocks, and college campuses, among others. By the mid-1980s some of these designs had become international landmarks: Sears Tower in Chicago and Lever House in New York were among them. Compared to rival firms SOM's image was rather staid, with its reputation staked to a brand of artistic expression that consciously submerged individualism and promoted instead a ***collective***, team-oriented approach to design.

SOM had assembled a core of well-trained, dedicated architects, engineers, and managers to design the ZCWK project. For many was the largest job on which they had ever worked. David Childs, a partner, who had been recently transferred from the Washington, D.C. office, was Lead Architect and held ultimate say regarding the shape, size, and colors of the new building. Childs was a pragmatist who had an appreciation for the ***business*** of architecture, and who had grown accustomed to the fact that compromise was integral to the construction process. At the same time, he was also an artist who believed that each design should be reflective of its owner's personality as well as its unique context in time and space.

Complementing Childs' architectural efforts was Leon Moed, another partner, who assumed the general management responsibilities of the project; associate partner Jim Bodnar, the Senior Design Architect; Rob Schubert, overseeing the day-to-day operations as Project Manager; and Ed Narbutas as the Job Captain who was responsible for coordinating the technical elements of the project; along with a full team of in-house project architects and structural engineers. Remaining design would be performed by subconsultants: mechanical and electrical engineering by Cosentini Associates; and elevator systems by the firm of Jenkins and Huntington. O&M's architectural interests would be represented by Lambert Mancini Woods. Weekly coordination meetings would help prioritize the work and assess design progress. It was estimated that some six-hundred contract drawings would be required to define the project, which would be prepared in the Manhattan offices of each firm.

Two important elements of the design would be tested in "off-site" laboratories, and would describe how scaled models of the future building would perform under simulated weather conditions. Wind tunnel analyses -- a routine part of skyscraper analysis since the 1960s -- were sub-contracted to the laboratories at the University of Western Ontario; Curtain wall tests (see Paragraph 3.5.2) would be performed by the Construction Research Laboratory in Miami. Although expensive, they would save ZCWK substantial money over the long-term through more efficient structural design and more effective waterproofing details.

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7 Skidmore had begun his career as a young architect during the Depression. One of his first positions was an architectural plum: that of chief designer for Chicago's Century of Progress exhibition of 1933. Through the years he gradually gravitated more towards the marketing and office operations side of the design business.

3.5 THE DESIGN PROCESS

3.5.1 - THE SCHEDULE

To finance, design, and construct the kind of facility that ZCWK had in mind would take ***at least*** four years. To accelerate the process the design-build model of construction was chosen. Design would begin in the Spring of 1985 and end in October 1986; this would partially overlap with solicitation and review of contractor bids, which would take about a year starting in the Spring of 1986; Construction would commence in November 1986 and finish late in 1988. Estimates showed that this "fast-track" strategy would enable the developer to open the building about a year sooner than if more sequential methods of design and construction were used.

As attractive as the design-build option seemed, however, it did have its perils. Delays in schedule, for example, would be reason for concern since they would have an undoubted "ripple effect" on nearly every other downstream activity, and negate those savings in cost and time for which the design-build approach was so attractive. Delays would also saddle ZCWK with extra payments on its high-interest short-term loan, which would amount to roughly $2.5 million for each additional month of construction. Finally, delays would also force the developer to pay lease extension premiums to its prospective tenants since they would not be able to move into Worldwide Plaza on time. Delays might occur for a variety of reasons, including inadequate design coordination, changes to the design, poor weather, labor shortages, and work stoppages.

In spite of the drawbacks of the design-build option, ZCWK felt that it really did not have much of a choice in the matter. It was developing the site on speculation, and ***any*** viable scheme that could offer promise cost savings to the project needed to be aggressively pursued.

3.5.2 - THE DESIGN

The architectural program was outlined early in 1985, at about the same time that the lease agreement between ZCWK and O&M had been reached. ZCWK had assigned SOM a target budget of $91 per square foot ($137 in 1994) with which to work. Partly in response to O&M's operational requirements for large floor plates, initial sketches showed a building that was long rather than tall, and generally lacking in architectural pizzazz. Later that summer and after several iterations, the 2.5 million square foot project was announced to the public: the complex would be called Worldwide Plaza. Models and renderings presented a group of buildings, consisting of office tower, residential tower, and low-rise housing clusters, that were laid out into an asymmetrically-tiered composition over the four acre site. The one acre public plaza, mandated during FAR negotiations, would separate the commercial office tower from the residential apartment tower. The office tower would rise 47 stories, the residential tower 38, the low-rise units six floors above grade. Entrance to the 50th Street subway station would be provided through the lobby of the office building; parking and service ways to the entire complex would be accessed from the thirty-foot deep basement.

Architecturally, Childs and his team had come up with a design that was both simple and sophisticated: the square floor plan of the office tower contained an animated tri-partite elevation that was full of classical allusion. Its pink and beige shaft would rise like a column

770 feet, and sit on a low, broad base that was three stories tall; it would be topped by a pyramid of copper and glass from which a beacon would shine at night. At once the design reflected that certain texture, rhythm and flair that was peculiar to Manhattan. Architectural critic Paul Goldberger was among the first to take note:

> "[It has] been designed by an architect who has walked the streets of New York, understands the architectural language with which the city of New York was put together, and [has] endeavored to speak that language himself....Like the best architecture in Manhattan, it is not directly imitative of the architecture of the past, but it is consistent with it in spirit; it combines a certain zest with a strong sense of classical order...."[8]

Structurally, Worldwide Plaza would need 19,000 tons of structural steel, working out to a unit weight of 17.2 pounds per square foot. Floors would be supported by concrete slabs on metal deck. Heaviest loads at the columns would average about 2,000 tons and transfer to concrete spread footings. To provide lateral support for the projected 75 pounds per square foot of wind pressure, the building would feature a composite system that combined moment frames at the building perimeter with braced frames at the central elevator cores. Wind tunnel tests predicted that this particular system would be quite stiff: deflections at the 45th-floor would be half those of comparably-sized buildings.

A traditional masonry curtain wall design had been specified for the building perimeter. In section, walls of concrete masonry block units (CMUs) would wrap around the steel superstructure; these CMUs would be coated with a membrane of mastic waterproofing on their outside faces; Styrofoam insulation would then firmly adhere to the mastic. All of this would be hidden from view, of course, by the building's brick veneer, separated from the Styrofoam by an air void, a vertically continuous quarter-inch ventilation pocket. This kind of wall treatment was labor-intensive, expensive, and would take time to build. It would also follow a sequential construction path, which meant that the CMUs would have to be laid-up prior to application of the mastic waterproofing, and that the brick veneer could not be placed prior to installation of the rigid insulation. Consequently, construction delays on the part of any earlier "upstream" phases of this work would necessarily translate to potential delays on later "downstream" activities, which was certainly a serious cause for concern on this "fast track" project.

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8 *The New York Times.* November 26, 1985.

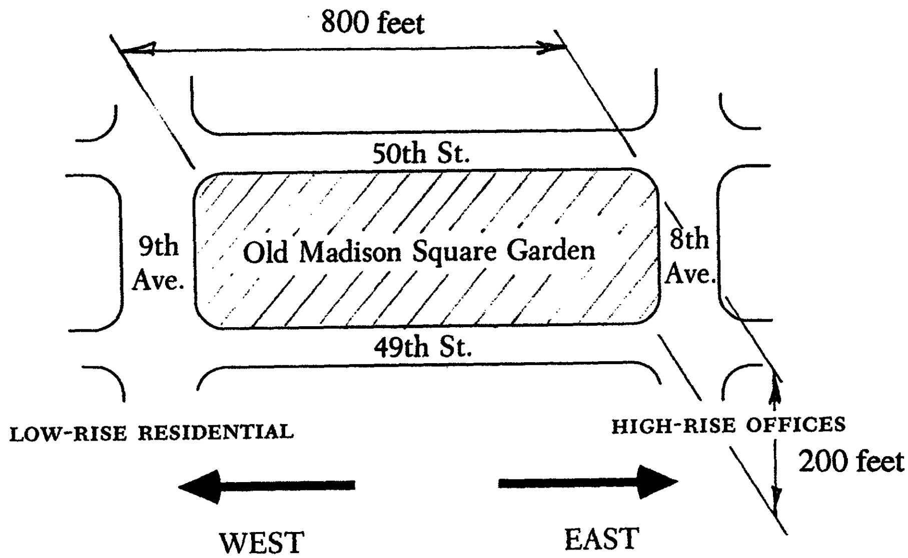

Figure 3.2 -- Site Plan of Worldwide Plaza
From *Skyscraper. The Making of a Building.* Page 35

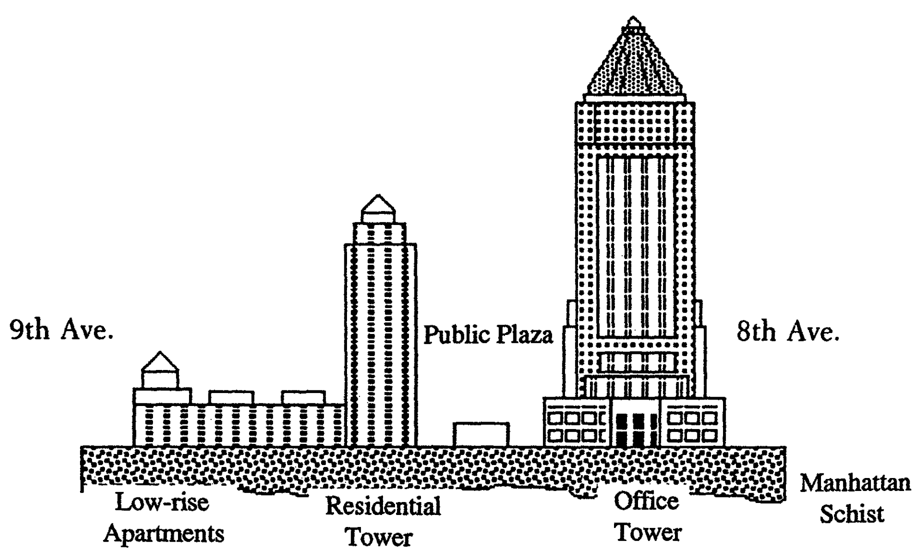

Figure 3.3 -- South Elevation of Worldwide Plaza
From *Skyscraper. The Making of a Building.* Page 40

3.5.3 - THE REVIEW PROCESS

Like every other plot of developed real estate in the City, Worldwide Plaza would be subject to thorough scrutiny under the Uniform Land Use Review Procedure (ULURP). First, this required that ZCWK submit its building plans to the Clinton Community Board. This was a group consisting of about fifty contentious volunteer residents, which would review the project and discuss neighborhood concerns directly with ZCWK. Although not obligated to change the design, it was considered politic for ZCWK to listen to what the Board had to say and make appropriate concessions. Beginning in 1985 Bill Zeckendorf had personally attended several of these board meetings. From the start, one of the Community Board's chief objections was what it saw as the inevitable displacement of current, low-income residents due to the gentrification effect that the project would have on the area. To mitigate these concerns, ZCWK offered to dedicate a portion of the site to construction of low-income housing, and to subsequently donate those units to the Clinton community.

After review by the Community Board all plans and comments went to the City Planning Office. The Planning Office, which was already familiar with the project during FAR negotiations, would hold hearings, weigh the opinions of the Community Board, and make recommendations to a third entity, the Board of Estimate (BOE). The BOE was a long-standing committee consisting of the five borough presidents of New York City, the Mayor and Comptroller of Manhattan, and the President of City Council. This powerful cartel controlled the ultimate fate of every construction project in Manhattan. By law it had sixty days from the start of its review to make final decisions. Simultaneously, ZCWK was required to independently coordinate with the Transit Authority regarding the proposed rehabilitation of the 50th Street Station, and to obtain a separate set of approvals from the NYTA for the associated work.

In ZCWK's eyes the entire review process was not only expensive, but inefficient and exasperating as well. Significant expenditures of time, energy, and money were needed to obtain these necessary approvals. To illustrate, after fifteen months sunken development costs in the project were already approaching $25 million, construction was still five months off, and ***everything*** was at risk pending a vote of approval from the omnipotent Board of Estimate. Fortunately, with the exception of some last-minute haggling over how ZCWK's donated housing would be precisely allocated among city residents, the BOE officially approved ZCWK's proposal in mid-July 1986. Soon after, the Transit Authority also gave its go-ahead for the proposed rehabilitation work. At last and amid audible sighs of relief, the march toward ground breaking could begin.

3.6 THE CONSTRUCTION PROCESS

3.6.1 - CONSTRUCTION LABOR

It was estimated that Worldwide Plaza would take some one thousand people over two years to build. Fifty distinct trades had been specified for the project, each trade represented by its own labor union. To complicate matters, organized labor in New York was more fractious than in most other parts of the country and it was not uncommon, for example, for two unions to co-exist within the same trade. Generally, the Worldwide Plaza workforce demanded wages that were among the highest in the country. This was due in part to New York City's traditionally high cost of living, and also because Worldwide Plaza was competing for labor against several other large projects then currently under construction in Manhattan. For most workers the typical workday began at seven in the morning and ended at three in the afternoon. The work would generally be spread among the following divisions:

architectural finishes
carpentry
concrete foundations
concrete masonry block
concrete slabs
demolition
door, window, and glass systems
excavation
fire protection
heating, ventilation and air-conditioning
lighting
masonry brick
metal decking
painting
plumbing
precast concrete
roofing and waterproofing
security systems
sitework and landscaping
stonework
structural steel
vertical transportation

There was a large supply of readily-available labor in the metropolitan New York City area, with two notable exceptions. In the first case there was a shortage of masons, due to the re-emergence of brick as a popular building material during the 1980s. The increased demand meant that masons could be very selective regarding which projects they would work on, and that they could also collect higher wages for their services. This shortage was of acute concern at Worldwide Plaza since the project called for large amounts of exterior brickwork, 1.2 million bricks in all.

The other exception was the ironworker "gangs," which were largely made up of Mohawk Indians. These Native Americans had a legendary fearlessness of heights which made them aptly suited for high-rise construction. Since the 1880s Mohawks had worked on several ambitious engineering projects; one was the ill-fated Quebec Bridge (1907) which had collapsed during construction, killing close to one hundred men. In the 1920s large numbers of the tribe were drawn to Manhattan from their native Quebec, where they found employment erecting steel for many of the skyscrapers that were then being built. One of the Mohawks on the job at Worldwide Plaza, in fact, was the grandson of an ironworker who had worked on the Empire State Building.

3.6.2 - BUILDING MATERIALS

Building materials for Worldwide Plaza were purchased from sources near and far. Concrete (suspected by many to be Mafia-controlled) was among the few components to be supplied locally. Structural steel on the other hand, had an especially circuitous journey: it was purchased in Luxembourg, shipped across the Atlantic from Antwerp to fabrication plants in Houston, barged to Pittsburgh, trucked to New Jersey for temporary storage, and finally erected at the site. Similarly, masonry brick for the building was manufactured in western Pennsylvania; precast concrete and copper roofing in Canada; windows from Wisconsin; granite from Brazil; and marble from Italy.

3.6.3 - BUILDING TECHNOLOGY

Worldwide Plaza would be built in much the same manner as the skyscrapers of three generations earlier, still relying on a lot of hand-labor and sheer physical exertion. Most of the advances in technology around the site tended to take the form of rather slow but steady incremental improvements to building machinery and equipment. "Crane jumping," featuring erection rigs that would "leap" from floor to ever higher floor, was such an example; protective hardhats made from high strength impact-resistant plastic was another; enhancements in air travel, overnight-delivery services, and electronic telecommunications were a third. These communications-related advances provided other distinct benefits as well in that they enabled coordination via rapid -- if not instantaneous -- information transfer, and facilitated the search for competitively priced building products on an international scale.

This does not mean, however, that technological innovation had not brought ***dramatic*** change to the architectural, engineering, and construction industry. A number of new products, practices and processes were being used during the construction of Worldwide Plaza as a result of rapid technological advancement. Among the most profound, of course, was the use of computers for the modeling, analysis, and design of buildings. Not only did computer-aided design and drafting (CADD) shorten the window of time required to define a structure and its behavior, but it enabled that structure to be studied under multiple conditions that had previously been too complex and/or expensive to consider. As consequence, developers were coming to ***routinely expect*** building designs that were significantly more efficient than those from previous decades.

Other applications of technology had a similarly important, if less dramatic, effect on the industry. Robotics used for manufacture of steel, stone, and masonry products added unprecedented precision, uniformity, and speed to the fabrication process. Seismometers to measure ground vibration enhanced geotechnical engineering knowledge and mitigated subsurface construction impacts. Earplugs protected the health of individuals exposed to high levels of noise. Even a state-of-the-art mechanical window washing system would replace the need for window washers that would otherwise have to rappel from the roof of the building twice every year.

3.6.4 - SUPERVISING THE WORK

One of ZCWK's more important decisions centered around ***how*** these concentrations of labor, materials, and technologies would be sequenced and supervised on the Worldwide Plaza site. There were two available options. The first was very traditional and entailed choosing a general contractor (GC) to oversee construction operations. The GC's responsibilities would include: coordinating with the Worldwide Plaza design team; obtaining all of the building permits required by the City of New York; constructing various portions of the project; and hiring subcontractors -- typically through a competitive bid process -- to perform all of the other work. Payment for construction services would channel directly between ZCWK and the GC; subcontractors would be paid by the GC after the GC had deducted his "management" fee that averaged five percent. There were at least a dozen GCs in the metropolitan New York City area alone who were capable of supervising construction of Worldwide Plaza, including such industry giants as Turner Construction, Perini Corporation, and the J.F. White Company.

The alternative approach required ZCWK to hire a construction manager (CM), who would in turn subcontract ***all*** of the work to the various trades. Like the GC, the CM would assume responsibility for managing schedules, controlling budgets, and assuring safety at the site for the duration of the project. ZCWK would pay the CM a flat fee for this service; and payments to each subcontractor would also be directly paid by ZCWK upon review of subcontractor invoices by the CM. In contrast to the GC approach, there were less than a handful of qualified CM firms from which ZCWK could comfortably choose.

From the developer's perspective, using a CM offered two distinct advantages: first, the CM held no financial stake in the project other than its fixed management fee. This would reduce, if not eliminate, associated side-deals and "kick-backs" among the subcontractors for which some GCs were notorious. In addition, this arrangement provided the CM with every incentive to maintain rigorous project control since, if successful, the developers would be more likely to retain the CM in a similar capacity for future projects. The second advantage to using a CM was that, in theory, it was more proactive and cost effective than the conventional GC approach. This was because the CM would be brought onto the project during -- rather than after -- the design phase. As consequence, the CM's expertise in construction practice and value engineering could be "captured" directly onto the contract drawings, thereby significantly reducing the chances of encountering costly field changes during construction.

After weighing these two options ZCWK hired the firm of Hymowitz, Ravitch and Horowitz (HRH) to act as CM for the Worldwide Plaza project. The company was named for one of its founders, Jay Horowitz, who had supervised the construction of the several famous Downtown skyscrapers, such as the Flatiron Building (1901-03), Woolworth Building (1910-13), and Equitable Building (1912-15). More recently HRH had overseen construction at Citicorp Center (1974-77) and architect Philip Johnson's AT&T Building (1979-84), both in Midtown.

3.6.5 - SAFETY

Congressional passage of the Occupational Safety and Health Act (OSHA) in 1970 had been a major step forward toward the advancement of safety in and around construction sites throughout the United States. The landmark statutes were administered by the federal government's Department of Labor through a series of rules, regulations, and orders. These contained very specific requirements and standards related to construction equipment and procedures; they also called for frequent site inspections to ensure regulatory compliance, and issued citations for violations. In the event that an inspection revealed imminent danger to workers or the general public, OSHA empowered its officials with shutting down all construction operations.

In response to these OSHA requirements, HRH itself assigned one full-time "police officer" to the Worldwide Plaza project whose sole daily function would be to enforce safety around the site. In turn, HRH would be monitored by the New York City Bureau of Enforcement and Safety Testing (BEST), which typically paid three to four unscheduled visits per week to the site. BEST wielded a substantial amount of power: fines for non-adherence with current safety regulations ranged between $1,000 and $10,000 per infraction. Continued non-compliance could result, of course, in closing down the ***entire*** job until the cited problem(s) had been remedied.

Before the building could be opened, ZCWK would be required to obtain a Temporary Certificate of Occupancy (TCO). The TCO was particularly directed toward issues of elevator safety, emergency egress, and adequacy of the fire detection and prevention systems. Not surprisingly, these inspections were often conducted jointly with the Fire Department and could take weeks -- sometimes months -- to schedule in advance. It was important for ZCWK to factor this, and the possibility that the building might require more than one test to pass final inspection, into Worldwide Plaza's construction and leasing schedule.

3.6.6 - CONSTRUCTION MILESTONES

ZCWK expected HRH to establish and manage an aggressive two-year construction schedule that would enable Worldwide Plaza to be occupied by December 1988. It was acknowledged that part of this work -- the subway station rehabilitation -- would be extremely delicate. HRH also learned from an early date that city agencies tended to view Worldwide Plaza as an opportunity to extract benefits for the city at ZCWK's expense. Replacement of disturbed sewer and water pipes; rehabilitation of subway and bus stations; landscaping and street "beautification" were classic examples. These added complications were recognized by ZCWK, HRH, and SOM as unavoidable "costs of doing business" in New York City, which, if not actively monitored might hamper the entire project schedule.

Ground breaking for Worldwide Plaza took place on November 2, 1986. Work proceeded as planned through the following July, when a three-week labor strike among the ironworkers set project progress back by about a month. By late Fall 1987 two other problems had besieged HRH. First, installation of the stonework within the building's lobby was turning out to be much more complicated than anyone, including the subcontractor, had envisioned. (It did not help matters that this same subcontractor was facing Federal indictment charges for racketeering.) Consequently, the bottom floors of the building could not be "closed-in" on time, meaning that O&M could not begin its interior finish work. This would delay in turn, O&M's occupancy of the building and thus its ensuing rent payments.

HRH's second problem involved the late start date of the exterior masonry work. Whether it was due to delinquent delivery of the bricks, poor weather, or cumulative effects of other, non-related delays elsewhere on the job, no one could say for sure. What ***was*** quite clear, however, was that by the time that the masons began to lay their bricks, masonry work was already three months behind schedule. Installation of the framing system for the pyramidal roof also proved problematic and added still ***another*** three months to the schedule. As a result, it was June 1989 by the time that Worldwide Plaza was fully complete, six months beyond the target date. A chronology of construction milestones follows:

1986	November	Mobilization and site preparation; Excavation begins to the Manhattan schist, 17 feet below grade;
1987	February	Excavation work completed; Blasting of bedrock begins
	April	Blasting to 30 feet below grade completed; Concrete footing pours begin
	May	Structural steel erection begins at average rate of one floor per week
	July	Concrete floor slab pours begin Steel worker strike for three weeks
	November	Exterior masonry and precast concrete work scheduled to begin
1988	January	Plumbing and electrical work begins
	February	Exterior masonry work begins, three months behind schedule
	March	Installation of 25 elevators begins; HVAC work begins;
	April 15	Target date for commencement of O&M custom finish work
	May	Structural steel "tops-out" at 47th floor; Interior finish work begins
	November	Finish date per initial construction schedule O&M given six month notice to proceed with interior finish work
	December	Initial target date for O&M to move in
1989	January	Target date for 100% leasing of office tower
	February	Temporary Certificate of Occupancy issued
	March	Tenants begin respective finish work
	May 15	Bottom 25 floors of office tower opened: O&M fills 17 of those floors; Permanent 20-year mortgage signed with Deutscher Bank Capital Corporation for $533 million
	June	Roof completed and remaining floors of office tower opened for occupancy, six months behind schedule; Construction costs close out at $283 million; "Soft" costs close out at $150 million

3.7 EPILOGUE

3.7.1 - REACTION

One year before the eventual opening of the building in May 1988, ZCWK began to appreciate the magnitude of the project delays and their associated cost implications. Bill Zeckendorf was perplexed about how the work could have fallen so far behind. Blind optimism, particularly with regard to the foreign suppliers, seemed to be a recurring theme. Regardless of the cause the developer was not happy, and believed that HRH was primarily to blame. Arthur Nusbaum, the HRH project manager for Worldwide Plaza, bore the brunt of Zeckendorf's displeasure and felt that it was largely misdirected:

> "My main problem is the feeling [on the part] of the owner that we deserted him. I find it an unbelievable position...[and] I take it very personally that he does not understand who are the guys with the white hats....I don't think that he's going to give HRH any more work, and that's unfortunate, because we did a good job. It think it's easier to blame [HRH] than to look at his own staff....It was my assumption that [his] people were telling him the news, good or bad. But evidently they were not."[12]

In fairness to ZCWK, HRH, and SOM, the sources of delay on the project were probably beyond the control of any one particular party. Everyone associated with the project had worked very hard to finance, design, and build Worldwide Plaza. In the words of Terry Soderhom, ZCWK's project manager, "we [had] all tried our damndest." In fact, considering the engineering, financial, legal, and bureaucratic obstacles, the project had been completed in a rather efficient manner.

Fortunately, the construction delays did not appear to dampen tenant interest in the building. By late-Summer 1989 occupancy at the Worldwide Plaza office tower had reached 100 per cent. This was a full three months ***ahead*** of schedule, all the more impressive given the slackened demand for office space due to the recent onset of economic recession around much of the country. It seemed that ZCWK's remarkable gamble at Eighth and 49th was destined for success.

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12 Skyscraper. The Making of a Building. Page 320.

CHAPTER FOUR: COMPARISONS AND ANALYSIS

4.1 PROJECT CONTEXT

4.1.1 - THE ECONOMIC ENVIRONMENTS

The Empire State Building was conceived during the "Roaring '20s," which between 1923 and 1929 had marked an era of unprecedented economic expansion in the United States. These conditions had sparked a rising apatite for real estate around the country and had fueled rampant land speculation particularly in California, Florida, and New York City. The bonanza had come to a crashing halt in 1929, of course, with the onset of the Great Depression and its associated deflationary effects on the national economy (see Table A.1). But this is only half of the picture. Most discussions of the era tend to overlook that between 1919 and 1921 the country had been mired in one of the most severe economic slumps in its history. It had been prompted by the policies of a fiscally conservative Federal government, which had tightened the nation's money supply in an attempt to eliminate war debt and ward-off inflationary trends. In fact, so difficult were these post-World War economic circumstances that in November 1929 when the venerable Harvard Economic Society surveyed the chaotic scene on Wall Street, it had prognosticated that "a severe depression of like that of 1920-21 [was] outside the range of possibility."[1]

Similarly, Worldwide Plaza was a product of the "Booming '80s," which occurred between 1983 and 1987. This economic crest had been sandwiched between the Recessions of 1978-81 and of 1987-91. The mid-'80s were years of enormous economic growth that had been largely promoted by liberal spending policies of the Federal government. Like the 1920s, such growth had led to unmitigated demand for land around much of the country; in turn, this had caused widespread escalation in real estate development activity.

Within these cyclical economic contexts, business in the architecture, engineering, and construction industry during the 1920s and 1980s was brisk. In Manhattan construction was booming with "a release of energy...throw[ing] upward new projects, new dreams and new towers."[2] Of course this could not last forever: interestingly, both the Empire State Building and Worldwide Plaza were under construction during the biggest collapses in the history of the New York Stock Exchange. In fact, after a review of Figures 4.1 and 4.2 it should not be surprising that the Empire State Building and Worldwide Plaza were among the last, large, privately-developed projects of their eras. The curves that are shown on these figures are empirical; their sole intent is to graphically situate each project within the general context of their respective business cycles.

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1 *The Weekly Letter of the Harvard Economic Society.* November 16, 1929. The prediction was grossly inaccurate, of course.

2 *The New York Times.* May 1, 1931.

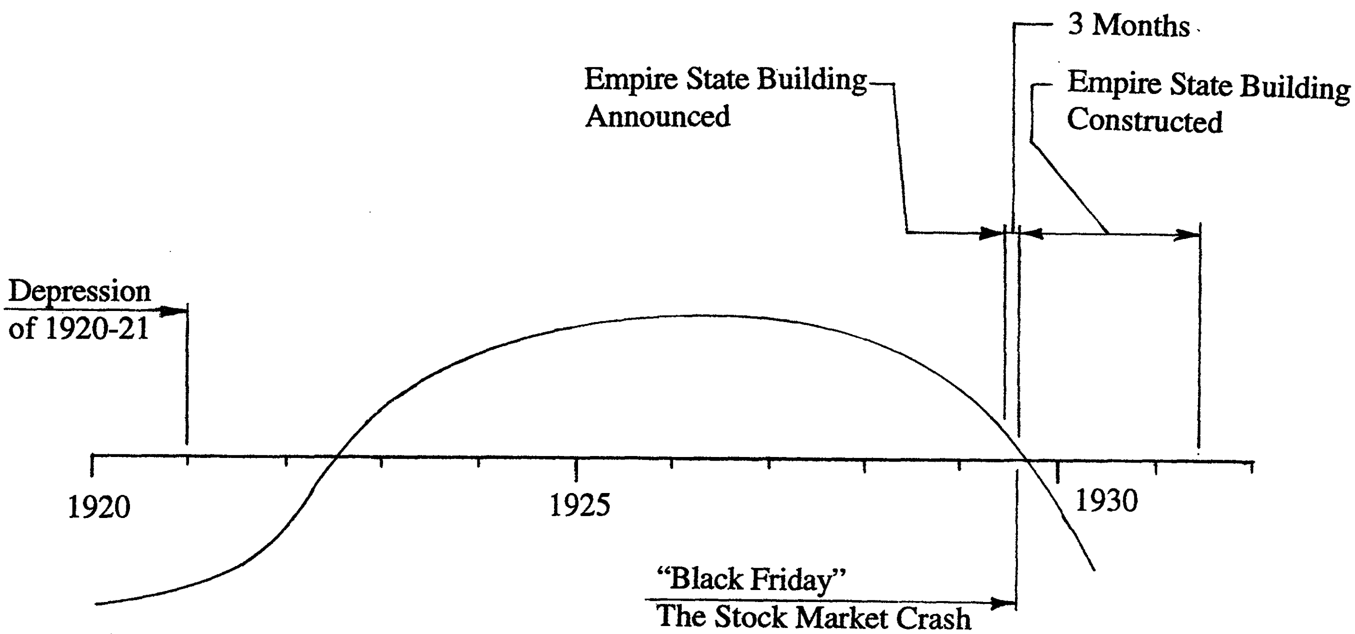

Figure 4.1
Relationship of the Empire State Building within its Respective Business Cycle

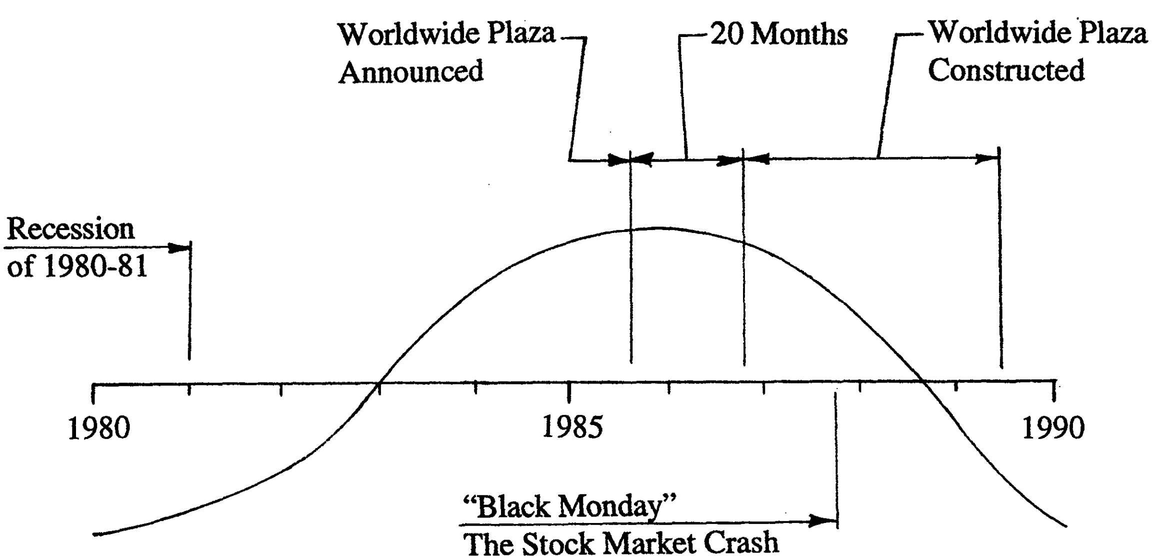

Figure 4.2
Relationship of the Worldwide Plaza Project within its Respective Business Cycle

4.2 SITE CONSTRAINTS

4.2.1 - SITE HISTORIES AND PARAMETERS

The Empire State Building at Fifth Avenue and 34th Street sat in a part of the city that had figured prominently in Manhattan's history. It had been farmland until 1859, the site of a prestigious residential block through the 1890s, and a center of social activity until 1929. By the late '20s the area between 30th and 42nd Streets had emerged as a bustling commercial district increasingly referred to by name as "midtown." It constituted the geographic heart of Manhattan, and was within an easy walk of Grand Central and Pennsylvania Stations. In terms of skyscraper construction, soil conditions at the site were excellent: bedrock was situated at an average depth of only 15 to 20 feet below grade. As real estate development continued northward on Manhattan Island, this site's strategic location made it increasingly valuable. In 1929 ESI paid $16 million for the two acre parcel, which was the equivalent of $139 million in 1994.

Conversely, the Worldwide Plaza site at Eighth Avenue and 49th Street was not in a prestigious quarter of the city. It was located on the West Side in an area called Clinton; many knew it better as "Hell's Kitchen." The Madison Square Garden had stood there between 1925 and 1968, and it had served as a parking lot since the late '60s. Reflective of the neighborhood's mixed-use character, the parcel's footprint fell within three distinct areas of zoning: residential, office, and commercial. It was accessible from Midtown and Uptown destinations by subway, was about a mile north of Grand Central Station, and the same distance south and west of Central Park. Like the Empire State Building, bedrock was at an average depth of only 15 to 20 feet below grade. ZCWK paid $100 million for the four acre parcel in 1985, which was comparable to $150 million in 1994.

Review of Table 4.1 reveals purchase prices for various lots in Manhattan, which have been normalized and adjusted to 1994 dollars. Analysis of the data indicates that on a per-acre basis ESI had paid an equivalent price for its site at Fifth and 34th as had Frank Woolworth, who in 1910 had bought and consolidated several parcels at the corner of Broadway and Park Place to construct the Woolworth Building. Further review of Table 4.1 also shows that ESI paid roughly 77% more for its lot on a per-acre basis than had ZCWK ($72.2 million versus $40.9 million). This is rational, given that the Fifth Avenue site was a much more desirable location.

4.2.2 - FLOOR-AREA-RATIOS

The Floor-Area-Ratio was perhaps the most critical parameter in the entire land development process. It governed the size and shape of all commercial high-rise buildings in New York City and as consequence, controlled the revenue streams into these projects. Although FARs did not formally exist in the 1920s, building heights and floor sizes were nevertheless restricted by formulas prescribed in New York's Zone Resolutions. The Empire State Building was located in a zone that allowed perimeter walls to rise in vertical runs that were "2-1/2 times" the width of Fifth Avenue (2.5 x 50 feet = 125 feet) before stepping back from the street. Conformance with this requirement reduced the leasable floor space within the Empire State Building to 2,158,000 square feet. Since the parcel on which it stood measured 83,860 square feet, the skyscraper carried a 26 FAR.

By the 1980s, zoning regulations had grown more complex and FARs had become more heavily regulated. But these regulations often provided "wiggle-room" for interpretation; consequently, FAR "negotiations" between real estate developers and city officials were commonplace. At Worldwide Plaza, ZCWK estimated that it would need 12 FAR minimum to satisfy its return-on-investment requirements. By conceding to make two site enhancements the developer was granted an additional 2 FAR, raising the project's total to 14 FAR. These kinds of concessions tactics were viewed by ZCWK as unavoidable "costs of doing business" with the city of New York. Since the site measured 160,000 square feet (minus the 40,000 square feet of open space per agreement with the city), this allowed ZCWK to construct a commercial office tower with 1,680,000 square feet of leasable floor space.

Table 4.1 compares FARs at various building sites in Manhattan. It clearly illustrates how FARs have steadily been driven downward during the 20th-century.[3] This was because during the '40s the city had learned that FAR ***management*** was one of the best ways that it could shape and direct effective urban development policy. By the 1980s and '90s Floor-Area-Ratios for most new real estate development ranged between 14 and 18 FAR.

Table 4.1 also compares real estate costs as a ratio of total leasable floor space. It takes land costs that have been normalized to year 1994, and divides them by total leasable building area as dictated by each project's FAR. Note the similarities in these costs among the Woolworth Building, the Empire State Building, and Worldwide Plaza: $66, $64, and $67 per square foot respectively. Inspection of other prices in this category indicates that today's developers should expect real estate costs that are in the order of $70 per leasable square foot.

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3 Note that the Seagram Building (at Park Avenue and 53rd Street) has a 9 FAR. This was part of the owner's conscious and deliberate decision to ***under-utilize*** the site in an attempt to create an aesthetic that was entirely free from the traditional "setback" approach. A similar philosophy had been embedded into the design of Lever House, which had been built across the street from the Seagram in 1950-52. Interestingly, neither Lever House nor the Seagram Building were speculative ventures. They were fully-financed by their respective owners, intended to serve as operations headquarters for each corporation. Generation of rental income was not a consideration at either project.

Property	Location	Year of Purchase	Lot Size (sq. ft.)	FAR	Purchase Price ($Million)	Cost Index	1994 Price ($Million)	Price Per Acre ($Million)	Price per Leasable Area ($ / sq. ft.)
Woolworth Building	Broadway & Park Avenue	1910	39,500	27	4.5	15.525	69.9	77.0	66
Equitable Life Building	Broadway & Pine Street	1912	43,500	28	13.5	15.525	209.6	209.9	172
Empire State Building	Fifth & 34th Street	1929	83,860	26	16.2	8.576	138.9	72.2	64
Seagram Building	Park & 53rd Street	1955	60,000	9	5.0	5.623	28.1	20.4	52
Pan Am Building	Park & 42nd Street	1959	150,000	16	---	---	---	---	---
Worldwide Plaza	Eighth & 49th Street	1985	160,000	14	100.0	1.501	150.1	40.9	67
Bertelsmann Building	Broadway & 45th Street	1985	40,000	18	40.0	1.501	60.0	65.4	83

Notes:
1) One Acre = 43,560 square feet
2) See Appendix A, Table A.1 for Cost Index data
3) Tracking of Consumer of Price Index by the U.S. Department of Labor began in 1914
4) Price per Leasable Area is a measure of land costs as a ratio of total allowable building floor space

Table 4.1

Comparison of Land Costs and Floor-Area-Ratios (FARs) at Various Manhattan Sites

4.3 PROJECT ORGANIZATION

4.3.1 - THE DEVELOPERS AND PROJECT COSTS

The Empire State Building and Worldwide Plaza were speculative projects that were each sponsored by private enterprises. Empire State, Incorporated was comprised of wealthy individuals who were influential figures in American business and politics. The president and spokesman for ESI was Alfred E. Smith, the congenial former Governor of the State of New York, who worked tirelessly in promoting the Empire State Building to the public. Smith -- and ESI for that matter -- had not had significant prior experience in the commercial real estate business. But given the sites's location and the history of escalating land values in Manhattan, ESI viewed its investment as a well-calculated risk that had a limited downside and a potentially unlimited upside. The Empire State Building would contain 2.5 million square feet of floor space, of which 87% was leasable. ESI had estimated that in 1929 dollars its total development costs would run $60 million. ESI's plan was to borrow about one-half of the amount. Due to the deflationary effects of the Great Depression, however, total costs came to approximately $41 million ($349 million in 1994 dollars), or $141 per square foot.

At Worldwide Plaza, members of ZCWK included a Japanese construction firm and three American realty companies. The consortium was led by William Zeckendorf, Jr., who by the mid-1980s had become the most active land developer in Manhattan. Zeckendorf had been in the business since the '60s, and was a consummate deal maker. ZCWK viewed the project as a double-edged sword with substantial risk: its four acre expanse was a developer's dream and an opportunity to reshape an entire neighborhood. On the other hand, its dubious location would be a difficult barrier to overcome while trying to lure prestigious tenants into the building. Like the Empire State Building, Worldwide Plaza would contain 2.5 million square feet of total floor space. ZCWK estimated that in 1985 dollars its total project costs would be about $550 million, and almost all of it would be leveraged. Actual costs totaled $533 million ($746 million in 1994), or $299 per square foot.

Analysis of the total project costs from Table 4.2 show that, when normalized for inflation and evaluated from a per-square foot basis, Worldwide Plaza was about 110% more expensive to build than the Empire State Building.

Developer	Year	Land Costs ($ Million)	Constr. Costs ($ Million)	"Soft" Costs ($ Million)	Total Costs ($ Million)	Cost Index	Total Costs per sq. ft. of Building	Land Cost / Total Cost	Constr.Cost / Total Cost	"Soft" Cost / Total Cost
Empire State, Inc.	1929	$16.2	$24.7	Unknown	$40.9	8.525	---	---	---	---
Normalized to 1994	---	***$138.1***	***$210.6***	---	***$348.7***	---	***$140.8***	*40%±*	*≤60%*	*Unknown*
ZCWK, Inc.	1985	$100.0	$283.0	$150.0	$533.0	1.400	---	---	---	---
Normalized to 1994	---	***$140.0***	***$396.2***	***$210.0***	***$746.2***	---	***$298.5***	*19%*	*53%*	*28%*

Note:
Construction costs for the Empire State Building include design fees and other "soft" costs such as legal fees, brokerage commissions, and financing charges

Table 4.2

Comparison of Project Development Costs at Various Manhattan Sites

4.3.2 - TENANTS

Like all developers, ESI and ZCWK wanted to fill their buildings quickly and with quality tenants. Both were also trying to rent as much office space as was possible prior to Opening Day. From the start, however, ESI and ZCWK necessarily pursued very different leasing strategies.

Floor space at the Empire State Building was rented in a very traditional and straight-forward manner. Since "the average prospective tenant [did] not grasp the meaning of floor plans and [was] more prone to await the time when it [was] possible to inspect the actual space,"[4] most leasing promotions could not begin before November 1930, when the project was well under way. Hundreds of people toured the unfinished skyscraper during that winter and a few actually signed leases with ESI: the du Pont Company rented three adjacent floors, and several banks opened branch offices at the building's lower levels. Because these agreements had been reached during the latter stages of construction, only minor accommodations in the building's design could be provided to suit special tenant requests.

In spite of the many tenants drawn to the building, ESI's leasing campaign went slowly; on Opening Day, May 1, 1931, the skyscraper was only 28% filled. There was so much unrented floor space, in fact, that for years it was known as "the Empty State Building." Not until the late '40s did occupancy rates rise above 95 per cent.

Worldwide Plaza, on the other hand, faced different circumstances. Being a highly leveraged project, ZCWK had adopted a partnering strategy with Ogilvy & Mather, one of its anchor tenants. This kind of arrangement had enabled the developer to draw on its tenant's $100 million letters of credit as collateral for short-term construction financing; in return, ZCWK "cut" O&M an equity position in the project, and gave it a substantial say in the building's architectural program. As consequence, over the course of construction O&M interjected building features that added significant cost to the project budget. But ZCWK had little choice in these matters and was obliged to accommodate its tenant/partner requests.

In the long-run ZCWK's strategy worked. By Opening Day on May 15, 1989 Worldwide Plaza was 55% occupied; by September of that year it was fully leased, three months ***ahead*** of schedule. This was a remarkable achievement considering the building's location in combination with the onset of economic recession in the metropolitan New York area.

4 *The New York Times*. December 7, 1930.

4.3.3 - THE DESIGN TEAMS

The advent of high-rise construction in the 1870s was largely due to technological advances in structural engineering, as well as technological improvements in mechanical, electrical and vertical transportation systems. As buildings grew more sophisticated so did the process by which they were designed. No longer could an architect work alone; rather, he needed to work with a "team" of professionals and craftsmen, each member working within an increasingly specialized discipline of design to satisfy the unique requirements of each project. This team-oriented process was very much in evidence, albeit in different ways, during the design phases of the Empire State Building and Worldwide Plaza.

Skidmore, Owings & Merrill was an extremely hierarchical organization. It had grown from a small practice with three general partners in the 1930s, to a large multi-office company having a combined total of about eighty partners and associate-partners by the 1980s. The firm had won several prestigious, high-profile commissions through the years and had designed an enviable variety of buildings. At Worldwide Plaza, project roles and responsibilities were distinctly delineated by job title. The Managing Partner addressed issues such as project staffing and contract administration; the Lead Architect directed client relations, developed the architectural program, and steered the conceptual design; a Project Manager saw to day-to-day operations that included oversight of design progress and allocation of project resources; a Senior Design Architect worked with the Lead Architect, the client, and the rest of the team to give the design full form; and a Job Captain was responsible for pulling together all of the technical facets of the project. Though members of this core staff often coordinated and interacted, they rarely delved with any great detail into the "jurisdictions" of the others.

Shreve, Lamb & Harmon, on the other hand, had a more horizontal organizational structure. Three partners directed the practice from a single Manhattan office, which tended to specialize in office buildings and residences located in the northeastern United States. The partners had varying architectural interests and business talents, and undoubtedly each gravitated to those project roles and responsibilities for which each was most comfortable. At the Empire State Building, William Lamb was the lead architect who conceived the design, met with the client, oversaw project progress, and directed technical coordination. Although available construction records are not explicit, it seems reasonable to assume that he would also have taken an active coordination and inspection role during the construction of the skyscraper. In other words, architectural practices at SLH seemed to foster a closer relationship between the architect and his design in comparison with SOM's more impersonal and hierarchical approach.

Another important difference between these two teams was the office technology that each had at their disposal, and how this affected the manner and speed in which each could coordinate with their respective members. Whereas the use of telephones and photocopiers were almost non-existent in 1920s America, by sixty years later they, along with facsimile machines, computers, CADD technology, and overnight mail delivery had become pervasive. Since information in the 1980s could be shared more easily, efficiently, and quickly, this kind of technology tended to heighten client expectations by compressing the design schedules. Viewed in this context the design effort for the Empire State Building, which was under a super-accelerated design schedule, is even more impressive.

The use of three-dimensional, laboratory model tests illustrated a final difference between how the two skyscrapers were designed. In the 1920s very little was known about wind and seismic phenomena and their effects on buildings. The first concentrated research efforts in these areas had taken place in the 1960s, which had enabled engineers to simulate the behavior of their structures with much greater reliability. Although expensive, these tests tended to expose potentially "weak links" in the design which might have otherwise gone undetected; conversely, they also demonstrated where added design economy might be introduced. As consequence, by the mid-1980s many code ordinances had come to ***stipulate*** that such kinds of tests be incorporated into the design process for tall buildings.

4.4 THE DESIGN PROCESS

4.4.1 - SCHEDULES AND MILESTONES

Both projects stipulated aggressive design and construction schedules. This was primarily due to economic realities that had dictated revenue to be generated as quickly as possible to pay off their enormous mortgages. These schedules are shown in Figures 2.1 and 3.1, and provide a general overview of the core tasks that were associated with each project. A comparison of activities that were common to both is shown below.

TASK	DURATION	
	Empire State Building	Worldwide Plaza
Project Duration	21 Months	53 Months
Review Process	Negligible	17 Months
Building Design	9 Months	18 Months
Excavation	3 Months	5 Months
Foundation Work	3 Months	3 Months
Structural Steel Erection	7 Months	12 Months
Elevator Installation	9 Months	10 Months
HVAC, Plumbing, Electrical Work	10 Months	12 Months
Exterior Masonry Work	7 Months	15 Months
Interior Finish Work	11 Months	12 Months

Note that significant differentials in durations occurred under three particular tasks: the review process, building design, and exterior masonry work. This was not happenstance, for reasons that are discussed in greater detail in Paragraphs 4.4.2 and 4.4.3.

Also note from Figures 2.1 and 3.1 that in both cases, construction of the buildings started ***before*** their designs were complete. Although in the 1920s this kind of practice did not have a formal name, by the 1980s it was known throughout the industry as "fast tracking." If used successfully it could shave several months, and all associated financing charges, from the construction schedule. But there was a peril to fast-tracking, which was that in the rush to construction items could be more easily overlooked and/or not as thoroughly detailed and coordinated. On occasion this would defeat the purpose of the strategy altogether by introducing unforeseen delay and cost to the schedule. Of course, there were other sources of potential delay as well. These included things over which members of the respective project teams held little or no control, such as unanticipated soils conditions, inclement weather, and late deliveries of building materials onto the sites.

In the history of skyscrapers, the Empire State Building stands as perhaps the pre-eminent example of the fast-track process in action. Starting in August 1929, it took just nine months to design; incredibly, this had coincided with the demolition of the Waldorf-Astoria Hotel (four months), excavation of the new building's basement (three months), and casting of concrete foundations (three months). That steel erection was already at the fourth floor when the last of the design drawings were "out on the street" for bid in May 1930, vividly demonstrates the crisp coordination that was required among all members of the project development team. From a late 20th-century perspective, this was all the more remarkable given the relatively crude communications "hardware" and scheduling "software" that was then available.

At Worldwide Plaza, fast-tracking was also in evidence but in perhaps less dramatic fashion. Due primarily to the nature of the project review process the building had taken nearly twice as long to design: eighteen months between the Spring of 1985 and Fall of 1986. One of the outcomes of this lengthening in project schedule was that many more contractors and material suppliers (from both the United States and foreign countries) were now able to participate for the various construction contracts during the year-long bidding period. This was certainly not in evidence at the Empire State Building, where the contract bid and award period had been measured in ***weeks***, and with materials sometimes requiring delivery to the site within ***days*** of their being ordered by the contractor.

4.4.2 - THE DESIGNS

Each developer wanted its project to have a distinct architectural presence and to create a powerful public impression. More than mere office space after all, these buildings were also advertisements that were trying to appeal to the staid tastes of corporate America.

The Empire State Building was a tall and slender office tower with a streamlined appearance that was characteristic of then-fashionable "Art-Deco" architecture. Its structural system of support consisted of a steel moment frame resting on cast-in-place concrete footings; foundations bore directly on the Manhattan schist bedrock. Fifty-seven thousand tons of steel formed the structural skeleton, working out to a unit-weight of 46 pounds per square foot. Furnaces and electrical generators were situated in two basement levels which extended to 35 feet below grade. By today's standards the building was rather utilitarian: its only true amenities included observation platforms, a state-of-the-art elevator system, marble-lined entrance foyers, and a dirigible mooring mast. Interestingly, it ***did not*** contain three elements which by the late 20th-century had become standard design features in high-rise office towers: a system of air-conditioning, a "food court," and an underground parking garage.

Worldwide Plaza was multi-use cluster of buildings that combined low-rise housing units, a residential tower, and an office tower; its polychromatic wall surfaces, picturesque roof-lines, and allusions to historicism, gave the composition a distinctively "Post-Modern" architectural flavor. Structural support for Worldwide Plaza's office tower consisted of steel moment frames in combination with a braced-frame core. The superstructure rested on cast-in-place concrete footings, which in turn sat on Manhattan schist bedrock. Computer-assisted analysis and design demonstrated that a 19,000 ton steel skeleton would be required, working out to a unit-weight of 17 pounds per square foot. Similar to the Empire State Building, the 30-foot deep basement contained most of Worldwide Plaza's heavy mechanical and electrical equipment.

Review of Table 4.3 quantifies the differential in steel unit-weights between the Empire State Building and other Manhattan skyscrapers. Such conservatism was driven by the fact that the building was "pushing the envelope" regarding contemporary knowledge of high-rise building design: over-design seemed prudent since no one could predict how the structure would actually behave. Also, it is important to recall that the structural engineer, H.G. Balcom, had been given only a few months to analyze, design, and detail the tallest skyscraper that had ever been built. This was an enormous task, ***especially*** without the assistance of high-powered computers. This undoubtedly led to a less-than-optimum structural design that was dictated by rigorous project deadlines.

Perhaps the key difference in design between the Empire State Building and Worldwide Plaza pertained to the curtain wall specifications. The Empire State Building's system of exterior cladding relied on vertical tracks of steel mullions into which continuous panels of limestone and window were framed. It was simple in concept, was made of parts that were easy to pre-fabricate, facilitated a minimal amount of custom fieldwork, and enabled stonework and window installation to take place on parallel paths. These design attributes served to enhance the building's architectural aesthetic, speed up construction, and reduce labor costs.

Worldwide Plaza on the other hand relied on a traditional masonry curtain wall design. This entailed construction of a concrete masonry unit enclosure wall at the building perimeter, sealing it with mastic waterproofing, attaching rigid insulation to the mastic, and covering it over with a brick veneer. One of the important difficulties to this approach was that it relied on several different kinds of building materials, each being handled by different tradesmen, who in turn were performing a good deal of customized fieldwork. It also dictated a sequential ordering of the work, meaning that certain trades could not begin until others were finished. Construction of this kind of wall system was labor-intensive, took longer to build, and was consequently expensive. Furthermore it also introduced additional ***risk*** into the project, since delays during installation of the curtain wall would detrimentally impact other "downstream" activities.

The advantages of the system of cladding that was used at the Empire State Building are dramatic when compared with the time needed to erect other, conventional masonry wall systems. As illustrated in Figures 2.1 and 3.1, the Empire State Building's cladding was installed in seven months; at Worldwide Plaza it required over twice that.

Property	Year	No. of Stories	Height (feet)	Steel Tonnage	Steel Unit Wgt (psf)
Woolworth Building	1913	55	794	24,000	34.3
Equitable Building	1915	38	---	---	---
Chrysler Building	1930	77	1,046	21,000	---
Empire State Building	1931	85	1,250	57,000	46.0
Pan Am Building	1963	59	---	---	---
Citicorp Center	1978	59	914	---	---
Worldwide Plaza	1989	47	770	19,000	17.2
Bertelsmann Building	1990	42	600	11,600	26.7

Table 4.3

Comparison of Design Characteristics at Various Manhattan Sites

4.4.3 - THE REVIEW PROCESS

A comparison of Figures 4.1 and 4.2 reveals that construction of the Empire State Building began just two months after ESI had announced the project to the public. Conversely it took eight times that -- seventeen months -- for ZCWK to reach ground breaking at Worldwide Plaza. This difference was primarily due to the growing complexity of New York's land development review process.

Zoning and building code ordinances in Manhattan were relatively simple in the 1920s with little, if any, regard for historic preservation, environmental protection, or public involvement. Although there was increasing recognition that uncontrolled development often wrought undesired consequences (such as traffic congestion), real estate could nevertheless be purchased and built on with minimal obstacles. For example, rumors surrounding development of what would eventually become the Empire State Building first began to surface in December 1928, when the Waldorf-Astoria first announced its intentions to move Uptown. Behind closed doors and within eight months these plans had solidified; by August 1929 the Fifth Avenue site had been purchased and the project publicly unveiled. Since ESI was a corporation that was comprised of powerful and influential business leaders, few questions and no objections were raised. Quite the contrary in fact: the public, the press, and local government officials appeared equally fascinated by the audacious proposal. In November 1929, demolition of the Waldorf-Astoria began; by February 1930 the historic hotel and selected adjacent buildings had been razed; and by March foundations for the new skyscraper had started to be poured.

By the 1980s this kind of "laissez-faire" policy toward land development was no longer tolerated. Under the Uniform Land Use Review Procedure (ULURP), every new project in New York City was subject to scrutiny by multiple city agencies, each with varying authority regarding whether to approve, alter, or deny the proposals. Neighborhood boards, the Planning Office, and the Board of Estimate were primary participants in this inclusive process, which for the developer was complicated, time-consuming, expensive, and bloated with an indecisive bureaucracy. Such a dynamic was very much in evidence at Worldwide Plaza. The Eighth Avenue site was purchased early in 1985 and it took until July 1986 for ZCWK to successfully weave its proposal through the Clinton Community Board, the City Planning Office, and the Board of Estimate. Advancing to this stage had cost the developer $25 million of its resources. Had the project been rejected, all of the money would have been lost.

In retrospect, the review process has stemmed from two distinct, well-intentioned sources. One has been city government, which introduced it as a way to shape and manage urban growth as well as temper the ambitions of overly-eager developers. The second source has been the general public, which felt that there should be room in the development process for outside opinion to help steer the design. By allowing people to "have their say," Americans are merely demonstrating their peculiar fondness for fairness. Taken together, the process tries to ensure that the interests of all parties -- the developers, the municipality, and the public -- are at least addressed if not satisfied, ***prior*** to any construction.

There have been two important consequences that have grown out of this dynamic. First, it has dramatically increased the monetary costs of real estate development. Review of Table 4.2 demonstrates at Worldwide Plaza, for example, that land plus construction costs accounted for 72% of the total project cost. This means that costs for things ***other*** than land

and construction (such as design and legal fees, brokerage commissions, finance charges, and review board expenses) amounted to 28% of the total. This stands in stark contrast to the Empire State Building where a large majority of the known project costs went toward land and construction expenses exclusively. Second, the dynamic has dramatically lengthened the time line of the commercial high-rise development process. This was evident during Worldwide Plaza's 53-month odyssey as shown in Figures 3.1 and 4.2.

4.5 THE CONSTRUCTION PROCESS

4.5.1 - CONSTRUCTION LABOR

The Empire State Building and Worldwide Plaza were constructed by two of the most seasoned contractors in New York City. ESI had hired Starrett Brothers & Eken (SBEI), Incorporated to serve as its general contractor; ZCWK had hired Hymowitz, Ravitch & Horowitz (HRH) to act as its construction manager. Since the early 1900s both firms had been closely associated with many of Manhattan's great skyscrapers. In fact one of the founders of HRH, Jay Horowitz, had worked for Starrett Brothers (then the Thompson-Starrett Construction Company) while supervising construction at the Flatiron, Woolworth, and Equitable Buildings. HRH as a company continued to manage jobs through the '70s and '80s such Citicorp Center by architect Hugh Stubbins, as well as Philip Johnson's AT&T Building. As for the Starrett brothers, the Empire State Building was their final project and was a fitting capstone to that remarkable family's construction legacy. Review of Table 1.1 indicates the dominance that these two firms held in Manhattan, reaching back nearly one-hundred years. This was a remarkable achievement given the historically volatile and fragmented character of the AEC industry.

Building these skyscraper demanded large workforces. SBEI and HRH both approached the process as a battle against time and the forces of nature, valuing sound leadership, solid organization, and thorough planning. Carefully-prepared, highly-synchronized construction schedules were plotted by each firm, through which each was better equipped to monitor daily progress of their respective "armies" of sixty subcontractors at Worldwide Plaza, and one-hundred at the Empire State Building. At the Empire State Building some three-thousand men were kept employed for 18 months; at the Worldwide Plaza site one-thousand men ***and women*** earned paychecks for 31 months. Most of the workers were drawn from New York City's vast labor pool, and were distributed over some fifty building trades. Both the number of trades and the kind of work in which each specialized had actually changed very little since the inception of high-rise construction in the 1870s. The largest trades included masonry, carpentry, concrete and excavation work, steel erection, and architectural finishes. By far, the ironworkers were the most "glamorous": their feats of daring were seen by the public and the press as the most tangible, most romantic, and most perilous part of the entire construction process. Few trades did ***not*** enjoy strong and vocal union representation, and on both projects the threat of strike action could ***never*** be dismissed. Average wages for skilled workers held steady over the years, earning a 1994 equivalent of roughly $17 per hour, with double pay for overtime.

Three key factors influenced the demand for workers and the wages that they were paid: competition from other local construction projects, the presence of organized labor, and New York City's traditionally high cost of living. Competition from other projects was by far the most important of the three. This was significant in 1929 when the stock market crashed, signaling the start of a massive slump in the archtiecture, engineering, and construction industry. Within months there was virtually no new construction underway anywhere in the city of New York. This is quantified in the table below which charts the unemployment rate in the United States between 1929 and 1933 as compiled by the Bureau of Labor Statistics of the Department of Labor:[5]

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[5] Between the Wars: America, 1919-1941. Page 132.

Year	Number of Unemployed Workers	% of Total Work Force
1929	1,499,000	3.1%
1930	4,248,000	8.8%
1931	7,911,000	16.1%
1932	11,901,000	24%
1933	12,634,000	25% to 33%

Note that during the years that the Empire State Building was under construction -- 1929 to 1931 -- the overall number of unemployed workers more than quintupled! And this in a country where unemployment insurance did not yet exist. Although available records are not explicit, it is entirely reasonable to imagine that ESI took advantage of its consequent shift in bargaining power by encouraging its contractor, Starrett Brothers & Eken, to negotiate with the labor unions for lower wages than had originally been anticipated on the project.

In October 1987 another market collapse, the worst since the Great Crash of '29, beset the New York Stock Exchange. This had occurred about one-third of the way into Worldwide Plaza's construction schedule and, if history was any kind of guide, was cause for serious concern within the building design and construction industry. Sure enough, for the next three years the country became mired in deep economic recession, with nation-wide unemployment rates during this period doubling from about 5% in 1987 to 10% in 1990. In spite of these economic reverberations, however, the demand for labor at the Eighth Avenue site remained high -- particularly for masons -- for the duration of the project. This was because there were so many other buildings in Manhattan that were under concurrent construction and that were therefore competing for labor against Worldwide Plaza.

4.5.2 - BUILDING MATERIALS

Other than concrete, most of the materials needed to build Worldwide Plaza and the Empire State Building came from sources that extended far beyond the metropolitan New York City area. Figures 4.3 and 4.4, for example, show that both projects purchased brick from the northeastern United States, windows from the Midwest, and polished marble from Italy. But the figures also reveal an important and fundamental ***difference*** between the projects, which relates to the changing dynamics of the materials procurement process during the sixty years that separated them. This is particularly well-illustrated when comparing how the structural steel was procured. Structural steel was integral to both projects, of course, because so many other disciplines relied on the skeletal superstructure to be in position before they could perform their respective work. As consequence, steel erection was among the most critical of all construction activities on the high-rise buildings. And since steel fabrication had traditionally required several months of lead-time before delivery to the job site, it was an item that generally warranted careful monitoring by each development team.

In the annals of construction history, raising the structural steel for the Empire State Building was an astonishing feat. It was performed in record time: 57,000 tons in seven months, which averaged to four floors per week. Much of this success could be traced to the project's systematic procurement process: all steel was fabricated 390 miles away in Pittsburgh; from there it was barged to Manhattan and riveted into final position within 80 hours of being cast in the blast furnace. Stagnant national economic conditions played a large role in this, of course, since in the 1930s the Empire State Building was among the country's few large projects then under construction, and many steel mills were starved for work. As consequence, the development team was advantageously positioned to bargain for this unprecedented and super-accelerated procurement arrangement.

At Worldwide Plaza the steel procurement process was more roundabout. Competitive bids from North American and European companies had been solicited by the construction manager for the 19,000-ton contract, and was awarded to ARBED, a Luxembourg-based firm. ARBED then arranged to make the 4,000-mile shipment between Antwerp in the Netherlands to Houston in the United States, where the steel would be fabricated. From there it was barged to Pittsburgh and trucked to northern New Jersey for temporary storage, from where it was finally hauled to the site. In spite of this circuitous route as well as the nine-month advance lead-time, steel routinely arrived on the Worldwide Plaza site according to schedule. In this there was a valuable lesson: the lengthy period of project review (as discussed in Paragraph 4.4.3) had extended the project schedule so dramatically that it had enabled foreign suppliers to overcome one of their most formidable barriers -- distance -- and had thereby enhanced their ability to compete in the American architecture, engineering, and construction market.

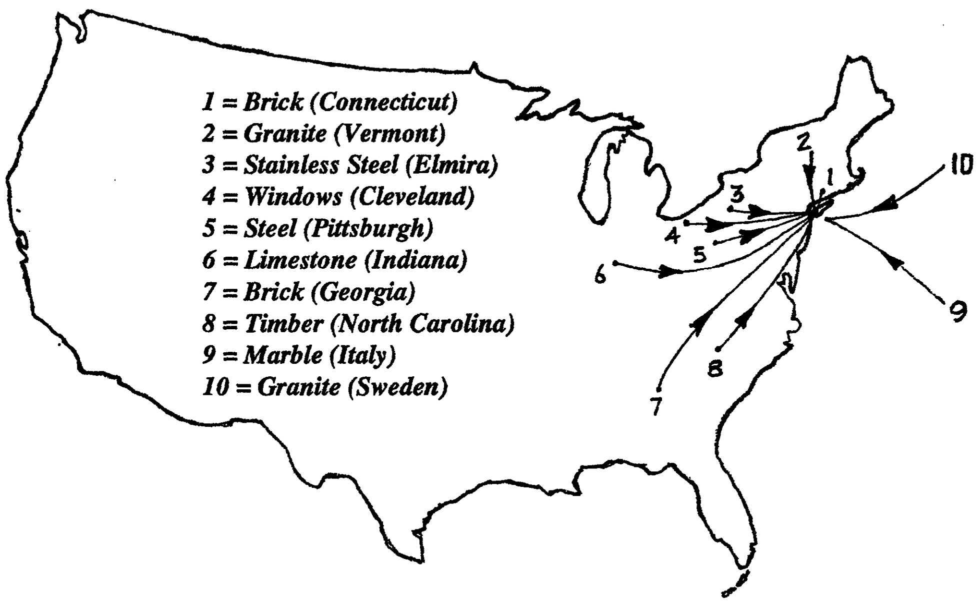

Figure 4.3 -- Sources of Building Materials for the Empire State Building

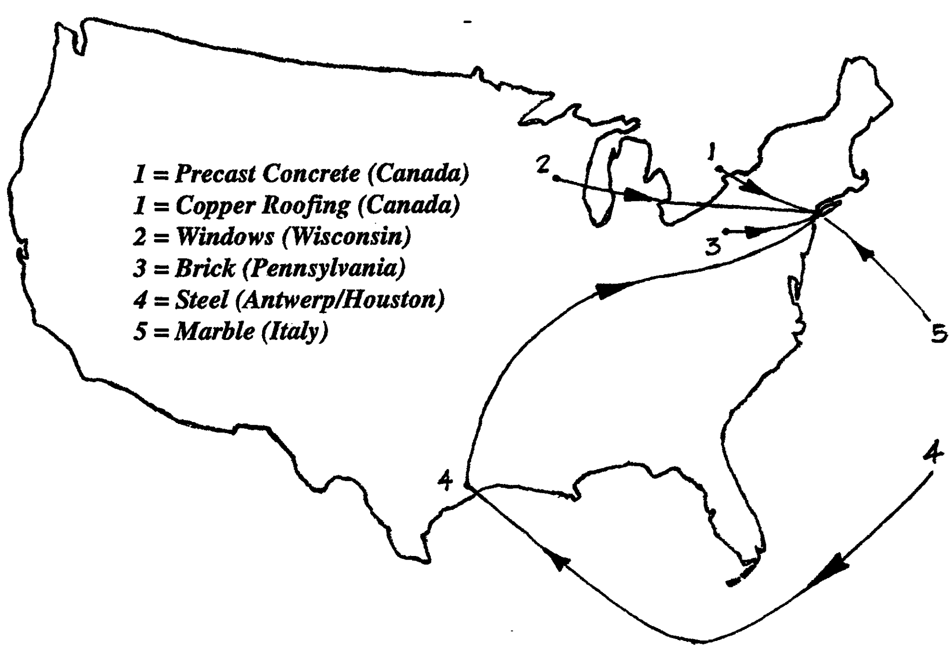

Figure 4.4 -- Sources of Building Materials for Worldwide Plaza

4.5.3 - SAFETY

Gauged by the statistics, construction safety at the Empire State Building was questionable at best, atrocious at worst. By November 1930, one year into the project, SBEI had publicly acknowledged five fatalities on the job; six months later *The New York Post* had reported another nine deaths at the site. This was a remarkable record under any circumstance, but especially when contrasted against the single fatality that had been recorded during recent construction of the thousand-foot tall Chrysler Building.

Equally disturbing was the pattern of the accidents. These fatalities had not mounted during a single, catastrophic incident; rather they were distributed across several trades and activities, and had been occurring at an ***increasing*** rate. Generally, hardhats and protective clothing, earplugs, and eyewear were not commonly used at the site. This, in combination with the Empire State's super-accelerated construction schedule, undoubtedly contributed toward the high fatality rate. From an objective perspective, it appeared that on several occasions the owner and the contractor had each encouraged practices which carried excessive construction risk, and had pushed the project workforce beyond its physical limitations. It was more than a little ironic, therefore, when the committee on accident prevention of the Building Trades Employers' Association featured the safety provisions that were in force at the Empire State Building as a national model for its "Safety Stories" pamphlet, published in January 1931.

By comparison, safety at Worldwide Plaza took a much higher priority primarily because it was so obligated by the Occupational Safety and Health Act (OSHA) statutes of 1970. In response, HRH had assigned a full-time "police officer" to the project whose sole function was to enforce issues of safety around the site. In addition, the New York City Bureau of Enforcement and Safety Testing (BEST) paid the project three to four unscheduled inspection visits each week. BEST wielded remarkable powers, which included shutting down a given job in the event of a significant safety violation.

Once construction was complete, both buildings were required to pass several safety-related tests. Most of the tests focused on elevator mechanisms, emergency evacuation logistics, fire detection, and fire-fighting systems; appropriately, they were conducted by the New York Fire Department. The tests were not to be taken lightly: without these required certificates of compliance the buildings could not be occupied by tenants. And while the Empire State Building had relatively few compliance-related problems, at Worldwide Plaza selected tests had to be postponed or re-run several times over a three-month period before its Temporary Certificate of Occupancy could be filed. This, of course, detrimentally impacted the schedule and represented lost revenue to the project.

4.6 EPILOGUE

4.6.1 - REACTIONS

The ribbon-cutting ceremony at the Empire State Building was front-page news on all of New York's newspapers. It was ***the*** event of the Spring 1931 season and was attended by 5,000 people, including Governor Franklin Roosevelt and Mayor James Walker. ESI was very pleased with the work of Shreve, Lamb & Harmon and for good reason since from the start the building had drawn rave reviews and had won prestigious awards. ESI was also pleased with the phenomenal construction effort put out by Starrett Brothers & Eken: not only had the building been erected in record time, but had only cost $41 million, about one-third less than the initial estimated budget. Overnight, the Empire State Building had become one of the most celebrated and widely-recognized structures in the world, a symbol synonymous with the New York skyline. In spite of its dominating presence, however, the effects of the Great Depression kept rental revenues far short of ESI's initial projections.

Opening Day at Worldwide Plaza was a more modest affair and was accompanied by far less fanfare. Even though the building had been well-received by the architectural critics, and in spite of the fact that the building's rental campaign had exceeded expectations, ZCWK was upset with what it had perceived as HRH's poor project performance. Delays in schedule and cost overruns in certain areas had biased ZCWK into the conclusion that it would not rehire HRH to perform future construction management services anytime soon. This was ironic since actual construction costs as managed by HRH had actually come in ***lower*** than ZCWK's original 1985 estimates ($533 million compared with $550 million). Viewed in this context HRH definitely deserved more credit for its efforts than ZCWK was willing to acknowledge. The developer had gotten what it had asked for, and Worldwide Plaza appeared on its way to becoming a successful investment property.

CHAPTER FIVE: CONCLUSIONS

The intent of the final segment of this paper is to identify and distill some of the changing trends that have taken shape over the last sixty years in the commercial high-rise building industry. Conclusions center around analysis of the Empire State Building, Worldwide Plaza, and six additional building projects that were described in earlier chapters. It could be argued, of course, that the discussion is "non-representative" and therefore skewed, given the hundreds of skyscrapers that have been constructed in Manhattan during the 20th-century. While this is undoubtedly true to a certain degree (and will consequently serve as a topic of rich future research), these conclusions, though based on a "random sample" of limited size, nevertheless point toward broad application within today's development, design, construction, and financial communities.

5.1 - THE DEVELOPMENT AND FINANCING PROCESS

1) The current formal review and approval requirements that have been adopted by city government regarding commercial high-rise building projects are elaborate, time-consuming, and expensive. These well-intentioned programs recognize that thoughtful urban development should attempt to address the combined interests of the developer, the municipality, and the local citizenry alike. From the developers' point of view, however, these fair-minded policies have detrimentally impacted the real estate development process in two ways: first, they have dramatically extended the duration of most project time lines; second, they have significantly increased the monetary "soft" costs that are typically absorbed by the developer.

2) "Soft" costs as a percentage of total project development costs are significantly greater in New York City today than they were sixty years ago. This phenomenon is a direct by-product of the growing political, financial, and regulatory complexity of real estate development in Manhattan, which necessitates higher design fees, legal fees, brokerage commissions, interest payments, financing charges, and review expenses. Soft costs are likely to escalate further given the fragmented character of the current development climate. Conversely, this indicates that steps taken to streamline, simplify, or combine the legal, financial, and regulatory aspects of the development process might substantially curb these kinds of costs.

3) Construction costs as a percentage of total project development costs have remained relatively stable between 1930 and 1990. These encompass expenses for building materials and labor, as well as construction management fees. Some of the ways that contemporary practice has managed to maintain cost efficiency in spite of increasing complexity in the overall development process has been through adoption of computer-based technologies, improved construction machinery, heightened safety practices, and faster transportation services. Construction cost stability also indicates that efforts to ***dramatically*** heighten efficiencies within the overall development matrix might have a better chance of success if they are directed toward improving ***other*** aspects of the process.

4) Economic context merits serious consideration when planning to build, operate, and finance a skyscraper. Typically, these kinds of projects are conceived during periods of surging demand for commercial office space; but since high-rise buildings can take several years to complete, economic conditions tend to reverse by the time that they open for business. This leaves developers and bankers facing the

unpleasant reality of owning a multi-million dollar "white elephant" which is generating little rental income. As consequence, it is important for developers and bankers to mitigate the effects of this phenomenon by factoring these system dynamics into account, and learning to time their projects to better synchronize with fluctuations in the business cycle. Specifically, these parties should re-align their expectations with regard to more realistic project durations and adjust their field of vision regarding optimal project start-up dates.

5) Because of the abundance of office space that has been built in Manhattan over the last one-hundred years, tenants appear to have greater leasing options and hold increased leverage in the development process than they did sixty years ago. As consequence, they are more sophisticated "consumers" of commercial office space. Given the current financial pressures within the high-rise building industry, developers now "court" potential tenants -- particularly anchor tenants -- during the early stages of the development process. This is beneficial for both parties in a few ways: first, it assures rental income into the project sooner, which makes project financing easier to secure; second, it provides tenants with the opportunity to "tailor-fit" their rented space to their custom specifications. These kind of arrangements should be approached with care, however, since tenant demands can introduce unanticipated added expense and delay to the project.

5.2 - DESIGN AND CONSTRUCTION PRACTICE

1) Generally, high-rise commercial buildings are constructed with the same kinds of materials and techniques today as were used sixty years ago. Incremental improvements in construction machinery and equipment, as well as the introduction of rigorous regulatory enforcement, have enhanced worker safety around the job site. This trend has permeated all sectors of the construction industry since the 1960s, and has continued to intensify since Congressional passage of the Occupational Safety and Health Act (OSHA) in 1970.

2) Foreign suppliers of building materials appear to be increasingly successful in their efforts to penetrate the construction market in the United States. The importation of structural steel is especially significant since it challenges an arena of traditional American dominance. One possible explanation behind this phenomenon may be the dramatic lengthening of project schedules, promoted in large part by an extended review process that is mandatory for all commercial high-rise development in New York City. In a very real sense, this has "leveled the playing field" among materials suppliers by enabling foreign firms to overcome the barrier of long-distance transport, and thereby compete more on a basis of price and service.

3) Organized labor has had a powerful presence in New York City's construction industry for generations. Like every other sector of the industry each building trade enjoys strong union representation, although it is unclear whether this trend will continue.

4) The role of Construction Manager (CM) has supplemented the traditional role of General Contractor (GC). Both roles typically assume complete construction management responsibilities, and each has its distinct benefits and drawbacks. The

CM arrangement tends to limit a contractor's financial stake in a project to a pre-determined fixed fee; however, since he provides none of the construction labor, he is "at the mercy" of his subcontractors to overcome difficulties that may arise in the field. Conversely, the conventional GC approach encourages a pooling of resources between the contractor and subcontractor, which can often enhance the construction team's effectiveness.

5) Skyscraper design remains a team-oriented process that is composed of several varieties of architectural and engineering disciplines. Project roles and responsibilities have become increasingly compartmentalized by titles such as Job Captain, Project Manager, Lead Engineer, and the like, which indicates that professional practice has grown increasingly complex and specialized. As a result, the design team of today seem to be more detached from the physical construction process than in times past.

6) Structural steel design for skyscrapers is more efficient today than in generations past. This is due in part to our increased understanding of wind and seismic phenomena and how they affect tall buildings. As consequence, lateral force design today is far less empirical and is much more precise compared to what it once was. Even more significant has been the architecture, engineering, and construction community's widespread adoption of computer and CADD technologies for purposes of building design. These applications have enabled designers to consider numerous, iterative loading combinations that previously were either too cumbersome, time-consuming, and/or expensive to explore. Continued research and refinement is expected in both of these arenas, which may yield new design efficiencies as well as lead to the development of new kinds of structural systems and materials altogether.

7) Rapid-paced design and construction remains a fundamental dimension of the commercial high-rise building development environment. To accommodate this requirement, the practice of "fast tracking" has been commonly applied to these kinds of projects. When employed successfully, fast tracking can shave several months, and all associated financing charges, from the construction schedule. This means that tenants can move in faster, which generates revenue for the project more quickly. This trend is particularly apparent in the commercial office segment of the construction industry, and will continue to intensify as project costs continue to escalate.

5.3 - CHALLENGES AHEAD

The central challenge that this thesis poses to the building design and construction community is simple enough: Namely, to promote the same kinds development, design, construction, and financing efficiencies that were instituted at the Empire State Building project, while maintaining the rigorous safety record and lively public involvement program that was in evidence at Worldwide Plaza. Not surprisingly, the keys to success appear to hinge on two particular factors, cost containment and schedule control.

At Worldwide Plaza, substantial costs were increasingly "siphoned-off" by tasks that were ancillary to the construction process. While these "soft" costs have always been a component of the development matrix, it is their alarming rate of escalation that seems to be a tangible signal that the process is becoming overly cumbersome, convoluted, and fragmented. Consequently, it appears that steps taken today to streamline, simplify, and/or integrate the development process might stand a good probability of translating to reduced legal fees, finance charges, interest payments, and review expenses.

Regarding schedule control, there are two striking aspects of the development process where improved efficiencies should to be sought. The first revolves around curtain wall design and construction technique. The advantages of a well-designed and easily installed curtain wall system was altogether apparent at the Empire State Building, especially when compared with wall construction at Worldwide Plaza. It is doubtful, in fact, whether the Empire State Building would have achieved its milestone targets had a different kind of wall composition been specified; conversely, curtain wall installation was a primary reason for Worldwide Plaza being completed six months behind schedule. Therefore, it is quite reasonable to assume that significant time savings might be accrued with heightened attention drawn toward improved efficiency in this area of the design and construction process.

Maintaining schedule control as it relates to the formal review process remains more problematic, however. This is primarily because the process is ***adversarial*** by nature. It pits developers and their distinctive interests, against city officials and local citizens, who usually have far different agendas. This disconnect tends to induce friction, conflict, or inaction over a protracted period until each side accepts that it must adjust its respective position and expectations in a manner that is mutually satisfactory to all sides. As the regulatory environment has intensified, and ***more*** parties have demanded access to the review process, developers consequently face increasing difficulty in gaining timely consensus and approvals for their projects.

In summary, it appears that this thesis has raised more questions than it has answered. To illustrate, comparison of the Empire State Building and Worldwide Plaza has uncovered tangible cost and schedule aspects of the building development process that merit further attention. Additional research might focus, for example, on strategies that shift project review negotiations away from their current, distributive form toward a more integrative dynamic. Continued study may also advance improvements in curtain wall design, procurement, and construction techniques. A third avenue of investigation might compare in greater detail the benefits and drawbacks of the General Contractor versus the Construction Manager models of construction management. Historical research of "hard" and "soft" development expenditures among a wider assortment of high-rise buildings would be another valuable exercise that may improve our ability to accurately forecast future project costs. A final area of study could examine the hypothesis that foreign materials suppliers are penetrating the American construction market more effectively than in times past, and how this is impacting the U.S. building industry. Heightened understanding of any or all of these topics holds interesting potential toward improving efficiencies in the development, design, construction, and financial communities as it enters the 21st-century.

APPENDIX A

Year	% Change	Cumulative % Change	Year	% Change	Cumulative % Change	Year	% Change	Cumulative % Change
1994	*2.7*	1.027	1967	*2.6*	4.542	1940	*1.4*	10.550
1993	*2.9*	1.057	1966	*3.3*	4.692	1939	*-0.7*	10.476
1992	*3.4*	1.093	1965	*1.5*	4.762	1938	*-2.0*	10.267
1991	*4.3*	1.140	1964	*1.6*	4.838	1937	*2.7*	10.544
1990	*6.0*	1.208	1963	*2.2*	4.945	1936	*0.0*	10.544
1989	*5.6*	1.276	1962	*1.6*	5.024	1935	*1.4*	10.692
1988	*4.5*	1.333	1961	*0.7*	5.059	1934	*2.8*	10.991
1987	*5.0*	1.400	1960	*2.0*	5.160	1933	*-5.4*	10.398
1986	*2.9*	1.440	1959	*1.3*	5.227	1932	*-9.1*	9.451
1985	*4.2*	1.501	1958	*3.1*	5.389	1931	*-7.3*	8.761
1984	*3.5*	1.553	1957	*3.2*	5.562	1930	*-2.7*	8.525
1983	*3.9*	1.614	1956	*1.5*	5.645	1929	*0.6*	8.576
1982	*5.5*	1.703	1955	*-0.4*	5.623	1928	*-0.5*	8.533
1981	*9.7*	1.868	1954	*0.4*	5.645	1927	*-1.1*	8.439
1980	*11.4*	2.081	1953	*0.7*	5.685	1926	*1.1*	8.532
1979	*8.9*	2.266	1952	*1.5*	5.770	1925	*2.8*	8.771
1978	*5.2*	2.384	1951	*7.6*	6.208	1924	*0.0*	8.771
1977	*5.3*	2.510	1950	*0.8*	6.258	1923	*1.1*	8.868
1976	*5.8*	2.656	1949	*-1.2*	6.183	1922	*-4.9*	8.433
1975	*7.5*	2.855	1948	*6.8*	6.604	1921	*-10.2*	7.573
1974	*10.8*	3.163	1947	*11.9*	7.389	1920	*13.9*	8.626
1973	*6.5*	3.369	1946	*9.9*	8.121	1919	*17.6*	10.144
1972	*4.3*	3.514	1945	*2.1*	8.291	1918	*17.7*	11.939
1971	*5.7*	3.714	1944	*2.7*	8.515	1917	*20.4*	14.375
1970	*7.5*	3.993	1943	*7.1*	9.120	1916	*8.0*	15.525
1969	*6.3*	4.244	1942	*9.7*	10.004	1915	---	15.525
1968	*4.3*	4.427	1941	*4.0*	10.405	1914	---	15.525

Source: Economic Indicators Handbook, 2nd Edition (1993).
United States Department of Labor, Bureau of Labor Statistics,
Division of Consumer Prices and Price Indexes

Table A.1 -- Consumer Price Index: New York, NY (Annual Averages)

A.2 - SELECTED BIBLIOGRAPHY

Adler, Jerry. High Rise: How 1,000 Men and Women Worked Around the Clock for Five Years and Lost $200 Million Building a Skyscraper. New York: Harper Collins Press, 1992.

Allen, Frederick Lewis. Only Yesterday: An Informal History of the 1920s. New York: Harper & Row Publishers, 1931.

Cadman, S. Parkes. The Cathedral of Commerce. Promotional pamphlet, 1917.

The Empire State Building...the World's Most Famous Observatory. Promotional pamphlet.

Goldberger, Paul. The Skyscraper. New York: Alfred A. Knopf Press, 1981.

James, Theodore. The Empire State Building. New York: Harper & Row Publishers, 1975.

Mackay, Donald A. The Building of Manhattan. New York: Harper & Row Publishers, 1987.

The New York Times: various editions 1910 to 1916.

The New York Times: various editions 1928 to 1931.

The New York Times: various editions 1955 to 1958.

Sabbagh, Carl. Skyscraper. The Making of a Building. New York: Viking Penguin Press, 1990.

Shannon, David A. Between the Wars: America 1919-1941. Boston: Houghton Mifflin Company, 1979.

Shreve, R.H. "The Economic Design of Office Buildings." *The Architectural Record.* April 1930: page 341-347.

Shreve, R.H. "L.P. Hollander Company Building." *The Architectural Record.* May 1931: page 367.

Simon, Kate. Fifth Avenue: A Very Social History. New York: Harcourt Brace Jovanovich, 1978.

Starrett, William A. Skyscrapers and the Men Who Build Them. New York: Charles Scribner's Sons, 1928.

United States Department of Labor. Economic Indicators Handbook, Second Edition. 1993.

Van Alen, William. "The Structure and Metal Work of the Chrysler Building." *The Architectural Forum.* October 1930: Pages 493-498.