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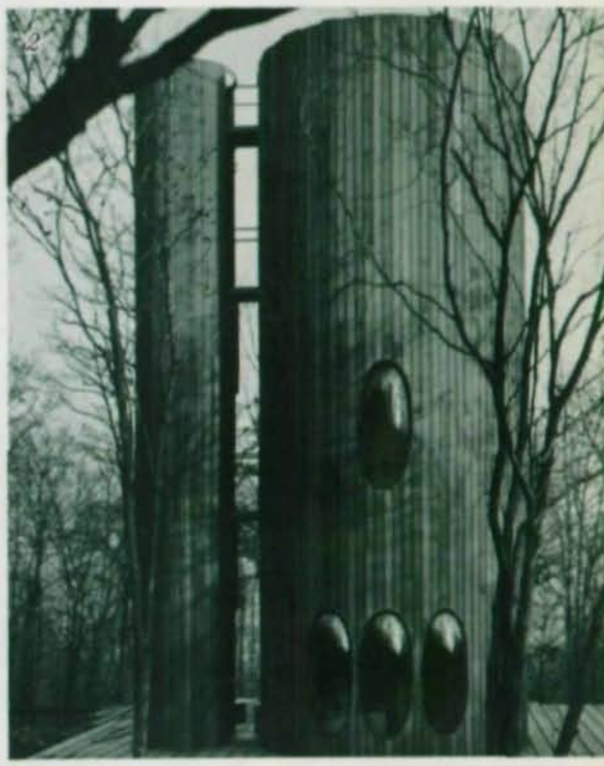
MODERN STEEL CONSTRUCTION



AISC

Steel

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American Institute of Steel Construction

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CONTENTS

Architectural Awards Jurors Are Selected

A distinguished group of architects, engineers, and educators have graciously consented to serve as jurors of this year's Architectural Awards of Excellence competition:

Leo A. Daly, AIA, president of Leo A. Daly Co., Omaha, Neb.; Morris Ketchum Jr., FAIA, Morris Ketchum Jr. & Assocs., New York, N.Y., member of the board of directors, AIA; Paul Weidlinger, consulting engineer, New York, N.Y.; Henry L. Wright, FAIA, Kistner, Wright & Wright, Los Angeles, Calif., past president, AIA; Philip N. Youtz, FAIA, dean, College of Architecture & Design, University of Michigan, Ann Arbor, Mich. The entries will be judged June 30 in New York.

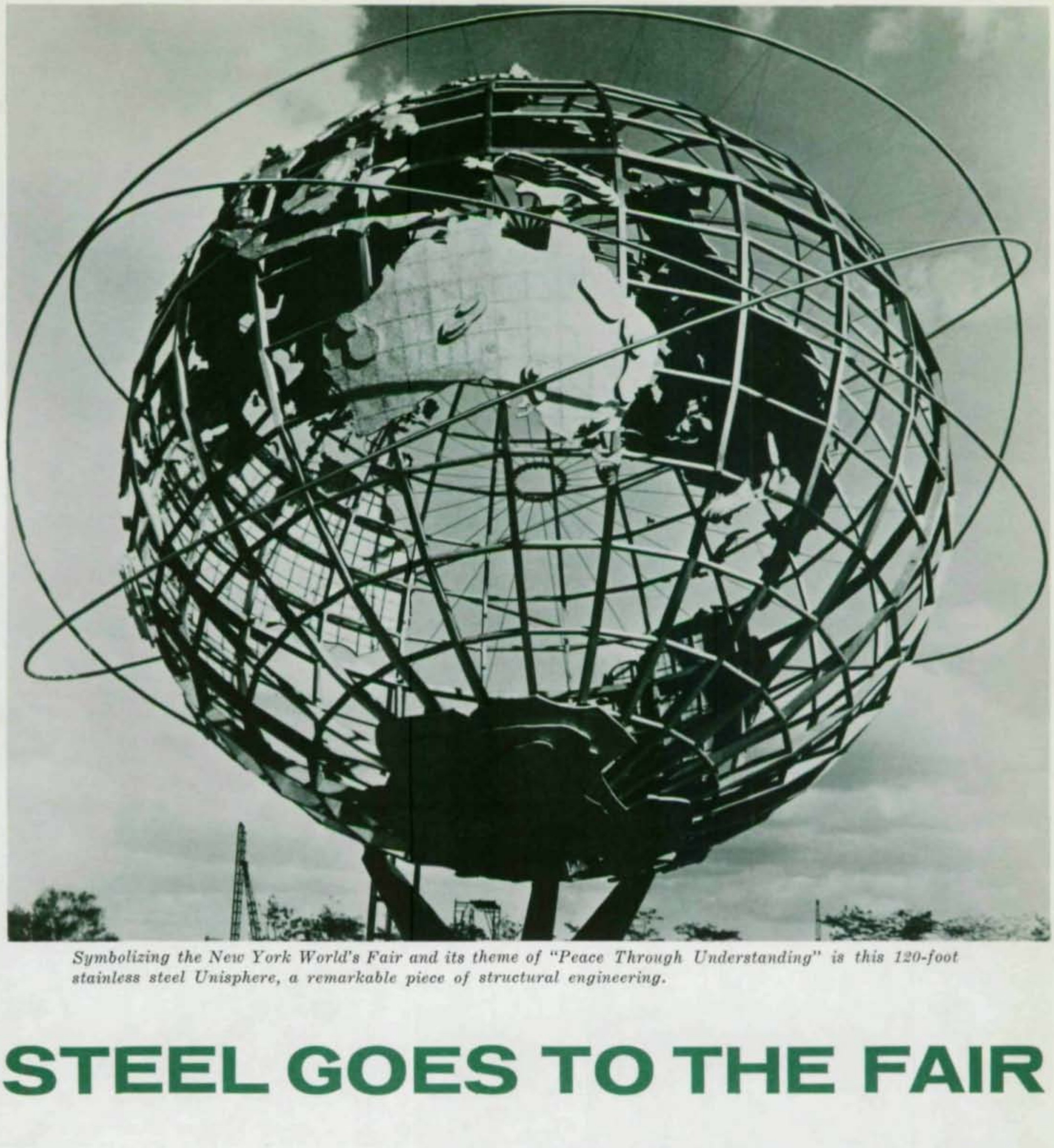
Engineering Conference Draws Record Attendance

The National Engineering Conference conducted by AISC in Omaha May 14 and 15 was, by any test, the most successful in the history of these annual meetings. Nearly 700 attended the two-day symposium — considerably more than the number who attended any previous one. Particularly gratifying was the large number of architects and engineers in attendance, along with educators, students, and fabricators, from many parts of the country. In addition, a number traveled from Canada and England. It is anticipated that an equally impressive turnout will be achieved at next year's Conference in Memphis.

New Sourcebook on Structural Steel

The latest design specifications of the AISC and three other major engineering organizations are brought together in an 829-page guidebook, "Structural Steel Design," published by the Ronald Press Co., New York. ($12.50)

The result of several years of intensive research at the Fritz Engineering Laboratory, Lehigh University, this impressively referenced and illustrated volume provides comprehensive information on the design and behavior of steel structures. It treats both plastic and elastic design and supplies the best available techniques for the solution of practical engineering problems. An entire section is devoted to advanced welding techniques.



Symbolizing the New York World's Fair and its theme of "Peace Through Understanding" is this 120-foot stainless steel Unisphere, a remarkable piece of structural engineering.

STEEL GOES TO THE FAIR

Seventy million visitors expected to visit the New York World's Fair will see examples of some of the most dramatic and creative architecture ever assembled on one site.

Structural steel, which is used to frame 75 percent of the buildings, has been daringly fashioned into airy circles, arches, domes, discs and free forms that distinguish the Fair's architecture.

Most of the designs for the buildings, some of which are shown here, call for large, open spaces within the structures, unobstructed by supporting columns.

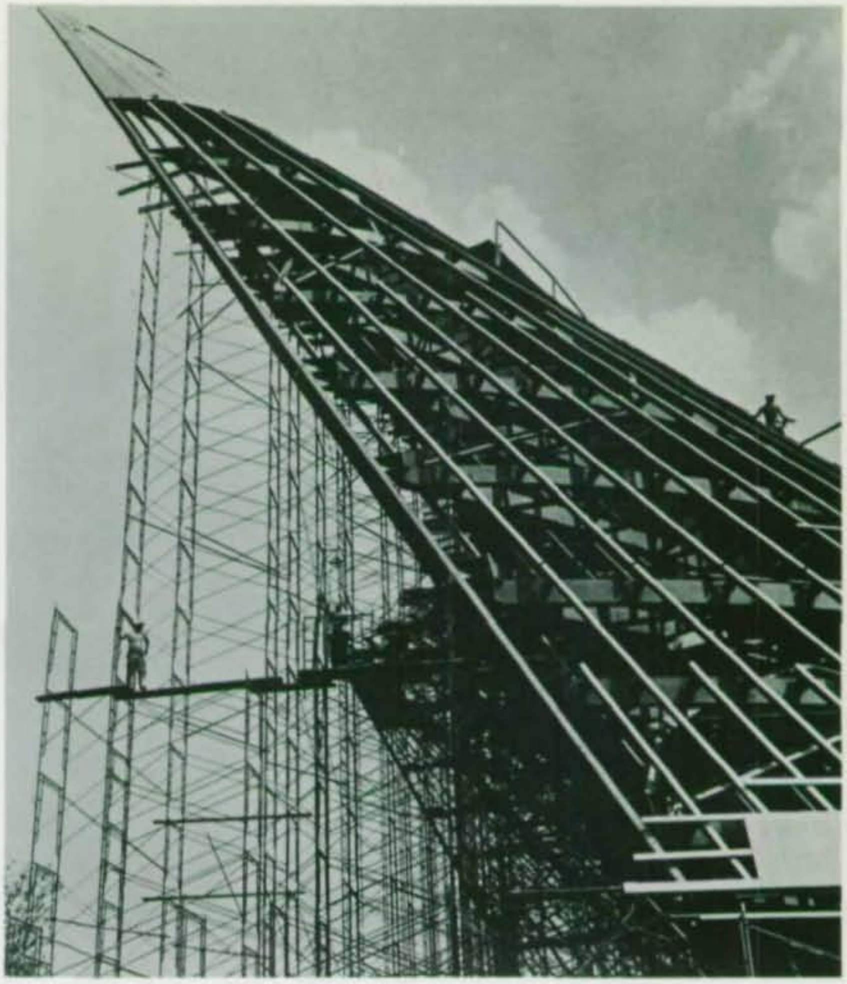
The highly original designs show the great versatility of modern steels, which permit designers to let their imaginations soar without limitation— to design structures of any shape, with exquisite beauty and economy.

An easy way to reach the Fair is by helicopter, landing on the 120-foot high heliport atop the Port of New York Authority's exhibit building. A two-level, glass-enclosed restaurant and lounge is suspended immediately below the flight deck. The entire 160 x 210 foot super-structure rests on four steel towers. Elevators and stairs inside the steel towers carry guests from the ground floor exhibit area to the restaurant and heliport levels. A huge elliptical steel box girder connects the tops of the towers and provides support for the heliport deck. Designed and engineered by the Port of New York Authority.

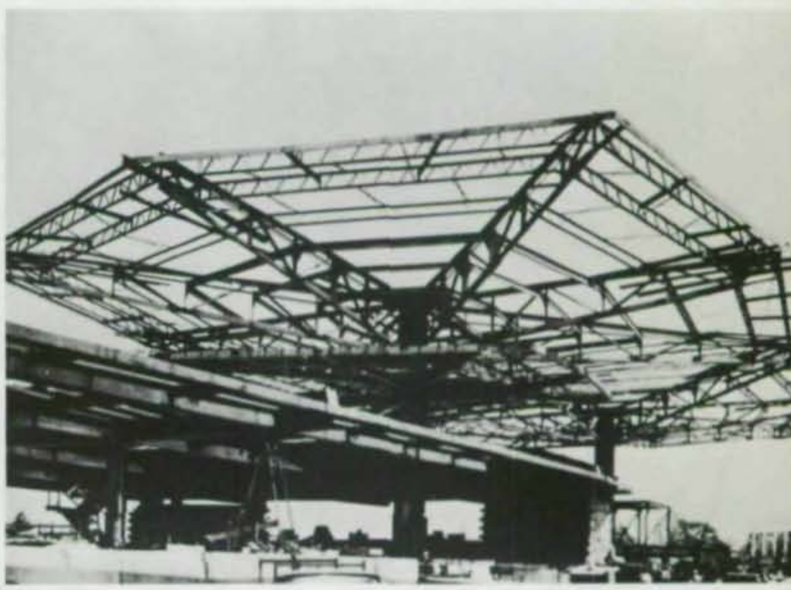
An unusual structure that is not really a building but a complex of geometric shapes houses the Electric Power and Light Exhibit. Pre-fabricated, easy to erect, steel-framed prisms staggered vertically to a height of 80 feet form the exhibit structure. The prisms rise from a reflecting pool and surround an open court marked by three 120-foot-high pylons of steel. Twelve searchlights in the court cast a 12-billion candle power beam of light vertically into the sky. Robinson, Capsis & Stern, architects and engineers for the exhibit, placed seven major exhibit chambers within the structure. A revolving ring carries visitors through the chambers where segments of a musical review are presented.

An elevated theater designed by Eero Saarinen & Assocs. highlights the IBM exhibit. The steel-framed, egg-shaped theater is large enough to hold an audience of 400, yet it is light enough to be supported on just four structural steel frames, making it appear to be balanced in the air. Hydraulically operated tiers of seats elevate audiences into the 80-foot-high theater to view programs on computer problem solving techniques. Structural engineer was Paul Weidlinger.

The General Motors Building complex consists of a 110-foot-high, steel-framed entrance canopy, a 200 by 680-foot building, and a 250-foot cantilevered dome of unusual design. The all-steel dome is supported by one center column and by 36 slanting columns along the outer edge. The slanting columns rise from a doughnut-shaped second floor, which is cantilevered from two concentric rows of columns. A four-foot-diameter pipe column extends through the structure supporting the radial roof trusses. Designed by Albert Khan and Assocs., Inc.



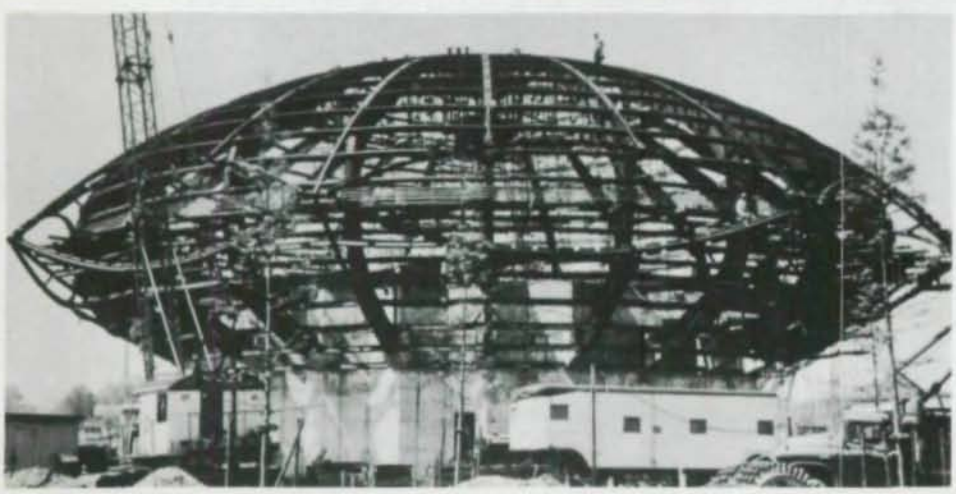
The General Electric Attraction is a circular, domed structure 200 feet in diameter, designed by Welton Becket and Assocs., to house a carousel-type theater created by Walt Disney's WED Enterprises, Inc. Design criteria for the dome called for a clear span structure which can be easily dismantled with high salvage value when the Fair is over. The lamella dome is formed by two layers of steel pipes, creating a spiral web from which a corrugated steel deck roof is suspended. The pipes are anchored at the circumference of the dome on a ring girder, set atop sloping steel pipe columns. The structural engineer is Richard Bradshaw.



For the Festival of Gas exhibit, Walter Dorwin Teague Assocs. created an all-white building complex housed under a white steel and gypsum umbrella roof. Supported by two slim, sculptured steel columns, the startling structure cantilevers 60 feet from each support. This type of steel construction provides maximum usable space and creates a light, airy, floating effect. Structural engineers were Purdy and Henderson Assocs.

Theme of the Ford Motor Company exhibit, created by Walt Disney's WED Enterprises, is "A Man and an Idea," where guests ride through an adventure that portrays man's growth and progress. The huge exhibition structure, designed by Welton Becket and Assocs. features a 235-foot, glass enclosed, circular pavilion surrounded by 64 gracefully curved steel pylons reaching more than 100 feet into the air. Adjoining the pavilion is a flared rectangular exhibit building 500 feet long and seven stories high. Structural engineer was Richard Bradshaw.

A dramatic gold colored disc housing a 500-seat theatre is the main attraction of the Johnson's Wax pavilion. Suspended from just six steel columns, the 90-foot-diameter, steel-framed building hovers like a flying saucer 10 feet above a huge circular reflecting pool. To make the dramatic structure visible from a distance, Lippincott and Margulies extended the steel columns to a height of 87 feet, flaring them into huge fan-shaped petals that touch each other at the edges. Engineers, Severud-Elstad-Krueger Assocs., specified steel for the unusual theater to permit easy dismantling and possible re-use after the Fair closes.



The familiar red umbrella, the Travelers Insurance Company's symbol of protection, provides the architectural theme . . . and imaginative steel design provides the structural solution for this building. Eight main and sixteen secondary welded steel ribs form an inverted open cup, 132 feet in diameter, which is post-tensioned with a "belt" of four cables of galvanized steel strand. The ribs are tied together at the apex by a central tension ring and steel bridge strands radiating from it. This design has considerable potential for arenas and auditoriums. Architects were Kahn and Jacobs and the structural engineers were Lev Zetlin and Assocs.

Steel for speed, flexibility, and economy

THE NEW STANLEY PLANT

The Stanley Tools Division of the Stanley Works selected steel to frame its new 403,000-square-foot factory in New Britain, Conn., for speed, flexibility and economy.

This plant will house the most modern manufacturing facilities for making precision hand tools.

The new building with a one-third mile perimeter has two manufacturing and two office floors with floor space comparable to eight football fields.

The structural steel frame building has reinforced concrete floors. Clear span areas (column spacing) on the first floor in the manufacturing areas will be 40 x 20 feet, and 40 x 40 feet on the second floor with 17 foot 6 inch clear heights on both floors. The office has 60 foot clear spans on both floors.

The second floor framing is continuous in both directions. The 14 inch stringers are placed on top of the girders and the space between the girders and the floor slab has been used for electrical ducts, sprinkler lines and other utilities. This has kept the space below the girders free of these obstructions and permitted flexibility in location of all manufacturing equipment. It is estimated that 374 tons of structural steel were eliminated by this design.

The large bay spacing makes possible a much more efficient layout of production equipment. It is in marked contrast to the old buildings that the Division is leaving.

The roof deck is of poured gypsum, and walls of the manufacturing building are constructed of concrete block with brick veneer. Tinted thermal glass and aluminum panels combined with brick are used in the curtain wall construction of the office building.

The building frame had approximately 2,300 tons of structural steel and was completed exactly 9 months after ground-breaking, fulfilling the owner's desire for speed and flexibility.

The architect-engineer was Caproni Assocs. of New Haven, Conn., the general contractor was the Turner Construction Company of Boston, Mass., and the steel fabricator and erector was The Berlin Steel Construction Company of Berlin, Conn.

LAST STEEL BEAM *for the building swings into place at new Stanley Tools plant, New Britain, Conn. At right is C. Kenneth Freedell, general manager of the hand tool division and vice president of The Stanley Works, with Albert Leavitt, Berlin Steel Construction Co., Berlin, Conn.*

NEW ALLIED CHEMICAL TOWER

Sixty-year-old Times Tower proves "steel stands for the future"

The old New York Times tower, located on one of New York City's busiest corners, will soon become an ultra modern 22-story office and marketing center for the Allied Chemical Corp. The steel frame of the old building, still in excellent condition, will serve as the framework for the new building. Only about 300 tons of new structural steel will be required to remake the building built in 1904.

New steel is added to make structural alterations within the building during its reconstruction. Among major changes are the relocation of elevator shafts and stairs and the creation of a 10-story high uninterrupted display window.

Lesser alterations include lowering of the first floor, adding a mezzanine on the sixteenth floor, and topping the structure with a new 75-foot stainless steel flagpole, to replace the old wooden one from which the ball is dropped to usher in each New Year.

Some of the building's components will be replaced even though the old ones were still in good condition. For example, steel pipe in the original plumbing system was still in excellent shape after sixty years of service. Though the durable pipe could be reused, it will be replaced with a new system specifically designed for the needs of the building's new owner, Allied Chemical Corp.

Moment Connections Are Altered

In the revamping process, everything except the steel skeleton will be replaced. And even that will undergo some minor surgery to make it more adaptable to modern building designs. For example, hundreds of steel gusset plates which form the wind bracing system to column-spandrel girder connections in the original structure will be notched to provide more clearance for exterior architectural treatment.

The original structure was put up in 1904 by American Bridge Co., when at a height of 375 feet—22 stories—the Times Tower became the tallest building in New York, taking the record away from the 20-story, 286-foot Flatiron Building erected in 1902. Architects were Eidlitz and McKenzie; the engineers were Purdy & Henderson.

In its day, the Times Tower was a modern construction marvel because tall, steel-framed, curtain-wall buildings had been built only since the mid 1880's. In engineering concept, both the 1904 and the 1964 versions of such buildings are the same, but the difference shows up in a host of structural details.

Wind Bracing

Most prominent of these details in converting the Times Tower into the Allied Chemical Tower is the wind bracing. The building occupies an odd shaped lot measuring approximately 142 feet along Broadway, 137 feet along 7th Avenue, 58 feet along 42nd Street and coming nearly to a point at 43rd Street where the building is 20 feet wide.

Because of this flat, slim shape, designers of the original structure were extremely conservative in providing wind bracing. They added gusset plates at all spandrel girder-column connections, creating a truss-like structure. It carried a curtain wall that was thick enough to be a bearing wall. As much as 2 feet thick in places, it consisted of stone-faced brick or terra cotta and brick.

In the new Allied Chemical Tower the walls are completely redesigned and will require revamping of the truss-like perimeter framing of the structure. This will include increasing the clearance along the perimeter of the building by notching the triangular truss plates to make possible the unobstructed window wall planned for the new structure.

To compensate for the reduction of the plate size by notching, steel angle bracing is added at all connections. Typically, this includes 3 x 3 x ⅜-inch angles welded to both sides of the gusset plates along the line of the notches cut into them.

New Steel Frames Display Case

A completely new framing system is needed to create Allied Chemical's 10-story-high display window at the narrow north end of the building. Originally, a spandrel plate girder connected the two corner columns and three 12 I-35 beams framed into the girder. All this is removed to make way for the display case, and new welded moment connections were added on three bays across the building.

In plain view, it forms a semicircle with a radius of approximately 8 feet with its open diameter where the spandrel girder used to be. The new framing and wind bracing was designed around the semicircular display case.

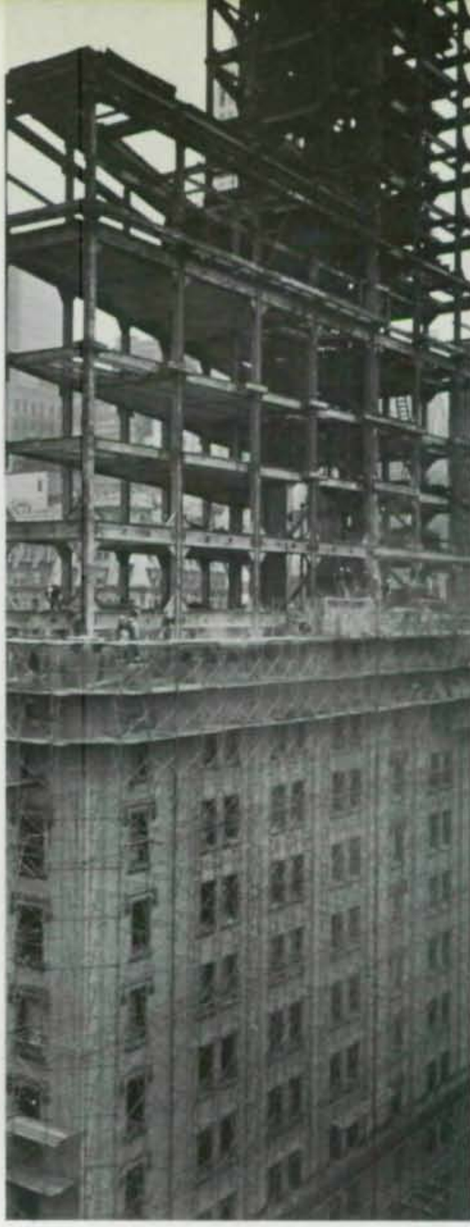
Main member of the new framing is a 21 WF 62 beam near the middle of the north bay—11 feet 3¼ inches from the corner columns. The beam is parallel to the narrow face of the building and spans between the building's spandrel girders. Compression bracing consists of two 12 WF 27 beams; two 1½ inch diameter steel rods form the tension bracing. Framing for walls of the display case consists of short sections of 12-inch channels placed tangentially to the semicircle.

These framing alterations are necessary for the fifth through thirteenth floors. Just above and below this, new bracing systems also are needed to form a floor and a ceiling for the display case.

New Elevator Shafts Alter Structure

Relocating the elevator shafts was the other major structural change in the building. The elevators are being moved from about the middle of the west side of the building to the south end. New

Original, 60-year-old Tower was too valuable to demolish; New York zoning restrictions would have limited any new building on the same site to only 10 or 12 stories.



At press time only the original steel framing was visible as the contractor prepared building for its new look.

New tower retains many characteristics of original structure: silhouette is unchanged; arches, prominent in old tower, will have counterparts in the new one; illuminated moving news sign will be reinstituted.

stairs will be in the southwest and southeast corners.

Reframing the two elevator bays is a simple job of installing two 14-inch light beams in each bay. One bay is 18 feet 8½ inches and requires a beam weighing 22 pounds per foot; the other bay is 20 feet 7 inches and calls for beam weight of 26 pounds per foot.

New steelwork is more complex at the south end of the building where the new elevator shafts and stairways will be located. Except for two I-beams, wide flange beams form the framing here.

Throughout the building, the use of light beams and wide flange beams is in marked contrast to the use of I-beams in the original structure. Main reason, of course, is that the light beams are a relatively recent development and were not available when the building was first erected in 1904.

The entire first floor will be framed in new steel because the floor is being dropped 9⅝ inches to the level of the sidewalk, eliminating steps. Original plate girders that form part of the subway structure will be retained.

In addition to all these changes, some new steel will be needed for a new mezzanine on the 16th floor and structures for air conditioning and other mechanical equipment on the 23rd floor of the building.

All structural members and steel for connections is being shipped loose and installed with high strength steel bolts wherever possible, or by welding.

The floors will be concrete reinforced with bars and welded wire fabric. Steel conduits will carry electrical and communications systems.

Architects-engineers for the Allied Chemical Tower project are Smith Smith Haines Lundberg and Waehler of New York. Their resident engineer is Charles Ormsby. General contractor is William L. Crow also of New York. The new steel was supplied by Bethlehem Steel Co. Demolition contractor was Wrecking Corporation of America.

DIGITAL COMPUTERS

opportunities/limitations

BEAM DESIGN

FLOOR ELEVATICN 12.00

BEAM	SECTION	CALCULATED SECTION MOCULUS (INCHES CUBEC)	******REACTIONS***** LEFT (KIPS)	RIGHT (KIPS)	MAX (KIPS)	***MAXIMUM MOMENT**** MAGNITUDE (KIP-FEET)	DISTANCE (FEET)	MAX. ALLCW. BENDING STRESS (KSI)
1	8 B 13.0	4.2	2.1	2.1	2.1	8.4	8.0	24.0
2	8 B 13.0	4.2	2.1	2.1	2.1	8.4	8.0	24.0
3	10 B 15.0	13.2	6.6	6.6	6.6	26.4	8.0	24.0
4	14 B 22.0	26.3	13.1	13.1	13.1	52.5	8.0	24.0
5	14 B 22.0	26.3	13.1	13.1	13.1	52.5	8.0	24.0
6	14 B 22.0	26.3	13.1	13.1	13.1	52.5	8.0	24.0
7	10 B 15.0	13.2	6.6	6.6	6.6	26.4	8.0	24.0
8	8 B 13.0	3.7	2.0	2.0	2.0	7.4	7.5	24.0
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7.5	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	27.0	[illegible]	[illegible]
15	12 B 16.5	7.3	2.8	2.8	2.8	14.7	10.5	24.0
16	12 B 16.5	7.3	2.8	2.8	2.8	14.7	10.5	24.0
18	12 B 22.0	21.6	11.9	11.9	11.9	43.2	7.2	24.0
19	12 B 22.0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	7.2	24.0
20	12 B 22.0	21.6	11.9	11.9	11.9	43.2	7.2	24.0
26	6 B 12.0	1.3	1.3	0.5	1.3	2.6	2.0	24.0
27	8 U 11.5	7.0	3.8	3.8	3.8	12.6	5.0	21.6
28	7 U 9.8	5.3	2.5	2.5	2.5	9.5	5.0	21.6
29	6 U 8.2	1.8	1.3	1.3	1.3	3.2	5.0	21.6
31	6 B 12.0	1.3	0.5	1.3	1.3	2.6	5.0	24.0
35	12 B 16.5	9.6	3.2	3.2	3.2	19.2	12.0	24.0
12	16 B 31.0	43.1	14.7	13.8	14.7	77.7	10.5	21.6
13	16 B 31.0	43.1	14.7	13.8	14.7	77.7	10.5	21.6
14	24WF 68.0	149.4	21.9	45.5	45.5	215.7	15.0	17.3
22	8 B 13.0	1.7	1.9	0.3	1.9	2.3	1.2	16.2
23	16WF 50.0	80.6	20.3	20.3	20.3	161.2	12.0	24.0
24	8 B 15.0	10.9	5.1	3.3	5.1	19.6	9.0	21.6

by Ralph DeMarco, Project Manager
The Service Bureau Corporation
New York City

In the previous issue of Modern Steel Construction, an introductory article dealing with digital computers was presented. The concluding sentence emphasized that the full impact of the computer's capabilities on the national economy has yet to be realized. Let us go from the national level directly to the civil engineering profession and look at some of the reasons which are not only delaying this impact, but causing a comparative lag in the use of computers by a sizable portion of engineering companies. Why is it that many engineers are unfamiliar and needlessly suspicious of these so-called electronic brains?

Certainly cost is a major factor. Small and medium sized engineering firms can not justify the expense of renting, let alone purchasing, a computer. Secondly, if they could, would the computer be properly and efficiently utilized? Additional expense would be necessary to train the engineers in the art of programming. Programmers, if available, could be hired; but how do you achieve effective communication between them and the engineers?

Another serious problem is the inefficient use of computers by companies fortunate enough to afford or have access to one. Urgency in obtaining results and programming inexperience have led to the development of restricted, poorly documented programs capable of solving a particular problem for a limited set of conditions. Should the conditions change, so must the program. The ultimate result is a library of inefficient programs having limited application. This is indeed a costly operation.

General flexibility of programs to be repeatedly used covering a wide range of conditions is not easy; often it is impossible to achieve. Large core memory and data storing peripheral equipment is needed. This necessitates bigger computers at higher costs.

Herein lies the important role played by the computer service bureau centers. The engineer can take advantage of the latest advances in computer hardware and software technology. He can rent computer time, obtain custom programming services, attend training classes and seminars, and have access to existing programs. The latter has proved particularly important in that no computer experience is required. Utilization of the programs is immediately available.

"FRAME"

One such pre-planned, pre-programmed computer application is FRAME, a Type 2 (simply supported) steel design program, developed by The Service Bureau Corporation.

Laborious, often repetitive, calculations are required to economically select beam and column sections of steel frames. Conformation to the revised AISC Codes (1963) further adds to the manual chores of the engineer.

FRAME allows the engineer to utilize the speed and efficiency of the IBM 7094 computer to perform the rigorous investigations necessary to select the proper sections. Selection is from a table of beam and column properties contained directly in the program.

The FRAME program is best described by considering the component parts of the logical flow chart shown in Figure 1.

Input

A prime objective during the program's development was to enable the engineer to describe even the most complex floor systems with a minimum amount of input effort. Engineers should be able to prepare input data sheets directly from floor plans and loading diagrams.

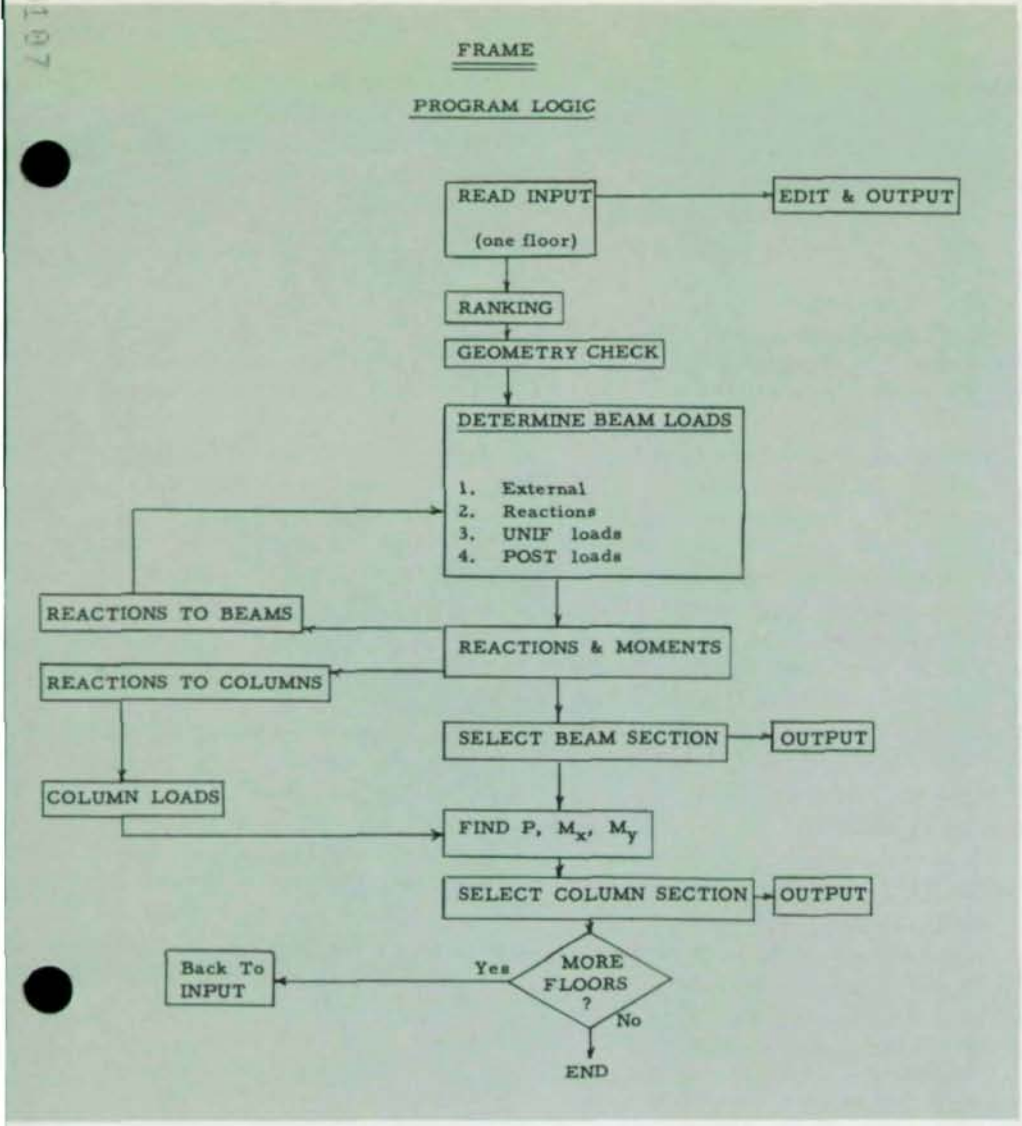


FIGURE 1

Beams are identified by assigning to each a distinct but arbitrary number. The normal practice of identifying columns by a letter-number combination, representing rows and columns, is sufficient and will be accepted by the program.

The geometry of each floor system is defined by indicating the length and relative position of each member with respect to its connecting members. Referring to Figure 2, which represents a simple floor system, beam 10 has a length of 12 ft. and frames into 2 and 1, 5 feet from the left-most end of each member.

Similarly, beam 7 is positioned 4 ft. from the ends of the connecting members 14 and 15. For beams framing directly into columns, only the beam length and column identifications are required.

The members shown in Figure 2 are orthogonal, i.e. mutually perpendicular. This condition is not a prerequisite, however. Any orientation of beams in the floor system is permitted.

External loads may be applied directly to the individual beams as uniform (kips/linear ft., see beam 5) or concentrated (kips, see beams 6 and 7) forces. The magnitude and location of each load is required as data on the input sheet.

In addition, area loads (kips/sq. ft., see UNIF) applied over specified areas can be accommodated. The load intensity and the identification of the two girders bounding the area is all that is needed. The program automatically proportions the load to the affected members. In Figure 2, the 400 PSF load is applied between girders 2 and 1, the 300 PSF load between 13 and 14.

A completed input data sheet completely describing the illustrated floor plan is shown in Figure 3. In addition, the following data and options may be included as input to the program:

a. Steel strength to be used
b. Maximum unbraced beam length (UBL)
c. Maximum depth of beam to be selected (DMAX)
d. Phantom loads, i.e. loads not carried forward to the girders or columns
e. Shape of section to be selected (symmetrical or channel)
f. Column splice elevations
g. Intermediate column bracing
h. Columns terminating at a floor
i. Columns with reversed axes
j. Suppression of the column design portion of the program

Ranking

Beams must be designed in a predetermined sequence to assure that all

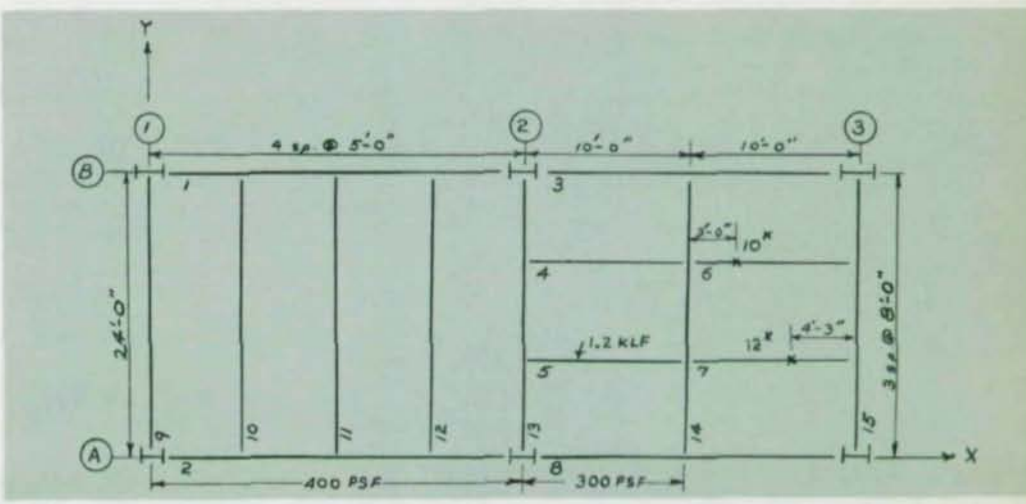


FIGURE 2

loads are considered. Aside from external loads, the weights of the members and the reactions of lower ranked beams must be included. This ranking or sequencing is accomplished automatically by the program.

Geometry Check

A very useful feature is an automatic check on the engineer to catch any possible beam length or dimension errors. The network of closed loops formed by the floor members is carefully analyzed. Component lengths are checked for closure errors. Should any exist, the magnitude and location of the erroneous data are outputted for subsequent correction by the engineer.

Beam Loads

Prior to the design of beams at each ranking level, the following loads must be assembled for each member:

a. External loads given on input sheet (directly applied or area loads)
b. Reactions of connecting members (including beam weight)
c. Total axial load of any columns (posts) terminating on designated members.

Reactions and Moments

Several analytical techniques have been developed whereby beam reactions and moments can be determined for any combination of uniform and concentrated loads. The numerical methods involve investigating each point of discontinuity in the program simulated shear diagrams. Maximum moment is located at the point of zero shear. Statics checks are also performed.

Beam Selection

Given the maximum unbraced beam length, and having determined the reactions and moments, the selection of the most economical section is governed by the following AISC code requirements:

a. Compactness
b. Lateral Support
c. Allowable bending stress
d. Allowable shear stress
e. Width – thickness ratios

In addition, the depth of each beam is controlled by the following:

deflection – the minimum depth of the selected member (inches) is limited to one-half the beam length (feet).

user option – the user has the option of specifying the maximum depth of each beam to be designed.

framing details – the selected depth of any member will not be less than the maximum depth of the lower ranked connecting members.

Column Loads (P, Mx, My)

Upon the completion of the beam design for a given floor, columns are designed from the elevation down to the next lower floor. Beam reactions are saved and added to the accumulated axial loads from previous floors.

Moments are automatically introduced onto the columns by cantilevers framing directly into columns and by the eccentricities of beam reactions on column flanges.

Column Selection

Similar to beam design, the maximum allowable bending stress is computed as a function of the column's unbraced length, compactness, and lateral support. Due to axial compression, the following additional code requirements are met:

a. Allowable axial stress
b. Combined stress

Output

Excerpts of the beam and column design portions of a typical output report are shown in the illustration at the beginning of this article. Additional output includes an edited version of the input data and an overall steel weight summary.

Summary

The procedures described above are repeated for each floor of the structure.

Sufficient flexibility exists in the program to enable the engineer to simulate many design conditions. For example, the engineer who wants to consider the eccentricities of beam reactions on column web connections may do so simply by simulating the web connections by short cantilevers. Other possibilities include the application of loads directly onto columns.

Engineers at a major chemical company, who have been using and testing the program, have been continually obtaining satisfactory Type 2 design results for a wide range of loading conditions and framing requirements.

FRAME is currently being offered as one of SBC's applications computer services. Simply submit the completed input data sheets* and you will receive a concise, accurate computer output report within twenty-four to forty-eight hours.

In addition to rapid processing, the service is inexpensive. Customer comments indicate substantial savings as compared to existing design procedures.

Acknowledgement

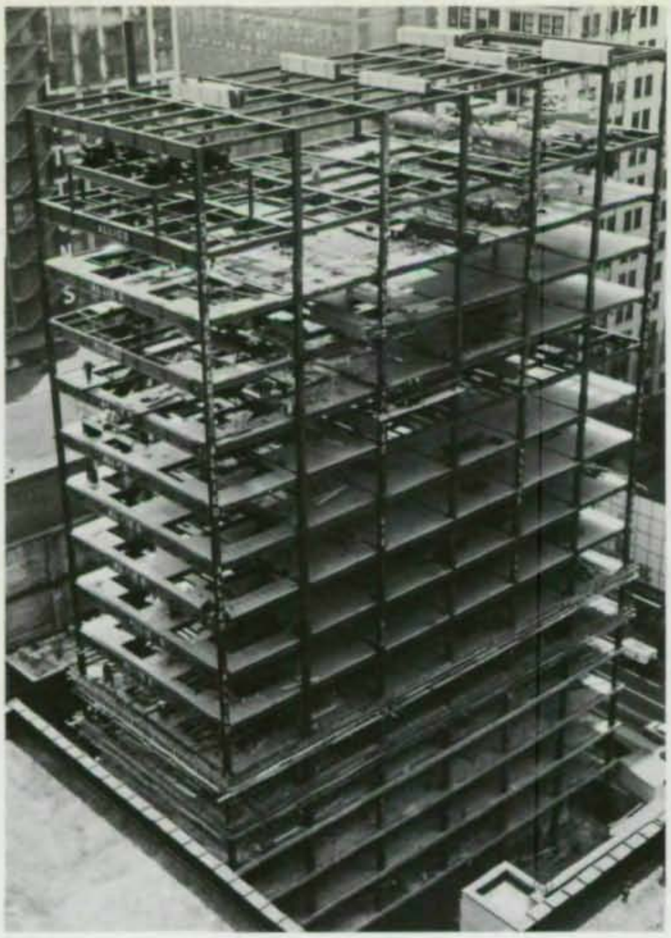
The Service Bureau Corporation wishes to thank the American Institute of Steel Construction for its cooperation and technical assistance in interpreting the various sections of the specifications, adopted April 17, 1963, which have been incorporated into the FRAME program.

STRUCTURES DESIGN

TYPE	IDENT	X-Y	FROM	FROM LENGTH	TO	TO LENGTH	LENGTH	UBL	SHAPE	LOAD	DMAX	PL
HED			ILLUSTRATIVE SAMPLE PROBLEM									
FLOR	1			12-0								
	1	X	B1		B2		20		SY			
	2		A1		A2		20					
	3		B2		B3		20	10				
	4		13	16	14	16	10					
	5		13	8	14	8	10			1.2		
	6		14	16	15	16	10	7				
	7		14	8	15	8	10	5-9				
	8		A2		A3		20	10				
	9	Y	A1		B1		24					
	10		2	5	1	5	24					
	11		2	10	1	10	24					
	12		2	15	1	15	24					
	13		A2		B2		24					
	14		8	10	3	10	24					
	15		A3		B3		24	4				
UNIF			2		1					0.4		
UNIF			13		14					0.3		
LOAD	6			3						10		
LOAD	7					4-3				12		
REM			COLUMN BASE PLATES AT ELEV. 0-9									
END				0-9								

FIGURE 3

*A Technical Bulletin describing FRAME is available. Write to: Marketing Dept., Computor Services Div., The Service Bureau Corp., 635 Madison Ave., New York, N. Y. 10022.



ON THE CORNER OF STATE AND ADAMS

The new Home Federal Savings & Loan Association of Chicago building at the southeast corner of State and Adams Streets is the largest building to be erected on State Street in Chicago's Loop in thirty-five years.

The free-standing sixteen story tower and its adjacent five story "bustle" enclose approximately 204,000 gross square feet of space, including two basement levels. Home Federal will occupy floors one through four initially, while floors five through fifteen will be rented as office space. The sixteenth floor houses some of the building's mechanical equipment. In the first basement the owners operate the safe deposit vault and dining and lounge facilities for their employees. The second basement contains the mail, stock, files, record rooms and building mechanical facilities.

Customers entering the main savings lobby on the ground floor can use an escalator to reach the upper Home Federal floors. Tenant space in the building is reached through a separate Adams Street entrance to the elevator lobby.

Steel as the basic structural material was employed to provide the client with the large, clear, open spaces required for proper operation of the banking business. Steel framing also permits a rental office tower completely free of structural columns for maximum flexibility of tenant layout requirements.

The 16-story tower is made up of seven two-column bents spanning 56 ft. 8 in. and spaced 23 ft. 3 in. apart. The tower extends 225 feet above the street level, and floor-to-floor height is 13 ft. except that from street level to the second floor the height is 21 ft. The five story "bustle" has a clear span of 40 ft. 4 in., also free of interior columns.

Welded Moment Connections

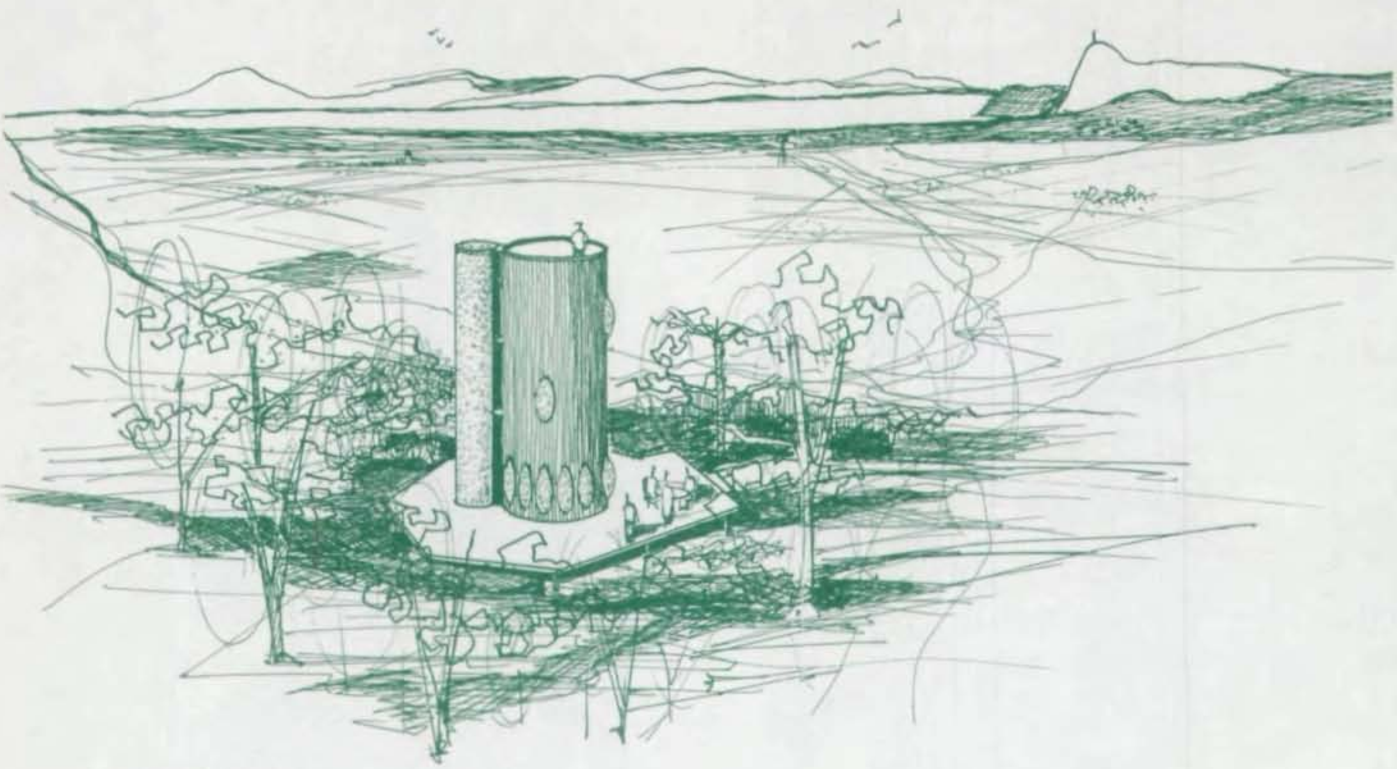
The rigid frame has welded moment connections between girders and columns and spandrels and columns to carry all dead load, live load and wind stresses. No other wind bracing is used. Floor beams and miscellaneous framing use high-strength bolted connections.

Main girders are three feet deep and holes for mechanical ductwork and piping were fabricated in the girders to permit integration of the mechanical systems and minimize floor-to-floor height. Main girders in the lower stories are welded plate girders while 36 WF sections were used in the upper stories. All columns are 14 WF sections. Approximately 2800 tons of structural steel were used in the frame.

The building is founded on the caissons of the old Republic Building which formerly occupied the site and only eight new caissons were required. Both new and old caissons are founded on rock about 105 feet below street level. Transfer girders were constructed below the sub-basement floor to carry the new column loads to the existing caissons.

Exterior walls of the new building consist of ⅜" gray plate glass windows and of enamel undercoated and tempered black spandrel glass. Both are glazed into neoprene rubber gasket and aluminum framing system. Vertical mullions are projected and have a bright anodized aluminum finish.

Originally, the owners had intended to remodel the fifty-five-year-old Republic Building. However, exhaustive studies demonstrated that a new steel structure would in the long run be a sounder investment and would better serve the Association's needs. Demolition of the Republic Building commenced in January 1961. Home Federal opened its doors in December 1962.



by John G. Hotchkiss
Senior Regional Engineer
AISC, New York City

ROCKLAND RETREAT

It is a delight to go around in circles in the house that M. Medcalfe built. The imaginative dreams of this architect for better living are provided for by an upright cylinder four stories high, and only 12 feet 8 inches in diameter. Perched atop the rugged Palisades, the woody site opens to a panorama looking eastward, and focuses on the majestic Hudson River, Indian Point and High Tor, just 60 miles from New York in Rockland County.

This mountainous setting, even by itself, is conducive to relaxed living. It may be true that most Americans have not learned how to relax. The Japanese for centuries have enjoyed the popular communal hot water baths called "Ofuro," meaning bath. Finland has its exhilarating, "Sauna"—hot dry air rooms. Why not, then, include these baths in a residence? This is just what the architect decided.

In the cellar of this house, which is below grade, a circular room is proportioned to include space for conferences and a galley just outside the perimeter. Next to the galley there is a smaller-diameter, enclosed tower with a circular staircase connecting to all five stories.

Situated on the second level plan, called the first floor, are several comfortable lounges, chairs and tables. This area is called the relaxation platform. The interior walls of the cylinder are finished in rosewood, pecan, and cherry paneling. Natural light has been handled very interestingly. Diametrically opposite each other are three oval panels—plastic window domes—which bulge outwards resembling bubbles.

The mechanical facilities—heating ducts, soil line, water risers as well as the electrical conduits are all nestled within the thin circular wall.

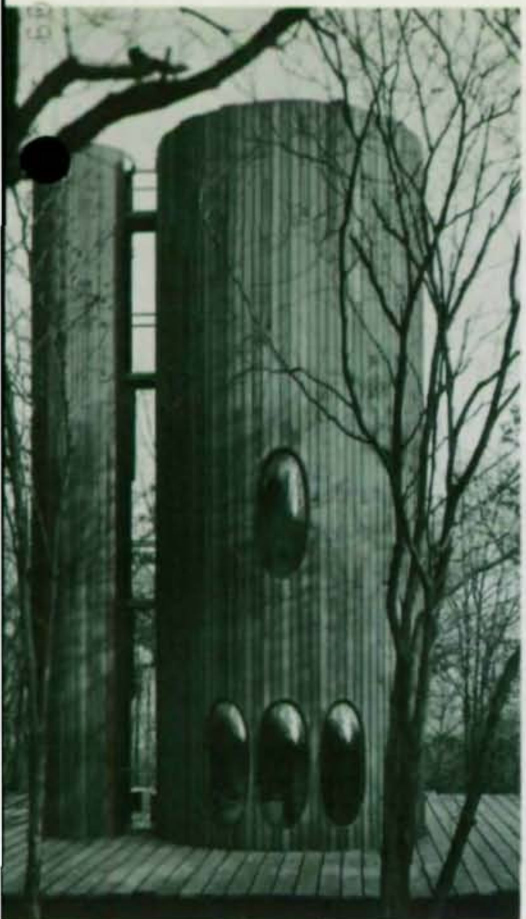
The exterior of the building is finished with redwood siding. All joints are vertical and give a pleasing shadow effect.

As one steps from the spiral stairs onto the second floor, third level, a carpeted entrance leads to the enclosed Sauna and adjoining dressing room. Within the Sauna are wooden steps that lead up to a low and a high wooden platform where one sits in the hot air. Light at this level comes from four plastic window domes.

For those individuals preferring the hot water bath, the next level or fourth floor is the location. The entrance through swinging doors opens into the "Araiba" area, a white, glass tiled floor. (The word araiba comes from the verb, arau meaning to wash). In the center is a circular, sunken, Japanese tub filled with very hot water. Splash screens are at one end of the tub. On the easterly side, five plastic domes permit natural light to flood the entire room.

The fifth level plan is the roof. Here a deck chair, table and umbrella and other lounge chairs are suited for those desiring solar heat. From this elevation the view across the Hudson will enchant anyone who loves to live with nature.

Nothing has been said about how this structure stands on its lofty mountain peak. The structural solution, according



With only five levels (one below grade) and one room in diameter, this unusual, round house combines Japanese, Finnish, and American ways of relaxing. Steel-framed structure is covered with redwood.

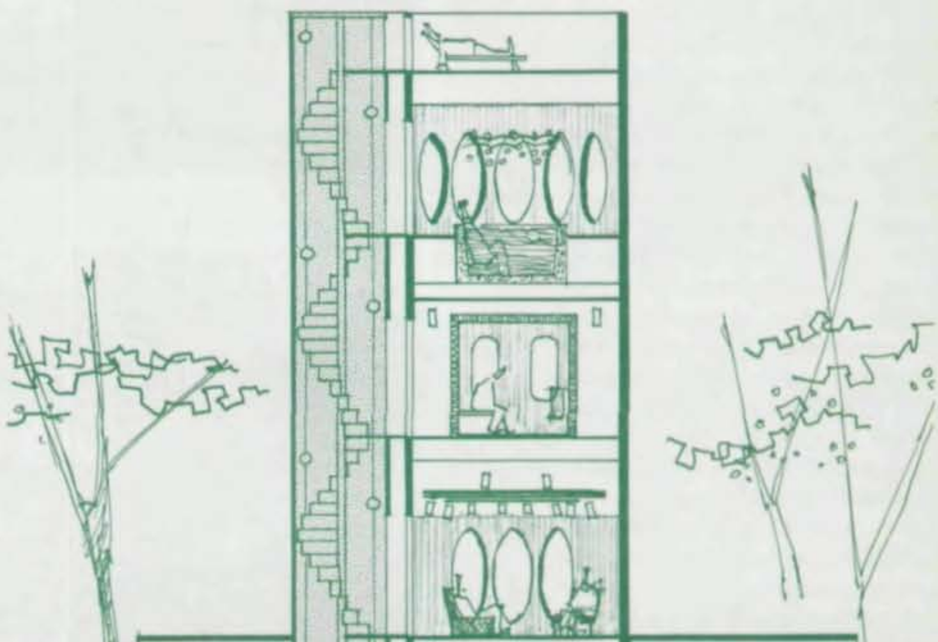
IN THE ROUND

to the architect, had to rely on eight structural steel tee-sections, ST3B spaced around the periphery. Extending continuously for the full five stories they connect to circular steel rings. At each floor level there are two of these rings made up of curved, 4 x 3 inch angles spaced 18 inches apart except at the roof and the fourth floor where the Japanese tub appears. As the architect said, "It would have been impossible to carry the heavy loads—sunken tub *filled with water—with any other material* than steel."

Other structural materials would have been too large to squeeze within the thin wall section and still support the dead loads.

In this circular residence we find a refreshing approach to better living, at least one man's dream accomplished with only four tons of structural steel.

Associate designer and fabricator was A. J. Fritschy.



19th HOLE FRAMED IN STEEL

A low cost, fire resistive steel frame was selected for the new Old Orchard Country Club in Prospect Heights, Ill. Since the previous clubhouse was destroyed by fire, the architects, Alper and Alper of Chicago, were particularly concerned with a new structure that would meet a required two-hour fire rating, and one which could be expanded at a later date.

The architects realized further advantages with an independent steel frame. They said "the steel columns would be light and unobtrusive." Also, since steel is partially prefabricated under shop conditions, the architects recognized additional cost advantages.

Old Orchard Country Club is a daily fee golf course serving 300 to 400 golfers daily. Functionally the program calls for locker facilities, a pro-shop, bar and golfers grill. In addition, restaurant and banquet facilities are provided for the general public.

The solution was a steel frame with exterior walls set back 10 feet from the edge of the roof, forming an arcade around the entire building. Exclusive of the arcade, the ground floor area of the building is 16,300 square feet.

This area was subdivided into 20 foot square modules. All spans then are 20 feet except in the center bay, which has a clear span of 40 feet. The 10 foot arcade is framed with exposed steel members and steel decking.

In order to provide a two-hour fire rating for the structure the architects used a fire resistant ceiling consisting of an exposed lay-in grid of steel and acoustical boards. This construction has been approved by the Underwriters Laboratories.

All the columns except those along the exterior perimeter of the arcade, are "fire-trols" with a two-hour rating. The perimeter columns along the arcade are 6 WF unprotected steel.

Roof framing over the clerestory consists of 24 inch open web joists. The roof decking consists of tar and gravel roofing on a 2 inch poured gypsum roof. Ceiling construction is Armstrong acoustical ceiling "Fireguard."

ABOVE: *West elevation looking toward entry canopy.* BELOW: *Arcade and entrance on west elevation of building. East entrance is identical except for the main canopy at right. Formal dining room is directly behind draperies.*

MAIN LOBBY: *Canopy over bar is constructed of steel tubing with walnut edging. Acoustical ceiling is hung from the steel tubing. In background are walls enclosing the central core containing the kitchen and bathrooms.*