

Good practice for my sins



When a spare sponge or two turns up at an autopsy, it's then not hard for the jury to decide the malpractice suit in favor of the sorrowing widow. Surgeons are supposed to be a cut above the average physician, and it is considered good, indeed mandatory practice for them to ensure that sponges are counted in and out. In most cases, however, it's not so clear as to what constitutes "good practice." This question started to trouble me and my conscience when I first read the evidence in the "case of the cracked overlays," over which I scooped the *National Enquirer* in last month's Presidential Memo.

In closing the discussion of "Control of Cracking in Concrete Structures," ACI 224R-80,¹ Committee 224 said it agreed that: "based on the current state of knowledge, it may be premature to recommend no traffic on bridge decks that are under construction" and deleted the recommendation to ban traffic. "Premature" seemed to imply, however, that given more time for overlays to fail, an embargo on traffic would be justified. Meanwhile, and just in case, the committee added the advice: "it is considered good practice to allow no traffic on decks while placing LMC overlays." An escape clause to the effect that things might turn out all right if traffic volumes were low and/or speed restrictions applied, proved of little comfort. The practice followed in Ontario of ignoring the trucks whizzing by in adjacent lanes of freeways that could not be closed, stood condemned. Since Saint Peter might not accept my unsupported explanation of necessity and satisfaction with the results for repairing bridge decks without ACI's "good practice seal of approval," it seemed prudent to look to a higher authority than Committee 224 for a defense or alibi he could not crack.

My first thought was to find an authoritative definition of "good practice" to see if it supported my case or, at least provided a loophole. I must report that I drew a blank in "Cement and Concrete Terminology," (SP-19), and other likely ACI reference documents. The only way out seemed to be to develop my own definition, based on the 1750 B.C. edition of Hammurabi's building code² and common sense, with the hope that someone in authority would eventually give it their seal of approval (copy to Saint Peter please).

What really seems to be lacking is a definition of "good enough practice" that reconciles the theoretically desirable with the practically possible. If so, then four essential elements must be included and due weight must be given to each depending on the particular circumstances. In these lights, I suggest that "good practice" is: "The best way known to do a job, in the circumstances under which it must be done, to achieve the desired results, at an affordable cost."

Some ACI reports and standards in fact already reflect this philosophy, e.g., "Standard Practice for Curing Concrete (ACI 308-81)." It might be taken up to advantage in many others as, I believe, the "case of the cracked overlays" shows.

By the way, since arriving at my definition of "good practice," I've had no further trouble with my conscience over bridge deck repairs. Moreover, I find I can now concentrate, without job-related distraction, on those more pleasurable sins for which I may be even less well prepared to account. Whether the accounting is to Saint Peter or the *National Enquirer* will, no doubt, depend upon which one gets first crack at the story!

References

1. "Discussion of ACI Committee 224 Report," *Concrete International*, May 1981, Vol. 3, No. 5, p. 108.
2. Feld, J., "Lessons From Failures of Concrete Structures," ACI Monograph No. 1, 1964, pp. 9-10.

President's memo

Christmas is forgiving — I hope!



With Thanksgiving over, it's none too soon to be thinking about Christmas. Even though we get a head start in Canada by celebrating Thanksgiving early in October, that still never seems to lessen the panic which sets in when you realize that there are only ten shopping days left to Christmas. Well, in case you are already at a last resort for gift ideas, there is still time to make a selection from ACI's 1982 Publications Catalog and have it delivered for Christmas anywhere in the U.S. or Canada. Just imagine the excitement and pleasure it will bring to a relative or friend when the mailman knocks at the door on Christmas Eve with all five volumes of the *Manual of Concrete Practice!*

In fact, ACI has such a wide selection of publications from which to choose that I thought it might be helpful to invite one of our members to suggest a few, that might be appropriate for that special person on your list.

Mark you, judging by the annotations (and perhaps his comments are slightly tongue-in-cheek), he doesn't seem to have read much beyond the title. However, with ACI's very fine print warranty you can hardly go wrong, and here is his list of twelve good buys for Christmas:

Concrete Primer (SP-1) — A long-standing best seller. For all who can read from Grade 2 to adult. The question and answer format makes for an exciting old-time party game by the fire.

Slabs on Grade (CCS-1) — Concrete Craftsman Series. A practical text. Will appeal to any fisherman on your list on the strength of the cover picture alone. Shows men in rubber boots digging for bait while trying to net the vibrator they just caught.

Manual of Concrete Practice. A full compilation of reports and standards, handsomely bound in red covers with gold lettering. Volume 4 in particular, the thickest and heaviest, will, if nothing else, make a striking door stop. (Sold separately)

Fatigue in Concrete (SP-41). "Covers the effect of age, moisture and condition. . . ." Most appropriate for Auntie if she just seems a little tired or out of sorts.

Standard Practice for Curing Concrete (ACI 308-81). Just the thing for a sick concrete aunt.

Guide for Determining the Fire Resistance of Concrete Elements (216R-81). New translation of Torquemada's classic Spanish Inquisition horror story of the effects burning at the stake had on heretical elements (structural, of course) of the population. Only recommended for those with a strong faith and stomach.

Models for Concrete Structures (SP-24). "Deals with all aspects of modeling concrete structures with emphasis placed on modeling the true inelastic behaviour. . ." No rubber bands apparently needed. Might be just the thing for a teenager tired of making aeroplanes.

Design Handbook, Vol. I (SP-17) and Vol. II (SP-17A). Matching volumes in attractive light blue 7-ring loose-leaf binders that can be used as photo albums if the technical content does not please.

Allowable Deflections (435.3R-68). Gives helpful advice and support for any members sagging under the weight of this permissive age. Certainly has its moments.

Step-by-Step Design Procedure (340.3R-77). Suitable diversion for any choreographer or ballet dancer you know, especially if you have designs on him/her.

Performance of Concrete in Marine Environment (SP-65). Most appreciated by relatives who used to live near the sea. Every page brings back the sound of waves pounding concrete to pieces and the tang of salt water (plus oxygen; you can't catch me on that one!) corroding reinforcing steel.

And as a final selection, if your "accompanying person" likes cooking:

Enchiridion-Concrete Quality (E704-4). Packed with ACI's favorite Mexican recipes.

Send right away for your free copy of the 32-page ACI Publications Catalog. Contains synopses and full information on how to order these Christmas specials and all other publications. ACI also carries a full line of stocking stuffers, party favors and prizes such as lapel pins, desk pen sets, key rings, money clips, neck ties, and golf hats; all at very reasonable prices. (Michigan residents add 4 percent sales tax).

By the way, a very Merry Christmas, Happy New Year, and a prosperous one for you and concrete.

President's memo

Toying with Concrete



When I suggested little kits of cement, sand, stone and steel rods so that kids could play reinforced concrete on wet afternoons, I never thought for a moment that anybody would actually take up the idea. However, the ink was hardly dry on my "Polish Your Apples" memo in the August issue of *Concrete International* when the Maginot Line Toy Company called from France. It seemed that they had been looking for a winning product ever since their original line folded in 1940. They even said they would try to get the kits into stores across North America and Europe in time for Christmas if ACI would help with the technical details. Well, all those children who were disappointed on Christmas morning deserve an apology, and the rest of us should make a New Year resolution to solve the outstanding technical problems before our budding young engineers and technicians grow too old to mix concrete with fun.

The first point of contention developed over the units of measurement to be used in the instruction manual to go with the kits. The draft received for review from the company's consultants in Europe was metric only. When the need was pointed out for an inch-pound, or at least a dual unit version for the U.S. market, they sounded somewhat taken aback. Surely this would be a waste of time and money, and pedagogically undesirable? The SI only version accorded with practice in Canada and the rest of the world, and much of the educational value would be lost since metric conversion was inevitable in the United States by the time the users grew up. The only compromise so far possible has been to agree upon a table of conversion factors inside the back cover.

A much more serious and intractable technical problem surfaced when reviewing the draft of Chapter 2, "Structural Design," due to divergence in the philosophy for defining load factors between the United States and the other planned markets in Canada and Europe. Not surprisingly, the consultants' draft for the chapter was based on the CEB/FIP Model Code which uses the reduced material strength concept to reflect the probability of the member being understrength. Our primary review comment pointed out that ACI Standard 318.77, Building Code, combines all the member understrength terms into one factor, ϕ , to reflect the type of failure in addition to the probability of the member being understrength. Accordingly, a different text would be needed for North America. Their response was by way of an astute question, "Does North America include Canada?" The answer had to be — probably no, in this respect, since the Canadian Standards Association committee responsible for the "Code for the

Design of Concrete Structures for Buildings" had resolved last May to draft the "Strength and Serviceability" section for a new edition of CAN 3-A23.3-M77 on the basis of the reduced material strength concept. This decision was not taken lightly since it required sacrificing 20 years of familiarity with the ϕ factor approach and compatibility with ACI 318. The CSA committee felt, however, that this was outweighed on grounds of both technical superiority when using limit states design, and uniformity with the approach already taken by the structural steel standard referenced in the National Building Code of Canada.

After listening to a long argument of the pros and cons, between the U.S. design philosophy for reinforced concrete on one hand and that proposed for Canada on the other, and considering also that an inch-pound version would be required for one country and a metric version for the other, the French company decided that they could not produce two manuals, associated design aids and computer software, yet still price the construction kits economically. With the ultimate strength of Gallic logic they argued that all this was a technical barrier to trade not permitted by GATT. The counterploy that, since structural safety was involved, the General Agreement on Tariffs and Trade entrenched a right to exclude foreign products that did not meet U.S. standards, proved of no avail. Regrettably, there seems to be little more that can be done until a meeting of minds is reached on a design philosophy. Then, and only then, will designers of any age have a design code and aids, which are simple and easy to use, yet yield safe and competitive concrete structures that can be built anywhere.

Things started off much better with the materials than with structural design. To cut down on transportation costs and ensure greater realism, everybody agreed that it would be best to ship only the packaging for the kits over from Europe and use local cements and aggregates. Mark you, there was some pressure to import the reinforcing steel, but eventually that idea was dumped. Indeed, only one serious question remains with the specification of the materials to include: Is the North America market ready for a superplasticizer as the admixture or not?

By the way, we never did settle on a name for the kits! In light of all the questioning that has gone on, the most appropriate suggestion so far seems to be "Toy B or Not Toy B."

President's memo



Shrinking Concrete to Fill the World!

One of the first signs of spring in ACI each year is that a new president pokes up through the snow of paper that blankets your desk, and bursts into flowery prose. This year, spring came early to ACI. Even before a groundhog stirred, the initiation rites for new officers took place in Atlanta, Georgia when ACI met, coincidental with the World of Concrete. Back home in Canada, your president's wife, Barbara, was only just throwing out the Christmas poinsettia and it will be a while before her heart can dance with the daffodils. Even in my native England the snowdrops and croci are only just peeping up through the cricket fields. Yet in the Southern Hemisphere, last summer's roses are already fading, and no doubt in the Far East, the makers of plastic flowers press on regardless of the season.

About one in four members of ACI live outside the United States in well over 100 countries, each with its own seasons and concrete problems. More often than not, the knowledge, techniques, and experience needed to solve a particular problem already exist, or are under research and development. The only trouble is that the required information may be in the corner of another mind, in another part of the world from where it is needed. This is where ACI and similar societies come in, and why so many people from far away places are members. ACI catalyzes the search for new knowledge and its subsequent documentation and dissemination worldwide, and *Concrete International: Design & Construction* is a most aptly named publication.

On a cold winter's day it is easy to be envious of a far away reader, soaking up the sun, a cool drink,

and the latest report on hot weather concreting. In fact, he missed a lot by not being part of the action responsible for preparing the report. If we are to succeed in shrinking concrete to fill the world, then input from all with the knowledge is essential, no matter where they happen to live. Ideas, information, and experience must be exchanged freely through local chapters and regional meetings and ACI must work hand-in-hand with like-minded organizations around the globe.

Such global thoughts seem in keeping with the Institute's objective to expand ACI's international impact. If so, is there any particular significance, or advantage in having a Canadian as president? It is, of course, not the first time this has happened. The late R. B. Young of Ontario Hydro, who was one of the all time greats of concrete, was ACI's president in 1940. Indeed I shall not even risk a claim to be the first Englishman to hold the office; instead I will try for the first Yorkshireman. As to the significance of this to the affairs of the Institute over the coming year: well, I will be continuing to drop a few clues in these memos for the amateur anthropologists amongst you to work over in search of any advantages.

By the way, I have often wondered why Margaret Mead never got around to studying what went on in Yorkshire. I guess that Samoa (and maybe even ACI) has more interesting initiation and fertility rites. Then again, I cannot be sure. Though I have lived and worked in a number of countries and visited many more, I have never been to Samoa, which seems to be one of the few places in the world where no ACI members live.

A handwritten signature in black ink, appearing to be 'T. S. H.' with a large, sweeping flourish above the letters.



Is Your Market-Washing Machines?

Not too long ago, I was called in as a consultant, by a nephew of mine who was trying to repair the family washing machine. It sounded as though it was laundering suits-of-armor and, in spite of being a recent graduate in mechanical engineering, he was even having difficulty in figuring out how to open it up to find out what was wrong. Impressed by the fact that he, at least, seemed to have learned one thing from his professor that many never learn: call for expert advice before, not after all else has failed, and touched by his confidence, I accepted the challenge.

Though, in truth, I know little about washing machines, it was very evident that we were up against one of those fiendishly clever designs characteristic of graduates from the Fort Knox School of Engineering. Indeed, how to frustrate reinforcing steel fixers or parents assembling children's toys on Christmas Eve must be at the core of their ergonomics (human factors) course. Notwithstanding, thanks to my experience with concrete mixers¹ and a large wrecking bar, we soon had the measure of the designer and the back off the washer. Inside I found the expected jumble of steel stampings, copper wires, rubber hoses and gaskets; each material selected as best for its particular purpose. What I did not expect to find were two intricately shaped pieces of precast concrete, strapped to the outer casing of the washing drum!

Why concrete inside a washing machine? Was it the result of a logical process of material selection? Or was it just another example of the perversity of the designer that had made it so hard to take the machine apart in the first place? The more I thought about them, the more these questions intrigued me.

The purpose of the concrete seemed reasonably clear. By adding mass to the thin sheet steel drum

casing, the increased inertia would damp out undesirable vibrations. A designer in the washing machine field however, would not likely be very familiar with the physical properties of hardened concrete, and might have been expected to have turned to cast iron or even lead for such an application. On the other hand, there is only a thin line between perversity, which is negative, and eccentricity which is said to be one of the virtues of mad professors, impoverished inventors, and English gentlemen alike.

Since the problem faced by the designer arose from an unbalanced load of wet clothes, I must concede that eccentricity played some part, but I have to conclude that the choice of concrete was a brilliant marriage of material with functional design. Concrete has a high mass-to-volume ratio, it is readily castable into the required shape, and is cheap and durable.

I happened to notice that the washing machine was made in Italy. This made me wonder if enough attention is being given in North America to seeking out innovative uses for concrete, and what more ACI could be doing to encourage such innovation. Can you beat my washing machine? If so, a good way to let the rest of the world know, is through the pages of *Concrete International*, and a brief account of a practical application is just as welcome for consideration as to publication as is a formal paper on the R & D phase.

By the way, the first time my nephew reassembled the washer, he forgot to reinstall the concrete blocks. So I had to leave him with the final piece of advice that he might best go back for post graduate work rather than try to make a practical living from the appliance repair business!

Reference

1. Smith P., and Van Dusen, H. A., "How Good is Your Mixer?" DHO Report No. 48, Ministry of Transportation and Communications, Ontario, 1964.

President's memo

PRRRRAR — Could Mean Money



So far, concrete seems to have escaped those jaded crossword puzzle fans, who coin acronyms to give a cute name to the cause of the moment or a handle to an otherwise forgettable title. We may, however, need their help because PRESERVATION and RESTORATION, REPAIR and RENOVATION, REHABILITATION or ADAPTIVE REUSE are beginning to sound like ringing words for the concrete cash registers of tomorrow. Strung together, all these words are a bit of a mouthful, yet, rehabilitation alone by no means covers the range of opportunities opening up for concrete.

These opportunities arise because a combination of social, environmental, and economic forces, is making extension of life of existing facilities an increasingly attractive alternative to replacement, especially in urban areas. Many of the candidate structures are of reinforced concrete, built in the first half of this century, and now at that critical stage in their lives at which even the owners recognize the need for major structural modifications or repairs if their profitable use is to continue.

Generally speaking, reconstruction work calls for much greater skill in structural engineering, materials technology, and aesthetic appreciation than does new construction. Yet most architects, engineers, and technicians have gained their knowledge and experience from new construction and likely need expert advice and authoritative information on a wide range of socio-economic and technical challenges before an old structure can take on a shining new face or use.

While many of the challenges are common, the very nature of reinforced concrete adds technical problems of its own to reconstruction work. Those properties and qualities of concrete which make it such a desirable and durable construction material in the first place, equally make it difficult to modify an existing structure. Even cutting a new door opening through a load-bearing wall requires a lot of brute force and a fair amount of structural engineering

know-how. The more complicated the proposed alterations are, the greater the difficulties; especially when plans and records from the time of construction are not available, current codes and standards may not be applicable, and new concrete and reinforcement must be married to unknown, time, and service modified properties of the old. To make matters worse, relevant technical information, old and new, and guidance on how to proceed with evaluation, design, and construction are sparse, or hard to track down, in ACI or other concrete publications.

For these reasons ACI, through its Technical Activities and Educational Activities Committees, is placing a greater emphasis on needs for extending the life of concrete structures. A three-session symposium was held at the Quebec City and Atlanta conventions to present the state of the art and case studies, and it is planned to publish the proceedings as soon as the manuscripts have been reviewed. Educational seminars on repair and restoration are being offered across North America during 1982. Contact Continuing Education at Headquarters in Detroit for details. A new Technical committee 364, "Rehabilitation", has been formed with the mission, "Develop and report information for the rehabilitation, renovation, and preservation of concrete and masonry structures." This committee, under the chairmanship of Howard Newlon, Jr., held its inaugural meeting in Atlanta on January 23, 1982. Write to Howard if you want to help.

That, I think brings you up to date on where ACI stands with PRRRRAR. While I have no idea how to pronounce such an acronym, it is the best I can derive out of one "P", one "A", and five "Rs" and still try to finish today's crossword before I start on my "In Tray."

By the way, I am quite stuck with 13 across — "six letter word meaning concrete." Surely the crossword compiler couldn't have had "cement" in mind! I must write to the editor, on your behalf.

President's memo

Business As Unusual

Part I — The Empty Meeting Room



Bankruptcies usually don't attract much concern, let alone sympathy, from the public at large unless their own jobs or investments happen to be at stake. When Laker Airways folded, things were different. Empathy of people on both sides of the Atlantic was quite striking, when they saw their champion of cheap flights falter and fall. Maybe ACI should have joined in the commiserations to Sir Freddie, because we stand to lose a lot more than the chance of a vacation in Europe if air travel gets much more expensive.

People may also be tending to stay close to home and their accountants these days for reasons other than travel costs. In times of depressed markets and high interest rates, management may not take kindly to time away at technical conventions, if all that is brought back is the fourth draft of a stale report rather than a hot-from-the-lab formula that will change red ink into black.

Problems with time, travel costs and slow communication by mail have regrettably always constrained overseas members from full participation in the affairs of ACI. While better ways must be found to facilitate their input, the fact remains that ACI can largely function without their physical presence. Warning signs from the statistics of convention attendances and the progress of technical committee work, however, suggest that these same physical constraints are now catching up on North Americans, and ACI cannot operate without them.

ACI plays a key role in the scientific/business system that drives the concrete industry. Many of the codes, standards and technical publications essential to designing, constructing and maintaining safe, durable, economical concrete structures come from the data, information, and knowledge generated, assem-

bled, assessed, and disseminated by the ACI subsystem. The processes presently involved require many members to meet face to face, usually twice a year, in various committee meetings or convention sessions. My concern deepens because success of the Long Range Plan* is heavily dependent on improving present processes.

Maybe ACI should look at alternative ways of doing business for another reason than just as a contingency plan for empty meeting rooms. More effective, efficient, and timely ways of discharging a large part of its purpose (see Section I of the By-Laws) may be possible. In subsequent memos, I will explore some of the concepts involved. These include more specialty conferences and the substitution of locally based technical activities and cheap electronic communication links for the costly and time consuming process of physically moving people and paper around concreteland.

By the way, somebody must be leaking my memos because I see at least one of the remaining airlines has already started to get worried. At a recent press conference, called to announce a loss of \$20 million in 1981 and planned cutbacks, Ian Gray, President of CP Air, is reporting as saying: "The market is not there . . . if the price of information transmission comes down, business travel could be substantially reduced by 1990."

*The Long Range Plan, developed by the Planning Committee and approved by the Board of Direction, was published on pp. 53-55 of the January 1982 issue of *Concrete International* and President Chastain's memo in the same issue addressed the purpose and significance of the Plan.

President's memo

Business as Unusual

Part II — We Could All Chip In



Last month I pointed out that the traditional processes which have kept ACI in the forefront of knowledge may be in jeopardy from empty meeting rooms. If so, alternative scientific/business systems, which permit more members to become involved, but avoid moving people and paper around as much, deserve consideration. Possible approaches include: decentralized technical activities, more regional think-tank and specialty conferences, and electronic communication linkages for the system. Some of the advantages (and pitfalls) may become clearer by example.

In the Fall of 1979, two groups set out to document the information and knowledge needed to correct the widespread deterioration of parking structures. In Toronto, sponsored by the Ontario chapter of ACI, a small group of concerned experts met frequently to draft interim guidelines. Including time for the TAC review process (so that the document could carry the authority of ACI and its logo), the required information and knowledge was placed in the hands of owners and engineers within about 18 months. The newly formed technical committee, 362, Parking Structures, on the other hand, followed the traditional path of meeting at national conventions with as many members present as could make it. Their first product, a state-of-the-art report, is expected by the Fall of 1982 and guidelines for the design, construction, and maintenance of parking structures are anticipated about two years later. One shortcut might have been to commission an individually authored synthesis of existing information to complement the papers in ACI Compilation No. 3, Parking Structures, published in 1980. No criticism of 362 is intended, however; their progress is quite acceptable by all present standards, except the urgency of solving the problem.

While the Ontario initiative only assembled and assessed existing information, a recent project involving the Southern California chapter of ACI set out to develop new knowledge. The Slender Wall Test Pro-

gram, jointly sponsored with the Structural Engineers Association of Southern California, examined the behavior of tilt-up, reinforced concrete, and concrete block and brick masonry walls when subject to eccentric axial and lateral loads that simulate wind and seismic forces. The program involved mobilizing voluntary contributions, equivalent to \$250,000, so it was a sizable undertaking and the results, about to be published, could be of wide value.

A dedicated symposium or paper session can be a depressing sight if more speakers than audience are present. Yet ACI relies heavily on such peer winnowing at conventions to sort worthy new knowledge and experience from the chaff; other options remain little explored. These include: preprints reviewed by critic reporters, sequestered think-tanks or colloquies by invitation, and open-to-all specialty conferences. The power of the specialty conference in advancing the state of an art and in bringing a whole new range of people, even industries, within the orbit of ACI is illustrated by the World Congress on Joint Sealing and Bearing Systems, held last Fall in Niagara Falls, N.Y. Initiated by Technical Committee 504, Joint Sealants, and sponsored by ACI, over 350 people, including 70 from overseas, attended the four-day meeting. The 64 papers presented and discussed occupy the two volumes of SP-70, and a new Technical Committee, 554, Bearing Systems, has been formed at the request of those attending.

With encouragement and some overall plan to direct and coordinate events, such efforts by small groups of enthusiasts could coalesce into the scientific/business system ACI may need for the future. In the concluding part of this memo, I will try to link all the pieces, people, and processes together — electronically.

By the way, Telex has just been installed at ACI headquarters to provide better communications, especially with overseas chapters and members. The number to call is 810-221-1454.

President's memo

Business As Unusual

Part III —

Achieving Goals the Digital Way



(The story so far: The President of ACI wanders from one empty meeting room to another, trying to find where Committee 318 is meeting. Despairing, he phones his office. The answering machine responds with the news that 318 had decided to teleconference its meeting to save the time and cost of travel and a P.S. that his secretary has decided to leave him for another. So he decides it's time to write a memo about new ways of doing business in ACI, even if it means learning how to use the newly installed word processor himself!)

Word processors and other microcomputers are fast becoming routine in most offices and, in conjunction with existing telecommunication services, they can provide the basic capability members need to launch ACI into a new scientific/business system. More sophisticated, dedicated, centralized or distributed network systems are available off the shelf, if we ever need and can afford them. In fact, the electronic technology involved is probably the least of our concerns in linking devolved technical activities, specialty conferences, and other new approaches for assembling knowledge with speedier processes for assessment and dissemination. A lot more is involved than just another on-line technical information service. The challenge is to build a more universal system without black holes that may bend the truth or swallow the goodwill of hard working committee members in a vortex of electrons.

To date, computer based systems have not won unqualified acclaim. Everybody seems to have some tale of wrong billings or lost reservations. Professional people, who would not be without computers for data analysis, have yet to give peer acceptance to electronic journals. It is likely that many ACI members rate meeting old friends in hotel lobbies on a par with seeing committee reports sooner on visual display tubes.

Fortunately, there are some hopeful signs that the nadir of electronic acceptability has passed. Calculators nestle in nearly everyone's pocket or purse and people are lining up to do their banking on remote terminals. Personal micro-computers and video games were amongst the few items that sold well last Christmas, and people usually buy only those things they feel are useful, fashionable, or fun to have. I'm

not sure which it is in this case, but the important thing is that people at last seem to be moving from a passive attitude, such as watching TV, to an interactive one.

Ad hoc electronic replication of paper-driven systems, without forethought as to the interaction of the medium with the message and the user, may only lead to disaster at the speed of light. The television reporting of the Viet Nam war proved that the medium itself can have far-reaching consequences on the course and conduct of the events it is supposed to be reporting objectively. An electronic game of ice hockey is quite different from the original, solely because of the medium of play. If you still want to win, then your perception and understanding must change to accommodate this constraint. If instead, silicon chip logic is given free rein, all sorts of possibilities for new and original games open up, and these are the ones that are captivating kids in dexterous space wars. As the battlefield moves to the terminals on the desks of the business world, it will be critical that data and information do not acquire an authority they may not deserve, or pass themselves off as knowledge whereas they have never been assessed as to worth and applicability, just because they appear on a display screen as if by magic.

Converging ACI's technical activities with computers and communications to improve the processes for making knowledge about concrete widely and quickly available may not prove easy. Clearly, a host of human factors and side effects of digital processing must be taken into account by the architecture, decision logic, and human umpires if the system is to gain acceptability and maintain ACI's reputation for integrity. Yet, we can hardly wait for others to pioneer information technology if the goals of ACI's Long Range Plan are to be achieved and the information needs of the concrete industry are to be met. Your views by telex or telephone would be welcome.

By the way, I am thinking of programming a new computer video game. It's rather like "Asteroids," except mine are made of fiber reinforced, polymer-impregnated concrete which should make them virtually indestructible. Watch out world, here come the "Concoids"!

Polish Your Apple



With only sounds of the laughing and splashing of youngsters at play in the pool to disturb your thoughts, high summer may be a good time to reflect on education. It's not that I have been waiting until classrooms are empty and teachers' backs are turned towards the sun, in the hope that this memo will miss their notice and I will escape any brickbats or spitballs which might follow. Rather, I wanted to get a quiet moment with you, away from the interruptions of work, to put a crucial question. "Will the next generation be ready to take over your job when the time comes?"

I am sure your first reaction will be: "Of course they will. They have always been in the past." I am not quite so certain, however, that the education and training requirements for a career in the concrete industry are being all that well satisfied by the education industry at present. If you need proof of this contention, try advertising for a new graduate with some knowledge and interest in concrete materials and see what you get! I am not sure if the problem lies with students being turned off by concrete, or not being turned on by their professor. Whichever it is, we cannot lay all the blame on the academics and expect them to solve it without our help. Compared with other, more glamorous aspects of science and engineering, and more financially rewarding careers in accountancy, law, or medicine, concrete must present a rather stony prospect, and this must first be overcome before inadequacies in instruction are addressed.

The Tennessee Society of Professional Engineers recently took a rather novel approach to counter this problem of image. In announcing a national competition for the design of an engineering toy for six to eight year olds, their executive director is reported as saying, "It has been developed to promote engineering at a point in a child's life when he or she wants to learn and explore. We feel that, with the demise of the Meccano construction kit, budding engineers have nothing to play with. Besides, if doctors can have a game, why not engineers? Playing 'doctor' may be more fun, but playing 'engineer' is more constructive." It may be harder to sell mothers on little

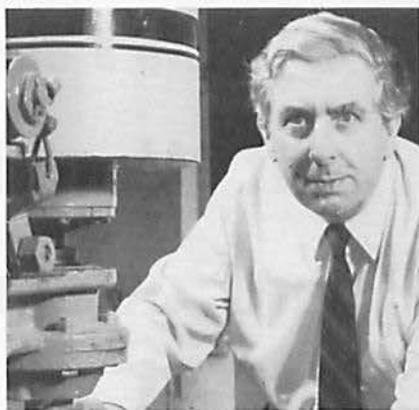
kits of cement, sand, stone, and steel rods so that the kids can play 'reinforced concrete' on a wet afternoon, so we may still be stuck with addressing school and university career days.

It is as well to remember that the leaders in the concrete industry for the next 50 years have probably already been born. Before they can reach for the top, somewhere between kindergarten and an ACI educational seminar, they must meet that great teacher who can fire their imagination and curiosity into an orbit of skill and knowledge. Unfortunately, too many "learning experiences" these days seem to involve lecture notes regurgitated to large classes and assignments that don't need much marking, rather than a dialogue with a concrete Plato after which all will have become known and clear about shrinkage and creep. Again, a lot of this may be our own fault because the brightest and best do not necessarily become teachers. If you have that precious gift, then the least you can do is volunteer as a speaker for an ACI educational seminar or spend a few extra hours passing along some of your knowledge and experience to any students who are working for you this summer. If you do not, then at least make sure that your company has a good training plan and promising individuals have full support for continuing education.

As one of the graduate students from Plato's academy, Aristotle, succinctly pointed out: "The fate of empires depends on the education of the young," and history has proven many times that it can be fatal to leave the fate of empires solely to the professional empire builders. If you agree, then we should go to the education industry, with our shiniest, reddest apple in hand, to tell them what we expect of them and to offer all the help we can, except for higher taxes!

By the way, the Law Society of Upper Canada recently turned down a sizable sum left by a lawyer on condition that a prize be given each year to the student who graduated from the bar admission examination with the poorest marks. He noted in his will "that many with very low standards at the examination have become illustrious members of the bar by keeping dark their want of legal knowledge."

North lies Detroit



I think Barbara and I will drive to Detroit for the convention at the end of September rather than fly. It's only 350 km from Toronto and less than a four hour drive west to Windsor. Then north over the bridge or through the tunnel straight into downtown Detroit. That's right — north. Detroit has the unique distinction of being the only place north of Canada, except for the North Pole!

Those last few kilometers into Windsor will be paved with memories of the first concrete job I worked on in Canada 25 years ago. (I wonder whatever happened to that paving mixer operator whose only qualification, I swear, was that he had driven a tank for Rommel during the war?) As the Detroit skyline looms ahead, thoughts will turn to those bright lights across the border and the welcome night out on payday. Over the intervening years, I've driven through Detroit from time to time and sadly noted the signs of decay, crime, and race problems. It's great to be going back to a city that is revitalizing itself in spite of poor times in the automotive industry and to be staying in the Renaissance Center which symbolizes Detroit's rebirth.

Through all these times — good, bad, and now getting better — Detroit has been the home of ACI. I'm proud that ACI has stood by Detroit and not joined the flight to the suburbs or to another city.

While they are in town for the convention, members may want to visit ACI headquarters to see what goes on. Well, there is no great laboratory nor grand training center to see, just a modest office building situated in a pleasant middle-class neighborhood. What makes this office rather special, and worth a visit, is the more than 40 hardworking people, professional and clerical, who run the day-to-day affairs of

ACI on your behalf. You probably already know many of the key members of the staff who handle technical questions, ready manuscripts and reports for publication, or plan convention and educational programs. You may have met them in person at conventions, seminars, or committee meetings. If not, their names at least are known from correspondence and the fly leaf of publications. There are many others, however, with whom you don't normally have direct contact, and should make a point of meeting them if you visit headquarters. They process your orders for publications within three or four days, keep the membership records up to date, run the library, operate the word processor, answer the switchboard, and do all the things that keep a \$4 million per year nonprofit enterprise, with a worldwide membership, running efficiently.

One of the staff once remarked to me that working at ACI headquarters was the nearest thing he could think of to working in paradise. He collected stamps for a hobby! We want a happy staff, so please keep your letters and orders for publications rolling in from the over 100 countries around the world where ACI has members. We surely have a dedicated staff and this is a way of thanking all of them on your behalf while we happen to be visiting with them in their home town.

By the way, before I head back south to Canada, I must remember to apologize for one thing. After the War of Independence (known to some as the American Revolution), Detroit was awarded to the United States in 1783 under the terms of the Treaty of Paris. The British, however, must have liked the place so much that they did not leave until 1796. Sorry about that, Detroit — you will just have to be patient and wait another 13 years to celebrate that bicentennial!

President's memo

Keeping the stables of consensus clean



Fortunately, ACI's stables are built of concrete which is, I suppose, one of the reasons why they are a lot easier to keep clean than those of King Auegas. From time to time, however, it's a good idea to peep in through the door to see how well our old favorite "consensus" is doing and to make sure that nobody is shoveling out the feed along with the manure.

"Consensus" is not, of course, out of "compromise" as some people seem to think. It is the reasoned agreement that is at the heart of the technical review and standardization processes of ACI. Rigorous, formal procedures are in place against abuse. Ultimately, however, it falls on the individual member to keep the system honest. Or does it? Two cases from the not so secret files of ACI speak to the issue.

One of the keystones of consensus is that objections raised by a negative voter shall not be swept under the rug. Yet, as Loring A. Wyllie, a member of TAC, recently pointed out, the standard concerned may not be improved as a result of the process of resolving a negative vote. If a strong negative vote is found persuasive by the committee and a significant change is made as a result, this change may attract more than one negative vote on the next letter ballot from those in favor of the original version. The committee must then consider these and rule if they are persuasive. This may be hard to do since the pros and cons have been thoroughly debated on the previous ballot and, if the second letter ballot as a whole has a two-thirds majority, the amended standard may quite likely go forward from the committee. In this case, one person (the original negative voter) has prevailed over the greater number of negative voters in favor of the first version, which also had the majority vote on the first ballot.

In the case of "two negatives don't make a positive," the lone individual may not have served the process of consensus that well. On the other hand, one watchful individual may perform a singular ser-

vice, and if ACI had awards for persistence and for magnanimity then my nominations would have to go to David Manning and David Darwin, respectively, in the case of the "cracked overlays."

The events surrounding the proposed awards culminated in the December 1981, issue of *Concrete International*.¹ To follow the evidence in detail you also need the earlier discussion and committee closure² and the report that started it all, "Control of Cracking in Concrete Structures."³ In essence, when the committee rebutted David Manning's well reasoned and documented discussion on latex modified concrete overlays, it tried to get away with papering over the cracks. Normally that closure would have ended the matter; questions had been raised and answered in print, and the process of consensus had been satisfied. David Manning, however, remained unconvinced, and he wrote a letter of last resort to the editor.¹ ACI "stopped the presses" while the committee had third thoughts.

The magnanimous response of David Darwin is worth quoting:¹ "I would like to thank Dr. Manning for his persistence and continued interest in ACI 224R-80, 'Control of Cracking in Concrete Structures.' He has made his points quite well and in the process won over ACI Committee 224. I expect that the full range of ACI documents would benefit if all readers and users showed a similar interest."

Should we ever falter in our labors for consensus, they tell me that Queen Omphale is still in the spanking business in Lydia (no outcalls)!

By the way, about a year ago Margaret Thatcher, the British Prime Minister, was quoted as saying: "Consensus seems to be the process of abandoning all beliefs, principles, values and qualities . . . What great causes have ever been fought under the banner of 'I stand for consensus?'"

I understand that Margaret Thatcher is also still in business at No. 10 Downing Street!

References

1. "Comments on Cracking" and "Author's Reply," Letters to the Editor, *Concrete International*, Dec. 1981, Vol. 3, No. 12, pp. 13-16.
2. Manning, David G., "Discussion of ACI Committee 224 Report," *Concrete International*, May 1981, Vol. 3, No. 5, pp. 103-104, and Committee Closure, p. 108.
3. "Control of Cracking in Concrete Structures" ACI 224R-80, *Concrete International*, Oct. 1980, Vol. 2, No. 10, pp. 35-76.

President's memo

A Perfect Pair



Several of the events and the impressions from the kaleidoscope of this presidential year have led Peter and me into discussions about the role of women in the concrete industry. One thing at least on which we appear to agree is that the role is changing to a more active and contributory one. Indeed, I think that the end result could well be a most significant advancement in the art of concrete. Therefore, I have accepted the President's invitation to make my case in this memo.

Peter opened one of our discussions by reminding me of a favorite slide of his. Taken from an old painting, it shows a group of women helpfully charging an early 19th Century cement kiln. I had to agree that women largely had stood on the sidelines of cement and concrete technology in the intervening 150 years, except to point out that, in times of national emergency, they had risen to every challenge. Admittedly most of the wartime challenges involved relatively unskilled work, and it is really only in the last generation that women have slowly entered into the technical and management mainstream. Recently I was part of two experiences that made me aware of the rapid acceleration in this trend. I was impressed and delighted to see such a large turnout of female students and well qualified engineers and technicians at a symposium on modern concrete technology in Caracas and at a seminar on architectural concrete in Monterrey, Mexico, organized by the Asociacion Venezolana de Productores de Cementos and the Instituto Mexicano del Cemento y del Concreto, respectively. Both events were co-sponsored by ACI and Peter had been invited to attend them as president and a guest speaker.

One of the papers to which I listened with interest at the Venezuelan symposium was about the 7,000,000 cubic yards of concrete in the Guri hydroelectric project. Later, Peter and I were privileged to fly down to the site on the Rio Caroni, some 400 miles south east from Caracas. At the time of our visit about half the concrete to raise an existing gravity dam and to build the powerhouse had been placed by the contractor, Consorcio Kavanayen, which is a consortium of Venezuelan, Brazilian, and United States contractors. The project also involves an extensive earthdam; indeed, it must be one of the largest and most impressive civil engineering works underway in the world at the present time. A peak work force of nearly 10,000 people is required to build such a vast project and, isolated as it is, the project becomes a microcosm of society.

Before work on the dam itself could start, new towns had to be built for the people from many lands whose skills are needed for the project. All of them,

irrespective of culture and lifestyle, are now learning to live together as they call Guri "home" for the next few years. Some have brought their wives and families along. This adds that civilizing touch to what would otherwise have been only men, machines, and concrete changing the face of the wilderness. Many women are making a direct contribution to the project as part of the workforce. Some, of course, are doing so in important traditional ways, such as teaching children in the schools, but others are directly involved in the technology of the project.

Certainly many social and economic benefits will follow the availability of cheap and abundant electricity from large, spectacular projects such as Guri. Perhaps concrete even contributes in larger measure to the improvement of the quality of life for women when it is used in simpler forms, such as masonry blocks in low-cost housing. Often I find the concrete exposed in apartment blocks, office buildings, and factories to be cold and unfeeling when compared to wood, brick, or mellow stone. I am sure this need not be so. A female touch added to the technical skills necessary for design and construction could bring a more human dimension to the many concrete structures that now shape our cities.

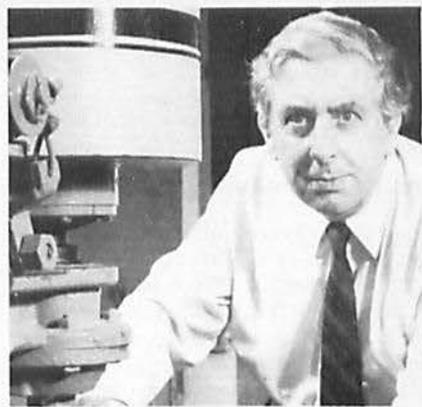
One concrete structure which symbolizes the reshaping of a city is the Renaissance Center in Detroit, in which ACI held its convention last fall. Though the technical proceedings at conventions are still largely male preserves, the warm hospitality and arrangements made by the wives of the local committee provide opportunities to make new friends, for all who attend. Again, a further dimension is added to concrete.

From my experience of participating in the symposium and seminar, from the technical and social impressions gathered at Guri, and from the many friendships formed at ACI meetings, I am convinced that women and concrete are a natural pair and an unbeatable combination.

Barbara Smith

President's memo

Curiosity Is The Touchstone



We have all been elliptically once round the sun and it's time for Spring flowers and a new President for ACI. Welcome Norm Scott, this page is all yours and I can retire to my laboratory with that peace of mind which comes from not having heard of any ACI members falling off the edge of the world during my term of office. Though it may have been a year in which cement sales slipped and tower cranes rusted, at least Kepler, Galileo, and Newton again have been proven right even if the economists have not. Those with more learning than I, tell me, however, that the classical theories of matter and motion can no longer be regarded as adequate to explain galaxies at one end of the scale, or atoms at the other. Furthermore, if one wants to stand any chance at all for a Nobel prize out of concrete research, then one really will have to get into special and general relativity, quantum physics, gauge symmetry, and even the theory of games.

This Einstein caliber of thinking may come as something of a shock to those of us who have been quite satisfied with describing the properties of concrete in terms of a slump of so many inches or millimeters. In fact the advice may hold that grain of truth which, if passed over, may land concrete in one of the closets of the industrial revolution alongside steel and steam engines, still useful, but not going anywhere new or exciting.

A pointer may be drawn from the three basic, wide impact improvements in concrete materials technology of this century. The first of these improvements (1918), the understanding of the relationship of strength to water-cement ratio was the result of a painstaking laboratory investigation involving about 50,000 tests. The second discovery (1940), the durability benefit of air entrainment was a fortuitous accident. Super-plasticizers (1960 -) are the product of sophisticated research in organic chemistry. At this stage of maturity in material sciences it seems unlikely that "coarse scale" investigations with batches of concrete will yield the next breakthrough. Nor should we count on serendipitous accidents. That

leaves only the type of basic research at the small end of the physical scale which has led to silicon chips revolutionizing man's ability to control, compute, and communicate. Somewhere in the still murky molecular and atomic depths of rheology and hydration and equal opportunity may lurk for cement and concrete, provided we search hard enough.

Unfortunately, many of the organizations which have traditionally underwritten basic cement and concrete research have had to retrench in the face of hard times. This may mandate closing out R&D altogether, or at least cutting its budget and concentrating on product improvement and customer service to turn a profit. Nor can more altruistic organizations like ACI take up the slack and sponsor research unless substantial new sources of funds are found and its members collectively decide to do so. It seems doubtful if a *best*, long-term strategy for improvement of the products of the concrete industry can flow from present expediencies.

Fortunately, the driving force of human curiosity remains as strong as ever. Curiosity is the one attribute which above all has brought man from believing that the world was a flat pancake under a circling sun to knowing that it wasn't. Indeed, curiosity seems to be the one guarantee that progress in cement and concrete technology will continue in spite of all the handicaps. As J. D. Birchall, who headed a five-year basic research study which led to the invention of a non-brittle cement based material stressed recently, "It was not targeted research . . . we are a multidisciplinary team employing scientific curiosity based on knowledge. Sometimes we had to fight to do it this way but we won."

Goodbye from Barbara (see last month's memo) and I. May your curiosity go with you all of your days.

Reference

1. "Cement Springs to Life as a Super Material," *New Scientist* (London), V. 95, No. 1317, Aug. 5, 1982, p. 365.