Canadian Fire Safety
Academic Capabilities and
Education Programs

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In this presentation

- Where are we today?
  - Fire science and engineering as fields
  - Canadian outlook
    - expertise, infrastructure, education
  - Global snapshot
    - education

- Opportunities and frameworks
- Conclusions
Components of Fire Science

- Chemistry
- Fluid Dynamics
- Heat Transfer
- Materials
- Structures

Real Fires ⇔ Interactions

...multi-disciplinary...
Fire Safety Engineering

- relatively young discipline
- rapidly emerging and changing field
- scientific advances often ‘piecemeal’
  - occur in response to tragedy

The Challenges

- must address complex problems
- broad, interdisciplinary, many stakeholders
- demographics – many experts retiring 3 -10 yrs
Stakeholders

- many backgrounds, levels of knowledge
- many philosophies and cultures
  … particularly with push to go global…

… have to remember we …

- share many common goals
- all play key roles - design, operations, safety
- have to do our best to maintain dialogue
To advance we must blend...

Science, Technology, Experience

are we doing this?
…Fire Safety Education in Canada…
Fire Safety Education in Canada

Linked with research

- broad base of expertise, isolated groups
- greatly expanded infrastructure over past 20 years
- federal/provincial/industry funding - limited

….the challenges

- funding often industry specific not ‘base’ funding
- some areas of research/education not addressed
  - fire fighter safety, aging, new energy sources, climate change, etc
- hard to capitalize on funding
Fire Safety Infrastructure

- large installations: >$15M federal/province
  - Dalhousie University
  - University of Waterloo
  - University of Alberta

...NRC, industry, government labs
Dalhousie: Dusts/Explosion
Waterloo Fire Research Facility

- 3,975 ft², 4+ storey test enclosure, 2 storey burn house
- Six 72” fans with plenum
- Crosswind:
  - up to ~ 12 m/s
  - 20 ft x 26 ft outlet
- Small-scale test rigs
- Integrated with fire training complex
Alberta: Clothing/Field/Wildfire
Fire Safety Infrastructure

- many smaller research specific labs
  - Memorial, ETS, Laval, Concordia, Lakehead, Queens, UOIT, York, Toronto, Saskatchewan, Lethbridge, UBC and others…
- collaborative efforts in lab and field
Saskatchewan: Cross Canada Collaboration
Canadian University Expertise

- covers wide range of fire safety issues
  - explosions, industrial fires, risk
  - tunnels, buildings, infrastructure, structures
  - forest, wildland fires
  - products, protective clothing
  - experiments, testing and modeling

**BUT….

experts often not identified as ‘fire safety’
need hybrid concepts-cases approach
Canadian Undergrad Education

- Individual **ELECTIVE** courses

- Co-op work internships, design projects

Memorial
Dalhousie
Carleton
Lakehead
Queens
Toronto
York
Waterloo
Western
Saskatchewan
Alberta
UNBC
UBC
BCIT....

UNIVERSITY OF WATERLOO
Canadian Graduate Programs

- Fire safety or fire protection engineering
  - MASc, PhD and MEng programs
  - individual courses and certificates

- first program: UBC MEng – closed down
- Waterloo: multi-institution (late 2000’s)
- Carleton: single institution (late 2000’s)

- engineering faculty: ‘fire safety’ research
College and PD Programs

- **Colleges**
  - Pre-service Fire for fire fighter training
  - Fire and Life Safety Systems
  - Fire Science, Management, Leadership

- **Professional Development**
  - many backgrounds/levels of education
  - many organizations provide ‘training’
  - many organizations certify ‘training’
...How do we compare in education?
FSE Education in USA

facing similar challenges

- Undergraduate, graduate: University & College
  - Two original engineering programs
    - Maryland and Worcester Polytechnic
  - Now 7 - 10 FPE programs and growing
    - California Polytechnic State, Case Western, Lawrence Tech, New Haven, St. Thomas, Eastern Kentucky (FPSET), Oklahoma
  - Another 25+: one course; other fire programs
FSE Education in Austral-Asia

....facing similar challenges

• Undergraduate, graduate - University
  – 5 well known programs
    • Canterbury, Hong Kong Polytechnic, Queensland, State Key Lab of Fire Science, Tokyo University of Science, Western Sydney,
    • Undoubtedly more with multiple courses
  – Many: one course; other fire programs
    • Kyoto, UTokyo, Victoria, China UMT, NTUSingapore, India (NAFS, UPES, CUSAT)
FSE Education in Europe

...facing similar challenges

• Undergraduate, graduate: University
  – Thirteen programs
    • Likely several more with multiple courses
  – Another 10+: one course; other fire programs
    • Glasgow Caledonian, Central Lancashire, London South Bank, Imperial College,
FSE Education in Europe

....very strong collaborative program

IMFSE Erasmus Mundus Program

- 2-year full time Masters programme
- EU funding - three universities
  - Ghent University (Belgium)
  - Lund University (Sweden)
  - The University of Edinburgh (UK)
- Partners for theses: University of Queensland (Australia), ETH Zürich (Switzerland), The University of Maryland (USA)
...No matter the place must mesh...
Theory and Practice, Research & Education
Science, Design and Engineering

- fundamentals: fire science, engineering, critical analysis, modeling, statistics
- field fire behaviour
- fire protection & life safety technologies, investigation
- codes and standards
- materials, fire performance testing
- concepts, case studies, design, skills, practical issues
Science, Design and Engineering

- human behaviour
- health and safety, toxicity, emissions
- risk and loss prevention
- wildland fires, industrial fires, explosions
- operational issues
  - fire department, inspections, emergency planning, disaster management, joint events

...wealth of fire safety options...
...A Canadian SWOT in brief
Strengths
• world class research infrastructure distributed across Canadian universities
• active, leading edge researchers in fire safety science and engineering

Weaknesses
• lack of funding to support infrastructure – staff, faculty, operations
• unable to attract enough HQP
• lack of coordinated collaboration and partnerships amongst all stakeholders
Threats

- loss of existing infrastructure, programs and opportunities due to
- low recognition of worth (not buzz-word research - hard to compete/grow)
- lack of time and funding (cannot keep up and capitalize on opportunity to grow)
Opportunities

• establish cross-Canada network to combine strengths and excel globally
• capitalize on available research opportunities (and new ops)
• train next generation of qualified fire safety professionals
…Future of Fire Safety Research and Education…
Multi-faceted Fire Safety Training

Certificate Programs
Specialty Aras
Professional Development

Advanced Certification
Continuing Education

Update and Upgrade
Extension Courses
Professional Development
Seminars

University Option
Programs

Professional Certification

Certificate, Diploma
Programs

Basic Training
Pre-entry Level, Skills Training
Forge Links through All Stakeholders

- AHJ key partner in education/research
- wealth of experience
- identify challenges
- practical design issues
- bring field know-how
- many opportunities

...experience largely untapped
To advance we must develop...

- effective communication at all levels
  - gather and interpret scientific information
  - two way transfer technology-experience

- a collaborative approach
  - engineers, scientists, fire service, authorities
  - internal and international partnerships, global trade
  - research, education and training for changing professional needs

ALL working TOGETHER!
Conclusions

- the many fire safety stakeholders
  - do blend science, technology, experience
  - are developing new educational pathways

- partnerships across stakeholders will lead to
  - more educational opportunities
  - innovative technical advancements
  - research ideas and shared facilities
Conclusions

- we need to develop common goals to
  - new avenues for technology transfer
  - enhance cross-stakeholder dialogue
  - reap mutual benefits by working together

- the future holds

  *many exciting, new opportunities for fire safety at all levels!*
Thank you!