THE MANITOBA
Professional Engineer
August, 1997
APEM

The Unpredictable Red River

By: W.G. McKay, P.Eng. (Ret.)

Floods – 1826, Before & After

A classic example of flood-plain settlement is the Red River valley, with its inevitable floods. Draining over 117,000 sq.km. (45,000 sq.mi), the Red crosses the flat bed of an ancient glacial lake, with a very gradual slope.

There are stories of an enormous flood in 1776 which created a giant lake south of the Red and the Assiniboine Rivers.

The first recorded flood, however, was in 1826. By this time, the pattern for floods had become well-established: a wet autumn, and an extremely cold winter with an unusually heavy snowfall. The ice moved out on May 5, and the river crested on May 22, sweeping away most of the settlement: houses, buildings and livestock. All was more or less forgotten until 1852, when another flood inundated the valley. It was not as severe, but there was more property loss because of the increased development in the settlement. In 1861, another flood was recorded.

Was there any engineering recognition of this pattern of flooding? In 1881, Sir Sandford Fleming, chief engineer of the CPR, who had documented the flood risks of the Winnipeg area, recommended a more northerly route through "dry" Selkirk. But the solicitations of, and bonuses offered by, the Winnipeg Council resulted in the railway location and the resultant population mushrooming on a well-known flood plain at the flood-prone junction of the Red and the Assiniboine Rivers.

The 1950 Flood

Disaster struck again in 1950. The previous fall was wet, while the winter was extremely cold, with heavy snowfalls, particularly towards its end. April 1950 witnessed record snowfalls, and May experienced heavy rains. The US Army Corps of Engineers had been taking moisture content surveys of the snow on the American end of the Red River valley since a serious flood two years before. The Corps and the US Weather Bureau, which issued flood forecasts, warned Winnipeg's city engineer, W.D. Hurst, on April 11 that a flood was imminent.

Unfortunately, Canada did not have a similar service, and local authorities could not accurately



predict flood levels – they could only rely on American warnings. Moreover, the Winnipeg City Council had failed to implement the recommendations of a 1948 report from its engineers calling for an expenditure of $1.2 million on dikes and flood walls. All that the City could do in May 1950, when the flood waters reached Winnipeg, was to reinforce existing dikes with rocks and millions of sandbags. On May 5, two dikes collapsed and large parts of the city were inundated. The Canadian army took over relief operations, including a giant airlift with 35 aircraft, and supervised the evacuation of over 100,000 people of a city of 234,600 inhabitants and 16,000 acres in area. On May 13, flood

Cont'd on page 6

Mandatory Professional Development is Coming!

By: T. Cornell, P.Eng. & B. Jorowski, P.Eng.

On June 19th, 1997 approximately 40 APEM members attended a focus group session on the first draft for a Mandatory Professional Development Program (MPDP) proposal. The main purpose of the session was to provide the MPDP Subcommittee with feedback on the proposal.

Brief introductions were made by APEM President, Mal Symonds, and Bob Bruce, Chair of the Professional Development Committee. Cathy Stewart, Chair of Council's Subcommittee on Continuing Competence, then presented some preliminary information regarding Council's plan for a Continuing Competency Program. She indicated that the MPDP would be the key building block of such a program.

The MPDP Subcommittee then presented the main details of the proposed MPDP. In the proposed program, every non-retired member of APEM would be required to:

- define, annually, his/her individual Scope of Practice (industry of employment, area of specialization, job duties, level of responsibility, impact of work on the public, environment, the employer, etc.);
- articulate, annually, the skills and knowledge required for carrying out his/her responsibilities and develop a plan for maintaining, improving or obtaining those skills and that knowledge;
- keep an annual record of the plan and the activities undertaken to fulfill the plan;
- provide a summary of PD activities undertaken in each of the activity categories with his/her annual membership renewal;

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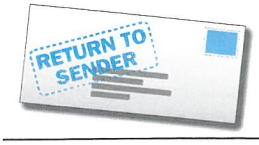
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WE HAVE LOST CONTACT. MAY WE HAVE AN ADDRESS?



A.J. Kondel

RETIRED EFFECTIVE JULY 1, 1997

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D.M. Gardiner
H.T. Goldie
D.B. Willis
P.B. Winslow
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R.K. Brandt
M.G. Buchwald
C.R. Dahl (SK)
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G.A. Barnett
D.N. Birenbaum
J.A. Boyko
T.W. Broschuk
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Roster Change

Please make the following change to your 1996 roster:

E.P. Debusschere, P.Eng. – Manengco Engineering, Partner.

REINSTATEMENTS MAY & JUNE, 1997

R.L. Hutchinson
P.A. Klassen

RESIGNATIONS JUNE 30, 1997

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B.M. Bichel
M.P. Bo
L.N. Chanasyk
S.D. Davies
E.L. Doherty
T. Donkersloot
J.W.A. Godfrey
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J.A. Noguera
G.O. Ouellette
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B.W. Russell
J.B. Sawers
A.F. Sultan
K.J. Van Dekerkhove
S.A. Wollin
M.Z. Xu

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S.J.E. Biswanger
C.N. Damiani
A.S.M. Desgroseilliers
K.C. Einarsson
J.A. Hunt
A.D. Hymers
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L.B.E. Lansard
M. Liu
M.D. Maykut
K.B. McIntosh
K.D. Norrie
B.E. Ostermann
J. Pereira
S.A. Tessier
J.S. Yulianti

EITs REMOVED FROM ENROLLMENT JUNE 30, 1997

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R.A.M. Cielen
N. Fanai
R.E. Haller
B.E.B. Heinrichs
D.J. Jaremowich
R.J. Kastalanych
S.M. Matheson
C.W. Mayor
M.J. McRae
T.W. Padfield
K.E. Preboy
L.S. Rankin
G.K. Swedlo
S.P. Thomas
E. Vera
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ENGINEERS IN TRAINING RESIGNATIONS JUNE 30, 1997

C.G. Bailey
J.H. Borger
T.G. Crowe
T.L. Smith
R.J. Stone
H.C. Turner

In Memoriam

The Association has received with deep regret notification of the death of the following member:

George Y. Tong

President's Message

J.M. Symonds, P.Eng.



The Flood of '97

Perhaps, for this President's Message, we will take a break from the issues of governance that are the usual topics of interest for the Association and deal with one of the more significant events for the citizens and the profession of Engineering in Manitoba – the Flood of '97.

For me this has been a most interesting and encouraging event. It was interesting because of the extremely complex, detailed, and competent engineering that went into the planning and construction of flood-related works as well as the ongoing monitoring and forecasting during the flood. It was encouraging to see the co-operation and teamwork that existed at all levels of government, the citizenry, the military, and the technical team.

Manitoba had not seen anything of this magnitude this century. The predictions of water levels were theoretical at best; but theoretical as they were, they proved to be remarkably accurate.

But we didn't start this year in this fight. With the previous flood experiences of 1950 and 1979, there have been previews of what the Red River can do. The foresight of the politicians and Water Resources personnel has built a flood-prevention infrastructure that has been most effective in protecting Manitoba citizens and property. The most famous is the Red River Floodway but there are many other structures that play a major role in controlling the water: the Shellmouth Dam, the Portage Diversion, and the ring dikes around major towns, to name but a few. The definition, design, and construction of these works are tributes to the skill and expertise of the technical team charged with leading the fight against the flood.

The flood was very evident at the APEM office as well – not because there was any water lapping at the door (the flood protection measures implemented in Winnipeg had taken care of that). It was more because most of the members of various committees and the Council were occupied with the fight. Several meetings, including an Executive Committee meeting, were cancelled while members engaged in flood-fighting. Some of these members, like Barry MacBride, we were able to watch on TV as they explained to the public what was going on.

We are all so proud of our members who contributed to this massive effort – so much so, that we decided to thank them in a special way. In the Winnipeg Free Press, on Saturday, May 31, 1997, there appeared a full-page acknowledgement of our members and the part that they played as members of the team that saved southern Manitoba. This article was also designed to give the public of Manitoba some idea as to the role the engineering profession plays in their everyday lives. In both ways, I believe that it succeeded.

But we were not alone. From across the country, inquiries of concern have been received. Again, during the crisis, many external engagements with other professional engineering organizations had to be cancelled. Everywhere, there was understanding and support, perhaps none so understanding and supportive as that from Quebec. Last year, in the Saguenay region, Quebec saw first-hand the power and devastation that flooding can bring. The engineering organization, the Ordre des Ingénieurs du Québec (OIQ), responded to that crisis by setting up a fund to pay for engineering services directed toward the reconstruction of flood-damaged property or for the future prevention of flood damage. Into this fund they donated $100,000. They also set up a committee to administer the disbursement of the funds.

At the recent Canadian Council of Professional Engineers (CCPE) annual general meeting in Halifax, the OIQ pleasantly stunned the entire meeting by making a $10,000 donation to a similar fund to be set up in Manitoba for the same purpose, and by challenging the other engineering associations to do the same. Some have responded already. Alberta has pledged $7,500, and B.C. has pledged $5,000. The CCPE, itself, has pledged to match all other donations to a limit of $40,000. It is expected that more provinces will donate as soon as they can meet with their councils. Your APEM Council has donated $10,000 to the fund, as well. As of this writing, we are setting up a committee of retired Manitoba engineers to administer this fund and ensure its fair and equitable disbursement.

The terms for the award of funds under this program are that they "must concern the fees and costs for services of a professional engineer (or a firm) retained by the flood victim or affected organization for the carrying out of a study, an appraisal, or a plan and estimate" up to $1,000 per application on a first-come, first-served basis. Based upon the Quebec experience, this is considered to be the best use of the funds.

All this goes to show that we in Manitoba have not been alone, and that the ideas of humanity and generosity are universal. They do not spring from partisan or political motives. These are the principles upon which our society and our profession are based.

Well done, Manitoba and Canada! □

University News

By: B. Stimpson, P.Eng.

Professor **Attahiru Alfa, P.Eng.**, Head, Department of Mechanical and Industrial Engineering, was awarded the Dr. and Mrs. H.H. Saunderson Award for Excellence in Teaching at the May, 1997 Convocation. With the Faculty of Engineering since 1984 and a specialist in operations research and techniques in industrial engineering, his reaction upon learning of his award was, "I feel like a little kid getting a Christmas present." The nominating students were also delighted that he received this award. One student noted that Alfa devotes "specific attention to maintaining the progress of each student."

Ralph Bullock, P.Eng. a long-time active supporter of the Faculty of Engineering, a leader in advancing science and technology transfer between universities and industry, and formerly Vice-President for Engineering and Quality at Bristol Aerospace Limited, was awarded an Honorary Degree of the University of Manitoba at the May 1997 Convocation.

The following retired members of the Faculty of Engineering were also honoured at the May Convocation:

Dean Emeritus

Garland Laliberte, P.Eng., Department of Biosystems Engineering. Head for 17 years and Dean of Engineering, 1989-94. Served the University from 1967-1997. A tribute to his contributions to engineering was published in the June, 1997 MPE.

Professors Emeritus

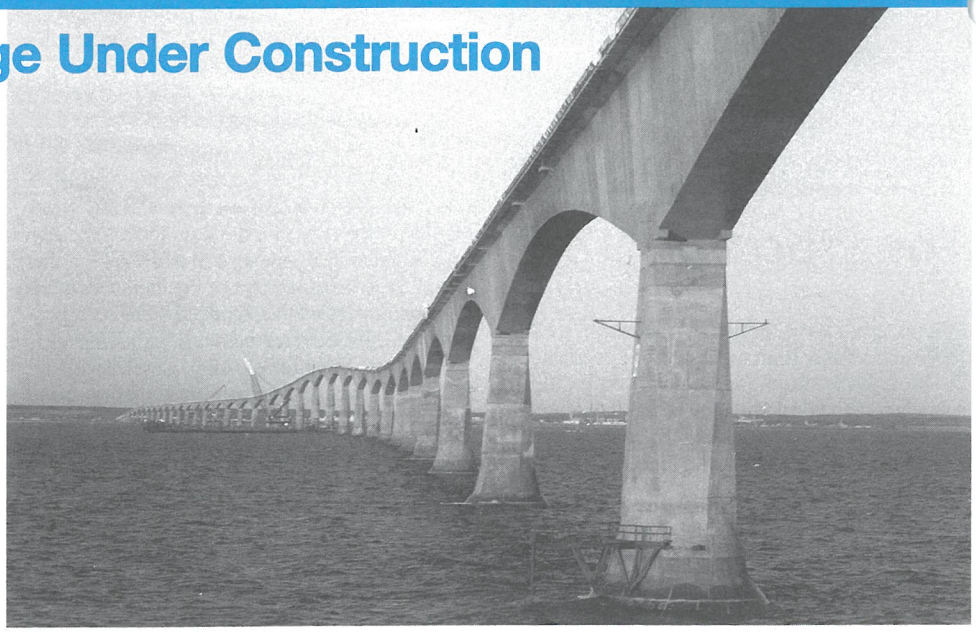
- **Andrew Baracos, P.Eng.**, Department of Civil Engineering, and first Head of the Department of Geological Engineering. Served the University from 1949-1989. Specialist in soil mechanics; estimated he taught 2,500 undergraduate and 200 graduate students in his long career.
- **Ernest Bridges, P.Eng.**, Department of Electrical and Computer Engineering. Involved in and initiated important changes to the Department, to courses, and to laboratory facilities, and advanced the study of electromagnetic fields during his years of service from 1955-1996.
- **Glenn Morris, P.Eng.**, Department of Civil and Geological Engineering. Head of Civil Engineering for five years, and Associate Dean for 12 years. Recognized as one of the best teachers in the Faculty, a respected researcher, and a Fellow of the Canadian Society for Civil Engineering. Served the University for 38 years.
- **Glenn Swift, P.Eng.**, Department of Electrical and Computer Engineering. Joined the University in 1960 and is known for his excellent teaching (a winner of the Saunderson Award) and as a research collaborator with local industry. His work on the "APT relay" contributed to a new division at Vansco Electronics in Winnipeg.

Ms. Norma Godavari, Engineering Librarian, won the 1997 Manitoba Library Endowment Fund Library Service Award for her work as editor of the *Manitoba Association Newsline*, the most important source of news about libraries in the province. She was also cited for her role as a mentor for younger librarians and for her activity in keeping colleagues updated through the Web. This award recognizes those who have made a significant contribution to provincial libraries. □

Research & Development

Confederation Bridge Under Construction

By: C.P. Gray, P.Eng.



Eric Loewen, P.Eng., from the Stanley Engineering Group, in addressing the May 7, 1997 luncheon meeting, first presented the fact that Prince Edward Island was constitutionally ensured a transportation link to mainland Canada when PEI joined confederation in 1873. This originally consisted of ice boats rowing 13 km across the Northumberland Strait and has subsequently progressed to large ice breaker ferries. As a result of Canada's obligation, Eric explained the economic benefit to Canada for building a bridge from New Brunswick to PEI by comparing the projected annual costs of operating a ferry service versus the annual fees for a bridge. A graph illustrated that the present annual costs are comparable, but that the costs of operating a ferry will increase while the annual bridge fees will diminish. Strait Crossing Joint Venture (who built the bridge) will finance and operate the bridge until the year 2032. As part of this contract, the Government of Canada will pay Strait Crossing Joint Venture an annual fee of $41.9 million (equal to the annual ferry subsidy) for 35 years, after which the bridge will become the property of Canada. The design life of the bridge is 100 years.

The bridge consists of three parts: the New Brunswick Approach Bridge (at Cape Jourimain Island, New Brunswick), the Main Bridge, and the PEI Approach Bridge (at Borden, PEI). The 150-acre casting yard at Borden-Carlton, PEI, was the site for fabrication of the main span bridge components. The PEI and New Brunswick approach bridges were cast at the New Brunswick staging facility. The total length of the bridge is 12.9 km (8 miles). The main bridge is 11 km (6.8 miles) and is typically 40 metres (131 feet) above the water and 60 metres (196 feet) above the water at the navigation channel. The bridge is the longest continuous marine span bridge in the world over ice-covered waters. Construction started in September 1994 and the bridge officially opened on June 1, 1997. During the height of construction, over 2,500 people worked directly on the project and over 2,000 people were employed by sub-contractors for the project. The total cost of constructing the bridge was in excess of $800 million (1992 dollars). Over 80% of the construction was on land to reduce costs, reduce weather dependency, maximize local labour, and minimize effects on the marine environment.



Daryl McCartney (r) thanks Speaker Eric Loewen.

The Main Bridge

Prior to the precast pier bases being installed, the Strait bottom was dredged and cleaned to competent bedrock (sandstone). Next, three "hard points" (at each pier base) were placed and grouted on the bedrock so that the pier bases could be accurately positioned at the design elevation. Each hard point consisted of a 2m diameter concrete disc with grout bags underneath. A large steel tripod was used to position the hard points and deliver the grout. After grouting, the tripod was removed. After the precast concrete pier bases were transported to the pier locations and lowered onto the hard points, the insides of the pier bases were filled with concrete. With the use of a Global Positioning System, the pier bases could be located within centimetres of their designed location. Each pier base extends from the bottom of the strait to 3 m above sea level. At the deepest point the pier bases are 40 m (131 ft.) in height.

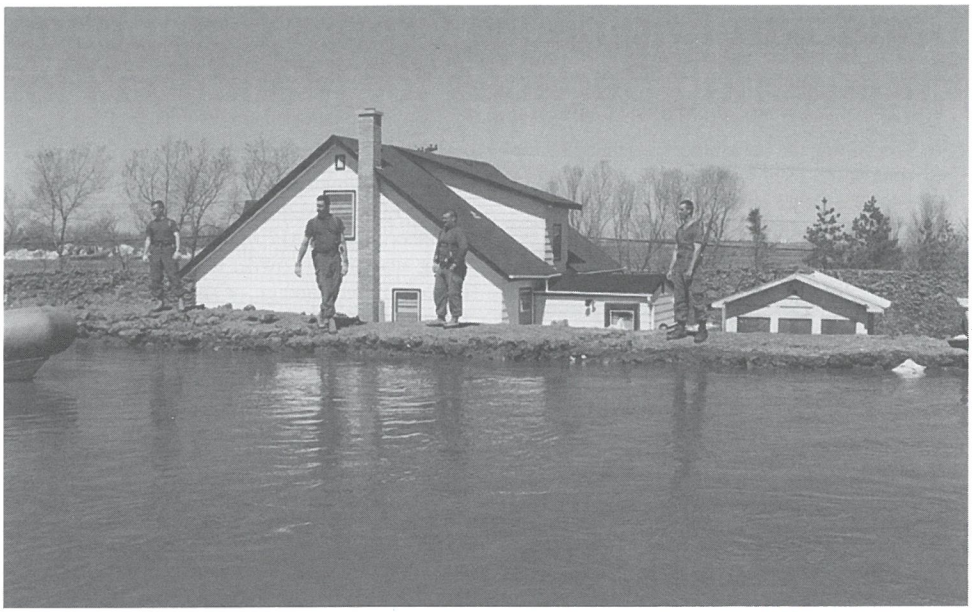
The next component, the ice shields, were placed on top of the pier bases. The ice shields are designed in a conical shape to cause the moving ice sheets within the Northumberland Strait to ride up the sides of the ice shield and crack and break up under the ice floes' own weight. These ice shields are the most critical component of the bridge, as the structure must resist monumental ice forces. The first ice shields were constructed with a steel plate covering to reduce abrasion. This was later replaced with high-strength concrete (80 MPa). The life of the steel plate is expected to be about 30 years in the highly corrosive marine environment, while the life of the high strength concrete ice shield is expected to be significantly longer. The concrete pier shafts (with the unique shape going from circular at the bottom to rectangular at the top) were cast as one component with the ice shield. After the ice shield/pier shaft components were lowered on top of the pier bases, the shafts were vertically post-tensioned down to the pier bases. A "match cast" was then placed on top of the pier shaft. This match cast is a small rectangular precast concrete cap that was cast individually against each pier shaft and main girder (to ensure a precise fit). Installing the match cast proved somewhat difficult due to its small relative weight and the strong, gusty winds. After accurate placement of the match cast, placement of the largest component, the 7,500-tonne (8,300-ton) main girder became a relatively simple task.

The bridge superstructure consists of main precast girders (which straddle the tops of the piers) and midspan drop-in girders. The main girder segments are 192 m (630 ft) long, 14 m (46 ft) deep at the piers, and 4.5 m (15 ft) deep at the ends. The drop-in girders are 58 m (190 ft) long. In total there are 44 main girders and 43 drop-in girders. The drop-in girders are either rigidly connected to the main girders or have a horizontally sliding connection to the main girders. Two main girders and one drop-in girder are rigidly connected with post-tensioned cables (within ducts in the precast girders) to act as one unit. Every alternate drop-in girder has a sliding connection. This sliding connection allows for the thermal movements of the bridge and prevents a progressive collapse in the event a pier is toppled by a major ship collision. The navigation channel piers are designed for full ship impact.

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1997 Flood Facts

By: M.E. Baril, EIT



The flood experienced by the Red River Valley this spring was a devastating event. Unfortunately, many people lost their homes and property to the "Flood of the Century". Also, many people had their homes and properties saved through the efforts of both government (civic and provincial) and private sector employees, military personnel, and countless volunteers. Among the many flood-fighters were numerous engineers, whose duties included flood forecasting and predicting, dike design and inspections, 24-hour emergency response to dike and flood protection breaches, and co-ordination of various aspects of the fight against the Red River and its tributaries.

Province of Manitoba

The provincial flood forecast for this spring was first released in late February. The initial prediction was that an event of this magnitude had a 10% chance of occurring, based on soil moisture in the fall, the frost depth, and the higher than normal snowfall in the Red River drainage basin in Manitoba (200%) and the states of North Dakota (300%) and Minnesota (300%). After the "blizzard of the century" – from April 4 to 6 – throughout the Red River drainage basin, the predicted flood elevations were raised by 1.5 feet. Following the tragic events in Grand Forks, the elevations were raised another three feet. The existing ring dikes surrounding numerous rural towns in Southern Manitoba were designed for the 100 year-flood event with two feet of freeboard. Raising of the ring dikes began immediately. When the magnitude of what was coming was apparent, provincial forecasters began to analyze all the possible overland flow patterns. In 1979, the La Salle River had received some overflow, either from the Red River or from overland flow. Since the forecasts for this year's event were much higher than in 1979, a survey of the terrain was done to determine if the La Salle River might actually see large volumes of water, effectively out-flanking the Floodway. The results were received on a Monday, the decision to construct the now famous "Z" dike was made on the Wednesday, and its construction began on the Thursday. (Fast track?)

During the flood, both the Winnipeg Floodway and the Portage Diversion were used extensively. Some work was done on the Floodway to prevent erosion at the inlet and outlet sections, as well as some bolting to the gates themselves, which had already been identified as work to be done. The Floodway saw a peak flow of 65,000 cubic feet per second (cfs), while the Diversion was used to reduce the flow of the Assiniboine River from 12,000 cfs to 25 cfs in Portage, reducing the Assiniboine's flow in Winnipeg to around 2,000 cfs. The Red River's peak flow through the City was 80,000 cfs. Without the flood-control works that exist, the City of Winnipeg would have seen a water elevation of 35.5 feet James Ave., instead of the 24.5 feet that did occur. In comparison, the 1950 peak level was 30.5 feet James Ave.

The following changes are being looked at on a provincial level due to this flood event: a review of minimum elevations for new construction permits; ring dikes for communities which currently do not have them; permanent flood protection to replace temporary construction (i.e. retain as much of the Z dike as possible); and re-evaluation of existing flood forecasting.

City of Winnipeg

The City of Winnipeg relies on the provincial forecasts to determine what elevations the City should see in a flood event. During this past flood, the City had to concern itself with the real event and the potential event. The potential event was the failure of the Z dike and out-flanking of the Floodway through the La Salle River. The water elevations within the City were measured daily at the Bishop Grandin and Chief Peguis bridges, and hourly at James Ave. and just before and after the Floodway inlet. An extensive survey of the City's primary diking system was made and it was determined that the lowest portions were at 26.5 feet James. To maintain two feet of freeboard, the critical water elevation became 24.5 feet James. In the potential scenario, water was projected to reach the equivalent of 26.5 feet James or higher in the south end of the City, so the primary dikes were raised accordingly.

Civic and private engineers inspected and evaluated all the permanent and temporary dikes in the City, and maintained a 24-hour response team to investigate and evaluate any leakage or breach encountered. Any such occurrence was investigated, and a solution was "engineered-on-the-go".

The Provencher Bridge was the only river-crossing structure in the City to suffer flood-related damage, causing its closure. The counterweights were partially submerged, reducing their weight by 25-30%, and causing some deflection and vibration of the center span. These deflections caused some damage at the piers supporting the middle span. In contrast, the Norwood Bridge was partially submerged at its north end, but this event was accounted for in its design. When the Red River was at its peak, the water was approximately 2 – 2.5 feet above the sidewalk, and 2.5 – 3 feet above the roadway.

The following changes are being looked at on a civic level due to this flood event: increase the number of sewer outfalls which have gates; construct new permanent secondary clay dikes; increase the elevations of the existing primary dikes which are below 27.8 feet James; adjust the river elevation associated with the flood frequency for design; and turn some of the temporary flood-protection measures to permanent structures.

I would like to thank Larry Whitney, P.Eng. (with the Province), Doug McNeil, P.Eng. (with the City), and Gord Smith, P.Eng. (with the City), for having taken the time to meet with me to discuss the flood, as all three are still busy dealing with the aftermath of the Flood of the Century. □

INTERESTING FLOOD FACTS

- Over 2,000,000 candle flares, dropped from Griffin helicopters, were used to allow 24-hour construction of the Z dike.
- The flood event was a 125-year event south of the Forks, and a 110-year event north of the Forks.
- The Z dike contained over 750,000 cubic yards of clay and over 150,000 cubic yards of granular material.
- The original 24 kilometers of the Z dike were built on a 72-hour construction deadline.
- The St. Norbert wastewater sewer system, while the area was evacuated, was at 90-100% capacity.

Canadian Engineers Create Compensation Fund for Engineering Services for Manitoba Flood Victims

Recognizing the hardship experienced by victims of the 1997 Red River flood, and to enhance future public safety, the professional engineers of Canada, at the initiative of the Ordre des Ingénieurs du Québec, have created a fund, which has reached $84,000 as of July 1, 1997, to help property owners defray a portion of the cost of services provided by professional engineers retained in the reconstruction of their property.

APEM will be responsible for administering this fund. The evaluation of requests for compensation will be carried out by a volunteer committee composed of three professional engineers and a chartered accountant.

The Committee will be empowered to allocate up to $1,000 per request in compensation for engineering fees. APEM defines a flood victim as being any property owner whose principal residence suffered damage, or any business or not-for-profit organization whose premises were damaged, as a result of the flood.

Flood victims will be able to obtain application-for-assistance forms (only one per victim) from the APEM office, effective July 14, 1997. Each applicant will be expected to complete a questionnaire and attach the necessary documents.

No direct relationship may exist between the flood victim and the engineer retained. The fund will be disbursed on a "first come, first served" basis. The expiry date for filing an assistance request is December 1, 1997. The Committee's decisions are not subject to appeal. The assistance cheques will be made out jointly to the flood victim and the professional engineer engaged for the work.

The Evaluation Committee will provide a report on its distribution of the funds to Council in January, 1998. Any of the Fund not disbursed will be turned over to the Red Cross for projects intended to assist flood victims. □

The Unpredictable Red River

cont'd from page 1

waters crested at 12.3 feet. above flood stage, flooding 10,500 homes, closing 50 schools, and forming a giant lake, 75 miles long and 40 miles wide, to the south. The waters did not begin to recede until the end of the month.

Institutions and Services

In addition to the 50 schools, the three municipal hospitals (King Edward, King George, Queen Elizabeth) and the St. Boniface hospital were flooded and out of service, as were very large portions of both St. Boniface and St. Vital.

Street-car and trolley-bus service was interrupted. Street cars were parked on higher ground and the car barns at Main Street and Broadway on the Assiniboine River were flooded and out of service. The water distribution system serviced by the McPhillips Street pumping station and its reservoir remained in service, but the sanitary- and storm-sewer systems were inundated.

Further protection

Through the installation of more gauging stations and measuring of snow moisture content, flood predictions improved. The diking system was enlarged, and more pumping stations were installed, such that the city would be protected against another '50 flood. Winnipeg was safe in the face of the 1956 and 1960 floods.

The Young Engineers – 1950 Graduation

R.(Dick) Russell, now retired, was a member of the University of Manitoba's civil engineering graduating class of 1950. Dick recalls that exams had been completed, and the iron ring ceremony had been held for about 220 engineering graduates at the Masonic Temple, corner of Ellice Avenue and Donald Street (now "Mother Tuckers") on March 18. By May 3, however, the University site had been severely flooded, and it was accessible only by boat. Hence, there was no convocation. The class of Engineering '50 celebrated its formal convocation 35 years later, in 1985!

As for the flood and his job activities, Dick advised that he worked at his first job, with Dominion Bridge, during the day, and sandbagged at night!

APEM Council – 1950

W.D. Hurst, Winnipeg's city engineer, was also the President of the Association in 1950. The minutes of the council meeting of June 9, 1950, quote Mr. Hurst as commenting that "a considerable amount of publicity and public recognition had been given to certain engineers in connection with their work and flood control during the recent crisis but that many who had done outstanding work had not received any recognition whatsoever."

It was agreed that the newspapers would likely carry articles on the engineering contribution toward the flood-fighting effort, and the members of Council were asked to solicit material and pass it on to the President.

The August 30 Council Meeting Minutes indicated that the material had not been forthcoming and that, by now, the Council considered it a bit too late for any publicity. □



Three municipal hospitals flooded in 1950.

Untangle the Web!

By: C.S. Roberts, P.Eng.

Many businesses are becoming aware of the global business advantages provided by the Internet. It is one of the most powerful tools available to business today, yet it is in its infancy in the public market.

Managers and engineers are interested in getting more involved in the Internet, but are unsure of how to start.

To bridge this gap, Industry Canada created the Student Connection Program, a professional Internet training program, for small- and medium-sized businesses in Canada. The program is conducted by specially trained university and college students.

To register for the Student Connection Program, call 474-6861, fax 275-3773, or E-mail csrober@cc.umanitoba.ca. □

Letter to The Editor

Sir:

V.L. Dutton's letter to the editor in the April issue of our publication argues that all engineers should be "concerned" about Canada's Nuclear Fuel Waste Management Program. Although Dutton is entitled to his opinion, as an engineer who works in Canada's nuclear industry, I can tell you that some of Dutton's comments are simply not true.

For example, Dutton calls the public hearings on Canada's concept for deep geological disposal of Canada's nuclear fuel waste to be "window dressing" for a decision the government had already taken to allow nuclear waste to be buried in the Canadian Shield. This is false. The government has taken no such decision.

The public hearings panel conducting the review consists of representatives from science, engineering, the social sciences, First Nations and organized religion which provide a broad base of review. The panel will submit its recommendations to the government late this summer or early fall. Although many professional organizations, companies and individuals have endorsed the work of the Canadian Nuclear Fuel Waste Management Program, ultimately it is up to the Canadian government to make the final decision. There is no time frame or deadline for the government to make this decision.

Dutton's letter implies Canada's recent sale of two CANDU reactors to China somehow confirms the burial of waste in Canada. This sale has nothing to do with waste disposal in Canada.

Dutton argues that nuclear waste is dangerous to all living things. Canada's current method of storing used nuclear fuel at reactor sites has an impeccable safety record and poses no danger to plant personnel, the public or the environment. But what happens if future generations, for whatever reason, are unable to maintain the current safeguards? Indeed, the potential then exists for the waste to become dangerous to the environment and human health. This is precisely why Canada has developed a concept for deep geological disposal.

The concept uses a system of multiple barriers, both natural and engineered to contain the waste. The rock of the underground vault would absorb the penetrating radiation from the waste. The form of the fuel, which is a solid material, is highly insoluble and is contained in zirconium alloy tubes which are further contained in corrosion-resistant containers. Should the containers, which are expected to last several hundred years, become compromised by corrosion, specially-selected buffer material surrounding the containers would absorb some of the released radioactive substances. Seals in the tunnels would absorb any migration within the tunnel. The vault itself would be deep enough to not cause any adverse impact to the above-ground environment. Future generations can still monitor such a facility if they wish, but if, for whatever reason, they are unable to do so, the vault design on its own will protect the above-ground environment from the nuclear fuel waste. This is based on the evidence gathered in 15 years of scientific and engineering research.

Dutton is also incorrect when he writes that the nuclear industry hasn't factored the true cost of disposing nuclear waste. In fact, the cost of nuclear fuel disposal is factored in Ontario and it is less than 3% of the cost of producing the electricity. Furthermore, the U.S. Nuclear Regulatory Commission Advisory Committee on Nuclear Waste characterized Canada's research on disposal as notably productive, effective and cost-effective.

Dutton argues the nuclear industry is not a responsible application of science. Consider the following – CANDU 6 reactors, like the ones sold to China, don't produce greenhouse or acid-rain-causing gases and the air and water discharges are free of contaminants. Over a 30-year period, a single CANDU 6 saves burning of 58 million tons of coal or about 250 million barrels of oil and eliminates the release of 128 million tons of carbon dioxide which would be produced by a similar-sized fossil-fuel plant. The nuclear fuel waste produced is small in comparison, roughly 3.3 cubic metres of used fuel bundles per year.

Lastly, Dutton questions if it is ethical for our profession to support waste disposal. I believe my above comments already answer this. But consider also that Canadian nuclear reactors produce up to 90% of the world's isotopes for medical diagnosis and treatment, particularly for cancer. Radiation sources, produced by Canadian reactors, are also used to sterilize medical instruments for surgery and other medical procedures. The CANDU 6 is regarded as among the world's safest reactor designs and consistently ranks among the world's top ten reactors. To me, this sounds responsible.

Your truly,

J.B. Martino, P.Eng.

APEM Supports Student Science Fair

By: R. Bernhardt, P.Eng.

APEM continued its involvement with the Manitoba Schools Science Symposium (MSSS) during the weekend of April 25 – 27. This year is the seventh year that the APEM has provided support to the MSSS.

The MSSS is the largest Science Fair in the province, featuring projects which were judged the best in their class at the school and division level. Over 600 projects were present at this year's event. There were only a very small number of no-shows due to the floods in the southern part of the province.

APEM, through the Public Awareness Committee, gives a variety of support to the MSSS. It provides financial assistance to the event organizers, and, more importantly, sponsors awards. As in past years, five enrollments to the Mini-University program at the University of Manitoba were awarded to students whose projects had engineering merit.

To illustrate the quality of the projects, Luke Klassen of Le Barrier Crossing School investigated the effects of the shape of the nose cone on model rockets. He made a number of nose cones of various shapes from balsa wood, and then examined their behaviour in a homemade wind tunnel, using tissue-paper strips to indicate airflow. He then flew his designs on his rockets, and correlated their flight performance to the behaviour he observed in the wind tunnel. Luke Klassen is 10 years old.

This year, the volunteer judges were Glen Thiessen, P.Eng., Brian Trenholm, P.Eng., Gene Manchur, P.Eng., Kris Dick, P.Eng., Jim Prendergast, EIT, Andy Lehman, EIT, Fil McNeil, EIT, Richard Sawka, EIT and myself. Special thanks to Jim Prendergast for his help in organizing APEM's involvement and to Gene Manchur for developing a judges' tally form. Brian Trenholm's judging was also greatly appreciated, since he was helping to plan evacuation of St.



Boniface Hospital only minutes after completing judging his assigned projects on the Saturday morning.

For the past seven years, the force behind APEM's involvement in MSSS has been Caroline Nieuwenburg, P.Eng. Caroline was unable to participate this year, however, she did provide a great deal of advice and direction. Thank you, Caroline. □

Council Reports

Tuesday, May 13,1997

By: S.C. Alford, P.Eng.

AT WHICH COUNCIL DISCUSSES MANDATORY PROFESSIONAL DEVELOPMENT, MANDATORY PROFESSIONAL SERVICE AND ORAP

Immediately prior to the meeting, a somewhat historic event took place in the Association boardroom. A memorandum of agreement was signed between APEM and the Manitoba Association of Architects (MAA). APEM President, Mal Symonds, and MAA President, Stephen Cohlmeyer, officially signed the MOA, with members of Council present as an enthusiastic audience. Mr. Cohlmeyer commented that it was a significant step forward in resolving our differences. *(Please see article on p. 14.)*

The meeting was called to order with a full agenda. One of the first issues to be discussed was the Engineering and Geoscientific Professions Act. Councillors received a copy of the current draft and Dave Ennis, the Executive Director, explained the changes.

Mandatory Professional Development Program (MPDP)

Council discussed the current MPDP proposal that has been developed by the Professional Development Committee. Members of the PD committee attended a portion of the Council meeting to receive direction and answer questions. President Symonds stressed the importance of clearly recognizing the MPDP as only one element of an overall competency program. The importance of communicating the new proposal to Association members was also stressed by councillors.

It was agreed that the next step in refining the MPDP proposal would be to have it reviewed by a focus group of various committee and other Association members.

Mandatory Professional Service

One idea from a Council "visioning" session received some heated, albeit polite, debate. A proposal recommending APEM members perform some type of service to the Association was discussed. Some councillors pointed out the merits of involving all members in the Association affairs, while other councillors felt it was impractical. It was also pointed out that the MPDP, if adopted, will encourage members to take a more active role in the Association's affairs. The matter was referred to Councillor Doug Kramble and Arnold Permut for further review.

Organizational Review Action Plan (ORAP)

Council was briefed on ORAP progress. A draft organizational chart was distributed and Doug Chapman, head of the Task Force, explained the roles, responsibilities, and reporting relationships of the various boards and committees in the proposed new structure.

Other Items

Council discussed the positive feedback the engineering profession has received for engineers' efforts related to the flood. It was decided that this was a very good opportunity to publicize the benefits of the profession to society. Despite the objections of Councillor Ron Britton, a motion was passed to run a full-page advertisement in the Winnipeg Free Press to recognize the efforts of engineers in preparing for, and dealing with, the flood. The advertisement copy would be professionally prepared and the complete cost of this initiative was estimated at $22,000. □



Stephen Cohlmeyer (l) and Mal Symonds sign historic agreement.

Tuesday, June 10,1997

By: C.P. Gray, P.Eng.

AT WHICH COUNCIL SETS UP A COMPENSATION FUND FOR FLOOD VICTIMS

The APEM Council meeting on June 10, 1997 was attended by all councillors and the executive (now that's commitment!). Executive Director, Dave Ennis gave his usual detailed report on APEM finances as well as summary comments. Mr. Ennis noted that a higher-than-usual number of practising members have not paid their annual dues.

APEM President, Mal Symonds, briefed Council on the current status of the proposed Engineering and Geoscientific Professions Act. The government has delayed the proposed Act because of the potential discrepancy between the Architects' Act and the Engineers' Act. Council is seeking to reach an accommodation with the Manitoba Association of Architects to encourage passage of the proposed Act.

Council agreed on an agenda for a focus group meeting on the proposed Mandatory Professional Development Program. The focus group would comprise primarily APEM committee members, as well as invited engineers from Portage la Prairie and Brandon.

A compensation fund to help Manitobans affected by the Red River Flood defray a portion of their engineering fees was initiated at the suggestion of the Ordre des Ingénieurs du Québec (who implemented a similar fund for the residents of the Saguenay region last summer). The OIQ have enthusiastically donated $10,000 and have encouraged other associations to participate to "ease a little of the misfortune which has befallen many of our fellow citizens". The Alberta Association (APEGGA) and The Canadian Council of Professional Engineers (CCPE) have generously donated $7,500 and $40,000, respectively. APEM has donated $10,000, and will administer the fund through a special committee comprised of APEM members and, hopefully, the donated services of an accountant.

The Canada Northland Development Award is granted (usually annually) to a deserving University of Manitoba engineering student who has worked in northern Manitoba. The award is presently administered by APEM. However, due to fewer applicants in recent years, Council moved that the University's Scholarship, Awards and Bursary Committee administer the fund to expose the award to a greater number of engineering students.

Council accepted the recommendation from the Registration Board to increase the passing grade on the Professional Practice Examination from a D to a C grade.

Council rejected the recommendation by the Registration Board that applicants who have practised engineering in Manitoba without being licensed or registered with APEM be required to submit a letter acknowledging and explaining their indiscretion and, in addition to the normal fees, pay an amount equal to the annual dues. However, Council did move that APEM develop an administrative plan to support effective Act enforcement. □

What is The Canadian Council of Professional Geoscientists?

By: B. Stimpson, P.Eng.

When the Engineering and Geoscientific Professions Act is declared into law, our geoscientist colleagues will be able to apply for professional registration in Manitoba. In so doing, they will join approximately 5300 geoscientists in British Columbia, Alberta, Saskatchewan, Newfoundland, and the Northwest Territories, whose governments have already combined and enacted engineering and geoscience right-to-practice legislation. Saskatchewan, the most recent addition, began registering geoscientists this year. It is estimated that, within the next few years, approximately 10,000 geoscientists will be registered as other provinces move to pass similar legislation. In Quebec, the Association of Professional Geologists and Geophysicists of Quebec (APGGQ) has certified geoscientists for many years and continues to lobby the government to recognize it as the professional geoscience association in that province.

In Manitoba, the effort towards professional registration for geoscientists has been led by the Sub-Committee for the Professional Registration of Geoscientists in Manitoba (SPRGM) working in consultation with APEM. Mr. Rick Lemoine, P.Geol. (APEGGA) has recently taken over from Bill Brisbin, Ph.D. P.Eng. as Chair of SPRGM. Bill selflessly devoted many, many hours of his time to this cause.

While professional registration of geoscientists is expanding into other provinces, a Task Force has been working to develop an umbrella organization called the Canadian Council of Professional Geoscientists (CCPG). The Implementation Task Force to establish CCPG was approved by CCPE in 1996 and has received from the parent organization initial funds for its establishment of approximately $40,000 per year for two years (1996/97). This sum is the total annual assessment collected from geoscientists by CCPE from Associations that currently register geoscientists. Membership in CCPG will be restricted to associations which license or certify geoscientists. Incorporated in April 1997, CCPG has as its principal objectives:

- To safeguard and promote the present and future interests of the geoscience professions in Canada;
- To establish and maintain liaison among the provincial and territorial associations and corporations of professional geoscientists and Canada and to assist them in:
  1. Co-ordinating, correlating and standardizing their activities, particularly in the areas of registration of geoscientists, mobility of registered practitioners and interprovincial practice;
  2. Promoting and maintaining high standards in the geoscientific professions;
  3. Developing effective human resources and promoting the professional, social and economic welfare of the members of geoscience professions;
  4. Promoting a knowledge and appreciation of geoscience and of the geoscience professions, and enhancing the usefulness of the professions to the public;
  5. Promoting the advancement of geoscience and related education; and
  6. Generally carrying out their various objectives and functions.
- to act on behalf of and to present the views of its constituent associations and organizations in matters that are national or international in scope, including international registration or certification of geoscientists, and reciprocal practice;
- to act on other matters of Canada-wide or international natures concerning the geoscience professions either alone or together with other bodies;
- to affiliate with, join, or enter into arrangements or agreements to carry on any undertaking with any society, association, or other body having similar or comparable objectives.

CCPG has established an office in Calgary (APEGGA's facilities) under the leadership and direction of the Implementation Task Force Chair, Gordon Williams, Ph.D., P.Geol., who also represents Alberta on CCPG. Other members of the Implementation Task Force are:

British Columbia – Linda Thorstad, P.Geo.
Manitoba – Brian Stimpson, Ph.D. P.Eng.
New Brunswick – Reg Wilson
Newfoundland – Hugh Miller, Ph.D., P.Geo.
Northwest Territories – Tim Canam, P.Geol.
Nova Scotia – Terry Hennigar, P.Eng.
Ontario – Bob Leech, M.Eng. Sc., P.Eng.
Quebec – Michel Bouchard, Ph.D.
Saskatchewan – Philip Reeves, P.Eng.
CCPE – Wendy Ryan-Bacon, P.Eng.

As part of its mandate, CCPG will "assist the constituent Associations in the assessment of educational and other qualifications for registration." In this regard, the first meeting of the CCPG's newly formed Canadian Geoscience Standards Board met in Ottawa on May 16, 1997 to consider the need for and development of national standards. This was followed by a meeting of CCPG on May 17.

Given the high mobility of geoscientists and the need for international recognition of credentials in the global marketplace, the development of professional registration and the formation of CCPG are important steps for Canadian geoscientists.

In the future, it is possible that CCPE and CCPG will operate as a single governing body. For the time-being, the Task Force is working diligently to make CCPG effective and valuable to its constituent Associations. □

Urgent Message for Designers of Roof Structures

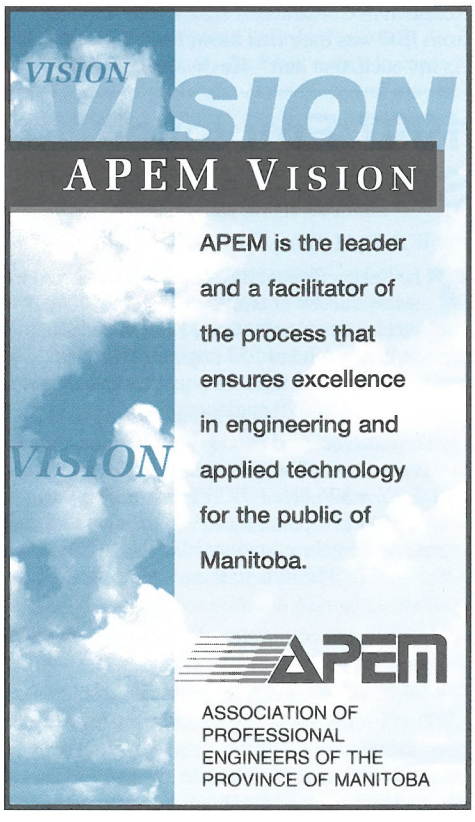
All APEM members involved with the design of roof structures should be aware of the following code change.

The 1995 National Building Code of Canada, through the First Errata to the User's Guide – NBC 1995, Structural Commentaries (Part 4), has revised snow build-up design conditions. The criteria for determining the value of snow build-up loading has been significantly changed.

Sample calculations for lower levels adjacent to higher roofs have indicated that the maximum snow build-up determined using these criteria may exceed double the value determined under previous code editions.

Within the jurisdiction of the City of Winnipeg, authorities are currently recommending compliance to the above changes. It is expected that the Manitoba Building Code based on the 1995 National building Code will be adopted this fall.

These code changes should be reviewed by all designers of structures subjected to snow loading and reflected in their designs. □



The R&D Committee LIFE-CYCLE OF AN IDEA Series

"We Must Have Been Insane"

By: D.M. McCartney, P.Eng.

Maybe they were insane, but whatever the reason, buildings will now last longer and will cost less to operate thanks to Kevin Knight and the innovators at Retro-Specs Ltd. Air barriers have long been recognized as a critical component in building designs. Retro-Specs' team of installers and inspectors knew the barriers were not going up the way the building code required. Rather than saying, "So what, it's not our problem," like so many of us often do, they cracked. Yes, according to Kevin, "We went insane!" And the life cycle of an idea began.

According to Kevin, the existing barrier tests were either too expensive or not practical enough to be of any use to the installers. Typically, the installer of an air barrier is only twenty minutes ahead of the mason, so there isn't much time for inspections, never mind any repairs. In 1993, they decided they needed a simpler way of testing for leaks. In simple terms, they decided to suck, not blow like other methods, and use the old soapy tire trick. These simple thoughts quickly led to their first prototype; a Dustbuster™ attached to an inverted salad bowl. At this point, looks didn't matter. The darned thing worked! That is what mattered. They were brilliant, or so they thought.

They sent a letter explaining their idea to the National Research Council's (NRC's) Institute of Research in Construction (IRC). The response from IRC was their first blow. Body blow, that is. As in "ouch, that hurt". Kevin recalled, "That IRC letter really shook us, but we quickly realized we hadn't given them enough information." Battered, but not defeated, Kevin flew to Ottawa with a hand-sketched drawing in his pocket. Within five minutes of the beginning of his meeting with a senior official of IRC, he had their blessing. In other words, cash! The official's comments were simple: "Ya, this will work. So get to work on it."

That was the beginning of a series of helping hands extended to Retro-Specs. The NRC, through their Industrial Research Assistance Program (IRAP), helped with the further development of the concept. Manitoba Hydro's Research and Development Program funded the bulk of the pure research, while Canada Housing and Mortgage Corporation (CHMC) helped with the durability testing. The Province of Manitoba's Industry, Trade, and Tourism Department provided assistance with obtaining a patent and developing a business plan. Industry Canada's International Trade Centre assisted them with international trade show exposure. The amount of help they received was incredible, and throughout the interview, Kevin continually emphasized how strong the support was.

Their biggest challenge has been the industrial design process. According to Kevin, "it's one thing to create one of something, it's quite another to manufacture one hundred a day!" Kevin sighed as he said, "The final design and manufacturing requires a huge amount of expertise."

Their biggest scare came when they had to leave for their first big trade show in Denver. They arrived at the airport with their first industrially designed prototype. Literally, the paint was still wet. Exhausted from a late-night finishing of the prototype, they felt nauseous when the airport official explained they couldn't take the device with them because it didn't have a 'Made in Canada' label. They were tired, stressed out, and now, defeated by a regulation. As the sense of failure welled up in their stomachs, the insanity kicked in again. "I think I put the engraver in the tool box," came the thought. Sure enough, they found an outlet, plugged in the engraver and *mmmmm-nnnnnnn-mmm-nnnnn*, and there it was, *Made in Canada*, eh! "To this day", said Kevin, "I have no idea why I put that engraver in our tool box. But I'm glad I did." Anyway, everyone and everything got on the plane, and the trade show was an unbelievable success. It seems there are some 47,000 roofing companies in the US, and they'd all like one of those things that sucks, but doesn't blow.

After speaking with Kevin, I get the feeling that Manitoba is an excellent place to be an insane inventor. Actually, during our interview, I didn't see someone who was insane. I saw someone who was possessed with an idea. An idea that he believed in. □

If you know of other innovative ideas that should be featured in this series, please contact any member of the R & D Committee. Daryl McCartney, P.Eng. is an Assistant Professor and Environmental Engineer in the Department of Civil & Geological Engineering at the University of Manitoba.

1997 Employer Survey Results

By: W.B. Todd, P.Eng.

The Salary Research Committee conducted a salary survey of employers for 1997. We received responses from 18 organizations, representing a total of 557 engineers. In 1996, we received responses from 12 organizations representing a total of 379 engineers.

The data received for the 1997 employer survey is represented by the equation: MEAN SALARY = $26,882 + 77.18P (where P represents the APEM points). In 1996 the data was represented by the equation: MEAN SALARY = $29,577 + 79.35P (where P represents the APEM points).

In 1998, the committee plans to again conduct an employer salary survey, along with an employee survey.

The committee wishes to thank the organizations that responded to this year's employer survey and welcomes any comments from APEM members. □

Confederation Bridge Under Construction

cont'd from page 4

A major reason for the success of this project was the ability to move and install large precast units in the Northumberland Strait. The largest self-propelled floating crane in the world, the HLV Svanen, transported and placed the bridge components (for the main bridge). The HLV Svanen is as tall as a 30-storey building and has a maximum lifting capacity in excess of 7,500 tonnes, which is the equivalent weight of a typical 14-storey office building. After the project was complete, the HLV Svanen was sold for a bridge project in Denmark.

The New Brunswick and PEI Approach Bridges

The approach bridges consists of a foundation similar to the main bridge and precast, post-tensioned girders which are 90 m (295 ft) long. There are 14 piers for the New Brunswick Approach Bridge and 7 piers for the PEI Approach Bridge. The precast girders were assembled with a steel launching truss using the balanced cantilevered method. The approach bridge follows conventional precast post-tensioned segmental construction and design.

The Final Product

The bridge has one lane and an emergency shoulder in each direction (11 m from barrier to barrier) and a utility corridor within the interior of the bridge. There is also a pedestrian and cyclist shuttle with waiting areas at each end of the bridge. The bridge will be open 24 hours a day, 365 days a year, with provisions for wind, response to accidents, and deck icing conditions. The bridge will be extensively monitored by closed circuit television and have changeable message boards and changeable speed limit signs. The toll rate will be at the current cost of ferry service and can only increase at 80% the rate of inflation.

The old saying "a picture is worth a thousand words" appropriately describes this presentation. All attendees walked away with a good overview of the project. Research and Development Committee member, Daryl McCartney, presented Eric with a small token of appreciation and thanked Eric for his interesting and informative presentation. □

CCPE Elects New Chair

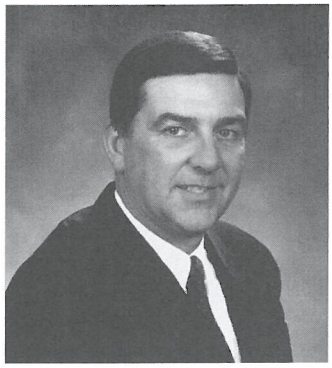
Pierre Desjardins, ing., has been elected as Chair of the Board for the Canadian Council of Professional Engineers (CCPE) at their Annual Meeting on May 23-24, 1997 in Halifax, Nova Scotia. CCPE is the confederation of ten provincial and two territorial regulatory bodies that represents more than 160,000 professional engineers across Canada.

In his address to the assembly of professional engineers at the meeting, Mr. Desjardins spoke of his desire to see the CCPE serve as a catalyst for the development of stronger linkages among engineering organizations across the country.

"Strengthening dynamic alliances is an important first step to unifying the engineering profession. A more united profession is better prepared to tackle emerging challenges such as how advances in engineering technology can be harmonized with public safety, sustainable development, respect for the environment, and improved standards in the quality of living for all citizens."

Mr. Desjardins indicated his intent to work closely with associations across Canada to develop better methods of exchanging information and communications on cooperative approaches to common challenges.

Mr. Desjardins, a former president of the Ordre des Ingénieurs du Québec, is a civil engineer experienced in the management of municipal works projects. Since 1987, he has been the president of Sovenca gestion de projets, inc., a Montreal-based project management firm. □



Pierre Desjardins, ing.

Coming Events

A Call for Canadian Environmentally Sustainable Buildings

The Green Building Challenge '98 is a two-year process of international building assessments that will be marked by an international conference in October 1998 in Vancouver, B.C.

Call for Building Nominations

The Canadian Team is interested in receiving submissions of mid-size office buildings, multi-family residential buildings and schools. These should be either built or in design stage and may include substantial reconstruction of existing buildings. Two buildings will be nominated for in-depth assessment.

The candidate projects must present a level of environmental and energy efficiency performance that exceeds current practices.

Initial submissions may be made on the GBIC Web Site at http://greenbuilding.ca or Nils Larsson at Green Building Information Council, 130 Lewis Street, Ottawa K2P 0S7. Telephone (613) 769-1242 or Fax (613) 996-9416. □

Mandatory Professional Development is Coming!

cont'd from page 1

- engage in at least 240 Professional Development Hours (PDHs) over a floating window of three years.

Members would be required to be active in at least three of the following six categories:

- Professional Practice
- Formal Activities
- Informal Activities
- Professional Service
- Presentations Outside Normal Job Function
- Contributions to Knowledge

The proposed program provides examples of activities in each of these categories and specifies the PDHs earned by participating in such activities as well as the maximum PDHs which may be claimed each year in each category.

Random audits would be performed to ensure that the member is engaging in sufficient professional development activity.

Following the presentation on the proposal, the floor was opened for a Question and Answer Session. The main areas of discussion are summarized below:

What Is The Proposed PDH Points System Based On?

National standards for a Professional Development Program have not been developed. In terms of defining activity categories, specifying the PDHs earned for each activity and specifying the overall level of effort required, the proposed program is based on the model recently accepted by the APPEGA membership. This model seemed reasonable to the MPDP Subcommittee. One option to confirm that this model is effective and practical would be to implement a pilot MPDP and survey participants. Another option would be to implement the full program, recognizing that it could be revised and improved in the future.

How Would The Program Account For Special Circumstances?

Special circumstances could include short-term unemployment, illness, paternity leave and special job circumstances such as project secondment. The proposed program recognizes that provisions for such circumstances are required, but is currently not specific about these provisions. The MPDP Subcommittee will work with Council to better define these provisions.

What Resources Would Be Required For The Program?

Council recognizes that additional resources will be required for program administration, for providing advice and guidance on professional development and for facilitating professional development opportunities for members, particularly those in rural and remote areas. Council is prepared to make these resources available.

Would APEM Annual Dues Increase Because Of The Program?

The draft 1998 APEM budget currently includes provision for an additional staff member within the current annual fee structure. Council believes that the proposed program should not be an overwhelming burden and that annual fees should not be significantly affected by the proposed program in the foreseeable future. However, until APEM has gained some experience, we cannot be certain of the program's impact on annual dues.

How Would APEM Help Members Whose Employers Don't Support Professional Development?

APEM would endeavor to communicate the importance and benefits of professional development to the member's employer. In addition, the proposed Engineering And Geoscientific Professions Act contains a provision for Group Practice Licences. One of the requirements of such a licence could be ensuring that all employee engineers are provided time and resources for meeting MPDP requirements.

How Would The MPDP Be Enforced?

APEM would provide resources to review information submitted by members and to provide guidance on the program. It would take a proactive approach in helping members to develop and, if necessary, improve their professional development programs. As a last resort, in cases where a lack of professional development may be compromising a member's ability to practise competently, the matter would be referred to the Investigation Committee.

Would The Program Be Reviewed And Enhanced In The Future?

Once the program is implemented, Council intends to review the program on an ongoing basis and look for opportunities for improvement. Members would always be consulted regarding proposed changes.

Based on comments made at the focus group meeting and on the response to the questionnaire which was distributed during the question-and-answer session, the MPDP Subcommittee will make revisions to the proposal. The revised proposal should be available to all members in October, it time for discussion at a special session to be held in conjunction with the Annual General Meeting.

The APEM Council and MPDP Subcommittee would sincerely like to thank all those who participated in this focus group meeting. The feedback received will be extremely valuable in developing a program which satisfies the needs of both the public and the APEM membership. □

Leading Traffic Research in North America underway at the U of M

By C. Rutkowski

Gathering data about highway traffic is essential for planning and development. Transportation engineers need data on traffic flow to determine how road surfaces wear, and which ones need replacing. The data can also be used to design safer highways and analyse traffic patterns, particularly truck transportation coast-to-coast.

The United States invests billions of dollars each year on these and other highway transportation issues. Some of their data comes from student research at the University of Manitoba.

Alan Clayton is head of the U of M Transportation Information Group in the Faculty of Engineering.

"Last year," he says, "our group generated more than $250,000 in contracts from organizations including the U.S. Federal Highway Administration, Transport Canada, the City of Winnipeg, Manitoba Highways, private sector companies, as well as the Natural Sciences and Engineering Research Council."

Professor Clayton says that his students use a number of tools, such as Geographical Information Systems (GIS), to analyse transportation data. Their work has included reports on truck traffic on American and Canadian highways, a study on truck accidents in Canada, and an investigation of whether truck traffic is damaging Winnipeg streets.

He notes: "For the accident study, the students have access to a knowledge base of about 3,000 truck accidents during a ten-year period on Manitoba highways. One study underway is looking to see if changes in highway safety codes are having an effect on the number of accidents."

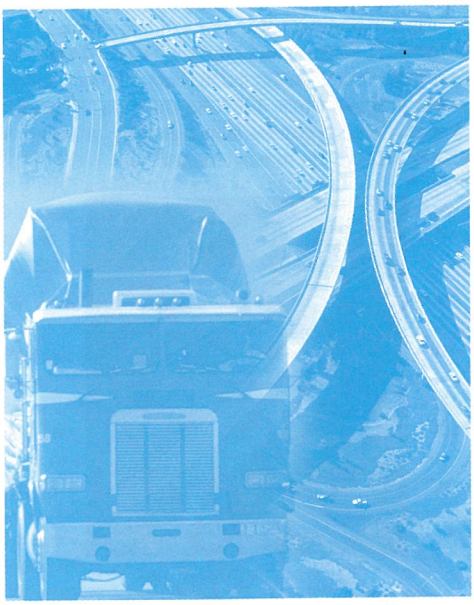
GIS is so sophisticated, it could be used to pinpoint the section of road with the highest number of truck fatalities. Information about numbers of vehicles, size, weight and loads is collected by the students and added to a number of databases for later analysis.

Professor Clayton emphasizes that the demand for their traffic data is due to the students considerable expertise gained through their projects.

The U of M Transportation Information Group has employed 15 students during the past three years. Each student gains valuable hands-on experience with GIS, and many go on to jobs in the public sector. Some become consultants with large companies.

Professor Clayton notes: "Our primary purpose is education. The income we generate supports our research activities, and students are able to attend conferences where they can give presentations on their work to people in the industry who need our data."

One study, on whether truck traffic is adversely affecting Winnipeg streets, reached a conclusion which may seem counter-intuitive to some people.



"We did not see any signal that the truck loading is causing significant damage compared with the natural effects of our difficult climate," Professor Clayton says. "On roads elsewhere in North America where the traffic is greater, the trucks would certainly be the greater factor, but with the relatively lower volume of trucking in Manitoba, the weather harms the roads more."

A study released in February 1997 used Weigh-in-Motion (WIM) and Automatic Vehicle Classifier (AVC) devices embedded in roads to calculate the load, and kinds of cars and trucks on roads.

"This is a key measure of transport," Professor Clayton says, "and is very valuable for many kinds of transportation studies. The students' research can provide data to both government and private organizations who need this information for their own research. Even the noted Battelle institute in Ohio has awarded our group contracts for some of its studies."

When this transportation information is added into the huge databases, interactive maps of North America can be drawn on computer, showing the volume, kind and changes in highway traffic throughout the continent. The GIS system is very sophisticated and precise, giving researchers a new tool to use in planning and development.

Professor Clayton says: "We can look at a computer map of North America and use a cursor to select a single street inside the city of Winnipeg, and tell you what its traffic flow is like. □

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Professional Development

New News on Building Envelopes

By: B.C. Jorowski, P. Eng.

On May 29, 1997 the Professional Development Committee hosted a breakfast meeting, complete with a presentation by Mr. David Stones, P.Eng. from The Forks North Portage Partnership, who spoke on building envelopes.

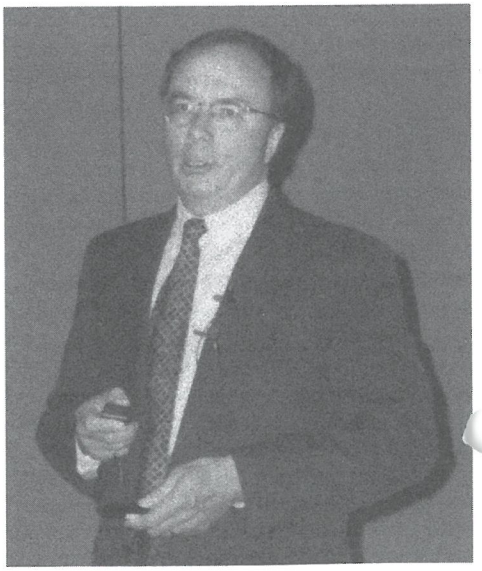
The building envelope (or the skin of a building) must provide air, water or vapour barriers which are adequate for the building's intended purpose. Mr. Stones presented slides of damaged building envelopes and various construction and repair projects, and discussed techniques for providing adequate barriers.

As well, the presentation focused on Part 5 of the 1995 National Building Code of Environmental Separation and the role of the engineer in building envelope projects.

Mr. Stones indicated that Part 5 was rewritten to reflect the current state-of-the-art technology and provide more detailed information than its predecessor.

Mr. Stones discussed the engineer's vital role in designing, constructing and repairing building envelopes. In the design, the engineer can be involved with structural, mechanical, civil and geological aspects of the building as well as with the selection and testing of materials. With construction and repair, the engineer can be involved in inspecting, testing, commissioning and troubleshooting.

The presentation was informative and provided an understanding of some of the issues related to the building envelope as well as an overview of Part 5 of the National Building Code. □



David Stones discusses Building Envelopes.

The Introspective Engineer

By: B. Stimpson, P.Eng.

What makes an engineer "tick"? What underlying values, characteristics, or approaches to decision-making do engineers tend toward or exhibit? What actions (or non-actions) lead to engineering failures? In late-20th-century practice, engineers are responsible for the safety of the public AND the welfare of the environment. How might we re-write or add to the code of ethics in light of answers to these questions and the imperative to care for the environment with due diligence? What about whistle-blowing?

The Technology and Society course offered to engineering students by the Department of Civil and Geological Engineering at the University of Manitoba is a setting where these important issues and the role of engineering in society can be discussed. Most of the students are in the second-year of a four-year program. At the mid-point of the course, following a series of classes on engineering history and the development of science and technology, students are asked to consider the following statements:

As an engineer-to-be, you are, or see yourself as:

1. A highly rational agent in society, who approaches problems objectively.
2. A guardian, provider, and/or creator in meeting society's need for material welfare, shelter, and protection (The Martha Attitude).
3. Using a utilitarian/positivist/consequentialist approach to problem-solving (see later).
4. Undertaking tasks within a framework of cost/benefit and risk analysis and numerical/quantitative solutions.
5. Contributing something of practical value to society.
6. Sometimes over bearing towards the less technically-educated.
7. Finding the solution of ethical dilemmas and political issues frustrating and unrewarding, preferring to devote your energies and time to "technical" work (The Dilbert Syndrome).
8. So focussed on the technical aspects of engineering as to lose sight of the fact, or be unaware, that modern engineering can, justifiably, be conceived as large-scale experimentation and an applied social science (e.g. Red River flood control and management), i.e. engineering practice has organizational and cultural aspects in addition to the technical.
9. Feeling unfairly blamed for the undesirable (but sometimes unavoidable) and highly publicized, negative impacts of technology (The "But-The-Doctors-Can-Bury-Their Mistakes" Syndrome).
10. First and foremost, a problem-solver.
11. Having a strong preference for "facts" in the form of numerical data and analysis and placing less value (even derision?) on subjective data.

Students are asked to measure themselves against each statement. Perhaps, it is suggested, engineers, as a sub-group in society, do respond to issues and problems with different emphasis and from different points of view than other segments of the population. Do some of the listed "characteristics" account for why relatively few engineers are found in the public arena and political life?

Engineering education and engineering experience promote and reinforce tenets or principles of utilitarianism/consequentialism/positivism[1] (item 3). The utilitarian/consequentialist approaches problems with the goal of taking actions that produce the most good, where good is the maximization of happiness for the greatest number of people, but with concern for all. It implies predictability of consequences and, for a number of reasons, can be difficult to live by. In some cases, individual rights or damage to the environment might be more critical than goodness of consequences to the most people. For engineers, who prefer to quantify, how do you quantify values and rights? Furthermore, utilitarianism requires input from everyone, which can be an insuperable task.

The positivist position, with which most engineers identify, considers that all knowledge should be, and is capable of being, based on scientific knowledge. However, is such clear separation of knowledge and values possible? The role of the values of the observer in collecting facts and data cannot be so easily dismissed. How many studies are, in reality, more descriptive than truly explanatory or predictive?

The next issue addressed in the class is the cause of failures. Some results of surveys of failures in structural engineering are summarized. They indicate that "the causes of failures should be seen in human mistakes, errors, carelessness, and so on... most of the mistakes could have been detected in time by additional supervisory control."[2] Further, even in the absence of this control, "roughly one-half of the failures could be avoided just by critical inspection of data, plans, etc... by the next person involved in the planning and construction process."

Having led the students through these statements and data, the class is then asked to consider how welfare of the environment, the safety of humans, the recognition of our fallibility, and our utilitarianism might be recognized in an engineering code of ethics as follows:

1. In recognition of inter-dependence and the evidence that modifications to the environment cause disturbances, I shall work and live with an attitude of stewardship towards all life and matter on the Earth.
2. In recognition that future generations have a right to a healthy environment and an adequate supply of food, shelter, and materials, I shall attempt to work and live within the framework of the principles of sustainable development.
3. In recognition that my own knowledge can never be complete, that I can never be completely objective, and that I am capable of mistakes, I shall endeavour to continually practise and sharpen carefulness, prudence, patience, modesty and scrupulousness. I recognize the importance of opening my work to critique by my peers and of conferring with others affected by my role as an engineer in order to reach acceptable decisions and practices.
4. In recognition that by education and training I tend to have a utilitarian approach to my work, I shall endeavour to improve my ability to communicate, to be open, and to understand those who operate within different frameworks and values.
5. In recognition of the impact of engineering on society and the importance of an informed public in a democratic society, I shall endeavour to see my engineering responsibilities as including an understanding of the social and political context in which my technical knowledge is called upon, a commitment to increase my ability to communicate articulately in these arenas, and a readiness to contribute to the common good through involvement in the public sphere.

Cont'd on page 15



Special Meeting Approves Memorandum of Agreement with Architects

By: B. Stimpson, P.Eng.

An important and historic occasion for the Association took place in Winnipeg on April 23, 1997 in Winnipeg. Despite an understandable professional and personal preoccupation with the advancing waters of the Red River, APEM members arrived at the Manitoba Masonic Centre to consider and vote on a proposed Memorandum of Agreement (MOA) between our Association and the Manitoba Association of Architects (MAA).

Hans Boge, Chair of the Task Force, very capably apprised the meeting of the three-year history leading up to this important opportunity to open up a new era of mutual co-operation between the two Associations. The challenge that faced the Task Force at its inception, namely the issue of overlap in areas of jurisdiction and practice between the Architects' Act and the Engineering Profession Act, was a profoundly difficult one, and there were times of impasse and difficulty. Although the vast majority of engineering and architectural projects proceed with no jurisdictional problems, difficulties do emerge from time to time – difficulties that can be costly to both professions, both financially and for their professional images.

The Memorandum of Agreement under consideration at the Special Meeting, already approved by the MAA, provides, among other things:

- for the creation of a Board, the composition, powers and operations of which are left to further negotiation, to develop guidelines based on precedents, continuing negotiations and the Board's own assessments, for determining the need and the extent of the need for the services of a professional engineer and/or an architect, including cases where either profession's Act is compromised or is perceived to be compromised;
- that the choice of the professional as the prime consultant on any project be determined by the client; and
- that the architect and professional engineer engaged in any specific building, in consultation with the client, decide among themselves whether, and to what extent which of, the tasks or services on a building shall be performed or provided by the architect or the professional engineer.

The full text is available at the Association office (ph. 204-474-APEM).

The underlying principle of the Memorandum of Agreement is joint consultation. The MOA does not have the force of law and the Board has no powers and cannot certify companies to operate in certain areas. Guidelines will be developed as cases are dealt with by the Board and, eventually, precedents will be established. The Agreement can be amended from time to time as agreed by both parties, and either party may terminate it on six months' notice, or by mutual agreement.

A spirited and positive question period followed Hans Boge's presentation before the matter was brought to closure with a unanimous vote in favour of the MOA. The views expressed by members were overwhelmingly supportive of the effort to move from an adversarial situation to a consultative one. There were, of course, some questions of clarification and comment on the cost of operating the Board, its powers and its structure. Since only about 2% of projects involving architects and engineers run into difficulties, it is not anticipated that the Board will entail excessive costs.

The meeting expressed its gratitude to Hans Boge and the other Task Force members – Dave Cross, Don Osman, Guenter Schaub, Doug Stewart and Peter Washchyshyn – with a vigorous round of applause. □

(Note: On May 13, APEM Council approved the nomination of the following Association members to the Joint Board, subject to APEM members approving the MOA in a mail ballot and acceptance of the nominations by MAA: Guenter Schaub (one-year term), Hans Boge, (two-year term), and Doug Stewart (three-year term).)

Letter to the Editor

Dear Sir:

I am glad A. Ball's article (Manitoba Professional Engineer, December 1996) inspired V. Dutton to attend the hearings examining the proposed concept to bury high level nuclear waste in the Canadian Shield. I would like to clarify the statement that the program is "entering the final stages of review prior to advancing to the siting phase". At present, an Environmental Assessment Panel is assessing the acceptability of the disposal concept. The Panel must make its recommendations to the federal government, and the government must then decide whether to proceed with siting a disposal facility or take some other course of action.

The Panel is certainly not "so much window-dressing for a decision...already taken" as V. Dutton would have us believe (April 1997 MPE). A great deal of research and analysis has been performed, at AECL's Whiteshell Laboratories and the Underground Research Laboratory, to develop the disposal concept. The Panel will, however, make its own evaluation of the acceptability of the disposal concept.

The sale of the two CANDU reactors to China has little to do with the Canadian disposal concept, except that the Chinese may desire to buy our disposal technology for themselves sometime in the future. The reactors will provide the Chinese with clean and smog-free electrical power as they strive to achieve a higher standard of living.

V. Dutton also condemned the proposal to dispose of weapons plutonium in Canadian reactors. Mixed-oxide fuel bundles (<2% Pu before irradiation) would change weapons plutonium to a form as unattractive for diversion to weapons as is current spent fuel, effectively reducing the amount of weapons material while generating electricity. The bundles would leave the reactor with little fissile content and can be disposed of as for standard fuel. Such plutonium destruction would be yet another example of Canada performing its role as mediator and peace keeper.

The fuel waste from nuclear energy production, unlike other forms of energy production, can be contained and isolated from the environment. The radioactive elements decay continuously such that the used fuel would be essentially as radiologically toxic as the same quantity of uranium with its natural decay products, after 10,000 years. While this is a long period compared with the human lifespan, it is a very short period when compared with the geologic time scale. The proposed repository would be built deep into a stable geological formation which has not noticeably changed, even with the passage of geological epochs. A sealed repository would not "be dangerous to all living things for the next 100 millennia" as V. Dutton claims. On the contrary, its multiple barriers would protect human health and the natural environment from effects due to release and movement of waste material. A waste repository would be an engineered facility, not just a hole in the ground.

I take very seriously our Code of Ethics, and am especially concerned about our responsibility to our one and only planet Earth. Nuclear energy is not perfect. Rather, it is a very reasonable means of generating electricity with an accountable, and readily audited, waste stream.

Sincerely,

M.J. Brown, P.Eng.
Chair, Manitoba Branch of the Canadian Nuclear Society

Thompson Chapter News

By: P. Yamada, P.Eng.

The Thompson Chapter is still very active, and this year hosted two new events: the Professional Practice Seminar and Examination, and a local Spaghetti-Bridge-Building contest during National Engineering Week.

The year began with the Annual General Meeting (September 26, 1996) which had Darren McLarty of Manitoba Natural Resources speaking on "Fire-fighting in the North". At the meeting, the Chapter executive changed with M. Holmberg, E. Kowalyk and P. Yamada joining A. Laing, G. Swaine, B. Mazerolle, C. Stewart and B. Rooks, who took over the Chair for the new season. B. Rooks thanked the outgoing executive members C. Kelly, W. Stewart and M. Aulakh for their time and energies.

The Professional Practice Seminar and Examination was held -for the first time in the north – in Thompson, on the first weekend in November. The seminar was well-attended with 18 EITs and engineers from Flin Flon, Gillam and Thompson. The overall comments were that the seminar was excellent, the shorter travel time was appreciated, and the speakers were very good. The group appreciated the speakers K. Dixon, R. Swystun nd C. Stewart who spoke with enthusiasm and made the weekend fly by. The Chapter greatly appreciated C. Stewart's efforts in bringing the seminar to town.

The Technical Dinner Meetings continued in January with J. Hackman of Appin Associates speaking on the R2000 house and how it fits into the modern house-building industry. In February, R. Wittebolle of Manitoba Hydro spoke on the use of thermosyphons to stabilize roadway embankments. This talk drew a large contingent from Gillam, and we have established a good relationship with them. The Annual Spring meeting, which is our other business meeting, saw our APEM President, M. Symonds of Bristol Aerospace, speak on the CF-5 avionics update and life extension and project management. At the beginning of May, T. Ta of Manitoba Hydro spoke on the HVDC transmission failure that happened last September. The chapter appreciates and thanks all the speakers for providing informative and interesting talks which enables us to keep current with all fields.

During National Engineering Week, a local Spaghetti-Bridge-building contest was held. The contest saw entries from both elementary and high school students, families and adults. The suspense of watching and listening as each grain of sand increased the bridge's load to its ultimate failure was enjoyed by contestants and spectators alike. The Thompson Chapter remains active with the schools' science fairs and as a resource for teachers. The Chapter hosts annual informal activities (in conjunction with CIM) such as bowling (June 14) and golfing (in the fall).

The Chapter executive is looking into hosting a fall field trip to Manitoba Hydro's facilities in Gillam and a winter testing program information session. Plan to attend the fall Annual General Meeting which will provide updates for the next season. □

Scientific Fraud: Incompetent or Dozing?

Source: Sciences et Avenir, December, 1996, translated by V.L. Dutton, P.Eng. (Ret.)

A student at the University of Michigan, working with the celebrated Francis Collins, director of the National Centre for Research on the Human Genome, fabricated, from various pieces of research, results sufficiently fantastic that they were published, on five different occasions, in specialised reviews of international renown. This falsification, which has just been discovered, would have cost the equivalent of 400,000 Francs ($900) to the American organizations financing this project.

Since 1992, the Office of Research Integrity has identified 60 cases of fraud in the United States. But how many have never been discovered?. □

Women in Engineering

Women's Network Compiling Database

By: K.F. Olischefski, P.Eng.

The Women's Engineering Network (WEN) would like to compile a list of fax numbers or e-mail addresses for sending out invitations to their meetings.

Membership in the network is open to all those interested in improving women's position in the engineering community. Meetings are held about four times a year. The format is informal, usually including a casual networking period during a meal, and normally a guest speaker is featured. Past topics have included mentoring, balancing career and family, personal safety, and financial planning. Our next meeting will be the annual WEN golf tournament to be held in early September.

If you are interested in attending WEN meetings, please submit your name, company, phone, fax number and e-mail address to:
Kelly Olischefski – phone 667-2260, or
fax 667-2041. □

Northwest Manitoba's Kelsey Chapter Formed

By: J. MacLeod, P.Eng.

At the request of area Professional Engineers and EITs, a meeting was held in Flin Flon on June 12, 1997 at the Hudson Bay Mining and Smelting Co., Ltd. Staffhouse. In attendance were 21 interested individuals from The Pas and Flin Flon areas as well as a member of the Thompson Chapter, Gail P. Swaine, who was the guest speaker.

A general discussion was held around the formation of an engineering chapter. A draft of a constitution and bylaws was developed, and the name "Kelsey Chapter" of APEM was chosen. A presentation was made by the guest speaker on the activities and events of the Thompson Chapter which stimulated interest amongst the group. Further support was offered.

The next meeting is scheduled for September 4, 1997 at 7:00 p.m. in the Staffhouse, to finalize for submission to the constitution and bylaws. The meeting is open to all interested parties. □

The Introspective Engineer

cont'd from page 13

6. In recognition that my greatest ethical contribution to society is to be truly an excellent engineer, it is my duty and responsibility to maintain an exemplary level of competence through a commitment to life-long learning.

Lastly, the class is challenged to consider one of the most difficult of decisions – "Should I whistle-blow on my employer?" What wise guidelines can be given? The following are suggested:

1. Are you personally convinced that your decision is not self-serving and is in the best interests of the firm, your profession, society, and the individual?
2. Have you made every reasonable attempt to resolve the issue within your organization before going public?
3. Have you applied Kant's "Categorical Imperative" to your satisfaction? "Act only according to that maxim by which you can at the same time will that it should become universal law."[3] □

References

1. Nelson, C. and Peterson. S.R. "If You're an Engineer, You're Probably a Utilitarian," *Issues in Engineering*, Vol. 108. No E11, pp.13-18, 1982.
2. Matousak, M. "Outcome of a Survey of 800 Construction Failures," Swiss Federal Institute of Technology, Zurich, 1977.
3. Kant, I. *Foundations of the Metaphysics of Morals*. Bobbs-Merrill, Indianapolis, 1785.

Thanks to a Great Team!

Fighting the flood of the century was a team effort.

Anticipation, preparation and teamwork prevented a major disaster.

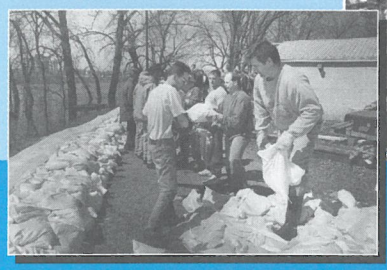
A team for the past designed and built the Red River Floodway, the Shellmouth Dam, the Portage Diversion and the permanent ring dikes around many rural communities.

Today's team developed flood protection plans, forecasted water flows and flood levels, interpreted satellite images, operated flood control works and built additional dikes.

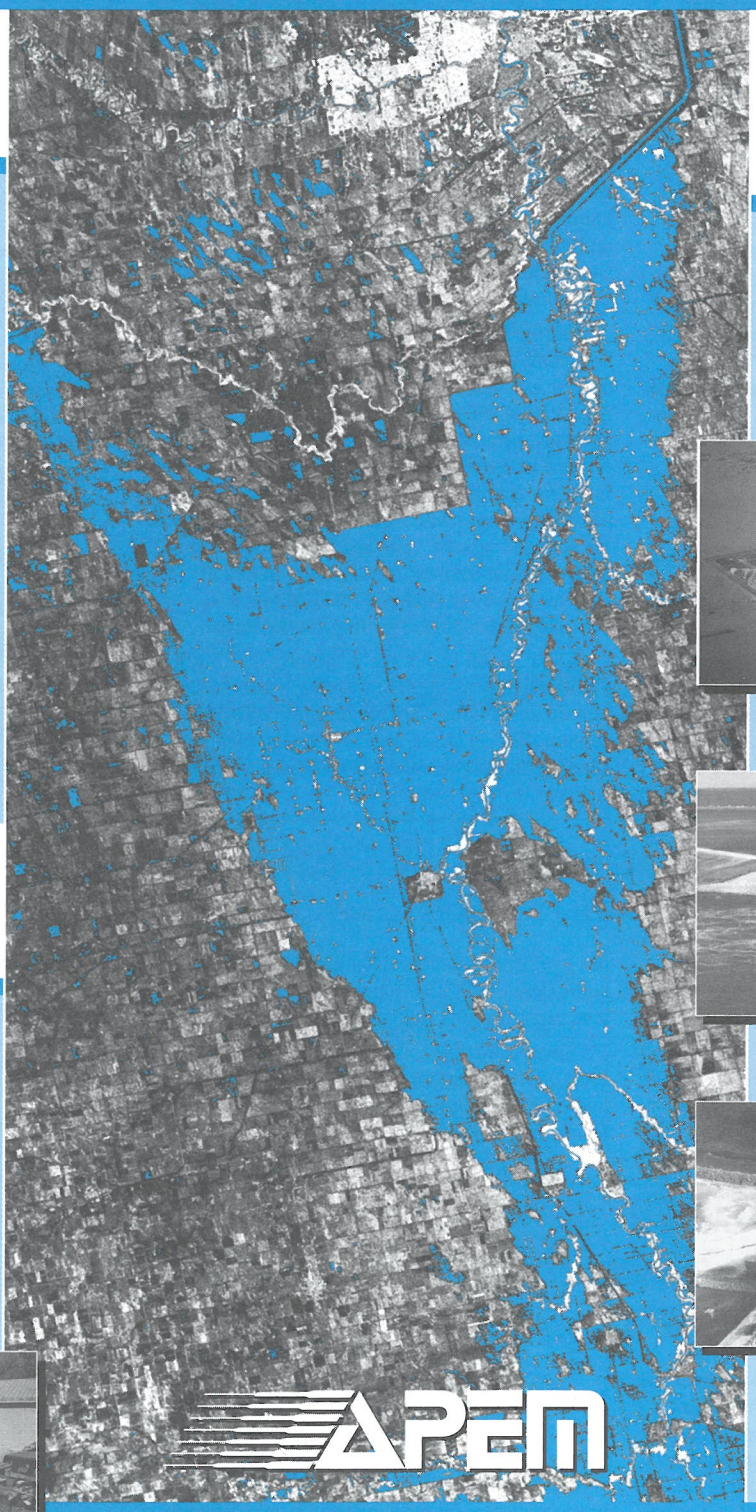
A team for the future will help rebuild Manitoba.

Without you, the team would be incomplete.

Many people became familiar with the various engineering water resource projects around the province. The engineers of Manitoba were honoured to team with all those individuals who worked so hard to fight the flood of the century.



Together, thousands of volunteers and the Armed Forces fought the flood of the century.

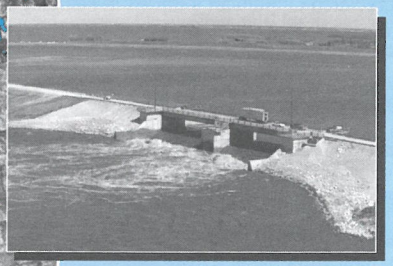


The best defence against future flooding is good engineering

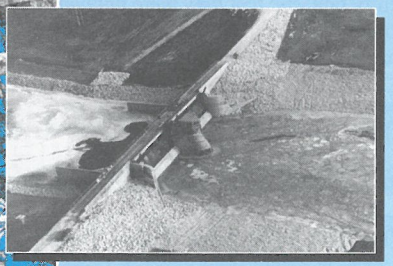
Existing flood protection works are engineered solutions subject to careful design. Future works will ensure that more Manitobans are protected from flooding.



The ring dike at Rosenort held, as did the dikes at Emerson, Letellier, St. Jean, Morris and St. Adolphe.



In 1997, the Red River Floodway was used for the 20th time since 1969.



The Portage Diversion takes excess spring flows from the Assiniboine River to ease the downstream water levels.

Satellite Image produced by The Manitoba Remote Sensing Centre, Land Information Centre.

APEM

We are the Association of Professional Engineers of Manitoba. Our mission is to serve and protect the public interest by governing and advancing the practice of engineering in accordance with The Engineering Profession Act of Manitoba.

We are proud of our members who helped fight the flood of the century.