Self-Erect Crane Operator Standards

Crane Operator Qualification

Self-Erect Crane Operator Standards

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Developed By
BC Crane Safety
Province of British Columbia

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FOREWORD

This document specifies the standards that must be met by an operator to be certified for operation of a self-erect crane.

These are competency based operator standards, separated into theoretical and practical components. Industry believes a crane operator becomes competent through building on theoretical knowledge with real world experience.

The theoretical component is made up of the Knowledge Unit Standards, which:

- can be learned in a classroom setting with a qualified instructor, or
- learned through self-study, either on-line or through printed materials, and
- are assessed by means of a formal independent third party examination.

The practical component is made up of the Workplace Unit Standards, which:

- may be first learned in a simulated setting such as a training yard, and
- are fully developed through hands-on work experience, and
- are assessed on the job by an independent third party Registered Workplace Assessor.

Safe working practices, though not always specified, are a part of the safe working and learning conditions underlying all these standards and will be required in the presentation of evidence to meet these standards.

This document will be useful in guiding competency-based training of crane operators who operate self-erect cranes. The competency standards provide a structure for on the job training and industry wishes to see trainers take full advantage of opportunities for on the job training.

This document also includes a list of recommended reference textbooks that are available to support achievement of the Knowledge Units.

ACKNOWLEDGEMENTS

The BC Association for Crane Safety (BC Crane Safety) is a non-profit society which was formed in 2005 to lead and coordinate activities and initiatives which promote safer crane operation in BC. BC Crane Safety was started and is governed by BC's crane industry through a volunteer board of industry stakeholders. A main area of concern for the organization is the development of standards for competent crane operation in BC and the promotion of industry standards to drive excellence in crane operation and operator training.

In 2005 a representative group of crane owners from the Mobile Crane, Boom Truck and Tower Crane industries in BC began work to identify standards required for all crane operators in BC. By mid-2006 the industry had endorsed a set of competency standards across all crane types, including core competencies which are common to all crane types. These standards were approved by WorkSafeBC.

The crane operator standards have been developed through extensive consultation with a broad cross section of stakeholders from BC's crane industry – crane owners, operators and other occupations which make occasional yet regular use of cranes.

This work would not have been possible without the contribution of thousands of hours of industry stakeholder time through the BC Crane Safety task groups. BC Crane Safety wishes to thank those Subject Matter Experts (SMEs) who contributed to this development effort.

BC Crane Safety also wishes to acknowledge the funding support for this work it has received from WorkSafeBC.

SAFETY ADVISORY
Be advised that references to the WorkSafeBC safety regulations contained within these materials do not/may not reflect the most recent Occupational Health and Safety Regulation (the current Standards and Regulation in BC can be obtained on the following website: http://www.worksafebc.com. Please note that it is always the responsibility of any person using these materials to inform him/herself about the Occupational Health and Safety Regulation pertaining to his/her work.

SECTION 1

OCCUPATION ANALYSIS CHART

Self-Erect Crane Operator Competency Profile Chart

A. **Safety** **Level 1**	**A12 K** Demonstrate knowledge of self-erect crane specific PPE	**A13 K** Demonstrate knowledge of regulations, standards, and documentation relevant to self-erect crane operations	**A14 K** Demonstrate knowledge of regulations and protocols for operating a self-erect tower crane in proximity to power lines, cable hazards, and high and low voltage equipment	**A15 W** Demonstrate knowledge of documentation for the site and the operator's self-erect crane
B. **Communications** **Level 1**	**B12 K** Demonstrate knowledge of self-erect crane hand signals	**B13 K** Demonstrate knowledge of self-erect crane radio protocols and vocabulary	**B14 W** Interpret self-erect crane hand signals in the workplace	**B15 W** Use self-erect crane radio protocols and vocabulary in the workplace
C. **Cranes** **Level 1**	**C15 K** Demonstrate knowledge of self-erect crane applications	**C16 K** Demonstrate knowledge of self-erect crane types and configurations	**C18 K** Demonstrate knowledge of components and their functions for different types of self-erect cranes	**C20 K** Demonstrate knowledge of drives, controls, and safety devices for self-erect cranes
I. **Maintenance and Service** **Level 1**	**I12 K** Demonstrate knowledge of daily and monthly inspections for self-erect cranes	**I13 K** Demonstrate knowledge of annual and special inspection requirements for self-erect cranes	**I14 W** Conduct a start of shift self-erect crane inspection in the workplace	**I15 W** Conduct self-erect crane motion checks and operational load limit tests in the workplace

	2			

C21 W Identify and describe the function of the drives, controls and safety devices on the operator's self-erect crane	
	2

M. Self-Erect Crane Operations	M9 K Demonstrate knowledge of hoisting and rigging for self-erect cranes	M10 K Demonstrate knowledge of self-erect crane load charts and load calculations	M11 K Demonstrate knowledge of how weather conditions affect self-erect crane operations	M12 K Demonstrate knowledge of a self-erect crane operator's duties and responsibilities	M13 K Demonstrate knowledge of protocols for leaving a self-erect crane unattended	M14 K Demonstrate knowledge of protocols for operating a self-erect crane on a multi-crane site
	2	2	2	2	2	2

M15 W Operate a self-erect crane safely in the workplace according to regulations and manufacturer's specifications	M16 W Leave a self-erect crane unattended in the workplace
2	2

SECTION 2

OPERATOR STANDARDS

SUGGESTED TIME ALLOTMENTS SELF-ERECT CRANE

Self-Erect Crane Operator

Unit	Section A – Safety	7% of Time
A12 K	Demonstrate knowledge of self-erect crane specific PPE	
A13 K	Demonstrate knowledge of regulations, standards, and documentation relevant to self-erect crane operations	
A14 K	Demonstrate knowledge of regulations and protocols for operating a self-erect tower crane in proximity to power lines, cable hazards, and high and low voltage equipment	
A15 W	Demonstrate knowledge of documentation for the site and the operator's self-erect crane	

Unit	Section B – Communications	6% of Time
B12 K	Demonstrate knowledge of self-erect crane hand signals	
B13 K	Demonstrate knowledge of self-erect crane radio protocols and vocabulary	
B14 W	Interpret self-erect crane hand signals in the workplace	
B15 W	Use self-erect crane radio protocols and vocabulary in the workplace	

Unit	Section C – Cranes	36% of Time
C15 K	Demonstrate knowledge of self-erect crane applications	
C16 K	Demonstrate knowledge of self-erect crane types and configurations	
C18 K	Demonstrate knowledge of components and their functions for different types of self-erect cranes	
C20 K	Demonstrate knowledge of drives, controls, and safety devices for self-erect cranes	
C21 W	Identify and describe the function of the drives, controls, and safety devices on the operator's self-erect crane	

Unit	Section I – Maintenance and Service	10% of Time
I12 K	Demonstrate knowledge of daily and monthly inspections for self-erect cranes	
I13 K	Demonstrate knowledge of annual and special inspection requirements for self-erect cranes	
I14 W	Conduct a start of shift self-erect crane inspection in the workplace	
I15 W	Conduct self-erect crane motion checks and operational load limit tests in the workplace	

Unit	Section M – Self-Erect Crane Operations	41% of Time
M9 K	Demonstrate knowledge of hoisting and rigging for self-erect cranes	
M10 K	Demonstrate knowledge of self-erect crane load charts and load calculations	
M11 K	Demonstrate knowledge of how weather conditions affect self-erect crane operations	
M12 K	Demonstrate knowledge of a self-erect crane operator's duties and responsibilities	
M13 K	Demonstrate knowledge of protocols for leaving a self-erect crane unattended	
M14 K	Demonstrate knowledge of protocols for operating a self-erect crane on a multi-crane site	
M15 W	Operate a self-erect crane safely in the workplace according to regulations and manufacturer's specifications	
M16 W	Leave a self-erect crane unattended in the workplace	

SECTION A
SAFETY

A. Safety

Unit Standard A12 K

Demonstrate knowledge of self-erect crane specific PPE

Task 1
Describe the PPE required by self-erect crane operators

Key Points

- Personal fall arrest equipment
- Steel toed boots
- Hi visibility vest (for operating crane remotely)
- Hard hat with chin strap
- Sun glasses (recommended)
- Horizontal life lines
- Full body harness, lanyards
- Ladder climbing safety device
- Vertical lifeline rope grabs

Task 2
Describe the use of personal fall arrest equipment and typical connection points on self-erect cranes
Standard: WorkSafeBC regulations

Key Points

- When are full body harness, vertical lifeline rope grabs, and lanyards required
- Who provides them
- CSA certified
- How to use them
- Lanyard anchor connection points (crane specific)

A. Safety

Unit Standard A13 K

Demonstrate knowledge of regulations, standards and documentation relevant to self-erect crane operations

Task 1
Identify and describe the regulations and standards which apply to self-erect crane operations.

Key Points

- CSA Standard Z248-2004 Code for Tower Cranes
- WorkSafeBC regulations
- Right to refuse
- Public safety

Task 2
Identify and describe site-specific documentation providing information required by the self-erect crane operator

Key Points

- Crane manufacturer's manual
- Crane load chart
- Crane logbook
- Erector's report and report of readiness
- Self-erect crane report maintenance history (history of components, deficits, and repairs)
- Site schematic showing limits of approach and crane work radius
- 30M33 form (if applicable)
- DEP procedures
- Contents of worksite safety board
- Soils report
- Concrete test
- Foundation cribbing design (certification) prior to pouring foundation
- Engineer's inspection prior to pouring foundation
- Shoring detail and design and inspection (by engineer), reshoring design if applicable
- NDT report and certification
- Radio frequency coordinated

Task 3
Describe the components of a site emergency plan

Key Points

- First aid location
- Mustering areas
- DEP location and DEP drop-off spot
- DEP evacuation procedures and protocols
- DEP load rating
- Ambulance entrance
- Site safety officer

A. Safety

Unit Standard A14 K

Demonstrate knowledge of regulations and protocols for operating a self-erect tower crane in proximity to power lines, cable hazards, and high and low voltage equipment

Task 1

Describe regulations and codes relating specifically to operating a tower crane near electrical hazards

Standard: WorkSafeBC section 19.24 – 19.26

Key Points

- Boom marker
- Contents of 30M33 form (if applicable)
- Transformers, guards and covers
- Limits of Approach for different voltages
- Site schematic showing crane work radius and power lines
- Energized cable hazards not shown on 30M33 form
- Qualified signal person/rigger

A. Safety

Unit Standard A15 W

Demonstrate knowledge of documentation for the site and the operator's self-erect crane

Task 1
List and describe site-specific documents important to operating the self-erect crane

Key Points

- Crane logbook
- Erector's report and report of readiness
- Crane manufacturer's manual
- Contents of site safety board
- Site schematic showing Limits of Approach and crane work radius
- DEP emergency procedures
- Other site policies and procedures
- NDT and certification
- Engineer's inspection prior to pouring foundation
- Shoring detail and design and inspection (by engineer)
- Radio frequency coordination

Task 2
Describe the contents and significance of the crane logbook and the operator's logbook

Key Points

- Crane logbook
  - Location
  - Significance
  - Contents
  - Consistently records required information in logbook (daily)
- Operator's logbook
  - Location
  - Significance
  - Contents
  - Consistently records required information

Task 3
Describe procedure for the self-erect crane operator to follow in an emergency personnel evacuation
Standard: WorkSafeBC section 32.2 (If crane manufacturer's manual actually specifies LIFTING of Personnel Allowed)

Key Points

- Radio protocol
- Drop off rigging
- DEP location
- DEP drop-off spot
- Self-erect crane operator responsibilities
- Connect to DEP with dedicated rigging hardware attached directly to the load hook
- Hoist limit switch
- Anchorage above the load block
- Capacity requirements of the crane
- Confirm that the safety line of person(s) being lifted is connected to the block (ten to one safety factor and freefall distance no more than six inches)
- DEP handling and landing precautions

Task 4
Identify and describe Limits of Approach for nearby power lines, cable hazards, and high and low voltage equipment
Standard: WorkSafeBC section 19.24 – 19.26

Key Points

- Boom marker
- Contents of 30M33 form
- Transformers, guards and covers
- Limits of Approach for different voltages
- Site schematic showing crane work radius and power lines
- Energized cable hazards not shown on 30M33 form
- Qualified signal person/rigger

SECTION B
COMMUNICATIONS

B. Communications

Unit Standard B12 K

Demonstrate knowledge of self-erect crane hand signals

Task 1
Identify and correctly interpret the hand signals of others (rigger) and clarify hand signals to ensure clear communication

Key Points

General Hand signals

- Stop
- Emergency Stop
- Dog everything
- Lower load
- Raise load
- Move slowly (lower load)
- Move slowly (raise load)
- Trolley in
- Trolley out
- Slew left
- Slew right

Luffing hand signals

- Boom up and trolley in
- Boom down and trolley out
- Boom up, lower load
- Boom down, raise load

Traveling crane hand signals

- Travel forward
- Travel backward

Task 2
Describe protocol for taking hand signals as defined by WorkSafeBC regulations

Key Points

- Taking hand signals from one person only
- Protocol for emergency stop signal

B. Communications

Unit Standard B13 K

Demonstrate knowledge of self-erect crane radio protocols and vocabulary

Task 1
Describe language and terminology commonly used in self-erect crane operations

Key Points

- Use consistent terminology
  (terminology that is clear and understood by both crane operator and rigger)
- Use clear, concise, relevant information
- Confirm and clarify to ensure understanding
- Use North, South, East, West (or clock face position) to aid in giving and interpreting directions

Task 2
Describe self-erect crane radio protocols

Key Points

- Dedicated coordinated frequency required for crane operator and rigger(s)
- Crane to crane communication (multi-crane and other equipment)
- Radio protocol for directing load movement
- Loss of radio contact
- Protocol for working in the blind
- Rigger calls out height as load is lowered
- Crane identification

B. Communications

Unit Standard B14 W

Interpret self-erect crane hand signals in the workplace

Task 1

1. Respond to hand signals during routine self-erect crane operations

   Key Points

   - Stop
   - Emergency stop
   - Dog everything
   - Lower load
   - Raise load
   - Move slowly (lower load)
   - Move slowly (raise load)
   - Trolley in
   - Trolley out
   - Swing left
   - Swing right

2. Demonstrate hand signals

3. Clarify instructions (hand signals) as required to ensure clear communication

4. Respond to or demonstrate Luffing Crane hand signals (if applicable)

   Key Points

   - Boom up or trolley in
   - Boom down or trolley out
   - Boom up, lower load
   - Boom down, raise load

5. Respond to or demonstrate travelling crane hand signals (if applicable)

   Key Points

   - Travel forward
   - Travel backward

Task 2
Describe protocols for taking hand signals as defined by WorkSafeBC regulations

Key Points

- Take hand signals from one person only
- Protocol for stop signal

B. Communications

Unit Standard B15 W

Use self-erect crane radio protocols and vocabulary in the workplace

Task 1
Demonstrate the procedure for working in the blind

Key Points

- Use consistent terminology
- Relay clear, concise, relevant information
- Confirm and clarify to ensure understanding
- Use measurements to clarify distance
- Use North, South, East, West (or clock face position) to aid in giving and interpreting directions
- Have rigger call out height as load is lowered

SECTION C
CRANES

C. Cranes

Unit Standard C15 K

Demonstrate knowledge of self-erect crane applications

Task 1
Describe specific handling requirements for different types of self-erect crane loads

Key Points

- Light weight, medium weight, and heavy weight
- Vertical and horizontal concrete placement with concrete bucket
- Forms (fly tables, gang forms, jump forms)
- Structural steel
- Pre-cast concrete
- Thrustout platforms
- Personnel lifts – IF ALLOWED BY MANUFACTURER (transportation cage, man basket)
- DEP box – IF ALLOWED BY MANUFACTURER
- Window boxes
- Flying forms
- Drywall cage
- Rebar
- Pressurized gases and other hazardous loads
- Multiple piece lifts (double loads, treed lifts)
- Multi-crane lifts – IF ALLOWED BY MANUFACTURER
- Garbage boxes
- Below the hook lifting devices
- Specialty lifting devices

C. Cranes

Unit Standard C16 K

Demonstrate knowledge of self-erect crane types and configurations

Task 1
Describe the various self-erect configurations available for self-erect cranes

Key Points

- Slewing tower
- Telescopic tower

Task 2
Describe the different types of jib configurations used on self-erect cranes.

Key Points

- Hydraulically controlled jib
- Horizontal jib/boom
- Inclined jib/boom

Task 3
Describe the basic mounting configurations available for self-erect cranes

Key Points

- Stationary (fixed)
- Rail
- Truck mounted

C. Cranes

Unit Standard C18 K

Demonstrate knowledge of components and their functions for different types of self-erect cranes

Task 1
Describe the components common to most self-erect cranes and explain their functions

Key Points

- Base of crane and foundation
- Tower section
- Tower ladder
- Operator's cab
- Slewing ring
- Jib or boom and boom tip
- Counterweight
- Hoist machinery and control cabinet
- Trolley and trolley lines
- Load block, load lines, sheaves and hook

Task 2
Describe the specific components of a travelling (rail) self-erect crane.

Key Points

- Bogies
- Power cable drum
- Travel control cabinet
- Ballast and rails
- Concrete ballast blocks
- Undercarriage frame
- Travel motor assembly
- Knee brace
- Designated park location

C. Cranes

Unit Standard C20 K

Demonstrate knowledge of drives, controls, and safety devices for self-erect cranes

Task 1

List the types of drive functions in self-erect cranes

Key Points

- Hoist drive
- Slewing drive
- Trolley drive
- Travel drive

Task 2

Describe safety devices for self-erect cranes and explain their functions.

Key Points

- Hoist upper limits
- Trolley travel limits
- Slewing limits
- Travel limits
- Maximum load limits
- Load moment indicator
- Gear load limit
- Safety switches
- Emergency stop buttons
- Safety guards and covers
- Anemometer (wind meter)
- Electrical lockout

Task 3
Describe hoist drive types and operating characteristics

Key Points

- Type of drive (frequency, gear, power requirements)
- Hoist gear options
- Multiple parts of line (two part, four part)
- Joystick position (motor speeds/steps)
- Self-centering joystick
- Continuous pressure controls
- Hoist braking functions (hoist holding brake)
- Emergency brakes
- Slack line cut-out
- Overspeed cut-out
- Overspeed governor

Task 4
Describe trolley drive types and controls available on self-erect cranes

Key Points

- Changeable gear boxes
- Joystick operation (motor speeds/steps)
- Trolley brake functions
- Automatic braking device
- Radio remote control
- Pendant remote control

Task 5
Describe slew drive types and controls available on self-erect cranes

Key Points

- Types of drives (frequency, gear, power requirements)
- Joystick operation (motor speeds/steps)
- Types of braking (eddie current, holding brake)
- Slewing brake functions
- Out-of-service brake release

Task 6
Describe various travel controls available on self-erect cranes

Key Points

- Joystick operation (motor speeds/steps)
- Brake functions
- Audible warning device (rail mounted cranes)

Task 7
Describe other functions controlled by buttons, switches, pedals and toggles on self-erect cranes.

Key Points

- On/Off controls
- Radio controls
- Switches

C. Cranes

Unit Standard C21 W

Identify and describe the function of the drives, controls, and safety devices on the operator's self-erect crane

Task 1
Point out the safety devices on the operator's self-erect crane and describe their functions.

Key Points

- Hoist upper limit
- Load limits - maximum load, load moment, and gear load limit
- Trolley limits (trolley in, trolley out)
- Self-centering joysticks
- Emergency stop buttons
- Emergency braking systems
- Anemometer (wind meter), operational wind speed, out of service wind speed

Task 2
Describe the hoist drive and operating characteristics

Key Points

- Type of drive (frequency, gear, power requirements)
- Changeable gear box
- Multiple parts of line
- Number of motor steps
- Hoist holding brakes

Task 3
Describe the trolley drive and operating characteristics

Key Points

- Trolley brakes

Task 4
Describe the slew drive and operating characteristics

Key Points

- Type of drive (gear drive, frequency)
- Type of braking (eddie current, holding brake)

SECTION I
MAINTENANCE AND SERVICE

I. Maintenance and Service

Unit Standard I12 K

Demonstrate knowledge of daily and monthly inspections for self-erect cranes

Task 1
Describe start of shift inspection requirements for self-erect crane operators, according to the crane manufacturer's manual.
Standards: WorkSafeBC regulations and CSA Z248-2004

Key Points

- Wind speed (anemometer)
- Crane base inspection
- Crane is level (outrigger footing/pads)
- Electrical power cords – main feed – junction box splice
- Ground fault circuit interrupter (GFCI)
- ON/OFF switch (main disconnect)
- Inspect walkways, handrails, guards, ladders, and perimeter barricade
- Inspect structure, pins, keepers, and mast connections
- Ensure all tower wedges or tie backs are in place and tight
- Ensure all doors, panels, and covers are in place and weather-tight
- Operators controls functioning properly
- Load moment hoist limit
- Load moment trolley limit
- Maximum load (line pull)
- Trolley out
- Trolley in
- Hoist up deceleration limit
- Hoist final up limit
- Hoist down limit
- Ensure all audio/visual indicators are functioning properly
- Hoist brake is functioning
- Slewing brake is functioning
- Trolley brake
- Visually inspect load block and hook
- Travel brake to rail where applicable
- Rail travel forward and reverse operation and limit
- Inspect tracks for loose connections, proper drainage, subsidence and bogie wear on traveling cranes, rail clamps, and end stops

- Housekeeping: concrete debris, rebar dowels, signage lights, access/egress and end stops
- Supervisor notified of defects or faults
- Operator to initial daily
- Check electrical connections to genset
- Check genset fluid levels
- Daily maintenance, grease slew ring and all crane grease points
- Rigging

Task 2
Describe weekly self-erect crane inspection requirements, according to crane manufacturer's manual.
Standards: WorkSafeBC regulations and CSA Z248-2004

Key Points

- Trolley rollers, tracks, slewing rings
- Sheaves, bushings, and pins
- Guy ropes, pendant lines/bars, cable clips, thimbles, and ferrules
- All rope attachments (dead end)
- Inspect load line, trolley line, and boom hoist rope, if applicable
- Tie-ins to slabs or other bracing systems if used
- Machine is properly lubricated and oil reservoirs checked
- Inspection of all drive components
- Counterweight supports and brackets are secure
- Anchor bolts/pins
- Tower bolts/pins
- Track level, parallel
- Supervisor notified of defects or faults
- Operator to initial weekly
- Required use of harness and lanyard for safety

Task 3
Describe monthly self-erect crane inspection requirements, according to crane manufacturer's manual
Standards: WorkSafeBC regulations and CSA Z248-2004

Key Points

- Bogie wear (traveling cranes)
- All belts for tension, alignment, and signs of chaffing
- All brakes for adjustment and wear
- Load line path: drums, sheave wear, bearings, and mounts
- Trolley line path: drums, sheave wear, bearings, and mounts
- Fire extinguisher (cab equipped)
- Windows and guards (visibility)
- Heater (cab equipped)
- Cab supports
- Pendant line/bar connections
- Supervisor notified of defects or faults
- Operator to initial monthly

I. Maintenance and Service

Unit Standard I13 K

Demonstrate knowledge of annual and special inspection requirements for self-erect cranes

Task 1
Describe annual and special inspection requirements for self-erect cranes

Key Points

- Certified by professional engineer
- NDT annually
- Sudden or unusual shock load or stress
- Contact with a power line
- Contact with a structure
- Crane to crane contact
- Lightning strike
- Two blocking
- Repairs certified by professional engineer

I. Maintenance and Service

Unit Standard I14 W

Conduct a start of shift self-erect crane inspection in the workplace

Task 1
Conduct and describe pre-start inspection according to crane manufacturer's manual and site procedures
Standards: WorkSafeBC regulations and CSA Z248-2004

Key Points

- Electrical power cords – main feed – junction box splice
- Ground fault circuit interrupter (GFCI)
- ON/OFF switch (main disconnect)
- Crane base inspection
- Crane level (outrigger footing/pads)
- Inspect walkways, handrails, guards, ladders, and perimeter barricade
- Inspect structure, pins, keepers, and mast connections
- Ensure all doors, panels, and covers are in place and weather-tight
- Operators controls functioning properly
- Load moment hoist limit
- Load moment trolley limit
- Maximum load (line pull)
- Trolley out
- Trolley in
- Hoist up deceleration limit
- Hoist upper limit
- Hoist down limit or slack line
- Ensure all audio/visual indicators are functioning properly
- Anemometer
- Hoist brake is functioning
- Slewing brake is functioning
- Trolley brake
- Visually inspect load block and hook
- Travel brake to rail where applicable
- Rail travel forward and reverse operation and limit
- Inspect tracks for loose connections, proper drainage, subsidence and bogie wear on traveling cranes, rail clamps, and end stops
- Housekeeping: concrete debris, rebar dowels, signage lights, access/egress and end stops

- Supervisor notified of defects or faults
- Operator to initial daily

Task 2
Conduct and describe weekly inspection requirements for self-erect crane according to crane manufacturer's manual
Standards: WorkSafeBC regulations and CSA Z248-2004

Key Points

- Trolley rollers, tracks, slewing rings
- Sheaves, bushings, and pins
- Guy ropes, pendant lines/bars, cable clips, thimbles, and ferrules
- All rope attachments (dead end)
- Inspect load line and trolley line
- Tie-ins to slabs or other bracing systems if used
- Machine is properly lubricated and oil reservoirs checked
- Inspection of all drive components
- Counterweight supports and brackets are secure
- Cribbing
- Anchor bolts/pins
- Tower bolts/pins
- Track level, parallel
- Supervisor notified of defects or faults
- Operator to initial weekly
- Required use of harness and lanyard for safety

Task 3
Demonstrate use of harness and lanyard for safety while conducting weekly inspections
Standards: WorkSafeBC regulations and CSA Z248-2004

Key Points

- Option 1: Double Lanyard
  (connects to safe point on structure, safely passes suspension points)
- Option 2: Rope Grab
  (securely fastens to horizontal life line and/or vertical life line as required)

Task 4
Conduct monthly inspection requirements for self-erect crane according to crane manufacturer's manual
Standards: WorkSafeBC regulations and CSA Z248-2004

Key Points

- Bogie wear (traveling cranes)
- All belts for tension, alignment, and signs of chaffing
- All brakes for adjustment and wear
- Load line path: drums, sheave wear, bearings, and mounts
- Trolley line path: drums, sheave wear, bearings, and mounts
- Fire extinguisher (cab equipped)
- Windows and guards (cab equipped)
- Heater (cab equipped)
- Pendant line connections
- Supervisor notified of defects or faults
- Operator to initial monthly
- Operator's cab (method of attachment and support)

I. Maintenance and Service

Unit Standard I15 W

Conduct self-erect crane motion checks and operational load limit tests in the workplace

Task 1
Conduct and describe trolley travel and hoist height limit tests according to crane manufacturer's manual

Key Points

- Trolley travel tests
  - trolley out
  - trolley in
  - high speed
- Hoist height limit tests
  - hoist up deceleration
  - hoist upper limit
  - hoist down limit
  - slack line
- Rail travel tests, if applicable
  - rail travel forward
  - rail travel reverse
  - rail travel brakes

Task 2
Conduct and describe load limit tests according to crane manufacturer's manual

Key Points

- Load moment tests (hoist limit, trolley limit)
- Maximum load test (line pull)
- Interprets load chart

SECTION M
SELF-ERECT CRANE OPERATIONS

M. Self-Erect Crane Operations

Unit Standard M9 K

Demonstrate knowledge of hoisting and rigging for self-erect cranes

Task 1
List and describe the steps and considerations in pre-lift planning

Key Points

- Communicate with rigger
- Assess lift (load weight, dimensions)
- Load chart
- 4 part line and 2 part line
- Shifting gears
- Load path
- Radius
- Rigging has been inspected before use
- Rigging is appropriate for lifting the load
- Rigging has identification tags with required information
- Centre of gravity (COG) has been determined
- Sling angle has been determined
- Rigging is protected from sharp corners
- Working load limits (WLL) are within the limitations of the rigging used
- Hitch points are suitable for the load
- Tag line need evaluated
- Personnel are clear of suspended loads
- Load to be lifted is level and stable
- Any unusual environmental concerns identified
- Slings are properly attached to load
- Factors that reduce capacity
- Hazards (weather, obstacles, public safety, etc.)
- Visibility - signaller location
- Powerlines
- Obstructions
- Critical lift (pre-lift meeting, lift plan)

M. Self-Erect Crane Operations

Unit Standard M10 K

Demonstrate knowledge of self-erect crane load charts and load calculations

Task 1
Calculate the lift requirements and limitations for a given load.

Key Points

- Determine load weight
- Determine rigging weight
- Calculate net load
- Calculate gross load
- Calculate maximum radius allowed to place load
- Determine crane configuration (gear and/or parts of line)

M. Self-Erect Crane Operations

Unit Standard M11 K

Demonstrate knowledge of how weather conditions affect self-erect crane operations

Task 1
Describe how wind speed affects self-erect crane operation

Key Points

- Anemometers, wind warnings and alarms
- WorkSafeBC regulations
- Manufacturers wind speed operating limit
- Slewing brakes, slewing drive
- Effect on crane load capacity
- Effects of wind resistance on load
- Turbulence over and around structures

Task 2
Identify and describe hazards associated with the following weather conditions

Key Points

- Lightning
- Fog
- Rain
- Snow and ice (weight, visibility, motors, sheaves, loads frozen to ground)
- Wind (wind speed, dust)
- Cold weather shutdown
- Glare (reflected and direct)

Task 3
Describe weather conditions which would require crane shutdown.

Key Points

- Lightning
- Snow
- Cold
- Wind
- Heat

M. Self-Erect Crane Operations

Unit Standard M12 K

Demonstrate knowledge of a self-erect crane operator's duties and responsibilities

Task 1
Describe the self-erect crane operator's role and responsibilities in the workplace

Key Points

- Crane operator's manual
- Site specific procedures
- Site safety responsibilities
- DEP box
- Maintain crane logbook
- Maintain operator's logbook
- Start of shift inspections
- Maintain good housekeeping (loose item hazards)
- Maintain crane in good operating order
- Act professionally
- Project schedule and daily lift schedule
- Operate crane safely and efficiently according to standards, regulations and site policies
- Attend controls when crane in operation/use
- No loads to be left suspended when operator is not at controls
- No other duties for crane operator when crane is in operation/use
- Ensure lift can be safely made before proceeding
- Avoid lifts over active work area (warn if must lift over active area)

M. Self-Erect Crane Operations

Unit Standard M13 K

Demonstrate knowledge of protocols for leaving a self-erect crane unattended

Task 1
Describe the steps for leaving a crane unattended
Standard: Crane manufacturer's manual and site protocol

Key Points

- No load on hook
- Trolley in to minimum radius – prior to limits, or as specified by manufacturer
- Raise hook to maximum height – prior to limits
- Position jib/boom facing down wind
- Power off
- General housekeeping
- Security (lock cab)
- Check for loose items outside cab
- Release slewing brakes
- Requirements in freezing conditions
- Tie downs - follow manufacturer's instructions or professional engineer
- Obstacle avoidance

Task 2
Explain additional steps required when leaving a travelling (rail) self-erect crane unattended

Key Points

- Rail bed – designated parking spot
- Machine tie-down (braking system on the wheels)

M. Self-Erect Crane Operations

Unit Standard M14 K

Demonstrate knowledge of protocols for operating a self-erect crane on a multi-crane site

Task 1
Describe safety protocols in effect on a multi-crane site

Key Points

- Right-of-way
- Radio protocol
- WorkSafeBC regulations (horizontal and vertical distances between cranes and from structures)
- Transfer point
- General contractor's site procedure
- Leave a crane unattended
- Site schematic showing cranes work radius and overlap
- Crane identification
- Load line sag/drape

Task 2
Describe safety protocols in effect when other cranes or lift equipment are in the self-erect crane work radius.

Key Points

- Site protocols
- Radio protocols
- Right-of-way
- Lift schedule
- WorkSafeBC – distances, clearance requirements, communication protocol

M. Self-Erect Crane Operations

Unit Standard M15 W

Operate a self-erect crane safely in the workplace according to regulations and manufacturer's specifications

Task 1
Perform basic self-erect crane moves

Key Points

- Hoist hoisting and lowering
  - Smooth gear operation
  - Appropriate speed
  - Ample braking time
- Trolley
  - Smooth trolley operation
  - Catch swinging load
- Slew
  - Smooth slewing operation
  - Coasting
  - Use reverse slewing for slowdown
  - Catch swinging load
- Other operating considerations
  - Determine safest route
  - Awareness of obstacles
  - Maintaining communication
  - Adjust crane operation for weather conditions
  - Maintain Limits of Approach
- Safety warning horn

Task 2
Handle a variety of self-erect crane loads of significantly different weights

Key Points

- Light weight
- Medium weight
- Heavy weight

Task 3
Describe the crane's capabilities and limitations by interpreting the crane load chart

Key Points

- Maximum load
- Tip capacity
- Interpret load chart

Task 4
Describe changing gears and/or parts of line

Key Points

- Advantages of each gear
- Changing gears (select gear and/or configure appropriate parts of line)
- Changing parts of line (if applicable) and describe the implications

M. Self-Erect Crane Operations

Unit Standard M16 W

Leave a self-erect crane unattended in the workplace

Task 1

Leave crane unattended according to crane manufacturer's manual

Key Points

- Remove rigging
- Trolley in to minimum radius (prior to limits or as specified by manufacturer)
- Raise hook to maximum height (prior to limits)
- Describe best practices regarding limits
  - Stopping prior to limits
- Power off
- General housekeeping
- Security (lock cab)
- Check for loose items outside cab
- Release slewing brakes
- Implement tie-downs (if required by site)
- Ensure no limits are tripped when parking crane

SECTION 3

TRAINING PROVIDER STANDARDS

TRAINING PROVIDER STANDARDS

Instructor Qualification:

For technical training, instructors must be occupationally competent to run the crane type they are training to and, as a minimum, hold a BC Certificate of Qualification for that crane type.

Minimum List of Shop/Laboratory Equipment Required for Self-Erect Crane

Industry has not set minimum equipment requirements for providing training for this trade. Industry standards are focused on the outcomes of training rather than the inputs. It is left to the crane training community to deliver training that will meet these standards in a time efficient and cost effective manner. Training providers are permitted maximum flexibility in the options and strategies they may employ in training operators to meet these standards.

RECOMMENDED REFERENCE TEXTBOOKS

From the Construction Safety Association of Ontario http://www.csao.org/

Crane Handbook
by Donald E. Dickie, P. Eng., D. H. Campbell, P. Eng.
Construction Safety Association of Ontario

Rigging Manual
by Donald E. Dickie, P. Eng.
Construction Safety Association of Ontario ..... ISBN 0-7726-1574-8

Hoisting and Rigging Safety Manual
Construction Safety Association of Ontario ..... ISBN 0-919465-70-6

Slings
Construction Safety Association of Ontario ..... ISBN 0-919465-76-5

From the Operating Engineers Training Institute of Ontario http://www.oetio.com

Mobile Craning Today
Operating Engineers Training Institute of Ontario ..... ISBN 0-8273-5460-6

Additional Resources

IPT's Crane and Rigging Handbook
by Ronald G. Garby ..... ISBN 0-920855-14-8

IPT's Crane and Rigging Training Manual
by Ronald G. Garby ..... ISBN 0-920855-16-4

Reference Authority

1. WorkSafeBC Occupational Health and Safety Regulation (OHSR)
2. CSA Standard Z248-2004 Safety Code for Tower Cranes