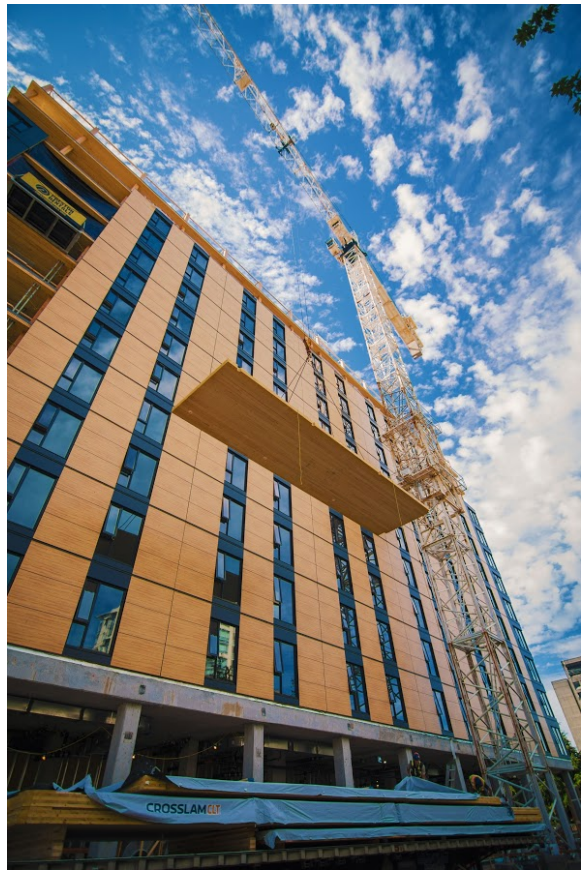
Wood Design Seminar Series

Mid-Rise Wood Buildings & Fire Safety During Construction.

May, 2017

Steven Street – Technical Manager – Ontario Wood-Works.



Presentation Outline

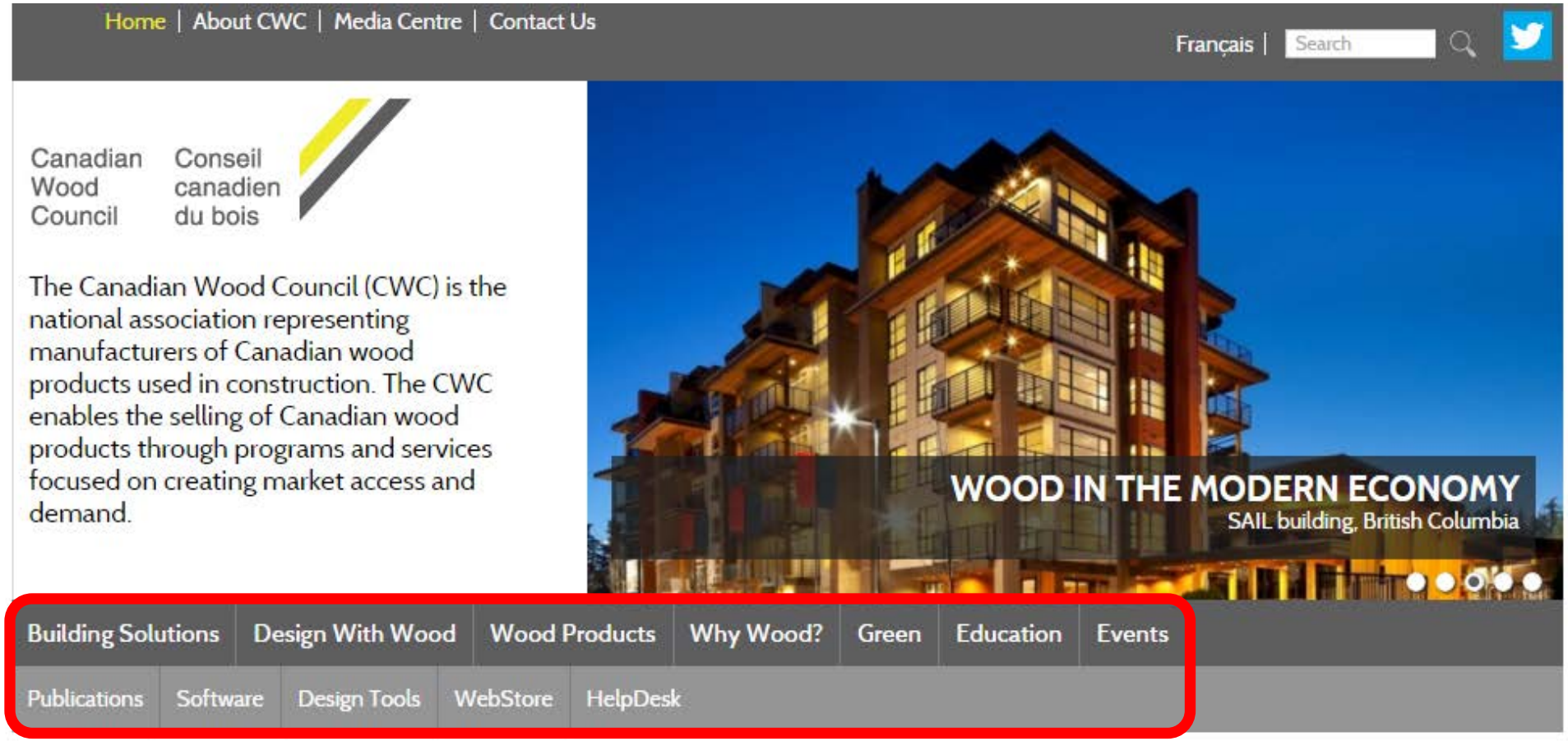
A recap – 4/5/6 Storey wood buildings.

Mid-Rise Construction Projects

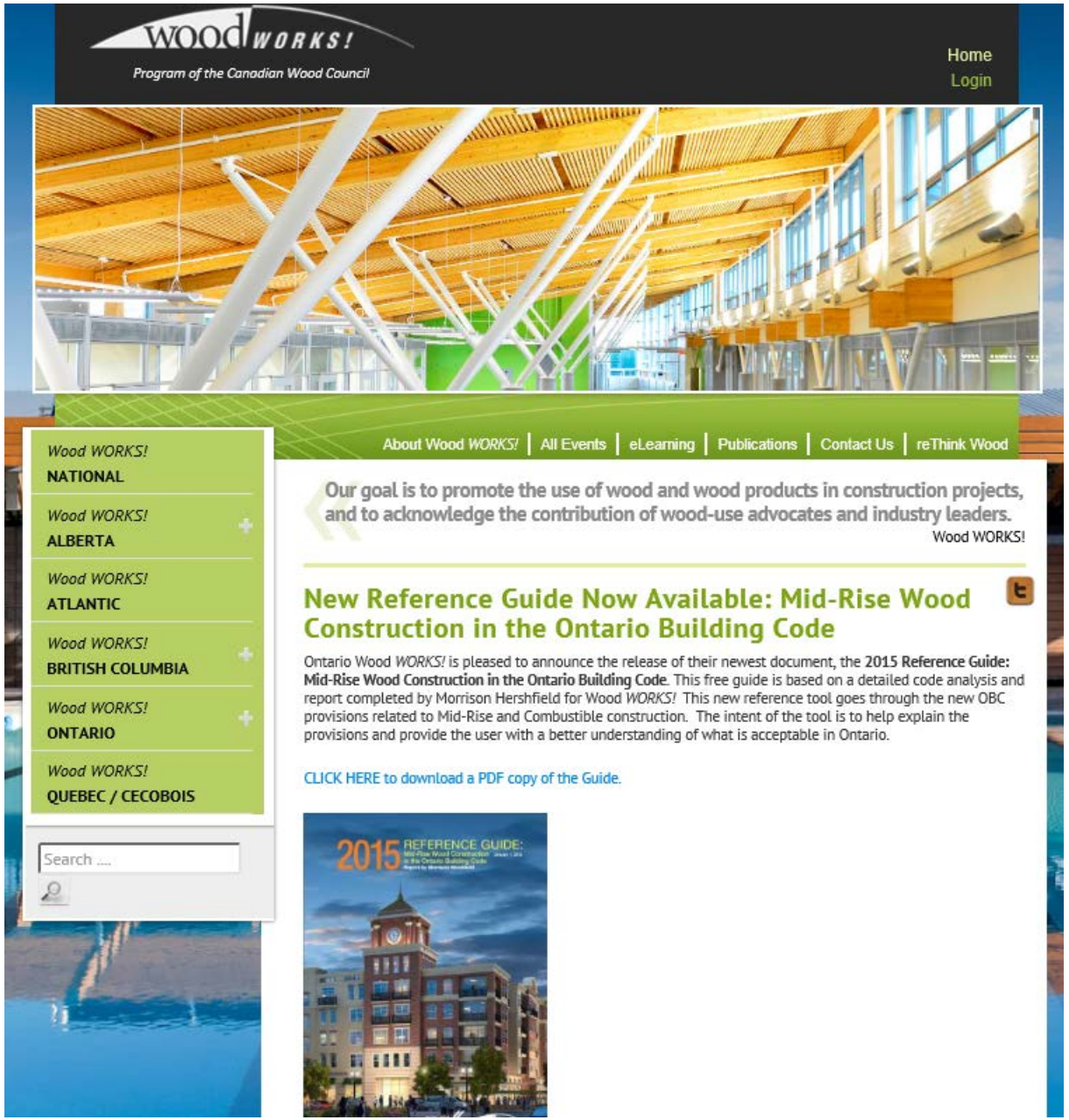
Fire Safety & Course of Construction


WOOD WORKS!
To infinity and beyond...


Templar Flats
HAMILTON, ON
Canadian Wood Council
Conseil canadien du bois
wood WORKS!
Program of the Canadian Wood Council



www.cwc.ca



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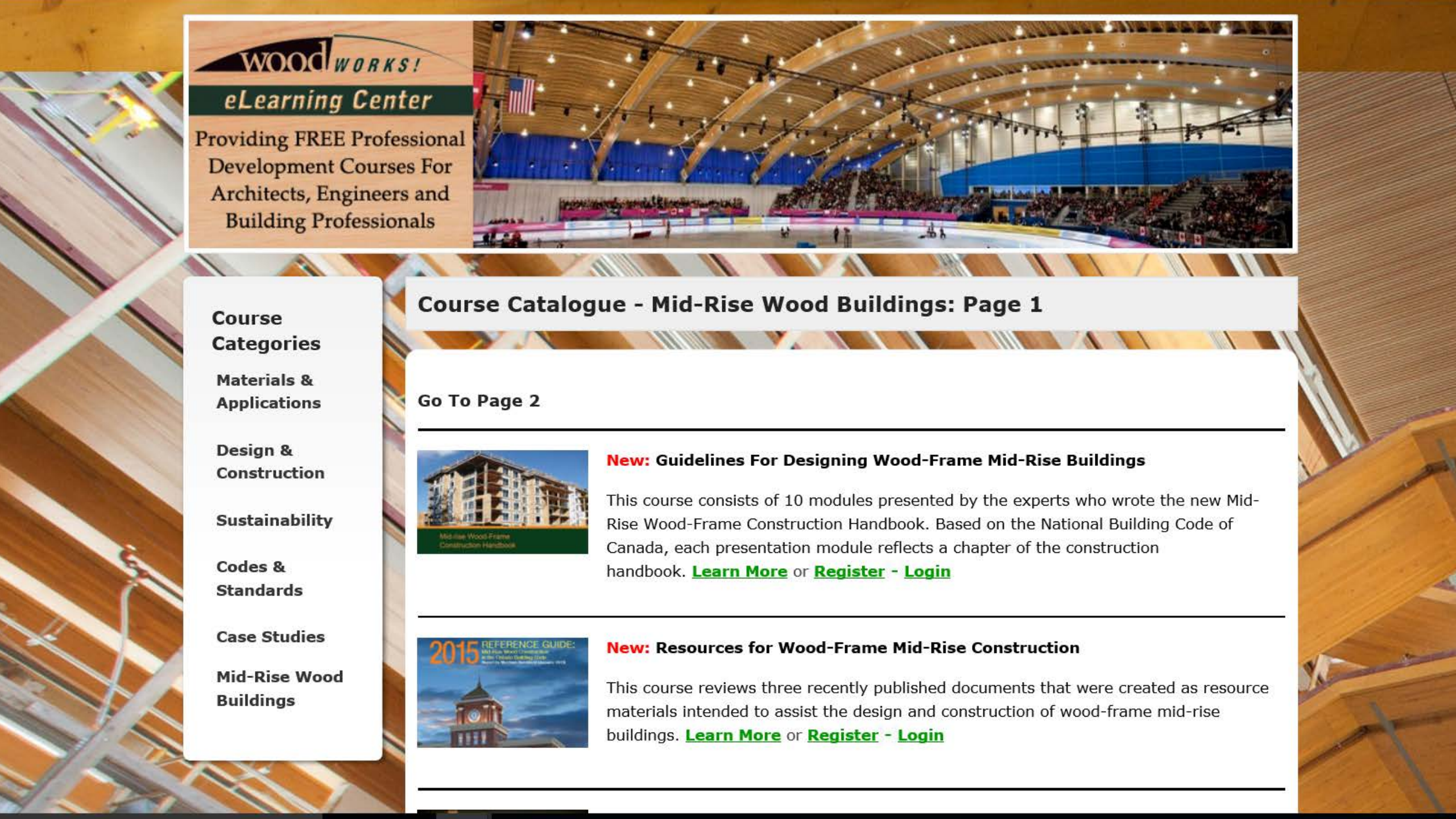


WOOD WORKS!

eLearning Center

Providing FREE Professional Development Courses For Architects, Engineers and Building Professionals

Course Categories

- Materials & Applications
- Design & Construction
- Sustainability
- Codes & Standards
- Case Studies
- Mid-Rise Wood Buildings

Course Catalogue - Mid-Rise Wood Buildings: Page 1

Go To Page 2

New: Guidelines For Designing Wood-Frame Mid-Rise Buildings

This course consists of 10 modules presented by the experts who wrote the new Mid-Rise Wood-Frame Construction Handbook. Based on the National Building Code of Canada, each presentation module reflects a chapter of the construction handbook. **Learn More** or **Register** - **Login**

New: Resources for Wood-Frame Mid-Rise Construction

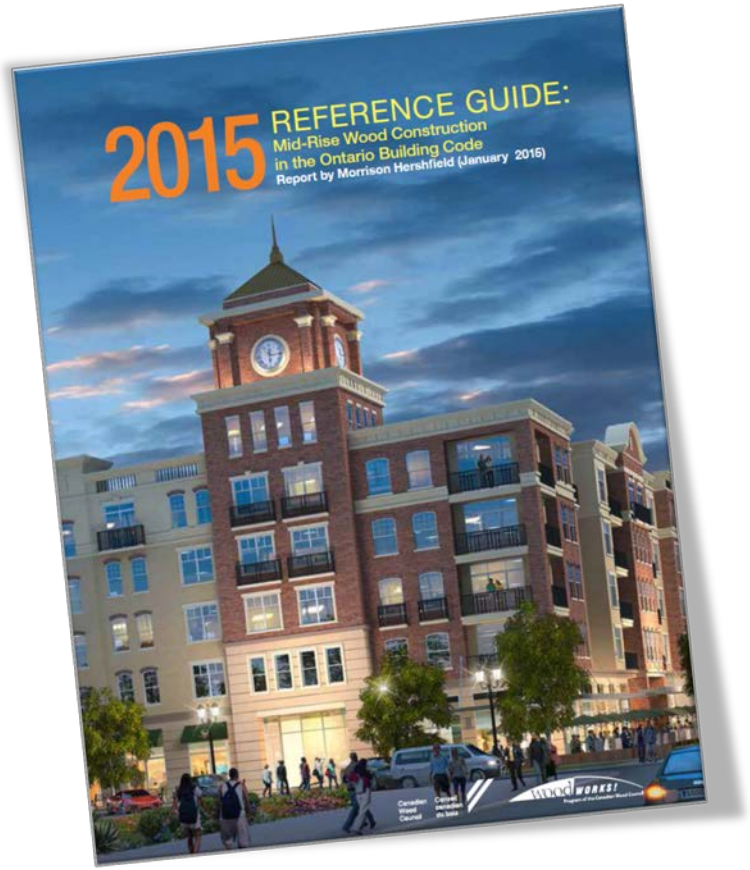
This course reviews three recently published documents that were created as resource materials intended to assist the design and construction of wood-frame mid-rise buildings. **Learn More** or **Register** - **Login**

Evolution

Post and Beam	→	Old methods/ new materials
Light Wood Frame (Stick Frame)	→	House framing/ mid-rise
Solid Wood Panels	→	Solid wood slabs CLT/LSL/LVL nailed/glued/dowelled laminations
Hybrid	→	Steel/concrete/wood

Light Wood Frame

Mid-Rise Combustible Construction



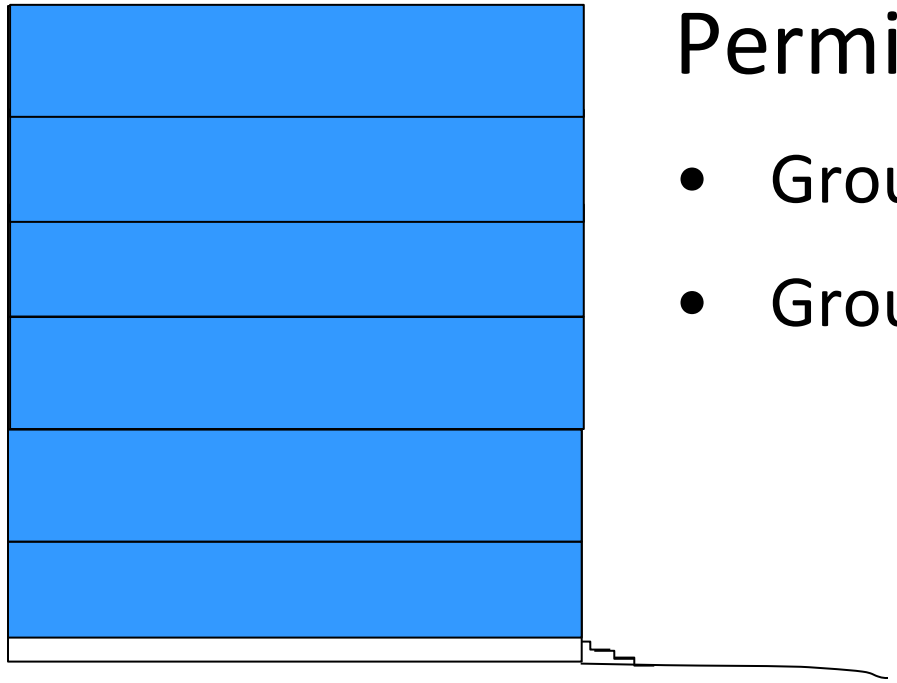
January 1, 2015 - Ontario Building Code Changed permitting the use of combustible construction for up to 6 storey buildings

(Ontario Reg. 191/14 filed to amend OBC to permit this)

2015 National Building Code of Canada will also permit 6 storey combustible construction

http://wood-works.ca/ontario/case-studies-videos/

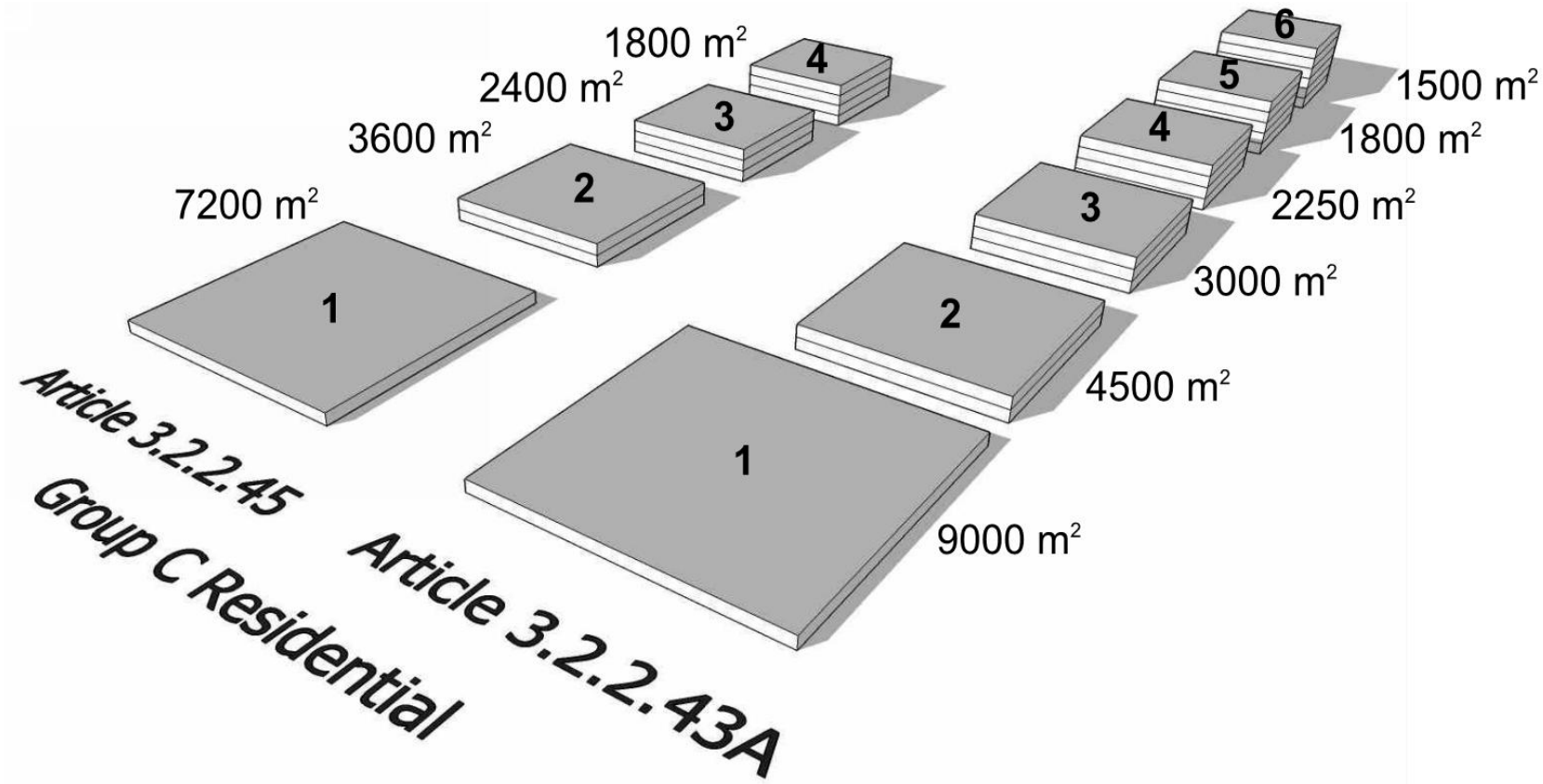
Mixed Uses
Major Occupancies - Group C or D



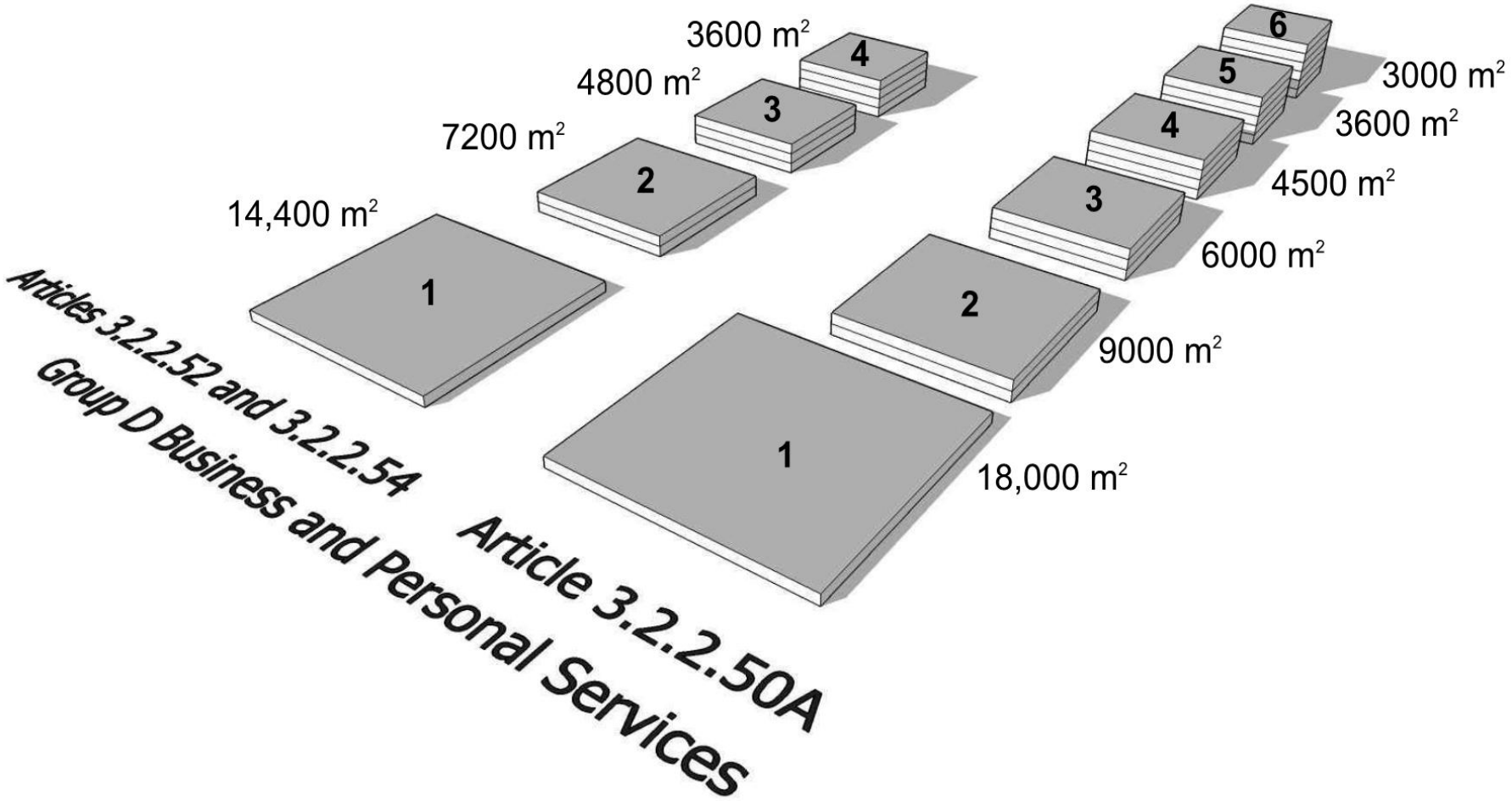
Permitted:

- Group C
- Group D

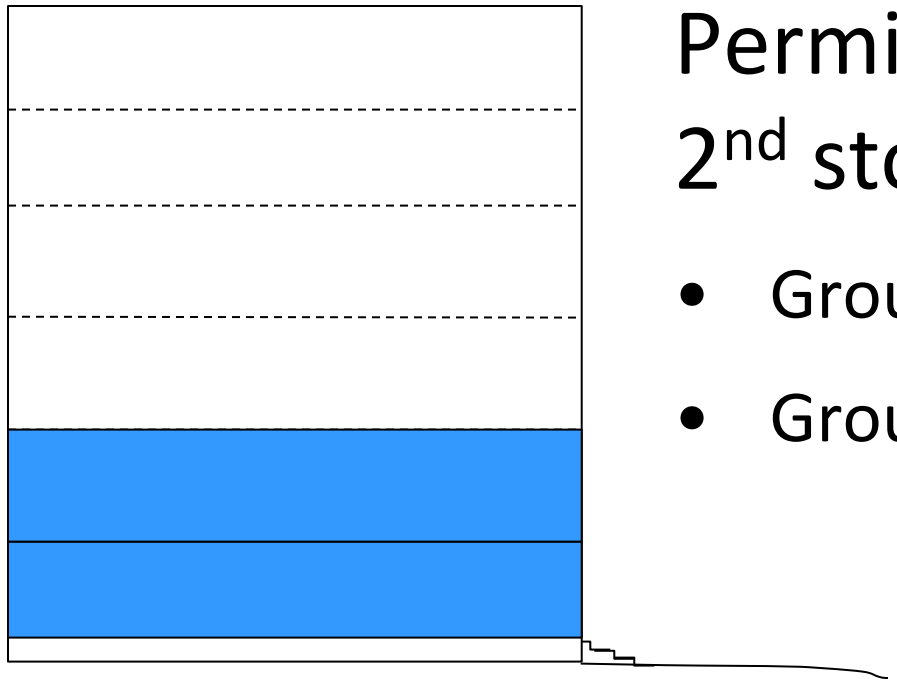
New Provisions – Group C Building Areas and Heights



New Provisions – Group D Building Areas and Heights



Mixed Uses
Major Occupancies - Group C or D

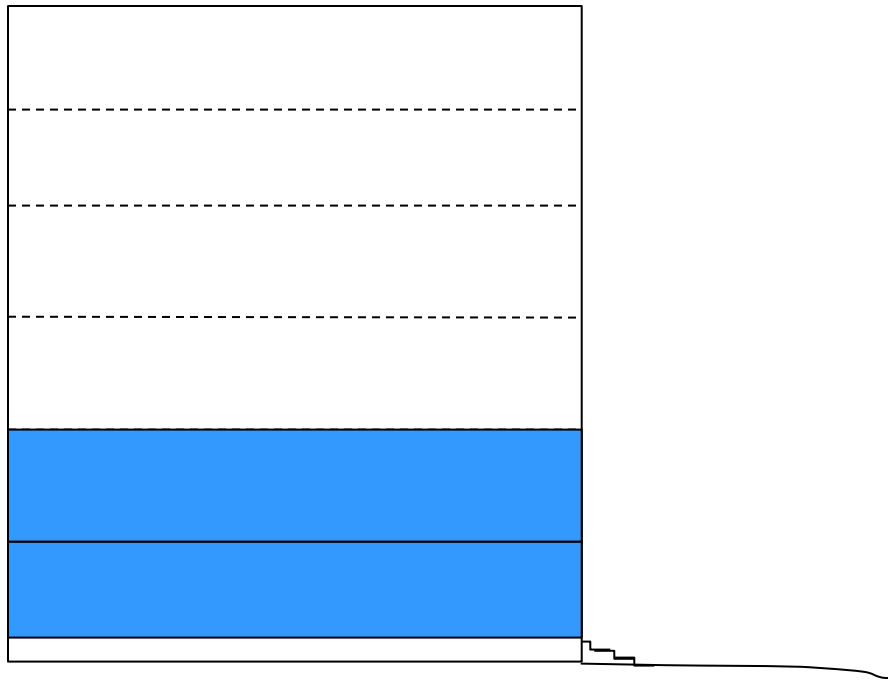


Permitted on 1st and 2nd storey:

- Group A, Division 2
- Group E

- 2 h fire-resistance rating for separation between some major occupancies

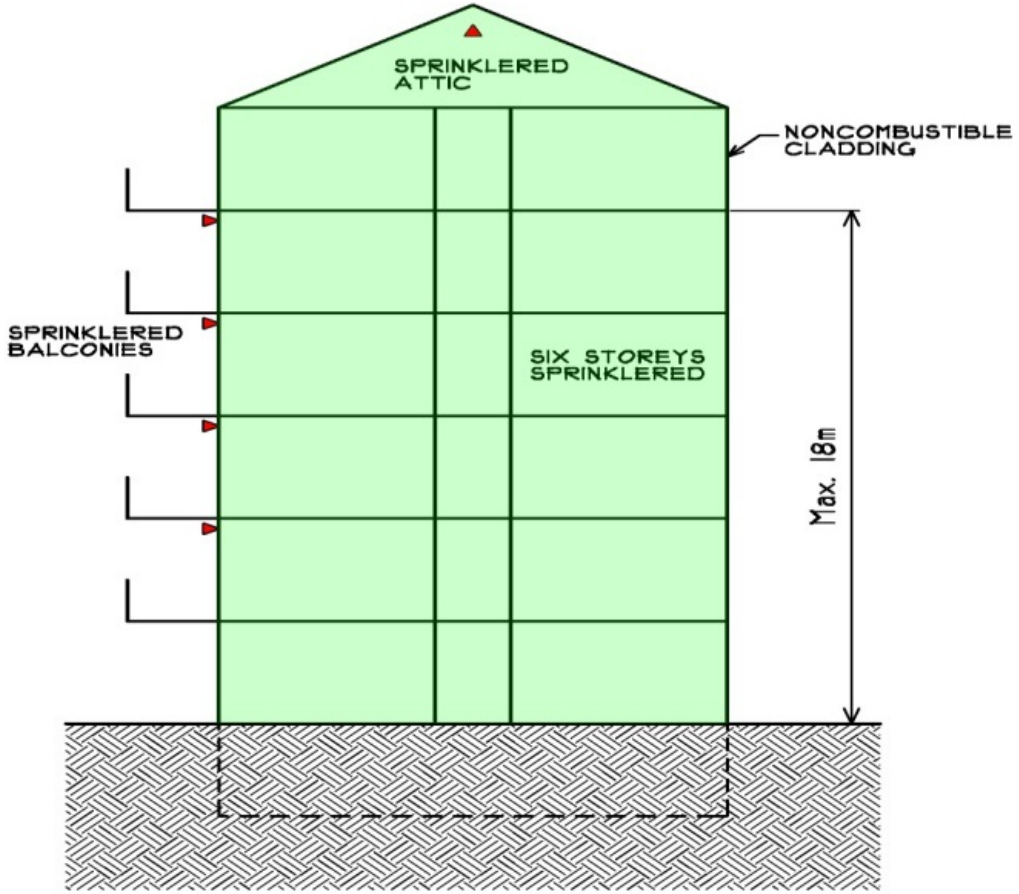
Mixed Uses
Major Occupancies - Group C or D



Building is permitted to be of combustible or noncombustible construction, used singly or in combination

Sprinklers

- NFPA 13 required
- Only balconies exceeding 610 mm must be sprinklered
- Roof decks may be unsprinklered



SIX STOREY WOOD-FRAME BUILDING

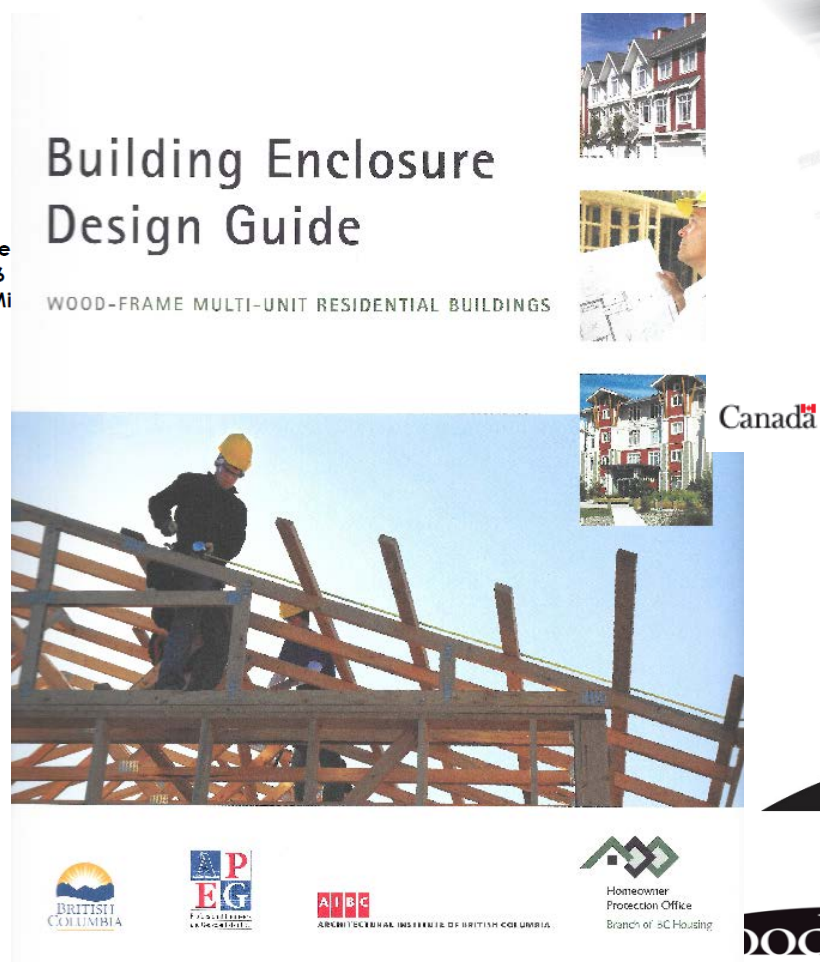
APEGBC Technical and Practice Bulletin

Professional Engineers and Geoscientists of BC

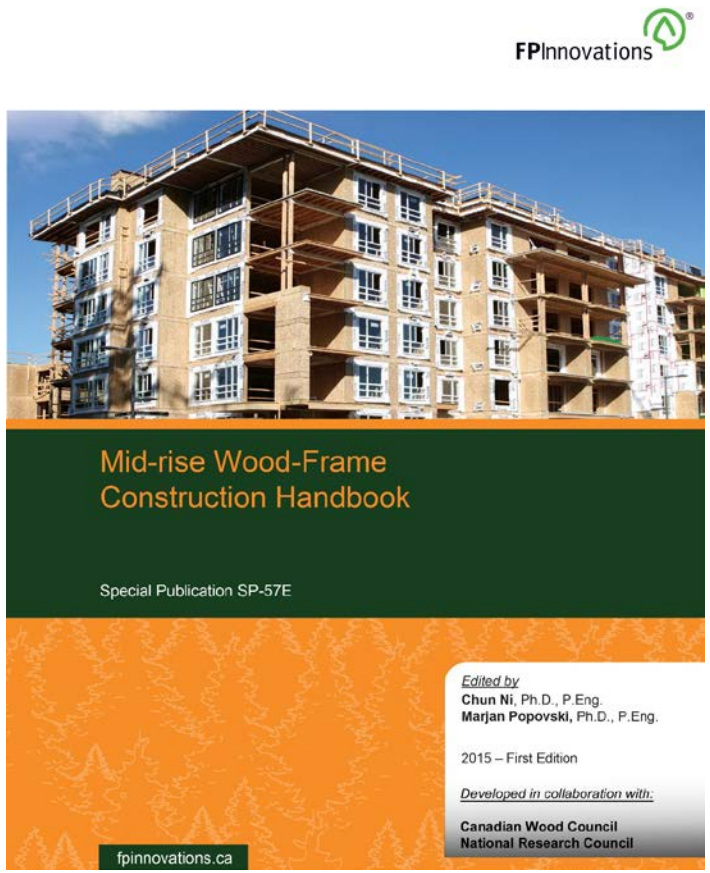
www.apeg.bc.ca

Structural, Fire Protection and Building Enve Professional Engineering Services for 5 and 6 Wood Frame Residential Building Projects (Mi Buildings)

Revised July 13, 2009

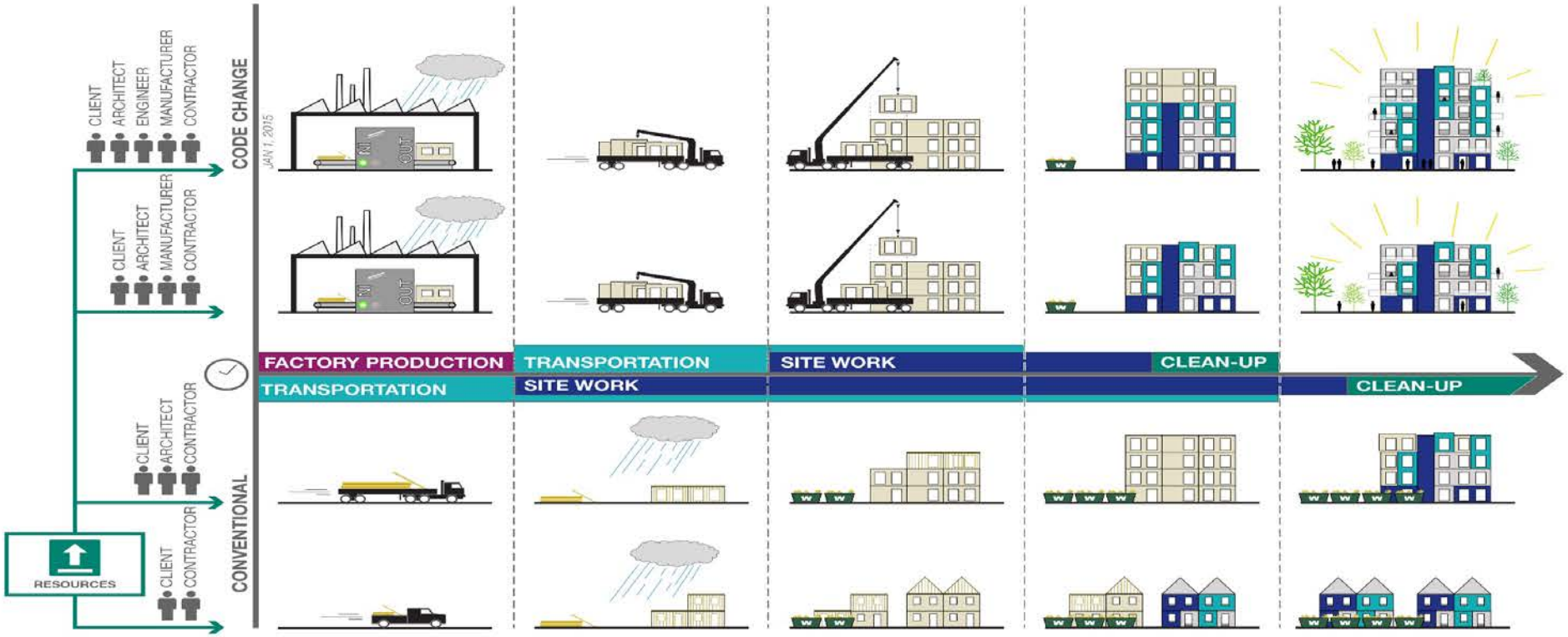


FP Innovations Mid-rise Wood Frame Construction Handbook



- Deals with the following:
  - Structural, components and assemblies, lateral load, floor vibration, design for differential movement, fire safety design, noise control, durability, design of elevator shafts, prefabricated systems
  - Final English version due for completion March 31st 2015
  - Complement WDM and APEGBC documents

How do we build?


CLIENT
ARCHITECT
ENGINEER
MANUFACTURER
CONTRACTOR
CODE CHANGE
JAN 1, 2015
IN
OUT
CLIENT
ARCHITECT
MANUFACTURER
CONTRACTOR
FACTORY PRODUCTION
TRANSPORTATION
SITE WORK
CLEAN-UP
TRANSPORTATION
SITE WORK
CLEAN-UP
CLIENT
ARCHITECT
CONTRACTOR
CONVENTIONAL
CLIENT
CONTRACTOR
RESOURCES

Typically the wood system is a combination of wall panels, I-joist and flat chord roof wood truss or I-joist roof system.

In-plant machinery is computer-controlled, allowing for a seamless flow of information to the assembly floor.

Floor and wall panels are fabricated and assembled ensuring the final product meets the highest standards.

Projects underway

Cambridge, ON

Building 1
85 units
6 storey
Total sqft 76,000

woodWORKS!
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Canadian Wood Council
Conseil canadien du bois

September 2016

Building 1
124 units
5 storey
Total sqft 125,000

AQUABLU
LAKESHORE CONDOS

Whether it's an invigorating jog along the many waterfront trails or a scenic hike in the Niagara Escarpment, a quiet moment of contemplation on your balcony that overlooks the lake, or a weekend of wine tasting, here you'll experience the energy and serene seclusion of lakeside living. Imagined to fulfill your dreams, AQUABLU's decidedly beachy vibes and small town charm will give the phrase 'living the dream' a whole new meaning.

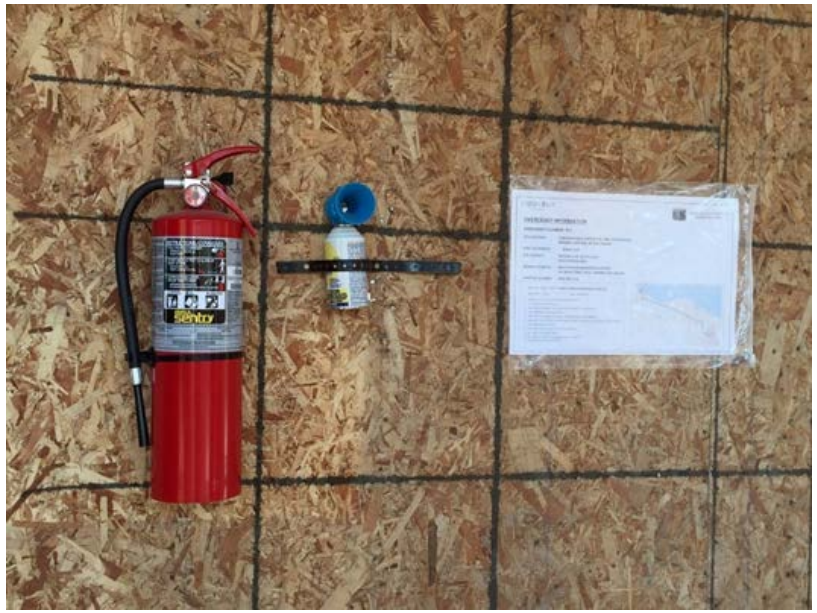
HOMES BY DeSantis
The Mark Of Excellence

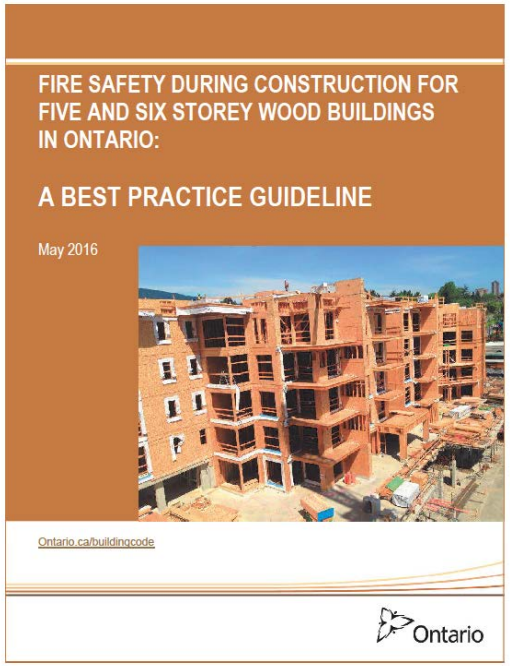
KNY
karp namisniak yamamoto
architects inc.

woodWORKS!

Canadian Wood Council
Conseil canadien du bois

4 workshops on Fire Safety in Modern Wood Buildings 2016





Canadian Wood Council | Conseil canadien du bois

Event Summary:
Ontario Mid-Rise Education Tours
OCT 18 & 28, 2016 (Grimsby, Ontario)

The intent of these two educational tours was to give the field review consultants a chance to see an active 5/6 storey LWF site, and to review construction techniques in use.

Wood *WORKS!* provided information on products, construction methods, and wood framing systems. Tie rod systems were observed, and how the wood framing interacted with the concrete block cores. The construction management company gave insight into how they managed their Fire Safety and Security plan including hot works that are done on-site.

Buildings Toured:

Aquablu
Lakeshore Condos
Homes by DeSantis
5 storeys | 120 units

LakeHouse
Waterfront Condos
Branthaven Homes
6 storeys | 220 units

Participants:
TARION Warranty Corporation, Field Review Staff

Con-Ed Delivered:
19 participants x 3 hours = 57 hours

Both projects are built over underground parking structures and have non-combustible concrete block cores, elevator shafts, and exit stairwells. LWF construction framed with LVL beams and conventional lumber, I-joist floor systems, wood exterior and interior walls, and flat roofs.

BRANTHAVEN
HOMES

wood WORKS!

Canadian Wood Council | Conseil canadien du bois

Buildings 1 & 2.
220 units
6 storey
Total sqft 187,000

https://1drv.ms/f/s!ApDjCd-LvmBzqFcmbuIiYxouokga

https://youtu.be/tlt2S3smcGw

Buildings 1&2
144 units
6 storey
Total sqft 180,000

Site Safety During Construction

Photo: ABC13 News

Montrose Apartment Complex, Houston

2014, 5 storey apartment building under construction, Cause – hot work suspected

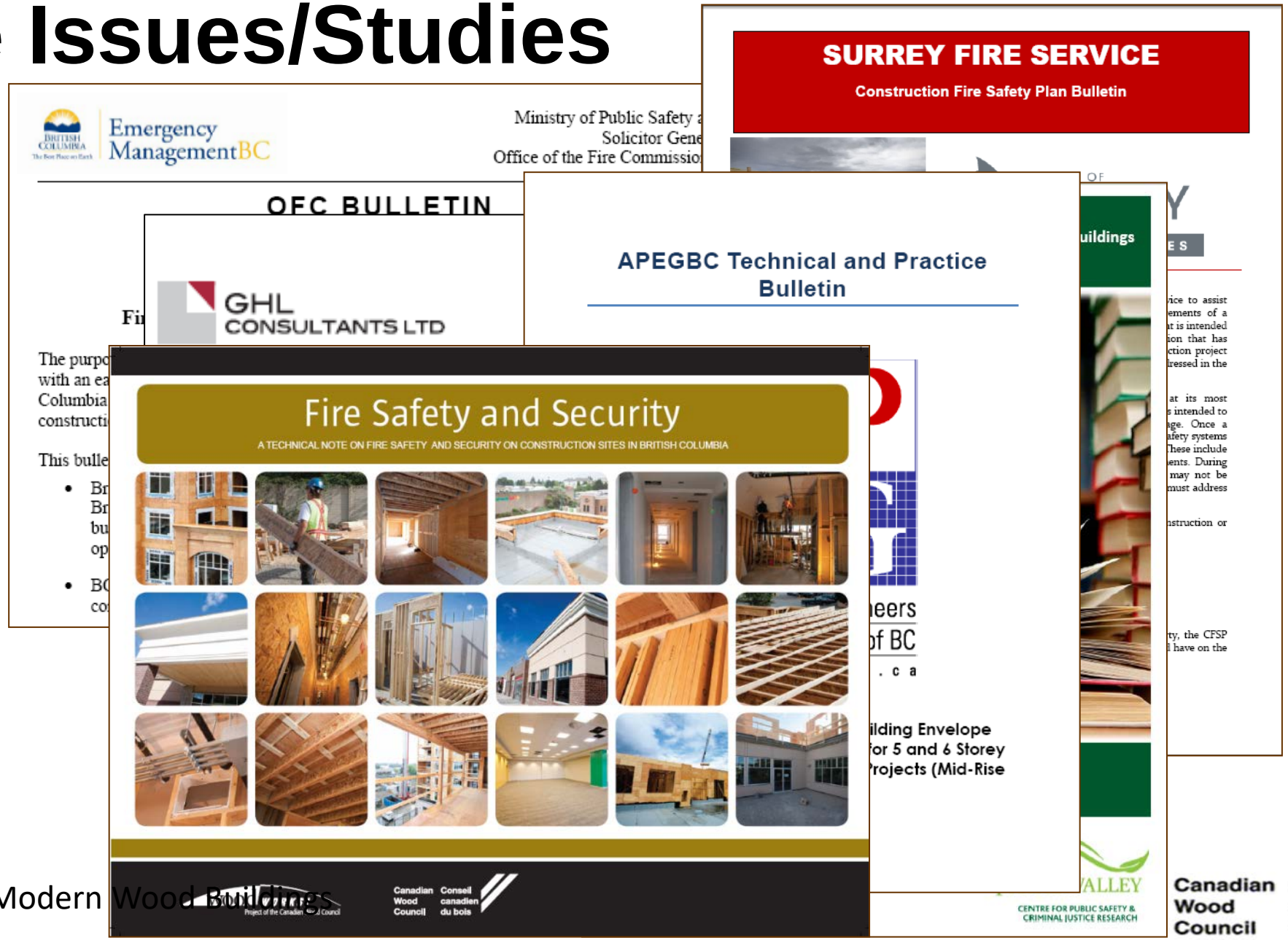
Condominium Complex, Calgary

2014, Four 3 storey apartment buildings under construction Cause – unknown

Photo: Calgary Sun

Higher wood buildings became a reality in BC

Fire Issues/Studies



Site Safety During Construction

- 2012 Project
- CHMfire Consultants Ltd- Steve Craft
- CWC/ WW
- Interviews held with large builders familiar with building with wood on a large scale
- Research on FSP (Fire Safety Plans)
- Construction phase
- Motivators- what is the driver?
  - Regs?
  - Insurance?
  - Company policy?
  - Local fire service?

Fire Safety Planning

- While not required in Ontario, it is highly recommended to develop a fire safety plan

Key Steps

1. Analysis of Site
2. Development of policies and procedures to minimize risks
3. Analysis of available resources
4. Emergency protocol for various individuals

Fire Safety Plan

1. Emergency procedures and information needed to plan for an emergency
2. Training of site personnel on evacuation procedures
3. Assigned site personnel must be responsible to install and maintain fire safety duties
4. Firefighting services
5. Fire Extinguishers
6. Hot works operations
7. Flammable and combustible storage
8. Electrical installations and petroleum gases
9. Security
10. Contact personnel
11. Building diagrams

Suggestions from: British Columbia OFC Bulletin “Fire Safety Planning for Construction and Demolition Sites,” April 17, 2009. http://www.pssg.gov.bc.ca/firecom/

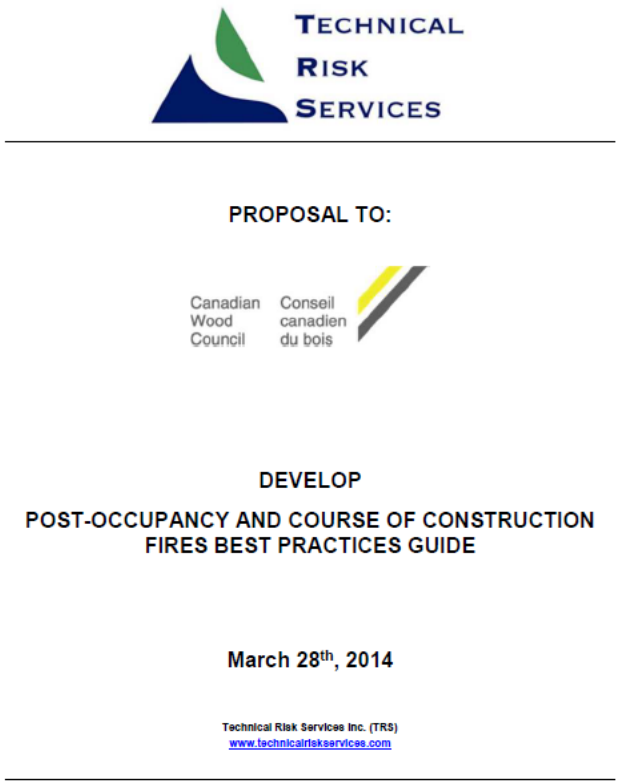
Summary

- Most construction site fires are preventable with knowledge, planning and diligence; and, the impact of those fires that do occur can be significantly lessened.

- Conformance with the local safety regulations is the foundation for the establishment of suitable construction site fire safety.

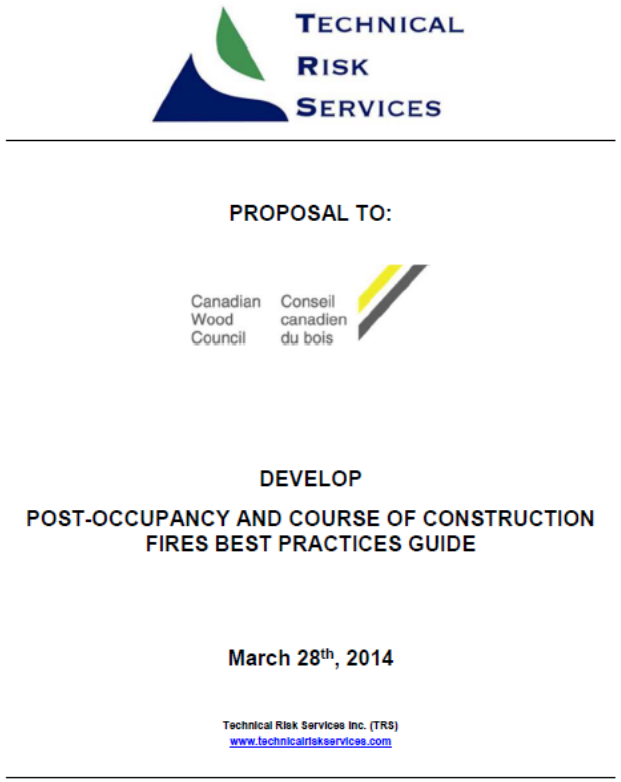
- Assessment, selection and successful implementation of various ‘best practices’, based on the specific needs of your site, builds on that foundation and leads to a culture of fire safety that can be understood and practiced by all.

Next step as code change got closer



- **Project 1: Course of Construction - Best Practice Review**

- 1) TRS developed best practice guidelines but utilising extensive experience working with clients who manage and insure construction projects.
  - From our insurance inspection experience and knowledge of insurance claims and investigations of same, we have a good base to work from towards developing Course of Construction Best Practices.
  - heavily involved in wood frame construction projects. Experience with the public sector fire services. Using risk management techniques, combined with our overall experience, we will research and collect Course of Construction best practices from other countries.
- 2) Analysis of collected data – comparison of best practice.
- 3) How do Canadian provinces adopt the Model Best Practices Guide?


TECHNICAL RISK SERVICES

PROPOSAL TO:

Canadian Wood Council / Conseil canadien du bois

DEVELOP

POST-OCCUPANCY AND COURSE OF CONSTRUCTION FIRES BEST PRACTICES GUIDE

March 28th, 2014

Technical Risk Services Inc. (TRS)
www.technicalriskservices.com

- Project 2: Analysis -- Course of Construction and Post-Occupancy Fires

- 1) analysis of data from project 1 with an aim of finding correlation between data sets, establishing the effective best practices procedures.
  - TRS utilized a risk management approach to the recommendation of content. Focus of work will be fire but will also include elements that address other issues such as worker safety, public liability exposures, safety of first responders and site security.

Site Safety During Construction

Global Leaders in Fire Engineering

SERECA

Comparison of the Canadian Construction Site Fire Safety Regulations/Guidelines

Our File Number: DV141190
Date of Report: September 9, 2014

Prepared for: Canadian Wood Council
100-99 Bank Street
Ottawa, ON
K1P 6B9

Prepared by: Sereca Fire Consulting Ltd.

Prepared By: Amanda Robbins, Ph.D.

Reviewed By: Keith D. Calder, M.Eng., P.Eng.

PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA K. D. W. CALDER # 23920

Sereca Fire Consulting Ltd
Unit 530
5600 Parkwood Way
Richmond BC
Canada V6V 2M2
604 255 4000 TEL
604 255 3434 FAX
serecafire.com

1.2 Scope of work:

- To provide detailed comparison of fire and life safety provisions from all applicable regs. and guidance documents related to construction sites
  - Comparison of the National Model Codes of Canada and Provincial Codes
  - Occupational Health and safety regs.
  - Guidelines and Interpretations of Construction Site safety regs issued by cities in Canada

Global Leaders In
Fire Engineering

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PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
K. D. W. CALDER
23920
SEPT 1, 2014

Sereca Fire Consulting Ltd
Unit 320
3600 Parkwood Way
Richmond BC
Canada V6V 2M2
604 255 4000 TEL
604 255 3434 FAX
serecafire.com

2.1.1 Construction Regulations:

- Construction regulations are intended to cover fire and life safety aspects of a building at the time of construction. These do not apply once the building is occupied unless undergoing alterations.

- Construction regulations used in comparison:
  - Part 8, 2010 National Building Code of Canada
  - Part 8, 2014 Vancouver Building By-Law
  - Part 8, 2006 Alberta Building Code.

  - Provinces and territories that have adopted Part 8 of 2010 NBCC with little of no modification:
    - BC,Sask,Man,QC,NB,NFL,NWT,NS,Yukon,PEI and Nunavut.

    - The 2012 OBC does not include requirements for fire and life safety at Construction Sites.

Global Leaders in Fire Engineering

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PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA K. D. W. CALDER # 23920

Sereca Fire Consulting Ltd
Unit 320 5600 Parkwood Way Richmond BC Canada V6V 2M2
604 255 4000 TEL 604 255 3434 FAX
serecafire.com

2.1.2 Fire Regulations:

- Fire regulations are intended to cover fire and life safety and on-going maintenance of existing buildings. The majority of fire regulations include provisions relative to fire and life safety of construction sites including operations occurring at those sites.

- Construction regulations used in comparison:
  - Section 5.6, 2010 National Fire Code of Canada
  - Section 5.6, 2010 British Columbia Fire Code
  - Section 5.6, 2006 Alberta Fire Code.

  - Provinces and territories that have adopted Section 5.6 of 2010 NFCC with little of no modification:
    - Sask,Man,QC,NB,NFL,NS,Yukon,

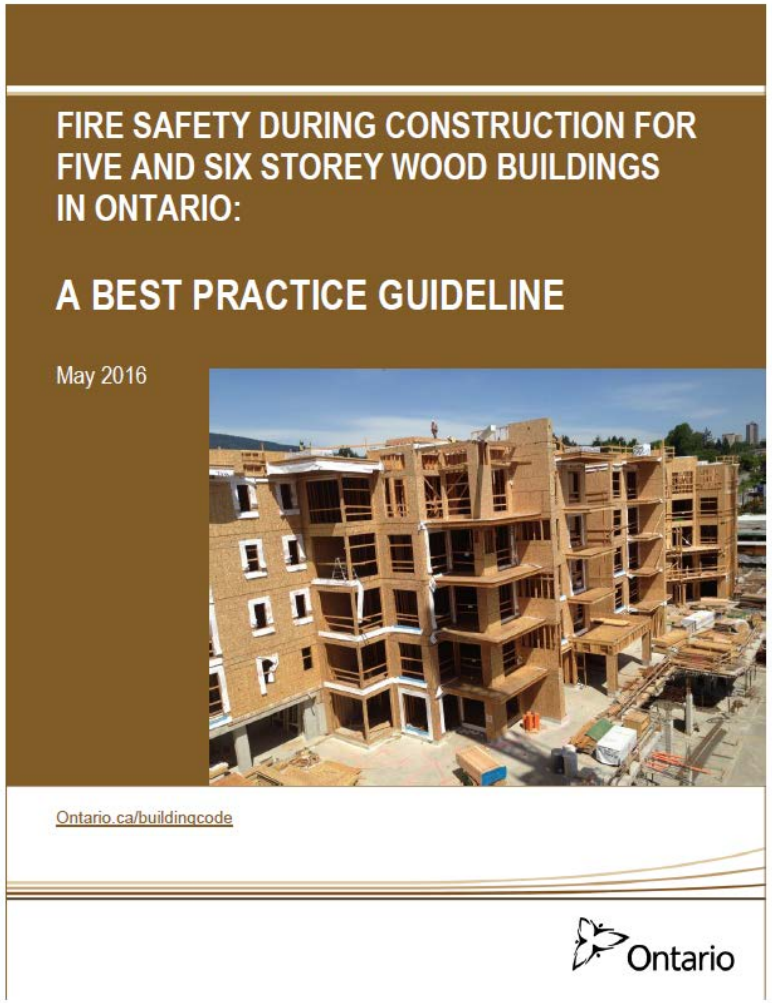
    - The 2012 OFC does not include requirements for fire and life safety at Construction Sites.However some requirements are prescribed for demolition through Part 8 OFC

- Analysis into COC fire/loss data- focussing on causes and loss
  - Arson- reports and statistical analysis shows that arson is #1 cause of all COC fires
  - Over 40% of US- numbers in Canada are about the same
  - Open flames- roofer's torches, heaters, burning garbage- 30%
  - Hot works 7-12%
  - Portable heaters- 15%
  - Careless smoking
  - Faulty wiring

We conducted the following stakeholder workshops:

- Fire safety during construction phase
- Risk management
- What works? Worker buy in?
- Insurance company – builder risk
- Best practice development.

The split in the road



Canadian Wood Council / Conseil canadien du bois

University of the Fraser Valley
School of Criminology & Criminal Justice

WoodWORKS!

Canadian Wood Council / Conseil canadien du bois

- Development started April 2014 By the Ministry of Municipal Affairs & Housing- Building Branch
- Best Practice Guideline
- Developed in consultation with the Ministry of Labour (MOL), the Office of the Fire Marshal and Emergency Management (OFMEM) (under the Ministry of Community Safety and Correctional Services). The fire services, builders, professional designers, municipal building officials and insurance firms were consulted in the development of this document, and contributed significantly to its contents. In particular, the Residential Construction Council of Ontario (RESCON), the Canadian Wood Council (CWC) and its Ontario Wood Works! Program, the Ontario Home Builders' Association (OHBA), the City of Toronto, FP Innovations, and the Ontario Building Officials Association (OBOA)

The Intent:

- To outline best practice for fire safety during construction of 5-6 storey predominately wood buildings.
- Minimize the risk of a significant construction site fire occurring, and minimizing spread and impact should one occur.
- Workers and builders strongly encouraged to follow guidelines
- The best practices described in the Guideline are intended to support and encourage a “culture of safety” on the construction site

Building Under Construction

- Exposed framing
- Limited or no gypsum board
- Fire protection systems not in place
- Fire separations not complete
- Fire Department features not in place or obstructed
- Storage of bulk combustibles (wood, packaging)
- Hot works

Finished Building

- Framing protected
- Gypsum board complete
- Fire alarm, standpipe and sprinkler systems active
- Fire separations complete
- Fire Department features in place
- Limited storage of bulk combustibles

Construction Fires

- Legitimate concerns
    - Fire Service
    - Insurance Companies
    - Communities
- Practical and reasonable ways to address concerns

Challenges for Fire Service – Buildings Under Construction

- Resource intensive
    - Personnel
    - Equipment
- Requires aggressive and advanced fire suppression techniques
- Active hydrants?
- Adequacy of available water supply?
- State of fire suppression systems?
- Vehicle access?
- Variables:
    - State of construction
    - Storage array and quantity of combustibles

All Buildings under Construction

- Inherent risk of fire ignition
- Ignition sources are similar on all construction projects
    - e.g., arson, hot work, roofing applications, heating equipment, smoking, etc.
- Combustibles on all construction sites
    - e.g., combustible building materials, foam plastic insulation, combustible and flammable liquids and gases, etc.
- But, construction period is short
    - but there are unique fire scenarios

Buildings of Wood Construction

- Exposed wood framing result in additional hazards
- Configuration and quantity of fuel can lead to a significant fire

High Risk Sites

- Rural site
    - No municipal water supply
    - Part time/volunteer fire service
- Infill construction
    - Exposure risks
- Large developments
    - Potential for fire spread beyond initial building

Risk Management

- Past fires indicate that we can do something different
- Two generic ways to reduce risk
    - Reduce chance of fire starting… i.e. reduce probability
    - Reduce impact from fire… i.e. reduce the consequence
- Reducing either probability or consequence will reduce risk

Probability x Consequence = Risk

Managing Fire Risk

- Starts with a “culture of fire safety”
    - Benefit to everyone
    - Applies to all construction sites
- Fire risk is mitigated by
    - fire prevention (reducing probability)
    - fire protection measures (reducing consequences)

Fire Safety During Construction:

- The construction phase of any building represents a relatively short period of time in the lifespan of the structure during which a unique set of risks are present.

- The risks and hazards found on a construction site differ in both nature and potential impact from those in a completed building. In a building that is under construction, the fire prevention and protection elements that are designed to be part of the completed building are not yet in place or only partially operational. For these reasons, construction site safety poses some significant challenges.

- An understanding of the hazards and their potential risks is the first step toward prevention and mitigation.

- While there are many types of risks that require consideration during construction of all buildings, this Guideline will focus on fire-related aspects associated with the construction of five and six storey mid-rise wood frame buildings.

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Site Safety During Construction

Section 1- A

Construction Site Fire Safety Plan (CSFSP)

What is a Construction Site Fire Safety Plan (CSFSP)?

1) Construction Site Fire Safety Plans (CSFSP) address typical construction site fire safety hazards. They are required by the National Building Code of Canada and mandated by most provincial building or fire codes outside of Ontario.

   The site CSFSP is a written document that:

   a) considers the fire risks,
   b) sets out what will be done to minimize the fire risks,
   c) highlights fire protection features designed to help protect the people working on the site, and
   d) prescribes actions to be taken in the event a fire should occur.

Who should get a copy of the CSFSP?

2) The CSFSP should be provided to the CFO at the municipal fire service, and the insurance firm that provides insurance coverage to the builder for risks arising during construction.

When should the CSFSP be prepared?

The CSFSP should be prepared as soon as possible, and well before the start of construction.

Designers and builders should take into account the guideline when planning and designing mid-rise wood frame buildings to avoid problems later on.

Work on the CSFSP should begin early during project development so that the fire service has time to review the document, provide comments, and allow time for any issues to be resolved.

Ideally, the CSFSP should be provided to the CFO before the builder submits an application to the building department for a Building Permit.

Risks considered in the CSFSP

1) Fire risks to be considered in developing the CSFSP include those related to:

   a) surrounding properties and structures which could be affected by fire spread,
   b) spot fires,
   c) capability of the local fire service including availability of personnel and equipment in relation to intervention time and emergency response resources (e.g. site access, hydrants, water supplies, etc.), and
   d) whether the fire service will need to rely on outside resources.

Some municipal fire services may have their own templates on risks to be considered in a CSFSP. The FSC may want to use such a template if one exists.

Section 1- D

Pre Incident Planning with Fire Department

What is a pre-incident plan?

1) Pre-incident plans are common for large construction projects in Ontario. They provide information required for emergency response by the fire service as outlined below.

   The pre-incident plan is part of the CSFSP.

When the pre-incident plan should be developed

2) The building owner's representative or the FSC, if appointed at that time, should work with the local fire department in developing a pre-incident plan.

   Development of the pre-incident plan should start before any substantial development of the construction site in order to avoid problems later on and facilitate the smooth implementation of the construction project.

Typical contents of a pre-incident plan

1) The pre-incident, plan focuses on information required for emergency fire department response.

   The pre-incident plan which is mainly composed of site plans and drawings, typically addresses:

   a) proposed location of fire access routes and future building access points,
   b) location of hydrants and availability of fire protection water supply,
   c) information on built-in fire protection systems, operative fire safety systems, and special provisions for firefighting activities
   d) location of assembly points and register of person currently on the building site
   e) proposed location of hazardous storage, such flammable and combustible liquids and flammable compressed gas, and
   f) potential fire exposure to adjacent buildings, and
   g) site security provisions in place to protect the site from unwanted intrusion

PART 3

SITE SECURITY

Arson is one of the primary causes of fires on construction sites. Site security is therefore of foremost importance to fire safety in mid-rise wood construction projects.

To reduce the risk of fire ignition, the construction site should be properly secured to prevent unwanted intrusion, specifically to prevent arson; such measures have the added advantage of reducing the potential for burglary. A combination of security systems and guards should provide site perimeter control.

Arson, vandalism and theft can also be discouraged by the presence of alert staff. The FSC should encourage workers to be alert while on site to attempts by unauthorized individuals to access the site.

The entire construction site should be fenced for security prior to start of construction.

Fencing around the site should be strong and sufficiently high. Other than openings required for material delivery, workers and fire department access to the site, the fencing should have no openings that would allow intruders to enter the construction site.

Section 5 – A

Hot Work Permits

What is hot work?

1) Hot work is any activity involving any of the following: cutting, welding, torching, brazing, soldering, grinding, hot tar roofing, any operation involving an open flame, or any other hot process or heat-producing activity.

2) The use of a blow torch or welding and cutting equipment should only be undertaken in accordance with MOL regulations and these Guidelines.

Avoid hot work if possible

3) Whenever possible, all hot work, such as hot tar roofing, should be avoided in favour of other less hazardous solutions. (see also section 4 - D)

4) When hot work cannot be avoided, it should be conducted if possible in a designated area away from the main structure and should be done under a hot work permit system described below.

Hot work within a mid-rise wood structure should be minimized to the degree practical.

The FSC is responsible for issuing Hot Work Permits

1) No hot work activity should start prior to getting approval from the FSC

APPENDIX A

Ministry of Labour Regulations
Related to Construction Site Fire Safety

From Ontario Regulation 213/91 "Construction Projects", Under the Occupational Health and Safety Act

Deals with existing legislation/ regulations and are provided to assist persons in using the guidelines.

- General requirements
- Housekeeping items
- Temporary Heat
- Fire Safety
- Access to and Egress from Work Areas
- Stairs and landings
- Welding and Cutting
- Hot Tar or Bitumen Roadtankers

Thank You