

FIRE SAFETY DURING CONSTRUCTION FOR FIVE AND SIX STOREY WOOD BUILDINGS IN ONTARIO:

A BEST PRACTICE GUIDELINE

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Disclaimer

This Guideline has been carefully prepared and is intended to provide a summary of complex matters. It may not include all details and may not take into account local facts and circumstances. The Guideline refers to or reflects, laws, guidelines and practices which are subject to change. Builders and others are responsible for making decisions about construction site safety, including decisions in compliance with law such as applicable statutes and regulations. For these reasons, the Guideline, as well as any links or information from other sources referred to in it, should not be relied upon as a substitute for specialized technical, legal or other professional advice in connection with any particular matter. The user is solely responsible for any use or application of this Guideline.

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Development of the Guideline

This Guideline has been developed by the Ministry of Municipal Affairs and Housing (MMAH) 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).

This guideline is issued jointly by the Building and Development Branch under the Ministry of Municipal Affairs and Housing, the Office of the Fire Marshal and Emergency Management, under the Ministry of Community Safety and Correctional Services, and the Occupational Health and Safety Branch of the Ministry of Labour.

In addition, other stakeholders, including fire services, builders, professional designers, municipal building officials and insurance companies, 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) have provided valuable input.

The document has been formally endorsed by the Residential Construction Council of Ontario (RESCON), and the Canadian Wood Council (CWC) and its Ontario Wood Works! Program.

The content of the Guideline is based on various source documents listed below.

Source Documents

COC - National Course of Construction (COC), Best Practice Guide (Fire)

CWC - Canadian Wood Council, "Fire Safety and Security: A Technical Note on Fire Safety and Security on Construction Sites" (BC and Ontario)

mNFC - model National Fire Code

mNBC - model National Building Code

NFPA - National Fire Protection Association

OHSA - Occupational Health and Safety Act Construction Regulations

Glossary of Acronyms

CFO – Chief Fire Official

FSC – Fire Safety Coordinator

CSFSP – Construction Site Fire Safety Plan

MOL – Ministry of Labour

NFPA – National Fire Protection Association

OFC – Ontario Fire Code

OFMEM – Office of the Fire Marshal and Emergency Management

OHSA – Occupational Health and Safety Act

MSDS – Materials Safety Data Sheet

MMAH – Ministry of Municipal Affairs and Housing

mNFC – Model National Fire Code

WHMIS – Workplace Hazardous Material Information System

Intent of This Guideline

In January 2015, changes to Ontario's Building Code came into effect that allow the construction of mid-rise (five- and six-storey) buildings of predominantly wood construction to be used for primarily residential and office occupancies.

Many of the new requirements for mid-rise wood buildings can be found under 3.2.2.43A and 3.2.2.50A of Ontario's Building Code.

This Guideline outlines some best practices for fire safety during construction of five- and six- storey buildings of predominantly wood (combustible) construction.

Builders and construction workers are strongly encouraged to follow the best practices outlined in this document, in light of the specific circumstances of the construction site.

The document is intended as a best practice guideline for builders and developers, but may also cover program requirements for the architect and engineers to include in their respective designs and specifications in order to facilitate adherence to best practice guidelines during construction.

While following these best practices may not eliminate all risk, the practices should minimize the risk of a significant construction site fire occurring in the first place, as well as to reduce the spread and impact of such a fire should one occur.

Since this is a Guideline, much of the information is presented in a narrative way, describing practices, their intent and matters to evaluate and consider. In a number of cases information is provided in lists that may appear prescriptive or that resemble the contents of a code. While this guideline may in some areas resemble a code, it is a best practice guideline and not a regulation.

Builders are encouraged, where possible, to follow these suggested best practices, or to devise equally effective approaches that achieve a similar level of performance.

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 can pose 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, this Guideline focuses on fire-related aspects associated with the construction of five and six storey mid-rise wood frame buildings.

Encouraging a “Culture of Safety”

The best practices described in the Guideline are intended to support and encourage a “culture of safety” on the construction site.

Many builders are already diligent in ensuring fire safety on construction sites. The suggested best practices outlined in this document are similar to those practices already adopted by many builders.

Given the potentially significant impact of a construction site fire in a five- or six-storey wood frame building, it is important that builders in particular adopt a “culture of safety” and implement best practices that achieve a high level of construction site safety, such as the practices set out in this Guideline.

Other Ways to Achieve Fire Safety

Where site conditions, construction methods, building materials or other factors make it difficult to put in place some of the suggested measures in the Guideline, builders should consider developing and employing alternative construction site practices to achieve a comparable level of fire safety on the construction site.

Builders may have to work from the general principles contained in the Guideline to develop site-specific approaches that respond to local conditions while providing comparable fire safety.

In developing such site-specific approaches, builders should consult with others, such as their insurance provider and the fire service.

Legislative Context

This Guideline is specifically intended to enhance fire safety within and around mid-rise (five- and six- storey) wood buildings while they are under construction.

Under the existing legislative regime in Ontario, there are no comprehensive regulatory requirements to address the full range of fire related risks on construction sites.

While Ontario's Building Code, authorized under the Building Code Act, 1992, establishes requirements for fire safety systems and equipment in new construction, renovation and change of use, it does not specifically address fire safety during the construction process.

The Ontario Fire Code (OFC), a regulation under the Fire Protection and Prevention Act, 1997 (FPPA), regulates fire safety in existing buildings. As provided in subsections 12.(3) and 12.(4) of the FPPA, the OFC does not generally regulate unoccupied buildings that are under construction. The OFC does apply only if there has been no substantial work related to the construction of the building for at least six months or if the conditions of the unoccupied portions of the building threaten the safety of the occupied portions.

Notwithstanding the above, fire services do have broad discretionary power under subsection 21.(1) of the FPPA to issue orders requiring measures to be taken where an inspector believes that there is a risk to fire safety. The best practices outlined in this guideline serve as a basis for assessing fire risks on construction sites and builders are encouraged to work in collaboration with the local fire service to develop a construction site fire safety plan that addresses identified risks.

Note also that certain requirements under the Construction Projects regulation (O. Reg. 213/91) made under the Occupational Health and Safety Act, provisions of which are excerpted in Appendix A to this Guideline, may also apply.

Ministry of Labour Regulations

The Occupational Health and Safety Act (OHSA) regulates the health and safety of persons in or about a workplace. The OHSA authorizes regulations for construction projects which cover a wide range of health and safety issues related to construction sites, including topics such as: scaffolding; stairs and landings; electrical hazards; and fire safety. The fire safety provisions in the Ministry of Labour's (MOL) construction project regulations are not as detailed as those in other regulations, for instance the model National Fire Code (mNFC).

Fire safety related regulations authorized under the OHSA "Construction Projects" regulations are found in Appendix A of the Guideline.

Employers have a legislative obligation under the OHSA to ensure their workers are protected on the construction site. These regulations contain many provisions related to fire safety on construction sites and, in some areas, overlap with the best practices outlined in this guide.

Since MOL regulations do not cover all aspects of construction site fire safety this Guideline may be helpful to supplement the MOL regulations wherever practicable. Recommended practices for mid-rise wood building construction site fire safety contained in this Guideline in some cases may exceed the minimum requirements contained in MOL regulations, and in some cases cover a broader range of topics than MOL fire-related regulations. These additional best practices are drawn largely from the model National Fire Code of Canada, the NFPA Codes and Standards, input from the OFMEM, and other guidelines for fire safety on construction sites.

Inspectors from the MOL will continue to require that builders and construction workers comply with its regulations for construction projects under the OHSA. MOL recognizes this Guideline as a best practice document that will reduce risks to workers, and may therefore encourage builders and construction workers to also follow the Guideline.

PART 01

FIRE SAFETY PLANNING

All mid-rise wood building construction sites should have a Construction Site Fire Safety Plan (CSFSP).

The site's CSFSP is a written plan setting out measures to take to minimize the risk of fire and to protect the safety of people working on site on that particular project. It should take into consideration risks associated with the construction project, relevant MOL regulations, and the content of this Guideline.

The CSFSP should focus on minimizing the chance of fire, as well as increasing the probability of prompt fire extinguishment, safe occupant evacuation, and early notification of the fire department.

Moreover the CSFSP should be provided to the Chief Fire Official (CFO) of the local fire department as early as possible, but no later than the start of construction. CFOs are likely to be very open to discussion with builders in regard to the CSFSP, and during development of this Guideline expressed a desire to facilitate early engagement and discussion regarding the content of the CSFSP.

Work on the CSFSP should begin very early and preferably well before, the application for a building permit. Ideally, construction site fire safety factors should be considered at the design stage. Engaging the fire service early in the process will provide more time to resolve any issues that may arise. The first step in developing a CSFSP is to consider the risks associated with the proposed construction project.

A 'one-size-fits-all' approach is not appropriate. Each project and site is unique and those unique aspects should be considered and addressed in the site's CSFSP.

Builders should designate an individual with the appropriate knowledge, skills and training, to be a Fire Safety Co-ordinator (FSC) responsible for implementing the CSFSP and fire safety training of workers. This person may be the same person who undertakes other functions on the building site, such as the MOL's Health and Safety construction site representative.

In addition, the fire department should be invited to the building construction site prior to the start of construction to undertake a pre-incident (pre-fire) discussion regarding matters such as water supply availability, exposure to other buildings, building access, and site access routes.

Details on suggested best practices are outlined below under Sections 1-A to 1-F.

Section 01 – A: Construction Site Fire Safety Plan (CSFSP)

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

- 1) Construction Site Fire Safety Plans (CSFSP) prepared by the builder/developer, 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?

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

Developers and builders should take into account the guideline when preparing their program of requirements for architect and engineers designing mid-rise wood frame buildings to avoid problems later on in the construction stage.

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

- 4) Fire risks to be considered in developing the CSFSP should 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.

Information to be included in the CSFSP

- 5) The CSFSP should include all information relevant to fire safety on the construction site, such the following information:
 - a) the designation and organization of site personnel to carry out fire safety duties, including fire watch and guard service where applicable,
 - b) measures for controlling fire hazards in and around the building, including good housekeeping, hot work procedures, inspections of electrical and heating equipment, and maintenance procedures for on-site firefighting equipment,
 - c) Information on the installation of fire protection equipment as building construction proceeds,
 - d) a site plan showing:
 - i) the size and location of buildings under construction, (including firewalls where provided),

- ii) the location of fire access routes, portable fire extinguishers, fire hydrants, fire department connections for standpipes and sprinkler systems, building access points, stairs accessing floor levels, hose standpipes, control valves for fire protection systems, and hazardous materials storage areas, and
 - iii) adjacent building when in close proximity (approx. 50 meters) to the construction site.
- e) information on how to maintain safety during any impairment of the fire safety systems or fire alarm, detection or communication systems,
 - f) all emergency response numbers, and names, addresses, and telephone numbers of persons to be contacted during and after normal operating hours in the event of an emergency, and
 - g) information on available water supply for firefighting purposes.
- 6) The CSFSP should also indicate specific actions and emergency procedures to be taken at the construction site in the event of a fire emergency, such as the following:
- a) initiating a fire warning, notifying the fire department, and instructing site personnel and neighbouring occupied buildings on the procedures to be followed once the warning has been initiated;
 - b) confining, controlling and/or extinguishing the fire;
 - c) checking sprinkler control valves to ensure they are open and operating, checking the fire pump(s) to ensure it/they are operating satisfactorily and checking the fire hydrants to ensure they are accessible,
 - d) checking alarm panel indicators,
 - e) providing direction to responding authorities as to location, source, extent and type of fire, and
 - f) safely shutting down fuel-fired or electrical equipment, and electrical power where it is contributing to the emergency or could impact fire suppression activities.

- 7) The CSFSP should also include fire drill procedures for testing the awareness of workers about their responsibilities under CSFSP and their ability to affect prompt egress from the building.

The fire drill procedures should include:

- a) provisions for unannounced drills during the lifetime of the construction project,
- b) prior notification to the municipal CFO to allow fire service staff to monitor the drill if they wish,
- c) documentation of time for full evacuation of the structure under construction, and verification of whereabouts of all workers,
- d) verification that all assigned duties were carried out as required, and if not, investigation of what prevented success and implementation of necessary corrections, and
- e) debriefing of workers on drill experience to determine where aspects of the CSFSP, training program, or other matters may require improvement.

Updates to the CSFSP

- 8) The CSFSP should be updated on an identified schedule, or as dictated by changing circumstances and provided to the CFO as per prior agreement.

Posting of emergency procedures information

- 9) Emergency procedures information should be posted in conspicuous places on the site, in accordance with MOL regulations.

Ideally this should include areas that are protected from weather, such as in the supervisor's on-site trailer and at workers' lunch or break areas.

Section 01 – B: Fire Safety Co-Ordinator (FSC)

Who is the Fire Safety Coordinator (FSC)?

- 1) The FSC for the construction project represents a role that should be undertaken on every mid-rise wood construction project. The person responsible for this role may be the builder's site supervisor or the builder's on-site health and safety representative under MOL's OHSA.

The FSC may be assisted and supported by other persons who report to the FSC.

When should the FSC be appointed?

- 2) The FSC should be appointed early in the project development process and prior to the start of building construction.

Since the FSC is responsible for preparing the CSFSP, and since the CSFSP should ideally be provided to the fire service prior to building permit application, the FSC should be designated at this time but at the latest before construction starts.

Suggested knowledge and experience of an FSC

- 3) The FSC should have sufficient background, knowledge, experience or training related to the following areas:
 - a) emergency services procedures,
 - b) the work being undertaken at the job site, the equipment being used, the hazards involved, and the means to control the hazards,
 - c) current applicable fire protection standards, available fire protection systems, and fire prevention inspection procedures,
 - d) identification and assessment of job site hazards, and
 - e) effective communication with the employer, workers and other inspectors and officials

General responsibilities of the FSC

- 4) The FSC is responsible for construction site fire safety and is responsible for implementing the CSFSP. The FSC should:
 - a) report directly to the project senior executive,
 - b) be responsible for the development and implementation of the CSFSP,
 - c) be responsible for retaining records of fire safety training, fire safety site inspections, incident reporting, hot work permits and hot work program, fire watches, and fire protection systems testing and maintenance (see more information on “fire safety site self-inspections”, “hot work permits”, “fire watch”, etc.),
 - d) be knowledgeable of the applicable fire protection standards, fire protection systems and fire inspection procedures,
 - e) be responsible for retaining records of fire safety training of workers in the use of fire protection equipment, that has been provided by the relevant trades,
 - f) have authority on the construction site to enforce the provisions of the CSFSP and applicable fire protection standards,
 - g) have authority to report contraventions to the individual’s supervisor and recommend corrective action or training,
 - h) be responsible for conducting fire drills as set out in the CSFSP,
 - i) on-going liaison with fire service (see “liaison with fire service”), and
 - j) report to the command post when a fire occurs (if it is safe to do so).
- 5) Where a guard service is provided, the FSC or other person reporting to the FSC should take responsibility for oversight of the guard service.
- 6) The FSC or other person reporting to the FSC should be responsible for ensuring the presence of adequate numbers of fire protection devices and appliances and their proper maintenance.

Ongoing liaison with the local fire service

- 7) The FSC should liaise with the local fire service before construction work starts, and should keep fire services informed of any changes impacting site access and firefighting as the work progresses.

Examples of changes that should to be reported to the local fire service include those related to:

- a) fire protection water supply;
- b) site access;
- c) evacuation routes
- d) arrival on site or relocation of hazardous materials storage; and
- e) firefighting equipment locations and operational status.

Section 01 – C: Fire Safety Training

Recommended construction worker training before start of the first day's work

- 1) Prior to the start of work, every construction site worker should receive training on:
 - a) site fire safety (including: smoking rules, elimination or control of common ignition sources, safe disposal of refuse, safe handling and storage of flammable and combustible liquids and gasses, and Workplace Hazardous Material Information System, WHIMIS, (or WHIMIS training should be verified if already required),
 - b) the demonstrated use of fire extinguishers provided on the site,
 - c) keeping access and egress routes clear, and
 - d) fire prevention and emergency evacuation procedures.

The FSC should keep a record of who has received training.

Training for workers assigned to firefighting duties

- 2) If there are workers assigned to firefighting duties, they should:
 - a) be given adequate training by a qualified instructor in fire prevention, fire suppression methods, emergency procedures, organization and chain of command, firefighting crew safety and communications applicable to their workplace, and
 - b) be physically capable of performing the assigned duties safely and effectively (e.g. use of charged fire hoses).

Additional training and re-training

- 3) The FSC should assess the need for additional fire safety training and implement that training as necessary, including regular retraining of workers.

Materials Safety Data Sheet (MSDS)

- 4) A Material Safety Data Sheet (MSDS) is a document that contains information on the potential hazards (health, fire, reactivity and environmental) of a chemical product and how to work safely with that chemical product.

Materials Safety Data Sheets (MSDS) should be kept on site.

Section 01 – 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

- 3) 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 persons currently on the building site,
 - e) proposed location of hazardous storage, such flammable and combustible liquids and flammable compressed gas,
 - f) potential fire exposure to adjacent buildings, and
 - g) site security provisions in place to protect the site from unwanted intrusion.

Informing the fire service of any changes to the pre-incident plan

- 4) The fire service should be made aware of any changes to the pre-incident plan that may occur as the construction progresses.

Site visits by fire service

- 5) During the course of construction the fire department may conduct site visits so that it becomes familiar with the site and aware of the types and nature of fire hazards present on the site during the course of the project; the installation of fire protection systems; and changes in potential fire exposure to adjacent buildings.
Volunteer firefighting personnel may have more limited capacity to attend and tour the site than professional fire services.
- 6) Records of such site inspections including notes and sketches should be kept on file and used in company training.

Section 01 – E: Regular Site Self-Inspection

Suggested Items to be covered by the fire safety site self-inspection

- 1) The FSC or a competent person appointed by the FSC, should periodically conduct a fire safety inspection of the site as outlined in 1 – E (2).
This site inspection should ensure that:
 - a) ignition sources are controlled or isolated,
 - b) all fire protection equipment that is installed and operational (e.g. portable fire extinguishers, fire hydrants, sprinkler system control valves, fire alarms, fire detection equipment, emergency communication systems) is in proper working order as set out in the CSFSP,
 - c) closures in firewall and stairway openings are kept closed or are able to self-close upon heat or smoke detection,
 - d) emergency fire access routes are free of obstructions,
 - e) evacuation routes are free of obstructions,
 - f) external exposures are noted and accounted for,

- g) safe procedures are followed for all handling and storage of flammable and combustible liquids, and flammable compressed gasses, and hot work operations,
- h) housekeeping conditions are well maintained,
- i) waste is removed on a frequent basis, and
- j) any other necessary tests, checks or observations are undertaken aimed at detecting any fire risks on the construction site.

Frequency of self-inspections

- 2) Timeframe of the self-inspections may be weekly, daily or at the end of each shift depending on the nature and stage of the construction site work.
End of shift and daily inspection sheets should include items associated with a higher risk of fire or an explosion, or associated with a greater fire impact, than items on the weekly inspection sheet.

Records of self-inspection

- 3) Records of fire safety inspections should be kept on file at the site until the building is occupied, and should be available for examination by the CFO.

Section 01 – F: Shut Down or Impairment of Fire Systems

Fire protection systems should be operational at all times if possible

- 1) Where a fire protection system is provided and made operational, it should remain operational at all times during the construction period, subject to construction needs.

Where impairment is necessary use isolation valves

- 2) Isolation valves for sprinkler and standpipe systems should be utilized in order to limit the shut-down to as small a section of the fire protection system as is possible.

Suggested actions during shut down of fire protection systems

- 3) Where any part of an operating fire protection system is temporarily shut down during construction, impairment should be limited to the shortest possible time and all hazardous operations (e.g. hot work) in affected areas should cease.
- 4) In addition, it is important to notify the CFO and all construction site workers of alternative measures during an impairment such as 24/7 site security, increasing the availability of portable fire extinguishers, or providing charged fire hoses with trained staff to operate them if required.
- 5) Where an impairment occurs on fire protection equipment (e.g., standpipe or sprinkler system) an impairment tag should be used which clearly shows that the equipment is temporarily inoperable. One portion of the tag is to be kept on the equipment and the other to be kept in the site office.

PART 02

EMERGENCY NOTIFICATION AND BUILDING EGRESS

Effective emergency notification procedures and building egress routes are critical to fire safety on the construction site.

Construction site emergency notification procedures are essential for ensuring that information on a discovered fire is quickly passed on to site supervisors, who can then pass it on to other workers and the fire department. This will help ensure a quick response by trained staff to initiate fire suppression activities and evacuation of the building or site. A prompt call to the fire department with vital information on the fire and its location, along with information on the location of the construction site and site access routes, can result in more rapid and effective response from the fire service.

For workers evacuating a building under construction, it is critical that they have optional egress routes that are clearly marked, unobstructed and well illuminated. This applies to all stairs designated as part of an evacuation route, as well as passageways to and from them.

Details on suggested best practices are outlined below under Sections 2 – A to 2 - B.

Section 02 – A: Emergency Notification Systems

Requirement for a functioning emergency notification system

- 1) Every mid-rise wood construction site should have a functioning emergency notification system.
- 2) A means to alert site personnel of a fire should be provided, and where this consists of an audible alarm or siren, it should be audible throughout the construction site and the building, including enclosed floor areas.
- 3) Every worker at the project should have ready access to a functioning two-way communication system in the event of an emergency.
- 4) Where fire alerts are activated from a central location on the construction site, every worker should have ready access to appropriate emergency phone numbers to this central location, and a telephone, two-way radio or other system of two-way communication.
- 5) Where a permanent or temporary fire alarm system within the building under construction is used to provide the fire alert, it should be installed and operational on each floor level located below the top floor under construction, or the roof, and should as a minimum, include:
 - a) alarm bells that are easily heard above ambient noises throughout the building, but as a minimum within 60.0 meters of all floor areas, and
 - b) manual pull stations at each stairway and person hoist.

Deactivation

- 6) Where a permanent or temporary fire alarm system is installed as a form of alert during an emergency and it needs to be deactivated for certain works, it should be reactivated as soon as possible.

As mentioned previously, any equipment that is deactivated or impaired should have a tag to indicate that it is impaired.

Protection from dust and debris

- 7) Where a permanent or temporary fire alarm is used to provide an alert then steps should be taken to protect the alarm devices from dust and debris resulting from building construction operations.

Testing

- 8) Testing of the fire alarm system should be conducted by activating different manual pull stations in the building once every week or two weeks, so that over the time that the building is under construction, each pull station in the building will have been tested at least once.

Records of the fire alarm testing should be kept on site until the building is occupied, and be available for examination by the CFO.

Section 02 – B: Egress Routes

Building access and egress routes

- 1) Stairways should be part of an unobstructed passage allowing access to and egress from all areas of the building.

There should be unobstructed passage on each floor level to stairs discharging at grade level.

Signs

- 2) Stairways providing egress from each floor should have a sign on each floor that identifies the floor level, stair location, street address.

Minimum requirements for 2 required egress routes

3) The building under construction should have a minimum of two egress routes.

The two required egress routes should:

- a) have a minimum width of not less than 900 mm and be maintained clear of obstructions,
- b) be provided with adequate lighting, and
- c) be located no closer than 3.0 m from a fuel-fired heating device.

Main egress route

4) During building construction, each floor area of each building should have at least one stairway to provide a means of egress that :

- a) extends upward as each floor is installed to the uppermost level unless this would interfere with the work to be performed,
- b) complies with the dimensional requirements of Article 3.4.6.8. of Division B of Ontario's Building Code for treads and risers, where it is practical and reasonable to do so for the builder,
- c) is provided with one handrail in conformance with Sentences 3.4.6.5.(3), (4), (5), (9), (11) and (12) of Division B of the Ontario Building Code,
- d) is provided with stair identification signs for floor level, stair designation, and exit path direction for safe egress,
- e) is enclosed, once the building exterior walls on that floor are in place (excluding exterior windows and doors), by fire-rated separations constructed of minimum 15.9 mm gypsum wallboard on each side of the studs unless of masonry or concrete construction, and
- f) when not yet enclosed, is provided with guards that have a height of not less than 920 mm measured vertically to the top of the guard from a line drawn through the outside edges of the stair nosings and 1070 mm around landings.

5) Doors should be installed in stairwell enclosure access openings as they are constructed and should:

- a) remain unobstructed,
 - b) have a minimum 20-min fire rating, with self-closing devices and latches,
 - c) if held in the open position by a hold-open device, release by a fusible-link, and
 - d) be kept closed during idle construction times (i.e., night time, weekends, civic holidays),
- 6) Temporary doors may be used during construction to protect the integrity of permanent installations.

Second egress route

- 7) In addition, all floors of buildings under construction should have a second fixed means of egress, such as another interior stair or an exterior scaffolding stair system.
- 8) Since the completed 5- and 6-storey mid-rise wood buildings are required to have, as a minimum, a 2nd exit stair as part of the required means of egress, the alternative egress route during construction can use this 2nd exit stairwell.
- 9) If it is not practical to use the completed building's 2nd interior stairwell as an alternative egress route during construction, then the alternative means of egress could be an exterior scaffolding stair system.
- 10) Where it is practical and reasonable to do so for the builder, the 2nd interior means of egress should meet the design standards that apply to the main means of egress.
- 11) The second means of egress should be at an appropriate distance from the first means of egress so that if a fire is blocking access to one there will still be access to the other.

Signs

- 12) Signs should be provided to designate the egress path.

Elevators

- 13) The main stairway access and second egress route already required as noted above, provides good access for firefighting personnel. If it is practical to do so, existing hoists or lifts may also be made available for use by firefighting personnel to reach all levels of the building under construction.

PART 03

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 robust, difficult to scale 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. In addition, stacking material close to the fencing (on the inside or outside) should be avoided in order to reduce the likelihood of unauthorized access to the site.

Other security requirements for fire safety should be in direct proportion to the amount of exposed combustibles present at the individual site. Before combustible materials are on site, for instance while foundations are being formed, security may be less critical. Once significant combustible materials are on site and especially while the mid-rise wood building is under construction, careful attention should be paid to providing comprehensive security.

Normally, trained site security personnel should be on site at all times that the site is not occupied by construction personnel. Exceptions would be where circumstances indicate that a lower level of security is reasonable or where alternative approaches provide the necessary level of security.

As an example, larger sites may employ additional measures including site lighting and security cameras.

Details on suggested best practices are outlined below under Sections 3 – A to 3 - D.

Section 03 – A: Fencing

Minimum height of fencing

- 1) A strongly constructed fence, hoarding, or barricade not less than 1.8 m high (unless municipal bylaws require a higher fence) and not easily scaled should be erected around the perimeter of the construction site.

The construction site refers to the part of the parcel of land on which construction related activities are occurring that need to be secured. The construction site may occupy the entire parcel of land or a portion of the land parcel.

Access openings

- 2) Hoarding or barricades should not have openings, except those required for authorized access.
- 3) Access openings through fencing/barricades should be equipped with gates that are kept closed and locked when the site is unattended. These gates should be in place until completion of the construction activity.

Access to site by fire service

- 4) Fencing, hoarding, and barricades should be constructed and maintained so that they do not restrict access to the construction site for firefighting and fire protection equipment.

Signage for emergency contact information

- 5) Fencing or hoarding should have posted on it signage which provides key emergency contact information.
- 6) Signage should be provided on the outside of the fencing or hoarding to indicate the address of the construction site for fire department information.

Section 03 – B: Site Office and Site Visitors

Purpose of site office

The construction site should have a site office identified by the appropriate signage. This office should provide access to key site personnel and to important materials.

On-site command post

- 1) A specific location, such as the site office or security office, could also be designated as the “on-site command post”.
- 2) Important materials that should be available at the command post include: the construction site fire safety plan (CSFSP); any pre-incident plan; building; utility and site drawings; emergency information; emergency contact list; one or more means of communication; as well as keys to locks, etc., for emergency responders and site fire safety officers.

Location of the on-site command post and site office

- 3) The location of the “on-site command post” should be chosen to facilitate emergency access and overall safety during a potential fire event.
- 4) Temporary offices, including the on-site command post if it is located in the site office, should have sufficient separation from buildings under construction and use approved heating devices with sufficient clearances.

Site visitors

- 5) Site visitors, upon entering the construction site, should be provided with an overview of the construction site fire safety rules including smoking and parking restrictions.

Unauthorized visitors

- 6) Workers should be encouraged to engage with unaccompanied visitors to establish or verify their reason for being on site, and to escort them to the site construction office where the site supervisor or the FSC can assess their reason for being on the construction site.

Section 03 – C: Security Guards

When should security guards be on the construction site?

- 1) Security guards should be engaged after-work hours to address fire risks and unauthorized intrusion once combustible materials are on site.
It is recommended that security guards be on the site at all times that the site is not occupied by construction personnel (e.g. during night, holidays and weekends).

It may not be necessary to engage security guards prior to arrival of significant combustibles i.e., during the construction of the foundation and first floor if they are of non-combustible (e.g. concrete) construction.

Security guard duties

- 2) As appropriate and as necessary, fire-safety functions of security guards should include:
 - a) regular fire checks including recognizing and reporting fire hazards,
 - b) routinely patrolling hot work areas,
 - c) serving as a fire watch,
 - d) notifying the fire department and management of fire detection, and
 - e) operating fire protection and suppression equipment (where trained to do so).

Notification of Impairment

- 3) Security guards should be informed of any fire protection equipment impairments.

Section 03 – D: After-Hours Lighting and Cameras

After-hours lighting

- 1) As appropriate, after-hours lighting in support of security should be provided.
Care needs to be taken that security lighting not impact adversely on neighbouring residents and businesses. Motion activated lighting may be appropriate in residential areas.

Security cameras

- 2) As appropriate, security cameras that are continuously operating or equipped with motion sensors, and linked to site lighting, should be provided.
- 3) Data from security cameras should be kept on file for a reasonable period of time (e.g. at least 30 days).
Where cameras are used they should be linked to a designated station where they can be continuously monitored.

PART 04

CONSTRUCTION PROCESSES

The fire safety systems required by the 2012 Building Code are essential to the safety of completed buildings.

Key fire safety systems/designs required by Ontario's Building Code for five- and six-storey wood buildings include: automatic sprinklers; fire doors; exit stairways; fire separations; fire stopping; fire blocking; smoke alarms; fire alarms; hose and standpipes; exterior non-combustible or limited combustible cladding; and firewalls where provided.

It is important that these key fire safety systems/designs be installed and activated as soon as practical during the construction process.

Installation and operability of permanent standpipes should be prioritized as the floors are completed, as part of the on-site fire protection strategy. Use of temporary standpipe systems is also an acceptable means of providing a manually operated fire safety system while the building is under construction. (see Section 09 – B)

Early installation of automatic sprinkler systems, where practical, will have an even greater impact on limiting fire growth and spread in a building under construction.

Another effective way of reducing the potential for fires to spread during construction is to ensure that the building, including concealed spaces, is properly segmented into fire compartments. This helps contain a fire to a smaller area, thus enabling safer evacuation, and providing additional time for firefighter response.

Furthermore, the potential for fire risk during construction can be reduced through the selection of certain construction materials at the initial design stage, and through the use of prefabricated construction methods (e.g. panelized floor, wall and roof structures). Adding exterior building skins and windows to the lower two storeys at the earliest opportunity also limits the potential for arson and unauthorized access to the building by “hardening” the areas that can be readily reached.

Details on suggested best practices are outlined below under Sections 4 – A to 4 - D.

Section 04 – A: Installation of Sprinklers

Progressive installation of automatic sprinkler systems

- 1) Automatic fire sprinkler systems should be brought into service as quickly as possible as construction takes place.

Activation

- 2) Where possible, the sprinkler system should be activated when there is no construction in the immediate area. However the sprinkler system may still need to be temporarily turned off during construction phases where it is at risk of potential damage.

It should be noted that where other construction site fire safety concessions are made as a result of advanced sprinkler installations, temporary sprinkler shut-offs need to be closely controlled and monitored. When shut-offs do occur, this information should be communicated to site personnel and/or signage to this effect should be visibly marked on the equipment (as is the case with standpipes).

Cold weather and progressive installation of sprinklers

- 3) Progressive installation of automatic sprinkler systems may not be practical in colder regions during the winter if, for example, there is no insulation or heating in the unfinished building.

Section 04 – B: Installation of Fire Separations, Firewalls, Fire Doors, Fire Blocking.

Construction priority for fire doors, separations, etc.

- 1) Fire separations, firewalls, fire-rated doors, and exit stairway enclosures should be given construction priority.

Firewalls

- 2) Where firewalls are provided to separate buildings, fire-rated closures (e.g. doors) should be:
 - a) installed in openings on each floor as soon as the fire-rated components of the firewall are completed,
 - b) operational and provided with self-closing and latching devices, and
 - c) kept closed during idle construction times (i.e. night time, weekends or civic holidays).
- 3) Fire-rated closures in firewalls that are kept open during working hours should be provided with fusible links so that the doors close automatically when exposed to a fire.

Fire separations

- 4) All fire separations with a fire-resistance rating located within the building should be completed as soon as practical, including the installation of fire-rated closures with self-closing and latching devices.

Any and all penetrations through the fire-rated assembly (floor, wall, etc.) should be sealed as soon as practical, with an approved fire stopping material or system, with a fire rating corresponding to that of the assembly.

Keeping fire rated stairwell doors closed during idle construction times

- 5) Where stair fire separations are provided on each floor of the building, the appropriately fire-rated doors should be kept closed during idle construction times (i.e. night time, weekends or civic holidays).

Temporary stair fire separations and doors, providing the recommended fire resistance rating, may be used during construction to protect the integrity of the permanent installations.

Protection from weather damage

- 6) Measures should be taken, where appropriate, to ensure that fire safety assemblies are protected from weather damage.

Section 04 – C: Temporary Doors and Windows

To inhibit entry into the building under construction, temporary windows and doors or window and door coverings (e.g. plywood), should be installed at the perimeter of the first storey as soon as possible or the first storey may be otherwise secured.

Also, to improve building resistance to exterior fires it could be helpful, subject to construction process requirements, to complete the fire resistant exterior cladding or skin of the building as soon as possible during the construction.

Section 04 – D: Construction Materials and Methods that can Reduce Fire Risk

Selection of alternative construction materials at the design stage

- 1) The selection at the design stage of construction materials and the use of alternative construction methods that simplify the construction process shortens the time period during which the building under construction is at greater risk to fire, and reduces on-site fire ignition sources.

The builder/developer should discuss with and advise the project architects and engineers of any specific program requirements.

The selection at the design stage of alternative construction materials and construction methods for elements such as walls, floors, roofs, roof coverings, exterior cladding systems and plumbing, can significantly reduce fire risk including risk related to the amount hot work necessary.

For example, the use of PVC piping versus copper piping can reduce fire risk by reducing the need for “hot work”, which could ignite nearby combustibles (see Part 05 of this document).

Use of prefabricated building components

- 2) Greater use of building components prefabricated off site can reduce the fire risk during construction.

The use of prefabricated construction components, such as panelized floor, wall and roof components, can significantly reduce construction time and on-site waste, thereby reducing fire risk.

Completing building envelope as soon as possible

- 3) Adding exterior building skins and windows to the lower two storeys at the earliest opportunity limits the potential for arson and unauthorized access to the building by “hardening” the areas that can be readily reached.

PART 05

HOT WORK PROTOCOL

Hot work is activity such as welding, torching, brazing, soldering, hot tar roofing, and any operation involving an open flame.

The use of a blow torch or welding and cutting equipment should only be undertaken in accordance with Ministry of Labour Regulations and these Guidelines.

No hot work activity should be undertaken prior to getting approval from the FSC. The FSC should be responsible for overseeing use and implementation of the hot work protocol and issuing Hot Work Permits.

Hot Work Permits are designed to provide authorization to conduct hot work activity, and to track its start and completion, while providing a checklist of precautions and fire prevention measures that should be undertaken with each such activity. A Hot Work Permit system should be implemented for all persons (employees and contractors) engaged in hot work activities of any kind. This system is an industry best practice that is supported by insurers and fire safety specialists. It is administered and enforced entirely by the FSC and site staff, and is not a responsibility of provincial or municipal inspectors.

A fire watch should be initiated whenever there is an open flame, torch or other ignition source on site and continues until after the ignition source is removed.

A fire watch involves an individual or individuals assigned to stand by with fire extinguishing equipment while hot work operations are conducted. These individuals should be trained in the use of the type of fire extinguishing equipment available and the procedures for sounding an alarm in the event of a fire.

Those performing the fire watch cannot be the same person(s) performing the hot work activity itself. Timing of hot work is also a key element in limiting fire risk under a hot work permit system. Standard practice among mid-rise wood builders in BC, for instance, is to cease all hot work by about 3:00pm to allow for an adequate length of time for fire watch to ensure that no fires are smoldering in the work area prior to the close of the site at the end of the workday.

Details on suggested best practices are outlined below under Sections 5 – A to 5 - B.

Section 05 – 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 04 – 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 greatest extent that is practical.

The FSC is responsible for issuing Hot Work Permits

- 5) No hot work activity should start prior to getting approval from the FSC.
- 6) The FSC is responsible for issuing the Hot Work Permit and overseeing the hot work protocol.
- 7) The Hot Work Permit tracks each instance of hot work from start to completion.
- 8) Before authorizing hot work and issuing the hot work permit, the FSC or the hot work trained designate of the FSC, should ensure that:
 - a) the person who receives the hot work permit is aware of the method used to contact the fire department,
 - b) available sprinklers, hose streams, and extinguishers are operable,
 - c) hot work equipment is in good working condition, and

- d) special permission is obtained to conduct hot work on metal vessels or piping lined with rubber or plastic.

Information included on the Hot Work Permit

- 9) The Hot Work Permit is displayed at the location of the hot work operation.
- 10) Information in the Hot Work Permit should include: the person who has been approved to undertake the hot work; the description of the work; the location of the work (e.g. floor); a checklist of procedures to be followed (which are discussed under “key elements” below); and the signature of the FSC issuing the Hot Work Permit.

Key elements or best practices to be addressed during hot work

- 11) Hot work is subject to special safety practices to address potentially hazardous situations and minimize risk.
- 12) Recommended safety practices within 11 m of hot work:
 - a) flammable liquids, dust, lint, and oily deposits should be removed,
 - b) explosive atmosphere in area, if any, should be eliminated,
 - c) floors should be swept clean and trash should be removed,
 - d) combustible floors should be wetted down or covered with damp sand or noncombustible materials or equivalent,
 - e) personnel should be protected from electrical shock when floors are wet,
 - f) other combustible storage material should be removed or covered with listed or approved materials such as welding pads, fire-resistive tarpaulins, metal shields, or other noncombustible materials,
 - g) all wall and floor openings that are located near to the area of hot work should be covered, and
 - h) ducts and conveyors that might carry sparks to combustible material should be shut down, properly and effectively blanked-off and/or disconnected.

Recommended safety practices for hot work on enclosed equipment.

13) These recommended practices include:

- a) the enclosed equipment should be cleaned of all combustibles;
- b) containers should be purged of flammable liquids and vapours; and
- c) pressurized vessels, piping and equipment should be removed from service, isolated and vented.

Fire watch for hot work activity under a hot work permit

14) A key element of a hot work permit system is the implementation of a fire watch. A fire watch should be provided whenever an open flame or other ignition source is used for hot work activity.

15) Recommended safety practices for hot work fire watch and monitoring include the following:

- a) the individual performing the fire watch should be provided with at least two suitable fire extinguishers and, where practical, a charged small hose line used to extinguish small fires,
- b) the individual performing the fire watch should be trained in the use of fire extinguishing and other equipment and in sounding the alarm (as noted under 1-C, Fire Safety Training),
- c) a continuous fire watch should be provided during hot work activity and for a minimum of 60 minutes after hot work activity, including any break activity, and
- d) after the continuous fire watch the hot work should be monitored in 30 minute intervals until at least 4 hours after the job is completed for potential signs of fire, including, but not limited to, smoldering of material (consideration should be given to using a thermal scanner to reduce the monitoring period to 3 hours after the hot work is complete).

16) The fire watch for each hot work activity should be documented, including:

- a) location, start and completion times of hot work activity,
- b) number of fire extinguishers ready for use,

- c) completion of site preparation to protect or eliminate combustibles,
- d) time of continuous, intermittent checks, and final fire watch, and
- e) name of the individual performing the fire watch and responsible FSC.

17) Records of the fire watch should be kept on file until the building is occupied, and be available for examination by the CFO.

Completion of hot work activity

18) Neither the hot work permit nor the fire watch duties should be transferred to the next shift without the approval of the FSC and the issuance of a new permit.

19) Upon completion of the hot work activity, the Hot Work Permit holder should return the permit to the FSC for final review and sign-off.

Section 05 – B: Bitumen Kettles

Who should do work using bitumen kettles?

- 1) As noted before whenever possible, all hot work, such as hot tar roofing, should be avoided in favour of other less hazardous solutions. (See Section 04 – D.)
- 2) If hot work is to be undertaken, only persons with a hot work permit should undertake hot work such as hot tar roofing and other work involving the use of bitumen kettles (see Section 05 – A).

General restrictions on the use of bitumen kettles

- 3) The use of bitumen kettles is typically subject to many restrictions to ensure safety. Bitumen kettles should:
 - a) not be located in the building or on the roof,
 - b) not be located in a fire access route,
 - c) not be located within 3.0 m of the building under construction, or means of egress from the building,
 - d) be equipped with metal covers that are close-fitting and constructed of steel,

- e) be maintained free of excessive residue,
- f) when in operation: i) be level, with most of the weight off the tires and on the legs; ii) not be heated above 260°C or within 14°C below the flash point of the material being used, whichever is the least; and iii) be kept clear of combustible debris or materials, and
- g) be constantly attended during operation and for one hour after shut down of the kettle by at least one employee who: i) is knowledgeable of the operations and hazards associated with the kettle; ii) is located within 7.6 m of the kettle, and iii) has the kettle in sight.

Bitumen kettles or road tankers fitted with propane fueled heaters

- 4) Where a hot tar or bitumen kettle or road tanker is fitted with a propane-fuelled heater:
 - a) the storage cylinder for propane should not be placed closer than three meters to a source of fire or ignition;
 - b) the lines connecting the storage cylinder for propane to the heating device should be located so that they do not come into contact with the hot tar or bitumen in the case of a spill or a failure of a component of the system; and
 - c) a fire extinguisher with an Underwriters' Laboratories of Canada (ULC) rating of at least 4A40BC should be provided with the roadtanker or kettle.
- 5) A propane burner used on a bitumen roadtanker or kettles should: a) have a thermal rating of no greater than that recommended by the manufacturer of the roadtanker or kettle, and b) consist of components that are adequate for their intended use.
- 6) Hot tar or bitumen should be transferred from a roadtanker to a kettle through enclosed piping.

Safe storage of mops and brooms used for spreading bitumen

- 7) Mops and brooms that have been used for spreading bitumen, and bitumen covered rags, should be stored at least 3.0 m away from the building in a safe location when not in use. Used roof mops should be cleaned and stored.

Roofing operations involving heat sources

- 8) As noted above in relation to Hot Work Permits and the use of bitumen kettles, roofing operations involving heat sources should be conducted only by qualified personnel. Single-ply and torch-applied roofing should be installed with caution.
- 9) Roofing membranes should not be over heated.

PART 06

CONTROL OF OTHER IGNITION SOURCES

Where there are ignition sources it is crucial to control these ignition sources to help prevent fires from starting.

As noted under Part 05, Hot Work Protocol, operations that involve heat sources and hot processes should be undertaken in accordance with Ministry of Labour Regulations and these Guidelines, in order to avoid igniting combustible materials.

Other potential ignition sources that need to be identified and carefully managed include temporary electrical heaters, liquid- or gas-fired heaters, and internal combustion engine operated equipment. These types of equipment should be used in strict accordance with MOL regulations and these Guidelines.

Smoking is a frequent ignition source. Even though in Ontario smoking is prohibited in enclosed workplaces such as the building under construction and temporary buildings on a construction site (e.g. construction office trailers) other parts of the construction site need smoking restrictions.

Since smoking may occur elsewhere on the construction site builders may find it prudent to designate a safe smoking area.

Details on suggested best practices are outlined below under Sections 6 - A to 6 - D.

Section 06 – A: “No Smoking” Policy

Smoking is not permitted in enclosed spaces on the construction site

- 1) The Smoke-free Ontario Act prohibits smoking in enclosed workplaces in order to protect workers from exposure to second-hand smoke.

Examples of an enclosed workplace include the inside of a trailer office on a construction site, and portions of the building under construction. The ban on smoking in enclosed workplaces is in effect at all times, even during off-work hours when people are not working.

If a smoking area is provided on the construction site

- 2) If a smoking area is provided on the construction site it should not be provided in an enclosed space, and should be located not less than 3 meters away from the building under construction or any combustible storage or refuse.
- 3) Designated smoke areas should be provided with signage indicating it as a designated smoke area, rules for smoking on the construction site, fire extinguisher, and safe receptacles for the disposal of smoking materials.
- 4) “No smoking” signage should be placed throughout the construction site as a reminder where smoking is not permitted.
- 5) All workers and visitors to the site should be informed of the smoking policy as well as the fire-safety reasons for prohibiting smoking in all locations other than a designated smoking area.

Section 06 – B: Heating Equipment, Including Fuel-Based Heaters

General requirements

- 1) All heating equipment, both temporary and permanent, should:
 - a) be installed, used, and maintained in accordance with the manufacturer's instructions, and/or recognized safe practices,
 - b) be situated so that it is secured,
 - c) be operated by personnel familiar with the operation of the equipment,
 - d) be maintained by properly trained personnel,
 - e) not be operated if damaged or there is a potential safety hazard, and
 - f) not have exposed radiant heating wires or open flames.
- 2) The clearance between combustible materials and temporary heating equipment, including flues, should be in conformance with minimum clearances shown on certified heating equipment.

Fuel-based heaters

- 3) Fuel-fired heating devices can pose a significant risk on a construction site unless appropriate precautions are undertaken.
- 4) Fuel-fired heating devices should not have an open flame and should not be permitted except where they are located, protected and used in such a way that there is no risk of igniting a tarpaulin or similar temporary enclosure or combustible material near the heater.
- 5) No fuel-fired heating device should be used in a confined, restricted or enclosed space unless there is an adequate supply of air for combustion and adequate general ventilation. This is also important to protect the health and safety of workers, and to limit temperature rise in the area.
- 6) A fuel-fired heating device should be protected from damage and from overturning.
- 7) No fuel-fired heating device should be located so as to restrict any means of egress.

- 8) A fuel-fired heating device that generates noxious products of combustion should discharge the products of combustion outside the building or structure in which it is located.
- 9) All fuel supply lines should be constructed, guarded or placed in such a way as to be protected from damage.
- 10) Chimney or vent connectors, where required from direct-fired heaters, should be located at least 460 mm from combustibles or be protected with thermal barriers.
- 11) Liquid- or gas-fired heaters should comply with regulations under the Technical Standards and Safety Act, 2000.
- 12) Internal combustion engines and other devices capable of producing ignition should be kept at a safe distance from combustible material, but under no circumstances should be less than 1.2 meters unless other protection measures, such as thermal barriers, are provided.

Tarpaulins and temporary enclosures

- 13) Temporary enclosures and tarpaulins consisting of fabric or plastic film, that are used in or within 9.0 meters of a building under construction should:
 - a) meet the requirements of CAN/ULC-S109, “Flame Tests of Flame-Resistant Fabrics and Films”, and
 - b) be securely fastened to prevent them from being blown against heaters or other ignition sources.

Section 06 – C: Electrical Equipment

General safety recommendations

- 1) All workers should be alert around electrical equipment.
- 2) When electrical equipment is not working properly, is hot to touch or gives off an unusual odour - often the first signs of a problem that could cause a fire - disconnect the equipment and call an appropriate maintenance contractor.

- 3) Temporary electrical heating equipment should be equipped with tip-over protection and overheat cut-offs.
- 4) Electrical installations, especially temporary ones, should be of sufficient capacity for the intended use and designed, installed, inspected and maintained by competent personnel, as prescribed by the Electrical Safety Authority (ESA).

Section 76 of the ESA sets out requirements for “Temporary Wiring”.

These requirements cover temporary wiring installations for buildings under construction and supplement or amend the general requirements of the ESA provisions for wiring.

As regards to lighting equipment, ESA requires all electrical products that are used, sold, displayed or advertised for sale in Ontario, to be approved by an accredited certification or evaluation agency. The item must carry the official mark or label of the agency which indicates that the product has been independently assessed for safety.

A list of ESA recognized marks and labels can be found at the ESA website.

Electrical cords

- 5) Some suggested safety practices related to the use of electrical cords on the construction site are outlined as follows:
 - a) Promptly replace any electrical cord that is damaged and requires repair, or has a broken connection, and
 - b) When using extension cords construction workers should:
 - i) protect them from damage;
 - ii) not put them across doorways or any place where they will be stepped on or chafed, or constitute a trip hazard, and if it is not possible to do that ensure that robust protection is provided;

- iii) if possible, check the amperage load specified by the manufacturer or the "listing laboratory", (if such information tags are attached to the extension cord), and not exceed it; and
- iv) do not plug one extension cord into another unless the outlet is capable of carrying the electrical load from more than one extension cord.

PART 07

STORAGE OF COMBUSTIBLE AND HIGHLY FLAMMABLE MATERIALS

The storage of combustible and highly flammable materials on site, in particular flammable liquids and gases, can have a significant adverse impact on construction site safety if not implemented properly.

Large quantities of flammable gases and liquids should never be stored inside the mid-rise wood building under construction itself, but should instead be stored well away from the building in accordance with this Guideline. Generally, the quantity of flammable liquids and gases in use in the mid-rise wood building under construction should be limited to what is required for one day's work, unless the material is suitably stored in accordance with this Guideline.

Flammable gases and liquids should be stored and transported carefully, in appropriate labeled containers and suitable storage facilities as suggested by this Guideline.

Storage of large quantities of ordinary combustibles or high hazard combustibles needs to be controlled and limited by pile size and separated from other combustibles.

“Ordinary combustible commodities” consist of predominantly wood, paper and natural fabrics, with or without metal components. The packaging (such as cartons, plastic wraps, wood pallets, etc.) must be considered as part of the overall commodity. Ordinary combustibles can have some plastics, but only in very small amounts by weight or volume.

“Higher hazard commodities” present a significantly greater challenge to control when involved in a fire. These would include: stacks of wood or plastic pallets; plastic piping, vinyl liners or tiles, plastic tarpaulins, rubber tires; plastic bubble wrap, and stacked foam insulation.

In addition, temporary site offices, trailers and sheds of combustible construction, need to be located at a safe distance from the building under construction.

Details on suggested best practices are outlined below under Sections 7 – A to 7 - D.

Section 07 – A: Flammable and Combustible Liquids

Minimize storage on site

- 1) Deliveries of flammable or combustible liquids should be scheduled in order to minimize overall quantities of combustible materials being stored on site.

Containers for flammable and combustible liquids

- 2) Flammable or combustible liquids should be stored in their original containers, or in listed/approved safety containers.
- 3) A portable container used to store or transport flammable and combustible liquids should:
 - a) be approved for use by a recognized certification or approval organization, and
 - b) have a label stating the use for which the container is approved and the name of the recognized certification or approval organization which gave the approval

Storage and handling of flammable and combustible liquids

- 4) No more than one work day's normal supply of a flammable or combustible liquid should be located in the building under construction.
- 5) All storage of flammable or combustible liquids in the building should be in storage cabinets labeled by an accredited organization to indicate compliance with applicable ULC standards.
- 6) Bulk storage of flammable and combustible liquids should be in a detached non-combustible structure that is at least 6 meters from the nearest building under construction, other combustible construction or storage, or building opening. The storage distance may be reduced to 3.0 m where the exposed building wall is of masonry construction with no openings.

The above clearances do not apply where the amount of flammable or combustible liquids stored is less than 5,000 litres and the exposed building wall is of masonry construction with no openings within 3 meters.

- 7) Dispensing and filling of containers from bulk storage containers should be conducted not less than 9.0 m from the nearest building under construction, other combustible construction or storage, or building opening. The dispensing/filling operation distance may be reduced to 3.0 m where the exposed building wall is of masonry construction with no openings.
- 8) The storage structures for flammable and combustible liquids should:
 - a) be lockable and vented, and
 - b) be provided with secondary containment to hold 110% of the largest potential spill or leak.
- 9) Good flammable and combustible liquids storage and handling practices as contained in Sections 4.1, 4.2 and 4.4 of the OFC, or NFPA 30, “Flammable and Combustible Liquids Code”, should be followed as applicable.

Disposal and cleanup

- 10) Materials susceptible to spontaneous ignition such as oily rags should be stored in a listed or approved disposal container. Containers should be emptied daily in keeping with the CSFSP.
- 11) Means should be provided to clean up and dispose of leakage and spills promptly and safely.

Posting of warning signs

- 12) Warning signs should be posted in prominent locations and in sufficient numbers to warn of storage locations for flammable and combustible liquids on a construction site, and should contain the word “Danger” in large letters (150 mm in height) and state that unauthorized access is forbidden.
- 13) No person should enter an area in which such a sign is posted other than a worker authorized to work in the area.

Section 07 – B: Flammable Gases

Minimize storage on site

- 1) Deliveries of flammable compressed gas should be scheduled in order to minimize overall quantities of combustible materials being stored on site.

Containers for flammable gases

- 2) Flammable compressed gas should be stored in suitable approved containers.

Flammable gases should be stored outside

- 3) Full or empty flammable gas storage cylinders should be stored outside of the building under construction. Only the cylinders needed for the day's use should be brought into the building.
- 4) Bulk storage of flammable compressed gases should be kept in a secure, outdoor enclosure, detached at 6.0 m from the nearest building under construction, or other combustible construction or storage, or building opening.
- 5) Storage cylinders for flammable compressed gas should be secured in an upright position with closed valves.
- 6) Flammable compressed gases should never be stored in common areas, stairways or exits.
- 7) Flammable compressed gases should not be stored near concentrations of combustible materials.
- 8) The control valve of storage cylinders for flammable compressed gas, other than cylinders connected to a regulator, supply line or hose, should be covered by a protective cap that is secured in a proper position.
- 9) Storage cylinders for flammable gas or compressed oxygen should not be placed within 3.0 m of a source of ignition or open flame. This does not apply to storage cylinders that:
 - a) form part of hand-held propane equipment, a lead pot used in plumbing or electrical work, or a propane-powered or propane-heated vehicle; or

- b) are protected from a source of ignition by a barrier, wall or other means of separation.

Section 07 – C: Storage of Ordinary Combustibles and Higher Hazard Materials

General recommendations for storage

- 1) Combustible materials or commodities should never be stored in common areas, or a designated evacuation route (i.e. stairways or exits of the building under construction).
- 2) Ideally, all combustible materials stored in buildings under construction should be: a) stored in tidy orderly piles or on shelves; b) stored to a maximum of 2 meters high; and c) if it is a higher hazard material, it should be stored outside, or where that is not possible, be minimized in volume.
- 3) Storage areas within the building under construction should not exceed 40 m², and should be minimally separated by 7.6 m from another storage area.
- 4) Storage areas should be secured and out of sight of the general public.
- 5) Ordinary combustibles and higher hazard commodities should not be stored in the same areas as flammable/combustible liquids or flammable compressed gases.

Separation from electrical, heating equipment and sprinklers

- 6) Combustible commodity storage should be kept at a minimum distance of 1.0 m away from any electrical panels or other live electrical equipment.
- 7) Combustible commodity storage should be kept at a minimum distance of 1.0 m away from any heating equipment, such as electric heaters, or any equipment prone to heating during use.
- 8) Material storage, whether piled or on shelves, should be kept at a minimum of 18 inches below any charged sprinkler heads.

Section 07 – D: Separation Distances

Separation distance for combustible yard storage

- 1) Where possible and practical, combustible yard storage should be stored no closer than 9.0 m from the building under construction. This may not be possible on all infill sites so other measures should be taken to reduce risk.

Separation distance for temporary combustible site offices and trailers

- 2) Separation distances between a building under construction and temporary site structures (i.e. offices, trailers, or sheds) of combustible construction should where possible be in accordance with item 3) below, which is based on NFPA 241. Where the suggested separation distances above are not feasible due to site conditions, or other factors, an alternative approach providing a similar level of construction site safety should be considered.
- 3) Minimum separation between a building under construction and the temporary site structure varies with the length of the exposing wall of the temporary structure. The length of the temporary structure exposing wall is the number on the left (in meters) and the minimum separation distance to the building under construction (in meters) is the number on the right.
 - 6 meters length of temporary structure exposing wall - 9 meters separation distance to building under construction
 - 9 meters length of temporary structure exposing wall - 11 meters separation distance to building under construction
 - 12 meters length of temporary structure exposing wall - 12 meters separation distance to building under construction
 - 15 meters length of temporary structure exposing wall - 14 meters separation distance to building under construction
 - 18 meters length of temporary structure exposing wall – 15 meters separation distance to building under construction
 - Over 18 meters length of temporary structure exposing wall – 18 meters separation distance to building under construction

Note 1: Where the separation distance between temporary structures is less than the minimum separation distance in Table 1, then the exposing wall length should be considered to be the sum of the individual exposing wall lengths of the temporary structures.

Note 2: A 75% reduction in separation distances should be permitted to be applied when the temporary exposing structure is protected by automatic sprinklers, as sprinkler protection of the temporary structure reduces the risk of the temporary structure becoming an ignition source to the building under construction.

PART 08

HOUSEKEEPING AND WASTE MANAGEMENT

The construction process produces considerable waste material, much of which is combustible. Sawdust, cut-offs, plastic wrapping and other similar materials are all combustible and are easily ignitable.

Good housekeeping is therefore one of the most important factors in site fire prevention. Proper storage and removal of combustible waste on the work site reduces the risk of fires.

Rubbish and construction debris should be lowered from the building by chute, container, crane or hoist. If disposal chutes are used, they should be installed as prescribed by regulations and as recommended in this Guideline.

Even when combustible waste has been removed from the building itself, it can still constitute a fire hazard if stored too close to the structure, or construction material storage areas. It should also be stored in appropriate lockable metal containers that reduce the potential for fire ignition and spread.

Arsonists or other opportunistic fire-setters may perceive the waste collection areas and receptacles as inviting places to start a fire. Careful location of storage containers can also discourage unauthorized access by reducing accessibility from off-site, and by increasing the likelihood of detection.

Regular removal of construction waste from the work site to a proper disposal facility can also help deter fire-setters by denying them accessible combustible materials.

Details on suggested best practices are outlined below under Section 08 – A.

Section 08 – A: Housekeeping and Handling Waste Material

Removal of waste material

- 1) To prevent a hazardous condition arising, waste material and recyclable material should be removed from the building under construction at least daily to a suitable on-site disposal area to reduce the combustible fire load.
- 2) Reusable material not currently in use should be removed to a storage area as often as is necessary to prevent a hazardous condition arising and, in any event, at least once daily.

If such material is no longer needed, resources such as ReuseWood.org can assist in finding services that will take this material.

- 3) Accumulated waste and recyclable materials should be removed from the site at least weekly. Resources such as ReuseWood.org can assist in finding services that will take this material.
- 4) Higher hazard wastes, such as used flammable or combustible liquids, idle wood or plastic pallets, and rubber tires, should be removed from the site as soon as possible.

Leaks or spills of flammable or combustible liquids or other materials should be cleaned up quickly and disposed of as per Section 07 – A.

Location of waste material on the construction site

- 5) Combustible refuse in sufficient quantities to constitute a fire hazard should be moved to a safe distance from combustible buildings or building materials storage areas.

If not stored in a lidded metal container, such combustible refuse should be located at least 7.6 m from combustible buildings or building materials storage areas, where practical.

- 6) Combustible refuse should, where possible, be stored in metal containers provided with lockable lids that remain closed during idle periods.
- 7) Where possible and practical, a minimum clearance of 3.0 m should be maintained between metal containers containing combustible refuse and the building under construction.
- 8) Waste storage containers should be stored in illuminated areas of the work site that are monitored by site security personnel.

Disposal chutes

- 9) Rubbish, debris and other materials should not be permitted to fall freely from one level of the building to another. All materials to be removed should be lowered by chute, container, crane or hoist.
- 10) Disposal chutes should:
 - a) be constructed of non-combustible material where practical,
 - b) be adequately constructed and rigidly fastened in place,
 - c) be enclosed on 4 sides if on a slope with a gradient over one in one,
 - d) have a gate at the bottom end where one is necessary to control the flow of material, and
 - e) discharge into a container or an enclosed area surrounded by fire-resistant barriers.
- 11) Access openings to a disposal chute should:
 - a) be constructed to prevent spilling over when rubbish, debris and other materials are being deposited in the chute,
 - b) if it is at or below floor level, have a curb that is at least 100 mm high to facilitate proper cleaning and drainage,
 - c) not be more than 1.2 meters high to facilitate cleaning if material becomes stuck in the chute,
 - d) be kept closed when not in use; and
 - e) be designed so that person are discouraged from entering the chute.

PART 09

FIRE PROTECTION AND FIREFIGHTING

Best practices outlined in this Guideline are intended to reduce two types of risk: the risk of a significant construction site fire occurring in the first place; and the risk that the fire will spread and adversely impact property and persons.

The provision of fire protection systems at a construction site can help to reduce both risks.

For example, the provision of manual fire suppression systems, e.g. extinguishers and hose standpipe systems can reduce the risk of a fire developing beyond its incipient stage, if used quickly and effectively.

Automatic fire suppression systems, e.g. sprinklers, if operational in the area of fire origin, will also reduce the risk of a fire developing beyond its incipient stage, but can also limit the impact of larger fires once started.

Installation and operability of permanent standpipes should be prioritized as the floors are completed, as part of the on-site fire protection strategy. Use of temporary standpipe systems is also an acceptable means of providing a manually operated fire safety system while the building is under construction.

An effective fire department response can also have a significant impact on fire growth and spread. Effective fire department response depends on prompt arrival, good site access, and an adequate and immediately available fire protection water supply. Early discussion with the municipal fire department during the development of the CSFSP and pre-fire planning will assist in addressing these issues.

Fire service access to the construction site and to the building under construction is a critical aspect of fire safety, with regard to fire rescue and limiting fire growth. As such, fire access routes need to be strategically located and should have the appropriate dimensions and features to ensure quick and unimpeded fire service access to the building under construction.

This section also addresses the need for stairs providing fire service access to be unobstructed at all times during construction and to have sufficient signage (i.e. floor level designation) enabling the fire service to quickly reach the fire location.

It also discusses the need for fire hydrants to be charged, operational and accessible year round during construction, where they are to be provided. Such fire hydrants should be available when combustible materials are brought to the site, and preferably before they arrive.

Water supply requirements should consider the building's size, construction stage, buildings exposed by the construction, operating fire protection systems, construction materials and methods, and effectiveness of fire department response. This water supply can be from public or private sources, or a combination of both.

This section also includes more detailed information on the installation of permanent and temporary standpipes during construction along with portable fire extinguishers.

Details on suggested best practices and factors to consider in determining adequate fire protection and firefighting are outlined below in Sections 9 – A to 9 - E.

Section 09 – A: Fire Department Access

At what point should the fire service have access to the construction site?

- 1) The fire department should have access to the construction site as soon as combustible materials arrive on site.

In addition, the fire department should have access to a key box (or other means of gaining access) where locked gates restrict access to the construction site.

Construction site access routes

- 2) Construction site access routes for fire department vehicles should be provided and maintained.
- 3) Access routes should have the appropriate location and dimensions to be useful for the fire service. To the extent possible, access routes should:
 - a) be located within 3.0 to 15.0 m of the principal entrance of the building under construction;
 - b) have a clear width not less than 6.0 m and a centreline radius not less than 12.0 m;
 - c) have an overhead clearance not less than 5.0 m; and
 - d) have a change of gradient not more than 1 in 12.5 over a minimum distance of 15.0 m.
- 4) In addition, access routes should, to the extent possible:
 - a) be designed to support expected loads imposed by fire department equipment, and allow access under all climatic conditions;
 - b) be connected with a public thoroughfare; and
 - c) be not be more than 20 m below the uppermost floor level under construction.

No obstruction of access routes

- 5) The required minimum width of access routes should not be obstructed in any manner, including obstruction by parked vehicles.
“No parking” signs or other appropriate notices prohibiting obstruction of access routes should be provided, maintained, and enforced.

Alternatives to providing all suggested access routes

- 6) On some construction projects, particularly in the case of small infill sites, it may not be possible to provide all the access routes or meet all the suggested dimensions outlined above.

Where all or some of the suggested access routes are deemed impractical, a fire protection system or systems should be provided as a compensating measure.

Such a fire protection system or systems should be an element of the CSFSP in consultation with the CFO.

Fire service should have access to the all floors of the building

- 7) In addition to stairway access already required, provision should be made for the use of existing elevators, hoists or lifts to assist firefighting personnel to reach all levels of the building under construction, where practical.

Access routes and the CSFSP

- 8) Information on access routes should be included in the CSFSP.
Access routes should not be modified until changes have been provided to and reviewed by the CFO.

Access route changes should not impair fire suppression or rescue operations.

Section 09 – B: Fire Protection Water Supply

Access to fire hydrants and water supply

- 1) Fire hydrants serving a construction site should be installed and operational prior to significant amounts of combustibles being brought to the site.
- 2) It is important that fire hydrants serving a construction site:
 - a) are charged and operational,
 - b) are clearly marked with a sign so that they can be located in all weather conditions,
 - c) have an unobstructed clearance of not less than 2.0 m at all times, and
 - d) are serviced regularly.
- 3) No material, equipment or construction should be located in a way that would interfere with access to fire hydrants.
- 4) Unobstructed access to fire department connections for standpipes and sprinkler systems should be provided and maintained.
- 5) A static water supply for firefighting operations should be readily available in the absence of a municipal water supply.

Water supply analysis in the CSFSP

- 6) A water supply analysis addressing water availability and needs should be included in the CSFSP that is submitted to the municipal CFO early in the project development process (Part 01, Construction Site Safety Plan).
- 7) This water supply analysis should address: the availability of reliable water supplies for firefighting, rescue operations, exposure protection and on-site fire protection systems; and how those water supplies are provided.
- 8) The water supply analysis should consider factors that would tend to increase water needs under item (9) below.

Factors affecting water needs such as building height, size and location are determined by the developer. The water supply analysis should also consider design and construction parameters over which the designer and contractor do have some control, which are listed under (10) below.

Factors that affect water supply needs

9) The water supply analysis should consider the following factors that affect potential fire size and potential fire spread to adjacent buildings.

a) Building height and area

The greater the number of storeys in the combustible building (for example 6 storeys versus 5 storeys) and the larger the building floor areas (subject to maximums in the OBC and permitted use of firewalls to add additional buildings), the greater the volume of combustible material.

As the volume of unprotected combustible building material increases there is an associated increase in the potential impact of a fire should it occur, resulting in the need for an increase in water supplies.

b) Proximity of adjacent buildings

The more sides of the building under construction that are close to other existing buildings, and the closer those existing buildings are to the building under construction, the greater the potential impact of the fire and therefore the greater the water supply needs. Additional fire suppression water will be needed to protect the adjacent buildings from fire exposure.

The OFMEM recommends that water supply analysis takes into account existing buildings within 25 meters of the building under construction. OBC provisions on adequate water supply require increased water supply for completed buildings when other buildings are within 13 meters.

Note: Heat radiation from a fire decreases exponentially with distance. For example, heat radiation from a fire in a building under construction that is 10 meters away, is 1/4 that from a building that is 5 meters away. Similarly the heat radiation at 20 meters is 1/16 that at 5 meters.

Factors that can reduce water supply needs

10) Water supply analysis should also consider factors that can reduce the impact of a potential fire and thereby reduce water supply needs. The factors listed below can reduce combustible fuel load and fire spread.

a) Minimizing exposed construction

Minimizing the number of storeys that are in the “building construction stage”, with exposed combustible structural members and insulation should contribute to reduced water supply needs.

b) Minimizing unsprinklered storeys

Minimizing the number of storeys at any point during construction that will not have charged sprinklers, should contribute to reduced water supply needs.

c) Using hybrid construction

Using hybrid construction to reduce the combustible load during construction. For example, using gypsum board on steel stud or concrete exit stairwells (as currently required by OBC) and using concrete for the first floor, can reduce the total combustible load.

Using hybrid construction should reduce water supply needs.

d) Using panelized and modular construction

The use of prefabricated wood building panels or modules constructed off site can substantially reduce on-site construction time and on-site construction waste, thereby reducing water needs. Prefabrication allows for cleaner construction sites and faster construction reducing the time during which wood framing is not protected.

Use prefabricated wood panels and modules should contribute to reduced water supply needs.

e) Using mass timber

Using mass timber products and systems (such as, post-and-beam construction, formed of solid-sawn heavy timber or glued-laminated timber (glulam) members; cross-laminated timber (CLT); and, nail-laminated timber (NLT)) in the building construction will tend to reduce water needs. While mass timber may consist of as much or more “total combustible fuel load” as lightweight wood members, less of the wood is “available” to a fire at any given time due to significantly reduced surface-area-to-volume ratios and the protection afforded by charring.

Using mass timber construction should contribute to reduced water supply needs.

f) Using fire-retardant wood products and fire-resistant wood and wood-based products

Using fire-retardant wood products in the building construction will tend to reduce water needs.

There are always new products being developed. These can include fire-resistant coatings for the surface of wood products that can protect the wood product from the effects of fire for a period of time, as well as wood-based products that incorporate fire-resistant compounds within the matrix of the product itself.



Photo of midrise wood frame building under construction.

Source: Steven Street, Ontario Wood Works!

Alternative water supply source

11) Where an adequate and reliable public water supply is not available, an alternative means of providing the water supply should be established, or means should be found to substantially reduce the fire risk. The CFO should be consulted on any alternative fire protection water supplies.

Section 09 – C: Standpipes and Hoses

Progressive installation of standpipes

- 1) As construction proceeds a permanent or temporary standpipe should be installed on all levels of the building. A temporary standpipe may be installed on the two uppermost floor levels where it may not yet be practical to install a permanent standpipe.

Permanent standpipes

- 2) A permanent standpipe that is progressively installed in a building under construction need not extend any higher than two storeys below the uppermost work level, but needs to be useful for the fire service and any on-site personnel specifically trained to use the standpipe.
- 3) A permanent standpipe must be designed and constructed in accordance with the building code. The provisions for permanent and temporary standpipes outlined below are based on current Ministry of Labour regulations.

Permanent standpipes should:

- a) have sufficient hose outlets to permit every part of the floor area to be protected by a hose not longer than 23 m,
- b) be provided with a fire department connection on the street side of the building: i) not more than 900 millimetres and not less than 300 millimetres above ground level; ii) to which there is clear access at all times; and iii) located not more than 45 m from an operational hydrant,
- c) be maintained so as to be readily operable if required to be used,
- d) have a valve at every hose outlet, and the hose valves and pipe size should conform to Subsection 3.2.9. of the OBC, and

- e) where practical, be located near an egress stairway to make it easily accessible to the fire department upon their arrival on the floor and for trained workers without being cut off from the egress stairway.

Hoses should be attached to each permanent standpipe with a nozzle attached to each hose. Every hose used with a permanent standpipe should:

- a) be at least thirty-eight millimetres in diameter;
- b) have a combination straight stream and fog nozzle; and,
- c) be stored on a rack in such a way as to protect it from damage and keep it available for immediate use.

Temporary standpipes

- 4) A temporary standpipe should be installed on those floors not provided with a hose connection on a permanent standpipe.
- 5) Where a temporary standpipe has been installed, it should not be disconnected until the permanent standpipe is connected, so that there is always a standpipe in service.
- 6) A temporary standpipe should be maintained so that it is readily operable.
- 7) A temporary standpipe should have at least one hose outlet per floor, with a valve and a 38 millimetres hose attached to each hose outlet and a nozzle attached to each hose.
- 8) Temporary standpipes should have a fire department connection to which there is clear access at all times, located between 300 and 900 mm above ground level on a side of the building that faces the street.
- 9) If a temporary standpipe is installed, details of its installation should be provided in the CSFSP.
- 10) Temporary standpipes may be dry systems complying with the above provisions.

Option to have on-site personnel trained in use of a fire hose

11) As part of the CSFSP, one option is to have personnel on the construction site, particularly during hot-work operations, specifically and properly trained in the use of a fire hose attached to a standpipe. Such personnel can be properly trained construction workers or other qualified persons (such as off-duty firefighters, part time firefighters, volunteer firefighters, and pre-service firefighters trained to NFPA 1001, “Firefighter Certification”).

This would allow such persons, where it is safe to do so, to initiate fire-fighting operations as soon as possible, while the fire service is on its way to the construction site.

Section 09 – D: Portable Fire Extinguishers

Location of fire extinguishers on the construction site

- 1) Portable fire extinguishers should be provided in locations on the construction site where:
 - a) hot work operations are carried out,
 - b) combustibles are stored,
 - c) internal combustion engines are located,
 - d) flammable and combustible liquids, and flammable compressed gases are stored or handled, and
 - e) temporary or permanent fuel-fired equipment is used.
- 2) Moreover, a portable fire extinguisher should be located
 - a) at each egress stair on each floor level of the building,
 - b) within 25 m of any portion of the accessible floor area of the building,
 - c) within 30 m of stored combustibles located outside the building under construction, and

- d) within 9 m of flammable and combustible liquids or flammable gases that are stored or handled, internal combustion engines, temporary fuel-fired equipment, and designated smoking areas.
- 3) At least two portable fire extinguishers should be located within 9 m of hot work operations, including hot surface roofing operations.
- 4) Portable fire extinguishers should be provided in or on vehicles working on construction sites, including industrial trucks.
- 5) Portable fire extinguishers should be visible or designated by signage, and be accessible.

Rating of fire extinguishers

- 6) The performance of portable fire extinguishers is rated with respect to water equivalency when used on ordinary combustibles (“A”), the amount of square footage that the extinguisher can cover when used on flammable and combustible liquid fires (“B”), and whether it is suitable for use on electrically energized equipment (“C”).

Portable fire extinguishers should have a minimum rating of:

- a) 3-A:10-B:C on moveable equipment, and
- b) 4-A:40-B:C in all other locations.

Training on use of fire extinguishers

- 7) Every worker who may be required to use a fire extinguisher should be trained in its use (see Section 01 – C).

Section 09 – E: Inspection, Servicing and Maintenance

As a minimum, the inspection, testing and maintenance of portable fire extinguishers, and fire protection equipment that are complete and permanent systems, should follow OFC requirements.

PART 10

PROTECTION OF EXPOSURES TO ADJACENT PROPERTIES

Construction site fires can produce considerable heat creating the risk of fire damage or spread to adjacent existing buildings.

Before starting construction it is important for a builder to consider in the CSFSP and the pre-incident plan the potential impact of a construction site fire on adjacent buildings or nearby properties, and how such potential risks can be mitigated. This is especially significant where mid-rise wood buildings are being constructed in existing built-up areas.

Various measures can reduce the probability and severity of a fire that exposes adjacent buildings. These measures should be addressed in the CSFSP.

Details on suggested best practices are outlined below under Section 10 – A.

Section 10 – A: Exposure Factors to Consider

Adjacent property exposures considered in CSFSP and pre-incident plan

- 1) The CSFSP and the pre-incident plan should consider the potential impact on adjacent buildings/property of a fire originating on the construction site.

The risk of a fire in a building under construction exposing adjacent properties is a function of the likelihood of a significant fire occurring in the first place, the potential magnitude of a fire, should it occur, and the proximity of adjacent buildings.

The risk of a significant fire occurring in the first place depends on the nature and extent of best practices implemented in the CSFSP, as well as whether the builder and construction site workers have embraced the “culture of safety”.

The potential impact of a fire on adjacent properties will be dependent on best practices that facilitate fire suppression measures and limit fire growth in the building under construction, the distance to adjacent buildings, as well as measures that protect the adjacent buildings/properties.

- 2) Water supply, firefighting requirements, or any other measures to protect adjacent exposures, should be established during the pre-incident planning process in collaboration with the municipal Chief Fire Official (CFO). (See Part 09 of this Guideline, Fire Protection and Firefighting).

Many of the factors affecting reducing risk to adjacent properties are the same as those that reduce water supply needs. .

Fire Exposure of Adjacent Properties: Risk Factors

- 3) Several risk factors that determine the level of exposure of adjacent buildings are determined largely by the developer and the building site.

These include:

- a) Building size – The greater the building area, within the Building Code area limits, the greater the potential amount of combustible material.
The use of firewalls permits two or more buildings to be attached, which can further increase the total combustibles on the work site.
 - b) Building height - Under the OBC, mid-rise wood buildings are limited to 6 storeys. As building height increases, within the OBC limits, total combustible material may increase.
 - c) Proximity of adjacent buildings – As noted in Part 09, the number of sides of the building under construction that will be in close proximity to adjacent buildings – whether just 1, 2, 3, or 4 sides, as well as the actual distance from those adjacent buildings, will both have a significant impact on the likelihood of fire spread or damage to those adjacent buildings.
- 4) Other site-specific risk factors include:
- a) exterior wall construction and openings in adjacent buildings;
 - b) occupancy of the adjacent buildings and the ability of occupants to evacuate quickly;
 - c) fire department access to the exposed face of adjacent buildings;
 - d) available fire department resources and their response time; and,
 - e) available water supplies for fire protection.

Best Practices Reducing Risk of Fire Occurrence

- 5) As discussed in Part 01, building developers and contractors can reduce the risk of a significant fire occurrence by developing a robust, effective and comprehensive CSFSP. Relevant parts of the CSFSP would include:
- a) Hot work protocols,
 - b) On-site smoking protocols (as per Smoke Free Ontario Act),
 - c) Controls on various other ignition sources,
 - d) Storage protocols related to combustible and highly flammable materials,
 - e) Waste management practices,

- f) Site security provisions,
- g) Maximization, to the extent possible, of the provision of manual fire suppression equipment (including charged standpipes and fire extinguishers),
- h) Worker training in fire suppression activities, such as the use of fire extinguishers and standpipes/fire hoses, and
- i) Complete acceptance of the “culture of safety” by the builder and construction site workers.

Some of these same areas of best practice can also reduce the risk of fire growth and spread to adjacent buildings.

Best Practices Reducing Risk to Adjacent Building of Fire Growth/Spread

- 6) Building developers and contractors can also reduce the risk of fire growth and spread to adjacent buildings, if a fire does occur, by developing a robust, effective and comprehensive CSFSP including:

- a) An effective CSFSP

Relevant parts of the CSFSP that can reduce fire growth and spread, including: i) storage protocols related to ordinary combustibles and higher hazard materials; ii) waste management practices; iii) maximizing, to the extent possible, the provision of manual fire suppression equipment (including charged standpipes and fire extinguishers) and implementing maintenance practices to ensure they are functioning properly; and, iv) worker training in fire suppression activities, such as the use of fire extinguishers and standpipes/fire hoses.

- b) Minimizing exposed construction

Minimizing the number of storeys that are in the “building construction stage”, with exposed combustible structural members and insulation.

This has the effect of reducing the fire impact on adjacent buildings.

- c) Minimizing unsprinklered storeys

Minimizing the number of storeys at any point during construction that will not have charged sprinklers, will in effect reduce the fire impact on adjacent buildings.

d) Using panelized and modular construction

The use of prefabricated wood building panels or modules constructed off site, can substantially reduce on-site construction time and waste.

This has the effect of reducing the fire impact on adjacent buildings as well as the length of time that adjacent buildings will be exposed.

e) Using mass timber (see Section 09 – B)

Using mass timber products and systems reduces the amount of wood that is “available” to a fire at any given time due to significantly reduced surface-area-to-volume ratios and the protection afforded by charring.

This has the effect of reducing the fire impact on adjacent buildings.

f) Using fire-retardant wood products and fire-resistant wood and wood-based products (see Section 09 – B)

Using fire-retardant wood products rather than non-fire-retardant wood products in the building construction, as well as wood-based products that incorporate fire-resistant compounds will reduce fire spread.

This has the effect of reducing the fire impact on adjacent buildings.



Photo of mid-rise wood frame building under construction.

Source: Steven Street, Ontario Wood Works!

PART 11

Part 11: OTHER

It is important for management to be committed to construction site safety, and to establish a “culture of safety” on the construction site. A commitment statement should be prominently displayed and disseminated to all staff.

This includes regular self-inspections by the FSC and the use of checklists to track review of key elements.

Insurance companies who provide insurance coverage for the construction site should be engaged to review the construction site fire safety plan before the start of construction.

Details on suggested best practices are outlined below under Sections 11 – A to 11- C .

Section 11 – A: Management Commitment

Corporate commitment statement

- 1) The construction firm should have a corporate commitment statement addressing safety, fire protection and general loss prevention.
- 2) This statement should be prominently displayed and disseminated to all staff and trades at the onset and throughout the term of the project.

Commitment to undertake self-inspections and training

- 3) Regular self-inspections of the entire construction site, both inside and outside of the building(s) under construction, should be conducted using a site-specific checklist for reference and a copy of the inspection results should be maintained on file at the site.
- 4) Training programs should be created that include not only fire prevention, but also security, site safety, and general loss prevention.

Section 11 – B: Insurer Engagement

Risk control representatives from the insurance company should be engaged in the review of the construction site fire safety plan (CSFSP) before the start of construction.

Section 11 – C: Culture of Safety

It is important to establish a “culture of safety” on the construction site.

Without a “culture of safety” being fully embraced by the builder and the construction site workers, the provision of a CSFSP and other steps to meet this guideline will be much less effective.

Establishing an effective “culture of safety” can be accomplished through measures such as training, explaining the reasons for construction site safety practices, making changes to construction practices that are not consistent with construction site safety, maintaining good communication between the builder and the fire service as well as between all levels of the construction site team, and the inclusion within sub-trade contracts the need to comply with the relevant parts of this Guideline.

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*

Note:

The excerpts from the Ministry of Labour regulations below are provided to assist persons in using the guideline. The best practices outlined in the guideline are considerably broader in scope than the MOL fire safety regulations outlined below. In those areas where the guidelines cover the same topics as the MOL regulations, the guidelines meet or exceed requirements in the regulation below.

Please consult Ontario Regulation 213/91, “Construction Projects”, for the authoritative version and complete regulation. Other regulations under 213/91 may also have an indirect affect on construction site fire safety.

GENERAL REQUIREMENTS

14. (1) A constructor shall appoint a supervisor for every project at which five or more workers will work at the same time. O. Reg. 213/91, s. 14 (1).

(2) The supervisor shall supervise the work at all times either personally or by having an assistant, who is a competent person, do so personally. O. Reg. 213/91, s. 14 (2).

(3) A supervisor or a competent person appointed by the supervisor shall inspect all machinery and equipment, including fire extinguishing equipment, magazines, electrical installations, communication systems, sanitation and medical facilities, buildings and other structures, temporary supports and means of access and egress at the project to ensure that they do not endanger any worker. O. Reg. 213/91, s. 14 (3).

(4) An inspection shall be made at least once a week or more frequently as the supervisor determines is necessary in order to ensure that the machinery and equipment referred to in subsection (3) do not endanger any worker. O. Reg. 213/91, s. 14 (4).

(5) A competent person shall perform tests and observations necessary for the detection of hazardous conditions on a project. O. Reg. 213/91, s. 14 (5).

17. (1) A constructor shall establish for a project written procedures to be followed in the event of an emergency and shall ensure that the procedures are followed at the project. O. Reg. 145/00, s. 11.

(2) The constructor shall review the emergency procedures with the joint health and safety committee or the health and safety representative for the project, if any. O. Reg. 145/00, s. 11.

(3) The constructor shall ensure that the emergency procedures are posted in a conspicuous place at the project. O. Reg. 145/00, s. 11.

18. The constructor shall ensure that every worker at the project has ready access to a telephone, two-way radio or other system of two-way communication in the event of an emergency. O. Reg. 145/00, s. 11.

19. If, under this Regulation, a record is required to be kept available for inspection at a project, the constructor or employer, as the case may be, shall keep the record for at least one year after the project is finished. O. Reg. 213/91, s. 19.

HOUSEKEEPING

35. (1) Waste material and debris shall be removed to a disposal area and reusable material shall be removed to a storage area as often as is necessary to prevent a hazardous condition arising and, in any event, at least once daily. O. Reg. 213/91, s. 35 (1).

(2) Rubbish, debris and other materials shall not be permitted to fall freely from one level to another but shall be lowered by a chute, in a container or by a crane or hoist. O. Reg. 213/91, s. 35 (2).

(3) Despite subsection (2), rubbish, debris and other materials from demolition on a project may be permitted to fall or may be dropped into an enclosed designated area to which people do not have access. O. Reg. 213/91, s. 35 (3).

(4) A chute,

(a) shall be adequately constructed and rigidly fastened in place;

(b) if it has a slope exceeding a gradient of one in one, shall be enclosed on its four sides;

(c) shall have a gate at the bottom end if one is necessary to control the flow of material; and

(d) shall discharge into a container or an enclosed area surrounded by barriers. O. Reg. 213/91, s. 35 (4).

(5) The entrance to a chute,

(a) shall be constructed to prevent spilling over when rubbish, debris and other materials are being deposited into the chute;

(b) if it is at or below floor level, shall have a curb that is at least 100 millimetres high;

(c) shall not be more than 1.2 metres high;

(d) shall be kept closed when the chute is not in use; and

(e) shall be designed so that any person will be discouraged from entering it. O. Reg. 213/91, s. 35 (5).

36. If a formwork tie, reinforcing steel, a nail or another object protruding from concrete or another surface may endanger a worker, the protrusion shall be removed, cut off at the surface or otherwise protected as soon as practicable. O. Reg. 213/91, s. 36.

37. (1) Material or equipment at a project shall be stored and moved in a manner that does not endanger a worker. O. Reg. 213/91, s. 37 (1).

(2) No material or equipment to be moved by a crane or similar hoisting device shall be stored under or in close proximity to an energized outdoor overhead electrical conductor. O. Reg. 213/91, s. 37 (2).

38. Blocking, support chains, metal bands, wire rope and rigging components shall be removed from material or equipment in a manner that does not endanger a worker. O. Reg. 213/91, s. 38.

39. Material and equipment at a project shall be piled or stacked in a manner that prevents it from tipping, collapsing or rolling. O. Reg. 213/91, s. 39.

40. (1) No material shall be stored, stacked or piled within 1.8 metres of,

(a) an opening in a floor or roof;

(b) the open edge of a floor, roof or balcony; or

(c) an excavation. O. Reg. 213/91, s. 40 (1).

(2) Subsection (1) does not apply with respect to material in a building or a completely enclosed part of a building that is used solely for storing and distributing materials. O. Reg. 213/91, s. 40 (2).

(3) Subsection (1) does not apply with respect to small masonry units including bricks, blocks and similar objects,

(a) that can be handled by one worker;

(b) that are to be used at the edge of a floor, a roof, an excavation or an opening in a floor or roof; and

(c) that are stacked in a pile whose height is less than the distance from the face of the pile to the edge of the floor, roof, excavation or opening in a floor or roof. O. Reg. 213/91, s. 40 (3).

41. A combustible, corrosive or toxic substance shall be stored in a suitable container. O. Reg. 213/91, s. 41.

42. (1) A storage cylinder for compressed gas shall be secured in an upright position. O. Reg. 213/91, s. 42 (1).

(2) The control valve of a storage cylinder for compressed gas, other than a cylinder connected to a regulator, supply line or hose, shall be covered by a protective cap that is secured in its proper position. O. Reg. 213/91, s. 42 (2).

(3) A spent storage cylinder shall not be stored inside a building. O. Reg. 213/91, s. 42 (3).

(4) No storage cylinder for propane shall be placed closer than three metres to a source of ignition or fire. O. Reg. 213/91, s. 42 (4).

(5) Subsection (4) does not apply to a storage cylinder,

- (a) that forms part of hand-held propane equipment;
- (b) that forms part of a lead pot used in plumbing or electrical work;
- (c) that forms part of a propane-powered or propane-heated vehicle; or
- (d) that is protected from a source of ignition by a barrier, wall or other means of separation. O. Reg. 213/91, s. 42 (5).

43. (1) A flammable liquid or gas shall be stored in a building or storage tank that is suitable for the purpose and, if practicable, not less than 100 metres from a magazine for explosives. O. Reg. 213/91, s. 43 (1).

(2) No more than one work day's normal supply of a flammable liquid shall be stored in a building or structure on a project unless it is stored,

(a) in a container that is suitable for the particular hazards of the liquid; and

(b) in a controlled access area or a room,

(i) that has sufficient window area to provide explosion relief to the outside, and

(ii) that is remote from the means of egress from the building or structure. O. Reg. 213/91, s. 43 (2).

(3) A portable container used to store or transport flammable liquids,

(a) shall be approved for use for that liquid by a recognized testing laboratory; and

(b) shall have a label stating the use for which the container is approved and the name of the testing laboratory which gave the approval required by clause (a). O. Reg. 213/91, s. 43 (3).

44. (1) Signs meeting the requirements of subsection (2) shall be posted in prominent locations and in sufficient numbers to warn workers of a hazard on a project. O. Reg. 213/91, s. 44 (1).

(2) A sign shall contain the word “DANGER” written in legible letters that are at least 150 millimetres in height and shall state that entry by any unauthorized person to the area where the hazard exists is forbidden. O. Reg. 213/91, s. 44 (2).

(3) Without limiting the generality of subsection (1), a sign shall be posted,

(a) adjacent to a hoisting area;

(b) under a boatswain’s chair, a suspended scaffold or a suspended platform;

(c) at the outlet from a chute;

(d) at a means of access to a place where there may be a noxious gas, vapour dust or fume, noxious substance or a lack of oxygen; and

(e) where there is a potential hazard from an energized overhead electrical conductor at more than 750 volts. O. Reg. 213/91, s. 44 (3).

(4) No person shall enter an area in which a sign is posted other than a worker authorized to work in the area. O. Reg. 213/91, s. 44 (4).

45. (1) The areas in which a worker is present and the means of access to and egress from those areas shall be adequately lit. O. Reg. 213/91, s. 45 (1).

(2) A light bulb used in a temporary lighting system shall be enclosed by a mechanical protection device. O. Reg. 213/91, s. 45 (2).

46. (1) A project shall be adequately ventilated by natural or mechanical means,

(a) if a worker may be injured by inhaling a noxious gas, vapour, dust or fume or from a lack of oxygen; or

(b) if a gas, vapour, dust or fume may be capable of forming an explosive mixture with air. O. Reg. 213/91, s. 46 (1).

(2) If it is not practicable to provide natural or mechanical ventilation in the circumstances described in clause (1) (a), respiratory protective equipment suitable for the hazard shall be provided to and used by the workers. O. Reg. 213/91, s. 46 (2).

47. No internal combustion engine shall be operated,

(a) in an excavation unless provision is made to ensure that exhaust gases and fumes will not accumulate in the excavation; or

(b) in a building or other enclosed structure,

(i) unless the exhaust gases and fumes from the engine are discharged directly outside the building or structure to a point sufficiently remote to prevent the return of the gases and fumes, or

(ii) unless there is an adequate supply of air for combustion and adequate natural or mechanical ventilation to ensure exhaust gases and fumes will not accumulate. O. Reg. 213/91, s. 47.

48. (1) When a drum, tank, pipeline or other container is to be repaired or altered,

(a) its internal pressures shall be adjusted to atmospheric pressure before any fastening is removed;

(b) it shall be drained, cleaned and ventilated or otherwise rendered free from any explosive, flammable or harmful substance; and

(c) it shall not be refilled during repair or alteration if the substance which is to be placed in it may vaporize or ignite. O. Reg. 213/91, s. 48 (1).

(2) Clauses (1) (a) and (b) do not apply with respect to a pipeline if hot-tapping and boxing-in are carried out by a competent worker under controlled conditions that provide for the protection of all persons. O. Reg. 213/91, s. 48 (2).

TEMPORARY HEAT

49. (1) A fuel-fired heating device shall be located, protected and used in such a way that there is no risk of igniting a tarpaulin or similar temporary enclosure or combustible materials adjacent to it. O. Reg. 213/91, s. 49 (1).

(2) No fuel-fired heating device shall be used in a confined or enclosed space unless there is an adequate supply of air for combustion and adequate general ventilation. O. Reg. 213/91, s. 49 (2).

(3) A fuel-fired heating device shall be protected from damage and from overturning. O. Reg. 213/91, s. 49 (3).

(4) No fuel-fired heating device shall be located so as to restrict any means of egress. O. Reg. 213/91, s. 49 (4).

(5) A fuel-fired heating device that generates noxious products of combustion shall discharge the products of combustion outside the building or structure in which it is located. O. Reg. 213/91, s. 49 (5).

50. All fuel supply lines shall be constructed, guarded or placed in such a way as to be protected from damage. O. Reg. 213/91, s. 50.

51. (1) Temporary steam-piping shall be installed and supported so as not to endanger a worker. O. Reg. 213/91, s. 51 (1).

(2) Temporary steam-piping shall be insulated or otherwise protected if a worker is likely to come into contact with it. O. Reg. 213/91, s. 51 (2).

FIRE SAFETY

52. (1) Fire extinguishing equipment shall be provided at readily accessible and adequately marked locations at a project. O. Reg. 213/91, s. 52 (1).

(1.1) Every worker who may be required to use fire extinguishing equipment shall be trained in its use. O. Reg. 145/00, s. 16.

(2) Without limiting subsection (1), at least one fire extinguisher shall be provided,

(a) where flammable liquids or combustible materials are stored, handled or used;

(b) where oil-fired or gas-fired equipment, other than permanent furnace equipment in a building, is used;

(c) where welding or open-flame operations are carried on; and

(d) on each storey of an enclosed building being constructed or altered. O. Reg. 213/91, s. 52 (2).

(3) At least one fire extinguisher shall be provided in a workshop for each 300 or fewer square metres of floor area. O. Reg. 213/91, s. 52 (3).

(4) Clause (2) (d) and subsection (3) do not apply to a building,

(a) that is to be used as a detached or semi-detached single-family dwelling;

(b) that has two storeys or less and is to be used as a multiple family dwelling; or

(c) that has one storey with no basement or cellar. O. Reg. 213/91, s. 52 (4).

53. (1) Fire extinguishing equipment shall be of a suitable type and size to permit the evacuation of workers during a fire. O. Reg. 213/91, s. 53 (1).

(2) Every fire extinguisher,

(a) shall be a type whose contents are discharged under pressure; and

(b) shall have an Underwriters' Laboratories of Canada 4A40BC rating. O. Reg. 213/91, s. 53 (2).

54. (1) Fire extinguishing equipment shall be protected from physical damage and from freezing. O. Reg. 213/91, s. 54 (1).

(2) After a fire extinguisher is used, it shall be refilled or replaced immediately. O. Reg. 213/91, s. 54 (2).

55. Every fire extinguisher shall be inspected for defects or deterioration at least once a month by a competent worker who shall record the date of the inspection on a tag attached to it. O. Reg. 213/91, s. 55.

56. No work shall be carried out at a height of 84 metres or more in a building unless the building has temporary or permanent fire pumps that provide a minimum water flow of 1,890 litres per minute at a discharge pressure of at least 450 kilopascals at and above the 84-metre height. O. Reg. 145/00, s. 17.

57. (1) As construction proceeds in a building with two or more storeys, a permanent or temporary standpipe shall be installed to within two storeys of the uppermost work level. O. Reg. 145/00, s. 18 (1).

(2) Subsection (1) does not apply to work carried out in a building which is not required by the Building Code to have a permanent standpipe. O. Reg. 213/91, s. 57 (2).

(3) A permanent standpipe,

(a) shall have sufficient hose outlets to permit every part of the building to be protected by a hose not longer than twenty-three metres;

(b) shall have a connection for the use of the local fire department located on the street side of the building not more than 900 millimetres and not less than 300 millimetres above ground level and to which there is clear access at all times; and

(c) shall be maintained so as to be readily operable if required to be used. O. Reg. 213/91, s. 57 (3).

(4) Every hose outlet in a permanent standpipe shall have a valve. O. Reg. 213/91, s. 57 (4).

(5) Every hose used with a permanent standpipe,

(a) shall be at least thirty-eight millimetres in diameter;

(b) shall have a combination straight stream and fog nozzle; and

(c) shall be stored on a rack in such a way as to protect it from damage and keep it available for immediate use. O. Reg. 213/91, s. 57 (5).

(6) If a temporary standpipe has been installed, it shall not be disconnected until the permanent standpipe is connected, so that there is always a standpipe in service. O. Reg. 145/00, s. 18 (2).

(7) A temporary standpipe shall be maintained so that it is readily operable. O. Reg. 145/00, s. 18 (2).

(8) A temporary standpipe shall have at least one hose outlet per floor, with a valve and a hose attached to each hose outlet and a nozzle attached to each hose. O. Reg. 145/00, s. 18 (2).

(9) In addition to the requirements of subsection (8), there shall be a connection to which there is clear access at all times, located between 30 and 90 centimetres above ground level on a side of the building that faces the street. O. Reg. 145/00, s. 18 (2).

(10) A hose outlet on a temporary standpipe,

(a) shall have a valve; and

(b) shall be capable of accepting a hose that is 38 millimetres in diameter. O. Reg. 145/00, s. 18 (2).

(11) If a temporary standpipe is installed in a building under construction, the constructor shall post at the project, or have available for review, a floor plan of the building indicating,

(a) the location of the hose outlets on each floor;

(b) the location of the point on the perimeter of each floor that is furthest from the hose outlet on that floor; and

(c) the location of each exit on each floor. O. Reg. 145/00, s. 18 (2).

(12) The constructor shall give a copy of the floor plan to the fire department located nearest to the project. O. Reg. 145/00, s. 18 (2).

58. No flammable liquid shall be transferred from one container to another by the direct application of air under pressure. O. Reg. 213/91, s. 58.

ACCESS TO AND EGRESS FROM WORK AREAS

70. (1) Access to and egress from a work area located above or below ground level shall be by stairs, runway, ramp or ladder. O. Reg. 213/91, s. 70 (1).

(2) Subsection (1) does not apply to a work area that is a suspended scaffold able to be moved to give access to a floor, roof or platform or to ground level. O. Reg. 213/91, s. 70 (2).

71. Adequate means of egress shall be provided from a work area to permit the evacuation of workers during an emergency. O. Reg. 213/91, s. 71.

72. A work area, a route to and from a work area and a scaffold platform on which work is being performed shall be maintained at all times in a condition that does not endanger workers and, without limiting the generality of the foregoing,

(a) shall be kept clear of obstructions;

(b) shall be kept clear of snow, ice or other slippery material; and

(c) shall be treated with sand or similar material when necessary to ensure a firm footing. O. Reg. 213/91, s. 72.

STAIRS AND LANDINGS

75. (1) No work shall be performed in a building or structure that will be at least two storeys high when it is finished unless stairs are installed in accordance with this section. O. Reg. 213/91, s. 75 (1).

(2) As the construction of a building or structure progresses, permanent or temporary stairs shall be installed up to,

(a) the uppermost work level; or

(b) if stairs would interfere with work on the uppermost work level, to within the lesser of two storeys or nine metres below the uppermost work level. O. Reg. 213/91, s. 75 (2).

(3) Subsection (2) does not apply with respect to,

(a) a part of a building or structure in which only the structural steel beams or columns are erected; or

(b) a structure to which a permanent ladder is attached before the structure is raised into position. O. Reg. 213/91, s. 75 (3).

76. (1) Temporary stairs and landings shall be designed, constructed and maintained to support a live load of 4.8 kilonewtons per square metre without exceeding the allowable unit stresses for each material used. O. Reg. 213/91, s. 76 (1).

(2) No temporary stair or landing shall be loaded in excess of the load it is designed and constructed to bear. O. Reg. 213/91, s. 76 (2).

77. (1) No work shall be performed in a building or structure with stairs unless the stairs meet the requirements of this section. O. Reg. 213/91, s. 77 (1).

(2) Stairs shall have,

(a) a clear width of at least 500 millimetres;

(b) treads and risers of uniform width, length and height;

(c) subject to subsection (3), stringers with a maximum slope of 50 degrees from the horizontal;

(d) landings that are less than 4.5 metres apart measured vertically;

(e) a securely fastened and supported wooden handrail on the open sides of each flight; and

(f) a guardrail on the open side of each landing. O. Reg. 213/91, s. 77 (2).

(3) The stringers of prefabricated stairs erected inside a tower formed by scaffold frame sections shall have a maximum slope of 60 degrees from the horizontal. O. Reg. 213/91, s. 77 (3).

(4) A wooden handrail shall measure thirty-eight millimetres by eighty-nine millimetres and shall be free of loose knots, sharp edges, splinters and shakes. O. Reg. 213/91, s. 77 (4).

(5) Skeleton steel stairs shall have temporary wooden treads securely fastened in place that are made of suitable planking extending the full width and breadth of the stairs and landings. O. Reg. 213/91, s. 77 (5).

WELDING AND CUTTING

122. (1) Cylinders, piping and fittings used in welding and cutting shall be protected against damage. O. Reg. 213/91, s. 122 (1).

(2) No cylinder of compressed gas used in welding and cutting shall be dropped, hoisted by slings or magnets or transported or stored in a horizontal position. O. Reg. 213/91, s. 122 (2).

(3) The valve of a cylinder shall be closed when the cylinder is spent or is not being used. O. Reg. 213/91, s. 122 (3).

123. Precautions to prevent a fire shall be taken when using a blow torch or welding or cutting equipment or a similar piece of equipment. O. Reg. 213/91, s. 123.

124. (1) No arc welding electrode or ground lead shall be hung over a compressed gas cylinder. O. Reg. 213/91, s. 124 (1).

(2) An area where electric welding is carried on shall be kept free of electrode stubs and metal scrap. O. Reg. 213/91, s. 124 (2).

(3) Receptacles for electrode stubs shall be provided and used. O. Reg. 213/91, s. 124 (3)

HOT TAR OR BITUMEN ROADTANKERS

211. (1) Only a competent worker shall operate a hot tar or bitumen roadtanker or kettle. O. Reg. 213/91, s. 211 (1).

(2) If a hot tar or bitumen roadtanker or kettle is fitted with a propane-fuelled heater,

(a) the storage cylinder for propane shall not be placed closer than three metres to a source of fire or ignition;

(b) the lines connecting the storage cylinder for propane to the heating device shall be located so that they do not come into contact with the hot tar or bitumen in the case of a spill or a failure of a component of the system; and

(c) a fire extinguisher with an Underwriters' Laboratories of Canada rating of at least 4A40BC shall be provided with the roadtanker or kettle. O. Reg. 213/91, s. 211 (2).

(3) A propane burner used on a bitumen roadtanker or kettle,

(a) shall have a thermal rating no greater than that recommended by the manufacturer of the roadtanker or kettle; and

(b) shall consist of components that are adequate for their intended use. O. Reg. 213/91, s. 211 (3).

(4) Hot tar or bitumen shall be transferred from a roadtanker to a kettle through enclosed piping. O. Reg. 213/91, s. 211 (4).

