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AN OPEN LETTER
FROM THE
STRUCTURAL ENGINEER
TO HIS FRIEND . . .
THE ARCHITECT

By John W. Hummel
Professional Engineer
To the Architect, my Esteemed Collaborator
in the Great Game of Creating Space
within the Budget:

Dear Sir:

Quite often in recent times, you and I have witnessed the capsizing of our design cost estimate as it disappeared into the credibility gap; and we have looked into each other's eyes and asked, "Where did we go wrong?"

At the risk of being presumptuous, I would like to offer some suggestions from my studies along these lines so far as structural framing is concerned.

I might start out with the design proverb that "Form Follows Function". This is your line, however, so I'll merely paraphrase it slightly. Structure Follows Loads but Avoids Cost. I don't suppose this quip will inspire a new school of design, but please consider it as an approach to better planning. Allow me to elaborate on what I think structure should be.

In a nutshell, I implore you to keep it simple. Find a theme of subtle repetition and modularity for the skeleton of your building and do not deviate therefrom. I suggest that complicated, dissimilar, experimental framing details strain the present day desire for automated systems of fabrication. When it comes to costs, such straining comes high. Our accomplished construction industry can perform most any feat we specify but not at matinee prices. Our clients hesitate to pay too much for a "research and development" phase on their project when they must save something for the "Operations" phase.

In the interest of promoting simplicity of structure without sacrificing ingenuity, I have reached into my file labeled, "It Might Have Been" and have collected the following pointers:

**MODULAR PREFABRICATION**

Structural steel, precast concrete, "glue-lam" wood and like components should be selected in predevised packages like a child's building blocks or like the erector sets we once enjoyed. The bigger the budget, the bigger the package. Keep the number of different configurations to a minimum. Try to develop all modulations of shape and size from one basic geometric theme. Try to make all connections of parts according to the same detail; or at least keep the various details in the same family. Remember automation...re-tooling or re-forming is expensive. This is also applicable to cast-in-place concrete so far as form work is concerned. If you want free form, this is the medium, but it pays to think..."re-use of forms" and..."standard lumber dimensions".

**TIME OFF FOR FLEXURE**

Don't over work the bending resistance of materials. Separate the heavy floor loads from the long spans. When long spans are a must, allow adequate depth for beams. Deep trusses are a better buy than shallow, stocky girders. Remember that an increase in depth to span ratio also reduces deflection.

Use continuity in your joist or beam arrangements. Think of cantilevers only as an extension of other
Open Letter to Architects

flexural members. Note: Please don't "paste" a cantilevered canopy to the face of a wall. Let it be a continuation of some internal horizontal framing.

STACK VERTICAL LOADS NEATLY
Make column locations in upper stories coincide with columns in lower stories. This goes as well for bearing walls. Catching a column or wall from above on a huge girder or truss can be a severe strain on the pocketbook as well as on the building frame. It must be, try to fashion an arching or vaulting type of support so that axial stress will dominate.

DON'T FORGET LATERAL LOADS
A professionally designed building frame should exhibit toughness and resiliency in resisting wind, mild earthquake or blast, even if such forces never occur. If you are thinking about this as you design, then providing such strength is not difficult or expensive.

One excellent method of providing lateral support is to build continuity into the frame, just as I discussed for beams. This is cast-in-place concrete's strongest suit. Welded steel will also provide continuity but usually at a slight cost premium.

A building is inherently a "box like" structure; thus a most natural way to provide lateral stability is to make use of the "diaphragm" or "plate" stiffness which is present in the walls, floors and roof. This comes at no additional cost. It is applicable to wood frame residences and steel skyscrapers alike.

There is a catch to the "box" scheme, however. Good, sound attachment of the various planes at their intersections is required. This is easy enough to accomplish at a wall corner, but also be sure to secure the roof deck to the walls. Another way to kill the potential of the "box" is to cut the walls full of holes. Some bracing system must substitute for the weakened walls if such openings are required.

FOLLOW THE LOAD
Back to my paraphrased proverb. There is no substitute for getting the "beef" to the points of maximum stress. To aid in this logistics task, imagine the general flow of load from source to reaction. Imagine how your body, acting as the structure, would work best. I might advocate the conservative idea that two feet squarely planted beats a lifetime of bad posture.

Avoid abrupt changes in material shapes or types. Don't "squeeze" the structure at its most critical points. Probably the most abused locations are in concrete flat slabs at the columns, shell structures at their abutments, precast beams at their bearing points, and in walls where openings occur. Notice that in general the points of concern are points of stress concentration.

Remember, for example, that all arches or vaulting structures come equipped with thrust. Accommodate ties or buttresses when allotting space. This includes rigid frames, folded plates, "hypar" shells and some space trusses.

AVOID COST
Now that we have a "healthy" structure, let's turn an eye to the efficiency of the framing scheme.

You might wish to combine your materials to serve both architecturally and structurally. If you are careful, efficient combinations can also include mechanical, electrical and plumbing designs.

Using structural components architecturally may not be your cup of tea, but the reverse process would not conflict too much with design philosophy. As you know, the idea of using architectural components structurally enjoys a long history; for example, in masonry bearing walls and arched portals. Handrails sometimes make good upturned girders. Window walls can bear load.

A word of caution, though, on combining. Don't get the assembly so sophisticated that field coordination is next to impossible. Many construction trades don't like to hold hands while working together. Don't require delicate, finished surfaces to be installed early in the game along with the rough structure.

Give consideration to the probable assembly or erection procedure of your building structure. No tricky stuff. . . remember the automation age . . . special skills at special costs. If it took seventeen hands to get the roof on your model, it might take seventeen cranes to erect the real one. I realize that the object of design is to favor the Owner rather than the Contractor, but usually a dual approach is compatible.

You may prefer to leave these matters solely to your structural engineer. On the other hand, you may be well aware of this sage advice and could probably add some pointers of your own. In either case, I have intended only to stir some ideas to the surface for our mutual benefit.

Until we embark on our next Monumental Achievement (which I hope is not a redesign to meet the budget), I remain your faithful servant with slide rule in hand.

Sincerely,
The Structural Engineer

P.S. A reply would be welcomed. I suspect that you have some "sage" words of advice for me in rebuttal.

T.S.E.
My remarks today will be directed toward the interprofessional trends now materializing. While others may deal with more specific aspects of design within their own field, I will briefly suggest how all of us involved in decisions concerning our environment, are actually becoming more interrelated, inter-dependent, and I hope inter-concerned.

I think we all see this trend to varying degrees in our own practice or experience. We find ourselves faced with problems that go beyond the traditional scope of our own particular professional training. We gradually are learning to identify these expanded areas with greater sophistication and less jealousy than before. The complexities of the environment make it essential that we utilize the broadest possible professional competence available (team approach or collaboration or whatever you call it) and at the same time utilize the latest techniques of gathering and evaluating data. These new techniques and processes are a result of the computer and tremendous potential it possesses. Names like SYMAP, TYPEMIX, COMPUTER GRAPHICS, are cropping up in today's publications and conferences, among other sources.

The time is quickly passing when we can each dwell in our own Ivory Tower and not recognize the overlap involvement our environment requires.

We find that a design determination made by one profession actually affects other parts of the environment or affects it as a whole and consequently will affect other professional areas. The sanitary engineer can, by virtue of his sewer plan, affect land use of a community or an area; the planner can, by his decisions on use patterns, affect the highway and circulation systems; the highway engineer can certainly affect the character and quality of a neighborhood or a natural landscape by his design for moving vehicles; the landscape architect may, by his design decisions, affect the form and locations the architect and his buildings must respond to.

We find that in our firm we are participating more and more as a part of a collaborative group. As an example of this, I would cite the Lakeview Estates development here in Lexington. This is an area formerly owned by the Lexington Water Company, consisting of some 1,100 acres. Before any zoning of the property was allowed the Planning Commission insisted that a master plan be developed for
The Team Approach to Design Opportunity

the whole area. Our firm was employed to coordinate development of this plan. The rest of the "team" then started to come together and contributed to the evolvement of the plan. Hammer, Greene, Siler and Associates did the economic feasibility studies which guided in the determination of land use allocation, phasing, and financing. Civil engineer for the project was Bill List; sanitary engineer was G. Reynolds Watkins; the Howard K. Bell firm did the engineering for the lakes and dams. For the shopping center area Homer Hoyt did the marketing surveys; Chrisman-Miller and Associates were consultant architects, and Harry Lockner Associates were the traffic and transportation consultants. Our firm then, in working along with these various consultants, was responsible for the land use planning and design, layout and the detail site planning of certain special areas. And I shouldn’t neglect to mention the contributions made by various members of the local planning staff.

Other projects that our firm undertakes, which are multi-discipline in scope, are large scale park and resource planning where the areas for development may be as large as 20 to 30 thousand acres. This is exemplified in the midwest where a coal company is consulting with our firm concerning land use in "pre-planning" of 10,000 acres before any strip mining is started. In Peoria, Illinois, we have just completed the first phase of a six-mile-long waterfront planning and design study. The scale and scope of these types of projects increases the necessity, the number and the involvement of various professional disciplines.

The organization within professional firms is changing to include greater professional scope. In our own firm we have planners and landscape architects; within that professional structure we have a specialization of various personnel. Some are expert in general land use planning, others in physical planning, project design, or recreational development, which comprises a few of the "sub-areas" of environmental design.

The Victor Gruen firm is a nationally known firm that offers this interdisciplinary service. The Doxiadis firm is an international firm that has professionals of various disciplines on their staff. New firms are now emerging that are formed by professionals representing many of the design disciplines. The John Andrews firm in Canada and the Recon firm of Cambridge are examples. These firms have recognized the need for the comprehensive approach to design.

State and Federal agencies have to some extent staffed their departments with the various professionals needed for a comprehensive review of projects under their jurisdiction. As a matter of fact these agencies now are exerting heavy demands on the number of graduates from the professional schools.

Training these professionals is, for the most part, the responsibility of the schools of architecture which reflects the multi-discipline attitude by changes in their curriculum and, in many cases, the overt restructuring of several related departemtns into an entirely new school or college within the university. Harvard has had its Graduate School of Design for some time, but the University of California, Louisiana State University and Rutgers, to mention a few, have newly organized schools using appellation such as "School of Environmental Studies" or "Environmental Science".

Faculty composition within these schools is changing in presenting greater breadth and depth of design experience. New techniques are being introduced and utilized in the early training of students. At the University of Kentucky, computer techniques and systems approaches are part of the second year design training. To further emphasize the important trend, it is interesting to note that the assistant dean at the UK School of Architecture is an expert in computer science.

With the vast amount of data and with many professions contributing diverse design talent toward one or a series of designs, it is essential that we equip ourselves with the best tools and the best training possible. The majority of professional schools recognize this.

We may find interesting outgrowths to this type of multi-disciplined design. Perhaps registration as we know it will have to be reconsidered. Perhaps in the not too distant future the registered engineer, or the registered architect or whatever other registration will give way to a broader type of responsibility under a new registration law—a new name, as an "Environmentalist"?!

The challenge is upon us as the design professionals. We can recognize and strive to meet the challenge, or we can ignore the vast potential and go back to what we have behind us. I don't think any of us can be truly satisfied with the disorganized mess we're creating for ourselves. We can't just blame the masses either, we have not been the leaders we need to be; we have not really equipped ourselves psychologically or technically to cope with today's problems.

Designers (and I use the word in the interprofessional plural) should not deal with buildings or landscapes or sewer systems or parking lots but with the environment!
SCHOOLS IN THE ROUND

Cafeteria-Auditorium Building, Paris; Gray and Coblin, AIA

West End School, Louisville; Luckett and Farley, AIA
Schools in the Round

GRAY & COBLIN, AIA
FRANKFORT, KENTUCKY

In 1963 we were employed by the Paris Independent School District to design a junior high school containing nine classrooms, an elementary school containing 18 classrooms and a cafeteria-auditorium building to be used by the students of the junior high, the elementary and an existing high school. The entire project was constructed on a very restricted site located at the intersection of Seventh Street and Houston Avenue. In addition to the problem of a small site an existing large elementary and junior high occupying a large portion of the site could not be destroyed until the new buildings were complete.

The elementary and junior high school buildings were constructed first. These two buildings contain 39,000 square feet and were built for $514,300. While they were being constructed, drawings were prepared for the cafeteria-auditorium building. This building was commenced in August, 1966. It contains 22,000 square feet and cost $497,592.00. The above cost figures do not include furnishings.

The cafeteria-auditorium building is round in conforming to the curve of Houston Avenue and because we felt that the elements occupying the building would work well in a round shape. Then, too, we felt that a round building would appear to occupy less space on a crowded site. The cafeteria, which occupies the ground floor, seats 500 students and is connected to a large kitchen. An auditorium seating 518, a band room seating 100 and a vocal music room for 60 along with various service spaces occupy the upper floor.

LUCKETT & FARLEY, AIA
LOUISVILLE, KENTUCKY

We were instructed to provide physical facilities and materials which would enable the individualizing of an instructional program meeting the needs of children with varying abilities and interests.

Our approach was the design of a building with areas of instruction rather than individual classrooms with a 30 student capacity. Such areas of instruction can accommodate 90 to 100 children in open instructional space plus having one enclosed classroom for each larger area. In addition, the instructional activities can overflow into special project rooms and even into corridor spaces.

An instructional material center contains a large reading room, a film and audio previewing and selection room, book storage room and workroom. Ample space has been provided for storage and circulating the variety of materials and tools to meet the individual needs of the children and the creative planning of the teachers.

A circular design, we feel, lends itself best to the program and economy. This provides the least amount of circulation, exterior walls and roof area. The circular design of the new West End School provides centralized service areas and provides easy access from any part of the building. It was found that the design permits a much larger percentage of instruction space than a conventional plan, when one considers that the corridors may become part of a teaching station. The entire design provides highly permissive mutable space.

Each instructional or learning space will be organized for utmost flexibility to the variety of learning activities which can easily be accomplished by the arrangement of mobile storage units. This will provide instructional units from a very small number of children upward to 90 or 100 children.

Large areas of instruction will be provided with ample storage space within easy accessibility for students and teachers within the unit itself. Each unit will contain a "Wet area". This area will be where classroom sinks are located and where such activities as finger painting, and other art instructional programs can be accomplished without tracking into the main areas.

The school as planned will be of a reinforced concrete structural frame three stories high with exterior walls of brick veneer and concrete block backup. The interior walls in general would be concrete block with the high use circulation areas and toilet rooms having walls of ceramic tile or structural glazed tile. Flooring, depending upon location, will be ceramic tile, quarry tile, vinyl asbestos tile and carpeting, depending upon the different areas. In general, the ceilings throughout the building will be suspended acoustical tile.
Design Conference at UKGathers Large Attendance, Wins Emphatic Approval

A meeting co-sponsored by eight societies of engineers, planners, architects and civil engineers provided on March 1, at Spindletop Hall, the harbinger of things to come within the design disciplines. The Design Professionals Conference provided a forum for the respective design disciplines in illustrating the interdependency of each upon the other in fulfilling the increasingly complex tasks confronting the design professions. Evidence of the heavily attended conference was the overflowing conference room at Spindletop Hall. Engineers, architects, landscape architects, city planners, and a variety of state government officials were in attendance. The trend toward the utilization of interdisciplinary design skills aroused a great deal of interest in the topics of the speakers.

Focusing attention upon the changes now contemplated in comprehensive design was a panel consisting of topics and speakers as "Lexington's Sewage Plan" (Theo Green, George Ely), "Corbin's Downtown" (D. Lyle Aten, A.S.L.A. and John Scruagas), "U.K.'s Campus Plan" (Lawrence Coleman, Director, UK Campus Planning Office), "Midland's New Town" (Jim Prestridge), and "Pikeville's Model City Program" (Bill Turner). This session was moderated by Jim Humphreys.

Room temperature and dialogue became apparently warmer with forceful statements made in regard to team design approach and the societal responsibilities of the design professions. (The Kentucky Architect will present a series of articles highlighting the statements made in both regards.) Highlighting the conference banquet was a speech by John Whisman, state regional representative on the Appalachian Regional Commission. Mr. Whisman's speech will be printed in an edited form in The Kentucky Architect at a later date.

William H. Qualls, Executive Director of City-County Planning Commission, was the organizer of the conference. Another such meeting is now being planned by the Kentucky Society of Architects in collaboration with allied design professions.

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KSA Statewide Meeting
Slated April 19 & 20

The first of three statewide Kentucky Society of Architects meetings slated for 1968 will be held Friday and Saturday, April 19 and 20, in Lexington. A primary purpose of the initial meeting, that of becoming better acquainted with the University of Kentucky School of Architecture, will be observed by an open house at the School of Architecture and a student awards dinner on the eve of the first day, April 19.

Student work will be exhibited during an open house at the School of Architecture and Charles P. Graves, AIA, Dean of the School of Architecture, will be the featured speaker during the student award dinner.

A meeting of the East Central Regional Council, AIA, will be held during the same time period as the statewide meeting of the Kentucky Society of Architects. The Indiana members and their wives will join KSA members and their wives at both the Friday and Saturday programs.

All members and wives are urged to attend this important statewide meeting. More details will be made available to KSA members through their respective AIA chapters.

Addendum

A reference made in the January issue of THE KENTUCKY ARCHITECT was in error regarding the title of the nationally respected publication, LANDSCAPE ARCHITECTURE QUARTERLY, as the LANDSCAPE QUARTERLY. A year's subscription may be secured for $6 at the Schuster Building, 1500 Bardstown Road, Louisville, Kentucky, 40205.

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