CHAPTER

1

EVOLUTION OF THE OFFICE BUILDING

by Jared Shlaes with Marc A. Weiss

INTRODUCTION

The roots of the office building reach deep into ancient times. Its ancestors, almost as old as the written word, appear for the first time in the form of chambers set aside for record-keeping in the palaces of the earliest kings. Much later, during the Italian Renaissance, the freestanding dedicated office building would begin to take shape in the *palazzi* of the great Italian banking houses. But it was not until a burst of technological innovation in the late 19th century allowed it to reach new heights of efficiency and structure that the office building would assume its modern form.

ORIGINS

"The king was in his countinghouse, counting out his money..."

Precursors of the modern office building first appeared about 6,000 years ago, in the palaces and temples of the earliest civilizations to leave written records. There, in the treasuries and warehouses of ancient kingdoms, much of the business essential to organized agriculture and trade was carried on.

Five-and-a-half millennia later, the spread of capitalism would lead to a wider distribution of office functions, their gradual separation from domestic functions and their consolidation into special buildings. For almost all of human history, though, beginning with the great river civilizations of the

Middle East—Egypt, India and China—dedicated office spaces of any size could have been found only in the palaces and outposts of kings and ecclesiastics who kept their books in the buildings where they lived.

THE INDUSTRIAL REVOLUTION

Through the Middle Ages, little happened to advance office development until the Renaissance brought the invention of double-entry bookkeeping, discount banking and modern capitalism. These inventions stimulated business capitals such as Venice, Florence, London and Amsterdam to impose a new order on the world. As early as 1480, powerful banking and trading houses headquartered in these new financial centers were building large, solid houses, some of which are still in use as banks and corporate headquarters.[1]

The late 18th and early 19th centuries brought with them a broad range of technological innovations and a radical rearrangement of the landscape. They also brought vast economic and social changes. Water-powered and later coal-powered manufacturing slashed costs and allowed the distribution of low-priced manufactured goods to an eager world marketplace. Standards of living rose and urban populations soared as immigrants poured in from the farm to share in the new prosperity, often by way of the new railroad and steamship lines. While many suffered from the associated dislocations, the general effect was to increase the wealth of the industrializing countries.

Among the consequences was a regrouping of business along new lines of travel and communication. River and canal crossings, road junctions and ports had always attracted trade and manufacturing. Now, as manufacturing was enabled by the coming of the steam engine to move down from the hills where water power was most readily harnessed, rail lines and especially the rail transfer points located in the cities began to compete with them for growth. In James Heilbrun's phrase, railroads "proved to be the most powerful agglomerative invention of all time," an observation confirmed by the vast influx of jobs, people and capital along the paths carved by the new trackage.

As the Industrial Revolution spread and prospered, cities in Great Britain and America launched upon a period of expansion that would be interrupted only by periodic financial panics. Growing inter-city and interregional trade, made easier by the new rail lines and communications, stimulated business and manufacturing activity of every kind. Centers like London, Manchester, Liverpool, Boston, Philadelphia and New York

[1] Nikolaus Pevsner, *A History of Building Types* (Princeton: Princeton University Press, 1976); Spiro Kostoff, *A History of Architecture* (New York: Oxford University Press, 1985).

became magnets for capital investment as well as for people in search of jobs and business opportunities, quickly absorbing the surplus population of nearby rural areas.[2]

To meet the growing need for business space in these cities, office buildings began to appear in some numbers as early as the 1830s. These four- and five-story structures, almost insignificant by modern standards, were imposing in their day and would spawn many imitators.[3]

The form of the city was changing in response to its new dynamism. For one thing, rapid horizontal expansion had been made possible by the horsecars and steam trains common in the 1850s and the electric tramways which appeared later in the century. Many people and businesses took advantage of this opportunity to move outward toward the suburbs, where the air was cleaner, the streets safer and the housing costs less, commuting downtown for work, shopping, and recreation.[4]

Another effect of rapid growth was that traffic congestion and rising land prices in the downtown districts soon began to force out those who could not afford downtown space costs. This freed up the city center, where the docks, railheads, banks, wholesalers and government agencies were already located, for functions that wanted to be close to them and could afford to pay the high rents and taxes.

Available sites were soon taken up by newspaper and book publishers, real estate and insurance firms, professional offices of every kind, light manufacturers, wholesalers, department stores, hotels and service enterprises, all of them able to use multi-story structures that could support downtown land values. The influx left city cores no choice but to grow denser and more vertical.

Office buildings began to rise in large numbers as the growth continued. At first, they generally took the form of multi-story, masonry-walled, store-and-office buildings, often 50 feet wide or less, with modest entrances between the storefronts. Visitors climbed upstairs by way of narrow stairhalls to the high-ceilinged offices above, which were lit by gas or whale oil and heated by stoves and fireplaces. Sanitary facilities were of the simplest and fire protection was primitive.

Technical Innovation

Office work was changing in response to new inventions and technical improvements such as the typewriter. Just as important to the comfort and

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[2] James Heilbrun, *Urban Economics and Public Policy, 3rd ed.* (New York: St. Martin's Press, 1987); Adna F. Weber, *The Growth of Cities in the Nineteenth Century* (Ithaca, New York: Cornell University Press, 1963).

[3] Richard MacCormac, "The Dignity of Office," *The Architectural Review*, (May 1992): 76-82; Fletcher, *A History of Architecture*.

[4] Mark Girouard, *Cities and People* (New Haven: Yale University Press, 1985).

productivity of office workers was gas light, invented by Lavoisier shortly before he was guillotined in the French Revolution. It became practical with the founding of the first gas company in London (1813) and was common by 1860, reaching a peak of perfection with the 1885 invention of the gas mantle, which multiplied the lumens it produced. Meanwhile, Thomas Edison had registered his patent on the incandescent electric bulb in 1879 and would open the Pearl Street Power Station in 1885, making electric light a commercial reality.[5]

White-collar work was growing more efficient in other ways thanks to the development of modern communications. By 1868 most American cities were connected by Samuel F. B. Morse's telegraph, which had seen its first public use as early as 1844. The telephone, independently invented by Elisha Gray and Alexander Graham Bell in the 1870s (Bell's patent dates to 1876), was in commercial use by 1878, and in 1887 the list of subscribers had more than 150,000 names. Soon the telephone and telegraph would be supplemented by Guglielmo Marconi's wireless telegraphy, which had reached across the English Channel in 1889 and would cross the Atlantic in 1901.

Toilets, Lifts and Skeletons

Three other key inventions were essential before the modern office building could take shape: the flush toilet, the passenger elevator and skeleton construction. The first of these had appeared at the Minoan court four millennia ago and reappeared in various forms over the years. It would come to near-perfection only with Alexander Cumming's 1875 patent for a toilet with a "stink trap" that prevented sewer gases from backing up through the drains. Cumming's invention allowed office tenants previously dependent on chamber pots to enjoy upstairs accommodations without paying servants to dump their deposits. The growth in the size, number and comfort of office buildings would not have been possible without corresponding improvements in sanitary and storm sewer installations.[6]

The second key to the future of the office building was the new safety-equipped, steam-driven passenger elevator exhibited by Elisha Graves Otis at the Crystal Palace Exposition of 1853 in New York City. Otis's elevator, which first appeared in practical form about 1858 in the Haughwout Building (designed by J. P. Gaynor and Daniel Badger) at Broadway and Broome Street in New York City, was far from the first mechanical

[5] Charles Panati, *Panati's Extraordinary Origins of Everyday Things* (New York: Harper & Row, 1987); Charles Panati, *Panati's Browser's Book of Beginnings* (Boston: Houghton Mifflin Company, 1984); Arnold Lehman, "The New York Skyscraper—A History of its Development 1870-1939," (Ph.D. diss., Yale University, May 1974).

[6] See Panati, *Origins of Everyday Things* and *Browser's Book of Beginnings*.

means of vertical transportation. Hand-operated hoists without rails had been used in the third century B.C., and Queen Anne had installed a lift at Windsor Castle in 1700. But Otis's inventions—a speed governor, the "automatic gravity-wedge safety" and the "automatic safety stop"—made them safe for human passengers even when operated at the high speeds made possible by steam power and electricity.[7]

However, it was only with the application of steam power to the improved hydraulic elevators in use by 1890 that buildings could comfortably reach to a height of 10 or 12 stories. There was much more to come. In 1898 a new high-speed direct plunger design allowed them to attain a dramatic 30 stories, tall enough to be taken seriously as skyscrapers. By the turn of the century, electric drive, push-button controls and speeds of 700 feet per minute were available.

The Skeleton Frame

These devices improved the practicality of the cast-iron and glass buildings pioneered by Daniel Badger and James Bogardus in the 1840s. Theirs was not the first use of these materials. Iron had been around since roughly 1200 B.C., though it was then too costly for use in construction. New 19th century technology made it much cheaper, and by 1830 cast iron columns, beams and store fronts were going up all over Europe and the United States. In New York, the Lorillard Building (1837) had a cast iron front, with cast iron beams and columns in its two lower stories. Of special architectural interest toward the end of this period was the elegant iron, stone and glass facade of Peter Ellis's Oriel Chambers in Liverpool (1864-65), which had cantilevered bay-window oriels in a repetitive pattern that anticipated the designs of the Chicago School later in the century.

Cast iron, which had been preferred to wrought iron and steel in structural columns because of its greater compressive strength, was discredited by the Chicago Fire of 1871 and the Boston fire of 1872, though "it was not until the Worth Street fire of January 1870 in New York that the history of cast iron in that city was severely curtailed."[8] Hidden defects in iron columns also caused problems; these were solved with the development of the box column, a riveted assemblage of plates and angles made at first of wrought iron and later of steel.

The Chicago, Boston and New York fires had other consequences. Among them were increasing use of terra cotta fireproofing wrapped around the iron and steel structural members and the development of the

[7] See Lehman, *The New York Skyscraper*; Thomas E. Tallmadge, ed., "The Origin of the Skyscraper, Report of the Committee appointed by the Trustees of the Estate of Marshall Field for the Examination of the Structure of the Home Insurance Building," (Chicago: The Alderbrink Press, 1939).

[8] Lehman, 14.

tile arch floor, a method of bridging the distance between cross-beams with flat arches of hollow terra cotta tiles, the flanges of which covered the I-beams to protect them. Steel lathing was used with "adamant" plaster for greater fire resistance; so was terra cotta partitioning covered with plaster, a technique still common in the 1950s.

Toward the end of the century, new foundation techniques employing grillages of steel embedded in concrete made it safe for architects such as Burnham & Root to push structures 300 feet into the air, as they did at the Masonic Temple Building at State and Randolph Streets in Chicago (1890). This impressive mixed-use development had 14 hydraulic passenger elevators and retail stores on its lower floors. It would set a standard for many subsequent buildings aimed at the prestige market.[9]

START OF THE MODERN ERA: LATE 19th AND EARLY 20th CENTURY

Through most of the 19th century serious commercial building had been characterized by masonry construction. It was limited to about six stories in height by its own weight and by the inability or unwillingness of most people to climb any higher in dim stairwells.

L. S. Buffington of Minneapolis had worked out the principles of steel framing in 1871 and patented a 28-story design in 1878. There followed a variety of skeleton-framed buildings in Europe and America. The technique reached a climax in 1884-85 with the competition entries of Frederick Baumann and William LeBaron Jenney for what would turn out to be Jenney's fire-resistant Home Insurance Company Building in Chicago, a ten-story marvel of skeleton framing and the first exemplar of the new Chicago school of architecture. The structure, completely self-supporting, incorporated the first steel I-beams rolled by the Carnegie Phipps Company of Pittsburgh, which sold them to Jenney for use in conjunction with the wrought iron beams and cast iron columns called for in the design.[10]

Soon after came the fully skeleton-framed Tacoma Building by Holabird and Roche (1887-89), which had riveted junctions for added structural rigidity. Home Insurance and Tacoma were bellwethers for the school of architecture that almost immediately formed itself on the principles of skeleton-frame construction: lightweight curtain walls of brick, stone and terra cotta; generous wooden "Chicago" windows grouped in threes; simple ornamentation and rational floor plans. This "Chicago School" would set the style for office buildings around the world.[11]

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[9] *Masonic Temple* (New York: Exhibit Publishing Company, no date).

[10] See Lehman and Tallmadge.

[11] John Zukowsky, editor, *Chicago Architecture 1872-1922* (Munich: Prestel-Verlag, 1987).

The Home Insurance Company Building (1884-85), Chicago, by architect William LeBaron Jenney, incorporated skeleton framing and was one of the first examples of the new Chicago School of Architecture. *(Chicago Historical Society/ Photo by J. W. Taylor ICHi-00989)*

The First Big Boom

Office buildings were rising at a great rate in downtowns all over America. In the central business district of Pittsburgh, for example, over 400 buildings were completed within five years beginning in the late 1880s. New York, Boston, Buffalo, Cleveland and many other cities saw their skylines rise and their business lives transformed as these new developments multiplied.[12]

The burgeoning downtowns attracted all kinds of facilities to feed, clothe, water, house and entertain their numerous employees and visitors:

[12] Earle Schultz and Walter Simmons, *Offices in the Sky* (Indianapolis: Bobbs-Merrill, 1959).

retail stores, restaurants, hotels, taverns, theaters, churches, schools and bawdy houses. More than ever, downtown was now the vibrant heart of the American city. It would continue to capture the bulk of new office construction for almost a hundred years, until suburban development began to take hold on a large scale in the late 1960s.

Steel-framed structures predominated but reinforced concrete was on the march. It had already been used for floor slabs in Great Britain since 1854, and Portland cement had been used in the United States since 1872.[13] French technology featured at the Paris Exposition of 1867 encouraged its wider use in the United States and elsewhere. Thirty years later, in 1902-03, the 16-story Ingalls Building in Cincinnati became "the first reinforced concrete skyscraper",[14] and by 1908 C.A.P. Turner published his system for manufacturing beamless floor slabs of this material.

Employers found that the advantages of the office space offered by these centrally located buildings more than offset its relatively high cost and

New York's Flatiron Building, constructed in 1902-03, was part of a wave of multi-tenant speculative structures built in response to businesses' demand for a downtown location. *(Library of Congress)*

occasional discomforts. It was strategically positioned on or near main transit lines, close to clients, and convenient to more visitors and employees than any outlying office was likely to be. It was also, as space went in those days, attractive, light and airy, easily cleanable and often with impressive upper-floor views.

The design of the buildings where this space was accommodated gave employers a chance to demonstrate their wealth and power, especially in New York, where rents were higher and tastes less Spartan. Many of the earliest and most prominent office structures were erected by large life insurance companies to house their headquarters and impress their current and future policyholders, using for this purpose the investment funds set aside to cover policy obligations. By the late 19th century, Equitable, Prudential, Manhattan Life, Metropolitan and others were battling to build the most impressive structure in Manhattan.

Driving a large share of the growth was the sheer convenience of doing business from a downtown location. All the facilities needed by busy entrepreneurs—post offices, banks, law firms, commodities and securities markets, repair services, equipment suppliers, advertising and employment agencies, clubs, restaurants, taverns and everything else one might want—were within easy walking distance. It would have been near-idiocy to choose a location anywhere else. The powerful socio-economic forces of agglomeration impelled both commercial and residential clustering.

Downtown: A New Kind of Information Processor

For many tenants, these assets were more than sufficient; for others, there was an even more powerful inducement to overcome any lingering distaste for the dirt and hurly-burly of the business district. This was the free flow of information available in downtown settings where businessmen could talk informally to customers and competitors on a daily basis.

In the larger buildings being built, with their many small tenants, new ideas could be floated and tested with great efficiency. The relevant experts and decision makers could often be found under the same roof, or at least within a few blocks' distance. Everywhere there was the cross-fertilization of different disciplines working together in an open environment. With faster access to the latest ideas, businesses located downtown could gain a leg up on the competition. Those that knew how to capitalize upon these opportunities found themselves blooming amid the smoke and noise, increasing the demand for yet more office building construction.

The result was a wave of multi-tenant speculative structures of which a notable example was New York's Flatiron Building (originally the Fuller

[13] Lehman, 24.

[14] Carl W. Condit, *American Building* (Chicago: University of Chicago Press, 1968) 291.

Building), a triangular structure built to the designs of Daniel H. Burnham and Company in 1902-03 at Fifth Avenue and Broadway. Many of these buildings were aimed at particular trades and industries: railroad companies, stockbrokers, insurance agents, lawyers, doctors, real estate men.[15]

Mechanical Systems

Long before the start of the Great War all new buildings were equipped with central heating. In various forms, it dated back to Roman times. Hot water systems fired by coal which distributed heat to cast iron radiators below the windows had been used through much of the 19th century. Steam heat, quieter than the burbling hot water systems common at the time, appeared toward 1890, the year the Masonic Temple Building was built in Chicago.

Coupled with electric lighting, steam heat made office buildings habitable, though uncomfortably dry, even on dark, cold winter days. Soon they would be tolerable even on hot summer days. Air cooling with ice and blowers was an old idea which had been revived by Adler and Sullivan at the Auditorium Theater Building (1887-89) in Chicago. It would be reinvented by Willis Carrier in 1902 with a system that controlled humidity and air movement as well as temperature, and used by Frank Lloyd Wright in the Larkin Building (Buffalo, New York, 1904). Later, in the 1920s, the first fully air-conditioned office building would be erected by architect George Willis: the Milam Building in San Antonio, Texas (1928).[16]

During the long years before air conditioning became common, office buildings generally lacked all but the most primitive artificial ventilation (vertical air shafts in the toilet rooms and sometimes fresh air inlets behind the radiators). Tenants were obliged to leave their windows open through the summer, despite air that was full of soot and would remain so until strict clean-air ordinances began to be enacted at mid-20th century.

In due course, technological progress and economic change would multiply the size of the new buildings and their efficiency as places of business. Steam-powered rapid transit lines to bring in the workers would make them more accessible to outlying residents. So would the improved roads and widespread automobile ownership that followed Henry Ford's application of mass production techniques and mass-market pricing to the private car. Commuters, customers and clients who had migrated outward toward the suburbs could now find their way downtown to the new office buildings with relative ease, and once there could enjoy the views from their upper-floor offices, however those views might be obscured by coal smoke and neighboring buildings.

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[15] See Lehman.

[16] *Encyclopedia of Architectural Design, Engineering and Construction*, vol.3 (New York: John Wiley & Sons, 1989).

While this was happening, land values in Lower Manhattan were reaching $200-$600 per square foot and office rents as much as $40 per square foot in 1912.[17] New York's 1916 zoning ordinance would alter the skyline with the wedding-cake designs encouraged by its setback requirements, which would soon be echoed in Chicago and other cities. There would be more to come; office tenants everywhere were growing larger and demanding more space. Yet over the 20th century, growth has been like a roller coaster, with severe cyclical swings in rents and land values.

THE PROHIBITION ERA

When center-city development reached a new peak in the 1920s, the downtowns of the larger American cities had become striking if confused agglomerations of tall office buildings, fancy department stores, palace hotels, shops, restaurants, saloons, betting parlors, factories and wholesale establishments of various kinds. These buildings, often heavily ornamented in a variety of quasi-historical styles, were built to the sidewalk lines under zoning ordinances that offered no rewards for open space at ground level, though by 1925 they generally required setbacks higher up to allow the passage of light and air. Soaring above the stores at ground floor level, they ranged in height up to the 1,250 feet reached by the 85-story Empire State Building (Shreve, Lamb & Harmon, 1931; a tower carries it upward to 102 stories) and in rentable area up to more than a million square feet. More typically they were 20 to 30 stories high with areas of less than 400,000 square feet. The very density of the new downtowns provided customers for a broad range of retail and service outlets which in turn made life easier and more agreeable for employees and their bosses.[18]

Fire safety, always a sensitive issue even though the structures were inherently fire-resistant, was greatly improved, though there were no sprinklers and floors were of hardwood or tile. Office buildings still had large openable windows to provide natural light and ventilation, and ceiling heights still ran 10 to 12 feet for greater tenant comfort in an era when cigar smoking was the rule among male employees who could afford it. The typewriter, the telephone and the teletype made it possible to do business more easily, cheaply and effectively than ever before.

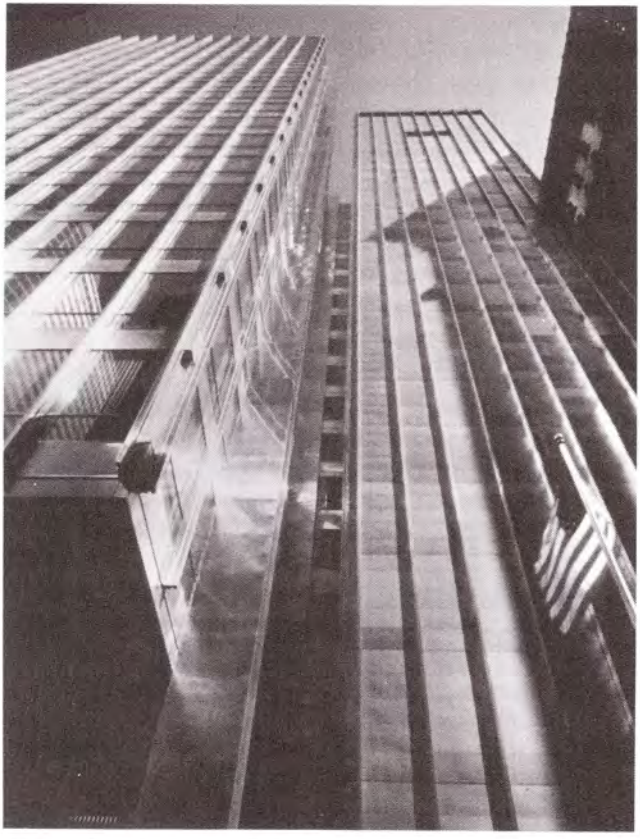
Tenants during this period were still relatively small for the most part; it was a rare building that had more than one multi-floor tenant, so that the social and business interchange among renters and between buildings remained far greater than in today's large corporation-tenanted structures. Along with this advantage came other, sometimes less desirable

[17] Lehman, 9; Moses King, *King's Views of New York, 1911-12* (New York: Moses King, 1912).

[18] See Lehman.

consequences of the new situation. Tenants in the new offices, separated from the manufacturing and agricultural operations that fed them, grew more specialized, their workers forming a new white-collar class that seldom had to dirty its hands with physical work. As it multiplied, this class would make new demands and force massive social changes.

While New York had almost 2,500 of the 4,800 buildings in 1929 that were 10 stories or higher, many other cities had significant numbers. Chicago, Los Angeles, Philadelphia, Detroit and Boston as well as New York each had more than 100 such buildings, while St. Louis, Pittsburgh, Kansas City, San Francisco, Cleveland, Seattle, Baltimore, Minneapolis, Tulsa, Dallas and Houston each had more than 30.[19]



Chicago's stainless-steel-clad Inland Steel Building (1955-57), by international style architects Skidmore, Owings and Merrill, paved the way for new cladding materials. *(Photo by Jon Miller/Hedrich-Blessing. Courtesy of Skidmore, Owings and Merrill)*

In a world where paper and information were fast replacing gold and commodities as the basic currencies, boom-bust cycles had become familiar. The office building boom of the 1920s came to a resounding halt with the depression of the 1930s, which bankrupted tenants, pushed most properties into receivership and wiped out many owners. A few major office structures, notably New York's Rockefeller Center (1931-40), a model grouping of quality buildings, and Chicago's Field Building (1934), were started during the Depression years, but World War II put a stop to all non-defense construction until late 1945.

THE POSTWAR YEARS

At the war's end, a generation of white collar workers reared in suburbia would in due course find its way back to the heart of the city. Employers there awaited them with open arms. Those cities fortunate enough to enjoy good commuter rail networks, modern expressway systems and attractive downtowns were special beneficiaries. Available space was in short supply, driving office rents to new highs.

Most cities, though, experienced no real resurgence of office development until at least the 1950s, when Lever House in New York (1952) and the stainless-steel-clad Inland Steel Building in Chicago (1955-57), both by international style architects Skidmore, Owings and Merrill (SOM), gave proof that the office building was still a viable art form, if not yet a guarantee of financial success for investors. The metal-and-glass skins of these two buildings would pave the way for other cladding materials. These included glass, stamped aluminum (Harrison & Abramovitz's 1953 Alcoa Building in Pittsburgh), precast concrete (most notably at the 1960 Pan Am Building in New York, by Walter Gropius with The Architects' Collaborative and Belluschi & Roth), composite insulating panels, and the oxidizing steel (actually a steel-copper alloy) used at Chicago's Civic Center (now the Richard J. Daley Civic Center, by Jacques Brownson with C. F. Murphy and Son, 1963-65) and the U.S. Steel Building in Pittsburgh (Harrison & Abramowitz, 1969). Stainless steel, discovered by accident in 1912 but little used for building before the Inland Steel Building because of its cost, would be used again at the Harris Bank Building in Chicago, also an SOM design, and at the Mobil Oil Building in New York.[20]

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[19] See Lehman.

[20] See, for example, William Brubaker, "The Evolution of Chicago's Tall Office Buildings," *Chicago Office* (Chicago: Building Owners and Managers Association, 1991); Robert Bruegmann et al., *A Guide to 150 Years of Chicago Architecture* (Chicago: Chicago Review Press, 1985); Paul Goldberger, *The Skyscraper* (New York: Alfred A. Knopf, 1982); Henry-Russell Hitchcock, *Architecture: Nineteenth and Twentieth Centuries, 3rd. ed.* (Baltimore: Penguin Books, 1971); Pauline A. Saliga, ed. *The Sky's the Limit: A Century of Chicago Skyscrapers* (New York: Rizzoli International Publications, Inc., 1990).

The design of these buildings, which rose straight up from the ground without setbacks and left much of the lot open, would also encourage major revisions to the zoning ordinances of New York, Chicago and other cities. Inside, the space was laid out to the new standards made possible by central air conditioning. The Inland Steel Building, for example, had all its mechanical services in a separate core, allowing its office tower to be designed without interior columns.

Central air conditioning, now refined to provide for supply and return zones, and a rising demand for the larger spaces it made possible, encouraged the new buildings to increase their floor sizes, though floor plates of 15,000 square feet or less remained common. At the same time, new building forms were made possible by zoning reforms such as those of the Chicago Zoning Ordinance of 1957 and the New York Ordinance of 1961, which set limits on floor area ratios instead of imposing height limits or requiring upper-floor setbacks. These reforms, reflective of international style architectural canons, allowed greater design flexibility and encouraged setbacks at grade rather than at the upper floors, often granting bonuses for arcades, plazas and other amenities.[21]

Technology had been evolving behind the scenes during the quiet years, and elevator manufacturers like Otis and Westinghouse were ready with new high-speed operatorless systems that could move people to the top of a 40-story building in less than a minute, popping eyes as well as ears. A shift from direct to alternating electric current and improvements in fluorescent lighting (invented 1938) reduced power consumption while encouraging light levels to rise. Oil and sometimes gas-fired boilers had begun to replace the stoker-fired coal boilers of an earlier era. Later, electric heating, cheaper to install and maintain, would have its turn.

Central air conditioning, still fairly rare in the 1950s because of its cost, became common and in fact almost mandatory during the 1960s. It reduced ceiling heights to as little as eight feet, though ceilings of nine feet or more remained the standard in Class A buildings. Also possible with air conditioning were floor plans far larger and more flexible than in the past, with greater core-to-perimeter distances and greater amounts of windowless space lighted by fluorescent fixtures. Older buildings through the period were often retrofitted with window air conditioners or package units serving selected tenants.

Meanwhile asphalt, rubber tile and carpet floor coverings were becoming common, and fire-resistant gypsum-based plasterboard, generally mounted on structural tile block or metal studs for reduced flammability, had appeared as a lower-cost partitioning material which allowed faster

[21] Seymour Toll, *Zoned America* (New York: Grossman, 1969).

and cleaner revision of tenant layouts. During the same period, mass-produced curtain wall elements were reducing costs and construction time for many buildings.

Decentralization Creates Major Locational Shifts

A system of interstate highways launched during the Eisenhower Administration—and the suburbanization that accompanied it—would at first contribute to the vitality of the downtown marketplace, now more accessible than ever to outlying users. Later, the rapid expansion of urban blight and the ensuing flight to the suburbs of office businesses and employees, facilitated by new expressways and transit lines, would begin to undermine the attractiveness and viability of many central cities. Suburban communities eager for new revenues fought to attract office development with liberal zoning and other incentives.

As a result, office buildings began to dot the suburban landscape, at first in isolation but soon, especially after about 1965, in growing clusters served by the new expressways. Industrial parks with carefully planned streets and facilities had been commonplace since the 1920s. Now office parks with landscaping and off-street parking were beginning to appear in many markets.

Tenants would also increasingly influence the location of office building sites. Wanting to work closer to home, and when possible to commute by private car rather than public transportation, the executives of the 1970s and 1980s would induce the development of exurban office concentrations in the "urban villages" or "edge cities" and along the growth corridors of sprawling American metropolises. Tyson's Corner near Washington, D. C., the Woodfield area near Chicago, and Route 1 near Princeton, New Jersey, are among the most striking examples. Perhaps the most notable individual buildings reflecting this phenomenon are a tower by architect Helmut Jahn some 17 miles west of Chicago in Oakbrook Terrace and the 1.6 million-square-foot 64-story Transco Tower, by Philip Johnson and John Burgee, in the Post Oak area of Houston, the tallest building ever built in an essentially suburban setting.

Through this period floor plates and building sizes continued to grow larger. Column spacing began to standardize on the five-foot module increasingly preferred for facilities planning, producing bays 30′ x 30′, 30′ x 50′ and 40′ x 40′. These cost more to build than less costly 20′ x 20′ bays but allowed more flexibility in tenant layouts. Specially designed computer rooms were installed to accommodate the growing computer needs of tenants; movable partitioning had made its appearance, while wall-to-wall carpet and vinyl tile floor coverings largely replaced the rugs and the asbestos-laden asphalt tile that had covered most floors until the 1960s. By 1965, asbestos, an ancient building material commonly used for fireproofing, was beginning to be rejected in favor of safer materials. Later, it would

become a serious problem for many building owners and manufacturers of building materials because of the health hazard it posed.

Electric heating systems and floor-to-ceiling windows had become common by the 1960s, but the energy crisis of 1973-74, when oil prices soared and people lined up for gasoline on the streets, yielded a new generation of buildings designed to conserve energy. These tight new structures were heated mainly by gas, often with provision for the use of oil as an alternate fuel. They came with low rooflines, reduced heat-wasting perimeter wall areas, insulating skins sealed to minimize heat loss, and smaller double-glazed non-openable metal sash equipped with thermal barriers.

In the 1980s a new problem was becoming apparent. The artificially-supplied air which replaced air that had formerly come in through the windows allowed toxic substances and germs released in the course of ordinary operations to accumulate inside, making breathing a riskier proposition. Also of growing concern was the danger of terrorist attack, which led many owners to rearrange their building entrances and install alarm systems for greater security.

In Chicago, major structures such as the John Hancock Center (Skidmore, Owings and Merrill, 1970), Sears Tower (SOM, 1974), the Amoco Building (Edward Durrell Stone with Perkins and Will, 1974) and Water Tower Place, an instant mixed-use landmark (Loebl, Schlossman, Bennett and Dart, 1975-76), dominated their market for several years. Far from the Chicago scene in the roughneck city of Houston, a new architectural standard would be set by Johnson and Burgee's Pennzoil Place (1972-76), which demonstrated to the world that good architecture could be worth its cost. Meanwhile, in New York, Donald Trump was proving at Trump Tower (Swanke, Hayden, Connell and Partners, 1976) that mixed-use design could be sybaritic as well as more or less functional.

THE EASY EIGHTIES

By 1982, when the country experienced a serious manufacturing recession and blue-collar jobs were lost by the million, people began to believe that the future of the United States lay with the service industries. Large amounts of space would be necessary to accommodate their growth, much of it in the suburbs where suburban baby boomers could get white-collar jobs close to home. The impact of IBM's first personal computer was multiplied by the proliferation of the photocopier, the telefax and the modem, novelties which greatly increased the flow of information and stimulated the creation of new businesses. Communication via satellite, fiber optic cable and laser printing increased unbelievably the speed of the information flow and enabled companies to move anywhere.

In the suburbs, office building development in many markets was proceeding even faster than in traditional downtowns, where construction continued apace. Some of this construction took the form of "smart buildings" prewired for computer networks and fiber optic communications, often with central computer and fax services available to tenants. Vertical chases were made larger to accommodate tenants' telephone lines and special wiring. Heating and air conditioning were by now integrated in new computer-controlled energy-conserving forms, often based on electricity rather than gas or oil, that allowed tenants to exert a high degree of control over temperature and airflow and shielded them from outside atmospheric conditions to such an extent that "sick buildings," with air contaminated by internal effluvia, would become a problem. Improvements in the art of slicing and fastening marble and granite veneers allowed them to be used as facing materials for tall buildings, but as the failure of numerous building skins would show, this flexibility was not without its perils.

Coming into fashion as the decade progressed was an almost frivolous post-modernism exemplified by Johnson and Burgee's Chippendale-style AT&T Building in New York (1984) and by two Michael Graves designs: the Portland Municipal Services Building (1980) and the Humana Building in Louisville (1982). New York's towering World Trade Center (Minoru Yamasaki and Associates, 1972-74) had been built in the international style, as would be Cesar Pelli's World Financial Center (1985-88) in New York, but European and Japanese architects as well as American post-modernists were beginning to come on the scene with buildings such as Kenzo Tange's AMA Center (1991) and Ricardo Bofill's R. R. Donnelley Building (1992) in Chicago. Daring, sometimes dazzling, office buildings by architects such as Jahn, Bofill, Richard Rogers, Michael Hopkins and many others meanwhile were rising in Europe and the Far East.

The great strides made in office technology had improved worker productivity throughout this period, allowing many office tenants to think about space and staff cuts as they modernized. They could also think about the kinds of new activities made possible by greatly improved information-handling and communications facilities. World capital markets were now increasingly integrated and able to operate with lightning speed, which facilitated the movement of funds across regional and national lines.

In response, decentralization became the order of the day. One result was the emergence of fast-growing global service businesses that could place their operations wherever labor costs might dictate, almost without regard to location. Another was the spreading institutionalization of real estate ownership and management as the insurance companies and pension funds, hoping for investment returns higher than they could earn as mere mortgage lenders, involved themselves more deeply in the property markets.

NOT THE END OF THE STORY

As the new century approaches, it is evident that the shape and function of the office building will continue to evolve, though the directions they will take are not yet clearly discernible. So will the office building's investment dynamics and its relationship to its community. Like a living creature, the office building must adapt to the vagaries of chance and change, as it always has done in the past, forever ready to make new—and possibly quite different—economic and social contributions to the constantly unfolding capitalist society which gave it birth.

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