

## CONTINUITY IN ACI



Each year around March there is a "changing of the guard" in ACI. When this takes place in federal, state, or local governments, the new administration replaces almost everybody and brings in new people. Those people, of course, will have to learn how to cope with existing problems and it takes quite some time before the system starts working and producing results.

With ACI, however, this is completely different. The new president, prior to his election, most likely spent two years as vice president and as a member of the Executive Committee. During those two years, he had plenty of opportunity to learn about the management of the Institute and had a chance to be part of the decision-making process. Our bylaws wisely make the immediate past president a member of the Executive Committee. This means that he can relate his experience as president during the previous year and give solid advice to the new incoming president.

There are changes also in the Board of Direction but again only four of the twelve elected members are new; the other eight will have participated for one to two years in the deliberation of the Board of Direction. The most senior past president who leaves the Board is automatically replaced by the immediate past president.

Regarding the Board committees, the newly-elected president receives advice from his peers before he appoints the new chairmen. Most likely, a chairman is either reappointed or a senior member from that particular committee is appointed as chairman.

Two very important committees (namely, the Technical Activities Committee and the Educational Activities Committee) follow the same procedure which

means that only a few members leave the committee and are replaced by new ones.

On technical committees, a chairman can be reappointed twice for a two-year term but ACI tries to limit chairmanship on those committees to six years. There could be, of course, exceptions especially when an important document is near publication.

Chapters follow bylaws similar to ACI's and also have a built-in continuity regarding chapter officers.

The importance of all this is that ACI has certain goals and very few of those goals are for a one-year period. A new president might have a slightly different priority than his predecessor but because he was part of the original goal-setting process, he most likely will continue to endorse and work for the ultimate achievement of the goals.

In this continuity lies the strength of ACI.

I took over the presidency with this strength in mind. To move ACI forward all I can promise is that I will make what the late Vince Lombardi called the "second effort." I realize, however, that alone I cannot succeed. I know that I can count on the help and support of the effective staff in Detroit, the Executive Committee, and the Board of Direction. I know I can rely on the work of the administrative and technical committees and the all-important chapters of our Institute. Last but not least, I turn to all who read this magazine and — if I may paraphrase the late President Kennedy — "ask not what ACI can do for you, but ask what you can do for ACI."

Success has a "thousand fathers; failure is an orphan." I am asking you, as a matter of fact I am challenging you, to join me and be a "father" for the success of ACI in the coming year.

Together we will succeed.

# Publications — You Are Getting

## More for Your Money



One of the most important functions of ACI is publications, starting with the now almost worldwide 318 Building Code, which is undoubtedly the most important contribution of the Institute to concrete design and construction. The Code and Commentary have a six-year cycle which means that immediately after their publication, Committee 318 starts the process of revision.

The *Manual of Concrete Practice* (MCP) contains all the important Institute standards and committee reports on a variety of subjects. Practically all symposium papers are published in Special Publications (SP) giving a member references on particular subjects. There are also Monographs covering special fields in concrete design, materials, and construction. The bi-monthly periodical *Concrete Abstracts* reviews concrete literature published throughout the world.

In the field of education, there are publications covering subjects geared to the person practicing in the field. The language of these publications is such that it is easily understood by the technicians dealing with concrete either as a material or with concrete construction in the field.

Nothing is more important, however, than the two periodicals we publish and which go to all members. Until 1979, we had one monthly publication containing both scientific and popular articles, plus news items related to the life of ACI. In the late seventies, the Board of Direction decided to separate the two subjects and authorized the creation of *Concrete International: Design & Construction* which is published monthly. It is more like a magazine rather than a scientific journal and it is one of the publications most widely read by people dealing with all aspects of concrete. At the same time, the ACI JOURNAL, published bimonthly, retained the scientific or archival papers. The original decision of the Board was to give all members both periodicals free for one year and

then charge extra for the JOURNAL. The charge, however, was never introduced and six years later the membership still receives both periodicals with payment of their dues.

In the middle of 1984, the Institute faced a rather "pleasant" problem regarding manuscripts received for the JOURNAL. Apparently, enough people felt that the ACI JOURNAL was the place to publish their papers because suddenly we received many more manuscripts than we could handle before a reasonable time elapsed between receipt of the manuscript and the actual date of publication. The Board of Direction responded to the emergency and authorized the staff to double the size of the JOURNAL to accommodate more papers. The Board also authorized the spending of \$88,000 as an emergency expenditure over and above the approved budget to cover the additional expenses.

To illustrate the magnitude of the problem, the number of manuscripts received were 197 in 1979, 168 in 1980, 149 in 1981, 193 in 1982, and 247 in 1983. As a consequence, the number of manuscripts awaiting publication at year-end went from 8 in 1979 to 52 in 1984.

The Board of Direction asked staff to study the problem and recommend a long-term solution in order to comply with the Institute's Long-Range Plan which says that a paper should be published within six months after acceptance of the manuscript.

At the Denver convention, staff reported the following as the long-range solution:

"Just publishing 90 papers per year (double the 1984 number) in itself will not solve the backlog problem. The solution will also require tighter review procedures to increase the number of papers being

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## President's memo

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declined. A task group of the Publications Committee is working on that part of the problem.

"It appears that even with tighter review procedures, printing of additional papers will be required on a continuing basis to meet the goal of publishing within six months of receiving finished manuscript. To minimize the subsidy, three options for increasing revenues were studied. These are:

"1. Continue to provide the expanded JOURNAL to all members as part of dues, but increase dues to cover additional costs.

"2. Provide the expanded JOURNAL only to those who subscribe to it.

"3. Divide the archival papers into two journals, one devoted to structural design and structural research information, and one devoted to concrete materials and materials research. Committee documents would be divided between the two journals according to subject. Members would be given a choice

of one journal to receive as part of dues with the option of subscribing to the second.

"In each case, *Concrete International* would continue to be sent to all members as part of dues."

At the same convention, both the Publications Committee and the Financial Advisory Committee studied the recommendations and members of both committees felt that the ultimate solution should be Option 3. They also felt that more information is needed before a final decision is made. Therefore, it was recommended to the Board and the Board approved the continuation of the extended JOURNAL for another year (through 1986) and it is expected that by the end of 1985 further data will indicate that the Institute should adopt a long-range solution to our publication problem.

I thought the membership might want to know that we are constantly working on improving all aspects of ACI publications.

*Emory Forbes*

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## President's memo

# The Concrete Materials Research Council — Revisited



In the November, 1984, issue of *Concrete International: Design & Construction*, the President's Memo by then President Ignacio Martín dealt with the formation of the Concrete Materials Research Council (CMRC) of the American Concrete Institute. This is a new and exciting venture by ACI; therefore, I feel it is important that soon after my predecessor's memo I deal with this issue again and bring the membership up-to-date on what has happened during the last six months with regard to CMRC.

The council had its organizational meeting during the fall convention in New York City. The response to the invitation to join the council was beyond expectations. As a result of the first meeting, the council membership is now comprised of 17 organizational and 53 individual members. At first glance, this may look high and unmanageable but we feel that everybody who is interested and endorses the concept of CMRC should be welcomed and should be given the opportunity for input.

There was a lot of discussion regarding the means for raising funds for CRMC. First, we aimed at \$100,000 as "seed" money with no strings attached. Later, we realized that it would be easier to get contributions if we had specific research projects. The next step was to issue a call for research proposals to which we received 15 proposals covering a wide range of subjects related to concrete. Each proposal was assigned to a task committee comprised of three persons knowledgeable in that particular field. The subjects varied from purely theoretical to the more practical, such as research on "cement paste" and research on "design of concrete mixtures." Although we should not put restrictions on the subject proposals, I feel that at least at the beginning we should prefer and support research where the results, after careful reviewing by technical experts, would help ACI to improve specification limits currently in the Code or in other standards.

During recent years, one of the most controversial issues discussed at ACI was the "chloride limits."

Each time ACI held a symposium or forum on the so-called "chloride issue," standing room only audiences indicated a widespread interest in that subject.

Because of the widespread use of admixed chlorides in concrete and the controversy regarding their effect on concrete, several private companies have indicated an interest in cosponsoring a research program under the auspices of CMRC to resolve this controversy. In May, a CMRC task group met in Washington, D. C., to develop a project statement for the proposed work and for inclusion in a request for proposals to be issued by the council. The research will include both laboratory and field studies on "the effect of admixed chloride on promoting corrosion in conventionally reinforced concrete not subsequently exposed to external chloride environments."

A call for support and solicitation for funds was published in the June issue of *Concrete International*. I hope that the membership will respond favorably to this call so that the awarding of the project and the actual work can start before the end of this year. I also hope that the results of the research work will be available by the time the next revision of the ACI Building Code is completed. If we can achieve this, hopefully the new Code will deal with the issue of corrosion by chloride and the limitation of chloride in concrete based on the latest research investigation sponsored by CMRC, using the most modern techniques available.

The message I am sending to the membership is that the Concrete Materials Research Council is a new venture at ACI and we moved faster on this than with any other new concept in the past. Credit is due to its chairman and secretary for this accomplishment. The primary goal of the council is to sponsor research which will result in improvement of limits and tolerances currently in our publications. This will produce better concrete and, as such, it deserves your support.

## President's memo

# How Old Is Concrete?

## Engineering versus Chemistry



It is an accepted fact that the origin of portland cement goes back to the early 19th century when an English bricklayer, Joseph Aspdin, created a cementitious product which when hardened looked similar to building stone found at the island of Portland in England.

The history of concrete, however, goes back to ancient times. The Greeks and Romans used calcined limestone and later developed the pozzolanic cement by grinding together lime and volcanic ash called "pozzolan" which was first found near Port Pozzuoli, Italy. The late Henry L. Kennedy, a past president of ACI in the middle 50's, had on his desk a sample of pozzolanic concrete which had been underwater in the harbor of Pozzuoli for over 2,000 years.

Sometime ago, an article in *Omni* magazine dealt with a fascinating idea which would put the origin of concrete much earlier. According to that article, a French chemist solved the mystery of the world's ancient "megaliths." According to Webster, megalith is one of the huge, undressed stones used in various prehistoric monuments. How did ancient people build the massive pyramids, the Easter Island statues, Stonehenge, or the monolithic arched Sun Gate of Tihuanaco? His solution is "chemistry" instead of "engineering."

According to this theory, we should forget the images of sweating laborers, straining with ropes to pull stones on wooden sleds as we have seen in the movies. The Great Pyramid of Cheops is a structure over 4,600 years old and is nearly half the height of the Empire State Building. It is composed of more than two million limestone blocks — each the size of an automobile — so closely joined on the outside that you cannot slip a piece of paper between them. This is where "chemistry" versus "engineering" comes into focus.

In order to build a pyramid, the early Egyptians had to have made ramps sloping gently enough to enable the huge limestone blocks to be dragged. Any ramp with a gentle enough gradient would have to be

more massive than the pyramid itself. On the other hand, Egyptian workers could have carried crushed limestone to the work site in buckets, mixed it with Nile River silt for the needed aluminum and silicon binder, and added salts available locally as catalysts to make the solution alkaline. They could have dumped the ingredients into wooden molds and a few hours in the desert heat would have dried the mixture to hard rock. This could have been done with neither massive ramps nor difficult tooling. This would also explain how each 2½ ton casing block was laid so close to the next. After one block dried, it formed the mold for the next.

No one knows how the pre-Incan Indians built the monolithic arched Sun Gate of Tihuanaco. The nearest quarry is several miles away over rugged mountains. But legend tells of a long-lost tribal art of turning rock into clay. Even today, witch doctors in Bolivia are known to powder rock, add natural chemicals, put the slurry in a mold, and produce amulets of solid stone. Could a similar method have been used to build the Sun Gate?

Chemical analysis of the stone showing a small amount of silico-aluminates provides the clue. Suppose that instead of hauling a multi-ton stone over mountains, the Indians had simply hauled sacks of crushed saltic rock. They could have added this powder to a silico-aluminate binder and formed it in a mold. The binder could have been made by dissolving common rock in acidic extracts from plants, such as cactus.

This is a fascinating theory but it is totally rejected by archaeologists who support the "engineering" aspect against the "chemistry" theory.

Whoever is right, it is interesting to note that concrete may be much older than we think and that in the ancient structures it might have been "engineering" or "chemistry" while in today's construction it is "engineering" and "chemistry" together which create the marvelous modern structures.

# The Role of Concrete in the Arts



Recently, the Board of Direction of ACI authorized the formation of a new Committee on Esthetics. With that decision, the Board recognized that concrete is not a material for only utilitarian structures but also for many different forms of the creative arts that has to appeal to the beholders' sense of beauty.

After the formation of the Esthetics Committee, Emery asked me to research the history of the usage of concrete in the arts. Being a college librarian by profession, I eagerly looked into the literature and was amazed to find many articles on the traditional, as well as the innovative uses of concrete all over the world. I have realized that the imagination of many sculptors has been stimulated by the unique characteristics of concrete. Whether using it as an indirect medium mixed with sand or fiber or directly for large size sculptures, applying the shotcrete method, artists are exploring the many avenues for the expressive uses of this flexible material.

The space for this memo is very limited; therefore, I can only talk about a few fascinating examples.

Between 1921 and 1954, Simon Rodia, an Italian immigrant and a tile-setter by profession, single-handedly created seven concrete sculpture towers in the Watts section of Los Angeles, Calif. Rodia created the Watts Towers using the direct method with merely a few simple hand tools, a bucket, and a window-washer's belt to support him high up on the towers, the highest reaching 99 feet. The Watts Towers are internationally known esthetic achievements and also, being structurally sound, have survived earthquakes.

The Black Hawk Monument stands 43 feet high on the Rock River near Oregon, Illinois. It is based on a figure modeled by Laredo Taft, and was constructed by the indirect casting method, using portland cement, sand, and granite chips and other aggregates.

I will be very eager to see another interesting work of this same artist at our fall ACI meeting in Chicago. Laredo Taft also created the *Fountain of Time* in Chicago's Washington Park. Thirty-five miles south of Chicago in University Park, Illinois, is the Nathan Manilow Sculpture Park, where stands Bruce Nauman's *House Divided*, a fantastic concrete structure illuminated by interior lights.

One of the most significant achievements in the use of concrete for large scale artistic endeavours happened in Mexico City at the XIX Olympic Games in 1968. Mathias Goeritz, a sculptor and architect, conceived of the idea of a "Route of Friendship" and expressed it by inviting an international group of artists to design and execute 18 monumental concrete sculptures to line a road leading to the Olympic Village. There were three criteria: the sculptures be of monumental type; they be made by a team, keeping in mind solutions related to the city; and—most of all—they be made of concrete.

This vast plan was brilliantly executed. I remember driving along the Anillo Periferico admiring the brightly painted statues, that represented the artistic talents of the many nations participating in the Olympic Games on the *Route of Friendship*.

In France, another visionary artist-architect, Pierre Szekely has proposed and participated in the building of a village of leisure and culture, "Renouveau" at Beg-Meil, in Brittany. Szekely believes strongly in using gunned concrete for sculpture-architecture. He is convinced that "it is possible for houses to be beautiful like eggs, fruit, shellfish, and waves."

In 1975 he constructed a large, unusual concrete sculpture for alpine mountain climbers in the city of Evry, south of Paris. It stands at the edge of a lake, and is called *La Dame du Lac*, "the Lady of the Lake." It is 17½ meters high, curving upwards from its broad solid base, like a rock cliff, making an artistic contribution to the surrounding scenery. It is embellished with ledges and handholds leading nowhere in particular, expressing the challenge accepted by humans to attain the limits of the possible! The artist says of his work: "It is a surface of concrete swept into the air between waters' edge and the lazily undulating hills of the site." He also used gunned concrete as his medium for *Universe de Jeux* at the Grenoble Olympic village, and for *Maison-Plante* at Sebourg, Valenciennes, both large size sculptures. He also participated in Mexico's *Route of Friendship* project, with his sculpture *Soleil Bipede* representing France and Hungary.

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## President's memo

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My research has produced evidence of the most surprising uses of concrete in Africa. In Nigeria, colorful, concrete sculpture, both traditional and modern, is made by the Fante tribe. They erect monumental military shrines with life size soldiers, officials and symbolic animals, using portland cement. The Ewe tribesmen, fishermen, farmers, and weavers, living in southeastern Ghana have evidently encountered Western civilization. Their modern roads are traveled by cars and concrete block houses are built along those roads. But the modern highway suddenly turns into sandy roads which are dotted with crude concrete ritual statues which act as protective figures for village, family and individual. More affluent families have local sculptors erect elaborate funerary memorials, made of cement mixed with the local sandy soil.

To mention a few other well-known structures which are made of concrete, let me list the huge

Christ statue at the top of Mount Corcovado in Rio de Janeiro, overlooking Guanabara Bay, and the memorial to Charles deGaulle in his hometown, Colombey-les-deux Eglises

I've discussed sophisticated and primitive artists, working with concrete on several continents. We need not go so far, however, to find beautiful artwork using the material that ACI is all about. Fred Nassaux, staff engineer at ACI headquarters in Detroit, is not only creating sculptures made of ferrocement, but he is making portraits using strictly cementitious material. His fine work will be exhibited during the Chicago convention this fall.

Upon completing my literature search, I was delighted to find that concrete is not merely the functional material that my husband's profession deals with, but it can and should be a medium for artistic expression and lasting beauty.

Lily Farka

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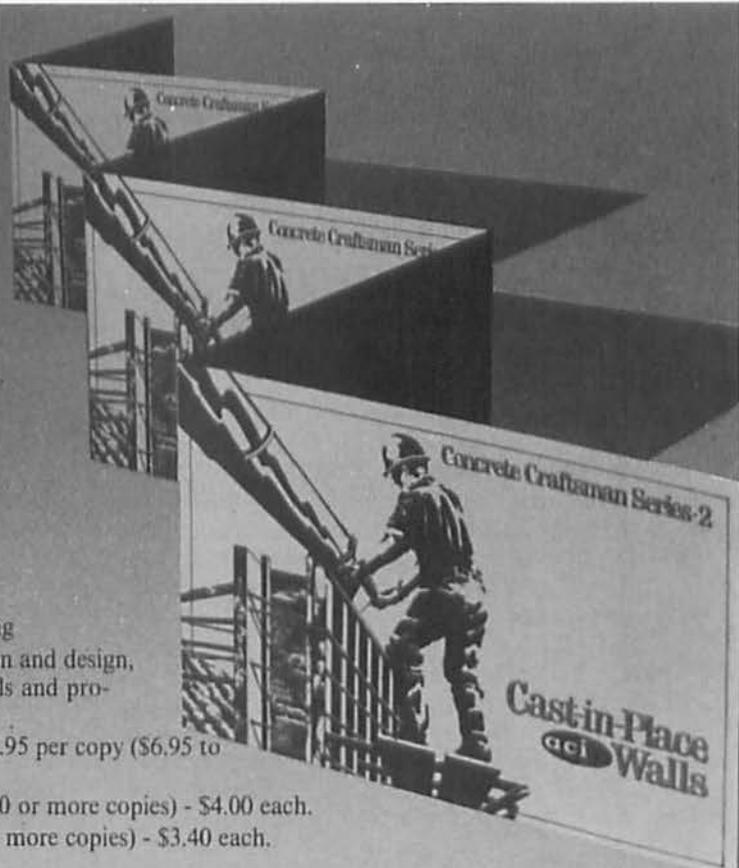
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# President's memo

## Conventions —

### "Our Window to the World"



The scene is the lobby of a downtown hotel in a major metropolitan area. At the registration desk, the typical ACI member, who just arrived by bus or taxi from the airport, presents his preregistration slip to the hotel clerk and within minutes he is in a comfortable room, the cost of which is significantly less than that posted on the door. Shortly after this, he goes to the convention floor and picks up his preregistration package at the ACI registration desk and he is off and running at another successful ACI convention.

"Now wait just a minute." Somebody — whose luggage was lost by the airline, whose room was not ready, and whose preregistration was put in the wrong box by ACI — might say, "What is this? Utopia?"

The answer to the unhappy member is no, it is not Utopia, it is ACI's goal to make the convention as perfect as possible and the purpose of this memo is to make members and visitors familiar with how we attempt to achieve that goal.

It may seem incredible but preparation for a convention starts 15 years (!) before it actually takes place. Right now, we are in the fall of 1985 and we already have sites for future conventions selected to the year 2000. The Convention Committee approved sites through 1995 and contracts with hotels are signed through 1989. Themes and outlines for the convention topics have been selected and approved by the Technical Activities Committee through 1987.

The selection for the site of the convention usually starts with a bid or request from a local ACI chapter to hold the meeting in their city. The request most likely will include hotel facilities, restaurant availability, and various possible programs for spouses. Once the Convention Committee approves the site, the next step is the selection of the hotel by the Convention Manager of the Institute. During the last 10 years, there was a large increase in the number of new, modern hotels all over the United States, Canada, and Mexico but very few qualify as a place for an ACI convention. The modern hotel has a grand ballroom, a few smaller but still quite large rooms but very few or no function rooms. During the height of our committee activities, ACI needs as many as 20 to

25 various size function rooms to accommodate the simultaneous meetings of the different technical, educational, and administrative committees. This is why in many cases we end up in an older hotel in a city otherwise having plenty of new, more modern facilities.

Once the site and the hotel are selected, communication and coordination with the local convention committee start. In some cases, they suggest certain subjects for the convention but most often, TAC selects the "theme" which if applicable should reflect upon the city where the meeting is being held. Usually, several chairmen of technical and educational committees have submitted requests for space on the program to cover subjects related to the missions of their committees. There are always requests by the local committee for one or two sessions dealing with local issues. ACI is very much in favor of that, hoping that it will attract a large number of local interests who otherwise would not attend the convention. The benefit for ACI is possible new memberships and continued attendance at future conventions by the new member.

Besides the input from ACI and the staff, the role of the local committee is equally important. A major contribution to the success of the convention is the Spouse Program and the social events, such as the Sunday "Wine and Cheese Party" for early arrivals and, of course, the "event of the week" — "The Concrete Mixer." ACI is strictly a technical society and five days are filled with technical and educational programs usually from 8 a.m. to 6 p.m. Consequently, the two occasions where people can meet other people under a relaxed atmosphere are those two social events mentioned earlier.

We try to make the conventions self-supporting but, of course, that is impossible and ACI subsidizes all the conventions. However, we emphasize with the local committees that, if possible, they should cover the expenses for those social events. The way to do this is to solicit funds from local people involved in concrete construction. In most cities, this can be achieved quite easily, especially when it is understood that ACI very seldom goes back to the same

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city more than once every 12 to 15 years. The Spouse Program, of course, is paid for by selling tickets to cover the cost.

John Nesbitt, in his book, "Megatrends," raises the issue of the replacement of the convention by computerized audiovisual conferences where people either from their office or from a local function room communicate with others across the nation or the world for that matter to discuss current issues. He says, "it won't fly" because people are looking for the informal, personal contacts in the hall or lobby during coffee break or during the more formal social functions. I agree!

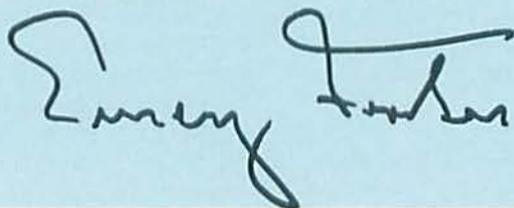
I consider spouses an important part of the success of a convention and their program is almost exclusively in the hands of the local committee. Staff can and are willing to help but the local committee's knowledge of the city and what it can offer is essential for a high-quality spouses' program. At the last four conventions, we passed the 1,000 mark in registrations, and at the same time, we reached 300 in

spouses attendance. The presence of spouses certainly helps make a convention successful and enjoyable.

As you see, by now there is a lot of work that goes into the preparation of a convention before you arrive at the hotel and register. In spite of that, the "system" can still break down if we do not have the full cooperation of the hotel and all of its employees. I thought it was a nice gesture in Denver where all the employees of the Marriott Hotel wore badges with the name ACI on them, indicating that they were there to serve and help us. This contributed to making the Denver meeting one of the most successful the Institute has had.

It is easier to attend a convention than to prepare for it, and ACI works hard to make it intellectually challenging and satisfying, and physically pleasant for all of its members and visitors.

Please try us and plan to attend the next ACI convention.



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## ACI's All-Important Chapters



Our Institute is an international organization with over 18,000 members representing 119 countries. More than 4500 of our members reside outside of the United States. An organization of that size has to be decentralized in some respects to be effective. Decisions, of course, are made by the Board of Direction, and our day-to-day operation is carried out by the staff in Detroit, but the worldwide success of the Institute partially depends on the activities of our chapters.

Presently, there are 66 approved chapters, 18 of them outside of the United States. By the time this memo goes to press, we expect that three new chapters, two domestic and one international, will be approved by the Board. We currently have three student chapters and a petition has been received for the formation of a fourth one. Student chapters, which have the sanction of local chapters in their areas, are very important to us because, if a student is exposed to our activities while studying, he most likely will join ACI international as a full member after graduation.

The first ACI chapter was the Southern California chapter, formed in 1958. The largest chapter in 1984 was the Ontario chapter in Canada with 350 members. The chapters which submitted annual reports in 1984 indicated that chapter membership increased 24 percent over 1983.

One of the most important activities of the chapters is their participation in the ACI educational program. Many chapters have their own programs but practically all of the United States and Canada chapters participate in the seminar series organized by the ACI education department under the supervision of the Educational Activities Committee (EAC). Chapters co-sponsored 42 seminars with ACI's education department in 1984 and received almost \$30,000 in rebates.

Several years ago, ACI initiated a new activity for chapters; namely, the roundtable conferences. At these regional meetings, representatives, mostly officers, of 8 to 10 chapters participate in a day-long discussion on how ACI international and the chapters can cooperate and complement each other for the benefit of the membership.

I thought it might be interesting to describe the reaction of a member who recently attended one of our roundtables. First of all, he expressed many of the opinions that other attendees have stated, one of them being that roundtables are very beneficial to chapter officers. He indicated he had not been active in ACI prior to becoming an officer in the chapter and that while at the roundtable, he was surprised to find that the staff and officers present were willing to assist the chapters in any way possible and that they were not the "stuffed shirts," he had anticipated they would be. He was very pleased to see that the roundtable was a first-class function and it gave him a sense of pride to be associated with an organization which obviously was run in a first-class manner. Finally, he said that in the future he hopes to attend ACI conventions and become more involved in ACI international, and that his change has been brought about through his association with the chapter and his contacts at the roundtable.

It is nice to hear a compliment like this.

I do not like to single out one chapter out of so many successful ones, but the example of the Singapore chapter is worth mentioning. The chapter is hardly two years old. It already has over 100 members representing Singapore, Indonesia, and Malaysia. They have a 15-member Board of Direction, technical, awards, and educational and training committees. They have a chapter library and are presenting awards of excellence to architects, engineers, and contractors for outstanding concrete projects in the region. This summer, the chapter started a certification program for field technicians Grade I, and within two weeks of its announcement, the course was oversubscribed by 300 percent.

The basic building material in Singapore is concrete and our chapter there contributes significantly to the quality of concrete used. Congratulations for a job well done.

In closing, ACI international considers the chapters an important arm of the Institute and appreciates the work they are doing for the benefit of ACI and concrete.



# Behavior of Concrete in Earthquakes

The recent earthquake in Mexico and the devastation wreaked in Mexico City was a tragic event. The latest estimated death toll numbered over 8000 persons and property damage is estimated at \$8 billion.

Unfortunately, as happens quite frequently, the media reports based on early observations and incomplete information offered misleading interpretations on how well concrete structures perform under severe loads.

Although it is too soon to draw conclusions, and investigations will go on for a long time, the purpose of this memo is to clarify some of the points on how concrete really behaved during the earthquake.

In the 20th Century there have been only three earthquakes of a Richter 8 or larger magnitude to effect a large metropolitan area. The first one was the 1906 earthquake which destroyed much of San Francisco, California. In 1923, Tokyo and Yokohama in Japan were badly damaged and 143,000 people died. And the third was the recent quake to hit Mexico City, which destroyed (totally or partially) 417 buildings and damaged approximately 1000 other structures. (It is well to note that 417 building collapses were out of approximately 1.4 million buildings in the city area.)

The earthquake which rocked Mexico City could be classed as a "1000-year" event. The resonance along with the unusual severity of the quake were probably the major factors behind the extent of the damage. You might say that the 2-second period of vibration acted on Mexico City and the soft subsoils like the cracking of a whip and produced acceleration on some buildings equal to about 1.0 g., several times seismic design force. Most failures occurred in the section of the city underlain by soft clay from an old lake bed.

Both concrete-framed and steel-framed structures failed; damage was not confined to concrete buildings. Most seriously affected by the earthquake were structures in the 5- to 15-story range, which had natural frequencies close to that of the soil. Concrete was widely used in Mexico City for structures in this size range. Some old construction, built before modern codes, failed, as well as newer structures. Some failures were certainly due to the fact that the buildings could not carry the shear developed during the quake. At the same time, many structures old and new, showed little or no damage.

One point seems evident—concrete buildings which were well designed and built generally performed well. There were also cases of well-designed concrete structures which collapsed because of soil failures or because of damage inflicted by adjacent structures.

The key to better performance of structures, whether they are subject to earthquakes, hurricanes, or any other destructive force, is quality construction. That means good design by the engineer and then care by all parties concerned to make certain that the design is built as the engineer visualized it.

We need to study those structures which collapsed and those which withstood the earthquake forces. Studies will undoubtedly look at soil-structure interactions. The analysis of this earthquake and its action on metropolitan-type structures will advance our knowledge of earthquake engineering and will influence the building codes around the world. The knowledge gained may save many lives in years to come.

A forthcoming issue of *Concrete International* will have an article with further information on the behavior of structures in the earthquake.



## Looking Ahead

Although the tenure of the president of ACI and of other elected officers ends in March at the end of the spring meeting, everything else with ACI is based on calendar year.

I will be reporting to the membership during my president's address at the San Francisco meeting regarding 1985. Therefore, in this brief memo I am looking ahead to 1986.

The year 1985 was generally a good year for the construction and, therefore, for the concrete industry. If we put all the forecasts together and apply the usual margin of error, we can safely say that 1986 should be another good year. Although many people limit their forecasts to only the first one-half of the year, if interest rates keep sufficiently low, we hope that the full year will be satisfactory.

As a general rule, the fortune of ACI goes with the construction industry; therefore, we are looking ahead to a good year in 1986. The Institute just announced a new series of seminars covering the subjects of parking structures, basic repair of concrete, and design and construction of slabs on grade. Our Educational Department will continue the progress in the certification area and we will expand to fields other than what we have covered so far. For instance, a certification program for concrete inspectors is scheduled to be operational in 1986.

After considerable discussion at the Chicago meeting, a revised Long-Range Plan will be presented to

the Board of Direction in 1986, and implementation will begin in 1986. Our plans for the next ten years are ambitious, and in order to reach the goals set for 1995, work should commence in 1986.

Our international ties are stronger than ever before. This was reaffirmed by the enthusiastic and friendly receptions our group, consisting of Past President Norman Scott, Director of Administrative Services Bill Tolley, and yours truly, received during our good-will trip to the Far and Middle East which was concluded only this past week. Again, I will have more to say about our trip during the annual meeting.

Many of our technical committees have important standards under revision, and ready to be submitted for TAC review in 1986. A number of new or updated publications are planned for the year.

We are also looking forward to two successful conventions in 1986: the spring convention in San Francisco on San Francisco Bay of the Pacific Ocean and the fall convention in Baltimore on Chesapeake Bay of the Atlantic Ocean. These two exciting cities promise to offer a lot to the members attending the conventions.

All in all, we have the momentum for ACI to accomplish its goals and we are looking forward to keeping that momentum.

I would like to take this opportunity to wish every member of ACI a good, prosperous, and successful 1986.

# Our International Aspects



As we become more and more international at ACI, the question frequently comes up as to why we still use the word "American" in our name. A few years ago, the Board of Direction debated the issue of changing our name to reflect our international aspects but the Board wisely decided that, since 1904 when ACI was established, our name has become synonymous worldwide with good concrete, education, and publications related to quality concrete and concrete construction. Therefore, a change in our name could be more harmful than beneficial. Our philosophy is that we want to encourage "good concrete — worldwide" and disseminate knowledge to an audience spread through each hemisphere.

Just a few examples to prove that the American Concrete Institute is international. First of all, our magazine is called *Concrete International: Design & Construction*. Out of our 18,500 members, more than 4,500 reside outside the United States, approximately 25 of the Institute's membership. Presently, we have 70 chapters, 20 of which are international, which is approximately 29 percent. In the United States, we are approaching the saturation level regarding chapters; therefore, in the future we might expect that the growth in chapter activities will come from the international scene.

When we look at the attendance at ACI conventions, we find that on the average we have 100 to 150 international members attending each year. Lately, our convention attendance has been around 1,000

which means 10 to 15 percent are international visitors. Considering the distance some of the members have to travel, I think this is a very encouraging number.

Through the Chapter Activities Committee, we recently have instituted a three-year rotation program to visit international chapters and hold seminars on various subjects related to the local interests. We plan to keep up this cycle which means that every three years a delegation will go to the Far and Middle East, to Central America, and to South America.

This past June we held a Spanish language structural seminar in Miami, Fla., attended by 60 people from Latin America. Based on the success of the seminar, we hope to have more of these in the future and we are even considering holding seminars in various Latin American countries. In early December, we had the thirteenth ACI/IMCYC seminar in Guadalajara, Mexico.

Another international activity of ACI is the co-sponsoring of international technical conferences all over the world. Although we have no direct financial commitment at these events, we are providing free publicity space in *Concrete International* and are helping in other ways to promote the events.

All in all, the American Concrete Institute is truly international with respect to the spreading of knowledge about concrete and, in the years ahead, we shall increase our efforts towards "good concrete — worldwide."



## Education — Communication

In spite of an all-out effort by the ACI Education Department, we still read regularly about failures in concrete construction, i. e., structures which collapse or material and structures which do not perform as designed. Fortunately for concrete as a construction material, after lengthy investigations and costly lawsuits the conclusion is that concrete as a material did not cause failures but what people did to it or how they handled concrete was the source of the problem. When a failure results in the loss of life, it makes headlines and hurts the reputation of the whole industry.

The importance of "communication" is stressed in all seminars whether they are business or technically oriented. What our educational effort is trying to do is to communicate the available information on concrete and concrete construction to people involved in the industry.

While a chartered purpose of the Institute was to "further engineering and technical education," it was not until the 1960s that a committee on education was established. In 1970, the Board of Direction, recognizing the need for more educational programs, authorized the formation of the Educational Activities Committee (EAC) as a Board committee. That same year, EAC established several "E" committees dealing with seminars, materials, structures, and student activities to mention just a few. The first seminar under the sponsorship of EAC was held in 1971 in Philadelphia and was on concrete aggregates. Over 300 people attended, which made us realize that there was a need for an extensive and well-organized education program within ACI to properly

communicate the knowledge and information available on various aspects of concrete.

The seminars are usually held as a cooperative effort between local chapters and ACI headquarters. The speakers are high-level experts in their respective field. Most of them volunteer their valuable time free and the attendees at the seminar can obtain useful information — at a very nominal registration fee — from speakers whose services would cost many times more if they were paid consultants on the subject. Unfortunately, many people do not take advantage of the opportunities offered by these seminars. When a failure occurs, we often hear that the person or persons involved were unaware of the standards or the "whys" and "hows" when the very same subject was discussed in their local city at a recent ACI seminar.

Our seminar program has grown steadily over the last 15 years. In 1985, 35 educational seminars were conducted. The other important function of our Education Department is the certification program. That program is growing faster than originally expected. Last year, 97 local programs were conducted, again through the cooperation of the local chapters.

Another lesser known fact is that ACI maintains a speakers bureau, listing available experts on practically every subject related to concrete and concrete structures.

One of ACI's basic missions is education — which means communication of our knowledge of concrete. The next time an ACI seminar is held in your area, I urge you to take advantage of it. I am sure you will find the experience rewarding.