President's Memo

ACI International

It is with a great sense of honor and privilege that I assume the position of President of the American Concrete Institute. I joined the Institute 35 years ago while I was a graduate student at the University of Illinois. Since then, two of my professors, Clyde Kesler and my advisor, Chet Siess, who was directly responsible for getting me involved with ACI, have been Presidents of the Institute. I have also had the pleasure of knowing and working on ACI committees with many of the Presidents in the past 30 years. I am proud to follow in their footsteps. I share their belief in what ACI stands for — *progress* in concrete construction *through knowledge*.

At a time when the world is shrinking and forming trade blocks, ACI must examine its international role in order to strengthen its position beyond North America. More collaboration and cooperation with concrete societies in other nations is necessary in order to achieve this. In this, my first President's Memo, I wish to examine and acknowledge the internationalism which already exists in ACI today.

Although named the *American* Concrete Institute, ACI is truly an international organization. We are an individual membership organization with members in more than 110 countries ranging from the United States of America to Angola, from Togo to Finland. ACI has members residing in every continent except Antarctica. The majority of our members live in the U.S.A. and Canada is second, followed by Japan, Australia, and Saudi Arabia. International members make up some 22.6 percent of ACI's membership. Our members, domestic and international, belong, not because we are a national body, but rather because we are the best single source and developer of high quality information about concrete design and construction in the entire world. They also belong because ACI gives all of its members a unique opportunity to participate in our activities through membership on our 120 plus technical and educational committees. This involvement brings with it both knowledge and friendship.

Twenty eight of our 80 chapters are outside the United States. There are six in Canada, two in Mexico, seven in the Caribbean and Central and South America, five in the Middle East, six in the Far East, and one each in Europe and Africa. (Two new chapters in Saudi Arabia and Bahrain were authorized at the March convention in Washington, D. C.) In all cases, these chapters serve the need for a local technical society specializing in cement and concrete. In Japan, the ACI chapter grew into the Japan Concrete Institute, a sister organization with close ties to the Institute. It is also worth noting that three of our five student chapters are in Latin American countries.

Our international members participate in many areas of Institute activity — they write valuable papers for publication in our journals and for presentation at our conventions, they participate in our committees, and they serve on our Board of Direction. At present, two of the 39 members of ACI Committee 318, the Building Code committee, are international members. In addition, there are 16 international members serving as liaison members of this committee. The distinction is made partially on the basis of ability to attend meetings on a regular basis. Two members of our Board of Direction, myself included, are international members.

Our international members bring the Institute a breadth of experience and a diversity of views. If we ignore these views and this expertise, we put ACI at peril in this increasingly integrated global community. We in North America have no monopoly on cement and concrete production and use — Europe consumes three times as much cement per year as North America; Asia five times as much. What we do have is ACI which is the world's leading source of information, standards, and recommended practices for the use of cement and concrete.

During the next year ACI will continue its efforts to expand its services to its international members. This will take several forms — we are starting to plan a Second International Conference and International Chapter Roundtable to follow up on the highly successful Hong Kong conference and roundtable last December. In addition to visiting chapters in the United States and Canada, as President I will be visiting chapters in Central and South America and I will be meeting with the New Zealand Concrete Society. ACI recently joined with ASTM to become the organizations representing United States interests on the International Standards Organization's committee on concrete. More news about other actions will follow in future President's Memos.

ACI is the world's best technical society dealing with concrete. We proudly establish our reports and standards in a consensus mode — not done by many international organizations. One of our challenges is to continue to be the best in these times of global competition. With the help of our domestic and international members alike, we will reach our goal.

President's Memo

Metrication in the Construction Industry

Metrication is coming in the construction industry, and soon. The introduction of a new system often meets up with a certain amount of apprehension and resistance. We must not let this delay our acceptance of the need to change because, after the initial break-in period, the use of metric units will lead to greater efficiency in the construction process. Metric dimensions simplify drafting and layout of construction projects. Metric calculations are no more difficult than foot-pound calculations.

As an illustration of one benefit of the metric system, add the following dimensions: 4 ft, 7 3/16 in., plus 12 ft, 9 3/4 in., plus 8 ft, 10 5/8 in. Did you get 26 ft, 3 9/16 in.? Now add 1402 mm, plus 3905 mm, plus 2708 mm. I am sure you calculated 8015 mm and got the answer in a fraction of the time. My second example: the floor to floor height in a building is 9 ft, 3 5/8 in. It is necessary to design a stairway with risers about 7 1/2 in. in height. Fifteen risers at 7 1/2 in. total 112 1/2 in., or 9 ft. 4 1/2 in. After some calculation, you settle on 15 risers at 7 7/16 in. In metric, the floor to floor height is 2835 mm, the desired riser height is 190 mm, and the solution is 15 risers at 189 mm.

The Metric Conversion Act of 1975 declared a national policy in the United States for voluntary conversion to the International System of Units (SI), the modern version of the metric system. This was not successful. Although the rest of the English speaking world adopted the SI system, the United States did not. Today, only three countries have yet to convert to SI: Burma, Liberia, and the United States. Convinced that the United States had to convert its exporting industries to remain competitive in the international trade area, Congress in 1988 introduced Section 5164 in its Omnibus Trade and Competitiveness Act. This system declares the SI system of measurement to be the preferred system of weights and measures for United States trade and commerce. It further provides that all federal agencies shall move toward metrication by a date prior to the end of the fiscal year 1992. An Executive Order signed by President Bush in July 1991 required federal agencies to have a plan for metrication ready by September 30, 1991, and to proceed with metrication if it was economically feasible.

The federal government hopes to use its buying power to move the United States into the metric camp within the next four years. By 1996, all federal government procurement will employ metric specifications. The General Services Administration will design and tender two buildings in metric units this year. Each will be in the $25 million range. The drawings will be totally in metric with no customary units given. Two more such projects are planned in 1993. The Federal Highway Administration has set September 30, 1996, as the date by which all federal highway contracts shall include metric specifications. This does not leave much time to get ready for the change.

Canada converted its construction industry to the SI system about ten years ago. Metric conversion proceeded very smoothly once SI codes were available. In Canada, there was no cost penalty associated with metrication. Today, all bridges and all concrete and steel buildings are designed and constructed in metric units. This has not been true in the housing and small building arena. The large United States market for Canadian lumber and plywood mandated that these products remain in the customary sizes, 2 by 4's and 4 by 8 sheets of plywood; hence, house construction still uses foot-pound units.

Metrication is a given. Apart from the will to change to metric and a recognition of the considerable medium and long-term benefits of the use of metric units, the following elements are required, very quickly; some involve ACI committees which should start to take action:

continued on p. 6

President's Memo

continued from p. 5

1) *An industry plan of action.* For the highway sector, this is being developed by the Federal Highway Administration. To date, no agency or other body has taken the leadership role in the building sector.

2) *Metric codes and standards.* For several years, ACI has published a hard metric (i.e., final) version of its Building Code. In the very near future, industry will be looking to us to publish hard metric versions of ACI 301 and other major construction oriented documents. Currently, the Technical Activities Committee requires committees preparing documents to provide metric conversions or a conversion table where applicable. TAC is currently studying the next steps. ACI will proceed document by document on an as-needed basis. When one considers that a hard metric standard must go through the complete standardization process, which can take up to two years, we don't have much time if we are to have usable metric standards in place by 1996. Also needed, but out of our hands, are hard metric conversions of the various model codes.

3) *Design aids, textbooks, and computer programs.* Again, there is an opportunity for ACI to contribute.

4) *Tools and materials.* Metric ASTM standards are available for reinforcing bars but not for wire products or prestressing tendons. The change to metric construction should be made as expeditiously as possible to minimize the need for double inventories of materials.

5) *Education of designers, inspectors, and workers.* ACI may have a role here in putting on seminars. In Canada, this step proved to be very easy and was accomplished with relatively little formal training. Perhaps the biggest problem is how to develop the intuitive feel that engineers, technicians, and draftspersons have for the correctness of a quantity calculated in foot-pound units.

ACI has a role to play in the conversion to metric units. We must take up the challenge.

President's Memo

Strength, Utility, and Grace —
The Challenge of Concrete Design

This issue of *Concrete International* has durability as its theme, with a special section on Denmark's Great Belt Link, which has been designed for a 100-year service life. The world wants quality concrete structures. Proper design and careful construction are necessary to achieve this aim.

This is not a new idea. About 30 B.C., the Roman architect and engineer Vitruvius wrote his *Ten Books on Architecture,* a review of the then current state of the art in building design. He wrote that a project or building should have the characteristics of strength, utility, and grace — in Latin, *firmatas, utilitas, venustas:*

> "Now these should be so carried out that account is taken of strength, utility, grace. Account will be taken of strength when the foundations are carried down to the solid ground, and when from each material there is a choice of supplies without parsimony; of utility when the sites are arranged without mistake and impediment to their use, and a fit and convenient disposition for the aspect of each kind; of grace when the appearance of the work shall be pleasing and elegant, and the scale of the constituent parts is justly calculated for symmetry."

A structure must be *strong* and *safe* enough to carry the loads that it may be reasonably expected to carry during its lifetime. ACI helps designers and contractors create and build strong and safe structures by providing codes, specifications, and practical guidance in the form of ACI committee reports. Construction quality is better if the workers and supervisors are well trained. Today, there are over 30,000 ACI certified concrete technicians and ACI certified floor finishers in the United States and Canadian work force. Increasingly, owners are calling for inspections by ACI certified inspectors. This is a positive step toward ensuring quality and durable concrete construction.

A structure must provide *utility*. It must fulfill the owner's needs. It must be *serviceable* throughout its lifetime. It must not deflect too much, it must not crack excessively, and vibrations must not be a problem. The structure must be *durable* enough to last its expected lifetime. The reinforcement in the structure must not corrode. ACI helps the designer and contractor by compiling the latest information on these subjects and publishing it in the form of committee reports and other guides to producing durable structures.

In 1989, the ACI Building Code was rearranged to bring together in Chapter 4 those parts of the code that dealt with selecting concrete mixes to improve the durability of the final structure. This was done to emphasize the need for designers to consider durability at an early stage in every design, rather than as an afterthought.

As Vitruvius wrote, bridges, buildings, and other structures should display *grace* and beauty in their design. Several years ago, ACI established a committee on esthetics with this in mind.

In closing, it is also of interest that Vitruvius wrote about the natural cement, pozzolana:

> "There is a kind of dust which by nature causes marvelous results. It is found in the vicinity of Baiae and in the property of municipalities around Mt. Vesuvius. When this material is mixed with lime and rubble, it strengthens buildings generally, and when piers are constructed in the sea, they set hard under water."

With concrete then, the quest down the ages has remained that of obtaining the best performance from this most durable of man-made building materials.

President's Memo

Building for ACI's Future

The American Concrete Institute has outgrown its current headquarters building in Detroit, Mich., and needs a new home. In the late 1980s, a number of options were considered by the Board of Direction, leading to the decision to buy land and build a new headquarters structure in the Farmington Hills suburb of Detroit. This land was purchased in 1989. In November 1991, after feasibility studies and preparations, the Board of Direction decided to embark on a Capital Campaign to raise money for this undertaking. Since then, a campaign organization has been put together. To date, we are over a fifth of the way to our goal of $3 million.

Already, ACI volunteers are calling or writing potential corporate contributors, requesting donations towards the new building. In October, we will start a general membership campaign. What follows in this President's Memo outlines the needs for a building and the decisions taken to date toward making the ACI headquarters a reality. We intend to give you the background behind our request for contributions.

ACI currently owns a building in Detroit, built in 1958 and added onto in 1970, plus an adjacent warehouse acquired in 1987. The 1958 structure, designed by renowned architect Minoru Yamasaki, was a showcase of the use of concrete in building design and construction, and it won architectural prizes. The building has a folded plate roof, cantilevering from 9 in. thick architectural concrete corridor partitions. Skylighting and doorways in the main corridor accent the visual pattern of the folded plate roof. The 1970 addition, however, is a very plain, functional rectangular structure.

At the time the 1958 building was erected, the ACI staff numbered 17. Today's staff consists of 60 full-time employees, serving a membership that has more than doubled to 19,500 since that time. Among many other duties it now undertakes, that expanded staff assists the needs of many more ACI committees, publishes two ACI journals, *Concrete International,* and *Concrete Abstracts,* along with administering educational and certification programs. As a consequence, the existing buildings are too small to adequately accommodate this staff and the cramped working spaces lead to inefficiencies in day-to-day operations.

Currently, ACI is updating its computer systems and installing a major local area network system. Installation has been difficult due to the absolute inflexibility of the layout of the 1958 building and its concrete partitions. As a result, the full capabilities of the new system will only be realized after it has been installed in a new modern building.

Moreover, the roof and the walls of the 1958 building are not insulated and it has a single pane glazing, leading to inefficient energy use and unnecessary expenditures. Also, the 1958 structure was built in what was then a desirable developing section in northwest Detroit. In the 34 years since, the neighborhood has deteriorated to the point that parking lots must be locked and security guards posted. All in all, the current buildings are too small and considerably less than ideal.

Starting about 1985, the Board of Direction considered various options with regard to obtaining a new headquarters. Financial impact statements indicated that it would be advantageous for ACI to stay in Detroit rather than move to Washington, D. C., or Chicago. Other studies considered whether the Institute should lease space, buy an existing building, or build. After thorough discussion by the Board of Direction over several years, it was decided that ACI would buy land in an office/research park in a quality area northwest of Detroit and, at the appropriate time, would build a headquarters structure on that land.

A five acre plot was purchased in the Country Club Estates Research Park in 1989. The major tenant in the park is Nissan Motors which a year ago completed a $68 million building for its North American research headquarters. Preliminary architectural programming and massing suggest that ACI requires a 40,000 sq ft building, probably two or three stories in height. At an estimated $125 per sq ft construction cost in 1993-94, this rendered an anticipated building expense of $5 million. We have emphasized to our architect that we want a durable, functional, and, above all, a flexible building that will accommodate ACI's needs for decades to come. We do not want another showplace, nor do we want opulent finishes.

An integral part of the decisions made about the new building was consideration of how it might be financed. Four basic scenarios were considered:

1) *Mortgage* — This alternative was rejected because it would represent a significant increase in the ongoing

continued on p. 6

continued from p. 5

financial obligations of the Institute and would require additional dues.

2) *Raise additional dues* — The per capita cost of the new building amounts to $250 for each of the current 19,500 members. Even if we considered an amortization period of ten years, and depending on variations hence in the cost of money, this would represent an increase in dues of $40 to $50 per member per year. And this is without any increase in services to members and is before any adjustments in the dues for cost of living escalations. Obviously, this option, too, was unacceptable.

3) *Use reserves* — In the mid-1970s, ACI was in a difficult financial position and with very limited resources. Since then, the Institute has gradually built up a reserve fund for rainy days. Interest from the reserves does help Institute cash flow from time to time. The land for the new building was purchased using reserve funds, and the building could be built using most of the balance of the reserves. This alternative, however, would leave the Institute vulnerable to downturns in the economy and eliminate funds needed for new programs.

4) *Capital Campaign* — A Capital Campaign to raise $3 million of the money needed plus a drawdown of reserves for the balance is the plan adopted by the Board of Direction.

What the preceding shows is that ACI needs a new headquarters building, that the decision to construct one was based on extensive study and consultation, and that, in the opinion of the Board of Direction, a successful Capital Campaign is a necessary part of the financing for the building.

How can you assist us at this stage? If asked to volunteer in the fund-raising campaign, please give us your sincere consideration. We need your support. How much should you give? Almost every member of the ACI staff pledged to the campaign; their average pledge is $800. Every member of the current and immediate past Boards of Direction have pledged to the campaign as well; their average pledge is $4,000 and these are personal pledges.

If for many of you, these numbers seem large, please give what you feel comfortable in contributing. Also, please remember that we do not need the full donation immediately — a three to five year pledge with equal annual payments is entirely appropriate.

Please help ACI build for the future!

President's Memo

Chapters — An Essential Part of ACI

During the past year, I have had the opportunity to attend two chapter roundtables and visit several ACI chapters. These meetings have reinforced my feeling that ACI chapters are a very important part of the total organization. ACI's 79 chapters provide a base for Institute operations at the local level. They are a place for members and nonmembers to meet and interact on educational and technical matters involving concrete, which are of interest at the local level. They are essential to the Institute's educational and certification programs. Most of ACI's educational seminars and certification programs are put on with the sponsorship of a local chapter. Chapters have programs aimed at the needs in their area, including sponsoring ACI conventions and assisting students who wish to enter Institute student competitions.

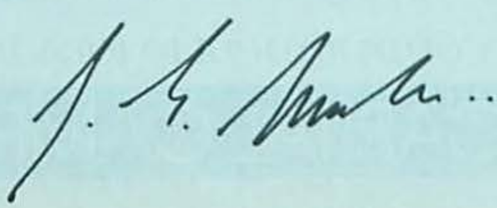
The first ACI chapter was formed in Southern California some 36 years ago. Today, there are 52 chapters in the United States, six in Canada, nine in Central and South America and the Caribbean, four in the Middle East, six in the Far East, and one each in Europe and Africa. In addition, there are seven student chapters. Areas where strong interest exists in forming new ACI chapters are Chile, Hong Kong, France, and Bangkok. Members wishing to form a chapter should contact Bill Palmer at ACI headquarters.

Communications between ACI and its chapters are fostered by chapter roundtables every year. On average, each North American chapter is invited to a roundtable every two years. Here, delegates from each chapter spend a day and a half discussing ways to improve chapter operations and exchanging experiences (successes and failures). The president of the Institute, the chairman of the Chapter Activities Committee, and two staff members representing ACI attend. Almost invariably when one chapter describes a problem, another chapter in attendance has met and solved that problem. These discussions allow needed information to pass from ACI International to the chapters and vice versa. The latter is especially true in the case of chapters' experience with educational and certification programs. As president, I have found the roundtables very informative.

Annually, the ACI president, the chairman of the Chapter Activities Committee, and a senior staff member tour the foreign chapters in one part of the world as part of the Institute's program to provide support to international chapters. Between the time I am writing this and the time you read it, we will have visited six chapters in Central and South America, met with chapter officers, and presented seminars. Plus, we will have conducted a chapter organizational meeting in Chile, including a half day seminar. As an alternative to these trips, the first roundtable for international chapters was held in conjunction with ACI's first international conference held in Hong Kong last December. It was attended by eight chapters and was a great success.

This issue of *Concrete International* presents the annual ACI Chapter Directory, listing the chapters, and the chapter addresses. Many members of ACI International do not belong to a chapter. If you are one of these, look up the chapter nearest you, and join it. Chapter membership will broaden your concrete experience.

As I mentioned in the first paragraph, chapters sponsor ACI's conventions. For the past three to four years, the Puerto Rico Chapter has been planning this fall's convention to be held in San Juan October 25-30 with post convention technical sessions in the Dominican Republic, sponsored by the Dominican Republic Chapter. The technical and social programs will be excellent. If you haven't registered for these meetings, I encourage you to do so now.



President's Memo

The ACI Building Code

During the next month, the 1992 interim revision of the 1989 ACI Building Code will be published. The Institute issues a major code every six years (1983, 1989, 1995) and an interim revision halfway between each major code revision. This President's Memo touches on what the ACI Code is, and outlines how changes in the code are approved.

The ACI Code, properly referred to as "Building Code Requirements for Reinforced Concrete," is adopted by reference or inclusion by the major model building codes. These, in turn, are adopted by municipal governments or similar local jurisdictions. The ACI Code only becomes a legal document when it has been adopted in this way. A building code sets *minimum standards* for the purpose of protecting the health and safety of the public. As such, it is not a guide to good practice but rather a listing of minimum acceptable standards.

The committee that writes the ACI Code, and indeed the committees writing all similar codes and specifications, must make certain assumptions about how the code will be used. It is assumed that structural design will be carried out by knowledgeable professionals who understand the basic theory and practice of the structural design of buildings. This assumption is validated by state engineering licensing boards.

It is further assumed that these knowledgeable professionals know, or have the ability to find out, which of the many possible structural framing systems will be best for a given structure. Inclusion of sections governing the design of precast structures, prestressed concrete, or two-way slabs do not endorse a particular form of construction for a given job — the designer has the responsibility to select the appropriate system.

The Building Code is written by ACI Committee 318, a technical committee made up of 39 members drawing from consulting engineers (18 members), academics (8), material suppliers (6), contractors (3), owners (3), local building code enforcement agencies (1), and, from time to time, architects, not currently represented. Currently, these members come from 14 of the 50 states and from two other nations, Canada and Colombia. Liaison members represent some 16 additional countries. Associate members who serve on ACI 318 subcommittees swell the ranks to a total of 73 members. This brings a wide range of backgrounds and expertise to the committee. All of these people donate their time and effort to the cause — ACI does not reimburse committee members for their time, travel expenses, or other expenses.

The ACI Code is a consensus standard. This means that any change requires a high degree of agreement, if not unanimity, among the 39 committee members. This is difficult and time consuming to achieve but it goes a long way toward ensuring that the final product is a solid technical document.

Although revisions to ACI 318 can be suggested by anyone, a typical code change is proposed by a user of the code, by another ACI technical committee, or by a member of Committee 318. A proposed revision is then assigned to one of the nine subcommittees of ACI 318. This subcommittee evaluates the code change proposal, develops code and commentary wording, and carries out design examples. When these are complete, the subcommittee votes on the change by letter ballot. A negative ballot may signify dissatisfaction with wording, technical content, or the entire concept. Each negative ballot must be resolved by making a change in wording, by being formally withdrawn, or by being voted as non-persuasive by the balance of the subcommittee.

When the subcommittee is satisfied with the proposed code change, it is explained to the full committee. The full committee then votes on it by letter ballot. Again, negative ballots must be resolved in the same fashion. This may take several months or several biannual meetings. Once the negative ballots have been resolved, the proposed change is reviewed by ACI's Technical Activities Committee (TAC) members who, in addition to reviewing it themselves, solicit comments from other interested or affected technical committees and/or selected external reviewers. TAC also reviews the negative ballots cast at the subcommittee and committee levels to assure that the voting and the resolution of negative ballots have been carried out properly with adequate consideration of all points of view. TAC returns a series of comments to Committee 318 which must modify the proposed code and commentary revisions or have an acceptable reason for not doing so.

Once all of this is done, the changes are published in *Concrete International* for Institute-wide discussion, are presented at a General Session at a convention, and are sent by letter ballot to the more than 19,500 members. The final step is a review by ACI's Standards Board which checks whether all the steps have been followed properly and all negative ballots have been given proper consideration. The revision then becomes an ACI standard.

All of this takes time — a minimum of two years for a simple, straightforward change, more for an extensive or complex change. The process is designed to ensure that all points of view have been heard and acted on, one way or the other. The ponderous process makes it very difficult to react quickly to new developments in theory or construction methods. On the other hand, it leads to the worldwide respect the ACI Code has as the leading source of requirements for the design and construction of concrete structures.

President's Memo

An International Concrete Code

In many countries of the world, the national concrete design code is based on ACI's Building Code. Typically, the basic engineering calculations are generically similar within this family of codes — flexural calculations use the same rectangular stress block, the same slenderness provisions apply, and the same shear design provisions apply. In these national codes, some of the basic design methods are different, reflecting local preferences among code writers. In Canada and New Zealand, different torsion design procedures are given; in Australia and Canada, the maximum steel percentage in beams is defined using a limiting neutral axis depth rather than a limiting steel ratio, and so on. These local preferences may reflect the opinions or research of a local professor or may be holdovers from the days prior to the adoption of ACI 318 as the basis of the local code.

This President's Memo will discuss the degree to which codes in different nations can have a common basis.

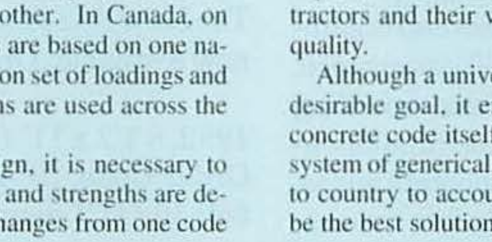
The framework within which a design code must function differs from country to country or even from region to region or city to city within a country. This framework includes the network of building regulations existing in the nation — model codes, material specifications, and structural design codes. In the United States, local building codes are generally based on one of three model codes, each with its own subtle and not so subtle differences. For example, some loadings differ from one model code to another. In Canada, on the other hand, all the provincial codes are based on one national model code. As a result, a common set of loadings and a common set of material specifications are used across the country.

When setting safety factors for design, it is necessary to consider the manner in which loadings and strengths are defined. If the definition of wind loads changes from one code to another, then the load factors on wind should change also. In the United States, wind speeds are defined using the "fastest mile" wind, averaged over roughly a one minute period. In Canada, the one hour average wind is used, giving a lower apparent wind speed. It is then wrong to use the same load factors for wind design in Canada and the United States.

Similarly, concrete strength is specified in the United States such that roughly one test in 12 may fall below the design strength, f_c', while in Europe only one low test in 20 is permitted. As a result, the required average strength, f_{cr}', will tend to be higher in Europe than in the United States. It would be wrong, therefore, to use the ACI strength reduction (ϕ) factors for design based on the European definition of concrete strengths.

The framework within which a code must function is also affected by a wide range of local conditions, including such things as exposure and climate, availability and quality of materials, customary contractual arrangements for construction, expertise of the design engineers, expertise of the local contractors and their work force, and local expectations about quality.

Although a universally adopted concrete design code is a desirable goal, it entails coordination of more than just the concrete code itself. Until this can be achieved, the current system of generically similar codes which differ from country to country to account for different local situations seems to be the best solution.



President's Memo

ISO 9000 and Construction

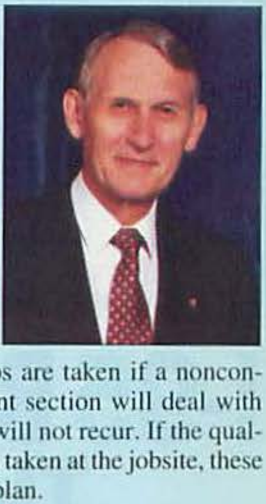
As I write this I am sitting on an airplane returning from a 10-day trip to New Zealand where I was a guest of the Cement and Concrete Association of New Zealand and the New Zealand Concrete Society. I gave a series of seminars, attended the annual convention of the NZCS, and visited 12 design offices and jobsites. I greatly appreciated the hospitality and friendship shown by everyone I met.

Concrete is the dominant construction material in New Zealand. The level of expertise is very high for materials, design, and construction and the latter is of excellent quality.

One of the more frequent topics of discussion at the conference and in my visits to offices concerned the application of ISO 9000 to the construction industry. ISO 9000 refers to a series of international standards for accrediting industries so that their products can be accepted by purchasers with little or no acceptance testing. If applied to the ready-mix industry, for example, the use of ISO 9000 would greatly reduce the need for jobsite test cylinders.

A number of governmental agencies in New Zealand have indicated that they will require designers, material suppliers, and contractors to be accredited in the near future if they are to work for those agencies. Accordingly, a number of consultants, ready-mix suppliers, and specialty contractors have started the work to become accredited to ISO 9000. In the United States some manufacturing industries are undergoing ISO 9000 accreditation, but to my knowledge this has not yet spread to the construction industry. It should be noted, however, that the precast and ready-mix industries have their own forms of accreditation.

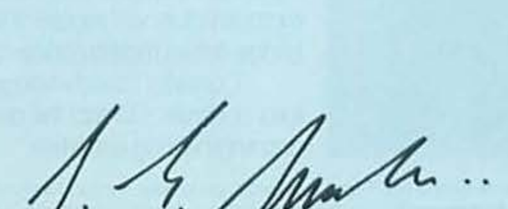
Three major steps are involved in ISO 9000 accreditation. First, it is necessary to write a quality manual which states quality policy, sets out the steps necessary to ensure quality at each step of the operation, and identifies who is responsible at each stage. The manual must deal with quality control of the design of the product, evaluation and/or testing of incoming supplies, quality control during production, and testing of the finished product. It also should outline how nonconforming batches are detected and what steps are taken if a nonconforming batch occurs. An important section will deal with steps to be taken so that a problem will not recur. If the quality of the product is affected by steps taken at the jobsite, these should be addressed in the quality plan.



Once the quality plan is derived, a procedure must be implemented to insure the quality plan is carried out. The necessary quality control records must be maintained at each stage where checking is needed. Finally, the quality process is audited by an outside agency to insure the process is adequate and that it is being followed and updated as needed.

In short, the ISO process consists of saying what you do to maintain quality and doing what you say.

The ISO 9000 system is a means of improving concrete construction. It requires a great deal of work to create the quality manual and checking procedures and may not be directly applicable to all aspects of concrete construction, but some aspects of it are worth considering by all of us.



President's Memo

Concrete in the Civil Engineering Curriculum

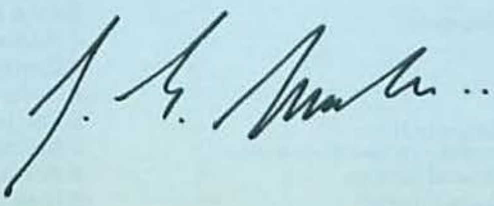
Concrete is a major building material that is used in some manner in almost all construction. It is a complex material with a wide range of strengths and properties. If properly produced, placed, and cured it is an excellent material but if any of these steps are incorrectly accomplished the concrete can be disappointing. Civil engineers design the concrete itself. They design the structures, roads, or other works in which it is to be used. Since they supervise its production and construction, their understanding of the material is essential.

Although it is imperative that all these engineers have at least a basic knowledge of cement and concrete technology, fewer and fewer civil engineering curricula include adequate coverage of this technology. In some cases, students are graduating with only a handful of lectures on concrete and no "hands-on" experience.

A few schools teach cement and concrete technology at the graduate level but these are few and far between. Graduate students frequently specialize in design or construction but they rarely take courses on cement and concrete technology. Instead, they specialize in structural analysis and design, acquiring less than adequate knowledge of the properties and strengths and weaknesses of a major material they are using. Concrete technology is considered paleo-tech among the high-tech wonders of finite elements and dynamic analyses.

One reason for this is the expansion of the civil engineering curriculum into areas such as environmental engineering, environmental risk assessment, construction management, and advanced structural analysis. Civil engineering curricula are currently chock-a-block full. To add a topic, another topic must be sacrificed. All too often the course that is dropped deals with concrete technology. Another reason lies in the lack of background that new faculty members have in the concrete area.

All civil engineering curricula should have at least the equivalent of a one semester course in cement and concrete technology. This course should include enough laboratory sessions to provide the opportunity to test cement and aggregates, and to design, mix, and test a batch of concrete. To improve the teaching of courses on concrete as a material, ACI's Educational Activities Committee and/or the Portland Cement Association should schedule short courses for university professors teaching concrete technology. To induce professors who might not otherwise attend, these courses should be offered at no charge to the participants with the possible exception of some travel and living expenses incurred during the trip. Possibly the courses could be offered at ACI conventions or in conjunction with other conventions, such as those of the Transportation Research Board, that the appropriate professors might attend. It is in the concrete industry's best interests to revitalize the teaching of concrete technology to civil engineers.



President's Memo

Technology Transfer and ACI

The motto of the American Concrete Institute is "Progress Through Knowledge." Progress in concrete construction translates into the knowledge of better ways to do things. Thus, our prime role is technology transfer to facilitate the advancement of new technology into accepted practice. Are we succeeding in this?

The current procedure goes something like this: researchers study problems and report their findings; each looks at an isolated aspect of a much larger problem, causing their findings to be disjointed and possibly in conflict in some cases. At some point, this new area of interest is recognized by the Technical Activities Committee (TAC) which establishes an appropriate technical committee. This new committee proceeds to write a state-of-the-art report on the subject, collecting together all the research findings and attempting to resolve conflicts. TAC reviews this report, subsequently published in one of ACI's technical journals. Convention sessions may be scheduled so that committee members can spread the word about the new technology. In some cases, the results are then incorporated in a standard or code. This involves more committee work, another set of ballots, and another TAC review. Significant new technology is also recognized by the Educational Activities Committee (EAC) which may sponsor a series of related seminars.

This process has the advantage of a much needed filter between research and the end user. If the committee is successful, the conflicts are resolved and explained. Opposing points of view are heard and these are reflected in the final report. This disadvantages of this process include the fact that it takes too long — eight to ten years from the original research and then the results are often published in a form that may not be directly available to, or even usable by, the people who must implement the improvements in the field.

An alternative path involves an inventor or innovator, developing a new device or a better method for doing something. The developer patents this and attempts to market it. However, engineers, contractors, and building officials are hesitant to use new processes or technology because of serious legal ramifications if the process or product does not measure up. Code writing bodies also are hesitant to endorse a patented device. Furthermore, such agencies may take several years to recognize the existence of a new concept and several more years to codify it.

How can these processes be improved? Let's look at each of the stages in the process — research or innovation, recognition of the new technology, collection and publication of data in a state-of-the-art report, and incorporation in a code or standard.

Research and innovation are difficult to channel. Each researcher's or innovator's stock in trade is his or her inventory of developing ideas. But, even though he or she may keep the ideas private until they have developed, the researcher is always amenable to guidance as to profitable areas of future research. ACI's Concrete Research Council, operating under the Concrete Research and Education Foundation (ConREF), has a committee which attempts to define areas of needed research. This committee, along with Committee 123, Research, determines which aspects of concrete as a material, concrete performance, and concrete construction effectively limit the use of concrete. This suggests areas of needed research. The output of this committee should be widely publicized.

How should developing areas be identified? The Hot Topics Committee of the Convention Committee has been very successful in identifying themes for "hot topic" sessions at conventions. TAC should receive copies of the ideas generated by this group. Also, TAC should spend a part of its agenda brainstorming to identify areas of emerging interest and directing these to the appropriate technical committee or to a specially formed task group for action.

Collecting data and publishing reports is what ACI does best. Frequently, however, our reports are aimed over the heads of the eventual users. TAC and all technical committees must identify which groups are most likely to affect construction practice if presented with a new technology and target their reports to this audience. The new series of "toolbox memos" aimed at construction workers, under development by the Construction Liaison Committee and others, will help improve the quality of concrete construction.

Currently, any significant change to a major standard such as the ACI Building Code takes about five or six years to implement. The process is slowed by the "we've always done it this way," the "if it ain't broke, don't fix it," or the "only good change is a dead change" syndromes. TAC and the

(continued on p. 6)

Board of Direction should establish a task group that includes representatives of the major standards committees to study ACI's standardization process with an eye to streamlining it while maintaining the present checks and balances. More rapid turnover of committee membership may be desirable to provide new points of view and a cadre of fresh workers. Standards writing bodies are frequently hesitant to recognize patented devices or processes. TAC should provide guidance in this area.

Because of the long lag in codification, a concrete technology certification agency should be devised, possibly through ConREF. A manufacturer or producer with a new process or product would request certification. The agency would establish the basis on which certification would be granted, including tests to be carried out and data and analysis to be provided. The producer would then have the tests done at an approved laboratory and submit the data to the certification agency for approval. The results of this certification could be presented to building officials as evidence of the acceptability of the process or product. Existing code writing bodies must have a system for accepting such reports. This concept, although a good idea, is a massive task and would require a substantial investment of ACI's resources.

In recognition of the importance of technology transfer, TAC has established an Ad Hoc Committee on Technology Transfer, chaired by Vice President Dean Stephan. This committee had its first meeting at the San Juan convention. TAC has also formed an Ad Hoc Committee on High Performance Concrete under Past President Paul Zia. A major emphasis of this committee will be technology transfer.

On page 81 of this issue of *Concrete International,* there is a TAC notice about identification of new technology. With this approach and the formation of the new ad hoc committees, ACI is moving toward better ways of doing things with concrete. This has always been an important role for the Institute — getting these better ways into practice sooner. TAC and the committee will welcome your ideas on technology transfer. These should be addressed to the secretary of TAC at the Institute's Detroit, Mich., address.

President's Memo

Developing ACI Standards

The American Concrete Institute publishes numerous useful documents for the concrete design and construction community. Many are reports, guides, handbooks, manuals, and symposium volumes that do not require standardization. These are not written in mandatory language and can present alternative procedures with advantages and disadvantages of each. Such documents are not intended to be referenced in project documents.

ACI also publishes widely accepted and respected standards for various aspects of concrete work. These include codes, code cases, specifications, and standard practices. All of these must undergo ACI's consensus standardization process. Such documents must be worded in explicit, mandatory language so that there is only one possible interpretation. Alternative procedures are permitted in standard practices, but the conditions under which they can be considered must be clearly set out. Specifications must follow a specific format spelled out in ACI's *Specifications Manual.*

All ACI standards originate in a technical committee. Committees writing standards have members representing all parties directly or materially affected by the standards. Such committees operate on a voluntary basis. Institute committees work by correspondence between conventions, and they meet twice a year at ACI conventions; there are over 200 such meetings at a typical convention.

When the proposed standard is completed, it is voted on by the committee. To pass, half of the committee members and two-thirds of those voting must approve the proposed standard. All negative votes must be considered by the committee and resolved. Most often this involves a change in the text which, if substantive, must be approved by half of the committee members and two-thirds of those voting.

When the proposed standard has finally been approved by the committee, it is sent to the Technical Activities Committee. All TAC members receive a copy for their scrutiny. Copies are also sent to an outside reviewer and to chairmen of related committees for their review. If the proposed standard is construction related, it is also sent to the TAC Construction Review Committee. Proposed specifications are examined by the TAC Specifications Committee.

The responses are collected by staff and assigned to a review team of TAC members. Review comments are evaluated and classified before returning the appropriate ones back to the originating committee.

The committee is required to respond to each primary comment and to each editorial comment if the editorial change is not made. If the committee disagrees with a primary comment, a technical reason for noncompliance must accompany the document. Staff then checks the document for compliance with the TAC comments.

If the comments are too voluminous and significant, TAC may require the committee to revise, reballot, and resubmit the proposed standard — the dreaded 3R's.

After the proposed standard has been approved by TAC, it goes to ACI's Standards Board which reviews the documentation to verify that the consensus process was carried out correctly. Then, the document is published in an ACI periodical and presented at immediately following the General Session at an ACI convention. The proposed standard is open for discussion for three months following publication. Changes may be made in response to the discussion as part of the closure. Committee members have one month to object if they disagree with the changes. The Standards Board then releases the proposed standard to Institute-wide letter ballot, again requiring two-thirds approval by those who vote.

This process is filled with checks and balances to ensure correctness and to ensure that all points of view are considered. The high quality of ACI standards results from this rigorous scrutiny, but all this takes time. The time frame is roughly:

- Start to completion of committee document, two to five years.
- Committee letter ballot, one month.
- TAC review, 2.5 months.
- Committee response to TAC comments, three months to several years.
- Standards Board, for release to publication, one month; for release to Institute letter ballot, one month.
- Editorial Department, four months for preparation.

(continued on p. 6)

President's memo

continued from p. 5

- Total of publication, convention presentation, discussion/closure, and Institute letter ballot, ten months.
- Publication of the standard as a separate document, 1.5 months.

This encompasses at least four years and for a new standard may drag on for six to eight years. This takes too long. What can be done to speed up the process without losing quality?

ACI's committee operations and standardization procedures must be reviewed to cut out steps or sources of delays. The major delays are in the time spent by the voluntary committee and in the procedural checks and balances.

Currently, the technical committee is allowed to proceed, perhaps for years, before the standard being developed undergoes a major review. If the committee has gone off in the wrong direction, a major revision will be required when the document reaches TAC. TAC should develop a mechanism for reviewing progress after a year or so to make certain that the technical committee has a clear focus on the need for the standard, its audience, and the required format and language. Engineering or editorial staff might be used in this review, but they are generally employed on other duties. Outside reviewers or editors are another option.

The TAC review of the proposed standard is carried out efficiently. The process would be improved if more technical committee chairmen took advantage of TAC's invitation to sit in on the review session. There are other procedural changes that could shorten the time needed to get a standard published. Possible changes are now being reviewed by ACI's Executive Committee, Technical Activities Committee, and staff. Streamlining the standards-producing process is a worthy Institute goal that will enable ACI to maintain its leadership in this most important activity.