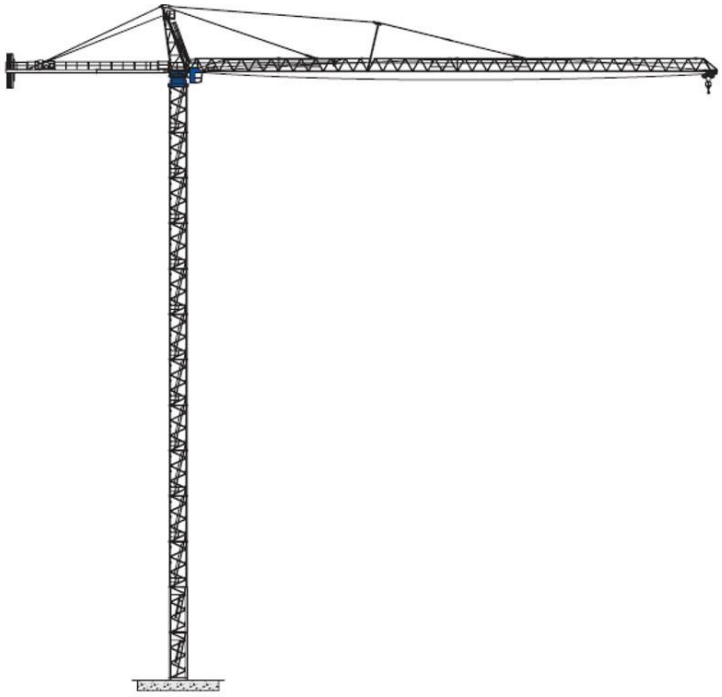
Tower Crane

Operator Standards

December 2009



BC Crane Safety

Crane Certification and Licensing Authority

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FOREWORD

The Tower Crane Program Outline guides the competency-based training of crane operators who aspire to operate Tower Cranes.

The outline contains Knowledge Units and Workplace Units (Workplace Unit Standards of Competence).

Learners complete the Knowledge Units away from their regular work location, typically in a classroom or through guided self-study, distance education and other non-traditional learning methodologies. (Note that the industry is encouraging the use of non-traditional methods as much as possible to facilitate the learning.)

The Workplace Units build upon the learning gained in the Knowledge Units and enable learners to amass their required, naturally-occurring evidence of workplace performance while they work. An assessor will compare this evidence to the performance standards that have been assigned to each Workplace Unit's set of tasks. All performance standards have been defined by industry.

Safe working practices, although not always specified in each of the units, are a part of the safe working and learning conditions underlying all these standards. They too are required during the presentation of evidence to prove that the performance standards have been met.

This outline includes a list of recommended reference textbooks that are available to support achievement of the Knowledge Units. The final section provides some direction by industry on training options for the program as a whole.

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.

DEVELOPMENT OF THE UNIT STANDARDS

All Unit Standards in the BCACS *Crane Operator Qualification Program* were developed through extensive consultation with a broad cross section of stakeholders in BC's tower crane industry – crane owners, operators and other occupations which make occasional yet regular use of cranes. (For more information on the program development process, please refer to the Acknowledgements section of the *Crane Common Core Program Outline*.)

The Unit Standards in this outline build upon the Crane Common Core and constitute the program for tower crane operators.

BCACS contracted the development of the *Tower Crane Operator Qualification Program* to North Pacific Training and Performance Inc. of Vancouver in 2007. Over the summer of 2007, North Pacific met several times with tower crane subject matter experts Barry Conroy and Paul Welder to validate the Competency Standards developed from the industry-endorsed Competency Profile.

Mechanism for Adjustment

The BC Association for Crane Safety is industry's lead body in coordinating development of and updates to these standards.

For revision suggestions please e-mail info@bccranesafety.ca.

BCACS will endeavor to respond as quickly as possible to suggestions or concerns over the standards. Some suggestions or requested changes may require an industry consultation to determine their validity and relevance across all sectors of the industry.

TOWER CRANE PROGRAM OVERVIEW

British Columbia Crane Operator's Qualification (includes Crane Operator Common Core)

Note: The numbering of the Tower Crane Unit Standards follows on from the numbering of the Crane Common Core Unit Standards, the completion of which is prerequisite to a learner beginning the Tower Crane Program

Section 1	Safety
Section 2	Communications
Section 3	Cranes
Section 4	Rigging
Section 5	Load Charts
Section 6	Transportation and Delivery
Section 7	Site Planning and Crane Positioning
Section 8	Crane Operations
Section 9	Maintenance and Service
Section 10	Hydraulic Boom Crane Endorsement (no tonnage restrictions)
Section 11	Lattice Boom Crane Endorsement
Section 12	Lattice Friction Boom Crane Endorsement
***Section 13**	**Tower Crane**

Assessments and Quality Assurance

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CSA Standard Z248-2004 Code for Tower Cranes, ANSI Standard ASME B30.4-2003, Portal, Tower, and Pillar Cranes, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

Any assessor assessing against this unit standard must be an occupationally competent crane operator with industrial experience, and must have completed the assessor registration competency.

References

WorkSafeBC Occupational Health and Safety (OHS) regulations
The Hoisting and Rigging Safety Manual, Construction Safety Association of Ontario, 1997
CSA Standard Z248-2004 Code for Tower Cranes,
ANSI Standard ASME B30.4-1990, Portal, Tower, and Pillar Cranes,
Workplace Hazardous Material Information System (WHMIS), and delivery agency policy

OCCUPATION ANALYSIS CHART

Core & Tower Crane Operator Competency Profile Chart

1. Safety (CS) **Level 1**	**1.1 K** Demonstrate knowledge of safe working practices for crane operators 1	**1.2 K** Demonstrate knowledge of power line hazards and high voltage equipment 1	**1.3 W** Comply with WorkSafeBC and OH & S regulations 1	**1.7 K** Demonstrate Knowledge of tower crane specific PPE 1	**1.8 K** Demonstrate knowledge of regulations, standards, and documentation relevant to tower crane operations 1	**1.9 K** Demonstrate knowledge of documentation for the site and the operator's tower crane 1
	1.10 W Demonstrate knowledge of documentation for the site and the operator's tower crane 1					
2. Communications (CCOM) **Level 1**	**2.1 K** Demonstrate knowledge of personnel involved in crane operations 1	**2.2 K** Demonstrate knowledge of hand signals 1	**2.3 K** Demonstrate knowledge of radio communications 1	**2.4 K** Demonstrate knowledge of workplace communications 1	**2.5 W** Use hand signals in the workplace 1	**2.6 W** Use radio communications in the workplace 1
	2.7 W Communicate information clearly and check for understanding in the workplace 1	**2.8 K** Demonstrate knowledge of tower crane hand signals 2	**2.9 K** Demonstrate knowledge of tower crane radio protocols and vocabulary 2	**2.10 W** Interpret tower crane hand signals in the workplace 2	**2.11 W** Use tower crane radio protocols and vocabulary in the workplace 2	

3. **Cranes (CC)** **Level 1**	**3.1 K** Demonstrate knowledge of types of cranes and classifications 1	**3.2 K** Demonstrate knowledge of terminology related to craning and craning concepts 1	**3.3 K** Demonstrate knowledge of hoisting terminology, functions and systems 1	**3.4 K** Demonstrate knowledge of regulatory requirements pertaining to cranes 1	**3.8 K** Demonstrate knowledge of training and certification process for tower crane operators 2	**3.9 K** Demonstrate knowledge of tower crane applications 2
	3.10 K Demonstrate knowledge of tower crane types and configurations 2	**3.11 K** Demonstrate knowledge of the erection and dismantling processes for tower cranes 2	**3.12 K** Demonstrate knowledge of components and their functions for different types tower cranes 2	**3.13 K** Demonstrate knowledge of tower crane climbing and towering methods and hazards 2	**3.14 K** Demonstrate knowledge of drives, controls, and safety devices for tower cranes 2	**3.15 K** Identify and describe the function of the drives, controls and safety devices on the operator's tower crane 2
4. **Rigging (CR)**	**4.1 K** Demonstrate knowledge of lifting theory and forces 1	**4.2 K** Demonstrate knowledge of rigging hardware, materials, tools and manuals 1	**4.3 K** Demonstrate knowledge of types and function of wire rope and chains 1	**4.4 K** Demonstrate knowledge of installation, inspection and storage of wire rope 1	**4.5 K** Demonstrate knowledge of rigging techniques 1	**4.6 W** Use rigging hardware and tools in the workplace 1
5. **Load Charts (CLC)** **Level 1**	**5.1 K** Demonstrate knowledge of determining weight loads using fundamental math functions and calculations 1	**5.2 K** Demonstrate knowledge of loading and lifting 1	**5.3 W** Interpret load charts and load study drawings to configure crane for workplace operation 1			
8. **Crane Operations (CCO)** **Level 1**	**8.1 K** Demonstrate knowledge of pre-operational requirements in crane operations 1	**8.4 W** Demonstrate crane set-up per manufacturer's instructions (except Task 4 in Mobile) 1				

9. **Maintenance and Service (CMS)** **Level 1**	**9.1 W** Maintain an equipment logbook to retain a permanent written record of maintenance and repairs 1	**9.8 K** Demonstrate knowledge of daily and monthly inspections for tower cranes 2	**9.9 K** Demonstrate knowledge of annual and special inspection requirements for tower cranes 2	**9.10 W** Conduct a start of shift tower crane inspection in the work place 2	**9.11 W** Conduct tower crane load limit and range of travel tests in the workplace 2
13. **Tower Crane Operations**	**13.1 K** Demonstrate knowledge of hoisting and rigging for tower cranes 2	**13.2 K** Demonstrate knowledge of tower crane load charts and load calculations 2	**13.3 K** Demonstrate knowledge of how weather conditions affect tower crane operations 2	**13.4 K** Demonstrate knowledge of tower crane operator's duties and responsibilities 2	**13.5 K** Demonstrate knowledge of protocols for leaving a tower crane unattended 2
	13.6 K Demonstrate knowledge of protocols for operating a tower crane on a multi-crane site 2				
	13.7 W Operate a tower crane safely in the workplace according to regulations and manufacturer's specifications 2	**13.8 W** Leave a tower crane unattended in the workplace. 2			

CORE & TOWER CRANE

OPERATOR STANDARDS

SUGGESTED TIME ALLOTMENTS CORE

Core Level		Theory	Practical
Unit	**Section 1 – Safety Knowledge** **% of Time**	**5%**	
CS 1.1 K	Demonstrate knowledge of safe working practices for crane operators	✓	
CS 1.2 K	Demonstrate knowledge of power line hazards and high voltage equipment	✓	
Unit	**Section 1 – Safety Practical (Workplace)**		**Must meet standards**
CS 1.3 W	Comply with WorkSafeBC and OH & S regulations		✓
	Total Percentage for Section 1	**5%**	
Unit	**Section 2 - Communications Knowledge** **% of Time**	**5%**	
CCOM 2.1 K	Demonstrate knowledge of personnel involved in crane operations	✓	
CCOM 2.2 K	Demonstrate knowledge of hand signals	✓	
CCOM 2.3 K	Demonstrate knowledge of radio communications	✓	
CCOM 2.4 K	Demonstrate knowledge of workplace communications	✓	
Unit	**Section 2 - Communications Practical**		**Must meet standards**
CCOM 2.5 W	Use hand signals in the workplace		✓
CCOM 2.6 W	Use radio communications in the workplace		✓
CCOM 2.7 W	Communicate information clearly and check for understanding in the workplace		✓
	Total Percentage for Section 2	**5%**	

Core Level		Theory	Practical
Unit	**Section 3 – Cranes Knowledge % of Time**	**10%**	
CC 3.1 K	Demonstrate knowledge of types of cranes and classifications	✓	
CC 3.2 K	Demonstrate knowledge of terminology related to craning and craning concepts	✓	
CC 3.3K	Demonstrate knowledge of hoisting terminology, functions and systems	✓	
CC 3.4 K	Demonstrate knowledge of regulatory requirements pertaining to cranes	✓	
	Total Percentage for Section 3	**10%**	
Unit	**Section 4 – Rigging Knowledge % of Time**	**20%**	
CR 4.1 K	Demonstrate knowledge of lifting theory and forces	✓	
CR 4.2 K	Demonstrate knowledge of rigging hardware, materials, tools and manuals	✓	
CR 4.3 K	Demonstrate knowledge of types and function of wire rope and chains	✓	
CR 4.4 K	Demonstrate knowledge of installation, inspection and storage of wire rope	✓	
CR 4.5 K	Demonstrate knowledge of rigging techniques	✓	
Unit	**Section 4 - Rigging Practical**	**Must meet standards**	
CR 4.6 W	Use rigging hardware and tools in the workplace		✓
	Total Percentage for Section 4	**20%**	
Unit	**Section 5 – Load Charts Knowledge % of Time**	**30**	
CLC 5.1 K	Demonstrate knowledge of determining weight loads using fundamental math functions and calculations	✓	
CLC 5.2 K	Demonstrate knowledge of loading and lifting	✓	
Unit	**Section 5 – Load Charts Practical**	**Must meet standards**	
CLC 5.3 W	Interpret load charts and load study drawings to configure crane for workplace operation		✓
	Total Percentage for Section 5	**30%**	

Core Level		Theory	Practical
Unit	**Section 8 – Crane Operations - Knowledge**	**30%**	
CCO 8.1 K	Demonstrate knowledge of pre-operational requirements in crane operations	✓	
Unit	**Section 8 – Crane Operations – Practical**	**Must meet standards**	
CCO 8.4 W	Demonstrate crane set-up per manufacturer's instructions (except Task 4 in Mobile)		✓
	Total Percentage for Section 8	**30%**	
Unit	**Section 9 - Maintenance & Service – practical**	**Must meet standards**	
CMS 9.1 W	Maintain an equipment logbook to retain a permanent written record of maintenance and repairs		✓
	Total Percentage for Section 9		
	TOTAL ALL UNITS	**100%**	

SUGGESTED TIME ALLOTMENTS TOWER CRANE

Tower Crane Operator			Knowledge	Practical
Unit	Section 1 – Safety	% of Time	7%	
1.7 K	Demonstrate knowledge of tower crane specific PPE		✓	
1.8 K	Demonstrate knowledge of the regulations, standards, and documentaion relevant to tower crane operation		✓	
1.9 K	Demonstrate knowledge of regulations and protocols for operating a tower crane in proximity to power lines, cable hazards, and high and low voltage equipment		✓	
1.10 W	Demonstrate knowledge of documentation for the site and the operator's tower crane			✓
Unit	Section 2 – Communications	% of Time	6%	
2.8 K	Demonstrate knowledge of tower crane hand signals		✓	
2.9 K	Demonstrate knowledge of tower crane radio protocols and vocabulary		✓	
2.10 W	Interpret tower crane hand signals in the workplace			✓
2.11 W	Use tower crane radio protocols and vocabulary in the workplace			✓
Unit	Section 3 – Cranes	% of Time	36%	
3.8 K	Demonstrate knowledge of the training and certification process for tower crane operators		✓	
3.9 K	Demonstrate knowledge of tower crane applications		✓	
3.10 K	Demonstrate knowledge tower crane types and configurations		✓	
3.11 K	Demonstrate knowledge of the erection and dismantling processes for tower cranes		✓	
3.12 K	Demonstrate knowledge of components and their functions for different types of tower cranes		✓	
3.13 K	Demonstrate knowledge of tower crane climbing and lowering methods and hazards		✓	
3.14 K	Demonstrate knowledge of drives, controls, and safety devices for tower cranes		✓	
3.15 W	Identify and describe the function of the drives, controls, and safety devices on the operator's tower crane			✓

Tower Crane Operator		Knowledge	Practical
Unit	**Section 9 – Maintenance and Service % of Time**	**10%**	
9.8 K	Demonstrate knowledge of daily and monthly inspections for tower cranes	✓	
9.9 K	Demonstrate knowledge of annual and special inspection requirements for tower cranes	✓	
9.10 W	Conduct a start of shift tower crane inspection in the workplace		✓
9.11 W	Conduct tower crane load limit and range of travel tests in the workplace		✓
Unit	**Section 13 – Tower Crane Operations % of Time**	**41%**	
13.1 K	Demonstrate knowledge of hoisting and rigging for tower cranes	✓	
13.2 K	Demonstrate knowledge of tower crane load charts and load calculations	✓	
13.3 K	Demonstrate knowledge of how weather conditions affect tower crane operations	✓	
13.4 K	Demonstrate knowledge of a tower crane operator's duties and responsibilities	✓	
13.5 K	Demonstrate knowledge of protocols for leaving a tower crane unattended	✓	
13.6 K	Demonstrate knowledge of protocols for operating a tower crane on a multi-crane site	✓	
13.7 W	Operate a tower crane safely in the workplace according to regulations and manufacturer's specifications		✓
13.8 W	Leave a tower crane unattended in the workplace		✓

CORE PROGRAM OUTLINE

PROGRAM OUTLINE FOR SECTION 1 SAFETY

SECTION 1 – SAFETY

Unit Standard CS 1.1 K

SAFETY
Demonstrate knowledge of safe working practices for crane operators Core

Purpose

This unit of competency covers knowledge of potential hazards in the workplace.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

Any assessor assessing against this competency standard must be an occupationally competent crane operator with Red Seal endorsement (in the case of Mobile Crane) and industrial experience; and have completed the assessor registration competency.

References

WorkSafeBC Occupational Health and Safety (OHS) regulations
The Hoisting and Rigging Safety Manual, Construction Safety Association of Ontario, 1997
CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes,
ANSI Standard ANSI/ASME B30.5-1994, Mobile and Locomotive Crane or ANSI/AMSE B30.22-1993, Articulating Boom Crane,
Workplace Hazardous Material Information System (WHMIS) and delivery agency policy

Task 1

Describe workplace hazards in terms of the WorkSafeBC OHS regulations and how to eliminate, isolate, or minimize hazards.

Performance standards

1.1 Energy source hazards are described.

Must include

1. hydraulic
2. steam
3. electrical
4. air
5. stored energy
6. gravitational
7. pinch points
8. barriers
9. guards

1.2 Overhead hazards are described.

Must include
1. power lines
2. cranes
3. scaffolding
4. falling objects

1.3 Falling and lifting hazards and safe lifting procedures are described.

Must include
1. open holes
2. scaffolding

1.4 Mobile machinery hazards are described.

Must include
1. trains
2. trucks
3. cranes
4. forklift trucks
5. mobile conveyor

1.5 Rotating equipment hazards are described.

Must include
1. belts
2. pulleys
3. sheaves
4. conveyors
5. sprockets
6. chains
7. couplings
8. pinch points
9. barriers
10. guards

1.6 Gas hazards are described

Must include
1. explosive gases
2. poisonous gases
3. atomizers
4. oxygen deprived atmospheres
    a. methane (CH_4)
    b. lower explosive limit (LEL)
    c. hydrogen sulphide (H_2S).

Task 2
Demonstrate knowledge of worksite hazard risk assessment and risk management procedures.

Performance standards

2.1 Risk assessment procedures and risk management procedures are described.

Must include

1. responsibility to maintain a safe work environment
2. changing weather
3. frozen surfaces
4. traffic
5. location
6. operating blind
7. slips
8. trips and falls
9. injury to others
10. injury from moving machinery.

2.2 Methods of communicating risks and risk situations to others are explained.

Must include

1. signage
2. tagging
3. verbal communications
4. written communications
5. safe work cards
6. risk hazard assessment procedures

2.3 Notifying local utilities when operating near utility lines or potential hazards is explained.

Task 3

Demonstrate knowledge of accident and incident reporting procedures.

3.1 Requirements for recording an accident and incident are

explained Must include

1. report form completion
2. report form processing

Task 4
Describe personal protection equipment.

Performance standards

4.1 Breathing protection equipment is described.

Must include

1. respirators and filters
2. dust protection
3. hand protection

4.2 Eye protection equipment in terms of goggles and shields.

4.3 Personal protective equipment and clothing (PPE) is described.

Must include
1. hard hat
2. boots
3. eyewear
4. hearing protection

Task 5

Demonstrate knowledge of response to fire emergencies.

Performance standards

5.1 Fire extinguisher types, servicing and use are described.

Must include
1. extinguisher types and capacities
2. use of extinguishers

5.2 Procedures for fighting electrical fires are explained.

Must include
1. isolate power
2. fire fighting equipment

5.3 Fire emergency response and evacuation procedures in accordance with industry practice are described.

Task 6

Describe procedure for emergency rescue from a crane.

Performance standard

5.1 Emergency rescue procedures are described.

Must include
1. tower crane operator station rescues
2. crane accident
3. crane fire

Task 7

Describe the 3 point contact method when mounting and dismounting equipment

Must include
1. cranes
2. other heavy equipment

Unit Standard CS 1.2 K

SAFETY
Demonstrate knowledge of power line hazards and high voltage equipment

Purpose

This unit standard covers knowledge about crane operation around high voltage equipment.

Prerequisite

CS 1.1 K Demonstrate knowledge of safe working practices for crane operators

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CSA Standard Z150-1974 Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

Any assessor assessing against this competency standard must be an occupationally competent crane operator with Red Seal endorsement (in the case of Mobile Crane) and industrial experience; and have completed the assessor registration competency.

References

WorkSafeBC Occupational Health and Safety (OHS) regulations

The Hoisting and Rigging Safety Manual,

Construction Safety Association of Ontario, 1997

CSA Standard Z150-1974 Safety Code for Mobile Cranes,

ANSI Standard ANSI/ASME B30.5-1994, Mobile and Locomotive Crane or ANSI/AMSE B30.22-1993, Articulating Boom Crane,

Workplace Hazardous Material Information System (WHMIS)

and delivery agency policy

BC Hydro High Voltage safety manual

Task 1

Describe procedures for operating in proximity of overhead conductors.

Performance standard

1.1 Operating procedures in the vicinity of overhead conducts are described.

Must include

1. `interpret signage related to high voltage
2. state safe limits of approach to overhead conductors

1.2 Procedures if contact is made with high voltage equipment are explained.

Must include

1. break crane contact with wire if possible
2. stay in cab until de-energized by utility company
3. jump clear
    a. step potential (toe to heel)
4. apply first aid
5. inspect machine for damage caused by contact
6. report contact to job supervisor immediately
7. report contact to WorkSafeBC immediately
8. report contact to utility company immediately
9. record contact in crane Work Record log book

Unit Standard CS 1.3 W

Safety
Comply with WorkSafeBC OHS regulations

Purpose

Interpret and comply with WorkSafeBC OHS regulations, standards and guidelines.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-1994, Mobile and Locomotive Crane or ANSI/AMSE B30.22-1993, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

Any assessor assessing against this competency standard must be an occupationally competent crane operator with Red Seal endorsement (in the case of Mobile Crane) and industrial experience; and have completed the assessor registration competency.

References

WorkSafeBC Occupational Health and Safety (OHS) regulations

The Hoisting and Rigging Safety Manual,

Construction Safety Association of Ontario, 1997

CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes,

Task 1

Comply with WorkSafeBC OHS regulations and procedures applicable to workers in the industrial workplace by demonstrating knowledge gained in training.

Performance standards

1.1 The purpose and role of WorkSafeBC is upheld while in the workplace.

1.2 The rights and responsibilities of employers and employees are protected and upheld

1.3 Reporting procedures are accurately completed

1.4 Thorough workplace inspections are performed

1.5 WorkSafeBC OHS regulations, standards and guidelines are complied with and adhered to in the workplace.

Must include

1. all regulations applicable in the apprentices workplace

CORE PROGRAM OUTLINE

PROGRAM OUTLINE FOR SECTION 2 COMMUNICATIONS

SECTION 2 – COMMUNICATIONS

Unit Standard CCOM 2.1 K

Communications
Demonstrate knowledge of personnel involved in crane operations - core

Purpose

Demonstrate knowledge of the personnel involved in crane operations and in a traditional workplace.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-1994, Mobile and Locomotive Crane or ANSI/AMSE B30.22-1993, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

Any assessor assessing against this competency standard must be an occupationally competent crane operator with Red Seal endorsement (in the case of Mobile Crane) and industrial experience; and have completed the assessor registration competency.

References

WorkSafeBC Occupational Health and Safety (OHS) regulations The
Hoisting and Rigging Safety Manual,
Construction Safety Association of Ontario, 1997
CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes,
ANSI Standard ANSI/ASME B30.5-1994, Mobile and Locomotive Crane or ANSI/AMSE B30.22-1993, Articulating Boom Crane,
Workplace Hazardous Material Information System (WHMIS), and
delivery agency policy

Task 1

Describe the personnel involved in a workplace and the roles they play.

Performance standards

1.1 The roles and responsibilities are explained for personnel in the

workplace Must include

1. site supervisor
2. crane operator
3. rigger
4. signaller
5. CSO – construction safety officer

Unit Standard CCOM 2.2 K

Communications
Demonstrate knowledge of hand signals – core

Purpose

Demonstrate knowledge of hand signals used in crane operations

Prerequisite

Unit Standard 2.1 K Demonstrate knowledge of personnel involved in crane operations

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

Any assessor assessing against this competency standard must be an occupationally competent crane operator with Red Seal endorsement (in the case of Mobile Crane) and industrial experience; and have completed the assessor registration competency.

References

WorkSafeBC Occupational Health and Safety (OHS) regulations
The Hoisting and Rigging Safety Manual,
Construction Safety Association of Ontario, 1997
CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, CSA Standard Z248 Safety Code for Tower Cranes ANSI Standard ANSI/ASME B30.5-1994, Mobile and Locomotive Crane or ANSI/AMSE B30.22-1993, Articulating Boom Crane,
Workplace Hazardous Material Information System (WHMIS),
and delivery agency policy

Task 1

Describe the hand signals used during crane operations.

Performance standards

1.1 Hand signals are accurately described

1.2 Hand signals are accurately identified and interpreted

1.3 Requirements of the crane hand signaller are explained

Unit Standard CCOM 2.3 K

Communications
Demonstrate knowledge of radio communications - core

Purpose

Demonstrate knowledge of the use of radio communications in the workplace.

Prerequisites

Unit Standard 2.1 K Demonstrate knowledge of personnel involved in crane operations
Unit Standard 2.2 K Demonstrate knowledge of hand signals

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

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References

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CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes,
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and delivery agency policy

Task 1

Describe the use of two-way electronic voice communication devices

Performance standards

1.1 The basic functions of the radio communication devices are described

1.2 Language and terminology used during radio communication is explained

Must include
1. short form words and phrases
2. use of 12 o'clock (clock face positioning reference) to aid in direction giving and interpreting

1.3 Use of two-way communication devices are demonstrated and tested in a class room environment.

Unit Standard CCOM 2.3 K

Communications

Must include

1. Lost contact by radio and requirements to stop operation

Unit Standard CCOM 2.4 K

Communications
Demonstrate knowledge of workplace communications - core

Purpose

Demonstrate knowledge of the use of effective communications in the workplace.

Prerequisite

Unit Standard 2.1 K Demonstrate knowledge of personnel involved in crane operations

Assessment

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Quality Assurance

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ANSI Standard ANSI/ASME B30.5-1994, Mobile and Locomotive Crane or ANSI/AMSE B30.22-1993, Articulating Boom Crane,
Workplace Hazardous Material Information System (WHMIS),
and delivery agency policy

Definitions

Active listening –the skills of listening. These skills may include but are not limited to questioning, reading and responding to body language, use of silence, paraphrasing, reflecting feels, summarizing

Task 1

Demonstrate knowledge of basic workplace documents and explain the need to correctly act on the content

Performance standards

1.1 Basic written communications in the workplace are described and interpreted accurately.

Must include

1. work orders and written instructions
2. work records
3. company logs
4. basic project plan
5. written reports

1.2 Techniques to ensure clear communication is achieved are

explained Must include

1. English workplace vocabulary
2. non-verbal communications
3. use of tone and volume
4. slang
5. cultural and geographical differences in language
6. tact
7. diplomacy
8. assertiveness

1.3 Techniques for checking understanding are described.

Must include

1. active and focused listening
2. recapping the key points
3. restating the instruction or sentence
4. clarifying questions

1.4 Hazards to personnel and equipment when communication breaks down in terms of safety and liability are described.

1.5 Causes of communication breakdowns are described.

Must include

1. noise
2. language differences
3. hearing problem (that may not have been identified)
4. bias
5. attitude
6. issues with egos and arrogance
7. issues with timidness and fear of speaking up

Unit Standard CCOM 2.5 W

Communications
Use hand signals in the workplace - core

Purpose

Demonstrate ability to use hand signals correctly in crane operations

Prerequisites

Unit Standard CCOM 2.1 K Demonstrate knowledge of personnel involved in crane operations
Unit Standard CCOM 2.2 K Demonstrate knowledge of hand signals
Unit Standard CCOM 2.3 K Demonstrate knowledge of radio communications
Unit Standard CCOM 2.4 K Demonstrate knowledge of workplace communications

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

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References

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Construction Safety Association of Ontario, 1997
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Workplace Hazardous Material Information System (WHMIS),
and delivery agency policy

Task 1

Use hand signals and respond to hand signals during crane operations.

Performance standards

1.1 Hand signals are accurately used

1.2 Hand signals of others are accurately identified and interpreted

1.3 Hand signals aided in the safe and correct completion of a crane operation

Unit Standard CCOM 2.6 W

Communications
Use radio communications in the workplace - core

Purpose

Demonstrate ability to use radio communications in the workplace.

Prerequisites

Unit Standard CCOM 2.1 K Demonstrate knowledge of personnel involved in crane operations
Unit Standard CCOM 2.2 K Demonstrate knowledge of hand signals
Unit Standard CCOM 2.3 K Demonstrate knowledge of radio communications
Unit Standard CCOM 2.4 K Demonstrate knowledge of workplace communications

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

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Workplace Hazardous Material Information System (WHMIS),
and delivery agency policy

Task 1

Use a two-way electronic voice communication device in the workplace

Performance standards

1.1 Basic functions of the radio communication devices are used according to equipment instructions

1.2 Language and terminology used during radio communication is clearly understood

1.3 Two-way communication devices are used to relay clear, concise, relevant information.

Unit Standard CCOM 2.7 W

Communications
Communicate information clearly and check for understanding in the workplace – core

Purpose

Demonstrate knowledge of the use of effective and clear communications in the workplace.

Prerequisite

Unit Standard CCOM 2.1 K Demonstrate knowledge of personnel involved in crane operations

Assessment

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Quality Assurance

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References

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Workplace Hazardous Material Information System (WHMIS),
and delivery agency policy

Definitions

Active listening –the skills of listening. These skills may include but are not limited to questioning, reading and responding to body language, use of silence, paraphrasing, reflecting feels, summarizing

Task 1

Read and demonstrate the correct interpretation of workplace documents

Performance standards

1.1 Use and interpret basic written communications in the workplace to accurately perform tasks as assigned.

Must include

1. work orders and written instructions
2. maintenance records
3. company logs
4. basic project plan
5. written reports.

1.2 Use techniques to ensure clear communication is achieved in the

workplace

1.3 Must include

1. English workplace vocabulary
2. non-verbal communications
3. use of tone and volume
4. colloquialisms
5. cultural and geographical differences in language
6. tact
7. diplomacy
8. assertiveness.

1.4 Use techniques for checking understanding with colleagues

Must include

1. active and focused listening
2. recapping the key points
3. restating the instruction or sentence
4. clarifying questions.

1.5 Breakdown in communication does not occur and personnel and equipment are not exposed to hazards

1.6 Communicates clearly, fairly and accurately despite workplace communication barriers.

May include

1. noise
2. language differences
3. hearing problem (that may not have been identified)
4. bias
5. attitude
6. issues with egos and arrogance
7. issues with timidness and fear of speaking up.

CORE PROGRAM OUTLINE

PROGRAM OUTLINE FOR SECTION 3

CRANES

SECTION 3 – CRANES

Unit Standard CC 3.1 K

Cranes
Demonstrate knowledge of types of cranes and classifications- Core

Purpose

Demonstrate knowledge of types of cranes.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

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Task 1

Describe the types of cranes and their key functions.

Performance standards

1.1 The purpose and functions of cranes are described.

Must include

1. boom trucks
2. mobile cranes
3. tower cranes
4. self erect cranes

1.2 Cranes are categorized using classifications.

Must include

1. carrier types (e.g. crawler, rubber)
2. hoist mechanisms (e.g. hydraulic, conventional, electrical)
3. lifting capacity
4. boom types (e.g. lattice, hydraulic, knuckle boom, luffing boom.)
5. heavy lift cranes (e.g. super lift, ringer)
6. tower cranes
7. self-erect cranes

Unit Standard CC 3.2 K

Cranes
Demonstrate knowledge of terminology related to craning and craning concepts - core

Purpose

Demonstrate knowledge of terminology related to craning and craning concepts.

Prerequisite

Unit Standard CC 3.1 K Demonstrate knowledge of cranes and classifications
Unit Standard CC 3.2 K Demonstrate knowledge of crane components and attachments

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

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Task 1

Describe terms related to craning commonly used in the work environment

Performance standards

1.1 Terms related to craning are explained and must include:

1. wire rope
2. fittings
3. drums
4. hooks
5. sheaves
6. winch

7. slew / swing
8. hoist
9. boom
10. swing brake
11. swing dog
12. mast
13. gantry
14. overload protection systems (limits)

Task 5

Demonstrate knowledge of travel braking systems in crane operations.

Performance standards

5.1 Components of the braking systems are described and their functions

explained Must include

1. air compressor
2. brake chambers
3. drums
4. brake bands
5. slack adjusters

5.2 Defects or malfunctions of braking systems are

described Must include

1. air compressors
2. brake chambers
3. drums
4. brake bands
5. slack adjusters

Unit Standard CC 3.3 K

Cranes
Demonstrate knowledge of hoisting terminology, functions and systems - core

Purpose

Demonstrate knowledge of hoisting terminology, functions and systems for crane operations

Prerequisite
Unit Standard CC 3.1 K Demonstrate knowledge of cranes and classifications
Unit Standard CC 3.2 K Demonstrate knowledge of crane components and attachments

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

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and delivery agency policy

Task 1

Demonstrate knowledge of hoisting functions and systems for crane operation

Performance Standards

1.1 Components of hoisting systems are described and their functions explained

Must include
1. hydraulic boom
2. lattice boom
3. drums
4. hooks
5. sheaves
6. winch

7. brakes and clutches
8. trolley
9. roller
10. swing bearing

1.2 Defects or malfunctions of hoisting systems are

described Must include

1. hydraulic boom
2. lattice boom
3. drums
4. hooks
5. sheaves
6. winch
7. brakes and clutches
8. trolley
9. roller
10. swing bearing

Unit Standard CC 3.4 K

Cranes
Demonstrate knowledge of regulatory requirements pertaining to cranes - Core

Purpose

Demonstrate knowledge of the regulations to legally and safely operate cranes.

Prerequisite

Unit Standard CC 3.1 K Demonstrate knowledge of cranes and classifications
Unit Standard CC 3.2 K Demonstrate knowledge of crane components and attachments
Unit Standard CC 3.3 K Demonstrate knowledge of engines and ancillary systems

Assessment

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Quality Assurance

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Workplace Hazardous Material Information System (WHMIS) and delivery agency policy
IPT Crane and rigging manual

Task 1

Demonstrate knowledge of how the regulations apply to the operation of cranes in a workplace.

Performance standards

1.1 The impact of current regulations on workplace practices and crane operations is described

Must include

1. WorkSafeBC Occupational Health and Safety (OHS) regulations
2. The Hoisting and Rigging Safety Manual

3. Construction Safety Association of Ontario, 1997
4. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes
5. CSA Standard Z248 Safety Code for Tower Cranes
6. ANSI Standard ANSI/ASME B30.5-1994, Mobile and Locomotive Crane or ANSI/AMSE B30.22-1993, Articulating Boom Crane
7. Workplace Hazardous Material Information System (WHMIS)
8. Delivery agency policy

CORE PROGRAM OUTLINE

PROGRAM OUTLINE FOR SECTION 4 RIGGING

SECTION 4 – RIGGING

Unit Standard CR 4.1 K

Rigging
Demonstrate knowledge of lifting theory and forces – Core

Purpose

Demonstrate knowledge of the fundamentals of leverage

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

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and delivery agency policy

Task 1

Demonstrate knowledge of the principles of leverage

Performance standards

1.1 The principles of leverage are described

Must include

1. Sling angles
2. Class 1 lever
3. Class 2 lever
4. Class 3 lever
5. Centre of gravity
6. Sine of angle

Unit Standard CR 4.2 K

Rigging
Demonstrate knowledge of rigging hardware, materials, tools and manuals - Core

Purpose

Demonstrate knowledge of rigging hardware, materials, tools and manuals to safely rig a crane.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

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ANSI Standard ANSI/ASME B30.5-1994, Mobile and Locomotive Crane or ANSI/AMSE B30.22-1993, Articulating Boom Crane,
Workplace Hazardous Material Information System (WHMIS),
and delivery agency policy

Task 1

Demonstrate knowledge of rigging hardware used in crane operations

Performance standards

1.1 Rigging hardware and its uses are described

Must include

1. hooks
2. shackles
3. slings
4. spreader bars
5. equalizer beams
6. chains
7. bridles
8. chokers

1.2 Specific information on rigging hardware from manufacturer's and rigging manuals is described and interpreted accurately according to industry standards

Task 2

Demonstrate knowledge of inspection, service and repairs to rigging hardware.

2.1 The procedure for inspecting rigging hardware is described as per manufacturer's manuals

2.2 Requirements for examining rigging hardware are described

Must include
1. excessive wear
2. damage
3. fraying
4. cracks
5. safety clips
6. broken wire

Task 3

3.1 Criteria for removing rigging hardware from service are described according to appropriate BC regulations

3.2 The procedure to remove clips is described as per manufacturer's manual and company procedures.

3.3 The process for removing rigging hardware is described

Must include
1. remove from crane and destroy.

3.4 The process of acceptable repairs to rigging hardware is described as prescribed by manufacturer

Must include
1. nylon sling – no repair
2. wire sling – no repair
3. chain – repair by manufacturer only
4. Kevlar – repair by manufacturer only

3.5 Defects and deficiencies are reported to appropriate personnel

Must include
1. job supervisor
2. crane supervisor
3. enter in crane logbook

Task 4

Demonstrate knowledge to store rigging hardware after use

4.1 Criteria for storing rigging hardware is explained as per manufacturer's guidelines

Unit Standard CR 4.3 K

Rigging
Demonstrate knowledge of types and functions of wire rope and chains - core

Purpose

Demonstrate knowledge of wire rope and chains in crane operations.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

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References

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and delivery agency policy

Task 1

Describe types of wire used in crane operation and their functions.

Performance standards

1.1 Types of wire rope, their characteristics, classifications and uses are

described Must include

1. Ordinary construction
2. Warrington construction
3. Seale construction
4. Filler construction

1.2 Interpret manufacturer's certificate of origin for wire rope

Task 2

Describe grades of chain and their uses in crane operations.

Performance Standards

2.1 Grades of chain and their uses are described

Must include

1. grade 8 for hoisting
2. grade 6 or 7 to tie down loads
3. grade 1000 – pending

2.2 Interpret manufacturer's certificate of origin and capacity tags on chains

Unit Standard CR 4.4 K

Rigging
Demonstrate knowledge of installation, inspection and storage of wire rope - core

Purpose

Demonstrate knowledge of inspection, installation and storage of wire rope for crane operation

Prerequisites

Unit Standard CR 4.1 K Demonstrate knowledge of lifting theory and forces
Unit Standard CR 4.2 K Demonstrate knowledge of rigging hardware, materials and tools
Unit Standard CR 4.3K Demonstrate knowledge of types and functions of wire rope and chains

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

Any assessor assessing against this competency standard must be an occupationally competent crane operator with Red Seal endorsement (in the case of Mobile Crane) and industrial experience; and have completed the assessor registration competency.

References

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Workplace Hazardous Material Information System (WHMIS),
and delivery agency policy

Task 1

Demonstrate knowledge of the process for inspection and replacement of wire ropes in accordance with manufacturer's recommendations

1.1 The inspection and examination procedure is described for wire rope defects

Must include

1. frayed wire rope
2. broken strands
3. lubrication
4. excessive wear
5. bird caging
6. kinking
7. flattening
8. proper spooling

9. broken wires

1.2 The criteria to remove damaged or defective rope is explained according to WorkSafeBC regulations.

1.3 The process to remove damaged or defective wire rope is described according to manufacturer's guidelines.

1.4 The process to examine the drum to ensure proper installation is described.

1.5 The process to record and report the inspection defects and deficiencies is explained.

Must include
1. record inspection in logbook
2. record defects in logbook
3. report defects and deficiencies to job supervisor
4. report defects and deficiencies to crane supervisor

Task 2
Demonstrate knowledge of installing the new rope according to manufacturer's instructions.

2.1 New wire rope installation process is described according to manufacturer's requirements.

Must include
1. interpretation of manufacturer's certificate of origin/data plates.

2.2 Wire rope system components are identified.

Must include
1. rope guides
2. drums
3. blocks
4. hooks
5. sheaves
6. wedge and socket termination.

Task 3
Demonstrate knowledge of storing wire rope

Performance Standards

3.1 The criteria for storing wire rope are described according to manufacturer's requirements.

Task 4
Demonstrate knowledge of maintenance of wire ropes

Performance Standards

4.1 Criteria for lubricating wire rope are

described Must include
1. inspection of rope
2. identifying rope needing lubrication.

4.2 Procedures to perform maintenance on wire ropes are described as manufacturer

dictates Must include

1. cutting wire ropes
2. cleaning
3. lubrication.

4.3 Record wire rope maintenance in the log book within the regulated timeframe.

Unit Standard CR 4.5 K

Rigging
Demonstrate knowledge of rigging techniques – core

Purpose

Demonstrate knowledge of rigging techniques as they are applied in the workplace

Prerequisites

Unit Standard CR 4.1 K Demonstrate knowledge of lifting theory and forces
Unit Standard CR 4.2 K Demonstrate knowledge of rigging hardware, materials and tools
Unit Standard CR 4.3K Demonstrate knowledge of types and functions of wire rope and chains

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

Any assessor assessing against this competency standard must be an occupationally competent crane operator with Red Seal endorsement (in the case of Mobile Crane) and industrial experience; and have completed the assessor registration competency.

References

WorkSafeBC Occupational Health and Safety (OHS) regulations
The Hoisting and Rigging Safety Manual, Construction Safety Association of Ontario, 1997
CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes,
ANSI Standard ANSI/ASME B30.5-1994, Mobile and Locomotive Crane or ANSI/AMSE B30.22-1993, Articulating Boom Crane,
Workplace Hazardous Material Information System (WHMIS) and delivery agency policy

Task 1

Demonstrate knowledge to assemble appropriate rigging for a given load according to manufacturer's recommendations.

Performance standards

1.1 Appropriate slings and hardware are selected for a given load

Must include

1. determining load weight
2. calculating sling size
3. safe working load (SWL / WLL) of wire rope

1.2 Safe and efficient rigging procedures for a given lift are established Must include

1. determining load weight
2. calculating sling size
3. safe working load (SWL / WLL) of wire rope.

1.3 Rigging is selected in a safe and efficient manner for a given lift Must include

1. calculations done
2. safe working load (SWL / WLL) calculated
3. correct sling size.

1.4 Load and hardware characteristics are defined.

Must include

1. advantages and disadvantages of particular hardware
2. characteristics of hardware
3. characteristics of the load.

Unit Standard CR 4.6 W

Rigging
Use rigging hardware and tools in the workplace - core

Purpose

This unit standard allows the trainee to demonstrate the knowledge he has gained by performing rigging activities in the workplace

Prerequisites

Unit Standard CR 4.1 K Demonstrate knowledge of lifting theory and forces
Unit Standard CR 4.2 K Demonstrate knowledge of rigging hardware, materials and tools
Unit Standard CR 4.3K Demonstrate knowledge of types and functions of wire rope and chains
Unit Standard CR 4.4 K Demonstrate knowledge of installation, inspection and storage of wire ropes
Unit Standard CR 4.5 Demonstrate knowledge of rigging techniques

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

Any assessor assessing against this competency standard must be an occupationally competent crane operator with Red Seal endorsement (in the case of Mobile Crane) and industrial experience; and have completed the assessor registration competency.

References

WorkSafeBC Occupational Health and Safety (OHS) regulations
The Hoisting and Rigging Safety Manual, Construction Safety Association of Ontario, 1997
CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes,
ANSI Standard ANSI/ASME B30.5-1994, Mobile and Locomotive Crane or ANSI/AMSE B30.22-1993, Articulating Boom Crane,
Workplace Hazardous Material Information System (WHMIS) and delivery agency policy

Task 1

Assemble appropriate rigging for a given load according to manufacturer's recommendations.

Performance standards

1.1 Appropriate slings, chains, wire ropes and hardware are selected and installed for lifts: concrete equipment and tanks

Must include
1. measure load
2. calculate weight of load

3. calculate sling requirements
4. complete the appropriate rigging
5. wear protective equipment
6. signal correctly

Task 2

Inspect, maintain and store rigging hardware, wire ropes and chains in workplace operations.

Performance Standards

2.1 Rigging hardware, wire ropes and chains are inspected, maintained and stored according to company and manufacturer's specifications and company requirements

CORE PROGRAM OUTLINE

PROGRAM OUTLINE FOR SECTION 5 LOAD CHARTS

SECTION 5 – LOAD CHARTS

Unit Standard CLC 5.1 K

Load Charts
Demonstrate knowledge of determining weight of loads using fundamental math functions and calculations - core

Purpose

This unit provides the basis for determining weigh loads for given lifts by using fundamental math functions and calculations.

Note

A scientific calculator is required for this unit

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

Any assessor assessing against this competency standard must be an occupationally competent crane operator with Red Seal endorsement (in the case of Mobile Crane) and industrial experience; and have completed the assessor registration competency.

References

WorkSafeBC Occupational Health and Safety (OHS) regulations
The Hoisting and Rigging Safety Manual, Construction Safety Association of Ontario, 1997
CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes,
ANSI Standard ANSI/ASME B30.5-1994, Mobile and Locomotive Crane or ANSI/AMSE B30.22-1993, Articulating Boom Crane,
Workplace Hazardous Material Information System (WHMIS),
and delivery agency policy

Task 1

Demonstrate the functions of a scientific calculator to perform mathematical calculations.

Performance standards

1.1 Fundamental mathematical functions are performed.

Must include

1. rounding off
2. fractions
3. metric and imperial units of measure
4. circumference of a circle
5. perimeter of an object
6. surface area of an object
7. Sine of an angle
8. Pythagorean theorem

Task 2
Demonstrate knowledge of accurately calculating load

Performance Standards

2.1 Accurate load weights are determined

Must include
1. volume of an object
2. weight of a cubic unit of an object
3. bearing pressure on the load supporting surfaces
4. weight of materials
5. total weight of load.

Task 3
Demonstrate knowledge of crane documentation affecting loads

Performance Standards

3.1 Engineer's drawings and blueprints are interpreted

accurately Must include
1. capacity
2. boom configuration
3. load weight
4. rigging weight
5. calculations
6. radius of crane
7. positioning of crane
8. positioning of the load

3.2 Shipping company's bill of lading is compared to an estimated weight based on volume, LMI (Load Moment Indicator) and type of load to determine accuracy

3.3 Load capacity charts are interpreted accurately

Unit Standard CLC 5.2 K

Load Charts
Demonstrate knowledge of loading and lifting - core

Purpose

This unit provides the basis for proper loading and lifting.

Prerequisites

Unit Standard CR 4.1 K Demonstrate knowledge of lifting theory and forces
Unit Standard CR 4.2 K Demonstrate knowledge of rigging hardware, materials and tools
Unit Standard CR 4.3K Demonstrate knowledge of types and functions of wire rope and chains
Unit Standard CR 4.5 K Demonstrate knowledge of rigging techniques

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

Any assessor assessing against this competency standard must be an occupationally competent crane operator with Red Seal endorsement (in the case of Mobile Crane) and industrial experience; and have completed the assessor registration competency.

References

WorkSafeBC Occupational Health and Safety (OHS) regulations
The Hoisting and Rigging Safety Manual, Construction Safety Association of Ontario, 1997
CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes,
ANSI Standard ANSI/ASME B30.5-1994, Mobile and Locomotive Crane or ANSI/AMSE B30.22-1993, Articulating Boom Crane,
Workplace Hazardous Material Information System (WHMIS),
and delivery agency policy

Task 1

Demonstrate knowledge to determine sufficient lifting capacity of a crane considering the configuration and attachments required for the lift.

Performance standards

1.1 Fundamentals of leverage are reviewed

1.2 Optimum boom configurations are described

Must include
1. boom length
2. boom angle
3. radius
4. hook height
5. quadrant.

1.3 Configurations appropriate for lifting loads are

selected Must include
1. radius
2. parts of line
3. height of the combined load and rigging
4. weight of the combined load and rigging
5. boom length
6. boom jib combination
7. counterweight combination.

1.4 Configurations for the lifts for the crane are verified by the site supervisor and the crane

supervisor Must include
1. complete lift forms as required by company

1.5 Differences between gross load and gross capacity are described

1.6 Static and dynamic loading and lifting principles are explained

Task 2

Demonstrate knowledge of selection of rigging hardware to safely lift loads in accordance with manufacturer's recommendations

Performance Standards

2.1 Load configurations are accurately

determined Must include
1. calculations for rigging
2. calculations for loads
3. load chart accuracy

2.2 Load height, weight, length and width are verified with crane

supervisor Must include
1. calculations for rigging
2. calculations for loads
3. load chart accuracy

2.3 Centre of gravity for a load is accurately calculated

2.4 The safe working load (SWL / WLL) for wire rope and rigging hardware is accurately calculated and

used Must include
1. prevent overloading
2. prevent spooling

2.5 Criteria for selecting the appropriate hardware are described according to the manufacturer's

requirements Must include

1. weight
2. size of load

2.6 Criteria for selecting the appropriate safety devices are described.

Must include

1. shape
2. weight
3. sharp edges
4. round edges.

2.7 Loads on slings of equal and unequal length are accurately

calculated Must include

1. weight of load
2. centre of gravity
3. sling angles
4. dimension of the load.
    i. height
    ii. weight
    iii. length.

Unit Standard CLC 5.3 W

Load Charts
Interpret load charts and load study drawings to configure crane for workplace operation - core

Purpose

This unit allows for the demonstration of correct crane configuration based on load charts and load study drawings

Prerequisites

Unit Standards CLC 5.1 K Demonstrate knowledge of determining weight loads using fundamental math functions and calculations
Unit Standard CLC 5.2 K Demonstrate knowledge of loading and lifting

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

Any assessor assessing against this competency standard must be an occupationally competent crane operator with Red Seal endorsement (in the case of Mobile Crane) and industrial experience; and have completed the assessor registration competency.

References

WorkSafeBC Occupational Health and Safety (OHS) regulations
The Hoisting and Rigging Safety Manual, Construction Safety Association of Ontario, 1997
CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes,
ANSI Standard ANSI/ASME B30.5-1994, Mobile and Locomotive Crane or ANSI/AMSE B30.22-1993, Articulating Boom Crane,
Workplace Hazardous Material Information System (WHMIS),
and delivery agency policy

Task 1

Configure crane appropriately after accurately interpreting load charts and lift plan drawings.

Performance standards

1.1 Load charts are interpreted accurately

1.2 Load dimensions are verified by crane supervisor, crane operator (and engineer as required)

1.3 Centre of gravity is calculated

1.4 Special lift instructions are followed

1.5 Safe working loads (SWL / WLL) for wire rope and rigging are determined

1.6 Appropriate hardware and safety devices are selected

1.7 Load on the slings is considered for equal and unequal lengths

CORE PROGRAM OUTLINE

PROGRAM OUTLINE FOR SECTION 8 CRANE OPERATIONS

SECTION 8 – CRANE OPERATIONS

Unit Standard CCO 8.1 K

Crane Operations
Demonstrate knowledge of preoperational requirements in crane operations - core

Purpose

This unit provides the knowledge required to do a pre-operational inspection in accordance with manufacturer's recommendations

Prerequisites

All Unit Standards in Sections 1 through 7

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

Any assessor assessing against this competency standard must be an occupationally competent crane operator with Red Seal endorsement (in the case of Mobile Crane) and industrial experience; and have completed the assessor registration competency.

References

WorkSafeBC Occupational Health and Safety (OHS) regulations
The Hoisting and Rigging Safety Manual, Construction Safety Association of Ontario, 1997
CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes,
ANSI Standard ANSI/ASME B30.5-1994, Mobile and Locomotive Crane or ANSI/AMSE B30.22-1993, Articulating Boom Crane,
Workplace Hazardous Material Information System (WHMIS),
and delivery agency policy

Task 1

Demonstrate knowledge of the pre-operational inspection procedures recommended for a mobile crane, a Boom truck, a tower crane and a self erect crane.

Performance Standards

1.1 Inspection procedures are described accurately

Must include

1. operator aids for crane in place

2. inspection and erection reports are completed
3. OH & S requirements followed
4. locate control systems and system gauges
5. according to manufacturer's requirements

1.2 The place, location and verification of operator aids for the crane are

described Must include

1. the LMI
2. boom length indicator (assessment note for Tower Crane and Self Erect Crane)
3. boom angle indicator (see above 1.2 2)

1.3 The completion and filing of inspection and erection reports is described

Must include

1. crane logbook
2. lift plan

Task 2

Demonstrate knowledge of tests, repairs and maintenance required during the pre-operation inspection stage.

Performance Standards

2.1 Function tests on hoist systems are

described Must include

1. boom up
2. boom down (assessment note for Tower Crane and Self Erect Crane)
3. hoist up
4. hoist down
5. swing left
6. swing right
7. scope in (assessment note for Tower and Self Erect)
8. scope out
9. brakes

2.2 Repairs and maintenance prior to operation are described according to manufacturer's requirements and they are entered in the crane logbook

Task 3

Demonstrate knowledge of reports and records required for reporting deficiencies or defects.

Performance Standard

3.1 The process of defects and deficiencies being accurately reported to the supervisor and

properly documented in the crane log book is described

Must include

1. date
2. description of issue
3. signature of person doing the repairs
4. signature of the operator
5. legal requirements entries must meet WorkSafeBC regulations, corporate standards, and any other applicable regulatory agencies codes, laws and guidelines.

3.2 The process to ensure repairs and maintenance are recorded in the appropriate crane log book is described

Must include

1. date
2. description
3. signature of repair person

Task 4

Demonstrate knowledge of the setup procedures for a mobile cranes/ boom trucks (assessment note for Tower Crane and Self Erect)

Performance Standards

4.1 Setup procedures are accurately explained according to manufacturer's specifications

4.2 Overhead obstructions and underground hazards are described.

Must include

1. power cables
2. trees
3. underground sewers
4. underground water
5. underground building structures

4.3 The requirements for blocking and mats to be sufficient considering the load requirements and surface conditions to level the crane is described

4.4 Programming and adjusting safety devices to ensure accuracy and safety while

lifting Must include

1. LMI Load moment indicator
2. anti two block systems, high speed limits and max. height limits
3. boom angle indicators

4. level

Unit Standard CCO 8.4 W

Crane Operations
Demonstrate safe crane set up according to manufacturer's instructions – core

(Note: Task 4 applies only to mobile cranes**)**

Purpose

This unit demonstrates a pre-operational inspection of a crane prior to use in accordance with manufacturer's recommendations

Prerequisites

All Knowledge Units in Sections 1 through 7.
Unit Standard CCO 8.1 K Demonstrate knowledge of pre-operational requirements in crane operations
Unit Standard CCO 8.2 K Demonstrate knowledge of crane operations to pick up and carry loads
Unit Standard CCO 8.3 K Demonstrate knowledge to leave a crane unattended

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations, and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/AMSE B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and delivery agency policy.

Quality Assurance

Any assessor assessing against this competency standard must be an occupationally competent crane operator with Red Seal endorsement (in the case of Mobile Crane) and industrial experience; and have completed the assessor registration competency.

References

WorkSafeBC Occupational Health and Safety (OHS) regulations
The Hoisting and Rigging Safety Manual, Construction Safety Association of Ontario, 1997
CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes,
ANSI Standard ANSI/ASME B30.5-1994, Mobile and Locomotive Crane or ANSI/AMSE B30.22-1993, Articulating Boom Crane,
Workplace Hazardous Material Information System (WHMIS) and delivery agency policy

Task 1

Conduct pre-operational inspections as recommended for a mobile crane, a Boom truck, a tower crane and a self erect crane

Performance Standards

1.1 Inspection procedures are accurately followed

Must include

1. operators aids for crane in place
2. inspection and erection reports are completed
3. OH & S requirements followed
4. control systems and system gauges are located
5. manufacturer's requirements

1.2 Operator aids for the crane are in place, located and

verified Must include

1. the LMI
2. boom length indicator
3. boom angle indicator

1.3 All inspection and erection reports are accurately completed and appropriately

filed Must include

1. crane logbook
2. lift plan

Task 2

Perform tests, repairs and maintenance required during the pre-operation inspection stage.

Performance Standards

2.1 Perform function tests on hoist

systems Must include

1. boom up
2. boom down
3. hoist up
4. hoist down
5. swing left
6. swing right
7. scope in
8. scope out
9. brakes

2.2 Perform repairs and maintenance prior to operation according to manufacturer's requirements and they are entered in the crane logbook

Task 3

Complete reports and records required for reporting deficiencies or defects.

Performance Standard

3.1 Defects and deficiencies are accurately reported to the supervisor and properly documented in the crane log book

Must include

1. date
2. description of issue
3. signature of person doing the repairs
4. signature of the operator

3.2 Repairs and maintenance are recorded in the appropriate crane log

book Must include

1. date
2. description of issue
3. signature of person doing the repairs

Task 4 is part of the Advanced Program - Mobile 80 tonnes and under.

CORE PROGRAM OUTLINE

PROGRAM OUTLINE FOR SECTION 9 MAINTENANCE & SERVICE

SECTION 9 – MAINTENANCE & SERVICE

Unit Standard CMS 9.1 W

Maintenance & Service
Maintain an equipment logbook to retain a permanent written record of maintenance and repairs

Purpose

This unit provides the correct use of and input to an equipment logbook for cranes.

Assessment

For assessment purposes, all explanations, descriptions, and activities must comply with current legislation, including WorkSafeBC regulations and industry practice. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes, ANSI Standard ANSI/ASME B30.5-2004, Mobile and Locomotive Crane or ANSI/ASME B30.22-2005, Articulating Boom Crane, Workplace Hazardous Material Information System (WHMIS) and Delivery Agency policy.

Quality Assurance

Any assessor assessing against this competency standard must be an occupationally competent crane operator with Red Seal endorsement (in the case of Mobile Crane) and industrial experience; and have completed the assessor registration competency.

References

WorkSafeBC Occupational Health and Safety (OHS) regulations
The Hoisting and Rigging Safety Manual, Construction Safety Association of Ontario, 1997 CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes,
ANSI Standard ANSI/ASME B 30.5-1994, Mobile and Locomotive Crane or ANSI/ASME B30.22-1993, Articulating Boom Crane,
Workplace Hazardous Material Information System WHMIS and delivery Agency policy

Task 1

Record all inspections and maintenance in an equipment log book

Performance Standards

1.1 All entries are legible and easily understood

1.2 All entries are complete and accurate

1.3 All inspections are accurately recorded when inspection is completed

1.4 All requests for the external supply of maintenance are accurately recorded within

1.5 All maintenance performed is accurately recorded when it is completed

Task 2

Report all inspections, defects, deficiencies, and maintenance to the crane supervisor and site supervisor

Performance Standards

2.1 Communication is clear and understood

2.2 Reports are made at the time of the inspection, request or maintenance.

CORE PROGRAM OUTLINE

SECTION 3 TRAINING PROVIDER STANDARDS

TRAINING PROVIDER STANDARDS

The Crane Core Program is a Competency Based Program of Instruction. This means that the Program Outline defines the Outcomes expected of training, not the inputs, which include time.

By their nature cranes require a one-to-one ratio of student-to-crane to develop the required competence. Industry believes a crane operator becomes competent through building on his or her theoretical knowledge with real world experience.

This program is divided into theoretical and practical components.

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

- can be taught in a classroom setting by a qualified instructor (see below)
- delivered on line
- learned through self study on line or through printed

materials The practical component is made up of the Workplace

Units, which:

- require hands on experience
- are assessed on the job by a Registered Workplace Assessor
- may be begun in a simulated setting such as a training yard, but are assessed for credit in the workplace

The industry is interested in the outcome of training and is looking for creative responses from the crane training community on how to best deliver training to these standards in a time efficient and cost effective manner. Industry has purposely not set minimum equipment requirements for this reason.

Past training experience in this area has shown consistent training outcomes to these standards in a wide range of times and with a variable mix of on seat equipment time vs. theory instruction time.

With these competence standards industry now has a vehicle for structuring on the job training and wishes to see trainers take advantage of the opportunity on the job training represents. For example, some ideas industry has discussed as options include:

1. Support learners on the job by bringing the trainer to the job site. Crane purchase or rental is not required by the trainer and the learner receives targeted instruction.
2. Deliver instruction in the evenings or on weekends to complement the learner's on the job experience.
3. Deliver targeted theory and practical instruction precisely geared to the standards in this outline – which will ideally guarantee a highly skilled individual to the employer who can demonstrate workplace competence in short order.

Instructor Qualification:

For technical training, instructors must be occupationally competent to run the crane type they are training to, and hold full scope certification for the crane type they are training to.

Minimum List of Shop/Laboratory Equipment Required for Crane Common Core

Industry wishes to state no minimum requirement in the interest of permitting training providers maximum flexibility in the options and strategies they may employ in training to these standards, in the case of Knowledge Units, and supporting development of workplace performance in the case of Workplace Units.

BC CRANE OPERATOR PROGRAM OVERVIEW

Section 14.34.1 of the OHS Regulation states: On and after July 1, 2007, a mobile crane, tower crane or boom-truck must be operated only

a) by a person with a valid operator's certificate issued by a person acceptable to the Board, and
b) in accordance with any conditions stipulated on the certificate by the issuing person.

Section 14.34.1 applies to operators of all mobile cranes, boom trucks, and tower cranes with a rated capacity greater than five tonnes or with a boom length greater than 8 meters.
Operator Certification/Qualification for Crane Operators in BC may be obtained to operate each of the following types of cranes:

Mobile Cranes

1. Hydraulic Mobile Crane 20 tonnes and under
2. Hydraulic Mobile Crane 80 tonnes and under
3. Mobile unlimited tonnage (Mobile Crane as per 2017 Harmonization)
4. Mobile Lattice Friction (Mobile Crane as per 2017 Harmonization)
5. Mobile Lattice Hydraulic (Mobile Crane as per 2017 Harmonization)

Boom Trucks

1. Folding Boom 10 tonnes and under
2. Folding Boom 22 tonnes and under
3. Folding Boom unlimited tonnage
4. Stiff Boom 20 tonnes and under
5. Stiff Boom 40 tonnes and under
6. Stiff Boom unlimited tonnage

Tower Cranes

1. Tower Crane
2. Self-Erect Tower Crane

Operator certification is granted for each crane type. A candidate may choose to undertake certification in one or two crane types only or in all crane types. Each crane type requires a course of study, on-job training and the successful completion the operator assessments for that crane type. Certification is granted according to the BC Association for Crane Safety (BCACS) Levels.

The BCACS Levels

Provisional Operator means a person who has passed the theory assessment and is certified to make routine lifts with a minimum of indirect supervision. but will require hands-on, direct supervision for all first time significant lifts and all critical lifts. These lifts will be clearly documented by both the operator and the employer. Theory assessments for existing operators who choose to obtain provisional certification will be conducted by the employer. New operators will be required to pass a formal written assessment. Provisional certification is valid for one year and can be renewed up to three times. A p r o v i s i o n a l certificate will specify what type of crane the operator may operate and their employer. The Provisional Certificate is only valid while working for the identified employer on the certificate. If the operator changes employers, they must submit a change of employer form.

Full Scope Operator means a person who has passed both the theory and practical assessments conducted by a third-party assessor for a specific crane type. A Full-Scope Certificate will specify what type of crane the operator may operate. This certificate means that the operator is competent to safely perform all crane lifts within the scope of the identified crane type and size. The employer is not identified on this certificate.

Assessors

Third Party Assessor means a person recognized by the BCACS to perform practical assessments. This person must be dedicated to assessing only and not be a trainer of crane operators or otherwise be in any other potential conflict of interest.

Theory Assessment means an assessment administered by the BCACS, conducted on either paper, computer, verbal, or other means. These assessments will be delivered through SkilledTradesBC (STBC) and administered by the BCACS.

Practical Assessment means an assessment conducted by a third-party assessor, approved by the BCACS. The assessment involves spoken questions, as well as the operator using the crane to show that they have the basic knowledge, skills, and ability to safely operate the crane. The operator is then considered to be **competent** (having the right skills and knowledge to operate the crane) and will receive written proof. If the operator is found **not yet competent** after performing the practical assessment they would be allowed to continue operating with Provisional Certificate

as decided by the third party assessor. An action plan and a follow-up date will be set following the completion of the assessment. The operator will be informed of this date both verbally and in writing.

The Steps to Qualification

To become a certified crane operator in British Columbia candidates may follow one of two options:

~~1.~~ Experienced operators who are not yet certified, must challenge the certification process. Some classifications require one to three theory exams before the full scope assessment can be attempted. Other classifications require only the full scope assessment. Operators who are certified in another jurisdiction, must apply to BCACS to have their credential(s) recognized in British Columbia.

2. New crane operators must apply, with their employer, for a provisional certificate and work under supervision until they have met the competency and hour requirements. Each course of study and on-job training includes:

    1. A mandatory common core program for all crane types.
    2. Advanced units of study in each of the individual crane types that build on the common core.

    This program is divided into theoretical and practical components.

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

    - may be taught in a classroom setting by a qualified instructor,
    - delivered online, or
    - learned through self-study online or through printed materials

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

    - require hands on experience
    - are assessed on the job by a Registered Workplace Assessor
    - may be begun in a simulated setting such as a training yard but are assessed for credit in the workplace

RECOMMENDED REFERENCE TEXTBOOKS

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

Mobile Crane Manual
by Donald E. Dickie, P. Eng., D. H. Campbell, P. Eng.
Construction Safety Association of Ontario ..... SBN 0-8273-6527-6

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

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

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

Safety in Rigging Video/DVD Series
The complete set of 10 *Safety in Rigging* DVDs (FD001-FD010), complete with instructor's notes. Includes:

1. Cranes: Types, Components and Case Histories (FD001)
2. Hazard Awareness in Crane Operating Areas (FD002)
3. International Hand Signals (FD003)
4. Wire Rope (FD004)
5. Hardware (FD005)
6. Chain (FD006)
7. Slings (FD007)
8. Reeving (FD008)
9. Hoists, Winches and Related Devices (FD009)
10. Jacks, Rollers and Related Devices (FD010)

Cranes: Types, Components and Case Histories Video/DVD (set of 10)

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

Mobile Craning Today
Operating Engineers Training Institute of Ontario..... SBN 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

(to be developed when revised OSH regulations released in Summer 07)

1. WorkSafeBC Occupational Health and Safety (OHS) regulations

2. WorkSafe BC Occupational First Aid Requirements

3. CAN/CSA-Z150-98 (R2004) Safety Code for Mobile Cranes,

4. ANSI Standard ANSI/ASME B30.5-1994, Mobile and Locomotive Crane or ANSI/AMSE B30.22-1993, Articulating Boom Crane,

5. ANSI Standard ANSI/SIA A92.2-2001 American National Standard Vehicle-Mounted Elevating and Rotating Aerial Devices

TOWER CRANE PROGRAM OUTLINE

SECTION 1 SAFETY

Section 1 – Safety Unit

Standard 1.7 K

Demonstrate knowledge of tower crane specific PPE

Task 1

Describe the PPE required by tower crane operators

Key Points

- Personal fall arrest equipment
- Steel toed boots
- Hi visibility vest (from operating crane remotely)
- Hard hat with chin strap
- Sun glasses (recommended)
- Horizontal life lines

Task 2

Describe the use of personal fall arrest equipment and typical connection points on tower cranes
Standard: WorkSafeBC regulations

Key Points

- When are lanyards required
- Who provides them
- CSA certified
- How to use them
- Lanyard connection points (crane specific)

SECTION 1 – SAFETY

Unit Standard 1.8 K

Demonstrate knowledge of regulations, standards and documentation relevant to tower crane operation

Task 1

Identify and describe the regulations and standards which apply to tower 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 tower crane operator

Key Points

- Crane manufactuerer's manual
- Crane load chart
- Crane logbook
- Operator's logbook
- WCB tower crane report (history of components, deficits, and repairs)
- Site schematic showing Limits of Approach and crane work radius
- 30M33 form
- DEP procedures
- Contents of Site Safety Board

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

SECTION 1 – SAFETY

Unit Standard 1.9 K

Demonstrate knowledge of regulations and protocols for operating a 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
- 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
- Spotters

SECTION 1 – SAFETY

Unit Standard 1.10 W

Demonstrate knowledge of documentation for the site and the operator's tower crane

Task 1

List and describe site-specific documents important to operating the tower crane

Key Points

- Crane logbook
- Crane manufacturer's manual
- Contents of site safety board
- WCB tower crane report
- Site schematic showing Limits of Approach and crane work radius
- DEP emergency procedures
- Other site policies and procedures

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 a
- Operator's logbook
    - Location
    - Significance
    - Contents
    - Consistently records required information

Task 3

Describe procedure for the tower crane operator to follow in an emergency personnel evacuation
Standard: WorkSafeBC section 32.2

Key Points

- Radio protocol
- Drop off rigging
- DEP location
- DEP drop off spot
- Tower Crane operator responsibilities
- Connect to DEP with appropriate rigging hardware (pigtail, whip)
- Confirm that the safety line of person(s) being lifted is connected to the block
- 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
- Spotters

TOWER CRANE PROGRAM OUTLINE

SECTION 2

COMMUNICATIONS

SECTION 2 – COMMUNICATIONS

Unit Standard 2.8 K

Demonstrate knowledge of tower 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
- Swing left
- Swing 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 stop signal

SECTION 2 – COMMUNICATIONS

Unit Standard 2.9 K

Demonstrate knowledge of tower crane radio protocols and vocabulary

Task 1

Describe language and terminology commonly used in tower 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 tower crane radio protocols

Key Points

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

SECTION 2 – COMMUNICATIONS

Unit Standard 2.10 W

Interpret tower crane hand signals in the workplace

Task 1

1. Respond to hand signals during routine tower 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 traveling 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

SECTION 2 – COMMUNICATIONS

Unit Standard 2.11 W

Use tower crane radio protocols and vocabulary in the workplace

Task 1

Demonstrate the procedure for working in the blind

Key Points

- Use consistent terminology
- Relays 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

TOWER CRANE PROGRAM OUTLINE

SECTION 3

CRANES

SECTION 3 – CRANES

Unit Standard 3.8 K

Demonstrate knowledge of the training and certification process for tower crane operators

Task 1

Describe the steps required to become a certified tower crane operator.

Key Points

- Nature of the learning process – competency based (knowledge and skill components)
- Non-traditional learning methodologies
- Written exam (costs, arrangements of time/location, rewrite requirements)
- Practical component – seat time (number of hours required)
- Trainee's logbook
- Workplace evaluation

SECTION 3 – CRANES

Unit Standard 3.9 K

Demonstrate knowledge of tower crane applications

Task 1

Describe specific handling requirements for different types of tower 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 (transportation cage, man basket)
- DEP box
- Window boxes
- Flying forms
- Drywall cage
- Rebar
- Pressurized gases and other hazardous loads
- Multiple piece lifts (double loads, treed lifts)
- Dual lifts
- Garbage boxes
- Below the hook lifting devices
- Specialty lifting devices

SECTION 3 – CRANES

Unit Standard 3.10 K

Demonstrate knowledge of tower crane types and configurations

Task 1

Describe the various tower configurations available for tower cranes

Key Points

- Fixed tower
- Slewing tower
- Inner tower and outer tower
- Telescopic tower
- Braces (tied back) tower
- Guyed tower

Task 2

Describe the different types of jib configurations used on tower cranes.

Key Points

- Saddle jibs
- Luffing jibs
- Incline jibs
- Articulated jibs
- Rear pivoted luffing jibs

Task 3

Describe the four basic mounting configurations available for tower cranes

Key Points

- Stationary (fixed)
- Rail
- Climbing
- Truck

SECTION 3 – CRANES

Unit Standard 3.11 K

Demonstrate knowledge of the erection and dismantling processes for tower cranes

Task 1

Describe the operator's role in the erection and dismantling process for tower cranes

Key Points

- Preassembly and setup of crane
- Testing limits
- Refer to Tower Crane Report for crane information and requirements
- Role in dismantling process
- Weather conditions

Task 2

Identify and describe the site documentation available to the operator regarding tower crane erection

Key Points

- Crane manufacturer's manual
- Tower Crane Report (history of components, deficits, and repairs)
- NDT and certification
- 30M33 Form
- Base Soils report
- Crane site plan drawings
- Concrete strength and foundation design
- Rebar inspection
- Radio frequency license

SECTION 3 – CRANES

Unit Standard 3.12 K

Demonstrate knowledge of components and their functions for different types of tower cranes

Task 1

Describe the components common to most tower cranes and explain their functions

Key Points

- Base of crane and foundation
- Tower section
- Tower ladder, catwalks and handrails
- Operator's cab
- Slewing ring
- Jib or boom and boom tip
- Counter jib and counterweight
- Hoist machinery and control cabinet
- Tower top section (apex) and pendant lines (guy wires)
- Trolley and trolley line
- Load block, load lines, sheaves and hook
- Trolley mounted basket

Task 2

Describe the specific components of a climbing tower crane.

Key Points

- Bottom or top climber
- Climbing support beam (braces, tie-ins)
- Jacking frame
- Ladders
- Beams, wedges and shoring

Task 3

Describe the specific components of a traveling (rail) tower 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

Task 4

Describe the specific components of a luffing jib tower crane.

Key Points

- Compensation sheave
- Boom luffing unit and luffing line
- Boom suspension line
- Boom stops
- Luffing jib/boom (suspension lines or pendant lines)

SECTION 3 – CRANES

Unit Standard 3.13 K

Demonstrate knowledge of tower crane climbing and lowering methods and hazards

Task 1

Describe methods and hazards associated with climbing and lowering **top climbing** tower cranes.

Key Points

- Climbing methods and lowering methods
    - Hydraulic systems
    - Electric systems
    - Tie-off procedures
    - Installation of tie-backs
- Hazards
    - Balancing the crane
    - Changes in weather conditions

Task 2

Describe methods, and hazards associated with climbing and lowering **bottom climbing** tower cranes.

Key Points

- Climbing methods and lowering methods
    - Hydraulic systems
    - Electric systems
- Hazards

SECTION 3 – CRANES

Unit Standard 3.14 K

Demonstrate knowledge of the types of drives, controls, and safety devices for tower cranes

Task 1

List the types of drive functions in tower cranes

Key Points

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

Task 2

Describe safety devices for tower cranes and explain their functions.

Key Points

- Hoist limits
- Trolley limits
- Slewing limits
- Travel limits
- Max. load limits
- Load moment limits
- Speed limits (trolley and hoist)
- Deadman 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, belt, AC or DC)
- Hoist gear options (e.g.: RACKO or ELMAG)
- Multiple parts of line (two part, four part)
- Joystick position (motor speeds/steps)
- Deadman switches

- Hoist braking functions (hoist holding brake)
- Emergency brakes

Task 4

Describe trolley drive types and controls available on tower cranes

Key Points

- Changeable gear boxes
- Joystick operation (motor speeds/steps)
- Trolley brake functions

Task 5

Describe slew drive types and controls available on tower cranes

Key Points

- Types of drives (AC, frequency)
- Joystick operation (motor speeds/steps)
- Types of braking (eddie current, holding brake)
- Slewing brake functions

Task 7

Describe various travel controls available on tower cranes

Key Points

- Joystick operation (motor speeds/steps)
- Brake functions

Task 7

Describe other functions controlled by buttons, switches, pedals and toggles on tower cranes.

Key Points

- On/Off controls
- Joystick controls on luffing cranes
- Radio controls
- Switches
- Pedals

SECTION 3 – CRANES

Unit Standard 3.15 W

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

Task 1

Point out the safety devices on the operator's tower crane and describe their functions.

Key Points

- Hoist limits (maximum pull, tip limit, gear load limit switches)
- Trolley limits (trolley in, trolley out)
- Deadman switches
- Emergency stop buttons
- Emergency braking systems
- Anemometer (wind meter)

Task 2

Describe the hoist drive and operating characteristics

Key Points

- Type of drive (Frequency, gear, belt, AC or DC)
- 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

- Gear change options
- Trolley brakes

Task 4

Describe the slew drive and operating characteristics

Key Points

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

TOWER CRANE PROGRAM OUTLINE

SECTION 9 MAINTENANCE & SERVICE

SECTION 9 – MAINTENANCE AND SERVICE

Unit Standard 9.8 K

Demonstrate knowledge of daily and monthly inspections for tower cranes

Task 1

Describe start of shift inspection requirements for tower crane operators, according crane manufacturer's manual.
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
- Inspect walkways, handrails, guards, ladders, and perimeter barricade
- Inspect structure, pins, keepers, and mast bolts
- 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 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

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

Key Points

- Trolley rollers, tracks, slewing rings, and rollers
- Sheaves, bushings, and pins
- Jib backstops (boom stop) if applicable (luffing only)
- Boom hoist brake (luffing only)
- Guy ropes, pendant lines, 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 tower 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
- Windows and guards (visibility)
- Heater
- Cab supports
- Pendent line connections
- Supervisor notified of defects or faults
- Operator to initial monthly

SECTION 9 – MAINTENANCE AND SERVICE

Unit Standard 9.9 K

Demonstrate knowledge of annual and special inspection requirements for tower cranes

Task 1

Describe annual and special inspection requirements for tower cranes

Key Points

- Performed by professional engineer
- Before each erection and if in use more than 1 year
- NDT before each erection
- Sudden or unusual shock load or stress
- Contact with a power line
- Contact with a structure
- Crane to crane contact
- Lightning strike

SECTION 9 – MAINTENANCE AND SERVICE

Unit Standard 9.10 W

Conduct a start of shift tower 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
- Inspect walkways, handrails, guards, ladders, and perimeter barricade
- Inspect structure, pins, keepers, and mast bolts
- 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 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 tower crane according to crane manufacturer's manual
Standards: WorkSafeBC regulations and CSA Z248-2004

Key Points

- Trolley rollers, tracks, slewing rings, and rollers
- Sheaves, bushings, and pins
- Jib backstops (boom stop) if applicable (luffing only)
- Boom hoist brake (luffing only)
- Guy ropes, pendant lines, 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

Demonstrate use of harness and lanyard for safety while conducting weekly inspections
Note: Assessor to select two weekly inspections at random which require use of harness and lanyard.

Standards: WorkSafeBC regulations and Changeable gear boxes (*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)

Task 4

Conduct monthly inspection requirements for tower 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
- Windows and guards (visibility)
- Heater
- Cab supports
- Pendent line connections
- Supervisor notified of defects or faults
- Operator to initial monthly

SECTION 9 – MAINTENANCE AND SERVICE

Unit Standard 9.11 W

Conduct tower crane load limit and range of travel 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

TOWER CRANE PROGRAM OUTLINE

SECTION 13
TOWER CRANE OPERATIONS

SECTION 13 – TOWER CRANE OPERATIONS

Unit Standard 13.1 K

Demonstrate knowledge of hoisting and rigging for tower 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
- Route
- Radius
- Rigging
- Factors that reduce capacity
- Hazards (weather, obstacles, public safety, etc.)

SECTION 13 – TOWER CRANE OPERATIONS

Unit Standard 13.2 K

Demonstrate knowledge of tower crane load charts and load calculations

Task 1

Calculate the requirements and limitations for a given load.

Key Points

- Load weight
- Rigging weight
- Radius required
- Calculate maximum load
- Crane configuration (gear and/or parts of line)

SECTION 13 – TOWER CRANE OPERATIONS

Unit Standard 13.3 K

Demonstrate knowledge of how weather conditions affect tower crane operations

Task 1

Describe how wind speed affects tower crane operation

Key Points

- Anemometers, wind warnings and alarms
- WCB regulations
- Manufacturers wind speed operating limit
- Slewing brakes
- Reduces 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 shut down.

Key Points

- Lightning
- Snow
- Cold
- Wind
- Heat

SECTION 13 – TOWER CRANE OPERATIONS

Unit Standard 13.4 K

Demonstrate knowledge of a tower crane operator's duties and responsibilities

Task 1

Describe the tower 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

SECTION 13 – TOWER CRANE OPERATIONS

Unit Standard 13.5 K

Demonstrate knowledge of protocols for leaving a tower crane unattended

Task 1

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

Key Points

- Trolley in to minimum radius – prior to limits
- Raise hook to maximum height – prior to limits
- Park crane aiming down wind
- Power off
- General housekeeping
- Security (lock cab)
- Check for loose items outside cab
- Release slewing brakes
- Best practices regarding limits
- Requirements in freezing conditions
- Tie downs

Task 2

Explain additional steps required when leaving a traveling (rail) tower crane unattended

Key Points

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

SECTION 13 – TOWER CRANE OPERATIONS

Unit Standard 13.6 K

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

Task 1

Describe safety protocols in effect on a multi-tower crane site

Key Points

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

Task 2

Describe safety protocols in effect when other cranes or lift equipment (such as concrete boom pumps, cherry pickers, mobile cranes) is in the tower crane work radius.

Key Points

- Site protocols
- Radio protocols
- Right-of-way
- Lift schedule
- WorksafeBC – distances

SECTION 13 – TOWER CRANE OPERATIONS

Unit Standard 13.7 W

Operate a tower crane safely in the workplace according to regulations and manufacturer's specifications

Task 1

Perform basic tower 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
    - Appropriate use of foot brake
    - Use reverse current 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 tower 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

SECTION 13 – TOWER CRANE OPERATIONS

Unit Standard 13.8 W

Leave a tower crane unattended in the workplace

Task 1

Leave crane unattended according to crane manufacturer's manual

Key Points

- Trolley in to minimum radius (prior to limits)
- Raise hook to maximum height (prior to limits)
- Describe best practices regarding limits
    - Stopping prior to limits
    - Impact of freezing temperatures on limits
- Power off
- General housekeeping
- Security (lock cab)
- Check for loose items outside cab
- Release slewing brakes
- Implement tie-downs (if required by site)

TOWER CRANE

SECTION 3

TRAINING PROVIDER STANDARDS

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TRAINING PROVIDER STANDARDS

The Tower Crane Program is a Competency-Based Program of Instruction. This means that the Program Outline defines the Outcomes expected of training, not the Inputs.

By its nature, crane training requires a one-to-one ratio of student-to-crane for the learner to develop the required competence. Industry believes a crane operator becomes competent by applying his or her theoretical knowledge to real world conditions and experience.

This program is divided into theoretical and practical components.

The theoretical component is made up of Knowledge Units, which:

- can be taught in a classroom setting by a qualified instructor (see below)
- delivered on-line
- learned through self study, on-line or through printed

materials The practical component is made up of Workplace Units, which:

- require hands-on experience
- are assessed on the job by a Registered Workplace Assessor
- may be begun in a simulated setting such as a training yard, but are assessed for credit in the workplace

The industry is interested in the outcome of training and is looking for creative responses from the crane training community on how to best deliver training to these standards in a time efficient and cost effective manner. For this reason, industry has purposely not set minimum equipment requirements.

Past training experience in this area has shown consistent training outcomes to these standards over a wide range of times and with a varying mix of on-seat equipment time vs. theory instruction time.

With the development of these competency standards, industry now has a vehicle for structuring on the job training and wishes to see trainers take advantage of the opportunity on the job training presents. For example, some ideas which industry has discussed as options include:

1. Support learners on the job by bringing the trainer to the job site. Crane purchase or rental is not required by the trainer and the learner receives targeted instruction.
2. Deliver instruction in the evenings or on weekends to complement the learner's on the job experience.
3. Deliver targeted theory and practical instruction geared specifically to the standards in this outline – which will ideally guarantee to the employer a highly-skilled individual who can demonstrate workplace competence in short order.

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 full scope certification for the crane type they are training to.

Minimum List of Shop/Laboratory Equipment Required for Tower Crane Training

Industry wishes to state no minimum requirement in the interest of permitting training providers maximum flexibility in the options and strategies they may employ in training to 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.....SBN 0-7726-1574-8

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

Slings
Construction Safety Association of Ontario.....SBN 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..... SBN 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 (OHS) regulations
2. WorkSafeBC Occupational First Aid Requirements
3. CSA Standard Z248-2004 Safety Code for Tower Cranes
4. ANSI Standard

Reference block to be added to each Competency in the Program Outline.

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