

NEWSLETTER

of Chartered Engineers

Winter 2012

Chairman's Notes Winter 2012

Happy New Year to all. Your executive hopes you had an enjoyable and relaxing break over the festive season with family and friends.

The year begins with the AGM – 6 pm Jan 21 at the Canyon Meadows Golf course Clubhouse – where we expect Jim Smith, the President of APEGGA, and Adrian Pritchard, the Director of Professions for Alberta Employment and Immigration, together with their spouses as our guests. Adrian originates from the UK and will enjoy discussing the latest in soccer, rugby and cricket with anyone who keeps up on those subjects. Part of his work is on mobility agreements – for example, the New West Partnership under development trying to increase trade and remove barriers between Saskatchewan, Alberta and BC. It will be an excellent opportunity for members to chat with both Jim and Adrian about anything of concern relevant to their roles.

In contrast to previous years, we will have a short after dinner talk and then a pub-night type quiz. We hope you will enjoy the evening. The members of the executive are all volunteers and between us we share out the work. Please join me in thanking all of the members for their fantastic effort and support over the past year. Technical talks have been well attended, with the lowest being in the order of 40 or so, so they have clearly been selecting and arranging topics that are of

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interest to you, the members. We are always looking for new ideas and new input; so do please consider volunteering to serve on your executive!

This year's technical talks will begin in February and we are trying to arrange another interesting and diverse set of subject areas across the varied disciplines we represent. Please do attend these – they are credited as CPD hours for APEGGA. If there are topics of particular interest that you would like us to work on, please let one of the executive know. One subject that has proven a little difficult has been putting together a calm technical debate on "climate change" – presentation and interpretation of data from each side of the debate dispassionately. While we have found a suitable speaker on the pro side, we still need to find one for the anti. Nevertheless, we look forward to a year of interesting presentations and hope to see you at many of them.

Nigel



Liaison
Nigel Shrive



Liaison
Dave Elson



Liaison
Ray Marsh



Liaison
John Charrett



Liaison
Alan Rhodes

Annual General Meeting (AGM) and Dinner

Saturday 21st January 2012
Meet at 6:00pm for AGM at 6.30 pm
Buffet Dinner at 7.00 pm

Canyon Meadows Golf and Country Club
12501 - 14th Street SW Calgary, Alberta

RSVP CPGCE Secretary via
E-mail: Secretary on the website
or phone Tel.: 403 254 3315

Please confirm your attendance before 16th
January 2012.

Our AGM after-dinner speaker this year will
be Dr. Kenneth DeLong.

Dr. DeLong is currently a Professor of Music
History in the Department of Music at the
University of Calgary.

He has given general interest talks on a variety of musical subjects to a large number of groups including those with a musical and those with a non-musical background. He is a correspondent and reviewer for *Opera Canada* magazine, and for over 30 years he has been the principal music critic for *The Calgary Herald*.



Dr. DeLong will discuss the subject *Beethoven as Engineer* in which he will describe some of the aesthetic and technical demands made by composers on the development of the pianoforte.

CANADIAN PRAIRIES GROUP OF
CHARTERED ENGINEERS (CPGCE)

AGM AGENDA for Saturday, January 21, 2012 6.30 PM

1. APPROVAL of AGENDA
2. APOLOGIES for ABSENCE
3. MINUTES of PREVIOUS MEETING
4. MATTERS ARISING FROM MINUTES
5. APPROVAL of MINUTES
6. CHAIRMAN'S REPORT
7. TREASURER'S REPORT
8. SECRETARY'S REPORT
9. ELECTION of OFFICERS
 - Chairman Nigel Shrive
 - Vice Chairman Emile Coetzer
 - Past Chairman Vacant
 - Treasurer Bob Enever
 - Secretary Colin Pollard
 - Members
 - Teddy Arevalo
 - Adrian Dumbrava
 - Alan Deazeley
 - Mohamed Jaffer
 - Arun Kumar
 - Tom Martin
 - Bob Sparrow
 - Maina Waiguru,
10. INCOMING CHAIRMAN'S REMARKS

Minutes of Annual General Meeting January 29, 2011 18:30 Held at Fort Calgary, Calgary,

Members present: Arun Kumar, Mac Stenson, Bill Meadowcroft, Francis Hartman, Adrian Dumbrava, Derrick Harrison, Mohamed Jaffer, Andre van Dijk, Emile Coetzer, Alan Deazeley, Teddy Arevalo, Maina Waiguru, Bob Sparrow, Bob Enever, Nigel Shrive

1. Approval of the Agenda

The agenda was approved.

2. Apologies for Absence

Om Malik, Paul Breeze, Iain Clayre, Bob Mote, Robert Ayieko, Nigel Wootton, Ray Marsh,

Chris Biggs, Desmond Njie, Tony Howard,
Saleh Sumar, Paul Camwell, Colin Pollard.

3. Minutes of the last AGM (January 23, 2010)

Moved by Andre van Dijk, seconded by Mac Stenson, that the minutes be approved.
Carried

4. Matters Arising from the Minutes

None

5. Amendment to the Constitution

Moved by Francis Hartman, seconded by Andre van Dijk, that the constitution be amended as follows:

FROM

- a) The Chairman shall not hold office in that capacity for more than two years in succession, and shall not simultaneously hold any other Office in the Group;

TO

- a) The Chairman shall not hold office in that capacity for more than two years in succession without re-election, and shall not simultaneously hold any other Office in the Group;

Carried

6. Reports

6.1 Chairman's report: N. Shrive reported that the technical program had been very successful with 70 attendees on a couple of occasions. He thanked the committee members for their hard work over the year, and noted with regret that Andre van Dijk was stepping down, he hoped temporarily, from the committee.

6.2 Treasurer's report: R. Enever reported that the Group was in an excellent position financially and could provide any details that any member would like.

6.3 Secretary's report: Unfortunately Colin Pollard was suffering from a cold, and was unable to attend. N Shrive read out his written report, indicating there had been nine executive

meetings in the year and that correspondence with London had been sparse but positive. There had been no visits from the sponsoring Institutions. There had been substantial correspondence from members of the Institutions related to possible immigration. He had received support from the Institution country representatives as necessary. Colin thanked the committee for helping him perform his job, notable Arun Kumar (website) and Bob Enever (Newsletter). Andre van Dijk suggested a hearty vote of thanks be recorded towards Colin for his sterling efforts as secretary – a suggestion agreed upon unanimously.

7. Scholarship

Adrian Dumbrava reported that while not as many applications had been received as in previous years – and none from Saskatchewan again – the committee had nevertheless had great difficulty selecting a winner, as there were so many excellent applications. After considerable deliberation, the committee agreed upon Matthew Dyck, reading the nanotechnology option in the Engineering Physics programme at the University of Alberta. Applicants would be so informed shortly.

8. Election of Committee members

As Andre van Dijk was not standing for election, he ran the election. The following were elected

Chairman: N Shrive

Vice Chairman: E Coetzer

Past Chairman:

Treasurer: R. Enever

Secretary: C. Pollard

Members at large: Adrian Dumbrava, Alan Deazeley, Arun Kumar, Bob Sparrow, Maina Waiguru, Mo Jaffer, Teddy Arevalo, Tom Martin.

9. Withdrawal of Institution of Chemical Engineers (ICHEM) as a funding Institution

Discussion resulted in a recommendation that the Group send a letter to IChemE suggesting the decision be reconsidered as members here

were paying their dues and should receive benefit for so doing. Adrian Dumbrava was to create the first draft. Meanwhile the logo would be removed from the website and future newsletters until the matter was resolved.

Note It was agreed in subsequent monthly meeting that the IChemE logo be kept until further resolution with London.

10. Any other business

There being no other business...

11. Adjournment

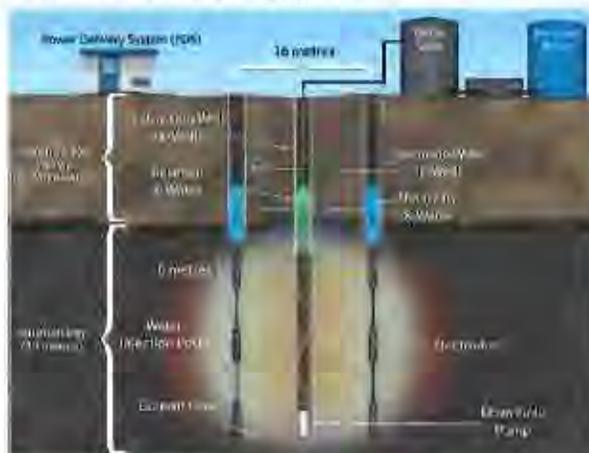
Moved by Andre van Dijk, seconded by Francis Hartman, that the meeting be adjourned.

Carried.

2012 Technical Programme

Wednesday, 8th February 2012

ET-DSP™ For Oil Sands ~ How It Works ~ What are the Economics



Bruce C W McGee CD, Ph D, P Eng,
McMillan-McGee Corporation

Dr. McGee is the President and CEO of McMillan-McGee. Founded in 1991, McMillan-McGee has successfully remediated over 45 contaminated sites using ET-DSPTM, achieving or surpassing non-detect targets. Dr. McGee has over 25 years experience in the energy and environmental industries focusing

on engineering and technological development of electro-thermal processes for the remediation of contaminated soil and groundwater.

Thermal recovery methods, as applied in heavy oil and oil sand deposits, and in environmental remediation, have the common objective of accelerating the hydrocarbon recovery process. Raising the temperature of the host formation reduces the oil and bitumen viscosity, and, in environmental remediation, increases vapour pressure. There is a cost to increasing the temperature of the reservoir and to producing the hydrocarbons to surface with this approach.

Wednesday, 14th March 2012

Airships & Hybrids - The Evolution of the Arctic Supply Chain

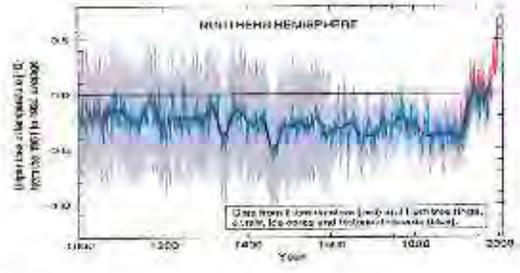


Stuart Russell, Vice-President Business Development Braden-Burry Expediting (BBE) Ltd, Calgary

Mr Russell and BBE have been actively encouraging the airship and Hybrid Air Vehicle (HAV) development efforts for Northern Canada, believing the time is right to move beyond the current delivery methods that are constrained by high operating costs of aging cargo aircraft, changing operating windows with a warmer climate and environmental concerns, as well as the need for improved efficiencies.

Over the course of the past 25 years there has been a renewed interest in airships, a very old method of air transportation and it has the potential to revolutionize the Arctic Supply Chain. The most exciting news in for northern Canadian based Logistic companies like Braden-Burry Expediting and their resource industry clients, was the announcement by HAV and Montreal based Discovery Air Innovations to proceed with plans to bring to the market the HAV hybrid airships in early 2015 with a 50 tonne payload that will operate in cold climates in winter conditions. The potential to utilize HAV's to access remote resource deposits and offshore facilities, resupply arctic communities, replace melting winter roads, reduce aircraft fuel consumption & noise, airlift materials too large for convention aircraft and allow resource companies and government to improve current methods of doing business and limit the footprint on the land when development is complete.

- Presentation/ discussion on **Global Warming**, the infamous **hockey stick curve prediction**.



- **Decommissioning of the Balzac Plant**



- Presentation on **Isambard Kingdom Brunel**, one of the greatest early Victorian Engineers



Wednesday, April 11, 2012.

To be confirmed

Wednesday, May 9, 2012.

To be confirmed

Wednesday, June 13, 2012.

To be confirmed

The early summer programme is being finalized and will probably include:

Wednesday, September 12th, 2011

Winter Construction

Pieter Diedericks, P Eng

Pieter Diedericks gave an interesting and informative presentation on Winter Construction, which in Alberta is a major challenge and a necessity given the length and severity of our cold weather window. The talk was broken down into the good and bad parts of winter, planning requirements and mitigation actions.

The bad part of winter is the significant safety challenges that arise from the low temperatures, snow and ice and the resulting lower productivity. Most outdoor construction tasks can be executed in extreme weather with



Large scale winter hoarding

a large cost penalty. See photograph of hoarding to effect significant concrete work in winter. Where possible this type of work should be scheduled outside of the expected extreme cold window.

The good part of winter construction is that once roads (and rivers) are frozen much heavier loads can be moved than in the non-frozen seasons. Much heavier lifts can be planned because the ground is solid. These are significant advantages. Much heavier and oversized equipment modules can be moved in winter. This is cost effective because offsite man-hours are less costly than onsite work. Gross loads of 1,000 tonnes are possible on defined highways in the Alberta winter. These

are effective strategies but it is critical that the work is constructed to schedule. If planned winter construction slides into the spring season the results can be catastrophic.



Spring thaw on a construction site

The basic strategy for winter construction is to plan the project around the winter.

- Pinch point is the transport of heavy equipment and modules
- Start with the heavy haul window as basis
- Plan back for when engineering should start and when foundations should be completed
- Plan forward for construction completion

The project engineering, procurement and construction schedules should be developed using these four steps.

The recommended rule for construction planning is to follow the 80/20 split where engineering needs to be 80 % complete for the 20% planned construction progress. See typical planning schedule on next page.

Essential mitigation actions must focus on safety and enabling the workforce. For the former it is necessary to enforce good housekeeping. Snow and ice clearance must be a priority and dedicated walkways provided for the construction teams to access all areas



Typical Alberta large project schedule based on heavy haul window

of the construction site. To optimise manpower productivity it is necessary to provide the correct winter clothing. A site wide plan needs to be developed for heating and hoarding. Pieter Diedericks message is that winter is bad for construction but it is also an ally. One must plan to optimize for both the advantages and disadvantages of the long winter construction season in Alberta.



Shipping an oversized load in winter

Wednesday, October 12th, 2011

Safe Water for the Long Haul: An Engineering Perspective on the Global Water and Sanitation Crisis

Laura Schuelert, P Eng, Director of Education Program Development, CAWST

Laura gave an overview of the Centre for Affordable Water and Sanitation Technology (CAWST), including its history, mission,

achievements, and goals for the next ten years plus an outline some of the technologies used.

CAWST is a non-profit organisation based in Calgary that provides training and consulting services in mainly developing countries to help them plan and implement effective water and sanitation programs that benefit the poor. Clients include NGOs, government organizations, international organizations (e.g. Oxfam and Red Cross), international agencies (e.g. WHO, UNICEF, UNDP and UN Habitat) and community groups. CAWST's clients have implemented projects in over 69 countries.

Laura started the presentation with a short video 'Think Fast' which illustrated the problem and a proposed solution. Water, sanitation and hygiene are the three things essential to health which most of us here in Canada take for granted. However, about half of the world's population or more than 3 billion people actually live without clean water or basic sanitation. These conditions cause diarrhoeal disease, which results in failure to go to school/work, lost income, higher medical expenses and less money for their basic needs.

CAWST proposes a '3E' solution – Engage, Educate and Empower. It believes that people needs to be educated and empowered to provide water, sanitation and hygiene for themselves. This is achieved by raising awareness on the issues, sharing solutions and training. Workshops are given to help

people become confident in making their own water and sanitation.

It is desirable to implement 'household water treatment' in developing countries rather than having large centralized treatment facilities. Small volumes are treated at the point of use eliminating the need for a water distribution system and minimizing the risk of recontamination of the treated water.



Water Treatment using Biofilter

CAWST conducts training workshops in the construction, installation and maintenance of biosand filters, which are used as household water filters in developing countries. Dr David Manz at the University of Calgary developed the filter in the 1990s. It is basically a 1 foot wide and 3 feet tall container with layers of selected sand and gravel, which reduce turbidity or suspended solids. A 1-2cm 'biolayer' develops at the top of the sand layer and this removes 99% of the pathogens. The filtered water is then sterilized with chlorine, sunlight or boiling before consumption to remove any remaining bacteria or virus. As of June 2009, it is estimated that over 200,000 biosand filter have been implemented in over 69 countries.

More than 2.5 billion people are also without adequate sanitation. In many cases, human waste is discharged in the open or at shallow holes contaminating nearby water sources.

CAWST train organizations on sustainable solutions such as ventilated improved latrine, pour-flash latrines and eco-sanitation to help prevent spread of disease.

CAWST provides educational posters on water, hygiene and sanitation adapted for use in different regions. These posters as well as other training materials are available at CAWST's website for download. The materials are being used worldwide by various organizations.

CAWST is building on its successful business concept with the assistance of many dedicated volunteers. It aims to help 20 million people get better water and sanitation by 2020.

At the end of her presentation, Laura appealed to the audience to help raise awareness and if possible volunteer or contribute to help them address the global water and sanitation crisis. CAWST may be invited to provide group presentation to those interested.

Wednesday, November 9th, 2011

How Your Joint Works with Special Reference to the Knee
Nigel Shrive, Ph D, P Eng.

Dr Nigel Shrive, our CPGCE chairman was introduced to a full house. Nigel is a professor of the Department of Civil Engineering and the director of the McCaig Institute for Bone and Joint Health at the University of Calgary. He has worked on the structural function of joints and soft tissue for many years and is an inventor of a knee joint, which has been implanted in thousands of patients worldwide.

The McCaig Institute is a joint effort of different branches of science between University of Alberta and University of Calgary, including kinesiology and medicine. Dr Shrive has worked with Dr Cy Frank, an orthopaedic surgeon and Dr Dave Hart, a molecular cell biologist for 20 to 30 years making 'some' progress in the complex problems of the human joints.

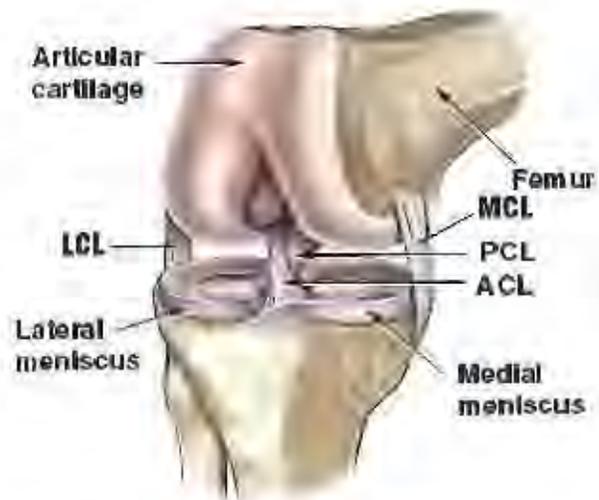
Arthritis afflicts over 4.5 millions of Canadians compared to 50 Severe Acute Respiratory Syndrome (SARS) cases, 10 West Nile cases and 1 Bovine Spongiform Encephalopathy (mad cow disease) related deaths. However, research funding is vastly disproportionate with millions of research dollars given to the less prevalent diseases. There is inadequate research funding to address arthritis, which afflicts about 1 in 2 men and 2 in 3 women over 75 years old. This is expected to get worse as life expectancy extends. The presentation focused on the knee joint, starting with the basic engineering mechanics of a joint and then what could go wrong in this complicated but delicate human joint.

A surprising fact is that muscles actually work at a mechanical disadvantage requiring about 6 to 7 times more force than the load it moves. The mechanical disadvantage provides a kinematic advantage as a trade off, providing large movement for small contraction. This is necessary for animal survival, i.e. catching prey and avoiding predators.

The engineering function of joints is to transfer loads between bones, enable motion, supply nutrients and remove waste from cells. The joint must perform its task over a lifetime without pain and minimal deterioration.

The coefficient of friction of the lubrication in a knee joint is about 0.001, which is much better than anything engineers have yet designed. This explains why the knee joints of marathon runners do not overheat even after 26 miles of running.

The typical details of synovial joint depicted in anatomy books are inaccurate. A joint is actually a complex organ with components working synergistically to transfer loads and to control motion. Joint components include cartilage, menisci, labra, ligaments, tendons and bones. Failure of any of these components leads to failure of the whole joint. The articulate cartilage is least able to heal during a joint injury because there is no nerve cell or blood supply. Nutrients are difficult to deliver into the joint capsule.



Parts of the knee joint

The knee motion which is a combination of rotation and sliding is constrained by a 'cruciate four-bar' chain formed by the anterior cruciate ligament (ACL) and the posterior cruciate ligament (PCL). There are thousands of ACL injuries (partial and complete ligament tears) every year typically from sports requiring frequent jumping, sudden direction change and an abrupt stop/start.

Ligaments are 80% water and are similar to fibre-reinforced materials with an amazing design. There is only a short insertion into the bone. For most activities, the ligaments are stressed at 'toe region', which is well within the stress limit. This gives enormous tensile strength reserves. It is 'crimped' in an unloaded state. Ligaments are also fatigue resistant unlike a metal beer can, which fails after repeated loading reversals. They are also relatively insensitive to creep which means even after sustained stresses, the joints do not become loose. This is achieved by the clever system of fibre 'recruitment' where more fibres are engaged as the ligaments are stretched, thereby spreading the loads to more cells and at the same time increasing the stiffness. The ligaments become tight when the twisting knees to maintain torsional stability.

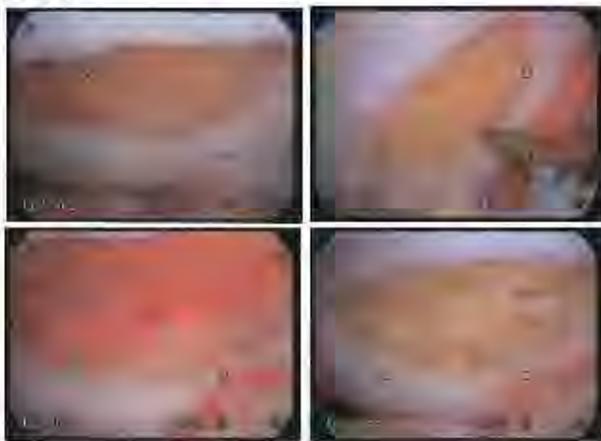
Compression across a joint is transmitted through articular cartilage, which is typically only 1mm thick and 80% water between the bones. There is 'contact' around the joint edges and as compression is increased the

contact area near the middle becomes increases. Finite element model analysis simulating pore pressure distribution in cartilage showed highest pressure gradient when the middle part of the joint is in contact. It is desirable to keep the fluid within the cartilage to carry the compression load.

The load carrying mechanism of the menisci and labra around the joint is presented using a ring model against which the convex femur bone presses. The ring expands radially and is subject to circumferential tension dependant of its stiffness.

Lubrication between the surfaces is provided by pure fluid film and boundary lubrication. However, there is continued debate on the exact mechanism of the fluid during low movement/high load bearing and during relatively high-speed swings.

The McCaig Institute is trying address the problem of 'arthritis' or 'inflamed joints', which afflicts over 10,000 Albertans. 1 in 6 active people also suffer from sports related joint (or post traumatic) injuries. One in three of health care visits are related to bone and joint problems. About 24% of physician visits are for muscular-skeletal disorders. Examples include Meniscal tear, osteoarthritis (OA) and ligament scars.



Stages of Osteoarthritis

Progressive loss of hyaline cartilage in OA starts with soft/cracking cartilage until finally losing full thickness. The inflamed joint gets filled with fluid and loses its original lubrication

system. Once OA has been initiated there is no turning back. It becomes painful when bone comes in direct contact with bone. Some people are more genetically prone to OA.

Joint replacement surgery typically lasts 10 to 15 years. A consequence of this limitation means that patients need to be at least 55 to 60 years old before joint replacement surgery is considered.

In conclusion, joints are complex organs, which are composed of technically great materials working in an elegant fashion. However, disruption in one component leads to failure of the whole joint. There is much research required in treatment of joint problems. Dr Shrive also acknowledged the various contributors to the research findings.

A lively discussion followed during the Q&A session. Dr Shrive advised not to do anything rash after an injury to allow the healing joint tissues to gradually adapt. Unlike muscles, which have higher cell concentration, ligaments heal more slowly.

Lots of research work is required to find better and quicker diagnosis of OA. At the moment joint space is measured by X-ray. As a result, there is less interest in developing arthritis treatment drugs, which require expensive clinical tests that takes 15 to 20 years.

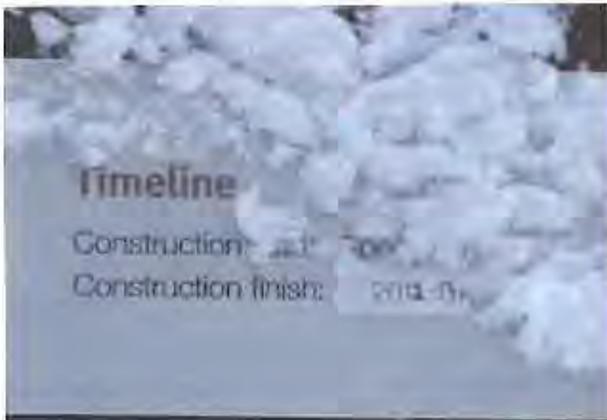
It was also pointed out that partial tear of ligaments have better chance recovery. Surgical techniques for ACL reconstruction used in North American differ from the European method but both procedures are equally successful.

Hip joint replacements are more successful since ball-socket joint is simpler. The rotation-sliding motion of the knee joint is more difficult to replicate.

Running on hard surface such as concrete or asphalt should be avoided since impact from heel strike pose increased risk of joint injury.

Update on the Calgary Peace Bridge

At the completion of the 2010 Technical Programme the CPGCE presentation was on the design and construction of the Calgary Peace Bridge across the Bow River. At the time of the presentation in November 2010 there was no indication of significant fabrication issues, which would delay the completion of the bridge. In December 2010 it was announced there would be significant delays. Now at the end of 2011 the Peace Bridge is in place and nearing completion. The following photographs were taken in late December 2011. As can be seen from the sign below there does not seem to be a firm target date for completion.



The bridge is in place and as usual the city seems to have a plethora of unnecessary safety signs.



The photo from the west side clearly shows the temporary bridge, which was used to place the

footbridge. The latter was slid over the river and then moved sideways.



This is the north access to the Peace Bridge and work is ongoing.



The last photo shows the details of the rib structure of the bridge from the north side.



The CPGCE Executive as of January 2011



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