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MODERN STEEL CONSTRUCTION

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INTRODUCTION

The American Institute of Steel Construction is pleased to introduce ***Modern Steel Construction,*** *successor to the "Steel Construction Digest". This quarterly magazine will feature original stories and photographs and will reprint from other sources articles of particular interest. It will highlight the new, the improved, the imaginative.*

The steel construction industry is entering a period of growth and dramatic change. New high-strength steels and advanced design concepts are creating fresh opportunities for steel structures that are more efficient, functional and economical. Exciting architectural concepts are increasingly using steel as an element of aesthetic expression.

Modern Steel Construction *will reflect these changes.*

HOW TO USE HIGH-STRENGTH STEELS

In continuing efforts to build more economical and attractive structures, architects and engineers are exploring the advantages of using the "new" high-strength low-alloy structural steels. Like so many things developed before demand, some of these steels have been in existence for 30 years. Unfortunately, designers have been relatively reluctant to use them because of the burden of revising rigid and outmoded building codes. The pioneering has now been done, and these steels are ready for extensive use.

Historically, the first high-strength steel was introduced in 1933 and is basically what is today designated as ASTM A242 with a yield point of 50,000 psi. As A242's advantages of less weight and maintenance (due to greater resistance to atmospheric corrosion) became recognized and accepted, the mills developed and introduced five new grades of structural steel.

The seven structural steels shown in Table I may be separated into three major groups. First the carbon steels consisting of A7, A373 and A36; secondly the high-strength steels consisting of A440, A441 and A242; and lastly the super-strength heat-treated steels.

A36 will eventually exceed the use of the other two carbon steels, because its higher yield strength (nine per cent higher than A7 and 12 per cent higher than A373) permits the use of higher allowable design stresses with a consequent saving of material. The chemical requirements of A36 have been patterned very closely to those of A373, the steel generally specified for welded bridges. Thus A36 has similarly good weldability characteristics.

In the second group of steels, A440, A441 and A242, no one of them stands out so dominantly as does A36 in the carbon group. These three high-strength steels have the same mechanical properties, hence, the selection of which one to use depends on the circumstances of how and where it will be utilized:

A440 is the most economical and is recommended primarily for use in riveted or bolted structures. It may be used for welded structures under controlled welding conditions.

A441 is specially recommended for welding because its chemical composition is carefully controlled for excellent weldability characteristics.

The last but oldest of this group is A242. This steel is recommended for use in riveted, bolted or welded structures which will be subjected to atmospheric corrosion or where resistance to corrosion is of prime importance. The ASTM Specification has an open provision permitting the inclusion of alloying elements which materially enhance the steel's resistance to atmospheric corrosion.

A dramatic first example of this novel corrosion-resistant characteristic will be in an office building for John Deere and Co. in Moline, Ill. Architects Eero Saarinen and Associates are designing all exterior columns and beams exposed for the full eight stories. Atmospheric conditions will turn the A242 steel a deep russet-brown color which, with the strong, bold lines of the framing, will form part of the exterior architectural treatment.

Actually all three of these low-alloy steels offer good atmospheric corrosion resistance properties. A440 and A441 have approximately twice the resistance of ordinary carbon steel, and A242's resistance is from four to six times that of carbon steel, depending on the alloying elements added by the manufacturers. Because of the open provisions

HIGH-STRENGTH STEELS

Continued

TABLE 1

THE FAMILY OF CONSTRUCTION STEELS

ASTM Designation Or Other	Year of Issuance of First ASTM	Primary Construction Use
A7	1936	Presently most-used material for structural plates and shapes in constructing buildings and bridges.
A373	1954	Developed primarily for use in construction of welded bridges. ASTM stipulates maximum percentages for carbon and manganese to increase weldability.
A36	1960	Developed for use in buildings, bridges and general uses similar to A7 with advantage of a higher yield strength. ASTM specification stipulates control of carbon and manganese as with A373 steel giving it similar weldability characteristics. A36 can advantageously replace both A7 and A373.
A440	1959	High-strength, low-alloy steel for riveted or bolted structures where weight saving is important. Atmospheric corrosion resistance of this material is twice that of structural carbon steel.
A441	1960	High-strength, low-alloy steel for welded structures where weight saving is important. Atmospheric corrosion resistance of this material is twice that of structural carbon steel. Excellent impact properties.
A242	1941	High-strength, low-alloy steel intended for use where atmospheric or other corrosion resistance is important. The ASTM specification has an open provision permitting the inclusion of alloying elements which will materially increase the steel's corrosion resistance. This material is 4 to 6 times as corrosion resistant as structural carbon steel.
Heat-Treated Alloy Steel	NONE	High-strength, heat-treated, low-alloy steel intended for use where high strength is required, and weight saving is important. This steel can be welded and offers atmospheric corrosion resistance four times that of structural carbon steel.

TABLE 2

COMPARISON OF BASIC CHEMICAL REQUIREMENTS AND MECHANICAL PROPERTIES OF HIGH-STRENGTH STEELS

ASTM Designation	Chemical Requirements %		Yield Point Minimum psi		
	Carbon (Max.)	Manganese (Max.)	To ¾ in. Inc.	Over ¾ in. to 1½ in. Inc.	Over 1½ in. to 4 in. Inc.
A440	.28	1.60	50,000	46,000	42,000
A441	.22	1.25	50,000	46,000	42,000
A242	.22	1.25	50,000	46,000	42,000

TABLE 3

CHEMICAL AND MECHANICAL PROPERTIES OF HEAT-TREATED ALLOY STEEL

NOTE: Properties vary with manufacturer.

Property	Material Thickness	
	¾" to 2½"	2½" to 6½"
Yield Strength, psi	100,000	90,000
Tensile Strength, psi	115,000 to 135,000	105,000 to 135,000
Elongation, pct. (2-in. specimen)	18	16
Chemical Composition (%):		
Carbon	0.10 - 0.20	0.10 - 0.20
Manganese	0.60 - 1.00	0.60 - 1.00
Silicon	0.15 - 0.35	0.15 - 0.35

Higher yield means

higher strength per pound for

lower dead weight and lower costs

for A242, designers should check with the manufacturer to see if the inclusion of special elements to increase the material's corrosion resistance have in any way reduced its weldability.

None of the super-strength heat-treated alloy steels have yet been given an ASTM designation or requirement of minimum or maximum chemical or mechanical properties. The primary reason is that they are proprietary products of particular manufacturers, each adhering to rigid chemical and mechanical requirements, but each varying slightly from the others.

Since building officials and most code-writing authorities have adopted the design recommendations of the AISC, engineers and architects may immediately start using the A36 carbon steel. Unfortunately, use of the high-strength low-alloy steels has been partly restrained due to the lack of adequate recommendations as to proper stresses to be used in designing with these materials. Many tests have been made on the high-strength steels, and the AISC Committee on Specifications is holding numerous meetings to develop safe working stresses to be recommended in the near future for use in the design of buildings.

High-strength steels offer the designer many advantages. The economy gained by employing them for columns in office buildings varies almost directly with the increase in the strength of the steel if the l/r ratio is below 60. As the l/r ratio increases, the strength/weight/cost economies decrease. Dead and live loads accumulate in the columns of a building, so that maximum loads occur in columns supporting the lower floors, with a gradual reduction in load moving toward the upper floors. Therefore, it is very practical to use high-strength steel for the columns of the lower floors and carbon steel for the columns in the upper floors.

The advantages of this concept in high-rise construction are: (1) reduced weight of steel, (2) reduced cost of fabrication by utilizing same size columns of different strengths, and elimination of cover-plated columns, (3) lower transportation costs due to reduced weight of material, (4) increased usable floor space, (5) reduced cost of fireproofing because column sizes are smaller, and (6) simplification of architectural details throughout the building.

These advantages were applied in the design of the 40-story United of America Building now being erected in Chicago. The columns for the lower 23 stories are of A440 and the upper-story columns are of A7. (See story, pages 6-7.)

Another example is the 16-story office building for the Standard Insurance Co. in Portland, Ore. By using A440 for the frame instead of A7, structural engineers Cooper & Rose reduced tonnage by 20 per cent or 560 tons. The greatest saving was in column weight — a reduction of 23 per cent. Use of the high-strength material in girders and beams resulted in additional reduction of 19 per cent in the weight of these members. In designing this building, the structural engineer used a basic allowable design stress of 30,000 psi. This is 50 per cent higher than the 20,000 psi permitted for A7 structural steel. The primary benefit of utilizing the A440 steel in place of A7 in this building was a reduction in cost of approximately $80,000.

The application of these new materials depends entirely on the imagination and ingenuity of the designer, and this introduction may guide him into paths of benefit to his client. Within the family of structural steels he now has seven possibilities. In making a selection, these factors, among others, should be considered: Is the structure to be riveted or welded? Will the conditions for welding be relatively controlled or uncontrolled? Will the steel be exposed? Of what importance is weight reduction? Can the fabrication be simplified? Answers to these questions will determine material selection. He will find the new steels cost more per pound than A7, but the economies result from the proper and proven use of their special characteristics.

This material is based on a more complete article by D. M. McGee, AISC regional engineer, that appeared in the June 1961 issue of "Architectural & Engineering News."

Photo by Hedrich-Blessing

14WF 78	14WF 78		40th Floor	14'8''
14WF 78	14WF 78	2'6''	38th Floor	16'6½''
14WF 95	14WF 87 (Col. Splice)	2'6''	35th Floor	37 FLOORS @ 12'4'' = 456'4''
14WF 119	14WF 119	2'6''	32nd Floor	
14WF 150	14WF 150	2'6''	29th Floor	
14WF 184	14WF 184	2'6''	26th Floor	
14WF 211	14WF 211	2'6''	23rd Floor	
14WF 211	14WF 211	2'6''	20th Floor	
14WF 211	14WF 228	2'6''	17th Floor	
14WF 237	14WF 264	2'6''	14th Floor	
14WF 264	14WF 287	2'6''	11th Floor	
14WF 287	14WF 314	2'6''	8th Floor	
14WF 314	14WF 342	2'6''	5th Floor	
14WF 342	14WF 370	2'6''	2nd Floor ↓	
14WF 398	14WF 320	2'6''	1st Floor ↓	21'
	14WF 20''x1¼''		1st Basement	13'2''
14WF 398	14WF 320	2'6''	2nd Basement	10'
	14WF 20''x1¼''	4''	3rd Basement	10'
			Mill Line, EL 11'4''	
Col. A1, A8, 40'' x 6'' x 3'4'' / Col. G1, G8, 41'' x 6½'' x 3'5''	Col. G4, G5, 44'' x 6½'' x 3'8'' / Others 42'' x 6'' x 3'6''		BASE PLATES	
A1, A8, G1, G8	A4, A5, B1, F1, B8, F8, G4, G5		COLUMN NUMBERS	

Schedule of columns at critical points on the plan.

Home offices of United of America, Chicago, Ill.

Experience with High-Strength Steel

Using A440 steel for the first 23 stories showed dramatic savings in time and tonnage.

When the 40-story United of America Building, on Chicago's Wacker Drive, was topped out in April 1961, all concerned with the job agreed that:

Lighter weight of the Man-Ten columns employed in the lower 23 floors allowed handling and lifting operations to move more quickly than would have been possible with heavier sections in A7 steel. In fact, the job has remained very happily on schedule from the start.

The unusual, longer (37-ft) column length of three stories, rather than the conventional two-story length, expedited handling. The main lifting crane was shifted every three floors rather than every two. For the fabricator, the freedom from cover plates for many of the lower-story columns eliminated the usual shop problems of hole-drilling and tight attachment of plates.

In general practice, plate thickness for punching A440 has to be reduced in the ratio of 1⅛-in. to ¾-in. to approximate the resistance of A7 steel. Reminder to the structural designer: Punching is less expensive than drilling.

Erection time for the essential steel framing of the 40-story structure was set for six months. The job was started on Oct. 30, 1960, and was topped out by 80 ironworkers on April 5, 1961, nearly a month ahead of schedule.

Some precautions are required in handling A440 steel: Where welding is necessary, it should be done by very experienced men with special instructions and special low-hydrogen rods. This type of steel is not recommended for extensive welding operations. Where possible, welding can be planned for connection to the A7 beams rather than to the A440 columns.

Additionally, in this high-rise job it was estimated that the smaller cross-sectional area of the columns could give a maximum wind deflection two inches greater than the same height structure using A7 columns with cover plates. That figure, while acceptable here, could lead to design modification for greater heights.

In the 23 stories employing the high-strength steel, the weight saved over A7 steel amounted to 800 tons. The A440 totaled 2300 tons, as against 3100 tons had A7 been used.

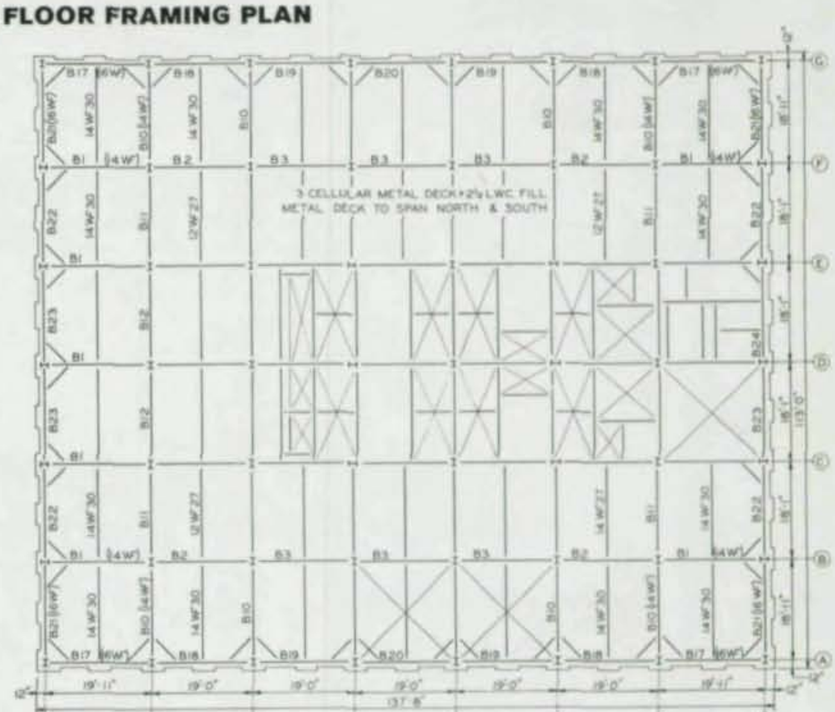
The total cost saving due to tonnage savings in the erected frame is estimated at $45,000. (Total building cost was approximately $22 million.)

In the structure discussed here, floors are of light-weight fill on corrugated steel deck. Walls will consist of poured concrete wall panels, with marble veneer and fixed window wall panels between the concrete units.

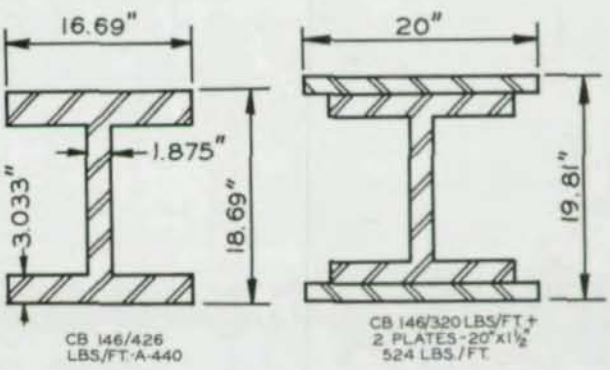
Architects-engineers for the structure are Shaw, Metz & Associates; general contractor: A. L. Jackson & Co.; and the American Bridge Division of United States Steel Corporation was the fabricator and erector.

Building Construction, April, 1961

TYPICAL FLOOR FRAMING PLAN



DETAILS



Typical cross section of columns (left) for first floors in Man-Ten steel. The larger cross section (right) indicates the cover plates that would be required for equal strength with A 7 steel.

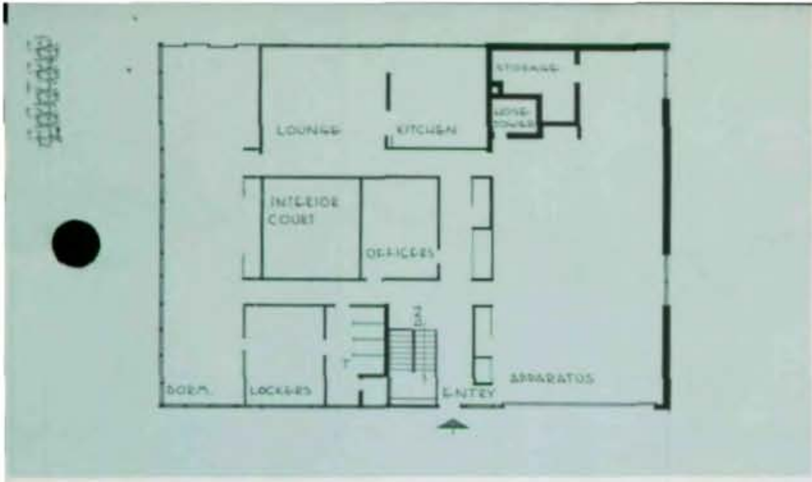
Cedar Rapids Fire Station #8 shows what can be done to achieve style, utility and economy in a modern firehouse located in a new residential area. Exterior steel is painted dark brown, and Fiberglas panels are gold-colored.

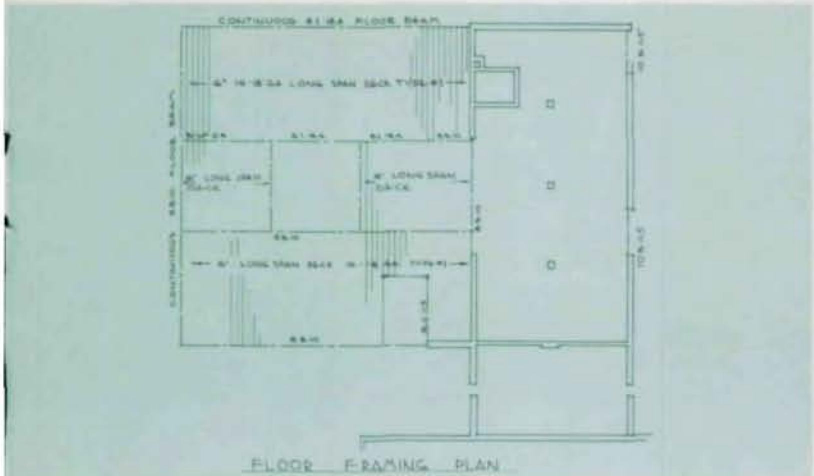
FIRE FIGHTERS GO MODERN

Cedar Rapids Fire Chief Jesse Hunter needed a two-company fire station for a rapidly growing suburb of this Iowa city, and he specified that it be of incombustible construction, durable yet not elaborate, easily maintained, and above all of maximum utility. The big problem was the available plot: it was small and irregular, well covered with trees and surrounded by residential property — and it sloped from the street to about ten feet below street level.

The very obstacles of the site, according to Richard D. McConnell of Architects Crites and McConnell, architects for the job, "turned out to be the key to the solution. . . . To preserve as much of the natural characteristics of the site as possible, the living quarters and apparatus room were placed at the level of the street and connected to it by a bridge. This left the ground floor open for parking and recreation.

"The decision to use steel," Mr. McConnell says, "was based on our cost analysis (the final cost, exclusive of architects' fees and sodding, was $121,-





Photos by Julius Shulman

Floor plan (top) shows living and sleeping quarters on the same level with apparatus room. This arrangement has proved most effective when an alarm rings. Framing plan shows how spandrel beams provide bearing for the six-foot long-span steel decking.

Plot dips ten feet below street level. This dictated a connecting bridge to apparatus room. Clerestory windows provided needed height for overhead doors and good general light. Part of ground floor (lower picture) was left open for parking and recreation.

217 or $17.60 per sq ft) and on the design concept which called for the visual lightness possible with steel."

On the exterior, the visual effect is strengthened by the repetitive use of lightweight steel tubing to carry the loads rather than the more conventional column-and-beam framing. This system also allows light sections for the spandrel beam so that it reflects only the depth of the cellular floor plus terrazzo topping. The spandrel is eliminated as a visual element from the inside, and the glazed areas can extend from floor to ceiling. The Fiberglas-surfaced insulating panels contribute to the effect of lightness, and by contrast in color emphasize the structural pattern.

Brick bearing walls, used for contrast with the light steel frame, contribute to the sense of stability.

The interior also reflects the feeling of lightness established on the exterior. This is accomplished both by a minimum of construction in the glass walls as well as by the color and texture of the finished materials, white terrazzo floors, white ceilings, and predominately white walls. Strong color is used for contrast as well as dark-stained wood and repetition of brick.

Firemen are known for their precision and cleanliness, and the building reflects this feeling by its lightness, cleanliness and machine-like quality.

Radiant heating coils were placed over the steel floor and under the white terrazzo. The exposed undersurface was sprayed with a two-inch covering of insulating material. The steel deck is exposed and painted in the apparatus room and on the lower floor. The remainder of the building has an acoustical tile ceiling. Clerestory-type treatment around the garage area provided needed height for overhead doors as well as providing good general light.

Two old firehouse traditions were imaginatively abandoned in the new station. The living and sleeping quarters and the apparatus are all on the same level, and so there are no trap doors to go through or brass poles to slide down when an alarm sounds. This new one-level route to the apparatus is quicker and safer. Secondly, this firehouse dispelled the notion that when economy and utility are wanted, then beauty has to take a rear seat.

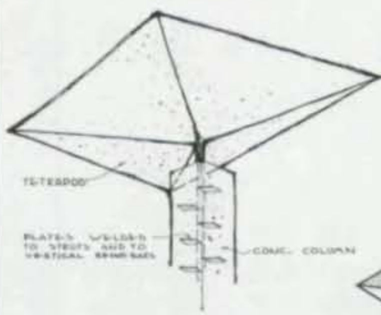
Chief Hunter reports that the men assigned to the new station are very proud of their quarters and keep everything spick-and-span. Even the neighbors are pleased, according to Chief Hunter, although their first reaction to having a fire station in their new residential area had been one of dismay. Upon completion, however, the residents became justly proud of it, and they are happy to have the protection and the good-looking building in the area.

The modular type of construction made it possible to use similar components in another fire station which was built at the same time. Although the stations were built by different general contractors, much of the sub-contract work and material purchasing was done on a joint basis. General contractor on Fire Station #8 was Abell-Howe Company, Cedar Rapids.

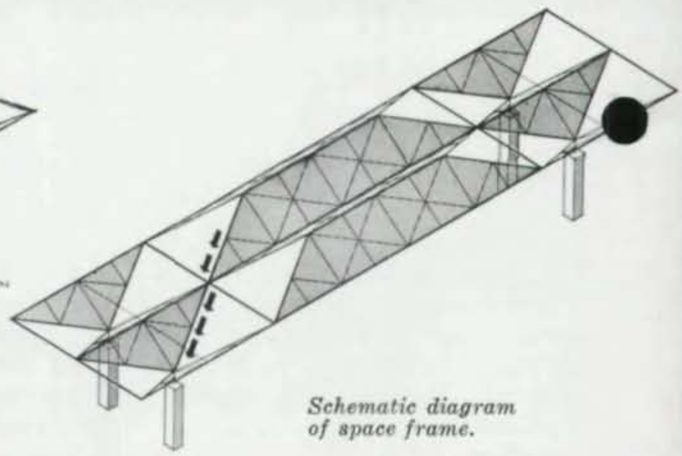
TWO FRIENDLY BANKS

The last decade has seen a revolution in the way a bank addresses its public. Banking institutions, whose stock in trade had always been a solid resistance to change as a mark of stability, have been competing increasingly with glamour investments. Analysis showed need for an about-face in their corporate image, and they displayed the results of this fresh thinking as the population spilled farther out into the suburbs and required branch banks. The new buildings are friendly rather than forbidding. The elaborate old stone and marble fortress has given way to clean, sharp, up-to-date architecture. Especially favored is some plan for offering all banking services in one wide-open and honest area with clear spans made possible by structural steel framing. The two banks shown here share that philosophy but still present quite different expressions of the new face of banks.

Floating roof of inverted pyramids spans 50x80 ft of uncluttered banking space.



Steel angle struts transfer axial loads to columns.



Schematic diagram of space frame.

CASPER

The Guaranty Federal Savings and Loan Association in Casper, Wyoming, appears gay and festive with its hexagon-motif roof overhanging enough to shelter pedestrian and vehicular traffic at a drive-in window. It is informality expressed in three dimensions; it seems to say, "Come on in — it's easy to bank with us."

The architectural device that figures most prominently in this impression is a blending of function and beauty demonstrated by the use of a simple tetrapod. Use of this technique by Robert Wehrli, of Casper's Architectural Guild, created a column-free interior of 50x80 ft. while also providing maximum air and light. The work space is open to the skies yet essentially free of direct sunlight for most of the working day. The overhang also permits non-glare, natural lighting without going to the expense of draperies.

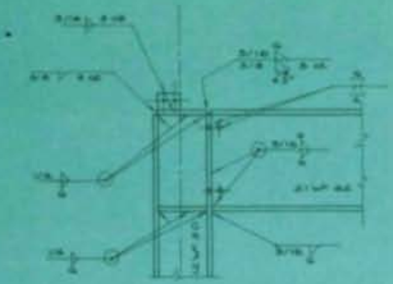
The tetrapods and space frames are of steel, fabricated in Casper by Pittsburgh-Des Moines Steel Company. Since space frames transfer their loads to adjacent diagonal tetrapods, shear plates at the transfer points were a special consideration.

To give a floating appearance to the entire roof structure, the tetrapods are suspended above concrete columns on thin (2½ x 2½-in.) steel struts. These struts are exposed about four inches, then extend well down into the columns and transfer axial loads to the concrete by a set of leaf-like steel plates welded to the struts and to the vertical reinforcing bars (see sketch above).

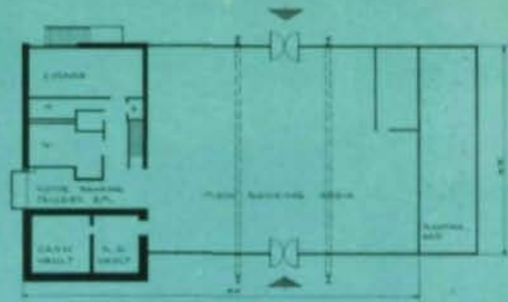
The form of the roof suggested the flattened hexagon shape which became a design feature. These hexagons are used throughout in the design of such elements as signs, door pulls, hardware, escutcheons, teller stations and table tops.

Exterior finishes are aluminum fascia with ceramic tile between the columns. The roofing is built-up type on flat areas, and mineral roofing was used on slopes.

Total cost for 8360 sq ft of basement and grade floors was $164,330., or $19.65 per sq ft. General contractor was L. D. Liesinger Construction Company, Inc. of Casper.



Welding connection at the knee.



Plan is divided into main banking and vault areas.

Rigid frame spans 50 ft-2 in. to allow column-free area. Precise nature of steel contrasts with white stone.

Left, visual lightness is combined with strength and permanence. Right, steel was used for the economy of long-span construction.

Photos by Hugh N. Stratford

EASTGATE

More conservative, but just as striking, is the small suburban Eastgate branch of the Seattle-First National Bank. The branch is located near the terminus of a major cross-state highway, and the parent banking organization, largest in the State of Washington, stipulated that the new branch must have "visual impact when seen from a fast-moving car." Architects Mithun, Ridenour and Cochran of Bellevue, Washington, chose steel to give the desired effect of lightness combined with strength and permanence. White-painted steel fascia sun louvers rimming the major portion of the building contrast effectively with white rubble stone used on the vault area; the total effect is well-organized precision combined with casual sturdiness — eminently suitable for a suburban bank. It has good residential, human scale which in its own sober way is just as inviting as the gay offering of Casper's new bank.

The plan was divided into the main banking area and the office and vault area. Since the client desired a column-free expanse for future flexibility of the banking section, three rigid frames span across 50 ft-2 in. This space is enclosed in glass and plastic walls, acoustic tile and a ceiling of exposed five-inch, 18-gauge T-steel decking. The back area is T-steel decking over light steel beams supported on pipe columns. All steel is exposed and painted white.

Donald C. Cochran also cites the choice of steel for its long-span framing economy, for versatility — it was used in the main structure, window mulls, roof deck, fascia sun louvers, trim and miscellaneous — and for its precise beauty. Cost for 6000 sq ft of basement and grade floors: $20.66 per sq ft.

Gerard R. Torrence was structural engineer, Stewart-Martens Co. was the general contractor.

ANATOMY OF A MEDICAL SCHOOL

by C. M. CORBIT
Senior Regional Engineer, AISC

When the Los Angeles architectural and engineering firm of Flewelling and Moody was commissioned by the University of Southern California to prepare plans and specifications for an instructional building and research laboratory for its School of Medicine, Mr. Flewelling decided to visit the most modern of similar plants to learn from the experiences of their administrators which planned features should be retained, modified, or omitted. His journey took him to two recently constructed medical research buildings in the Middle West, to the East Coast and to Louisiana.

On his return to Los Angeles, Mr. Flewelling and his associates tabulated the accumulated information for guidance in the actual planning of the project. The result is an L-shaped building located on a hilltop, adjacent to the Los Angeles County Hospital. This new unit of the University of Southern California Medical School will provide full instruction for the first two years of medicine. The remaining years of medical education will be given at the County Hospital in conjunction with the use of facilities of this new school.

The building is separated into two components. The Seely Wintersmith Mudd Memorial Laboratory of Medical Sciences is housed in a steel-framed six-story-and-basement structure which dominates the site. It is rectangular in plan, 45 ft wide by 144 ft long. The second component, Paul S. McKibben Hall, is the two-story-and-basement instructional building, also steel framed. It is 92 ft wide by 107 ft long and is joined to the six-story building by a connecting link — the first floor is a spacious lobby serving both buildings, and the second serves as a lounge area for faculty seminar groups as well as a connecting corridor between the two components. Along the main entrance side of the building this second floor area is set back from the wall so that it overlooks the lobby area immediately inside the entrance.

Columns for the structural steel frame of the laboratory building are spaced 20 ft on centers along the longitudinal dimension, which is east and west. Across the width of the building the columns are spaced 20 ft-6 in. on centers. This symmetrical spacing is ideal because the rooms on the north side are, by planning for their specific use, shallower than those on the opposite side. The corridor is therefore off-center with its south wall being close against the north face of the center line columns.

The building is designed to resist seismic forces. The consulting structural engineer, Carl B. Johnson, elected to use wide-flange beams of H-sections for the columns in the north and south walls to take advantage of their larger resistance to bending. To reduce the bending moment induced by east-west forces he used 34½ in.-deep spandrel trusses framed between flanges of these columns.

The structural concrete floor spans 6 ft-10 in. between 12 in. WF beams which in turn are supported by 18 in. WF beams. In addition to providing the structural support for the imposed dead and live loads, the floor has been designed as a diaphragm to deliver the north-south seismic forces to the shear walls in each end. In these end walls the steel framing is designed for vertical loads only. The design of the horizontal diaphragms became somewhat complicated because of the size and location of openings for stairways, elevators and utility ducts. In spite of these, however, the computed deflection of the diaphragms was kept within one-quarter of an inch.

The two-story instructional wing is in reality a separate building designed to resist the lateral forces its own mass would create. To accomplish this separation, the beams from the lobby, second floor corridor, and roof rest directly on Lubrite bearing plates on haunched supports where they join the instructional building. The beam ends are provided with sufficient clearance so that in the event of an earthquake there will be no battering action transmitted from one section of the combined building to the other due to their different periods of vibration.

The instructional building has five multiple discipline laboratory classrooms and one lecture room with a seating capacity of 98 on each of its two floors. The lecture room floor and ceiling both slope down towards the speaker's platform.

The acoustical problems throughout the building were expertly solved by Dr. Leo P. Del Sasso, consulting acoustical engineer. The success of his recommendations is probably most apparent to the layman when visiting the lecture rooms where a speaker may talk without raising his voice and without the aid of a public address system and be heard distinctly by everyone present.

The classrooms contain four cubicles, each of which has desk space for four students. Each student is assigned his own space for the year so that all of his work, except that required in attending lectures, is done at this one station. Each cubicle has a specially designed laboratory work-unit of chemical-resistant molded plastic sinks and table tops conveniently located in the center of the cubicle to serve two students on each side.

Because plumbing for laboratories is a major item of expense, the architects were anxious to devise a scheme for keeping this cost to a minimum. They accomplished this by running all of the horizontal piping for the classrooms on both floors beneath the second floor, taking off from these feeder lines with vertical pipes to the stations above and below, which are identically located on each floor. This same idea was of course also carried out in the six-story laboratory building so that between the two a very substantial savings resulted.

The architects in making the survey had learned that one of the vexing problems encountered in laboratories concerned the piping for distilled water, Such water is distilled on the roof and must be entirely free of any contamination when delivered through the outlet valves. This means that the piping must be of block tin and the valves specially lined. Wherever joints are required, they must be made by fusing. This is a difficult operation to perform, and complete fusion of all joints cannot always be accomplished. Therefore an occasional leak is bound to occur. By planning the piping so that the joints are located over the drain areas at the stations where the water is drawn, damage from flooding should be nil. Should the volume of water in a stand of pipe be greater than the capacity of the drain provided, there is an additional outlet which would take care of the overflow. This is nearby in the corridor floor where its prime function is to carry away the water from a deluge shower to be used in an emergency by anyone exposed to harmful contamination.

The north side of the six-story building is devoted to small laboratory rooms. The wall along this side contains windows on five-foot modules. These are glazed with slightly tinted glass. The south wall is solidly faced with charcoal-colored one-quarter-inch Vitrolux. The end walls of the building for aesthetic effect are slightly concave on the outside. These are faced with light gray California granite which has been given a texture by shot blasting. Around the base the building is faced with black granite.

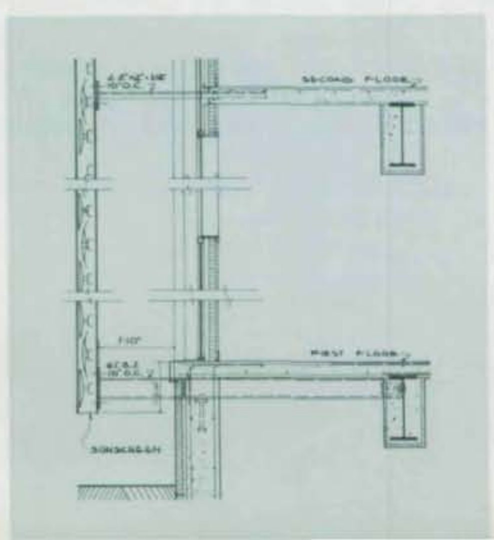
Because the architect had delved so thoroughly and intensively into the multitude of problems encountered in the planning and designing of such a highly specialized educational plant as this, he has achieved outstanding success. Inside, the arrangement of the specially designed equipment, their location, and the overall planning and arrangement of space testify to the great degree of efficiency attained. This is not attained, however, at the sacrifice of architectural beauty. One is impressed with the effective uses of materials and colors and the pleasing proportions of rooms, corridors and exterior elevations.

The general contractor for this $2,800,000 structure was Myers Bros., of Los Angeles.

A spacious lobby serves both buildings. Special features of the teaching facilities are in turn being copied by other medical schools.

Entire side wall of the Mudd Laboratory is tempered enameled glass. The 6x5-ft panes present a graceful, imposing facade.

Laboratory classrooms feature a single piping system for two floors, resulting in considerable savings in material and labor.

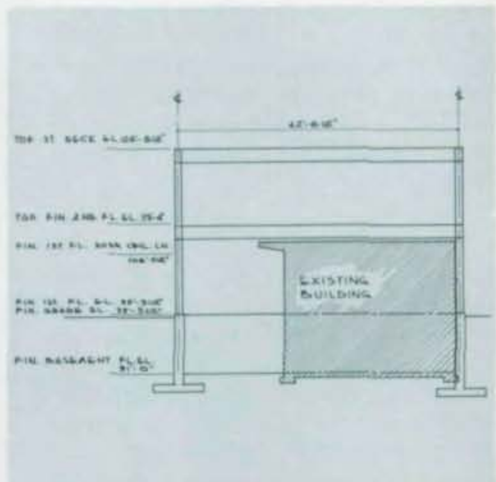


Detail of sunscreen seen in background of photo above.

The older building is visible behind the two-story-high steel columns which support the new building.

BUILDING AROUND A BUILDING

Completed building has a monochromatic color scheme: buff-colored brick, raffia-tan panels and chocolate-brown steel columns.



Cross section shows how the new building was built around the existing structure.

PROBLEM given Lang, Raugland and Brunet, Inc., architects and engineers of Minneapolis, Minnesota: Expand the David Agency building, a one-story structure on a limited plot, without interrupting use of existing office space; do it on a low budget and within 120 working days so that a tenant could then occupy part of the new space.

SOLUTION: An independent two-story structure built around the original building. The frame had to be rigid since the new building was not to be laterally anchored to the old one. The new second floor was just above the existing roof, and so the designers reasoned that "placement, support and removal of concrete would have been difficult if not impossible. The new footings on the south side projected under the existing wall footings. Keeping the footing load as light as possible dictated steel frame construction."

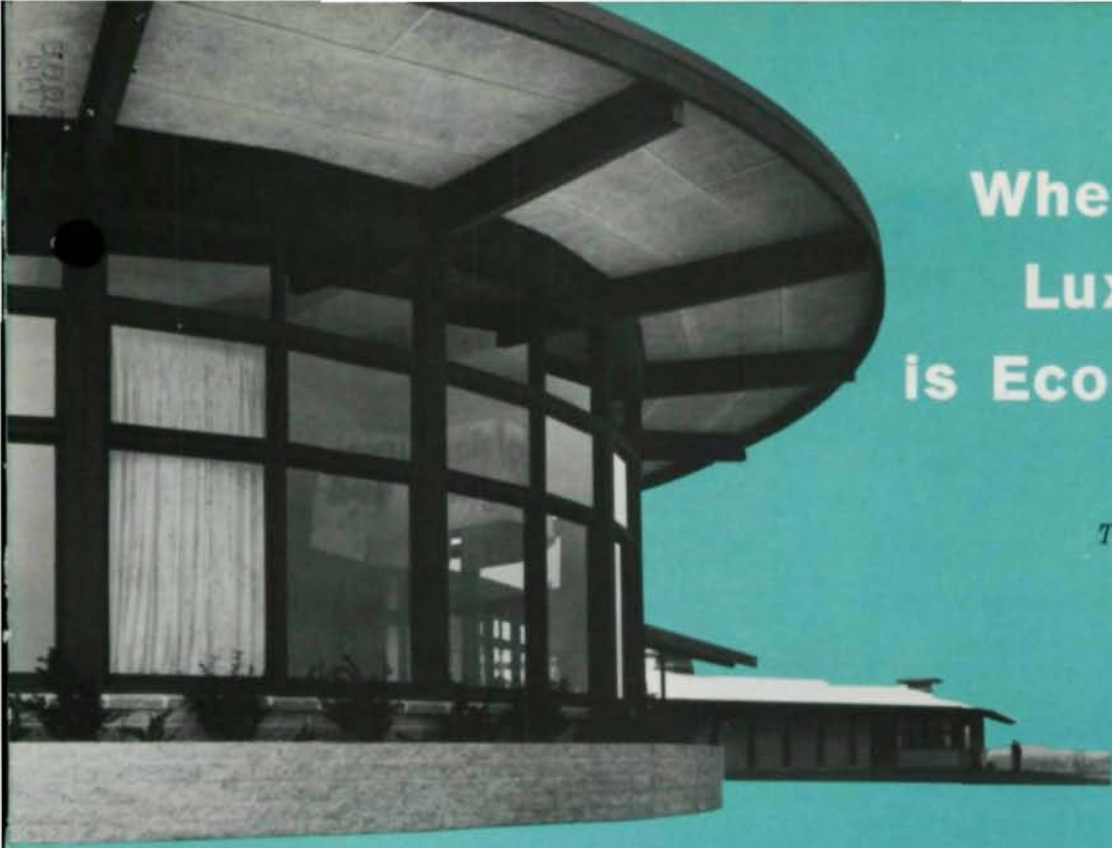
Due to space limitations, steel columns were erected 2½ in. from the existing rear wall and left exposed. Street-side columns were also left exposed so that placement of interior movable partitions planned for the second floor would not be bound by column locations.

Two rows of columns 42 ft-6 in. apart support the new second floor and roof. The beams framing across the top of the existing roof are designed rigid at the columns to provide stiffness required for wind load, live and dead loads. Fixity was established between columns and beams by field-welding the beams to bottom seat-plates previously shop-welded to the columns. Loose top plates were also field-welded to columns and beams. All welds were down hand. Shear web plates with two erection holes were shop-welded to beam webs after moment connections had been made.

As stipulated, all this was accomplished on schedule while the David Agency carried on its insurance business as usual.

RESULT: The crisp new building above, with almost three times as much premium space as its predecessor.

Total building cost was $161,116 for 8248 sq ft, or $19.54 per sq ft.



When Luxury is Economical

This country club cost only $10.10 per sq ft, yet promises ease of both maintenance and rental.

From the clubhouse site, highest on the property, members may overlook the entire golf course.

"We were able to build York's Out Door Country Club for only $10.10 per sq ft," stated the designers, "through framing the one-story building in structural steel and leaving the steel exposed throughout 90 per cent of the building." The interior steel exposure brought a double bonus: it provided an attractive architectural feature and eliminated the cost of a separate ceiling.

"Further economies were realized," adds G. C. Weisensale, engineer-partner of Associated Architects and Engineers of York, Pennsylvania, "through using a modular system of 7 ft-2 in., so that all the framing spanned either 21 ft-6 in. or 28 ft-8 in. All beams were 12-in.-deep sections and all columns 4 x 4 x ¼-in. steel tubes. Shop connections were welded and ground, and all field connections were bolted." The structural steel weighs about 4½ lbs/sq ft of roof surface, not including bulb tees which support the Insulrock roof panels.

The result is a building low in first cost and low in future cost. The shop coat of paint for the steel was specified to match the finish painting, and repainting is planned on an eight-year cycle. The steel frame will never warp or rot, and it is termite-free. Terrazzo floors are provided in most of the public areas, and exterior masonry is repeated on many of the interior walls to further minimize maintenance woes.

A third factor of the building's economy is operating income through well-planned provisions for rental to groups of varying sizes and needs. The ballroom, private dining room and main dining room can be opened into one huge Z-shaped area—with no load-bearing columns to block the view, serving or dancing. This space comfortably accommodates as many as 550 persons for either club dances or rental groups. Any of the three rooms can easily be closed off and rented separately, and their arrangement minimizes the moving of heavy furniture.

The exposed steel roof framing creates an interesting and attractive pattern over the dining area as shown in the accompanying photograph. Until recently, framing for this kind of rambling structure has been more familiar in wood, but the Out Door Country Club is another example in a continuing trend. Buyers of buildings are beginning to realize that steel, far from being useful primarily for skyscrapers, is also the most desirable framing material for many one-story structures. The reasons are obvious: more usable floor space, faster erection, greater durability, less maintenance — plus, often, lower cost than wood.

General contractor was Kaltreider Construction, Inc. of York, Pa.

Dining area is unencumbered by columns. Simple steel space frame is painted redwood color.

Photos by Jim Hayman

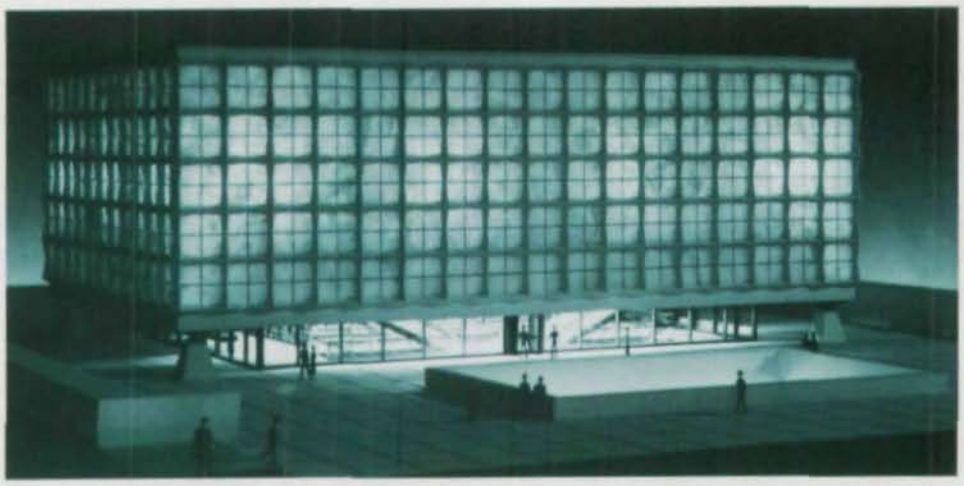


Photo by Ezra Stoller Associates

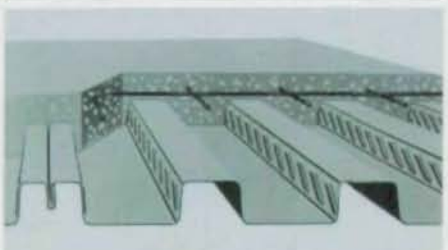
A441 FOR VIERENDEEL TRUSSES

Four Vierendeel trusses, spanning 130 ft and 87 ft, form the exterior walls of the Yale Rare Book Library. These 44-ft-high trusses and all columns will be fabricated of A441 steel with welded connections.

The exterior finish of the facade will consist of a granite veneer over the truss members, with onyx-windowed inlays. Architect: Skidmore, Owings & Merrill. Structural consultants: Paul Weidlinger.

IDEAS FOR MODERN BRIDGES

A booklet describing 36 bridge designs was published recently by the American Bridge Division of U.S. Steel. The projects, originally submitted in the 1959 Steel Highway Bridge Design Competition, were chosen on the basis of the individual ideas for simpler, safer, more attractive and economical short-span bridges. Copies of 36 Ideas for Tomorrow's Short-Span Bridges are available from 525 William Penn Place, Pittsburgh 30.



STEEL DECK ACTS COMPOSITELY

Inland Steel Products Company is producing a new floor deck – **Hi-Bond** – that provides a vertical and lateral mechanical composite bond with concrete flooring without reinforcing bars. The contoured lugs are formed in the web during the rolling process.

On the reverse side, these indentations supply keys for sprayed fireproofing. The thin rods in the drawing are temperature steel inserted by the contractor. Fast to erect as a permanent form, **Hi-Bond** eliminates shoring and is a safe working platform. For more information: P.O. Box 393, Milwaukee 1.

The Connecticut Bank and Trust Company in Hartford's Constitution Plaza was designed with A7 steel. When ASTM A36 was approved, structural engineers Weiskopf & Pickworth redesigned the 20-story structure and saved 150 tons of steel, or about one pound per square foot. Dollar savings for structural steel were between six and seven per cent.

Kahn & Jacobs are architects for the owners, Constitution Plaza, Inc.; Carson, Lundin & Shaw are architects for the Bank. General contractor: F. H. McGraw & Company. Structural steel fabricator: Bethlehem Steel Company.

A36 STEEL APPROVED IN N. Y. C.

Use of A36 steel with allowable working stresses of 22,000 psi — ten per cent greater than A7 — was approved by law for New York City in September, 1961.