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Daylight as a Zoning Device for Midtown

MICHAEL KWARTLER

Michael Kwartler and Associates, New York, NY and School of Architecture, Rensselaer Polytechnic Institute, Troy, NY (U.S.A.)

RAYMON MASTERS

Computation Center, Penn State University, State College, PA and School of Architecture, Rensselaer Polytechnic Institute, Troy, NY (U.S.A.)

SUMMARY

Since 1960, New York City's Midtown district has experienced an office building boom with the construction of seventy million square feet (650 300 m^2) of new office space in one hundred eleven buildings. During this period it became increasingly clear that this new generation of superscale office towers, such as AT & T and IBM, were overpowering their context by dramatically diminishing the daylighting available to the public streets, parks, plazas, and neighboring buildings.

The prime cause of this environmental dilemma was the permissive and subjective manner in which the City Planning Commission reviewed Midtown buildings. The waiving of the rigid as-of-right or automatic height and setback regulations for a negotiated review, conceived to encourage good architecture, resulted in daylighting conditions which were measurably worse than those that, in part, led to the call for zoning to protect public access to "light and air" in 1916. The as-of-right zoning regulations which were enacted to guarantee an adequate level of solar access had been superceded by negotiated or discretionary zoning and in the process one of the original goals of zoning was lost.

Responding to the defined need for procedural certainty, public accountability, and design and development flexibility, the consultants proposed a performance system of as-of-right zoning based on objective criteria and measurement techniques. The centerpiece of the new building bulk regulations is a modified Waldram Diagram on which the daylighting performance of a building is evaluated against a threshold and standard. The threshold and standard were systematically derived from an analysis of the sixty-year historical expectation for daylight in Midtown. The performance system as adopted by the City is presently being programmed for computer evaluation.

HISTORICAL BACKGROUND: THE COMMUNITY EXPECTATION OF DAYLIGHT

"Whereas, there is a growing sentiment in the community to the effect that the time has come when effort should be made to regulate the height, size and arrangement of buildings, erected within the limits of the City of New York, in order to arrest the seriously increasing evil of shutting off light and air from other buildings and from public streets, to prevent unwholesome and dangerous congestion both in living conditions and in the street ..." [1].

On the 27th of February 1913, the Board of Estimate and Apportionment of the City of New York adopted a motion proposed by the President of the Borough of Manhattan and quoted above in part to create the Heights of Buildings Commission which developed the United States' first comprehensive zoning resolution. That Resolution, adopted in 1916, became the model for all subsequent American zoning resolutions. The Height, Court, and Use Districts of the 1916 Zoning Resolution continued to be the urban design and development rules for Midtown Manhattan ("Midtown") through the early sixties, and are the focus of this paper. Street wall heights, courts, building setback ratios, and tower coverage and location regulations were the primary instruments in creating both the physical form of Midtown and the publics' and property owners' expectation of

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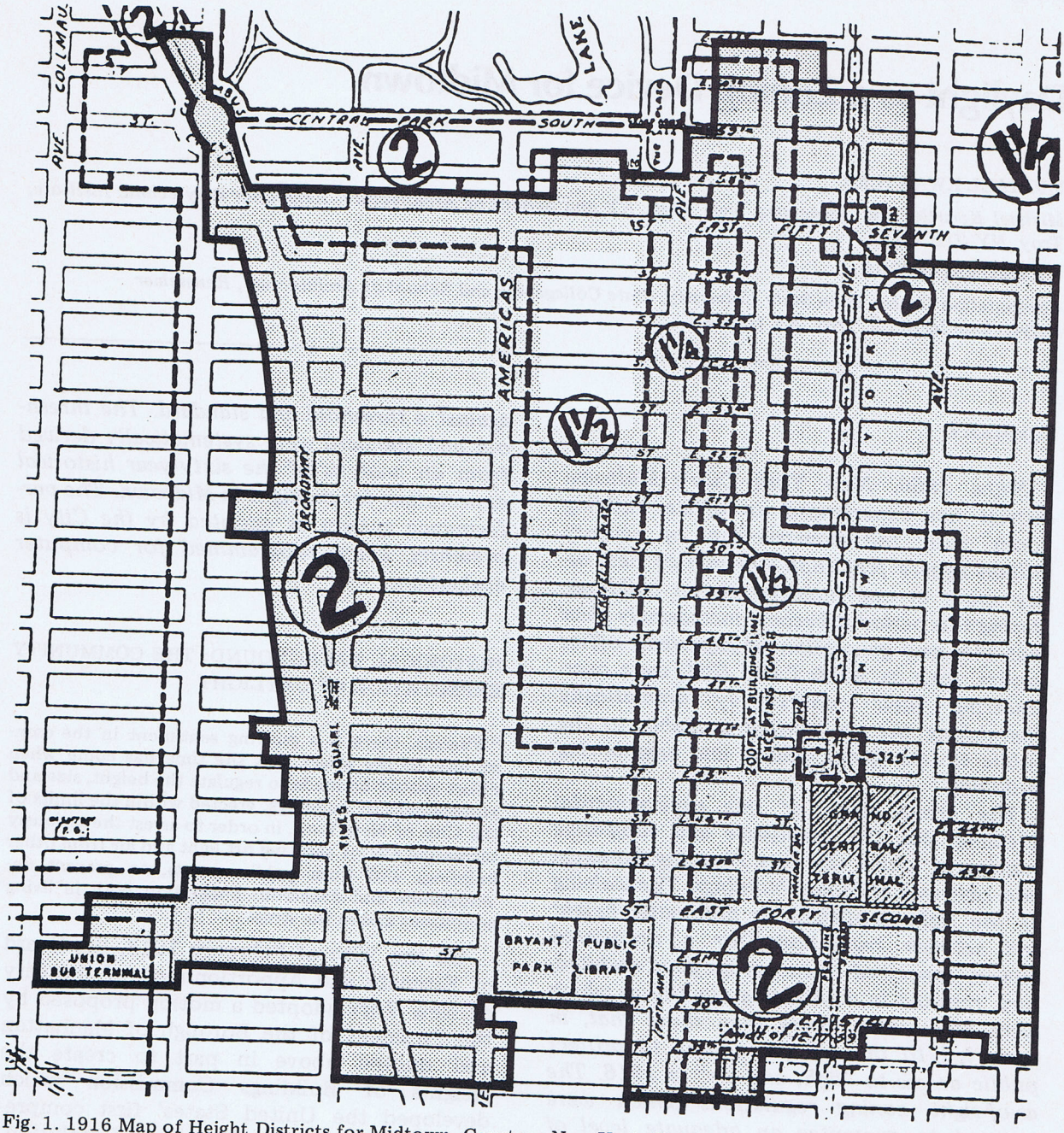


Fig. 1. 1916 Map of Height Districts for Midtown. Courtesy New York City Department of City Planning.

the amount of daylight available in the public space of the street and to the commercial building interiors. Up to the end of World War Two, the majority of office buildings used daylight as an organizing and form giving criterion by adhering to the general rule that whenever possible no desk should be more than 10.67 m (35 ft) from a window.

Subsequent amendments to the 1916 Zoning Resolution, (including the omnibus 1961 [2] amendments which fostered the tower/slab and plaza schema of development) held true to the daylighting expectation incorporated in the original resolutions. Because the combined effects of the as-of-right building bulk regulations of the 1916 and 1961 ordinances represent more than sixty years of building activity, they have created an uninterrupted record of community expectations regarding daylighting in Midtown, upon which the public and property owners relied.

While the daylight standard developed for Lower Manhattan, then the center of high-rise commercial building, may have been less than desired based on expectations from an earlier time, the 1916 Zoning Regulations as they applied to Midtown proved to be a serviceable daylighting standard that was responsive to demands for environmental quality and development economics. (This is explained by the mapping of lower height and court districts for Midtown than prevailed in Lower Manhattan.)

The omnibus amendment of 1961 represented a continuation of the standard, although achieved in an entirely different manner. The 1961 building bulk regulations were derived from the 1950 *Plan for Rezoning the City of New York* and as such recognized that

> "While numerous buildings are being built in the molds determined by the setback regulations, plenty of others are being built with towers, illustrating the point that light may come along the side or sides of a thin tall building instead of over the top of a wide building." [3].

These modifications to the 1916 Resolution (which included an angle of light obstruction or sky exposure plane) assumed an equivalency between the two approaches. While not objectively evaluated as such, the intent was to fulfill the standard of daylight in the streets and on building facades established in the 1916 Resolution. (Subsequent analyses by us verified this equivalency.) Tower regulations in both the 1916 and 1961 Resolutions further insured solar access to the upper reaches of the facades of high-rise office buildings by limiting their size and location relative to the street and hence to themselves by spacing the towers apart from each other.

The height, setback, and open space regulations of the 1916 and 1961 Resolutions also created an urban design standard (and subsequent expectation) regarding the character of the street. Because the 1916 Resolution had no requirement or incentive for publicly accessible outdoor space on the zoning lot, the building street walls and the upper portions of the building setback from the street wall generally filled their entire zoning envelope. With few exceptions (Lever House and the Seagram's Building, both corporate headquarters built under the 1916 Resolution) buildings defined the street space of Midtown by continuous and almost uniform street walls built to the street line. These and earlier structures have created the dominant image of Midtown, e.g., Fifth Avenue, Madison Avenue, etc.

In 1961 the New York City Planning Commission adopted a comprehensive amendment to the 1916 Zoning Resolution. While the prescriptive and essentially as-of-right or automatic structure of the Resolution remained unchanged, its content was dramatically different. The new Resolution addressed three major concerns in its regulations:

(1) density, in terms of maximum floor area to be developed on any one zoning lot;

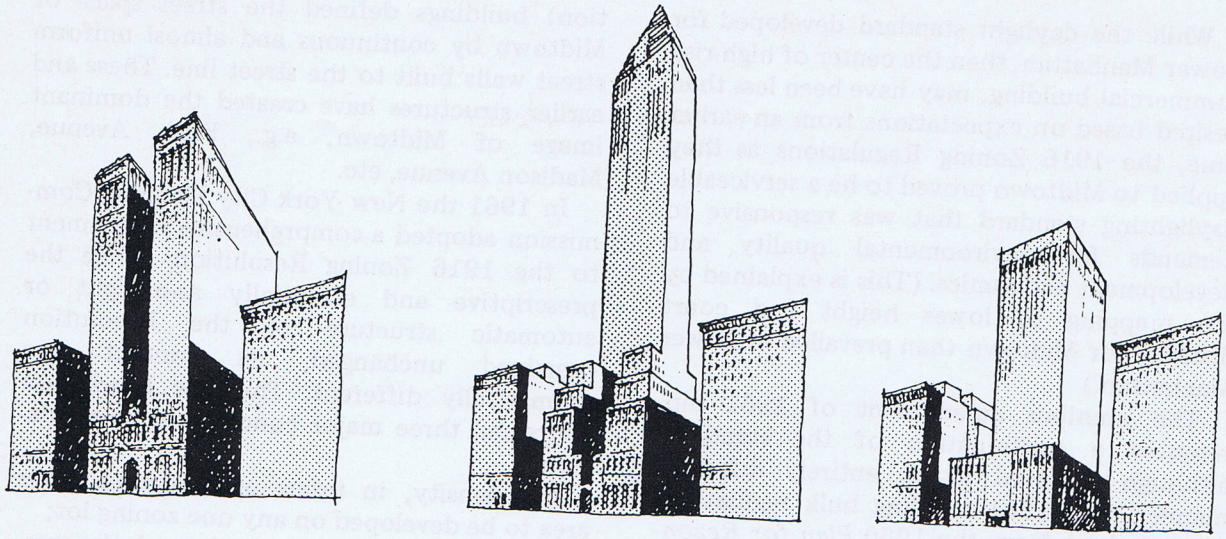
(2) access to light and air, through the creation of exterior publicly accessible plazas; and

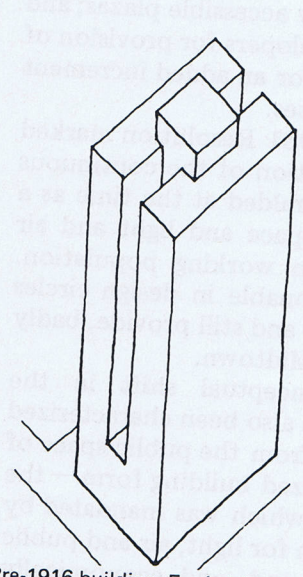
(3) incentives to developers for provision of these plazas in return for an added increment of floor area on their sites.

The plazas of the 1961 Resolution marked a break with the tradition of the continuous street wall and was heralded at the time as a gesture to the open space and light and air needs of the Midtown working population. While no longer fashionable in design circles these spaces provided, and still provide, badly needed open space in Midtown.

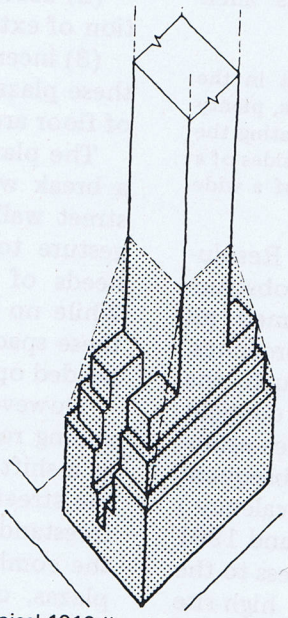
However, this conceptual shift in the zoning regulations has also been characterized as a shift in concern from the public space of the street to an idealized building form — the freestanding tower — which was mandated by the combined concern for light, air and public plazas, on the one hand, and economically feasible densities on the other. In the late 1960s, it became clear that the 1961 regulations were producing avenues of grinding uniformity — Sixth Avenue being the most notable example.

By the middle 1970s, site assembly had become increasingly more difficult in Midtown. Available sites were getting smaller while demand for office buildings with large floors was increasing. The 1961 as-of-right regulations made it virtually impossible to accommodate what were perceived to be marketable floor sizes and an exterior bonusable plaza on an irregular and small site. In response the Planning Commissioner allowed public space to become internalized within the building, which occupied up to 80%, and in some cases



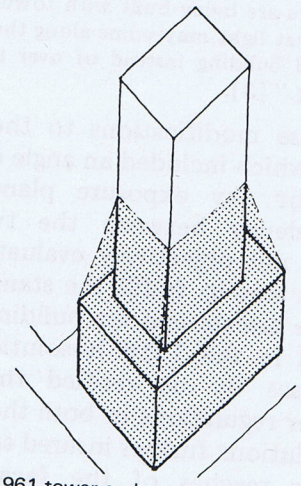


Pre-1916 building, Equitable Life Insurance, 120 Broadway
Fig. 2.



Typical 1916 "wedding cake" building
Fig. 3.

Note: dotted lines represent maximum zoning envelope



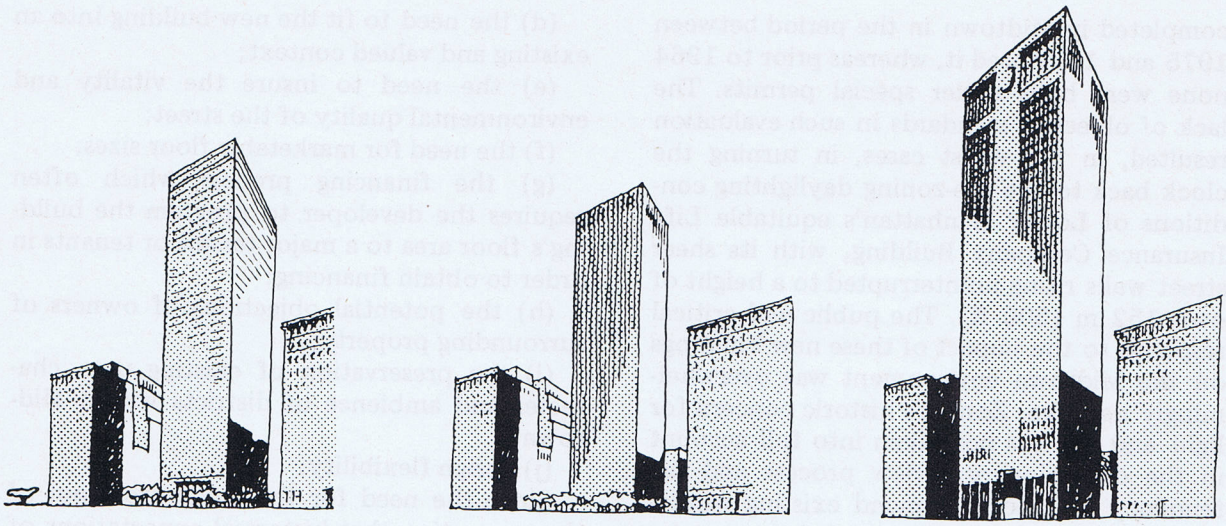
1961 tower on base, FAR 15
Fig. 4.

Figs. 2 - 7. Axonmetric view of building types and building envelopes of the 1916 and 1961 Zoning Resolutions. Courtesy New York City Department of City Planning.

100% of the lot leaving no viable outdoor publicly accessible space.

More recently the development technique of combining a series of lots, some with and some without occupied structures, into a single, often irregular, zoning lot that could utilize unused development rights from the merged lots solved the assembly problem only to further exacerbate the building and urban design problems. In many cases the buildable portion of the merged lot represented 40% or less of the total zoning lot, resulting in very high but allowable floor area on the buildable portion of the lot. The effect of these buildings was to reduce daylight in Midtown to pre-zoning conditions. The as-of-right regulations were never meant for this type of zoning lot, nor was it ever assumed that each zoning lot might be built to its maximum floor area through the transfer of development rights.

As a result, the Planning Commission developed a series of Special Districts and Special Permits [4] for Midtown that were based on a discretionary or negotiated rather



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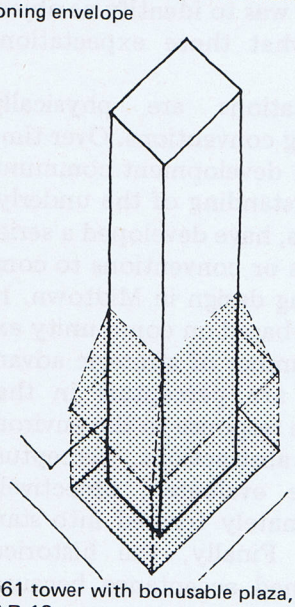
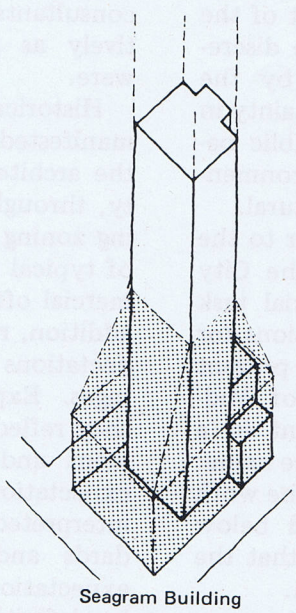


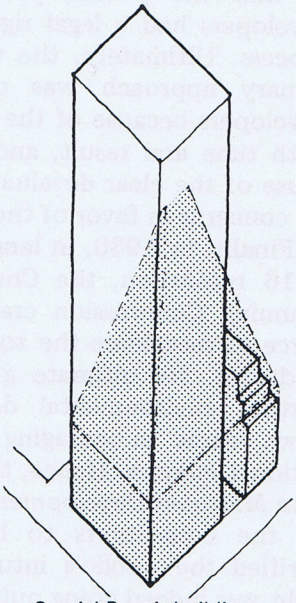
1961 tower with bonusable plaza, FAR 18

Fig. 5



Seagram Building

Fig. 6.



Special Permit building

Fig. 7.

(For Figure legends please see facing page.)

than as-of-right review. The goal of these regulations was to go beyond the limits of traditional zoning's police power based on preventing a harm to one of conferring a good. A discretionary review, it was felt, would result in better designed buildings which would reinforce their context better than the isolated and acontextual towers specified by the as-of-right regulations of the Resolution. The factors that helped induce developers to reject the simple and speedy as-of-right process for the lengthy and uncertain discretionary process were additional floor area for interior amenities and the waiver of the height, setback, and building coverage regulations for small and/or merged lots. Most of the discretionary Special Permit regulations were created around the particular needs of a succession of developments and as a result did not conform to any consistent set of daylighting or any other objective environmental criteria.

The Special Permit discretionary process became so successful that 75% of all buildings

completed in Midtown in the period between 1975 and 1979 used it, whereas prior to 1964 none were built under special permits. The lack of objective standards in such evaluation resulted, in the worst cases, in turning the clock back to the pre-zoning daylighting conditions of Lower Manhattan's equitable Life Insurance Company Building, with its sheer street walls rising uninterrupted to a height of over 152 m (500 ft). The public and critical response to the impact of these new buildings on the Midtown environment was overwhelmingly negative. Zoning's historic concern for light and air was not taken into full account in the discretionary review process and the tendency to tailor or amend existing legislation for each new building eroded the certainty that the public, property owners, and developers had a legal right to expect of the process. Ultimately, the value of the discretionary approach was questioned by the developers because of the lack of certainty in both time and result, and by the public because of the clear devaluation of environmental concerns in favor of those architectural.

Finally in 1980, in language similar to the 1916 resolution, the Chairman of the City Planning Commission created a special task force to reevaluate the zoning regulations for Midtown. Its ultimate goal was to prevent further environmental degradation of Midtown while encouraging development in a rational manner. Hence, the task force name: *The Midtown Development Project.* The work of the consultants to be described below verified the public's intuitive sense that the light was indeed going out in Midtown.

APPROACH

The consultants and the City Planning Commission agreed that the new regulations should embody standards, objectivity, accountability and the flexibility to deal successfully with the complex requirements of development in Midtown:

(a) widely varied site assemblages — including merged zoning lot, transfer of development rights and irregular and small sites;

(b) public space on the building or zoning lot;

(c) energy conservation, solar access, and daylighting;

(d) the need to fit the new building into an existing and valued context;

(e) the need to insure the vitality and environmental quality of the street;

(f) the need for marketable floor sizes;

(g) the financing process which often requires the developer to program the building's floor area to a major tenant or tenants in order to obtain financing;

(h) the potential objections of owners of surrounding property;

(i) the preservation of existing uses, character and ambience of districts within Midtown;

(j) design flexibility.

Since the need for the study arose out of the perception that historical expectations of available daylight were not being met, the consultants first task was to identify as objectively as possible what those expectations were.

Historical expectations are physically manifested in building conventions. Over time the architectural and development community, through an understanding of the underlying zoning regulations, have developed a series of typical approaches or conventions to commercial office building design in Midtown. In addition, regulations based on community expectations have a number of strategic advantages. Expectations are perceptual in that they reflect a sensate response to the environment and are not abstractions. Perceptual expectations can be evaluated, objectively interpreted and ultimately formed into standards and criteria. Finally, the historical expectation has gained acceptance because, by definition, a public expectation represents a long-held consensus. So rather than develop a new series of standards out of whole cloth with all the legal, political, economic, and social disruption that would entail, the major effort was focussed initially on defining and quantifying existing standards of the daylighting and the nature of the street environment. These would then be evaluated for their adequacy to meet the needs of the future.

From a review of the 1916 and 1961 Zoning Resolutions and their effect on the form of buildings, public spaces of the streets, parks, and plazas, the consultants were able to develop a series of building "types" [5] representing the built response to the as-of-right and discretionary regulations of the Zoning

Resolutions. To insure representativeness the "types" were compared to the complete inventory of Midtown office buildings. The analysis concluded that "types" represented an overwhelming majority of the buildings in Midtown. Exceptions (generally including buildings on very large sites such as the Empire State, RCA and Lincoln Buildings built under the 1916 as-of-right regulations and Citicorp under the 1961 discretionary regulations) were targeted for separate evaluation. The variations within each "type" represented the range of response to the regulations. In order to shape the street context and daylight delivery of each building type, we used two analytical techniques. New York City's Housing Quality Zoning [6] provided a working performance system for analyzing an existing street context and establishing criteria for performance.

With the assistance of our daylighting and energy consultant, Prof. Harvey Bryan, we reviewed the analytical tools available to measure daylight in outdoor spaces in graphic form. The Waldram diagram was selected because of its extensive use in the United Kingdom as a daylight indicator for site planning [7] and its ability to approximate the visual experience of the building from the street. The shapes of buildings on the diagram approximate the way one would perceive them from one point in the street, by bracketing or sweeping the view, as in a panoramic lens. The intent was to work within a representational convention understood by both architects and lay people. With these two tools, the existing standards could be identified objectively and evaluated for their applicability to the problem at hand — responsible regulation of new building in Midtown.

Daylight Evaluation Chart (DEC)

The traditional form and use of the Waldram diagram was modified to better fit the conditions of Midtown and with this modification is known as the Daylight Evaluation Chart or "DEC". DECs were devised to respond to the 18.3, 22.9, 24.4 and 30.5 m (60, 70, 80 and 100 ft) street widths of Midtown.

The combination of the typically high existing street walls and the closeness of the viewpoint produced distortions of the build-

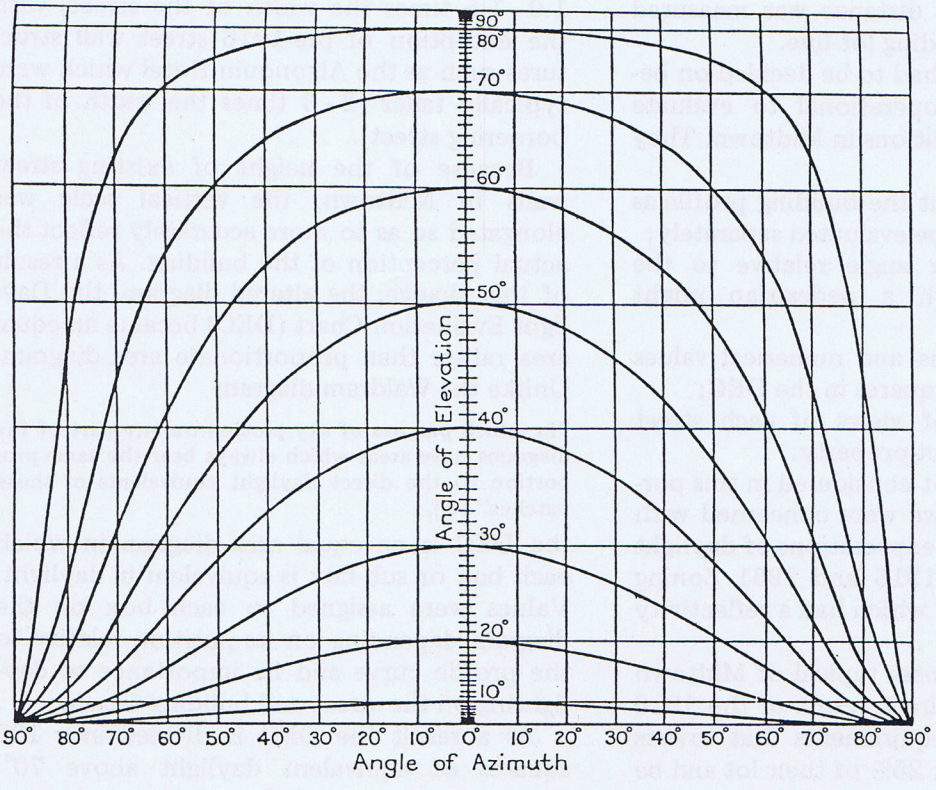


Fig. 8. Waldram diagram for uniform sky (i.e. true sky factors). Courtesy Heineman Publishing Co.

ing which were unacceptable. More importantly, the typical pedestrian's experience is glancing or nearly parallel to the building face. Furthermore, a pedestrian experiences two major impacts of buildings regarding daylight and the sense of openness. One is the amount of sky visible above and around the building. The second is the effect in the long view down an avenue or street of the profile of the building relative to the sky dome. Sheer thin towers built at the street line may have exemplary daylighting at the adjacent sidewalk but from a block or two away obscure significant areas of the sky dome by the constricting effect of the leading edge of the building. In a sense these represent the micro- and macro-impacts of a tall building.

Our first task was to select a viewpoint. Empirical testing and some subjective analysis led us to choose 76.2 m (250 ft) for the approximate distance for the viewpoint as the optimum between the relatively far view at which a building can be differentiated from others in a continuous row, and the relatively near view necessary to prevent distortion on the DEC. The viewpoint was placed in the center of the street, which was consistent with zoning practice in New York City and the 76.2 m (250 ft) distance was measured from the furthest building lot line.

Four other factors had to be decided on before the DEC was operational to evaluate existing daylight conditions in Midtown. They were:

(1) whether to treat the building profile as a special situation to be evaluated separately;

(2) the degree or angle relative to the horizon above which a pedestrian might expect to see sky;

(3) the subdivisions and numerical values given to the daylight squares in the DEC;

(4) the number of views of each street frontage for the subject property.

Reflectivity was not considered in this portion of the work as we were concerned with the evaluation of the expectations of daylight incorporated in the 1916 and 1961 Zoning Resolution neither of which had a reflectivity component.

The sense of openness typical of Midtown intersections was a direct result of the 1916 Zoning Resolution requirements that towers occupy no more than 25% of their lot and be located at least 22.9 m (75 ft) away from the centerline of fronting streets. This historic and characteristic opening up of the intersections to daylight and, in many cases, sunlight resulted from the dramatic setback of towers and the orientation of New York's street grid of almost 30° east of north and can be directly experienced as one moves through Midtown.

It was decided, therefore, that the blockage of the sky in the macro- or profile view of a building, while not having localized daylighting impacts, created the perception in the viewer's mind of a dark street simply because less sky was visible. A profile curve was developed which defined the area of the sky-dome which would have historically been expected to be visible from the street.

Since holding a uniform cornice line was not isolated as a main urban design consideration, a weighted average of street wall heights was derived from the 1916 Height Districts for Midtown. Seventy degrees (70°) above the horizon was chosen as the average height of street walls in Midtown. Above 70° a pedestrian could historically expect to see patches of sky. The street walls that predominate in Midtown are almost entirely the result of the 1916 regulations (ranging from 1.0 - 1.5 times the width of the street) with the exception of pre-1916 street wall structures such as the Algonquin Hotel which were typically taller (2 - 3 times the width of the bordering street).

Because of the height of existing street walls in Midtown, the vertical scale was elongated so as to more accurately reflect the actual perception of the building. As a result of this change, the altered diagram, the Daylight Evaluation Chart (DEC) became an equal area rather than proportionate area diagram. Unlike the Waldram diagram

> "in which patches of sky plotted on any part of the diagrams have areas which always bear the same proportion to the direct daylight equivalents of those patches" [8],

the DEC is an equal area diagram in which each box or sub-box is equivalent in daylight. Values were assigned to each box on the diagram depending on its position relative to the profile curve and its importance to daylighting on the street and building facade.

As a result the DEC is divided into 100 squares of equivalent daylight above 70°. Each square above 70° is the equivalent of

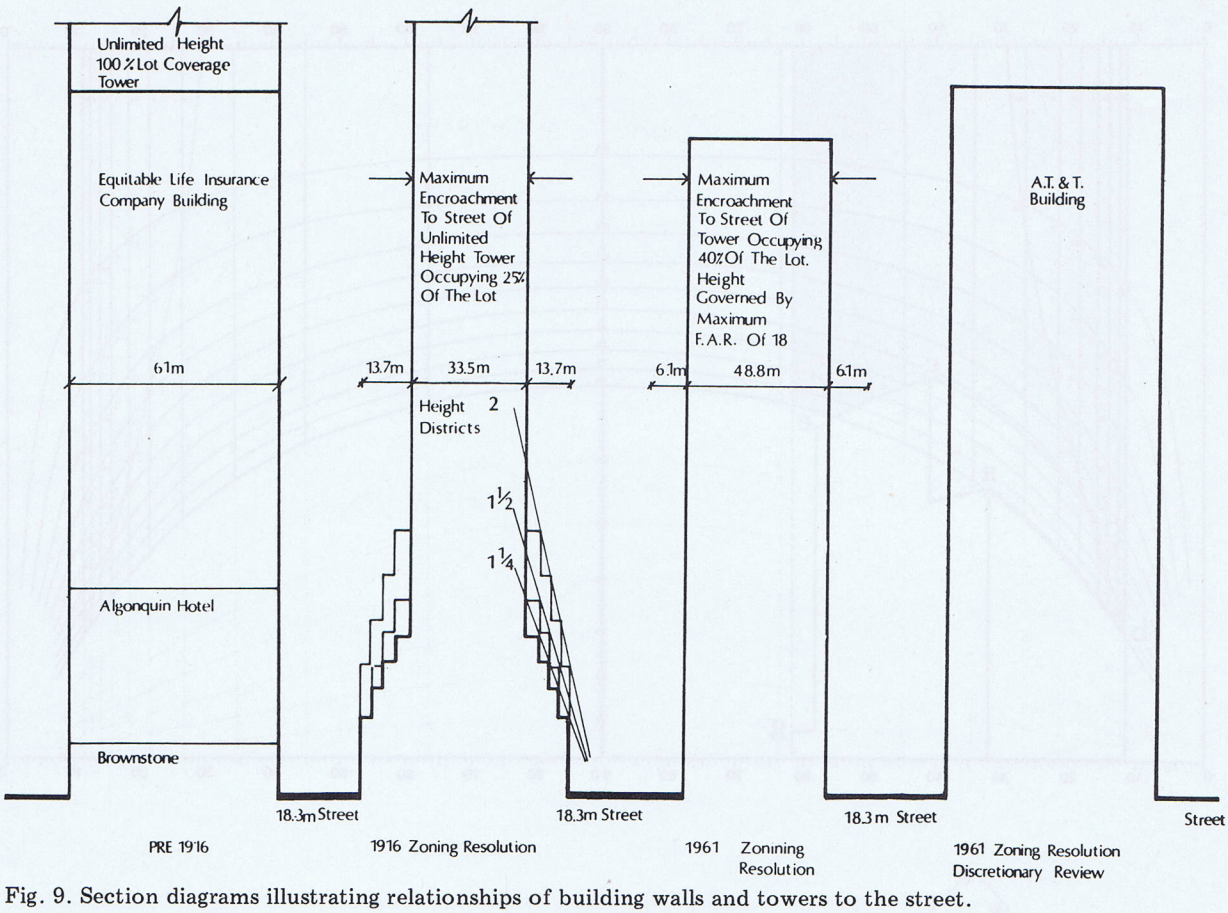
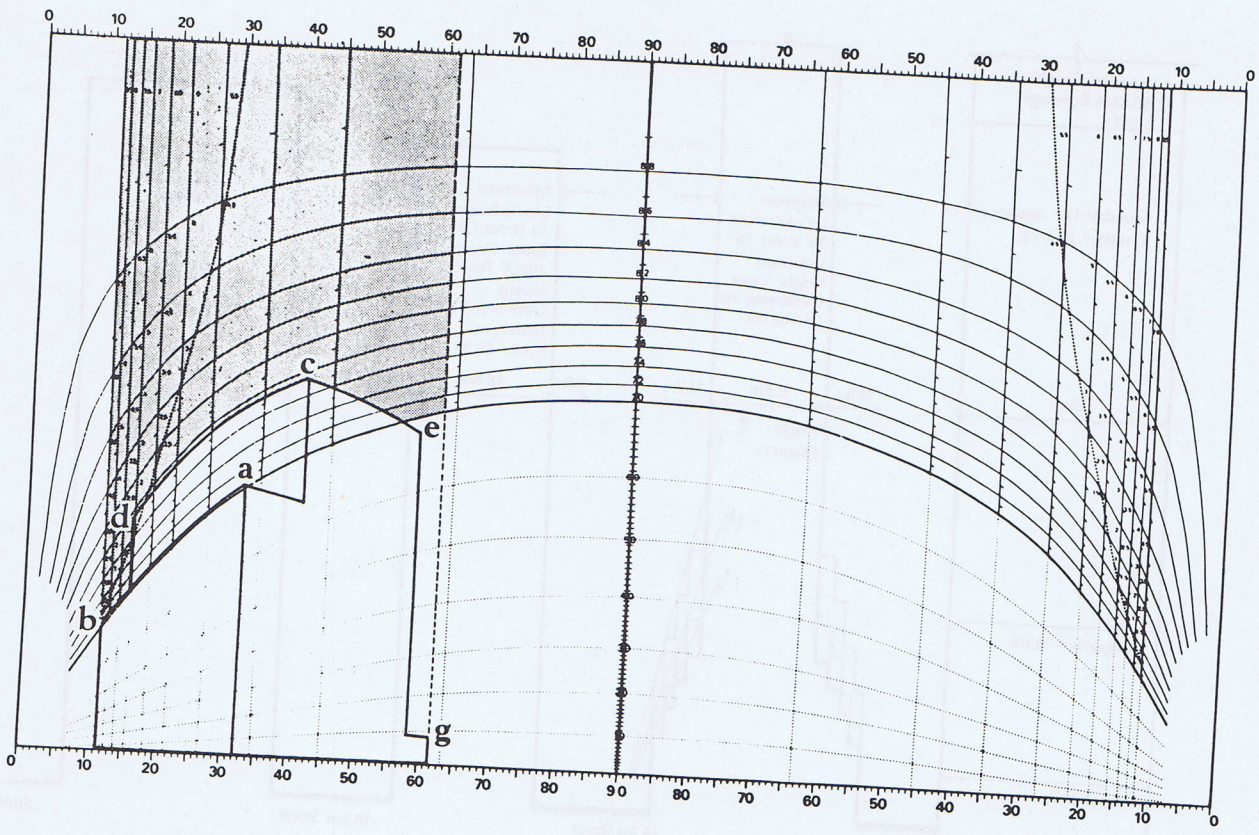


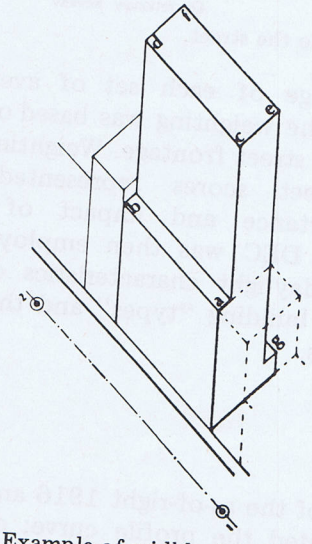
Fig. 9. Section diagrams illustrating relationships of building walls and towers to the street.

7.6 m (25 ft) horizontally and 2° vertically. Buildings are evaluated by comparing the number and value of squares blocked as weighted and compared to the maximum expectation. The maximum expectation is equal to the number of squares above 70° and between the far lot line and a projection of the centerline of the block at the rear lot line. Boxes that are blocked above the 70° lines (the typical street wall height) are multiplied by their value (1.0 and greater in the profile area in ascending order corresponding to the vertical scale) and then added together and given a minus sign. Boxes below 70° that are left open to daylight are multiplied by their value (0.3) and then given a plus sign. The sum of these is the daylight equivalency score for that street frontage. Each street frontage required two views to be drawn and evaluated. Their combined score was then averaged. If a building such as a corner building, fronted on other streets, two more views were required from the second street, and, if a block front, four more views. The total daylight equivalency score was determined by a weighted average of each set of averaged street scores. The weighting was based on the length of each street frontage. Weighting the individual street scores represented the relative importance and impact of each frontage. The DEC was then employed to evaluate the daylight characteristics of the representative building "types" and their as-built variations.

RESULTS

Very few of the as-of-right 1916 and 1961 "types" violated the profile curve; close to 80% of the skydome above 70° averaging all frontages was left unobstructed. Variations of the "types" left about 75% of the sky above 70° unobstructed when averaging all frontages. In some instances midblock through-lot, as-of-right 1916 and 1961 buildings left in the range of 66% of the sky above 70° unobstructed on certain frontages. The frontage scores for these buildings was due to a minor incursion in the profile curve at the lot lines.





The example building should be scored as follows:

AVAILABLE DAYLIGHT SQUARES	89.9
SQUARES BLOCKED TIMES VALUE	
Squares above 70° blocked	−20.5
Squares below 70° open	+0.0
Profile Encroachment	
0.1 × 1.5 =	
0.25 × 1	−0.4
Total blockage	−20.9

DAYLIGHT SCORE

$$\frac{89.9 - 20.9}{89.9} = 0.7675 = 76.75\%$$

Fig. 10. Example of midblock building scored on the Daylight Evaluation Chart. Courtesy New York City Department of City Planning.

Almost every building built under the discretionary regulations of the past ten years in Midtown failed to meet either the low expectation of 66% of the skydome being visible, or the more typical expectation of 75% for the entire development. While their exceedingly low scores were blamed on the evaluation process itself by the DEC's critics, later refinements of the process had minimal effect on their average daylight equivalency scores. For instance, the sheer street wall of the Olympic Towers, the first tower/slab building to disregard the low street wall, acute setbacks and discrete tower locations of Fifth Avenue,

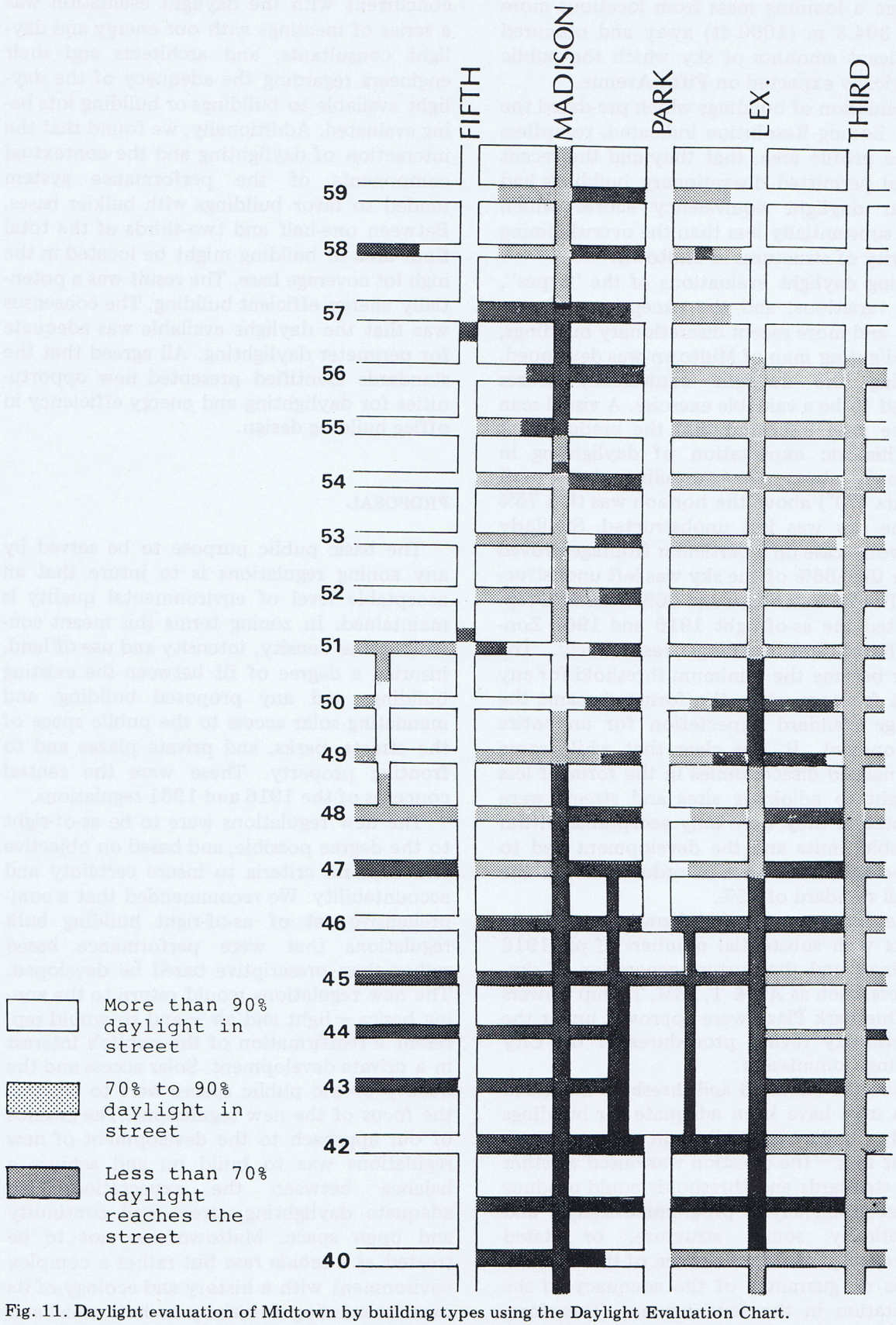


Fig. 11. Daylight evaluation of Midtown by building types using the Daylight Evaluation Chart.

became a looming mass from locations more than 304.8 m (1000 ft) away and obscured significant amounts of sky which the public historically expected on Fifth Avenue.

Evaluation of buildings which pre-dated the 1916 Zoning Resolution indicated, regardless of the profile area, that they *and* the recent special permitted discretionary buildings had similar daylight equivalency scores which were substantially less than the overwhelming majority of structures in Midtown.

Using daylight evaluations of the "types", built variations, and the exceptions of pre-1916 and more recent discretionary buildings, a daylighting map of Midtown was developed. Plotting the daylight equivalency scores proved to be a valuable exercise. A visual scan of the map indicated that the predominant and historic expectation of daylighting in Midtown above the prevailing street wall heights (70°) above the horizon was that 75% of the sky was left unobstructed. Similarly the worst case on a particular frontage proved to be that 66% of the sky was left unobstructed. The 75% standard and 66% threshold represented the as-of-right 1916 and 1961 Zoning Resolution buildings respectively. The latter became the minimum threshold for any street frontage while the former became the average standard expectation for an entire development. It was clear that while some externalized diseconomies in the form of less daylight to adjoining sites and streets were acceptable, they were only acceptable within tolerable limits and the development had to compensate elsewhere in order to reach the overall standard of 75%.

The darkest areas of Midtown proved to be blocks with substantial numbers of pre-1916 buildings, and the current generation of skyscrapers, such as AT & T, IBM, Trump Towers and One Park Plaza were approved under the discretionary review procedures of the City Planning Commission.

While the standard and threshold described above may have been adequate for buildings already built — generally on larger, more regular lots — the question was raised whether these standards and thresholds could produce an economically, programmatically and aesthetically sound structure, or stated another way, the continuance of the expectation is no guarantee of the adequacy of the expectation in the first instance. Therefore, concurrent with the daylight evaluation was a series of meetings with our energy and daylight consultants, and architects and their engineers regarding the adequacy of the daylight available to buildings or building lots being evaluated. Additionally, we found that the interaction of daylighting and the contextual components of the performance system tended to favor buildings with bulkier bases. Between one-half and two-thirds of the total floor area of building might be located in the high lot coverage base. The result was a potentially energy efficient building. The consensus was that the daylight available was adequate for perimeter daylighting. All agreed that the standards identified presented new opportunities for daylighting and energy efficiency in office building design.

PROPOSAL

The basic public purpose to be served by any zoning regulations is to insure that an acceptable level of environmental quality is maintained. In zoning terms this meant controlling the density, intensity and use of land, insuring a degree of fit between the existing buildings and any proposed building, and mandating solar access to the public space of the streets, parks, and private plazas and to fronting property. These were the central concerns of the 1916 and 1961 regulations.

The new regulations were to be as-of-right to the degree possible, and based on objective and uniform criteria to insure certainty and accountability. We recommended that a comprehensive set of as-of-right building bulk regulations that were performance based rather than prescriptive based be developed. The new regulations would return to the zoning basics — light and air — and so would represent a reaffirmation of the public's interest in a private development. Solar access and the quality of the public spaces were to become the focus of the new regulations. The essence of our approach to the development of new regulations was to build on and achieve a balance between the expectations for adequate daylighting, street wall continuity and open space. Midtown was not to be treated as a *tabula rasa* but rather a complex environment with a history and ecology of its own, demanding sensitivity to both small and

large scale urban design concerns. The energy crises of the 1970s further strengthened this position. Solar access for perimeter lighting and lower bulkier buildings that represented an awakened energy consciousness were consonant with the public's historic expectations of the physical development of Midtown. We proposed an as-of-right comprehensive performance system of building bulk regulations that would incorporate and make manifest the historic expectations discussed earlier.

Such a system based on pre-regulation has many advantages, such as procedural certainty for both the public and developer, accountability, speedy processing and design and development flexibility. The structure of the proposed performance system was similar to and built on the precedent of Housing Quality Zoning [9], an interactive trade-off performance system adopted by the City in 1976. The system defined a goal to be met; gave it a numerical value indicative of its importance relative to other goals; established an objective numerical system for measuring the degree of compliance for each component; and established localized and overall thresholds of performance. In the process all regulations regarding building height, street wall height, building and tower coverage, and courts were to be superceded by the performance system.

The Midtown performance system as proposed [10] had four interactive components (see Table 1). Each component had a numerical value. The sum of the values equalled a maximum of 100 points. Any proposed building was required to score a minimum of 85 points in order to comply with the proposed standards. This system reflected the understanding that the components were interdependent and that decisions affecting a building's configuration were a meshing of the public program (the zoning regulations) and the developer's economic and tenant space program in an artful way. Of the four components only daylighting had a minimum acceptable score corresponding to a threshold below which the historic expectations would not be met. The excessive externalization of diseconomies to adjoining property and the public street was forbidden.

Reflectivity of the buildings surface was added as a "buy back" for those buildings

TABLE 1

Interactive components of the proposed Midtown performance system

Component	Maximum points	Minimum points
1a Daylighting	60.0	40.0
1b Building reflectivity	5.0	(optional)
2 Street wall length	25.0	
3 Street wall height	15.0	
4 Sunlighting (on parks, plazas)	10.0	(optional)
Total	100.0	

whose daylighting score failed to meet either the minimum score for each street or the passing score for the entire development. It was observed in Midtown that many of the older buildings and developments utilized limestone or light colored brick in combination with the limestone as facing material. This is particularly evident on Fifth Avenue, Rockefeller Center, the Empire State Building and the Chrysler Building, as well as many of the less well-known buildings in Midtown. The observable fact was that the public spaces adjacent to these structures benefitted from reflected light, and in many cases, compensated for sky blocked.

Unlike daylighting, which in our case assumed a uniform overcast sky, building reflectivity is sensitive to the orientation of the sun. Facades facing due south utilizing the same material are more reflective by a magnitude than facades facing north. Because of this variability and inherent built-in penalty for some sites, building reflectivity was incorporated as an option.

THE PUBLIC REVIEW

With the publication in June 1980 of the Final Draft Report [11], the official public review process began. The consultants and City entered into a series of formal presentations to the Department of City Planning staff and Commissioner; professional organizations such as the American Planning Association (APA) and the American Institute of Architects (AIA), concerned good government groups including the Municipal Arts Society, Citizens' Housing and Planning Council, Real

Estate Board, and the Regional Plan Association, and the affected Community Planning Boards. A number of informal presentations were given to lawyers, developers, and architects active in Midtown development. The AIA created a separate committee of architects familiar with the architectural issues of commercial office buildings in Midtown, to evaluate the impact of the proposed regulations including energy and operating costs, programming, interior layout, and aesthetic implications of the proposed performance system. The Department of City Planning staff concurrently began a review of the consultants' recommendations with the goal of refining and coalescing the draft report into a legal text to be ready for adoption by the City Planning Commission in early 1981.

Two reactions to the consultants' proposal quickly emerged. Both of them concerned the concept of a performance system:

(1) as an approach to as-of-right or automatic zoning; and

(2) as an approach to controlling building bulk through the dynamic interplay of the contextual street regulations and the Daylight Evaluation Chart (DEC).

Initially, the CPC staff and the AIA committee, for a variety of reasons resisted the concept that an as-of-right performance system could achieve all the positive benefits of a discretionary approach, while maintaining certainty, accountability, contextual design, and a system open enough to encourage creative and artistic responses to the Midtown context and the developer's program.

This has clearly not been the case historically. Well conceived as-of-right zoning regulations based on the adequate provision of light and air were the vehicle from which much creative and responsible architecture in New York City sprang. Witness the Empire State, Chrysler, Chanin, Lincoln and RCA Buildings as well as Madison, Park, Fifth Avenues and Central Park West with its art "Deco" apartment towers. In view of this, the consultants believed that objections to the proposed regulations may have been, in large part, a perceptual problem. The proposed zoning changes did not look for function-like traditional prescriptive zoning. The DEC was particularly problematic. Most as-of-right zoning is based on New York City's 1961 example. It is prescriptive — in that it defines an envelope in which the structure must fit regardless of site size, configuration, context, or orientation. This very simple approach allows someone familiar with the mechanics of the zoning text to virtually design the envelope — and generally the building shape — in an hour or so. The advantage to the developer is obvious: in an instant total building size, typical floor sizes, and building configuration and site plan can be known. Sixth Avenue is an example of these regulations in practice.

The proposed as-of-right performance system was both sophisticated and more complex in its practice than the 1961 regulations. By definition and by design there were, depending on the site size, orientation and location, and context, a variety of very different possible schemes, all of which met the overall performance threshold of 85 points. The number of possible approaches was open-ended rather than closed. The opportunity for a creative response was encouraged, and in some cases mandatory, in order to achieve the maximum allowable density *and* score the threshold 85 points. Many questioned whether the flexibility and fine-grained nature of the entire performance system was worth the effort. Others questioned its flexibility vis-à-vis design possibilities, e.g., were there schemes that were inherently unacceptable?

Members of the Department of City Planning felt strongly that the performance system and particularly the DEC had to be translated into a traditional, prescriptive, zoning format that was understandable as a result of years of familiarity. As a result the consultants developed, at the request of the Department of City Planning, a complimentary as-of-right prescriptive tier which, while restrictive and hence predictable, was a "quick and dirty" method available to architects in lieu of the more complex yet flexible performance tier. The prescriptive regulations had the same basic components but all were executed in traditional zoning format of the Mosaic "Thou shall not . . .", including a parabolic sky exposure plane derived from the daylight performance system. As the evaluation proceeded, the AIA recommended the consultants work with committee members in applying the proposed regulations to development sites in Midtown. The consultants requested that the architects attempt to utilize the sys-

tem and particularly the DEC as a design aid rather than the traditional use of zoning as an evaluative device. The architects were also asked to evaluate the utility of the "quick and dirty" prescriptive tier on the same sites. This work ultimately focused on the DEC and the prescriptive daylight envelope of the prescriptive tier.

The test schemes that passed the 85-point threshold were analyzed by the architects and the other members of the development team as to economic viability, the capital cost required, floor configuration, floor sizes, energy impacts and maintenance and operation. All of the architects reported that the schemes that conformed to the performance system met the developers' criteria. On the other hand, the architects said the DEC required substantially more time and effort than standard as-of-right zoning. The open endedness of the system required that a strategic tack be taken in the pre-design phase to insure that the range of possibilities had been fully explored and that the preferred scheme was not just the best of a poorly defined sample. Some architects enjoyed the challenge, others disliked it. Their experience with the DEC indicated that while difficult to use initially, it was an effective design and evaluation tool that offered the architect a great deal of design flexibility not possible with the prescriptive tier. They recommended that it be dropped in favor of the performance tier.

A number of substantive and procedural issues which ultimately helped define and clarify the zoning text were raised. Most members of the AIA committee suggested changes in the DEC to make it more usable and familiar to architects. Many praised it because it required architects to think about how a building is actually perceived at grade in addition to the abstraction of models or aerial, or axonometric views. Concurrently, the Department of City Planning staff was developing its own version of a prescriptive tier which was not too dissimilar from the daylight compensation method of the 1950 Plan [12]. This prescriptive system was designed to replace the "quick and dirty" prescriptive tier they had requested and the performance tier as well. Because the approach was inherently intuitive there was no method other than the DEC to objectively evaluate the performance of the daylight compensation system. The consultants agreed to evaluate the consistency of the staff approach using the DECs and found dramatic and inconsistent swings in the behavior of the system. Equivalency, a legal consideration of paramount importance, was not being met. In many cases buildings which substantially failed the DEC passed the prescriptive daylight compensation system. In effect, the prescriptive system was advocating a substantial diminution of environmental quality. The potential for litigation was apparent. Initially, there was strong disagreement as to whether there had to be equivalency between the historic standard, incorporated in the use of the DEC and that of the daylight compensation system. Some members of the staff suggested that the solution to the equivalency issue was the elimination of the DEC. The project director overruled the staff recommendation, as the DEC represented the only objective and consistent method of daylight evaluation. If the DEC did not appear in the zoning text, it was argued by its partisans, the standards and thresholds readily apparent in the use of the DEC would be subsumed in the abstraction of the prescriptive system. Over time, modifications to the prescriptive system would not be accountable vis-à-vis the threshold and standard.

The resolution of the controversy resulted in the prescriptive daylight compensation system with its inconsistent standard becoming the replacement for the consultants' prescriptive tier. The second tier performance system was reduced to the DEC and building surface reflectivity as a performance system for evaluating daylight. Architects were free to submit buildings for zoning compliance under either tier. The interaction of the urban design contextual components derived from Housing Quality Zoning and the daylighting DEC were traded for a hybrid prescriptive/performance system with the performance based contextual component redrafted as a set of traditional mandatory maxima and minima that applied uniformly to both tiers. The dynamic interplay of daylighting and context in determining the building form was excised from the draft legislation.

Additionally the DEC, because of its perceived complexity and novelty, had to be computerized to make detailed review of buildings submitted under the Tier Two per-

formance system possible without extensive retraining of Building Department examiners. The DEC and the entire performance system had been conceived with an eye toward computer application. The consultants in fact had begun investigating computer application on their own as had SOM/NYC, one of the firms on the AIA committee. All the modifications to the Waldram Diagram as it evolved into the DEC were done on a computer. The final DECs for each street width were drawn by the computer to insure consistency and accuracy. Without computerization, the DEC would in all likelihood not have been part of the zoning text adopted by the City.

Even so daylighting, for its aesthetic, health, energy, and economic importance, became the focus of the public debate along with that old battle horse — density. When the regulations were finally adopted, almost two years after the final draft report, the issue of insuring an adequate level of daylighting and hence solar access as a primary purpose of the police power of zoning were firmly reestablished — only this time on a firm and accountable basis.

PROGRAMMING THE DEC

Soon after the passage of the Midtown Zoning Regulations by the City Planning Commission, in late 1981 before its adoption by the City's Board of Estimate in March 1982, we were asked to draft a comprehensive proposal to program the performance Tier Two regulations including the reflectivity component. The basic program draws the building on a computer generated diagram, scores each view, aggregates all views into a daylight equivalency score, evaluates the reflectivity component and presents a final score in a detailed printout.

The final program as delivered in April 1983 to the Department of Buildings and the Department of City Planning was modified to accommodate the exigencies of visual, hand-done calculations and the Constitutional requirements of procedural due process and equal protection. The proposed building as drawn in perspective on the DEC has all hidden lines and planes removed. All information contained on the computer printout is presented in an aggregated and disaggregated format including all input data. Presently the two city agencies, with our assistance, have begun testing the program. We anticipate the program to be fully operational by the end of November 1983. When the program is operational it will be the first use of the computer in the processing of zoning applications in New York City. The immediate decision is to limit its use to the Building Departments zoning review of a filed proposed building and internal use by the Department of City Planning. This decision was also reflected in the zoning text. The number of sub-squares was restricted to ten per full daylight square as represented on the DEC. Additionally, a partial blockage of sub-square would be scored as full blockage regardless of the actual amount of sub-square blocked. While finer graduations were explored, they proved to be too fine grained for a consistent and equivalent visual scoring of blocked daylight boxes.

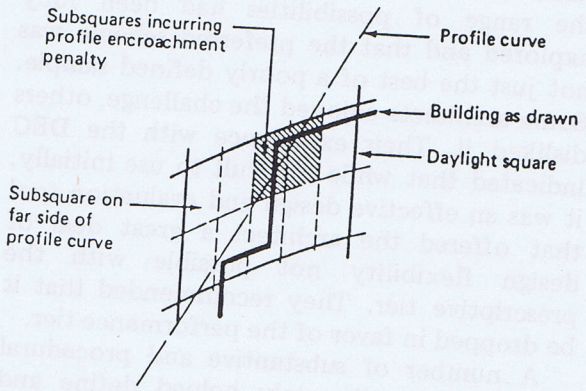


Fig. 12. Illustration of profile encroachment incurring profile penalty. Courtesy of the New York City Department of City Planning.

This was an unfortunate limitation. The DEC as noted earlier is a modified Waldram diagram. As a result it became a proportionate rather than equal area diagram. The computer program on the other hand was designed to score the DEC as an equal area diagram thus presenting minimal constraints on accuracy. This was achieved by the computer scoring the proposed building on an undistorted Waldram Diagram while drawing the building on the distorted equivalency based DEC. This process was internal to the operation of the program thus obviating the need for finer graduations of sub-squares.

When the computers hyperaccurate area score was compared to a visual scoring of the

same building using the equivalent DEC sub-square system as outlined above, the results generally indicated a higher daylight equivalency score for the building as scored by the computer. The variation in score which varied between 5% and 10%, depended on the number and location of partially blocked sub-squares. The point differential between the equivalency and area scoring techniques was significant enough to represent the difference between the proposed building passing or failing the performance tier. As a result, the computer scoring was made consistent with the visual scoring upon which the zoning text was based. The program was revised to calculate the full area of any partially or fully blocked sub-square on the Waldram diagram and translate it numerically and graphically to the printout and the DEC. The program basis in an area calculation was retained as it allowed for the re-introduction of greater accuracy should a "user friendly" publicly accessible second phase become a reality sometime in the future.

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