# **ON-SITE CONSTRUCTION SAFETY**



## BEST PRACTICES

**2nd Edition** 

## COMMEMORATION Michelle Krsek

The On-Site Construction Safety Committee was formed as a result of the loss of life of Michelle Krsek due to a construction incident.

The purpose of this BEST PRACTICES guide is to help prevent injuries through education, training, advocacy and partnership.

## **INTRODUCTION**

The Calgary On-Site Construction Safety Committee is an initiative between the Calgary Construction Association, The City of Calgary and Alberta Occupational Health & Safety, and was formed as a result of concern over incidents. The BEST PRACTICES guide was developed to raise awareness of the various hazards and conditions at and adjacent to construction sites. Being that construction activities occur in diverse environments, pre-planning for public safety is essential.

Committee members include representatives from the Calgary Construction Association, The City of Calgary and Alberta Occupational Health & Safety who have volunteered many hours to support the development of this guide. The main purpose of the committee is to develop and communicate industry recommended practices for safe working conditions on construction sites.

## This booklet is published for the benefit of all industry stakeholders.

In order to achieve due diligence, management is responsible to implement systems and procedures to ensure the safety of the workers and public. Tasks should be carried out by competent staff at all times.

The following organizations have endorsed this booklet: Alberta Construction Association Alberta Construction Safety Association Calgary Construction Association Canadian Home Builders' Association – Calgary Region The City of Calgary Alberta Occupational Health and Safety has reviewed this booklet and as of the date of publication finds the set out information meets occupational health and safety legislative requirements. Users are cautioned that the booklet is a guideline only and that proper compliance requires a customized program that addresses the conditions of the specific worksite.

This On-Site Construction Safety Best Practices guide does not exempt readers from their responsibilities under applicable legislation. In case of inconsistency between this booklet and Alberta Occupational Health & Safety legislation, the legislation will always prevail.

Whilst every effort has been made to ensure the accuracy of the information contained in this publication, neither the Calgary Construction Association nor any of its members past, present or future guarantees its accuracy or will, regardless of its or their negligence, assume liability for any foreseeable or unforeseeable use made thereof, which liability is hereby excluded. Consequently, such use is at the recipient's own risk on the basis that any use by the recipient constitutes agreement to the terms of this disclaimer. The recipient is obliged to inform any subsequent recipient of such terms.

NOTE: Photographs are for general illustration purposes only and may not represent the exact work site setting or be interpreted as actual depiction of the OH&S Act, Regulation and Code requirements. Not all possible options are represented by the photographs.

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## Hoarding of a Construction/ Demolition Site

#### 1. HOARDING OF A CONSTRUCTION/DEMOLITION SITE

#### **1.1 TASK**

To ensure site fencing and hoarding are adequately constructed to provide public protection.

To protect the public from overhead and horizontal hazards on a construction site, provide securement to keep the public from harm and to facilitate safe passage.

#### **1.2 HAZARDS**

The potential hazards include, but are not limited to:

- 1.2.1 Construction activity
- 1.2.2 Traffic (vehicular and pedestrian)
- 1.2.3 Public Entry
- 1.2.4 Overhead
- 1.2.5 Reduced visibility

#### **1.3 BEST PRACTICES FOR PERIMETER HOARDING/ FENCING AT CONSTRUCTION/DEMOLITION SITES**

- 1.3.1 The contractor is responsible to use proper material when building hoarding (e.g. lumber, plywood, scaffold frames, tarps).
- 1.3.2 All hoarding must be designed to sustain loads that it is likely to be subjected to such as wind and snow loads and falling debris.
- 1.3.3 Hoarding must meet permit conditions and be constructed in accordance with all local regulatory requirements.
- 1.3.4 Site fencing must be adequately braced and/or secured to withstand site conditions including wind. Consider securing bases and avoid base details that create a tripping hazard.

- 1.3.5 Plan for any additional wind load due to attached signs and/or coverings.
- 1.3.6 Perimeter fencing around excavation sites should be a minimum of 2.4 meters (8 feet) in height. This may be accomplished by using plywood affixed to jersey barriers or may be secured to vertical supports positioned at intervals no greater than 3.0 meters (10 feet) on centre. Fencing must be set back an appropriate distance from the edge of an excavation which varies depending on site conditions.
- 1.3.7 Jersey barriers can be utilized at strategic points around a construction site to protect the public and construction workers from high incident traffic intersections that are in close proximity to the entrance gates of work sites. Jersey barriers may also be used to protect fire hydrants, gas valves and main power distribution equipment. The location of Jersey barriers would be at the discretion of the jurisdiction having authority.
- 1.3.8 Consider having viewing cutouts in solid fencing, complete with protection, to allow for public viewing.



- 1.3.9 Light duty scaffold, although designed of sufficient strength to provide the minimum building code or OHS Code standard for an overhead protection system, has restricted width due to the arch frame. It should only be used in the event that the exterior public walkway or sidewalk is too narrow to provide a wider frame work system. Considerations should be made to the width for ease of access and travel for the handicapped, snow removal and maintenance.
- 1.3.10 Heavy duty scaffold is the preferred system if a contractor is planning to utilize the space on top of the hoarding for storage of materials or for locating their field office. This system must be engineered to comply with the building code and OHS Code and have a height of not less than 2.5 meters (8'- 3") and a clear width of not less than 1.5 meters (5' 0"). The roofing system must be designed and constructed to safely support a minimum of 2.4 kPa (50 PSF). The roofing system must also be watertight and sloped towards the construction site. Splash boards with a minimum height of 300 mm (12") must be installed on the street side. A railing of 1070 mm (42") is required on the street side where the covered way is supported by posts. The structure must also be totally enclosed on the street side with a smooth surface.
- 1.3.11 Consider the use of pre engineered structures such as modified containers.
- 1.3.12 When heating equipment is used within a hoarding, adequate fire protection must be used. Air quality monitoring may be required for enclosed hoarding. A minimum of a 20lb. ABC fire extinguisher must be placed outside the hoarding in an easily accessible location in the vicinity of propane/gas heaters.
- 1.3.13 Hoarding should be adequately illuminated.

1.3.14 Access gates must be clearly marked as per the traffic management plan.



- 1.3.15 Adequate signage must be placed outside the hoarding warning of all hazards that may exist.
- 1.3.16 Gates must be locked and the perimeter fencing secured to provide security against public access during off work hours and monitored in high traffic areas during operation.



- 1.3.17 Hoarding must be marked clearly "No Trespassing Construction Personnel Only", and personal protective equipment requirements clearly marked (e.g., "Hard Hats and Safety Footwear Must Be Worn Beyond This Point").
- 1.3.18 Conduct regular inspections, as required, of hoarding for general condition and have a scheduled inspection procedure in place.
- 1.3.19 Emergency contact information, as required by the jurisdiction having authority, must be prominently posted.

Managing Vehicular and Pedestrian Traffic Adjacent to Construction Sites

#### 2. MANAGING VEHICULAR AND PEDESTRIAN TRAFFIC ADJACENT TO CONSTRUCTION SITES

#### **2.1 TASK**

To prevent vehicular traffic on roadways adjacent to a construction project from becoming a hazard to:

- 2.1.1 Workers on-site
- 2.1.2 Pedestrians near a construction site
- 2.1.3 All vehicles travelling on the adjacent streets and alleys
- 2.1.4 Mobile construction equipment

#### 2.2 HAZARDS

#### 2.2.1 Controlling Vehicular Traffic

Uncontrolled vehicular traffic entering and exiting a construction site and all other vehicular traffic travelling the streets adjacent to the project pose a hazard to workers on the project, pedestrians and other vehicles utilizing the streets and alleys that surround the construction site.

The potential hazards include, but are not limited to:

- 2.2.1.1. Vehicle to vehicle collision
- 2.2.1.2. Vehicles colliding with construction barriers
- 2.2.1.3. Vehicles striking pedestrians
- 2.2.1.4. Vehicles striking workers on construction sites

#### 2.2.2 Controlling Pedestrian Traffic

Pedestrian traffic entering/exiting public sidewalks or other thoroughfares adjacent to the project are at risk of injury from

work activities on the project that may expose the public to hazards which may include, but are not limited to:

- 2.2.2.1. Being struck by operating equipment
- 2.2.2.2. Tripping on uneven surfaces
- 2.2.2.3. Being struck by uncontrolled vehicular traffic
- 2.2.2.4. Being struck by material that may fall from the structure

#### 2.3 BEST PRACTICES FOR CONTROLLING VEHICULAR/PEDESTRIAN TRAFFIC

#### The Prime Contractor or Owner will:

2.3.1 Develop a traffic management plan for the project that meets all local government agency requirements and



addresses the control of and safe movement of all traffic that enters/exits the site along with traffic that travels the streets adjacent to the project.

- 2.3.2 Obtain all necessary permits from the jurisdiction having authority for planned lane and street closures.
- 2.3.3 Conduct a hazard assessment in relation to the vehicular/pedestrian traffic that both enters/exits the work site, and traffic that utilizes the streets adjacent to the project.



- 2.3.4 Secure traffic management signage/materials.
- 2.3.5 Appoint qualified persons to supervise traffic control procedures to ensure they are in accordance with the traffic management plan.
- 2.3.6 Ensure adequate flag person(s) appointed to control traffic/pedestrians are:
  - 2.3.6.1 Trained and competent in their duties.
  - 2.3.6.2 All required to wear high visibility personal protective equipment and use the appropriate traffic control devices (e.g., stop/slow paddle, illuminated wand for night time traffic control).
  - 2.3.6.3 Instructed in the details of the project management plan.
  - 2.3.6.4 Trained in good communication skills and act professionally at all times.
- 2.3.7 Provide all necessary traffic signage at strategic locations that warns motorists of changes to traffic patterns.
- 2.3.8 Provide all traffic barriers and delineators necessary to funnel traffic into appropriate laneways.
- 2.3.9 Consider the use of media notices to communicate substantive planned traffic pattern changes to major commuting routes.
- 2.3.10 Manage temporary signage as per the permit conditions (which may include installation, removal, covering).
- 2.3.11 Ensure regular inspections as required.

- 2.3.12 Install signage that gives the public enough advanced notice of the closure / delay / detour so other routes can be planned.
- 2.3.13 If attempts to ensure compliance are failing, document the issue and consider seeking assistance from the Calgary Bylaw Services at 3-1-1.



### 3. LIFTING AND HOISTING OPERATIONS

#### 3.1 **TASK**

To provide guidance for all mechanical lifting and hoisting activities in construction, included but not limited to, tower cranes, mobile cranes, telehandlers, forklifts and small lifts.

#### 3.2 HAZARDS

- 3.2.1 Lifting and hoisting operations are one of the major causes of fatalities and serious incidents in construction. Every type of lift has a set of risks that need to be managed if the lift is to be undertaken in a safe and efficient manner.
- 3.2.2 Despite the vast number of regulations, standards and guidelines that apply to lifting, incidents continue to occur. In an effort to protect the public, construction workers and property, it is the construction industry's expectations that all companies conducting lifting activities have a management system that includes specific procedures based on a full assessment of the risks and control measures required.

#### **3.3 BEST PRACTICES FOR LIFTING AND HOISTING SAFELY ON CONSTRUCTION SITES**

#### 3.3.1 PLANNING

- 3.3.1.1 General
  - 3.3.1.1.1 Proper planning is required for all lifts. If the lift deviates from the plan, make safe and revise the lift procedures.
  - 3.3.1.1.2 Hazard identification and risk assessment (e.g., weather conditions) must be carried out as part of planning of all lifts.

- 3.3.1.1.3 An assessment of the lift and determination of the lift method, equipment and number of people required is critical to planning of the lift.
- 3.3.1.1.4 All lifts are to have a standard lifting procedure.
- 3.3.1.1.5 Specific procedures are required based on risk assessment.
- 3.3.1.1.6 All lift plans shall be reviewed and approved by the jurisdiction having authority on-site (e.g., safety officer and/or hoisting superintendent).
- 3.3.1.1.7 Environmental conditions should be considered when planning.
- 3.3.1.2 Lifts

All lifts of materials such as lumber, rebar, concrete buckets, etc. are required to have hoisting procedures.



Critical and engineered lifts will require further hazard and risk assessments as per OH&S. (Refer to OH&S definitions of what is an engineered/critical lift)

The lift plan shall clearly address, but not be limited to the following:

- 3.3.1.2.1 Public way protection (traffic, pedestrian) lane or sidewalk closures, overhead protection (hoarding).
- 3.3.1.2.2 Completion of a hazard assessment, including communicating with the affected workers prior to beginning a lift.
- 3.3.1.2.3 The type and number of construction personnel required, their specific roles and competencies, and how they will be briefed.
- 3.3.1.2.4 Being reviewed and checked by the person in charge.
- 3.3.1.2.5 The centre of gravity, nature and weight of the load and lifting points.
- 3.3.1.2.6 Pick up and set down points and constraints such as space and stacking.
- 3.3.1.2.7 Equipment required and certification checks (e.g., chains, slings, tag lines).
- 3.3.1.2.8 Step-by step instructions.
- 3.3.1.2.9 Pre-determine communication methods to be used (e.g., hand signals, radio).
- 3.3.1.2.10 Emergency and rescue plan as required by risk assessment logistics.
- 3.3.1.2.11 Restrictions on the lift (e.g., building interferences, proximity to power lines, weather, daylight, people).
- 3.3.1.2.12 Entering and exiting for slinging and de-slinging the load.

- 3.3.1.2.13 Conflicting or nearby operations or work.
- 3.3.1.2.14 Load integrity check.
- 3.3.1.2.15 Load charts for generic lift plans and for heavy or complex lifts.
- 3.3.1.2.16 Weather conditions.

#### **3.3.2 CONTROL**

- 3.3.2.1 General
  - 3.3.2.1.1 One person of the lift team shall be designated as the person in charge of the lifting operation (e.g., rigger, crane operator, hoisting superintendent)
  - 3.3.2.1.2 All personnel involved in the lifting operation shall have their individual responsibilities clearly defined (as per safe work procedure).
  - 3.3.2.1.3 All people shall be kept clear of overhead loads and areas of potential impact.



3.3.2.2 Person in Charge

The person in charge has operational control of the lift and:

- 3.3.2.2.1 Ensures that the lift team has tested and understood visual, radio or other communications prior to the lift.
- 3.3.2.2.2 Ensure all permits and procedures are in place before moving loads over public and other work areas.
- 3.3.2.2.3 Is designated as being in charge of coordinating, controlling and executing the lift.
- 3.3.2.2.4 Reviews the lift plan and ensures that the required controls are in place.
- 3.3.2.2.5 Ensures that the lifting equipment is inspected and appropriate for use.
- 3.3.2.2.6 Checks that load integrity and stability is satisfactory.
- 3.3.2.2.7 Ensures the lift is carried out in accordance with the plan. Suspends the lift if changes or conditions (e.g., wind) occur that would cause a deviation from the plan.
- 3.3.2.2.8 Checks that there is no deviation from standards for routine lifts.
- 3.3.2.2.9 Shall allow for concurrent or simultaneous operations that may affect or be affected by the lift (e.g., other cranes, moving equipment).

- 3.3.2.3 Conducting the Lifting Operation The following are critical practices in conducting the lifting operation:
  - 3.3.2.3.1 The hoisting equipment operator shall obey an emergency stop signal at all times, no matter who gives it.
  - 3.3.2.3.2 The operator of the hoisting equipment shall not leave the operating controls while the load is suspended.
  - 3.3.2.3.3 Construction personnel shall have an escape route in the event of an unexpected movement of the load or lift equipment.
- 3.3.2.4 Communication
  - 3.3.2.4.1 All critical lifts require a documented pre-lift meeting by all involved. Safe work procedures are to be reviewed and acknowledged by all involved.



- 3.3.2.4.2 When lifting operations need to be controlled by signals, a designated signaler shall be assigned. Signals between the lifting device operator and the signaler shall be discernable audibly or visually at all times. When using radio communications, continuous verbal instructions shall be used. The operator shall stop whenever there is no clearly understood signal.
- 3.3.2.4.3 In order to facilitate good communication, it is important that personnel involved in the lifting operation are not distracted. The use of mobile phones or other devices unrelated to the lift should be prohibited.
- 3.3.2.4.4 Administrative controls such as sub-trade coordination meetings may be utilized to inform trade contractors of hoisting activities in advance.
- 3.3.2.4.5 Communication from general contractor to the jurisdiction having authority should be established (e.g. permit requirements for traffic lane and pedestrian sidewalk closures).
  Communication from the jurisdiction having authority to the public should be established advising them in advance of long term closures.

#### 3.3.3 EQUIPMENT

3.3.3.1 General

Lifting equipment is comprised of lifting devices (equipment performing the lifting), lifting accessories (devices that connect the load to the lifting device) and lifted equipment (e.g., containers, baskets). All shall be marked with the safe working load (SWL) or working load limit (WLL) and identification number. An equipment register, including maintenance records and evidence of certification shall be available on-site.

- 3.3.3.1.1 Equipment shall be in good working order and utilized for the purpose it was designed.
- 3.3.3.1.2 Equipment shall be fitted with appropriate safety devices.
- 3.3.3.1.3 Any safety devices installed on lifting equipment shall be operational and not overridden.



#### 3.3.3.2 Equipment Minimum Standards

To ensure that equipment is fit for its intended purpose, local controlling documentation shall specify design, certification, storage, maintenance and inspection criteria in accordance with a recognized industry standard and/or manufacturer's recommendations. The manufacturer or an approved body shall issue a certificate or a letter of conformance to theappropriate standards.

3.3.3.3 Procurement (Services and Equipment) The manufacturer or service provider shall supply all lifting equipment with documentation that defines the permissible operating conditions, design criteria, documentation of testing, maintenance and operation manuals and examination/inspection requirements. Pre-used equipment shall also be supplied with operations and maintenance history, including records of any incidents, overload, damage, major repairs, modifications or limitations arising from previous use.

> All lifting devices and accessories shall be designed, manufactured, inspected, tested and certified in accordance/with applicable standards and industry accepted codes of practice. Engineered lifting accessories (e.g., spreader bars) shall be designed, manufactured and tested in compliance with the intent of the relevant industry standards. Any lifting equipment not certified to an acceptable code shall be structurally verified by a professional engineer and load tested.



#### **3.3.4 LOAD INTEGRITY AND STABILITY**

3.3.4.1. General

Equipment operators shall know the rated lifting capacity of the equipment and understand the effects of changes in configuration on the capacity. They shall be provided with all the necessary information in an easily understandable form at the place where they are operating the equipment.

The safe working load of the lifting system shall be assessed, taking into account the configuration of the equipment and operating environment. For example, change in sling angles/sheave arrangements will

change capacity. Any lifting device operating on a slope will have a different capacity from operation on level ground. The dynamic effects of liquids and shifting or uneven loads must be considered.

The load shall possess sufficient integrity to withstand the forces applied during lifting. The method of rigging the load shall ensure that it remains stable and cannot tip, slip, swing or fall unintentionally. Stability shall be confirmed before lifting and if necessary by a trial lift. The quality, design and labeling of packaging shall be specified at the procurement stage to ensure the load integrity and stability. Cargo in containers shall be secured such that it does not shift during lifting. Wheeled equipment requires direct restraint. The rigger shall have the final say when rejecting loads unfit for hoisting.

Stacking shall only be carried out if a risk assessment of stacking operations has been performed and documented. Equipment shall only be stacked if it is designed for this purpose or uses an approved stacking system. Stacked containers shall be slung so that the crane hook can be attached and/or detached while the load handler is standing at floor level, or by other safe means.

- 3.3.4.1.1. Load shall not exceed the rated capacity of the lifting equipment with consideration to dynamic or static forces.
- 3.3.4.2.2. The integrity and stability of loads shall be verified before lifting.

Securing Construction Materials and Equipment On-Site

#### 4. SECURING CONSTRUCTION MATERIALS AND EQUIPMENT ON-SITE

#### **4.1 TASK**

To safe guard construction workers and the public from falling materials, equipment, tools and debris from a construction project.

#### 4.2 HAZARDS

Any object that falls from a building has the potential to cause injury to any person or create damage. When dropped or blown from a building, the following objects constitute a considerable hazard (All construction materials and equipment are susceptible to wind):

- 4.2.1 Hand tools
- 4.2.2 Fasteners and other connecting devices such as bolts and taper ties
- 4.2.3 Dust and debris
- 4.2.4 Temporary hoarding and scaffolding
- 4.2.5 Secured and unsecured material

## **4.3 BEST PRACTICES FOR SECURING MATERIALS, TOOLS, EQUIPMENT AND DEBRIS ON A CONSTRUCTION SITE**

#### 4.3.1 Pre-Planning for the Site

- 4.3.1.1 Conduct pre-project hazard assessments to:
  - 4.3.1.1.1 Evaluate the potential of falling tools, equipment and material, and establish control measures to prevent the hazard:
    - 4.3.1.1.1.1 Eliminate the hazards or if not reasonably practicable,
    - 4.3.1.1.1.2 Control the hazard.
  - 4.3.1.1.2 Review tasks associated with the wind and the environment.
- 4.3.1.2 Provide material storage containment areas.

## 4.3.2 On-Site Procedures for Material and Equipment (by General and Trades)

- 4.3.2.1 Develop a safe site specific procedure to prevent tools, equipment and materials from falling from a building. The procedures should include types of material being used, and methodology for securement at different levels of risk (by installation).
- 4.3.2.2 Whenever possible ensure that all construction materials or debris is placed in secured and covered containers. Engineered Debris containers may be required.
- 4.3.2.3 Require the use of tool lanyards.
- 4.3.2.4 Conduct education and training to construction personnel on proper methods of securing building materials, equipment and tools.

#### 4.3.3 Weather Forecasting and Wind Management

- 4.3.3.1 Utilize an advanced weather forecasting system that provides notification of high wind gusts and the potential of such winds to blow materials, equipment and tools from the building and/or construction site.
- 4.3.3.2 Utilize netting and screening.

#### 4.3.4 Close Out

- 4.3.4.1 Ensure proper installation of perimeter edge guardrails and containment meshing.
- 4.3.4.2 Require trade specific material inspection sign-off sheets, as required, for work areas for unrestrained tools, equipment and material that can fall from a building. Issues that may be included are: clean-up, guardrail installation, re-shore post restraints, etc.



For information on Construction Safety Coordinator Gold Seal Certification, please visit:

#### www.goldsealcertification.com

Other Gold Seal designations include:

- Project Manager
- Superintendent
- Estimator
- Owner's Project Manager







## Dave Smith Calgary Construction Association

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#### **TO ORDER THIS BOOKLET, OR FOR MORE INFORMATION, CONTACT:** THE CALGARY CONSTRUCTION ASSOCIATION

- 9. Any unsafe act or hazardous conditions must be reported immediately to the Site Superintendent or Salety Official 10. All accidents, injuries, or near-misses must be reported nediately to the Site Superintendant or Safety Offices. ity programs and must
- 8. "Horseplay" will not be tolerated on site.
- W.H.M.I.S. Legislation to the Site Superintendent or Construction Safety Office, prior to use on site. 7. Alcohol or Drug use will not be tolerated on site.
- 5. Worker Compensation/ Occupational Health and Balety Regulations must be followed by all personnel, 6. Submit all Material Safety Data Sheets for all materials regulated by
- 4. Report any medical conditions to First Aid Station prior to work.
- 3. All Employees are to receive a Site Orientation on this Project.

SITE SAFETY RULES

- as required must be worn at all times.

1. All visitors are to report to Site Office before proceeding to site. 2. Hard Hats, Safety Footwear, and Personal Protective Engineent