



PROGRAM OUTLINE

Tower Crane Operator Program Outline





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TOWER CRANE OPERATOR PROGRAM OUTLINE

**APPROVED BY INDUSTRY
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**Developed by
Industry Training Authority
Province of British Columbia**



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Section 1

INTRODUCTION

Tower Crane Operator



Foreword

This Program Outline is used to guide competency-based training of crane operators who operate Tower Cranes.

This Program Outline contains both Theory and Practical standards of competence. Theory standards may be achieved outside the performance of the learner's regular work; for example, in a classroom or through self-study of learning resources. Practical standards build upon the theory and allow learners to gather naturally occurring evidence of workplace performance while they work.

Typically, credit for theory standards will be achieved through learning sponsored by the Industry Training Authority (ITA). The theory standards described in this document define the desired knowledge outcome for learners to achieve. Industry wishes learners to have options for achieving credit for these theory standards, including using a variety of non-traditional learning methodologies such as distance education and self-study.

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

This Program Outline includes a list of recommended reference textbooks that are available to support achievement of the standards.

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.



Acknowledgements

These standards were developed through extensive consultation with a broad cross-section of stakeholders in BC's crane industry – crane owners, operators and other occupations which make occasional yet regular use of cranes.

The BC Association for Crane Safety (BCACS) is a non-profit society which was formed in 2005 to lead and coordinate activities and initiatives which promote safer crane operation in BC. BCACS was established and is governed by a volunteer board of crane industry stakeholders. The organization's main goals include setting the standard for competent crane operation in BC and promoting the industry standard to drive excellence in crane operator training. BCACS led the development of these standards through funding support from WorkSafeBC and the Industry Training Authority of BC (ITA).

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

The Industry Training Authority would like to acknowledge the dedication and hard work of all the industry representatives appointed to identify the training requirements of the Tower Crane Operator occupation.



How to Use this Document

This Program Outline has been developed for the use of individuals from several different audiences. The table below describes how each section can be used by each intended audience.

Section	Training Providers	Employers/Sponsors	Apprentices	Challengers
Program Credentialing Model	Communicate program length and structure, and all pathways to completion	Understand the length and structure of the program	Understand the length and structure of the program, and pathway to completion	Understand challenger pathway to Certificate of Qualification
Program Assessment	Communicate program completion requirements and assessment methods	Understand the various assessment requirements for the program	Understand the various assessment requirements for the program	Understand the assessment requirements they would have to fulfill in order to challenge the program
OAC	Communicate the competencies that industry has defined as representing the scope of the occupation	Understand the competencies that an apprentice is expected to demonstrate in order to achieve certification	View the competencies they will achieve as a result of program completion	Understand the competencies they must demonstrate in order to challenge the program
Training Topics and Suggested Time Allocation	Shows proportionate representation of general areas of competency (GACs) at each program level, the suggested proportion of time spent on each GAC, and percentage of time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the relative weightings of various competencies of the occupation on which assessment is based
Program Content	Defines the objectives, learning tasks, high level content that must be covered for each competency, as well as defining observable, measurable achievement criteria for objectives with a practical component	Identifies detailed program content and performance expectations for competencies with a practical component; may be used as a checklist prior to signing a recommendation for certification (RFC) for an apprentice	Provides detailed information on program content and performance expectations for demonstrating competency	Allows individual to check program content areas against their own knowledge and performance expectations against their own skill levels
Training Provider Standards	Defines the facility requirements, tools and equipment, reference materials (if any) and instructor requirements for the program	Identifies the tools and equipment an apprentice is expected to have access to; which are supplied by the training provider and which the student is expected to own	Provides information on the training facility, tools and equipment provided by the school and the student, reference materials they may be expected to acquire, and minimum qualification levels of program instructors	Identifies the tools and equipment a tradesperson is expected to be competent in using or operating; which may be used or provided in a practical assessment



Section 2

PROGRAM OVERVIEW

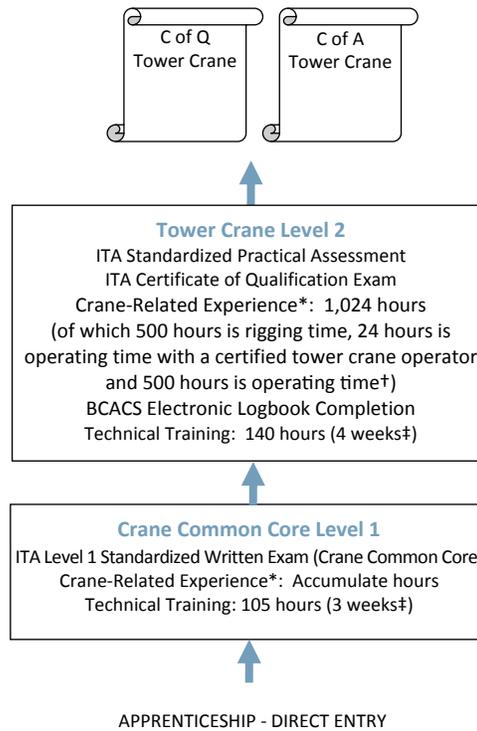
Tower Crane Operator



Apprenticeship Pathway

This graphic provides an overview of the Tower Crane Operator apprenticeship pathway.

C of Q = Certificate of Qualification
 C of A = Certificate of Apprenticeship



*Crane-related experience as entered in the operator's BCACS electronic logbook

†Actual operation of the crane

‡Suggested duration based on 35-hour week

CROSS-PROGRAM CREDITS

Individuals who hold partial credit in a crane program and plan to move to an alternate crane program

Crane Common
Core Level 1

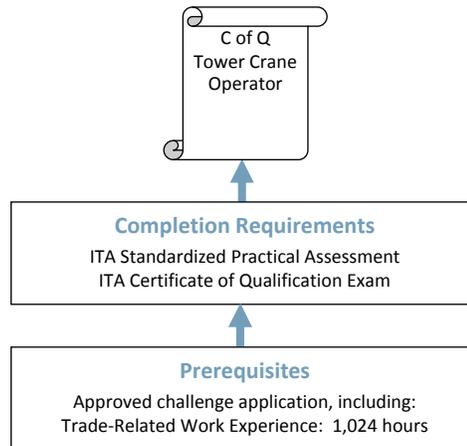
Technical Training: Level 1, including ITA Level 1
Standardized Written Exam (Crane Common Core)



Challenge Pathway

This graphic provides an overview of the Tower Crane Operator challenge pathway.

C of Q = Certificate of Qualification



CREDIT FOR PRIOR LEARNING

Individuals who hold the credentials listed below are entitled to receive partial credit toward the completion requirements of this program

None



Occupational Analysis Chart

TOWER CRANE OPERATOR

Occupation Description: “Tower Crane Operator” means a person who operates tower cranes (including luffing jib and articulated jib tower cranes) to perform lifts and hoist loads, and has experience with rigging practices and procedures.

SAFETY A	Demonstrate knowledge of safe working practices for crane operators A1	Demonstrate knowledge of power line hazards and high voltage equipment A2	Comply with WorkSafeBC OHSR W A3	Demonstrate knowledge of tower crane specific PPE A7	Demonstrate knowledge of regulations, standards, and documentation relevant to tower crane operations A8	Demonstrate knowledge of regulations and protocols for operating a tower crane in proximity to power lines, cable hazards, and high and low voltage equipment A9		
	1	1	1	2	2	2		
	Demonstrate knowledge of documentation for the site and the operator's tower crane W A10							
	2							
	COMMUNICATIONS B	Demonstrate knowledge of personnel involved in crane operations B1	Demonstrate knowledge of hand signals B2	Demonstrate knowledge of radio communications B3	Demonstrate knowledge of workplace communications B4	Use hand signals in the workplace W B5	Use radio communications in the workplace W B6	
		1	1	1	1	1	1	
		Communicate information clearly and check for understanding in the workplace W B7						
		1						
		Demonstrate knowledge of tower crane hand signals B8						
		2						
Demonstrate knowledge of tower crane radio protocols and vocabulary B9								
2								
Interpret tower crane hand signals in the workplace W B10								
2								
Use tower crane radio protocols and vocabulary in the workplace W B11								
2								

W = Knowledge or skills are primarily acquired in the workplace
 EN = Endorsement
 EL = Elective



Program Overview

CRANES C	Demonstrate knowledge of types of cranes and classifications C1	Demonstrate knowledge of terminology related to craning and craning concepts C2	Demonstrate knowledge of hoisting terminology, functions and systems C3	Demonstrate knowledge of regulatory requirements pertaining to cranes C4	Demonstrate knowledge of tower crane applications C9	Demonstrate knowledge of tower crane types and configurations C10
	1	1	1	1	2	2
	Demonstrate knowledge of the erection and dismantling processes for tower cranes C11	Demonstrate knowledge of components and their functions for different types of tower cranes C12	Demonstrate knowledge of tower crane climbing and lowering methods and hazards C13	Demonstrate knowledge of drives, controls, and safety devices for tower cranes C14	Identify and describe the function of the drives, controls and safety devices on the operator's tower crane W C15	
	2	2	2	2	2	
RIGGING D	Demonstrate knowledge of lifting theory and forces D1	Demonstrate knowledge of rigging hardware, materials, tools and manuals D2	Demonstrate knowledge of types and function of wire rope and chains D3	Demonstrate knowledge of installation, inspection and storage of wire rope D4	Demonstrate knowledge of rigging techniques D5	Use rigging hardware and tools in the workplace W D6
	1	1	1	1	1	1
LOAD CHARTS E	Demonstrate knowledge of determining weight of loads using fundamental math functions and calculations E1	Demonstrate knowledge of loading and lifting E2	Interpret load charts and load study drawings to configure crane for workplace operation W E3			
	1	1	1			
CRANE OPERATIONS H	Demonstrate knowledge of pre-operational requirements in crane operations H1	Demonstrate crane set-up per manufacturer's instructions W H4				
	1	1				

W = Knowledge or skills are primarily acquired in the workplace
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Program Overview

MAINTENANCE AND SERVICE I	Maintain an equipment logbook to retain a permanent written record of maintenance and repairs W I1 1	Demonstrate knowledge of daily and monthly inspections for tower cranes I8 2	Demonstrate knowledge of annual and special inspection requirements for tower cranes I9 2	Conduct a start of shift tower crane inspection in the workplace W I10 2	Conduct tower crane load limit and range of travel tests in the workplace W I11 2	
	TOWER CRANE OPERATIONS M	Demonstrate knowledge of hoisting and rigging for tower cranes M1 2	Demonstrate knowledge of tower crane load charts and load calculations M2 2	Demonstrate knowledge of how weather conditions affect tower crane operations M3 2	Demonstrate knowledge of tower crane operator's duties and responsibilities M4 2	Demonstrate knowledge of protocols for leaving a tower crane unattended M5 2
	Operate a tower crane safely in the workplace according to regulations and manufacturer's specifications W M7 2	Leave a tower crane unattended in the workplace W M8 2				

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Training Topics and Suggested Time Allocation

TOWER CRANE OPERATOR – LEVEL 1

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
Line A	SAFETY	5%	70%	30%	100%
A1	Demonstrate knowledge of safe working practices for crane operators		✓		
A2	Demonstrate knowledge of power line hazards and high voltage equipment		✓		
A3	Comply with WorkSafeBC OHSR			✓	
Line B	COMMUNICATIONS	5%	60%	40%	100%
B1	Demonstrate knowledge of personnel involved in crane operations		✓		
B2	Demonstrate knowledge of hand signals		✓		
B3	Demonstrate knowledge of radio communications		✓		
B4	Demonstrate knowledge of workplace communications		✓		
B5	Use hand signals in the workplace			✓	
B6	Use radio communications in the workplace			✓	
B7	Communicate information clearly and check for understanding in the workplace			✓	
Line C	CRANES	10%	100%	0%	100%
C1	Demonstrate knowledge of types of cranes and classifications		✓		
C2	Demonstrate knowledge of terminology related to craning and craning concepts		✓		
C3	Demonstrate knowledge of hoisting terminology, functions and systems		✓		
C4	Demonstrate knowledge of regulatory requirements pertaining to cranes		✓		
Line D	RIGGING	20%	80%	20%	100%
D1	Demonstrate knowledge of lifting theory and forces		✓		
D2	Demonstrate knowledge of rigging hardware, materials, tools and manuals		✓		
D3	Demonstrate knowledge of types and function of wire rope and chains		✓		
D4	Demonstrate knowledge of installation, inspection and storage of wire rope		✓		
D5	Demonstrate knowledge of rigging techniques		✓		
D6	Use rigging hardware and tools in the workplace			✓	



% of Time Allocated to:

		% of Time	Theory	Practical	Total
Line E	LOAD CHARTS	30%	70%	30%	100%
E1	Demonstrate knowledge of determining weight of loads using fundamental math functions and calculations		✓		
E2	Demonstrate knowledge of loading and lifting		✓		
E3	Interpret load charts and load study drawings to configure crane for workplace operation			✓	
Line H	CRANE OPERATIONS	28%	50%	50%	100%
H1	Demonstrate knowledge of pre-operational requirements in crane operations		✓		
H4	Demonstrate crane set-up per manufacturer's instructions			✓	
Line I	MAINTENANCE & SERVICE	2%	0%	100%	100%
I1	Maintain an equipment logbook to retain a permanent written record of maintenance and repairs			✓	
Total Percentage for Tower Crane Operator Level 1		100%			



Training Topics and Suggested Time Allocation

TOWER CRANE OPERATOR – LEVEL 2

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
Line A	SAFETY	9%	75%	25%	100%
A7	Demonstrate knowledge of tower crane specific PPE		✓		
A8	Demonstrate knowledge of regulations, standards, and documentation relevant to tower crane operations		✓		
A9	Demonstrate knowledge of regulations and protocols for operating a tower crane in proximity to power lines, cable hazards, and high and low voltage equipment		✓		
A10	Demonstrate knowledge of documentation for the site and the operator's tower crane			✓	
Line B	COMMUNICATIONS	6%	50%	50%	100%
B8	Demonstrate knowledge of tower crane hand signals		✓		
B9	Demonstrate knowledge of tower crane radio protocols and vocabulary		✓		
B10	Interpret tower crane hand signals in the workplace			✓	
B11	Use tower crane radio protocols and vocabulary in the workplace			✓	
Line C	CRANES	32%	90%	10%	100%
C9	Demonstrate knowledge of tower crane applications		✓		
C10	Demonstrate knowledge of tower crane types and configurations		✓		
C11	Demonstrate knowledge of the erection and dismantling processes for tower cranes		✓		
C12	Demonstrate knowledge of components and their functions for different types of tower cranes		✓		
C13	Demonstrate knowledge of tower crane climbing and lowering methods and hazards		✓		
C14	Demonstrate knowledge of drives, controls, and safety devices for tower cranes		✓		
C15	Identify and describe the function of the drives, controls and safety devices on the operator's tower crane			✓	
Line I	MAINTENANCE & SERVICE	8%	50%	50%	100%
I8	Demonstrate knowledge of daily and monthly inspections for tower cranes		✓		
I9	Demonstrate knowledge of annual and special inspection requirements for tower cranes		✓		
I10	Conduct a start of shift tower crane inspection in the workplace			✓	
I11	Conduct tower crane load limit and range of travel tests in the workplace			✓	



% of Time Allocated to:

		% of Time	Theory	Practical	Total
Line M	TOWER CRANE OPERATIONS	45%	75%	25%	100%
M1	Demonstrate knowledge of hoisting and rigging for tower cranes		✓		
M2	Demonstrate knowledge of tower crane load charts and load calculations		✓		
M3	Demonstrate knowledge of how weather conditions affect tower crane operations		✓		
M4	Demonstrate knowledge of a tower crane operator's duties and responsibilities		✓		
M5	Demonstrate knowledge of protocols for leaving a tower crane unattended		✓		
M6	Demonstrate knowledge of protocols for operating a tower crane on a multi-crane site		✓		
M7	Operate a tower crane safely in the workplace according to regulations and manufacturer's specifications			✓	
M8	Leave a tower crane unattended in the workplace			✓	
Total Percentage for Tower Crane Operator Level 2		100%			



Section 3

PROGRAM CONTENT

Tower Crane Operator



Level 1

Tower Crane Operator



LINE (GAC): A SAFETY

Competency: A1 Demonstrate knowledge of safe working practices for crane operators

Objectives

To be competent in this area, the individual must be able to:

- Describe how to isolate, minimize and eliminate workplace hazards.
- Describe the types of personal protective equipment.

LEARNING TASKS

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

CONTENT

- Energy source hazards
 - Hydraulic
 - Steam
 - Electrical
 - Air
 - Stored energy
 - Gravitational
 - Pinch points
 - Barriers
 - Guards
- Overhead hazards
 - Power lines
 - Cranes
 - Scaffolding
 - Falling objects
- Falling and lifting hazards and safe lifting procedures
 - Open holes
 - Scaffolding
- Mobile machinery hazards
 - Trains
 - Trucks
 - Cranes
 - Forklift trucks
 - Mobile conveyor
- Rotating equipment hazards
 - Belts
 - Pulleys
 - Sheaves
 - Conveyors
 - Sprockets
 - Chains
 - Couplings



- Pinch points
 - Barriers
 - Guards
 - Gas hazards
 - Explosive gases
 - Poisonous gases
 - Atomizers
 - Oxygen deprived atmospheres
 - Methane (CH₄)
 - Lower explosive limit (LEL)
 - Hydrogen sulphide (H₂S)
-
2. Demonstrate knowledge of worksite hazard risk assessment and risk management procedures
 - Risk assessment procedures and risk management procedures
 - Responsibility to maintain a safe work environment
 - Changing weather
 - Frozen surfaces
 - Traffic
 - Location
 - Operating blind
 - Slips
 - Trips and falls
 - Injury to others
 - Injury from moving machinery
 - Methods of communicating risks and risk situations to others
 - Signage
 - Tagging
 - Verbal communications
 - Written communications
 - Safe work cards
 - Risk hazard assessment procedures
 - Notification to local utilities when operating near utility lines or potential hazards
-
3. Demonstrate knowledge of accident and incident reporting procedures
 - Requirements for recording an accident and incident
 - Report form completion
 - Report form processing



- 4. Describe personal protection equipment
 - Breathing protection equipment
 - Respirators and filters
 - Dust protection
 - Hand protection
 - Eye protection equipment such as goggles and shields
 - Personal protective equipment (PPE) and clothing
 - Hard hat
 - Boots
 - Eyewear
 - Hearing protection

- 5. Demonstrate knowledge of response to fire emergencies
 - Fire extinguishers
 - Types and capacities
 - Servicing
 - Use
 - Procedures for fighting electrical fires
 - Power isolation
 - Fire fighting equipment
 - Fire emergency response and evacuation procedures in accordance with industry practice

- 6. Describe procedure for emergency rescue from a crane
 - Emergency rescue procedures
 - Tower crane operator station rescues
 - Crane accident
 - Crane fire

- 7. Describe the 3-point contact method when mounting and dismounting equipment
 - Cranes
 - Other heavy equipment



LINE (GAC): A SAFETY

Competency: A2 Demonstrate knowledge of power line hazards and high voltage equipment

Objectives

To be competent in this area, the individual must be able to describe procedures and safety precautions when operating a crane in the vicinity of overhead conductors.

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <p>1. Describe procedures for operating in proximity of overhead conductors</p> | <ul style="list-style-type: none"> • Operating procedures in the vicinity of overhead conductors <ul style="list-style-type: none"> ○ Signage interpretation related to high voltage ○ Knowledge of limits of approach to overhead conductors • Procedures if contact is made with high voltage equipment <ul style="list-style-type: none"> ○ Breakage of contact between crane and wire if possible ○ When to stay in cab until de-energized by utility company? ○ When to jump? ○ Step potential (toe to heel) ○ First aid ○ Machine inspection for damage caused by contact ○ Requirements for reporting contact to job supervisor immediately ○ Requirements for reporting contact to WorkSafeBC immediately ○ Requirements for reporting contact to utility company immediately ○ Documentation of contact in crane work record log book |
|---|--|



LINE (GAC): A SAFETY

Competency: A3 Comply with WorkSafeBC OHSR

Objectives

To be competent in this area, the individual must be able to interpret and comply with WorkSafeBC Occupational Health and Safety Regulation (OHSR) during crane operation.

LEARNING TASKS

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

CONTENT

- Requirements to uphold the purpose and role of WorkSafeBC while in the workplace
- Protection and upholding of the rights and responsibilities of employers and employees
- Completion of reporting procedures
- Thorough workplace inspections
- Compliance with and adherence to WorkSafeBC OHSR, standards and guidelines in the workplace
 - All regulations applicable in the apprentice's workplace

Achievement Criteria

- | | |
|-------------|---|
| Performance | Demonstrate competence complying with WorkSafeBC OHSR. |
| Conditions | Trainee will be given a project(s) and the tools and materials required to demonstrate safe operating practices in accordance with WorkSafeBC Occupational Health and Safety Regulation (OHSR). |
| Criteria | Within specifications, safety standards and time frames acceptable to industry. |

**LINE (GAC): B COMMUNICATIONS****Competency: B1 Demonstrate knowledge of personnel involved in crane operations****Objectives**

To be competent in this area, the individual must be able to describe the roles and responsibilities of personnel in the workplace.

LEARNING TASKS

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

CONTENT

- Roles and responsibilities of personnel in the workplace
 - Site supervisor
 - Crane operator
 - Rigger
 - Signaller
 - CSO – construction safety officer

**LINE (GAC): B COMMUNICATIONS****Competency: B2 Demonstrate knowledge of hand signals****Objectives**

To be competent in this area, the individual must be able to describe, identify and interpret hand signals accurately.

LEARNING TASKS

1. Describe the hand signals used during crane operations

CONTENT

- Hand signal descriptions
- Accurate hand signal identification and interpretation
- Requirements of the crane hand signaller

**LINE (GAC): B COMMUNICATIONS****Competency: B3 Demonstrate knowledge of radio communications****Objectives**

To be competent in this area, the individual must be able to:

- Describe basic functions of radio communication devices.
- Use appropriate language and terminology during communication.

LEARNING TASKS

1. Describe the use of two-way electronic voice communication devices

CONTENT

- Basic functions of radio communication devices
- Language and terminology used during radio communication
 - Short form words and phrases
 - Use of 12 o'clock (clock face positioning reference) to aid in direction giving and interpreting
- Demonstration and testing of two-way communication devices in a classroom environment
 - Lost contact by radio and requirements to stop operation



LINE (GAC): B COMMUNICATIONS

Competency: B4 Demonstrate knowledge of workplace communications

Objectives

To be competent in this area, the individual must be able to:

- Describe and interpret basic workplace documents.
- Describe techniques to check for understanding.

LEARNING TASKS

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

CONTENT

- Accurate description and interpretation of basic written communications in the workplace
 - Work orders and written instructions
 - Work records
 - Company logs
 - Basic project plan
 - Written reports
- Techniques to ensure clear communication is achieved
 - English workplace vocabulary
 - Non-verbal communications
 - Use of tone and volume
 - Slang
 - Cultural and geographical differences in language
 - Tact
 - Diplomacy
 - Assertiveness
- Techniques for checking understanding
 - Active and focused listening
 - Key point recapping
 - Instruction or sentence restatement
 - Question clarification
- Hazards to personnel and equipment in terms of safety and liability when communication breaks down
- Causes of communication breakdowns
 - Noise
 - Language differences
 - Hearing problem (that may not have been identified)
 - Bias
 - Attitude
 - Issues with egos and arrogance
 - Issues with timidity and fear of speaking up



LINE (GAC): B COMMUNICATIONS
Competency: B5 Use hand signals in the workplace

Objectives

To be competent in this area, the individual must be able to use hand signals correctly during crane operations.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <p>1. Use hand signals and respond to hand signals during crane operations</p> | <ul style="list-style-type: none"> • Accurate use of hand signals • Accurate identification and interpretation of hand signals • Use of hand signals to aid in the safe and correct completion of a crane operation |
|--|--|

Achievement Criteria

- | | |
|-------------|---|
| Performance | Demonstrate competence using various hand signals. |
| Conditions | Trainee will be given a project(s) where they are required to identify, interpret and respond to various hand signals used during crane operations. |
| Criteria | Within specifications, safety standards and time frames acceptable to industry. |



LINE (GAC): B COMMUNICATIONS

Competency: B6 Use radio communications in the workplace

Objectives

To be competent in this area, the individual must be able to use basic functions of radio communication devices to relay information clearly.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <p>1. Use a two-way electronic voice communication device in the workplace</p> | <ul style="list-style-type: none"> • Use of basic functions of radio communication devices according to equipment instructions • Clear and easy to understand language and terminology • Clear, concise, relevant information |
|--|--|

Achievement Criteria

- | | |
|-------------|--|
| Performance | Demonstrate competence using radio communications. |
| Conditions | Trainee will be given a project(s) and a two-way voice communication device to relay information clearly using correct language and terminology. |
| Criteria | Within specifications, safety standards and time frames acceptable to industry. |



LINE (GAC): B COMMUNICATIONS

Competency: B7 Communicate information clearly and check for understanding in the workplace

Objectives

To be competent in this area, the individual must be able to:

- Interpret basic workplace documents to accurately perform tasks.
- Communicate clearly and check for understanding.

LEARNING TASKS

1. Read and demonstrate the correct interpretation of workplace documents

CONTENT

- Interpretation and use of basic written communications in the workplace to accurately perform tasks as assigned
 - Work orders and written instructions
 - Maintenance records
 - Company logs
 - Basic project plan
 - Written reports
- Techniques to ensure clear communication is achieved in the workplace
 - English workplace vocabulary
 - Non-verbal communications
 - Use of tone and volume
 - Colloquialisms
 - Cultural and geographical differences in language
 - Tact
 - Diplomacy
 - Assertiveness
- Techniques for checking understanding with colleagues
 - Active and focused listening
 - Key point recapping
 - Instruction or sentence restatements
 - Question clarification
- No breakdown in communication
- No exposure of personnel and equipment to hazards
- Clear, fair and accurate communication despite workplace communication barriers
 - Noise
 - Language differences
 - Hearing problem (that may not have been



identified)

- Bias
- Attitude
- Issues with egos and arrogance
- Issues with timidness and fear of speaking up

Achievement Criteria

Performance	Demonstrate competence communicating information clearly and checking for understanding.
Conditions	<p>Trainee will be given a project(s) and the tools and materials required to communicate clearly and effectively in the workplace, including:</p> <ul style="list-style-type: none"> • Interpreting various written communications to accurately perform tasks • Using techniques to check for understanding to avoid breakdowns in communication
Criteria	Within specifications, safety standards and time frames acceptable to industry.

**LINE (GAC): C CRANES****Competency: C1 Demonstrate knowledge of types of cranes and classifications****Objectives**

To be competent in this area, the individual must be able to describe the types and classifications of cranes and explain their key functions.

LEARNING TASKS

1. Describe the types of cranes and their key functions

CONTENT

- Purpose and functions of cranes
 - Boom trucks
 - Mobile cranes
 - Tower cranes
 - Self-erect cranes
- Crane classifications
 - Carrier types (e.g. crawler, rubber)
 - Hoist mechanisms (e.g. hydraulic, conventional, electrical)
 - Lifting capacity
 - Boom types (e.g. lattice, hydraulic, knuckle boom, luffing boom)
 - Heavy lift cranes (e.g. super lift, ringer)
 - Tower cranes
 - Self-erect cranes



LINE (GAC): C CRANES

Competency: C2 Demonstrate knowledge of terminology related to craning and craning concepts

Objectives

To be competent in this area, the individual must be able to define terms commonly used in the crane industry.

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <p>1. Describe terms related to craning commonly used in the work environment</p> | <ul style="list-style-type: none"> • Terms related to craning <ul style="list-style-type: none"> ○ Wire rope ○ Fittings ○ Drums ○ Hooks ○ Sheaves ○ Winch ○ Slew/swing ○ Hoist ○ Boom ○ Swing brake ○ Swing dog ○ Mast ○ Gantry ○ Overload protection systems (limits) |
| <p>2. Demonstrate knowledge of travel braking systems in crane operations</p> | <ul style="list-style-type: none"> • Components of braking systems and their functions <ul style="list-style-type: none"> ○ Air compressor ○ Brake chambers ○ Drums ○ Brake bands ○ Slack adjusters • Defects or malfunctions of braking systems <ul style="list-style-type: none"> ○ Air compressors ○ Brake chambers ○ Drums ○ Brake bands ○ Slack adjusters |



LINE (GAC): C CRANES

Competency: C3 Demonstrate knowledge of hoisting terminology, functions and systems

Objectives

To be competent in this area, the individual must be able to:

- Describe components and functions of hoisting systems.
- Describe defects and malfunctions.

LEARNING TASKS

1. Demonstrate knowledge of hoisting functions and systems for crane operation

CONTENT

- Components of hoisting systems and their functions
 - Hydraulic boom
 - Lattice boom
 - Drums
 - Hooks
 - Sheaves
 - Winch
 - Brakes and clutches
 - Trolley
 - Roller
 - Swing bearing
- Defects or malfunctions of hoisting systems
 - Hydraulic boom
 - Lattice boom
 - Drums
 - Hooks
 - Sheaves
 - Winch
 - Brakes and clutches
 - Trolley
 - Roller
 - Swing bearing



LINE (GAC): C CRANES

Competency: C4 Demonstrate knowledge of regulatory requirements pertaining to cranes

Objectives

To be competent in this area, the individual must be able to describe current regulations and their impact on crane operations.

LEARNING TASKS

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

CONTENT

- Impact of current regulations on workplace practices and crane operations
 - WorkSafeBC Occupational Health and Safety Regulation (OHSR)
 - 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)
 - Delivery agency policy

**LINE (GAC): D RIGGING****Competency: D1 Demonstrate knowledge of lifting theory and forces****Objectives**

To be competent in this area, the individual must be able to describe the fundamentals of leverage.

LEARNING TASKS

1. Demonstrate knowledge of the principles of leverage

CONTENT

- Principles of leverage
 - Sling angles
 - Class 1 lever
 - Class 2 lever
 - Class 3 lever
 - Centre of gravity
 - Sine of angle



Line (GAC): D RIGGING

Competency: D2 Demonstrate knowledge of rigging hardware, materials, tools and manuals

Objectives

To be competent in this area, the individual must be able to:

- Describe the types of rigging hardware used in crane operations.
- Describe how to inspect, maintain and store rigging hardware.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <p>1. Demonstrate knowledge of rigging hardware used in crane operations</p> | <ul style="list-style-type: none"> • Rigging hardware and its uses <ul style="list-style-type: none"> ○ Hooks ○ Shackles ○ Slings ○ Spreader bars ○ Equalizer beams ○ Chains ○ Bridles ○ Chokers • Description and interpretation of specific information on rigging hardware from manufacturer's and rigging manuals according to industry standards |
| <p>2. Demonstrate knowledge of inspection, service and repairs to rigging hardware</p> | <ul style="list-style-type: none"> • Procedure for inspection of rigging hardware as per manufacturer's manuals • Requirements for examining rigging hardware <ul style="list-style-type: none"> ○ Excessive wear ○ Damage ○ Fraying ○ Cracks ○ Safety clips ○ Broken wire |



3. Demonstrate knowledge of removing rigging hardware from service
 - Criteria for removing rigging hardware from service according to appropriate BC regulations
 - Procedure to remove clips as per manufacturer's manual and company procedures
 - Process of rigging hardware removal
 - Removal from crane and destruction
 - Process of acceptable repairs to rigging hardware as prescribed by manufacturer
 - Nylon sling – no repair
 - Wire sling – no repair
 - Chain – repair by manufacturer only
 - Kevlar – repair by manufacturer only
 - Reporting of defects and deficiencies to appropriate personnel
 - Job supervisor
 - Crane supervisor
 - Crane logbook entry

4. Demonstrate knowledge to store rigging hardware after use
 - Criteria for storing rigging hardware as per manufacturer's guidelines



LINE (GAC): D RIGGING

Competency: D4 Demonstrate knowledge of installation, inspection and storage of wire rope

Objectives

To be competent in this area, the individual must be able to:

- Describe the inspection, maintenance and storage of wire rope.
- Describe the criteria and process to remove damaged or defective wire rope.
- Describe the wire rope installation process.

LEARNING TASKS

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

CONTENT

- Inspection and examination procedure for wire rope defects
 - Frayed wire rope
 - Broken strands
 - Lubrication
 - Excessive wear
 - Bird caging
 - Kinking
 - Flattening
 - Proper spooling
 - Broken wires
- Criteria to remove damaged or defective rope according to WorkSafeBC regulations
- Process of removing damaged or defective wire rope according to manufacturer's guidelines
- Drum examination to ensure proper installation
- Recording and reporting process for the inspection defects and deficiencies
 - Documentation of inspection in logbook
 - Documentation of defects in logbook
 - Requirements for reporting defects and deficiencies to job supervisor
 - Requirements for reporting defects and deficiencies to crane supervisor



- 2. Demonstrate knowledge of installing new rope according to manufacturer's instructions
 - New wire rope installation process according to manufacturer's requirements
 - Interpretation of manufacturer's certificate of origin/data plates
 - Wire rope system components
 - Rope guides
 - Drums
 - Blocks
 - Hooks
 - Sheaves
 - Wedge and socket termination

- 3. Demonstrate knowledge of storing wire rope
 - Criteria for storing wire rope according to manufacturer's requirements

- 4. Demonstrate knowledge of maintenance of wire ropes
 - Criteria for lubricating wire rope
 - Inspection of rope
 - Identification of rope needing lubrication
 - Maintenance procedures on wire ropes as manufacturer dictates
 - Wire rope cutting
 - Cleaning
 - Lubrication
 - Documentation of wire rope maintenance in the log book within the regulated timeframe

**LINE (GAC): D RIGGING****Competency: D5 Demonstrate knowledge of rigging techniques****Objectives**

To be competent in this area, the individual must be able to describe the selection and use of appropriate slings and rigging hardware for a given load.

LEARNING TASKS

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

CONTENT

- Selection of appropriate slings and hardware for a given load
 - Load weight determination
 - Sling size calculation
 - Safe working load (SWL/WLL) of wire rope
- Safe and efficient rigging procedures for a given lift
 - Load weight determination
 - Sling size calculation
 - Safe working load (SWL/WLL) of wire rope
- Selection of rigging in a safe and efficient manner for a given lift
 - Calculations
 - Safe working load (SWL/WLL) calculation
 - Correct sling size
- Load and hardware characteristics
 - Advantages and disadvantages of particular hardware
 - Characteristics of hardware
 - Characteristics of the load



LINE (GAC): D RIGGING

Competency: D6 Use rigging hardware and tools in the workplace

Objectives

To be competent in this area, the individual must be able to:

- Select and use appropriate slings and rigging hardware for a given load.
- Inspect, maintain and store rigging hardware.

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <p>1. Assemble appropriate rigging for a given load according to manufacturer's recommendations</p> | <ul style="list-style-type: none"> • Selection and installation of appropriate slings, chains, wire ropes and hardware for lifts: concrete equipment and tanks <ul style="list-style-type: none"> ○ Load measurement ○ Weight of load calculation ○ Sling requirement calculation ○ Appropriate rigging completion ○ Protective equipment ○ Correct signalling |
| <p>2. Inspect, maintain and store rigging hardware, wire ropes and chains in workplace operations</p> | <ul style="list-style-type: none"> • Inspection, maintenance and storage of rigging hardware, wire ropes and chains according to company and manufacturer's specifications and company requirements |

Achievement Criteria

- | | |
|-------------|---|
| Performance | Demonstrate competence using rigging hardware and tools. |
| Conditions | Trainee will be given a load(s) to be hoisted and a variety of rigging hardware to demonstrate the correct techniques for selection, assembly, maintenance and storage of rigging tools and hardware. |
| Criteria | Within specifications, safety standards and time frames acceptable to industry. |



LINE (GAC): E LOAD CHARTS

Competency: E1 Demonstrate knowledge of determining weight of loads using fundamental math functions and calculations

Objectives

To be competent in this area, the individual must be able to:

- Calculate load weights accurately.
- Interpret engineer's drawings and blueprints.

Note: A scientific calculator is required for this unit

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>1. Demonstrate the functions of a scientific calculator to perform mathematical calculations</p> | <ul style="list-style-type: none"> • Rounding off • Fractions • Metric and imperial units of measure • Circumference of a circle • Perimeter of an object • Surface area of an object • Sine of an angle • Pythagorean theorem |
| <p>2. Demonstrate knowledge of accurately calculating load</p> | <ul style="list-style-type: none"> • Accurate load weight determination <ul style="list-style-type: none"> ○ Volume of an object ○ Weight of a cubic unit of an object ○ Bearing pressure on the load supporting surfaces ○ Weight of materials ○ Total weight of load |
| <p>3. Demonstrate knowledge of crane documentation affecting loads</p> | <ul style="list-style-type: none"> • Accurate interpretation of engineer's drawings and blueprints <ul style="list-style-type: none"> ○ Capacity ○ Boom configuration ○ Load weight ○ Rigging weight ○ Calculations ○ Radius of crane ○ Positioning of crane ○ Positioning of the load • Comparison of shipping company's bill of lading to an estimated weight based on volume, LMI (Load Moment Indicator) and type of load to determine accuracy • Accurate interpretation of load capacity charts |

**LINE (GAC): E LOAD CHARTS****Competency: E2 Demonstrate knowledge of loading and lifting****Objectives**

To be competent in this area, the individual must be able to select the appropriate configuration for a lift and determine the sufficient lifting capacity of a crane.

Note: A scientific calculator is required for this unit

LEARNING TASKS

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

CONTENT

- Fundamentals of leverage
 - Optimum boom configurations
 - Boom length
 - Boom angle
 - Radius
 - Hook height
 - Quadrant
 - Selection of configurations appropriate for lifting loads
 - Radius
 - Parts of line
 - Height of the combined load and rigging
 - Weight of the combined load and rigging
 - Boom length
 - Boom jib combination
 - Counterweight combination
 - Verification of configurations for the lifts by the site supervisor and the crane supervisor
 - Lift form completion as required by company
 - Differences between gross load and gross capacity
 - Static and dynamic loading and lifting principles
2. Demonstrate knowledge of selection of rigging hardware to safely lift loads in accordance with manufacturer's recommendations
 - Load configuration determination
 - Calculations for rigging
 - Calculations for loads
 - Load chart accuracy
 - Verification of load height, weight, length and width with crane supervisor
 - Calculations for rigging
 - Calculations for loads
 - Load chart accuracy
 - Centre of gravity calculation for a load



- Accurate calculation and use of the safe working load (SWL/WLL) for wire rope and rigging hardware
 - Overload prevention
 - Spooling prevention
- Criteria for selecting the appropriate hardware according to the manufacturer's requirements
 - Weight
 - Size of load
- Criteria for selecting the appropriate safety devices
 - Shape
 - Weight
 - Sharp edges
 - Round edges
- Load calculations on slings of equal and unequal length
 - Weight of load
 - Centre of gravity
 - Sling angles
 - Dimension of the load
 - Height
 - Weight
 - Length



LINE (GAC): E LOAD CHARTS

Competency: E3 Interpret load charts and load study drawings to configure crane for workplace operation

Objectives

To be competent in this area, the individual must be able to interpret load charts and lift plan drawings accurately to configure a crane.

LEARNING TASKS

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

CONTENT

- Load chart interpretation
- Load dimension verification by crane supervisor, crane operator (and engineer as required)
- Centre of gravity calculation
- Special lift instructions
- Safe working load (SWL/WLL) determination for wire rope and rigging
- Selection of appropriate hardware and safety devices
- Load considerations on slings for equal and unequal lengths

Achievement Criteria

Performance	Demonstrate competence interpreting load charts and load study drawings to configure a crane for workplace operation.
Conditions	Trainee will be given a load(s) to be hoisted and the load charts and lift plans required to configure a crane for workplace operation.
Criteria	Within specifications, safety standards and time frames acceptable to industry.



LINE (GAC): H CRANE OPERATIONS

Competency: H1 Demonstrate knowledge of pre-operational requirements in crane operations

Objectives

To be competent in this area, the individual must be able to:

- Describe pre-operational inspection procedures.
- Describe tests and required maintenance and repairs.
- Describe the process of accurately recording and reporting defects and deficiencies.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>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</p> | <ul style="list-style-type: none"> • Inspection procedures <ul style="list-style-type: none"> ○ Properly placed operator aids for crane ○ Completion of inspection and erection reports ○ Compliance with OHSR ○ Control system and system gauge location ○ In accordance with manufacturer's requirements • Place, location and verification of operator aids for the crane <ul style="list-style-type: none"> ○ LMI ○ Boom length indicator (assessment note for tower crane and self-erect crane) ○ Boom angle indicator • Completion and filing of inspection and erection reports <ul style="list-style-type: none"> ○ Crane logbook ○ Lift plan |
| <p>2. Demonstrate knowledge of tests, repairs and maintenance required during the pre-operation inspection stage</p> | <ul style="list-style-type: none"> • Function tests on hoist systems <ul style="list-style-type: none"> ○ 'Boom up' ○ 'Boom down' (assessment note for tower crane and self-erect crane) ○ 'Hoist up' ○ 'Hoist down' ○ 'Swing left' ○ 'Swing right' ○ 'Telescope in' (assessment note for tower and self-erect crane) ○ 'Telescope out' ○ Brakes • Repairs and maintenance prior to operation according to manufacturer's requirements, and |



documentation in the crane logbook

3. Demonstrate knowledge of reports and records required for reporting deficiencies or defects
 - Accurate reporting of defects and deficiencies to the supervisor and proper documentation in the crane log book
 - Date
 - Description of issue
 - Signature of person doing the repairs
 - Signature of the operator
 - Legal requirements entries compliant with WorkSafeBC regulations, corporate standards, and any other applicable regulatory agencies' codes, laws and guidelines
 - Process of ensuring repairs and maintenance are recorded in the appropriate crane log book
 - Date
 - Description
 - Signature of repair person

4. Demonstrate knowledge of the setup procedures for mobile cranes/boom trucks
 - Setup procedures according to manufacturer's specifications
 - Overhead obstructions and underground hazards
 - Power cables
 - Trees
 - Underground sewers
 - Underground water
 - Underground building structures
 - Requirements for blocking and mats to be sufficient considering the load requirements and surface conditions to level the crane
 - Programming and adjustment of safety devices to ensure accuracy and safety while lifting
 - LMI Load moment indicator
 - Anti-two block systems, high speed limits and max. height limits
 - Boom angle indicators
 - Level



3. Complete required reports and records for deficiencies or defects
 - Accurate reporting of defects and deficiencies to the supervisor and proper documentation in the crane log book
 - Date
 - Description of issue
 - Signature of person doing the repairs
 - Signature of the operator
 - Documentation of repairs and maintenance in the appropriate crane log book
 - Date
 - Description of issue
 - Signature of person doing the repairs

Achievement Criteria

Performance	Demonstrate competence setting up a crane safely according to manufacturer's instructions.
Conditions	Trainee will be given a project(s) and the tools and materials to perform the required tests, repairs and maintenance on a crane as part of the setup process.
Criteria	Within specifications, safety standards and time frames acceptable to industry.



LINE (GAC): I MAINTENANCE AND SERVICE

Competency: I1 Maintain an equipment logbook to retain a permanent written record of maintenance and repairs

Objectives

To be competent in this area, the individual must be able to record all inspections, defects, deficiencies and maintenance in an equipment logbook.

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <p>1. Record all inspections and maintenance in an equipment logbook</p> | <ul style="list-style-type: none"> • Legible and easy to understand entries • Complete and accurate entries • All inspections after they are completed • All requests for the external supply of maintenance • Documentation of all maintenance performed when it is completed |
| <p>2. Report all inspections, defects, deficiencies, and maintenance to the crane supervisor and site supervisor</p> | <ul style="list-style-type: none"> • Clear and easy to understand communication • Reporting requirements at the time of the inspection, request or maintenance |

Achievement Criteria

- Performance** Demonstrate competence maintaining an equipment logbook.
- Conditions** Trainee will be given a project(s) and the information required to record all inspections and maintenance in an equipment logbook, ensuring entries are legible and easy to understand.
- Criteria** Within specifications, safety standards and time frames acceptable to industry.



Level 2

Tower Crane Operator



LINE (GAC): A SAFETY

Competency: A7 Demonstrate knowledge of tower crane specific PPE

Objectives

To be competent in this area, the individual must be able to:

- Identify and describe the required PPE for tower crane operation.
- Describe the use of personal fall arrest equipment.

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Describe the PPE required by tower crane operators | <ul style="list-style-type: none"> • Personal fall arrest equipment • Steel-toed boots • Hi visibility vest (for operating crane remotely) • Hard hat with chin strap • Sunglasses (recommended) • Horizontal life lines |
| <ol style="list-style-type: none"> 2. Describe the use of personal fall arrest equipment and typical connection points on tower cranes | <ul style="list-style-type: none"> • Lanyard requirements • Equipment provider • CSA certified • Proper usage • Lanyard connection points (crane specific) |



LINE (GAC): A SAFETY

Competency: A8 Demonstrate knowledge of regulations, standards and documentation relevant to tower crane operations

Objectives

To be competent in this area, the individual must be able to:

- Describe regulations and standards that apply to tower crane operation.
- Describe site-specific documentation.

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Identify and describe the regulations and standards which apply to tower crane operations
 2. Identify and describe site-specific documentation providing information required by the tower crane operator
 3. Describe the components of a site emergency plan | <ul style="list-style-type: none"> • CSA Standard Z248-2004 Code for Tower Cranes • WorkSafeBC regulations • Right to refuse • Public safety
 • Crane manufacturer's manual • Crane load chart • Crane 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 worksite safety board • Soils report • Concrete test • Foundation design prior to pouring foundation
 • 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 |
|--|---|

**LINE (GAC): A SAFETY**

Competency: A9 Demonstrate knowledge of regulations and protocols for operating a tower crane in proximity to power lines, cable hazards, and high and low voltage equipment

Objectives

To be competent in this area, the individual must be able to describe regulations for operating a tower crane in proximity to electrical hazards.

LEARNING TASKS

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

CONTENT

- 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



LINE (GAC): A SAFETY

Competency: A10 Demonstrate knowledge of documentation for the site and the operator's tower crane

Objectives

To be competent in this area, the individual must be able to:

- Describe the importance of the crane logbook and operator's logbook.
- Describe site-specific documentation relevant to tower crane operation.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <p>1. List and describe site-specific documents important to operating the tower crane</p> | <ul style="list-style-type: none"> • Crane logbook • Crane manufacturer's manual • Contents of site safety board • WorkSafeBC tower crane report • Site schematic showing Limits of Approach and crane work radius • DEP emergency procedures • Other site policies and procedures |
| <p>2. Describe the contents and significance of the crane logbook and the operator's logbook</p> | <ul style="list-style-type: none"> • Crane logbook <ul style="list-style-type: none"> ○ Location ○ Significance ○ Contents ○ Consistent recording of required information in logbook (daily) • Operator's logbook <ul style="list-style-type: none"> ○ Location ○ Significance ○ Contents ○ Consistent recording of required information |
| <p>3. Describe procedure for the tower crane operator to follow in an emergency personnel evacuation</p> | <ul style="list-style-type: none"> • Radio protocol • Rigging drop-off • DEP location • DEP drop-off spot • Tower crane operator responsibilities • Connection to DEP with appropriate rigging hardware (pigtail, whip) • Confirmation of connection between the safety line of person(s) being lifted and the block • DEP handling and landing precautions |



4. Identify and describe Limits of Approach for nearby power lines, cable hazards, and high and low voltage equipment
 - 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

Achievement Criteria

- | | |
|-------------|--|
| Performance | Demonstrate competence describing documentation for the site and the operator's tower crane. |
| Conditions | Trainee will be given a project(s) and materials required to list and describe site-specific documents and explain their significance. |
| Criteria | Within specifications, safety standards and time frames acceptable to industry. |



LINE (GAC): B COMMUNICATIONS

Competency: B9 Demonstrate knowledge of tower crane radio protocols and vocabulary

Objectives

To be competent in this area, the individual must be able to:

- Describe proper tower crane radio protocols.
- Describe the use of appropriate language and terminology when relaying information.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>1. Describe language and terminology commonly used in tower crane operations</p> | <ul style="list-style-type: none"> • Consistent terminology (terminology that is clear and understood by both crane operator and rigger) • Clear, concise, relevant information • Confirmation and clarification to ensure understanding • North, South, East, West (or clock face position) to aid in giving and interpreting directions |
| <p>2. Describe tower crane radio protocols</p> | <ul style="list-style-type: none"> • Dedicated frequency requirement for crane operator and rigger(s) • Crane to crane communication (multicrane and other equipment) • Radio protocol for directing load movement • Loss of radio contact • Protocol for working in the blind • Height callouts from rigger as load is lowered • Crane identification |



Line (GAC): B COMMUNICATIONS

Competency: B10 Interpret tower crane hand signals in the workplace

Objectives

To be competent in this area, the individual must be able to interpret and respond to tower crane hand signals.

LEARNING TASKS

CONTENT

1. Interpret and respond to hand signals

- Respond to hand signals during routine tower crane operations
 - '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'
- Hand signal demonstration
- Instruction clarification (hand signals) as required to ensure clear communication
- Respond to or demonstrate luffing crane hand signals (if applicable)
 - 'Boom up or trolley in'
 - 'Boom down or trolley out'
 - 'Boom up, lower load'
 - 'Boom down, raise load'
- Respond to or demonstrate travelling crane hand signals (if applicable)
 - 'Travel forward'
 - 'Travel backward'

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

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



Achievement Criteria

- | | |
|-------------|---|
| Performance | Demonstrate competence interpreting various tower crane hand signals. |
| Conditions | Trainee will be given a project(s) to interpret and respond to hand signals, and to clarify instructions as required to ensure clear communication. |
| Criteria | Within specifications, safety standards and time frames acceptable to industry. |



LINE (GAC): B COMMUNICATIONS

Competency: B11 Use tower crane radio protocols and vocabulary in the workplace

Objectives

To be competent in this area, the individual must be able to:

- Follow proper tower crane radio protocols.
- Use appropriate language and terminology when relaying information.

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <p>1. Demonstrate the procedure for working in the blind</p> | <ul style="list-style-type: none"> • Consistent terminology • Clear, concise, relevant information • Confirmation and clarification to ensure understanding • Use of measurements to clarify distance • North, South, East, West (or clock face position) to aid in giving and interpreting directions • Height callouts from rigger as load is lowered |
|--|---|

Achievement Criteria

- | | |
|-------------|--|
| Performance | Demonstrate competence using tower crane radio protocols and vocabulary. |
| Conditions | Trainee will be given a project(s) and a two-way voice communication device to demonstrate the correct procedure for working in the blind. |
| Criteria | Within specifications, safety standards and time frames acceptable to industry. |



LINE (GAC): C CRANES

Competency: C9 Demonstrate knowledge of tower crane applications

Objectives

To be competent in this area, the individual must be able to describe different types of loads and their specific handling requirements.

LEARNING TASKS

1. Describe specific handling requirements for different types of tower crane loads

CONTENT

- 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



LINE (GAC): C CRANES

Competency: C10 Demonstrate knowledge of tower crane types and configurations

Objectives

To be competent in this area, the individual must be able to describe the various tower, jib and mounting configurations for tower cranes.

LEARNING TASKS

1. Describe the various tower configurations available for tower cranes

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

3. Describe the four basic mounting configurations available for tower cranes

CONTENT

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

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

- Stationary (fixed)
- Rail
- Climbing
- Truck



LINE (GAC): C CRANES

Competency: C11 Demonstrate knowledge of the erection and dismantling processes for tower cranes

Objectives

To be competent in this area, the individual must be able to:

- Describe the operator's roles and responsibilities during the erection and dismantling process.
- Describe the types of documentation available to the operator.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Describe the operator's role in the erection and dismantling process for tower cranes | <ul style="list-style-type: none"> • Preassembly and setup of crane • Testing of limits • Referral to Tower Crane Report for crane information and requirements • Role in dismantling process • Weather conditions |
| <ol style="list-style-type: none"> 2. Identify and describe the site documentation available to the operator regarding tower crane erection | <ul style="list-style-type: none"> • 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 |



LINE (GAC): C CRANES

Competency: C12 Demonstrate knowledge of components and their functions for different types of tower cranes

Objectives

To be competent in this area, the individual must be able to describe the basic components of a tower crane and explain their functions.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>1. Describe the components common to most tower cranes and explain their functions</p> | <ul style="list-style-type: none"> • 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 |
| <p>2. Describe the specific components of a climbing tower crane</p> | <ul style="list-style-type: none"> • Bottom or top climber • Climbing support beam (braces, tie-ins) • Jacking frame • Ladders • Beams, wedges and shoring |
| <p>3. Describe the specific components of a travelling (rail) tower crane</p> | <ul style="list-style-type: none"> • Bogies • Power cable drum • Travel control cabinet • Ballast and rails • Concrete ballast blocks • Undercarriage frame • Travel motor assembly • Knee brace • Designated park location |



4. Describe the specific components of a luffing jib tower crane
 - Compensation sheave
 - Boom luffing unit and luffing line
 - Boom suspension line
 - Boom stops
 - Luffing jib/boom (suspension lines or pendant lines)



LINE (GAC): C CRANES

Competency: C13 Demonstrate knowledge of tower crane climbing and lowering methods and hazards

Objectives

To be competent in this area, the individual must be able to describe the methods and hazards associated with climbing and lowering tower cranes.

LEARNING TASKS

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

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

CONTENT

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

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



LINE (GAC): C CRANES

Competency: C14 Demonstrate knowledge of drives, controls, and safety devices for tower cranes

Objectives

To be competent in this area, the individual must be able to:

- Describe the types of drives and controls for tower cranes.
- Describe safety devices and their functions.

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <p>1. List the types of drive functions in tower cranes</p> | <ul style="list-style-type: none"> • Hoist drive • Slewing drive • Trolley drive • Travel drive • Boom hoist drive – luffer |
| <p>2. Describe safety devices for tower cranes and explain their functions</p> | <ul style="list-style-type: none"> • Hoist limits • Trolley limits • Slewing limits • Travel limits • Maximum load limits • Load moment indicator • Safety switches • Emergency stop buttons • Safety guards and covers • Anemometer (wind meter) • Electrical lockout |
| <p>3. Describe hoist drive types and operating characteristics</p> | <ul style="list-style-type: none"> • Type of drive (frequency, gear, belt, AC or DC) • Hoist gear options (e.g., RACCO or ELMAG) • Multiple parts of line (two part, four part) • Joystick position (motor speeds/steps) • Safety switches • Hoist braking functions (hoist holding brake) • Emergency brakes • Slack line cut-out • Overspeed cut-out • Overspeed governor |



- | | |
|--|--|
| <p>4. Describe trolley drive types and controls available on tower cranes</p> | <ul style="list-style-type: none"> • Changeable gear boxes • Joystick operation (motor speeds/steps) • Trolley brake functions • Automatic braking device |
| <p>5. Describe slew drive types and controls available on tower cranes</p> | <ul style="list-style-type: none"> • Types of drives (AC, frequency, geared, belts, fluid coupling) • Joystick operation (motor speeds/steps) • Types of braking (eddy current, holding brake) • Slewing brake functions • Out-of-service brake release |
| <p>6. Describe various travel controls available on tower cranes</p> | <ul style="list-style-type: none"> • Joystick operation (motor speeds/steps) • Brake functions • Audible warning device (rail mounted cranes) |
| <p>7. Describe other functions controlled by buttons, switches, pedals and toggles on tower cranes</p> | <ul style="list-style-type: none"> • On/Off controls • Joystick controls on luffing cranes • Radio controls • Switches • Pedals |



LINE (GAC): C CRANES

Competency: C15 Identify and describe the function of the drives, controls and safety devices on the operator's tower crane

Objectives

To be competent in this area, the individual must be able to:

- Identify types of drives and describe their operating characteristics.
- Identify safety devices and describe their functions.

LEARNING TASKS

CONTENT

<p>1. Point out the safety devices on the operator's tower crane and describe their functions</p>	<ul style="list-style-type: none"> • Hoist limits (maximum pull, tip limit, gear load limit switches) • Trolley limits (trolley in, trolley out) • Safety switches • Emergency stop buttons • Emergency braking systems • Anemometer (wind meter)
<p>2. Describe the hoist drive and operating characteristics</p>	<ul style="list-style-type: none"> • Type of drive (frequency, gear, belt, AC or DC) • Changeable gear box • Multiple parts of line • Number of motor steps • Hoist holding brakes
<p>3. Describe the trolley drive and operating characteristics</p>	<ul style="list-style-type: none"> • Gear change options • Trolley brakes
<p>4. Describe the slew drive and operating characteristics</p>	<ul style="list-style-type: none"> • Type of drive (AC, frequency) • Type of braking (eddy current, holding brake)

Achievement Criteria

Performance	Demonstrate competence identifying and describing the function of the drives, controls, and safety devices on a tower crane.
Conditions	Trainee will be given a project(s) and the tools and materials required to identify the drives, controls and safety devices on a tower crane and describe their operating characteristics and functions.
Criteria	Within specifications, safety standards and time frames acceptable to industry.



LINE (GAC): I MAINTENANCE AND SERVICE

Competency: I8 Demonstrate knowledge of daily and monthly inspections for tower cranes

Objectives

To be competent in this area, the individual must be able to:

- Describe the start of shift inspection and monthly inspection for tower cranes.
- Describe procedures for recording and reporting all defects and deficiencies.

LEARNING TASKS

1. Describe start of shift inspection requirements for tower crane operators, according to the crane manufacturer's manual

CONTENT

- Electrical power cords – main feed – junction box splice
- Ground fault circuit interrupter (GFCI)
- ON/OFF switch (main disconnect)
- Crane base inspection
- Walkways, handrails, guards, ladders, and perimeter barricade
- Structure, pins, keepers, and mast bolts
- Properly positioned and tight tower wedges or tie backs
- Properly positioned and weather-tight doors, panels, and covers
- Properly functioning operator controls
- Load moment hoist limit
- Load moment trolley limit
- Maximum load (line pull)
- Trolleying out
- Trolleying in
- Hoist up deceleration limit
- Hoist upper limit
- Hoist down limit or slack line
- Properly functioning audio/visual indicators
- Anemometer
- Functioning hoist brake
- Functioning slewing brake
- Trolley brake
- Load block and hook
- Travel brake to rail where applicable
- Rail travel forward and reverse operation and limit
- Track inspection for loose connections, proper drainage, subsidence and bogie wear on travelling cranes, rail clamps, and end stops



- Housekeeping: concrete debris, rebar dowels, signage lights, access/egress and end stops
 - Notification of defects or faults to supervisor
 - Daily initials from operator
2. Describe weekly tower crane inspection requirements, according to crane manufacturer's manual
- 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)
 - Load line, trolley line, and boom hoist rope, if applicable
 - Tie-ins to slabs or other bracing systems if used
 - Properly lubricated machine
 - Oil reservoirs
 - All drive components
 - Secured counterweight supports and brackets
 - Anchor bolts/pins
 - Tower bolts/pins
 - Level and parallel track
 - Notification of defects or faults to supervisor
 - Weekly initials from operator
 - Required use of harness and lanyard for safety
3. Describe monthly tower crane inspection requirements, according to crane manufacturer's manual
- Bogie wear (travelling cranes)
 - Belt tension, alignment, and signs of chafing
 - Brake 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
 - Pendant line connections
 - Notification of defects or faults to supervisor
 - Monthly initials from operator



LINE (GAC): I **MAINTENANCE AND SERVICE**
Competency: I9 **Demonstrate knowledge of annual and special inspection requirements for tower cranes**

Objectives

To be competent in this area, the individual must be able to describe annual and special inspection requirements for tower cranes.

LEARNING TASKS

1. Describe annual and special inspection requirements for tower cranes

CONTENT

- Inspection by professional engineer
- Before each erection and if in use more than one 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



LINE (GAC): I MAINTENANCE AND SERVICE

Competency: I10 Conduct a start of shift tower crane inspection in the workplace

Objectives

To be competent in this area, the individual must be able to:

- Conduct a start of shift inspection.
- Record and report all defects and deficiencies.
- Use a harness and lanyard when required.

LEARNING TASKS

1. Conduct and describe pre-start inspection according to crane manufacturer’s manual and site procedures

CONTENT

- Electrical power cords – main feed – junction box splice
- Ground fault circuit interrupter (GFCI)
- ON/OFF switch (main disconnect)
- Crane base inspection
- Walkways, handrails, guards, ladders, and perimeter barricade
- Structure, pins, keepers, and mast bolts
- Properly positioned and tight tower wedges or tie backs
- Properly positioned and weather-tight doors, panels, and covers
- Properly functioning operator controls
- Load moment hoist limit
- Load moment trolley limit
- Maximum load (line pull)
- Trolleying out
- Trolleying in
- Hoist up deceleration limit
- Hoist upper limit
- Hoist down limit or slack line
- Properly functioning audio/visual indicators
- Anemometer
- Functioning hoist brake
- Functioning slewing brake
- Trolley brake
- Visual inspection of load block and hook
- Travel brake to rail where applicable
- Rail travel forward and reverse operation and limit
- Track inspection for loose connections, proper drainage, subsidence and bogie wear on



- travelling cranes, rail clamps, and end stops
 - Housekeeping: concrete debris, rebar dowels, signage lights, access/egress and end stops
 - Notification of defects or faults to supervisor
 - Daily initials from operator

- 2. Conduct and describe weekly inspection requirements for tower crane according to crane manufacturer's manual
 - 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)
 - Load line, trolley line, and boom hoist rope, if applicable
 - Tie-ins to slabs or other bracing systems if used
 - Properly lubricated machine
 - Oil reservoirs
 - All drive components
 - Secured counterweight supports and brackets
 - Anchor bolts/pins
 - Tower bolts/pins
 - Level and parallel track
 - Notification of defects or faults to supervisor
 - Weekly initials from operator
 - Required use of harness and lanyard for safety

- 3. Demonstrate use of harness and lanyard for safety while conducting weekly inspections
 - Option 1: double lanyard (connection to safe point on structure, safely passes suspension points)
 - Option 2: rope grab (securely fastens)



4. Conduct monthly inspection requirements for tower crane according to crane manufacturer's manual
 - Bogie wear (travelling cranes)
 - Belt tension, alignment, and signs of chafing
 - Brake 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
 - Pendant line connections
 - Notification of defects or faults to supervisor
 - Monthly initials from operator

Achievement Criteria

- | | |
|-------------|--|
| Performance | Demonstrate competence conducting a start of shift tower crane inspection. |
| Conditions | Trainee will be given a project(s) and the tools and materials required to conduct a pre-start inspection and demonstrate the use of a harness and lanyard where required. |
| Criteria | Within specifications, safety standards and time frames acceptable to industry. |



LINE (GAC): I MAINTENANCE AND SERVICE

Competency: I11 Conduct tower crane load limit and range of travel tests in the workplace

Objectives

To be competent in this area, the individual must be able to:

- Conduct trolley travel and hoist height limit tests.
- Conduct load limit tests.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>1. Conduct and describe trolley travel and hoist height limit tests according to crane manufacturer's manual</p> | <ul style="list-style-type: none"> • Trolley travel tests <ul style="list-style-type: none"> ○ 'Trolley out' ○ 'Trolley in' ○ 'High speed' • Hoist height limit tests <ul style="list-style-type: none"> ○ Hoist up deceleration ○ Hoist upper limit ○ Hoist down limit ○ Slack line • Rail travel tests, if applicable <ul style="list-style-type: none"> ○ Rail travel forward ○ Rail travel reverse ○ Rail travel brakes |
| <p>2. Conduct and describe load limit tests according to crane manufacturer's manual</p> | <ul style="list-style-type: none"> • Load moment tests (hoist limit, trolley limit) • Maximum load test (line pull) • Load chart interpretation |

Achievement Criteria

- | | |
|-------------|--|
| Performance | Demonstrate competence conducting tower crane load limit and range of travel tests. |
| Conditions | Trainee will be given a project(s) and the tools and materials required to conduct trolley travel, hoist height limit and load limit tests according to the crane manufacturer's manual. |
| Criteria | Within specifications, safety standards and time frames acceptable to industry. |



LINE (GAC): M TOWER CRANE OPERATIONS

Competency: M1 Demonstrate knowledge of hoisting and rigging for tower cranes

Objectives

To be competent in this area, the individual must be able to describe the steps required to plan a lift.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>1. List and describe the steps and considerations in pre-lift planning</p> | <ul style="list-style-type: none"> • Communication with rigger • Lift assessment (load weight, dimensions) • Load chart • 4 part line and 2 part line • Gear shifting • Route • Radius • Rigging inspection before use • Factors that reduce capacity • Hazards (weather, obstacles, public safety, etc.) |
|---|---|

**LINE (GAC): M TOWER CRANE OPERATIONS****Competency: M2 Demonstrate knowledge of tower crane load charts and load calculations****Objectives**

To be competent in this area, the individual must be able to interpret load charts and calculate lift requirements.

LEARNING TASKS

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

CONTENT

- Load weight determination
- Rigging weight determination
- Net load calculation
- Gross load calculation
- Calculations for maximum radius allowed to place load
- Crane configuration determination (gear and/or parts of line)



LINE (GAC): M TOWER CRANE OPERATIONS

Competency: M3 Demonstrate knowledge of how weather conditions affect tower crane operations

Objectives

To be competent in this area, the individual must be able to describe hazards associated with various weather conditions and how they affect tower crane operation.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <p>1. Describe how wind speed affects tower crane operation</p> | <ul style="list-style-type: none"> • Anemometers, wind warnings and alarms • WorkSafeBC regulations • Manufacturer’s wind speed operating limit • Slewing brakes • Effect on crane load capacity • Effects of wind resistance on load • Turbulence over and around structures |
| <p>2. Identify and describe hazards associated with the following weather conditions</p> | <ul style="list-style-type: none"> • 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) |
| <p>3. Describe weather conditions which would require crane shutdown</p> | <ul style="list-style-type: none"> • Lightning • Snow • Cold • Wind • Heat |



LINE (GAC): M TOWER CRANE OPERATIONS

Competency: M4 Demonstrate knowledge of a tower crane operator’s duties and responsibilities

Objectives

To be competent in this area, the individual must be able to describe the role and responsibilities of a tower crane operator.

LEARNING TASKS

1. Describe the tower crane operator’s role and responsibilities in the workplace

CONTENT

- Crane operator’s manual
- Site specific procedures
- Site safety responsibilities
- DEP box
- Maintenance of crane logbook
- Maintenance of operator’s logbook
- Start of shift inspections
- Good housekeeping (loose item hazards)
- Maintenance of crane to good operating order
- Professional conduct
- Project schedule and daily lift schedule
- Safe and efficient crane operation according to standards, regulations and site policies
- No loads left suspended when operator is not at controls
- No other duties for crane operator when crane is in operation/use



LINE (GAC): M TOWER CRANE OPERATIONS

Competency: M6 Demonstrate knowledge of protocols for operating a tower crane on a multi-crane site

Objectives

To be competent in this area, the individual must be able to describe safety protocols in effect when other cranes or lift equipment are operating in the same work radius.

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <p>1. Describe safety protocols in effect on a multi-tower crane site</p> | <ul style="list-style-type: none"> • Right-of-way • Radio protocol • WorkSafeBC regulations (horizontal and vertical distances between cranes and from structures) • Transfer point • General contractor's site procedure • Procedures for leaving a crane unattended • Site schematic showing cranes' work radius and overlap • Crane identification • Load line sag/drape |
| <p>2. Describe safety protocols in effect when other cranes or lift equipment (such as concrete boom pumps, cherry pickers, mobile cranes) are in the tower crane work radius</p> | <ul style="list-style-type: none"> • Site protocols • Radio protocols • Right-of-way • Lift schedule • WorkSafeBC – distances |



LINE (GAC): M TOWER CRANE OPERATIONS

Competency: M7 Operate a tower crane safely in the workplace according to regulations and manufacturer’s specifications

Objectives

To be competent in this area, the individual must be able to:

- Perform basic tower crane operations.
- Handle a variety of loads with significantly different weights.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <p>1. Perform basic tower crane moves</p> | <ul style="list-style-type: none"> • Hoist hoisting and lowering <ul style="list-style-type: none"> ○ Smooth gear operation ○ Appropriate speed ○ Ample braking time • Trolleying <ul style="list-style-type: none"> ○ Smooth trolley operation ○ Catching swinging load • Slewing <ul style="list-style-type: none"> ○ Smooth slewing operation ○ Coasting ○ Appropriate use of foot brake ○ Use of reverse current for slowdown ○ Catching swinging load • Other operating considerations <ul style="list-style-type: none"> ○ Determination of safest route ○ Awareness of obstacles ○ Maintenance of communication ○ Crane operation adjustment for weather conditions ○ Requirements to maintain Limits of Approach • Safety warning horn |
| <p>2. Handle a variety of tower crane loads of significantly different weights</p> | <ul style="list-style-type: none"> • Light weight • Medium weight • Heavy weight |
| <p>3. Describe the crane’s capabilities and limitations by interpreting the crane load chart</p> | <ul style="list-style-type: none"> • Maximum load • Tip capacity • Load chart interpretation |



4. Describe changing gears and/or parts of line
- Advantages of each gear
 - Gear changes (gear selection and/or configuration for appropriate parts of line)
 - Changes to parts of line (if applicable) and the implications

Achievement Criteria

- Performance** Demonstrate competence operating a tower crane safely in the workplace according to regulations and manufacturer’s specifications.
- Conditions** Trainee will be given a project(s) and the tools and materials required to perform basic tower crane operations within the crane’s capabilities and limitations.
- Criteria** Within specifications, safety standards and time frames acceptable to industry.



LINE (GAC): M TOWER CRANE OPERATIONS

Competency: M8 Leave a tower crane unattended in the workplace

Objectives

To be competent in this area, the individual must be able to perform shutdown procedures and leave a tower crane unattended in accordance with the manufacturer's manual.

LEARNING TASKS

1. Leave crane unattended according to crane manufacturer's manual

CONTENT

- Trolley at minimum radius (prior to limits)
- Hook elevation to maximum height (prior to limits)
- Best practices regarding limits
 - Crane stoppage prior to limits
 - Impact of freezing temperatures on limits
- Power off
- General housekeeping
- Security (lock cab)
- No loose items outside cab
- Slewing brake release
- Tie-down implementation (if required by site)

Achievement Criteria

Performance	Demonstrate competence leaving a tower crane unattended.
Conditions	Trainee will be given a project(s) and the tools and materials required to demonstrate the procedures for shutting down and leaving a tower crane unattended for short and long periods of time.
Criteria	Within specifications, safety standards and time frames acceptable to industry.



Section 4

TRAINING PROVIDER STANDARDS



Training Provider Standards

This Program is a competency-based program of instruction. 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 competencies. Industry believes a crane operator becomes competent through building on his or her theoretical knowledge with real world experience.

This program is divided into theory and practical standards.

The theory component of the standards may be:

- taught in a classroom setting by a qualified instructor (see below)
- delivered online
- learned through self-study online or through printed materials

The practical component of the standards:

- 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 leaves it to the crane training community to deliver training to these standards in a time efficient and cost effective manner. With these competence standards, industry has a vehicle for structuring on-the-job training and wishes to see trainers take advantage of the opportunity that on-the-job training represents, including:

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.



Facility Requirements

Industry has purposely not set minimum facilities requirements for this trade in the interest of permitting training providers maximum flexibility in the options and strategies they may employ in training to these standards. The industry is interested in the outcome of training and leaves it to the crane training community to deliver training to these standards in a time efficient and cost effective manner.

Classroom Area

- N/A

Shop Area

- N/A

Lab Requirements

- N/A

Student Facilities

- N/A

Instructor Office Space

- N/A



Tools and Equipment

The crane and equipment used for training should be representative of the appropriate crane license classification.

Hand Tools

Recommended

- Adjustable wrenches (various sizes)
- Calculator
- Flashlight
- Grease gun
- Hammers (ball peen, sledge, various sizes)
- Hammer wrench
- Level
- Line-up bar, drift pin, pry bar
- Measuring tape
- Oilcan
- Pliers (needle nose, slip joint)
- Ratchet and socket set
- Screwdrivers (flat, Phillips, Robertson, various sizes)
- Sprayer
- Squeegee
- Wear gauge (wire rope and sheave)
- Wire brush
- Wire rope cutter
- Wrench sets (open and closed ends, metric and imperial)

Power Tools and Equipment

Recommended

- Handheld and stationary radios
- Headphones



Personal Protective Equipment (PPE) and Safety Equipment

Recommended

- Coveralls
- Ear plugs and muffs
- Eye wash station
- Face shields, safety glasses and goggles
- Fall arrest harness and lanyards
- Fire extinguishers
- First aid kit
- Gloves
- Hard hat
- Masks (particles, vapour)
- Safety boots
- Spill kit
- High visibility vest



Reference Materials

Recommended Resources

- IPT's Crane and Rigging Training Manual, by Ronald G. Garby
Publisher: IPT Publishing and Training Ltd. <http://www.iptbooks.com>
- IPT's Crane and Rigging Handbook, by Ronald G. Garby
Publisher: IPT Publishing and Training Ltd. <http://www.iptbooks.com>
- Hoisting and Rigging Safety Manual
Publisher: Construction Safety Association of Ontario, <http://www.csao.org>
- Tower Crane Reference Manual, <http://www.nccco.org>
- WorkSafeBC Occupational Health and Safety Regulation (OHSR)
- WorkSafeBC Occupational First Aid Requirements
- CSA Standard Z248 Safety Code for Tower Cranes
- ANSI Standard B30.3, Construction Tower Cranes
- ANSI Standard B30.4, Portal, Tower, and Pedestal Cranes

NOTE:

This list of Reference Materials is for training providers. Apprentices should contact their preferred training provider for a list of recommended or required texts for this program.



Instructor Requirements

Occupation Qualification

The instructor must possess:

- Unrestricted Proof of Competence from the BC Association for Crane Safety appropriate to the crane classification for which they provide training.

Work Experience

Instructors must have a minimum of five years experience working as a journeyperson operator for the appropriate crane type(s).