Synthesis Tower

Chicago, Illinois

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Synthesis Tower, Chicago, Illinois

Synthesis Tower: it represents an effort to meld a philosophy, a set of ideas observed by an individual, which are cultural and social in nature. I have interpreted the city and by making observations of such found ideas to translate into forms. All the philosophy is plausible, but in architecture fails unless the concepts apply within the functional requirements of the problem. Functionally then, the tower is a mixed use high-rise. It comprises 1.8 million g.s.f. leasable office space, 500,000 g.s.f. apartments, 100,000 g.s.f. commercial, and 200,000 g.s.f. parking. Extra amenities include a marina and heliport. I have sought to reconcile aesthetics and function on many levels of scale. Scale is a key element for analysis of the building as a whole from views at long distance through entry and approaching as close as touching elements of the interior. The flow of analysis has been from the largest division of use through a continuing process of differentiation. An organism of technical tissue grows. As organisms accommodate particular functions, so does the tower. The building's form is distilled from observations of the nature of the organic items in the natural environment. The natural environment also includes the context of the urban site in Chicago. Man and his work, in this definition of natural environment, are included among nature. Finally, what occurs is a solution with threads woven in thought, then form.
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Broadleaf Categories: 1) Commercial
  2) Leasable Office Space
  3) Apartments
  4) Parking
     a) cars
     b) boats
  5) Service

1) Commercial: circulation and tenant space

   a) Circulation-vertical and horizontal: is a negative space, circulation nodes become activity centers with atria and exciting forms. Performance areas, fountains, sitting, and so on. Includes points of entry and exit: these areas must be keyed in terms of the senses. The architecture states unequivocally where to enter and exit the building.

   b) Tenant Space
      1) Restaurant @ 100 seats 14,000 s.f.
      2) Tower Club @ 100 seats 14,000 "
      3) Small Restaurants; 2 @ 6,000 s.f. 12,000 "
      4) Small Shops; 8 @ 1,600 s.f. 12,800 "
      5) Medium Shops; 3 @ 2,400 s.f. 7,200 "
      6) Large Shops; 2 @ 3,000 s.f. 6,000 "
      7) Administration 2,800 "
      8) 3% walls 2,040 "
      9) 10% systems 6,800 "
     10) 30% circulation 20,400 "

     Total g.s.f. --- 98,040

2) Leasable Office Space: tenant space and core

   a) Tenant Space-Levels 1-40. 45' Lease Span Typical
      1) Lineal perimeter; area = 120' x 3 sides x 45' = 16,200 n.s.f.
      2) Curved perimeter; area = \pi \times 45' \times 45' = 6,361 n.s.f.

     Total n.s.f. 22,561/floor

   b) Core Elements: Levels 1-20.
      1) Elevators - 42 @ 63 s.f. 2646 s.f.
      2) Firestairs - 3 @ 200 s.f. 600 s.f.
      3) Washrooms - 2 @ 160 s.f. 320 s.f.
      4) Electrical Vault @ 80 s.f. 80 s.f.
      5) Electrical Room @ 80 s.f. 80 s.f.
      6) Janitor Closet @ 80 s.f. 80 s.f.
      7) Telephone Room @ 80 s.f. 80 s.f.
      8) Supply Air @ .03 n.s.f. 200 s.f.
      9) Return Air @ .05 n.s.f. 340 s.f.
     10) Walls @ .03 n.s.f. 200 s.f.
     11) Circulation @ .12 n.s.f. 810 s.f.

     Total g.s.f. --- 5436/ft.
c) Core Elements: Levels 21-40.
   1) Elevators - 28 @ 63 s.f. 1,764 s.f.
   2) Same as 2-11 in b above
   3) "
   4) "
   5) "
   6) "
   7) "
   8) "
   9) "
   10) "
   11) "
   Total g.s.f.--- 2,790 s.f.

   d) Leasable Office Totals:
   1) 22,561 x .03 walls = 677 s.f.
       + 22,561 s.f.
       = 23,240 g.s.f. / floor
   2) 5,436 g.s.f. x 20 = 108,720 g.s.f.
   3) 4,554 g.s.f. x 20 = 91,080 g.s.f.
   4) Total Office g.s.f. = 1,129,400

3) Apartments: apartments and core

   a) One to four bedroom apartments. Spaces within said:
      1) Bedroom @ 300 s.f.
      2) Living Room @ 400 s.f.
      3) Dining @ 200 s.f.
      4) Foyer @ 25 s.f.
      5) Kitchen @ 100 s.f.
      6) Baths @ 100 s.f. ea.
      7) Utilities @ 50 s.f.
      Base Total: 1,175 s.f.

   b) Apartment portions:
      1) 80 One bedroom @ 1,175 s.f.
      2) 100 Two bedroom @ 1,475 s.f.
      3) 60 Three bedroom @ 1,775 s.f.
      4) 20 Four bedroom @ 2,475 s.f. Includes 400 s.f. library

   c) Square foot totals to g.s.f.
      1) 80 x 1,175 = 94,000 s.f.
      2) 100 x 1,475 = 147,500 s.f.
      3) 60 x 1,775 = 106,500 s.f.
      4) 20 x 2,475 = 49,500 s.f.
      3% walls
      12% circulation
      Total g.s.f.--- 457,125
4) Parking: autos and boats
   a) Autos-from Chicago Zoning Ordinance
      1) Required for apartments: 1 space/dwelling
         262 dwellings = 262 spaces
      2) Required for offices: 1,129,400 g.s.f.
         a) 1st 140,000 g.s.f. -- none required
         b) 2nd 280,000 " -- 1/10,000 g.s.f. = 28 spaces
         c) 3rd 280,000 " -- 1/5,000 g.s.f. = 56 spaces
         d) Remaining " -- 1/2,500 g.s.f. = 170 spaces
            Total 254 spaces
      3) Required for commercial: none if g.s.f. is below 140,000
      4) Total parking required: 516 spaces
      5) Heliport with 80' diameter landing pad
   b) Boats-marina created along site edge
   c) N.s.f. to g.s.f. for auto parking:
      1) 516 spaces x 190 s.f. = 98,040 s.f.
      2) 98,040 x .3 (circ) = 29,400 s.f.
         Total 127,440 g.s.f.

5) Service: combined for commercial and tower
   a) 6 tower loading docks @ 600 s.f./dock = 3,600 s.f.
   b) 4 commercial loading docks @ 600 s.f./dock = 2,400 s.f.
      Total 6,000 s.f.
   c) 6,000 s.f. x .5 (circ) = 3,000 s.f.
      Total g.s.f. = 9,000

6) Total Tower Gross Square Footage:
   a) Commercial: 98,040 g.s.f.
   b) Leasable Office: 1,129,400 "
   c) Apartments: 457,125 "
   d) Parking: 127,440 "
   e) Service: 9,000 "
      1,821,005 g.s.f.
APARTMENT ZONING

north
ONE +48'-0"

TWO THRU FOUR +66'-102"

FOUR +136'-0"

COMMERCIAL LEVELS
Designing a high-rise building was the most difficult thing I could think of for a thesis. In terms of structure such buildings are more a province of the engineer, but the challenge of creating a different solution was too tempting. This short text illustrates thoughts behind the form with the intent being to give you a greater understanding of what I have done. The building is hypothetical in one sense in that in reality the City of Chicago would be wholly against such a structure in its present position on the lake. As the designer, I feel that if such a tower was built it would become an open challenge to rekindle the creative tide that began and ebbed with the Chicago School. The Chicago Fire created the opportunity for the talent of the early 20th Century. Does not the burned-out urban core of today present a similar wasteland for reconstruction? The Chicago Fire of the present has burned slowly over the past 50 years. As this century ends the interior of the city will rise again and grow with the emerging post-industrial society. Precedents for the future are being created today. I would like to contribute an optimistic study of how the future might look through the tower.

Please use your imagination with me for a moment. You can refer to the site plans for basic orientation. In your mind, place yourself above Chicago at one mile in altitude directly over the Tower's site, then look around and take in the splendor of the city. Having done so, slowly drop toward the east along an arc one mile in radius until you are at the surface of the lake looking back toward the city. As you do so, notice that Synthesis Tower is framed by Lake and Harbor Point Towers. Synth completes the composition and becomes a focal point. Given this condition, I feel obligated to complement and complete a grand sculpture. With this solution, I do not want to be at odds with the surroundings, but rather study them as a source for inspiration. At the largest scale of the surrounding city I drew
ideas for expression of the form from the intense activity and
dynamicism of Chicago, I will expand on this later. I found a point
of departure in the design vocabulary of Harbor and Lake Point Towers.
Their vocabulary being based in the equilateral triangle and the
circle. I create congruence on one level by giving Synth the same
vocabulary expressed in a differing manner.

My present feelings as a designer are expressed as bluntly
as possible in the physical form of the building. I am given the
impression by certain academics at this school that the conceptual
framework for a project is developed and guides from beginning to
end. I agree with this in part: the architect must have a point of
departure, but along the route study of the problem will reveal
information that will enrich and evolve the originally developed
philosophy.

What is the conceptual substructure for the development of
form? I now subscribe to the notion of two separable, but in archi-
tecture, fully integrated ideas. These are aesthetics and function.
This is not new, but the means to the ends that I will now outline
do provide a new approach. The underlying idea for this means may
be thought of thru the word scale. This word is often abused, its
meaning subdivided within meaningless jargon. Webster's says, "2. A
progressive classification, as of size, amount, importance, or rank.
3. A relative level or degree." With this in mind I may state that
I use scale as a guide for sizes of elements which depends on the
distance of the viewer from an object. This becomes a process which
occurs as a sequence from the farthest distance away from the tower
through observing minute detail at close range. See figure one.

Synthesis Tower seeks to integrate three major portions of
urban society: where people work, live and play. Having the basic
building elements of the city in one place creates a miniature city
cosmic scale  
macro universe  

(aesthetic criteria  
(near) distance

(far) distance  
timeline

threshold of sensory reality  
functional criteria  
sub-atomic scale  
asymptotic diagram of crucial relationships

Figure 1.
within the tower. With this knowledge I then must ask myself about the city and its meaning. In so doing I find a characteristic of cities which is typified in Chicago; incredible dynamism and energy. Over time, the skyline changes before the inhabitants eyes like an organism of megalithic size. And indeed, the city is an organism in many senses. If we identify the characteristics of organisms, i.e. physical structure such as organs and circulatory systems we find the city to include buildings (organs) and streets (circulation) which may be likened to a living thing of a different magnitude. Since the tower is a city of itself, by right it should incorporate these attributes. So then, the building becomes a dynamic organism; a cellular being of a new type and mass.

How are the notions of dynamism and organism translated into form? First, to deal with the notion of the building as an organism: there are features both obvious and subtle. Most organisms are bilaterally symmetrical, so is the building parti. One very seldom sees square organisms; curves are the rule in nature. The tower incorporates the curve and the equilateral triangle, an essential element of structural rigidity. This is found in both plan and section. The second area for development is this dynamic, energetic quality, so noticeable in the city. To express this energy in a static form I have created "kinetic pattern." This occurs as a result of motion about the static entity of the tower. One may experience this phenomenon at differing velocities on foot, in a boat, in a car, airplane or helicopter. As you approach the kinetic pattern manifests itself. It has three identifiable criteria. First, a facade must have negative and positive space. Secondly, these must be generated, at some depth in section, and then repeated to create repetitive elements. The third requirement demands a level of contrast between the elements and a background. In the tower this
coincides with the megatruss (repetitive elements) and the glazing (background). With the system of form developed for this project the result of the kinetic pattern is a base for the tower which physically expresses the active shifting sense of the city by changing before your eyes as you pass by. The kinetic pattern is backed up in contrast to the static form of the commercial zone. The intersection provides a visual entrance from the lake side and a formal entrance from the city side. The kinetic pattern transmutes from base to tower and the eye is drawn to the crown of the building where a final twist of vocabulary states that the tower has ended.

Having made some meager explanation of several months thought on the tower's philosophy, I now find it necessary to point up functional issues interlinked to conception of the tower. A majority of high-rise buildings in America today are generated by a select group of what seem to be extremely narrow minded engineers. You could call the tower reactionary in a sense; it seeks to create a precedent, unbuilt though it may be. I wish to state that I have not "cheated." The tower is buildable: I have studied the criteria applied by my engineer counterparts and wielded them within a concern for philosophy and aesthetics. Let us examine the criteria of function, then apply them to the tower. The structural requirements for high-rises are demanding of the most careful attention, particularly in relation to wind loading. Wind creates the greatest stresses in the building. Since the first steel skeleton frame, the high-rise has grown to astounding heights. As this building type rose to the sky, structural systems employed at varying heights have been developed to allow taller towers economic feasibility. High-rises of 80 stories and more are feasible using tube within tube, framed tube, and bundled tube configurations.

Synthesis Tower is a tube within a tube. And in this much
corresponds with given knowledge. Intuitively, I have taken this a step further; for at the base one finds 18 mega-trusses 150 feet high by 30 feet deep. These elements have a specific purpose: they diffuse the gargantuan shear and bending loads created by wind over the height of the building. See figure 2. This occurs because the loads transferred down the skin are spread from an effective depth of 5 feet to an effective depth of 30 feet. Thus, the truss improves stability and minimizes deflection. Diagrammatically, one may use the example of tubing in a bicycle frame. See figure 3. The second sketch demonstrates what occurs in the tower. The effect of wind on high-rises also contributes to other facets of the building's expression. First, the shape of the plan; essentially that of an equilateral triangle with rounded corners is aerodynamically superior to the rectangular solid. Secondly, the core is an equilateral triangle in plan, the essential structural rigidity of this element, when extended vertically into the third dimension, is greater than the square or rectangular core. From the standpoint of developing responses to wind imposed criteria the tower seeks to optimize these constraints.
Another major set of issues dependent upon functional considerations revolves around the core. Of primary importance is the system of elevating and how it is configured. An optimum configuration has been developed. See figure 4.

6-8 elevators are optimum
10+ cabs causes distance problem

This allows a user to catch any of the six elevators when they appear without running long distances. Another consideration is the plight of the user who confronts using the vertical circulation for the first time. You should be able to orient yourself quickly to which bank of cabs goes where. The core plan utilizes opposed 3 cab banks. A central space is created at the tower's base where the user may observe all elevator banks which serve the offices and apartments above. When one is standing at the base of the tower in the center of the core you can turn 360° round and see each ascending bank in turn.

Another system of activity is the commercial zone. Two cores serve the tenant spaces. This occurs as a result of the service parti below the main level. The cores derive their shape from the turning radius of semi-trailer rigs. The separation of the cores is also derived from the five loading docks and resultant centralized access to either core. Twenty feet above, on the main level, the separation of the cores frames a view to the southeast. The arrangement of the cores also provides flexible storage space for retail arrangements above. One final consideration was obvious from the building types study: as it progressed I saw a response inappropriate in context with the surrounding area. Time and time again I saw an implicit
introversion of commercial space in high-rises. On Lake Michigan I had no desire whatsoever to introvert the commercial solution; so with service below I could bring the cores up within the commercial and let the shops and circulation look to the exterior, interior, or both.

Moving up into the tower another system of organization asserts itself: leasable office space. A primary consideration for the speculative builder is lease span. Markets in Chicago will accept lease spans from 35' to 45'. The distance is measured from the face of the core to the building skin. The tower's lease span is 45'. A second area for integration is the concept of flexibility of space. This translates roughly into space without columns. Office space in the tower is column-free. Finally, the three rounded corners of the tower become a selling point as they are unique. These spaces make for deluxe executive offices with panoramic views and so on.

Another important zone of the tower is the apartments. In the past, those who felt a pleasurable attitude toward developing technology looked forward eagerly to the future. The idea of tall buildings, and the idea of living in them was greeted with excitement. As time has passed, we have learned our most effective lessons the hard way. The scientific community, psychology that is, questions whether people, especially families, should live in high-rises at all. The contention is that high-rise living is detrimental to one's mental health. With this in mind, we are faced with identifying the inadequacies of accommodations created for people high above the ground. The ultimate, unsolvable problem, would be that simply living in high-rises is not healthy. If we examine the social aspects of human behavior, seeking to identify those traits promoting interaction on a constructive basis, we find a process which is revealed through: one, the realization that each individual seeks to express himself in some
way; two, the basis for interaction among people occurs most naturally in an environment having recognizable zones, a series of transitions, from public to private areas. Within this experience of space, the opportunity for individual expression is created.

How are the apartments, as created in the tower, treated in regard to the crucial problems above? The primary criteria for expression is facilitating the interaction of the inhabitants, through the process of recognizable transitions in the nature of space. In the scalar phenomenon we have penetrated the tower to the point where an inhabitant is stepping off at an apartment level. He then follows a sequence of space to his residence. In this area, spaces with differing purposes are created. The circulation provides direct access to an activity space. These spaces are unique to a three level zone. There are six three level zones: two areas in the plan of each three level zone have the possibility to become differentiated in terms of use. For example, three areas are for day-care, the remaining nine include perhaps a health club, a Japanese garden, half a basketball court, a raquetball court, a performing area, and so on. Having given the occupants the chance to interact publicly we now become aware of the transition from public to private space. The crucial consideration here seems to rest on an intrinsic arrangement of the major functions in an apartment. If you refer to the drawings you will note that the kitchen area is always adjacent to the public circulation area. There is a specific reason for this: preparation and consumption of food is fundamentally a communal and social act. The function of the kitchen then, provides a convenient link from public to private. Within the prototypical apartment one experiences an implied boundary running approximately down the center of the apartments parallel to the exterior skin of the tower. At the interior face the kitchen. At the exterior face the living/familial areas. From
there, sequence to the private areas of each dwelling.

In conclusion, it becomes obvious that a complete description of all the factors contributing to the final condition of this study would be quite lengthy. However, it is possible to identify the overall criteria that culminate in the tower. Such a dichotomy seems to have appeared regularly throughout this project. Having spent this time in such a manner I have found that identification of a single crucial guiding fact or need is paramount to the weaving of space. What were the prime elements in this context? Two primary concerns: accommodating the functions generated, and positive response to the needs of people using the building. And what was this to serve? An individual, a single man. And the goal? To please. To allow a person to be comfortable at any point in or around the tower. After all, such things have always embodied the aspirations and dreams of those who use, build, and conceive space.
MACRO SITE PLAN
ONE + 60'-0"

TWO thru FOUR + 75'-105'-0"

ROOF GARDEN + 125'-0"

FIVE + 120'-0"

COMMERCIAL LEVELS
+150' - 554'-0"  0  10  20  40  70  120 feet

OFFICE LEVELS 1-18: ZONE 1
OFFICE LEVELS 19 - 36: ZONE 2

+366' - 582' - 0"

0 10 20 30 40 70 150 feet


