THE REVAY REPORT

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RAL

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by Steve Revay

In this issue we are departing from our usual format as the French-language edition is published under the name of Wagner, Daigle, Revay. This company, which is a wholly-owned subsidiary of RAL, has recently been incorporated, with a view to emphasizing our Quebec-based origin. We have been contemplating taking such a step for some time, and Carol Wagner's coming on board made the timing an easy choice. We are looking forward to increased activities in Quebec and in francophone Africa with the help of Carol.

The lead article is a reprint from the November 1986 issue of the Military Engineer, the official journal of The Society of American Military Engineers. That issue was dedicated in its entirety to "engineering education". We selected Jack Morris's article, both because it expresses views we at RAL have been supporting for a long time, and because of Jack's relationship with us.

It is nothing but a coincidence that the Université de Montréal has recently announced a new post-graduate joint program by the faculties of Architecture, Engineering and Business Administration (Faculté de l'aménagement, École Polytechnique and École des hautes études commerciales (HEC)), aimed at serving the needs of construction practitioners. To this end, classes will be held in the evening or late in the afternoon. The Université de Montréal ought to be congratulated for their endeavors in this area, that ought to help in improving the construction industry's cost-effectiveness.

J. Revay

RAL President

ROUTE TO/OR FILE:	

CONSTRUCTION MANAGEMENT TRAINING
An Industry/Academia Challenge

by LTG John W. Morris
President, MSR International Inc.

Over the past couple of years, a continuing dialogue has been occurring throughout the United States about "more construction for the money." This is the result of the work done by The Business Roundtable in evaluating problems in the construction industry. Many recommendations from these evaluations relate to better leadership, safety, scheduling, and management. This brings us to the basic question: "Where do managers come from to oversee today's investment of billions of dollars in construction?"

There are 325,000 people who manage construction projects and the majority have learned or are learning on the job. Many are good solid managers. A basic concern, however, is the cost paid in mistakes, correcting errors, climbing the steep learning curve, and, to a lesser degree, from a narrow perspective due to continued association with a specific type of work, often in the same location.

Interestingly, there is no shortage of school-trained business managers. The formal education systems in the United States and throughout the world have long produced bachelors and masters of business administration. This is not the case with construction engineering and management. Prior to 1960, management courses relating to engineering and construction were rare and, conversely, engineers were rarely found in management.

In the absence of academia as a source, one of the principal fields for training engineer managers has been the military. The assignment and promotion systems within the military move young men from job to job to management. Consequently, he learns - and expects to learn - to manage people after on-the-job experience. Perhaps this is why so many chief executives or chief operating officers of large firms come from the military.

Changes in Academia

The situation in education began to change in the mid-1960's. Courses in industrial engineering began to appear and Stanford University started a construction engineering program and offered a degree. These events were regarded with some curiosity. In the late 1950's, I was responsible for the assignments of Engineer officers below the grade of Colonel; and, at that time, our Chief of Engineers' policy was for 95 percent of the Engineer officers to have bachelor degrees and one-half to have graduate degrees.

In selecting courses for our officers to attend, we looked for civil, electrical, and mechanical. We considered industrial and construction engineering as peripheral and not mainstream types of education. This concept continued for some years, so the problem was not only a shortage of educational institutions which provided training in management, but the profession itself was not too concerned about the value of this training.

Recently, however, changes have begun and today 60 universities include construction engineering management courses in their curricula. Of these, 44 have courses at the graduate level; however, most of them offer no degree program. Universities offering degrees often include courses in both engineering and business. Overall, however, there is no specified or basic group of courses or standard for recipients of Construction Engineering Management degrees.

Other problems also exist, such as the lack of qualified teachers. This does not mean that those who are teaching are not excellent people, but they have limited experience in construction engineering management. Also, teachers receive lower salaries than those who use similar or the same talents on the job. There are other problems in the universities, such as the competition for the course offered by the College of Business, College of Engineering, or the College of Architecture.

Equally important are the industry's lack of interest in seeing that educational institutions do a good job and a general lack of acceptance of construction management as a profession. Finally, there is a shortage of dollars for research - research being the amount of money universities need to supplement instructors' pay and also to underwrite an investigation to solve various problems related to management.

The University of Maryland Program

In the fall of 1982, I was asked to help the University of Maryland set up a Construction and Engineering Management course. Why they asked me is not entirely clear. Nevertheless, having had 40 years experience in the field, I had many contacts and associates to call on for help. In becoming involved in the situation, I learned that some of the problems I just related had been recognized and were being resolved at Maryland. Most important, this course had been financed by the generous donation by a Regent of the University of Maryland, James A. Clark, of Hyman Construction Company and Omni Construction. Also, the College of Engineering took firm control by initiation and assuming responsibility for the program.

A committee was established (with Mr. Clark as chairman and myself as vice chairman) to develop this construction engineering and management program. The committee also included individuals from Stanford University, the Corps of Engineers, the University of Maryland, and industry.

Establishing Course Criteria

We began our work with a survey, by personal contact and letter, of principal executives of some major U.S. companies involved in engineering and construction. We asked these leaders one fundamental question: "If you were to receive a graduate from the University of Maryland's Construction Engineering Management course, what would be the educational assets that you would like him to bring to you?" From the responses to this survey, we developed a White Paper, which included certain basic conclusions.

- The course would be a graduate-level program. The committee, based on input from industry, concluded that not all B.S. degree undergraduates knew if they were managerial material and if they wanted to go into management.
- We felt that a strong B.S. degree program was essential to developing good construction engineering managers. Consequently, we did not wish to weaken the criteria and degree requirements in the basic fields of engineering.
- The graduate-level approach gave industry leaders the time to evaluate an individual's potential for growth as a manager.

The White Paper recommended 30 credit hours, of which four courses (or 12 hours), would be from the College of Business. The remaining six courses, or 18 credit hours, would be from the College of Engineering. This turned out to be a very good breakdown and allowed us to start our course using available assets. The industry responses were fairly clear as to the subjects most valuable to them. The following were mentioned in the industry leader responses in the percentages shown:

Contractual Law	82%
Construction Methods	82%
Leadership	75%
Financial Management	75%
Managerial Systems	73%
Cost Control	55%

Subjects mentioned less frequently included project simulation, local relations, materials, mega-projects, statistics, and accounting.

The White Paper was approved by the appropriate authorities and classes began in 1984. By 1985, a faculty of four was established and hired, and the student load had grown to be the second largest in the graduate-level engineering course. A class on one subject was attended by 40 students, of which half came from industry.

Evaluating the Program

Having been privileged to be the first Chair Professor in charge of the graduate-level Construction Engineering and Management course and having overseen the beginning of the instructions in the spring of 1984, I was interested to know how well our course correlated with other university courses and also with the industry's needs. An evaluation of the latter was based on five inputs: the Associated General Contractors had completed a study involving 431 responses; The Business Roundtable, 112; Project Management Institute, 59; Frederick Mueller's independent study for a doctorate degree, 44; and the earlier mentioned University of Maryland survey. By evaluating these data, we were able to provide a list of sought-after skills in a single industry.

We then surveyed the 44 universities mentioned above. They were fairly well distributed geographically - 8 in the far west; 10, mid-continent; 11, midwest; 7, northeast; and 8 in the south. This distribution meant that not only did we see what was happening in that regard regionally, but we were also able to bring in all major schools in the country that have construction engineering and management programs. The courses offered by these universities parallel quite closely the industry's needs. For example, among the 10 courses appearing most often in the university survey, seven of them are mentioned in the broad industry survey which differed somewhat from the more limited University of Maryland survey of industry leaders. We also found that only four universities (9 percent) provided all seven and about 30 percent offered at least six. (The University of Maryland was one of the four universities that provided all of the courses requested by industry in the survey.)

- Planning and Scheduling
- Contract Law
- Project Management
- Construction Methods
- Cost Estimating/Engineering
- Engineering Economics/Cost Control
- Decision Making

Four subjects on the industry list were not included in the education institute survey results: Human relations-leadership; and financial, human resource, and business management. These four courses would be appropriate ones to be offered by the College of Business.

Improving Support to the Industry

Besides learning about the close correlation between the needs of industry and the university offerings, we identified two opportunities to improve the educational system's support of the industry's needs: To establish a core curriculum which would be adopted by all universities to serve more consistently the industry and for the industry to express a stronger voice in measuring academia.

The present perception of success at universities is often based on the amount of research money collected and how they compare to other universities in their peer group. This approach seems somewhat off target because engineering is a science and management is an art. It is not only difficult but also inappropriate for engineering colleges to evaluate success and management training in the same way as they do engineering education. Scientists are not necessarily good management teachers. Therefore, the industry served by academia should help evaluate university programs through the quality of the product and speak out on how well the universities are doing.

The educational systems in the U.S. are steadily expanding their programs for developing construction engineering managers. This effort is timely - in fact, overdue if the U.S. engineering and construction industries are to keep pace internationally and domestically by becoming more efficient at the project and program levels. Even so, academia should not proceed without carefully targeting their efforts at the needs of the industry that their products will enter.

The trick to total success depends on close and continuing relationships between the universities and the engineering construction industries to develop a core curriculum for construction engineering courses and to establish, within industry, a mechanism to evaluate how well the product being provided by our universities meets their needs. Bringing these two elements together will require co-ordination and planning.

TECHNOLOGICAL IMPLICATIONS OF MAJOR ISSUES FACING THE CANADIAN CONSTRUCTION INDUSTRY DURING THE NEXT DECADE

In July 1986 a meeting took place at the National Research Council of Canada in Ottawa, of senior provincial officials concerned with issues facing the Canadian Construction Industry. A briefing document was prepared by the Institute for Research in Construction (IRC) for this meeting, in consultation with experts on various aspects of construction. The document gave an up-to-date and comprehensive view of the economic, regulatory and technological concerns of the industry.

RAL was retained to report on the technological implications of major issues facing the Canadian construction industry during the next decade.

The following is a summary of RAL's report:

INTRODUCTION

Strong emphasis has been placed in recent years on a couple of contentions concerning the Canadian Construction Program:

Firstly, that construction should receive greater recognition in public circles for its importance in the overall economy and especially for its key role in economic development. Construction is Canada's largest industry and ranks at or close to the top in all provinces and territories.

Secondly, that construction is a technology-intensive industry and that most of the issues facing it in the next decade will accordingly have important technological implications. Attention is also drawn to the facts that the overall construction research-and-development program is estimated to amount to only 0.1% to 0.2% of the value of the construction program and that the application of new or improved construction technology is typically a slow process. This has led to strong recommendations that many more resources should be allocated to both of these areas.

A number of explanations have been offered to explain the relatively low level of construction R & D and slow rate of construction technology transfer in Canada. Notwithstanding the increased attention focused on these subjects in recent years, many members of the industry assign a low priority to technological matters.

In this paper it is planned to:

- cite some of the main reports dealing with this subject in recent years;
- assess for technological implications a sampling of major construction industry issues as currently identified by industry leaders.

In doing so, some of the gaps, opportunities and obstacles for R & D and technology transfer in various sectors of the overall construction industry will be identified.

PRINCIPAL REPORTS REVEIWED

Construction RD & D in Canada - Present and Potential, prepared by RAL in April 1983.

The Bottom Line - Technology, Trade and Income Growth, issued by the Economic Council of Canada in mid 1983.

Canada Constructs - Capital Projects and Canadian Economic Growth in the Decades Ahead, prepared by the Construction Industry Council (CIDC) in December 1983.

The Canadian Construction Industry - A Sector Profile, prepared by the Department of Regional Industrial Expansion (DRIE) in October 1984.

Building Together: A Strategy for the Ontario Building Industry, published by the Government of Ontario in April 1985.

Canadian Construction Research Board - Selected Papers, published by the CCRB in 1985.

MAJOR ISSUES IDENTIFIED BY NATIONAL CONSTRUCTION BODIES

A telephone survey was conducted over a four-day period among national bodies representing industry practitioners, in which their spokesmen were asked to identify major issues confronting the construction industry or their respective sector. The time frame was stated to extend from the present to the next decade. No reference was made to any special interest in construction technology in asking for a response.

The participating national organizations in this sampling of opinion were:

- Association of Consulting Engineers of Canada
- Canadian Construction Association
- Canadian Electrical Contractors Association
- Canadian Federation of Labour
- Canadian Home Builders' Association
- Canadian Institute of Public Real Estate Companies
- Canadian Institute of Steel Construction
- Canadian Portland Cement Association
- Canadian Society for Civil Engineering
- Canadian Industry Development Council
- Mechanical Contractors Association of Canada
- Royal Architectural Institute of Canada
- Society of the Plastics Industry of Canada

In addition, a local opinion was obtained from the Ottawa Construction Association. The interviews ranged in length from ten minutes to an hour and perhaps averaged a half-hour. Participants were asked to cite those issues which came first to mind spontaneously.

Some of the major issues identified had no direct technological implications, but most of them did so to varying degrees.

The following summary by groups attempts to grade the relationship in this regard arbitrarily as being vital (v), significant (s), and minimal or negligible (m).

The survey confirmed the contention that technology is an important factor in the construction industry's operations. The tally - on an unweighted based as to importance - of the significance of technology vis-à-vis the major issues identified by participants in the survey is as follows:

(v)	vital	15
(s)	significant	15
(m)	minimal or negligible	16
	Total:	46

In summary, two-thirds of the major issues identified by industry spokesmen have significant or vital technological implications.

THE B.C. ARBITRATION CENTRE

In the last issue of the Revay Report we stated erroneously that the British Columbia International Commercial Arbitration Centre (BCICAC) does not formally administer arbitrations, and has no capacity to appoint arbitrators. We regret this error and would like to make the following corrections:

The B.C. Arbitration Centre occupies 3800 sq. ft. on the 6th floor of the World Trade Centre of Canada Place in Vancouver. It is a fully contained, completely equipped and furnished facility for the conduct of commercial arbitrations - both domestic and international.

The Centre has a growing commercial arbitration library with microfiche access to the library collections in the Vancouver Courthouse Library and the UBC Law Library. A completely secure locker facility permits counsel or parties to leave their papers and exhibits behind during lengthy adjournments.

Clerical support can be provided by the Centre. There are telex and telecopier machines for instant communication and the usual office support equipment for convenience of the parties. Secretarial support can be provided on short notice.

In addition to physical facilities and administrative services, the Centre will also act as appointing authority. The Centre is presently building up panels of domestic and international arbitrators. The Centre will make appointments using the list procedure. After having been advised of the arbitrator's qualifications, 5 or 6 names of arbitrators with those qualifications will be provided to the parties. Each party may

B.C. CENTRE *(Cont'd)*

delete unacceptable names and priorize the balance. The Centre will make an appointment taking into account these preferences.

The services and facilities of the BCICAC are available to parties for arbitrations or other forms of dispute resolution under any rules or procedures they wish. The BCICAC will, on request, assist the parties to conduct those procedures to the extent possible in all of the circumstances of the cases.

The BCICAC recommends, however, that parties considering an arbitration clause in an agreement or an agreement to arbitrate an existing dispute, give serious consideration to the advantages of adopting the Rules of BCICAC.

These choices can be made and designated by the arbitration clause chosen by the parties. For example, if the parties wish to use the BCICAC Rules but not have the Centre administer the arbitration, BCICAC recommend the following clause (with any appropriate modifications):

> "All disputes arising out of or in connection with this contract, or in respect of any defined legal relationship associated therewith or derived therefrom, shall be referred to and finally resolved by arbitration under the rules of the British Columbia International Commercial Arbitration Centre."

The Revay Report is published by Revay and Associates Limited, a national firm of Management Consultants and Construction Economists specializing in the Construction and Government Relations Sectors. Contents may be reproduced; with a credit as to source appreciated. Your comments and suggestions for future articles are most welcome.

Edition française disponible sur demande.

WAGNER, DAIGLE, REVAY LTÉE

Since October 1st, 1986, Revay and Associates Ltd. has joined forces with Carol Wagner to set up Wagner, Daigle, Revay Ltéé. This new firm, which aims more particularily to serving the French-speaking market in Québec as well as in the rest of the world, will offer the same services as RAL, in fact will be utilizing RAL's existing staff. Additionally, it will also benefit from Wagner's extensive experience in construction. Executives of the WDR team are Carol Wagner, President, Baker Daigle and Steve Revay, and Jean Hudon who will act as principal consultant.

WDR will cater to the needs of all involved in construction: owners, designers, contractors, in the areas of disputes arbitration, claims expertise and construction management.

WDR's offices are located at 4333 St. Catherine West, 5th Floor, Montréal, Québec, H3Z 1P9, telephone: (514) 932-9596.

B.C. CENTRE *(Cont'd)*

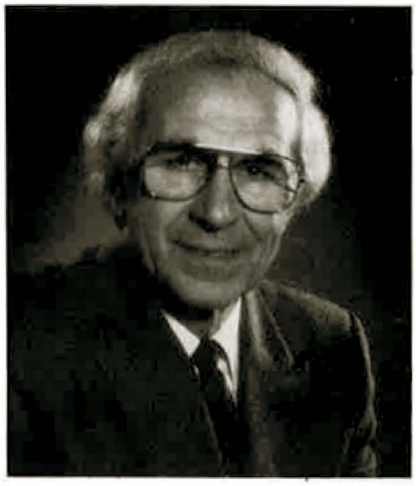
If the parties also wish to have the Centre administer the arbitration, BCICAC recommend the inclusion of this additional clause:

> "The case shall be administered by the British Columbia International Commercial Arbitration Centre in accordance with its "Procedures for Cases under the BCICAC Rules".

If the parties also wish to have the Centre act as appointing authority BCICAC recommend the inclusion of this additional clause:

> "The appointing authority shall be the British Columbia International Commercial Arbitration Centre."

CAROL WAGNER, Eng.



Carol Wagner graduated in civil engineering from École Polytechnique of Montréal in 1952. He was President, from 1972 to 1973, then General Manager, from 1976 to 1986 of the Québec Road Builders and Heavy Construction Association. This position allowed him to gain considerable experience in the construction industry through his daily encountrers with contractors and his numerous interventions to the various Departments. Prior to that, Carol had been actively involved in construction for nearly 25 years for firms such as Truscon Steel Ltd., Defence Construction (1951) Ltd., Béton Moderne Ltée, and Construction St-Paul Ltée.

Carol Wagner is mayor of Saint-Césaire, Québec, and is a member of the Union des municipalités du Québec. He is also a member of the Ordre des ingénieurs du Québec; member of the Arbitrators Institute of Canada, Québec Section, of which he is President of the Members' Eligibility Committee; President of the Construction Section for the Commission de normalisation at the Department of Industry and Commerce; member and past Vice-President of the Commission industrielle montérégienne.

CONTACT INFORMATION

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