



# Law and Ethics in Engineering Practice

## Lecture: Engineering Practice

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## 1. Introduction

- Session 8 explores the history and regulation of engineering in Canada.
  - Based on *Canadian Professional Engineering and Geoscience* (Andrews, 5th or 6th ed.).
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## 2. History of Engineering in Canada

### 2.1 Pre-Industrial Era

- Engineering was taught through apprenticeship.
- Primarily military-focused, serving state leaders.

### 2.2 Industrial Revolution (1760–1840)

- Increased demand for Canada's natural resources.
- Triggered large-scale infrastructure projects.

### 2.3 Major Historical Projects

- **Rideau Canal (1832)** – 202 km, UNESCO site.
- **CPR (1880–1885)** – Linked Atlantic to Pacific.

- **DHC-2 Beaver (1947)** – STOL bush plane.
  - **CANDU Reactor (1966)** – Nuclear innovation.
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### **3. Top 5 Canadian Engineering Achievements (20th Century)**

3.1 CPR Rogers Pass Project

3.2 Confederation Bridge (1997) – 12.9 km bridge

3.3 Canadarm – Space manipulator developed by SPAR Aerospace

3.4 IMAX System – High-definition large-format projection

3.5 Hopps Pacemaker (1950) – Life-saving heart device

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### **4. Engineering Disasters and Reforms**

#### **4.1 Quebec Bridge Disasters**

- 1907 collapse: 75 deaths
- 1916 collapse: 13 deaths
- Caused by poor calculations, ego, miscommunication
- Prompted introduction of licensure in Canada

#### **4.2 Elliot Lake Mall Collapse (2012)**

- Parking garage failure killed 2
- Contributing factors:
  - Use of weak hollow slabs
  - Poor inspections by Robert Wood (unlicensed)
- Led to PEO reforms (e.g., PEAK program, new structural standards)

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## 5. The Iron Ring & Engineering Ethics

- 5.1 Tradition began in 1925 from Prof. Haultain (U of T)
  - 5.2 Obligation written by Rudyard Kipling
  - 5.3 Symbolizes humility, ethics, and remembrance of engineering failures
  - 5.4 Only worn by engineers who completed the “Ritual of the Calling”
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## 6. Licensing and Regulation

### 6.1 Why Licensing Was Needed

- Driven by public safety after 19th and 20th-century disasters
- Example: 1864 Richelieu River train crash (100+ deaths)

### 6.2 Closed Licensing Laws

- Title “Engineer” and practice both protected
- By 1955: All provinces enforced mandatory licensing

### 6.3 Licensing Criteria

- Engineering degree (CEAB or equivalent)
  - 4 years of qualifying experience (incl. 1 year Canadian)
  - Ethics & law exam, good character, English proficiency
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## 7. Regulatory Organizations

### 7.1 Professional Engineers Ontario (PEO)

- Licenses engineers in Ontario under the *Professional Engineers Act*

- Investigates complaints, disciplines members, issues seals

## 7.2 Engineers Canada (formerly CCPE)

- National federation of licensing bodies
  - Operates CEAB (accreditation) and CEQB (exam syllabus)
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## 8. Legal Definition of Engineering (Ontario)

“Planning, designing, evaluating, advising... that safeguards life, property, public welfare or the environment.”

- Includes managing such activities
  - Defined in the *Professional Engineers Act*
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## 9. Licensing Requirements (Expanded)

9.1 **Education** – Accredited or equivalent degree

9.2 **Experience** – 4 years, including Canadian content

9.3 **Knowledge** – Must pass Professional Practice Exam

9.4 **Language & Ethics** – Fluency and good conduct

9.5 **Seal Usage**

- Only licensed engineers may seal final documents
  - Must not seal unfinished or unreviewed work
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## 10. Enforcement and Discipline

10.1 **Illegal Acts**

- Practicing without a license
- Misusing “engineer” title
- Forging or misusing a seal

## 10.2 Common Disciplinary Grounds

- Professional misconduct
- Incompetence or negligence
- Ethics breaches
- Mental incapacity
- Criminal convictions

## 10.3 Disciplinary Process

- **Stage 1:** Evidence Gathering
  - **Stage 2:** Complaint Investigation
  - **Stage 3:** Discipline Hearing (with penalties)
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# 11. Continuing Professional Development

## 11.1 PEAK Program (PEO)

- Requires engineers to self-assess risk, role, and knowledge
  - Mandates continuous learning to retain license
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# 12. Technical Societies

### **12.1 Purpose**

- Research, standards, publications
- Industry updates, legislation, trends

### **12.2 Benefits**

- Networking, mentoring, discounts
- Soft skills and career support

### **12.3 Student Chapters**

- Run at universities
  - Provide access to professional engineers, field trips, events
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## **13. Career Progression & Experience**

### **13.1 Experience Evaluation Criteria**

- Application of Theory
- Practical Experience
- Project/Team Management
- Communication
- Social Implications

### **13.2 Responsibility Levels**

<b>Level</b>	<b>Title</b>	<b>Experience</b>
A	Entry-Level Engineer	0–2 years
B	Junior Engineer	2–3 years
C	Professional Engineer	5–6 years
D	First Supervisor/Specialist	7–8 years
E	Middle Management	10–12 years
F	Senior Manager/Director	15+ years
F+	Executive	Extensive