

SKILLED**TRADES**^{BC}

PROGRAM OUTLINE

Tower Crane Operator

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TOWER CRANE OPERATOR PROGRAM OUTLINE

**APPROVED BY INDUSTRY
OCTOBER 2016**

**BASED ON
NOA 2012**

AND

**CCDA HARMONIZATION
RECOMMENDATIONS 2015**

**Developed by
SkilledTradesBC
Province of British Columbia**

TABLE OF CONTENTS

Section 1 INTRODUCTION..... 3

 Foreword..... 4

 Acknowledgements..... 5

 How to Use this Document..... 6

Section 2 PROGRAM OVERVIEW 7

 Program Credentialing Model..... 8

 Occupational Analysis Chart..... 9

 Training Topics and Suggested Time Allocation - Level 112

 Training Topics and Suggested Time Allocation - Level 214

Section 3 PROGRAM CONTENT..... 15

 Level 1 Mobile Crane Operator and Tower Crane Operator16

 Level 2 Tower Crane Operator.....77

Section 4 ASSESSEMENT GUIDELINES..... 106

 Assessment Guidelines - Level 1107

Section 5 TRAINING PROVIDER STANDARDS..... 108

 Facility Requirements109

 Tools and Equipment.....110

 Reference Materials.....112

 Instructor Requirements.....113

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 SkilledTradesBC. 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

The Program Outline was prepared with the advice and direction of Industry Subject Matter Experts retained to assist in the development and review of Program Outline content:

- Ken Morland
Branch Manager, Sterling Crane
- Ryan Burton
Managing Partner, Bigfoot Crane Company
- Clinton Connell
Branch Manager, Eagle West Truck & Crane
- Chris Grajek
Director of Health & Safety, Allteck Line Contractors Inc.
- Gary Hamata
Vice President and General Manager, Vancouver Pile Driving
- Shawn Lynch
Health Safety Environmental Manager, Convoy Supply Ltd.
- Jason Gilmore
Co-owner and Manager, Phoenix Truck and Crane
- Michael Goett
Lifting and Hoisting Specialist, Shell Canada Ltd.
- Steve Gibson
Canadian Regional Crane Compliance Manager, Kiewit
- Corey Sedgwick
Group Leader Mobile Lift Group, Teck Metals
- Gordon Lindberg
Owner/trainer, GL Training Services Ltd.
- Jeff Gorham
Administrator, IUOE

SkilledTradesBC 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.

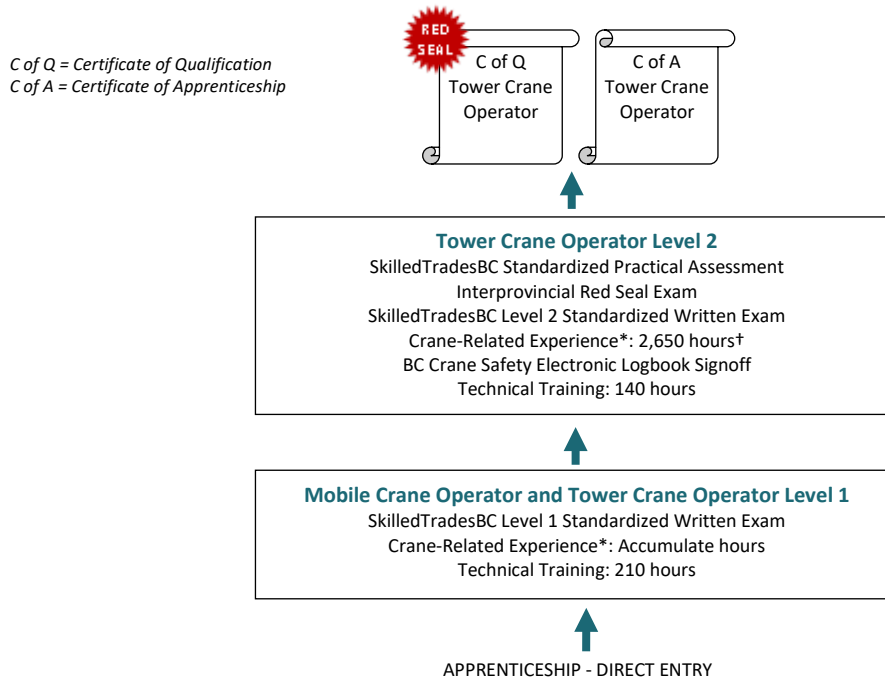
Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Program Credentialing Model	Communicate program length and structure, and all pathways to completion	Understand the length and structure of the program	Understand the length and structure of the program, and pathway to completion	Understand challenger pathway to Certificate of Qualification
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

Program Credentialing Model

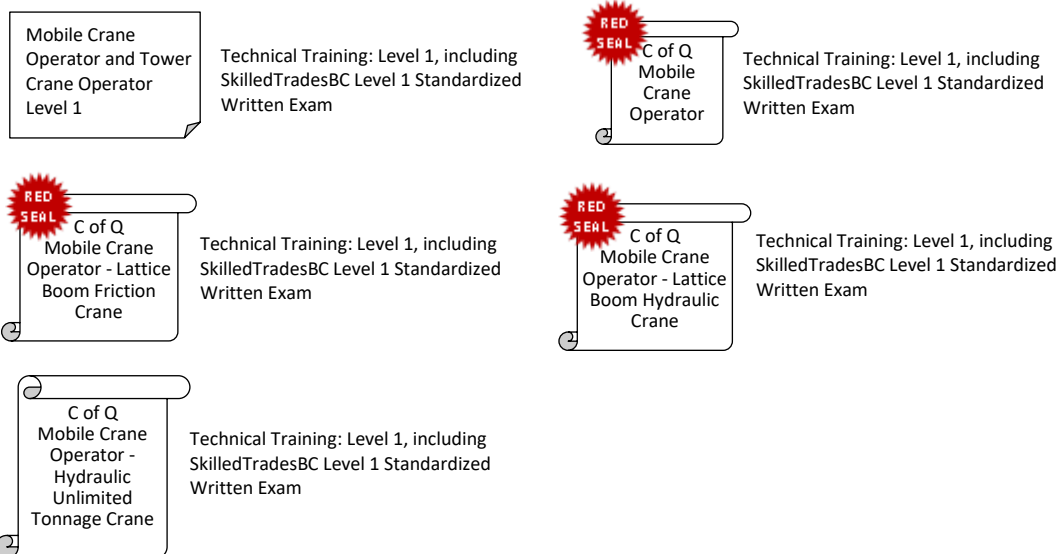


*Crane-related experience as entered in the operator's BC Crane Safety electronic logbook
 † The 2,650 hours include:

- A minimum of 500 hours of documented rigging time
- A minimum of 500 hours operating tower crane equipment with a minimum mast height of 90 ft.

CROSS-PROGRAM CREDITS

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



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	Comply with regulations, policies, and manufacturers' manuals A1	Maintain a safe working environment A2	Follow emergency procedures A3	Be aware of power line hazards A4	Practice effective worksite communications A5	
	1	1	1	1	1	
TYPES AND TERMINOLOGY B	Define types of cranes B1	Define crane classifications B2	Use crane terminology B3			
	1	1	1			
SYSTEMS AND COMPONENTS C	Describe the components and functions of carrier systems, outrigger systems, and turntable assemblies C1	Describe the components and functions of power plants and drive systems C2	Describe the components and functions of pneumatic systems, hydraulic systems, and electrical systems C3	Describe the components and functions of steering systems and braking systems C4	Describe the components and functions of hoisting systems and attachments C5	Describe the functions of safety components, devices, and aids C6
	1	1	1	1	1	1
WIRE ROPE AND RIGGING D	Specify types of wire rope and their uses D1	Follow wire rope installation procedures D2	Inspect wire rope, slings, and rigging hardware D3	Specify types of slings, rigging hardware, and their uses D4	Use rigging techniques D5	Maintain and store wire rope, slings, and rigging hardware D6
	1	1	1	1	1	1
LIFT PLANNING E	Follow site assessment procedures E1	Determine load weights E2	Determine crane lifting capacity E3	Determine rigging requirements E4		
	1	1	1	1		

Program Overview

CRANE APPLICATIONS F	Interpret operator manuals F1 1	Perform a pre-operational inspection F2 1	Perform a pre-operational setup F3 1	Demonstrate hoisting techniques F4 1	Operate a 20-80 tonne telescoping boom crane F5 1	Operate a tower crane F6 1
	Leave a crane unattended F7 1					
TRANSPORTING A CRANE G	Define Commercial Transport Regulations G1 1	Prepare a crane for travel G2 1	Prepare a crane for transport G3 1	Assemble and disassemble a crane G4 1		
CRANE MAINTENANCE H	Use tools for basic crane maintenance H1 1	Perform basic crane maintenance H2 1				
LIFT PLANNING - HAMMERHEAD TOWER CRANE I	Conduct a site assessment for a hammerhead tower crane I1 2	Use a crane capacity chart for a hammerhead tower crane I2 2				
HAMMERHEAD TOWER CRANE OPERATIONS J	Interpret operating manuals for a hammerhead tower crane J1 2	Perform a pre-operational inspection for a hammerhead tower crane J2 2	Perform a pre-operational setup for a hammerhead tower crane J3 2	Perform hoisting techniques for a hammerhead tower crane J4 2	Operate a hammerhead tower crane J5 2	Leave a hammerhead tower crane unattended J6 2

LIFT PLANNING - LUFFING JIB TOWER CRANE K	Conduct a site assessment for a luffing jib tower crane K1	Use a crane capacity chart for a luffing jib tower crane K2							
	2					2			
LUFFING JIB TOWER CRANE OPERATIONS L	Interpret operating manuals for a luffing jib tower crane L1	Perform a pre-operational inspection for a luffing jib tower crane L2	Perform a pre-operational setup for a luffing jib tower crane L3	Perform hoisting techniques for a luffing jib tower crane L4	Operate a luffing jib tower crane L5	Leave a luffing jib tower crane unattended L6			
	2				2				2
SPECIALIZED OPERATIONS M	Operate a suspended work platform M1	Perform engineered lifts M2	Perform multiple crane lifts M3						
	2								
CLIMBING CRANES N	Follow assembly and raising procedures for a bottom climbing tower crane N1	Follow assembly and raising procedures for a top climbing tower crane N2							
	2								

Training Topics and Suggested Time Allocation – Level 1

MOBILE CRANE OPERATOR AND TOWER CRANE OPERATOR – LEVEL 1

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
Line A	SAFETY	7%	70%	30%	100%
A1	Comply with regulations, policies, and manufacturers' manuals		✓	✓	
A2	Maintain a safe working environment		✓	✓	
A3	Follow emergency procedures		✓	✓	
A4	Be aware of power line hazards		✓	✓	
A5	Practice effective worksite communications		✓	✓	
Line B	TYPES AND TERMINOLOGY	2%	50%	50%	100%
B1	Define types of cranes		✓	✓	
B2	Define crane classifications		✓	✓	
B3	Use crane terminology		✓	✓	
Line C	SYSTEMS AND COMPONENTS	12%	60%	40%	100%
C1	Describe the components and functions of carrier systems, outrigger systems, and turntable assemblies		✓	✓	
C2	Describe the components and functions of power plants and drive systems		✓	✓	
C3	Describe the components and functions of pneumatic systems, hydraulic systems, and electrical systems		✓	✓	
C4	Describe the components and functions of steering systems and braking systems		✓	✓	
C5	Describe the components and functions of hoisting systems and attachments		✓	✓	
C6	Describe the functions of safety components, devices, and aids		✓	✓	
Line D	WIRE ROPE AND RIGGING	10%	50%	50%	100%
D1	Specify types of wire rope and their uses		✓	✓	
D2	Follow wire rope installation procedures		✓	✓	
D3	Inspect wire rope, slings, and rigging hardware		✓	✓	
D4	Specify types of slings, rigging hardware, and their uses		✓	✓	
D5	Use rigging techniques		✓	✓	
D6	Maintain and store wire rope, slings, and rigging hardware		✓	✓	
Line E	LIFT PLANNING	22%	70%	30%	100%
E1	Follow site assessment procedures		✓	✓	
E2	Determine load weights		✓	✓	
E3	Determine crane lifting capacity		✓	✓	
E4	Determine rigging requirements		✓	✓	
Line F	CRANE APPLICATIONS	35%	20%	80%	100%
F1	Interpret operator manuals		✓	✓	

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
F2	Perform a pre-operational inspection		✓	✓	
F3	Perform a pre-operational setup		✓	✓	
F4	Demonstrate hoisting techniques		✓	✓	
F5	Operate a 20-80 tonne telescoping boom crane		✓	✓	
F6	Operate a tower crane		✓	✓	
F7	Leave a crane unattended		✓	✓	
Line G	TRANSPORTING A CRANE	7%	30%	70%	100%
G1	Define Commercial Transport Regulations		✓	✓	
G2	Prepare a crane for travel		✓	✓	
G3	Prepare a crane for transport		✓	✓	
G4	Assemble and disassemble a crane		✓	✓	
Line H	CRANE MAINTENANCE	5%	30%	70%	100%
H1	Use tools for basic crane maintenance		✓	✓	
H2	Perform basic crane maintenance		✓	✓	
Total Percentage for Mobile Crane Operator and Tower Crane Operator Level 1		100%			

Training Topics and Suggested Time Allocation – Level 2

TOWER CRANE OPERATOR – LEVEL 2

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
Line I	LIFT PLANNING – HAMMERHEAD TOWER CRANE	12%	30%	70%	100%
I1	Conduct a site assessment for a hammerhead tower crane		✓	✓	
I2	Use a crane capacity chart for a hammerhead tower crane		✓	✓	
Line J	HAMMERHEAD TOWER CRANE OPERATIONS	28%	20%	80%	100%
J1	Interpret operating manuals for a hammerhead tower crane		✓	✓	
J2	Perform a pre-operational inspection for a hammerhead tower crane		✓	✓	
J3	Perform a pre-operational setup for a hammerhead tower crane		✓	✓	
J4	Perform hoisting techniques for a hammerhead tower crane		✓	✓	
J5	Operate a hammerhead tower crane		✓	✓	
J6	Leave a hammerhead tower crane unattended		✓	✓	
Line K	LIFT PLANNING – LUFFING JIB TOWER CRANE	12%	30%	70%	100%
K1	Conduct a site assessment for a luffing jib tower crane		✓	✓	
K2	Use a crane capacity chart for a luffing jib tower crane		✓	✓	
Line L	LUFFING JIB TOWER CRANE OPERATIONS	28%	20%	80%	100%
L1	Interpret operating manuals for a luffing jib tower crane		✓	✓	
L2	Perform a pre-operational inspection for a luffing jib tower crane		✓	✓	
L3	Perform a pre-operational setup for a luffing jib tower crane		✓	✓	
L4	Perform hoisting techniques for a luffing jib tower crane		✓	✓	
L5	Operate a luffing jib tower crane		✓	✓	
L6	Leave a luffing jib tower crane unattended		✓	✓	
Line M	SPECIALIZED OPERATIONS	15%	30%	70%	100%
M1	Operate a suspended work platform		✓	✓	
M2	Perform engineered lifts		✓	✓	
M3	Perform multiple crane lifts		✓	✓	
Line N	CLIMBING CRANES	5%	100%	0%	100%
N1	Follow assembly and raising procedures for a bottom climbing tower crane		✓	✓	
N2	Follow assembly and raising procedures for a top climbing tower crane		✓	✓	
Total Percentage for Tower Crane Operator Level 2		100%			

Section 3
PROGRAM CONTENT
Tower Crane Operator

Level 1

Mobile Crane Operator and Tower Crane Operator

Line (GAC): **A SAFETY**
Competency: **A1 Comply with regulations, policies, and manufacturers' manuals**

Objectives

To be competent in this area, the individual must be able to locate information related to crane operations from government regulations, manufacturers' manuals and training provider references and policies.

LEARNING TASKS

1. Describe the format and general content of books, manuals and sources of information related to crane operations

2. Locate specific items of information in documents related to crane operations

CONTENT

- WorkSafeBC regulations
- Canadian Standards Association (CSA) Z150 and Z248
- Commercial Transport Regulations
- IHSA Hoisting and Rigging Safety Manual
- Manufacturers' manuals including user and maintenance manuals
- Training provider training references and policies
- ASME standards
- Safe operating practices
- Safety devices
- Crane load charts
- Crane setup instructions

Achievement Criteria

Performance The individual will be able to locate and understand information in various sources of information related to crane operation.

Conditions To be assessed during technical training.

Criteria The individual is able to demonstrate that he/she can locate specific information in various documents.

Line (GAC): **A SAFETY**
Competency: **A2 Maintain a safe working environment**

Objectives

To be competent in this area, the individual must be able to work safely at the work site in accordance with Occupational Health and Safety Regulations and the training provider policy.

LEARNING TASKS

1. Describe unsafe workplace conditions, including hazards and obstructions

2. State the procedures for notifying local utilities when operating near utility lines or potential hazards

3. Describe when barriers are required

4. Explain the procedure for reporting incidents

5. Describe operating procedures during different environmental conditions

CONTENT

- Energy source hazards
 - Hydraulic
 - Electrical
 - Pneumatic
- Overhead hazards
 - Power lines
 - Cranes/other equipment
 - Obstructions
- Mobile machinery hazards
 - Trucks
 - Cranes
 - Mobile equipment
- Rotating equipment hazards
 - Belts
 - Pulleys
 - Sheaves
 - Sprockets
 - Chains
 - Pinch points
 - Barriers
- WorkSafeBC regulations

- Swing hazards
- Shear hazards
- Traffic
- Pedestrians

- Report form completion
- Report form processing
- Report within allotted time

- Load Moment Indicator (LMI)
- Operator aids
- Slow operation

LEARNING TASKS

6. State the operator’s responsibilities in maintaining a safe work environment

7. Wear, maintain, and remove from service personal protective clothing and equipment as appropriate

8. Use the 3-point contact method when mounting and dismounting cranes and other heavy equipment

9. Complete a report to record an incident

CONTENT

- Qualified operator
- Full control of equipment controls
- Hoist within limits
- Safe handling of loads
- Secure loads

- Hard hat
- Boots
- Eyewear
- Hearing protection

- Manufacturer specific access systems
- Handholds and step ladders
- Security of components
- Safe access to equipment

- Reporting procedures
- Report within allotted time
- OHS requirements
- Employer requirements

Achievement Criteria

- | | |
|-------------|--|
| Performance | The individual will be able to: <ul style="list-style-type: none"> • Work safely around hazards and in various environmental conditions • Record and report incidents • Wear proper Personal Protective Equipment (PPE) |
| Conditions | To be assessed during technical training. |
| Criteria | The individual is able to demonstrate that he/she can follow safe work procedures in accordance with WorkSafeBC regulations and training provider policy. |

Line (GAC): **A SAFETY**
Competency: **A3 Follow emergency procedures**

Objectives

To be competent in this area, the individual must be able to follow emergency procedures in accordance with Occupational Health and Safety Regulations and the training provider policy.

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <p>1. Describe recommended fire safety procedures</p>
<p>2. Describe various types of firefighting equipment normally found on a worksite</p>
<p>3. State the requirements for fall protection training on the worksite</p>
<p>4. State the procedure for an emergency rescue from a crane (e.g., tower crane operator station, crane incident, fire)</p> | <ul style="list-style-type: none"> • Fire extinguishers <ul style="list-style-type: none"> ○ Types and capacities ○ Servicing ○ Use
 • Fighting electrical fires <ul style="list-style-type: none"> ○ Power isolation ○ Appropriate firefighting equipment
 • Fire emergency response and evacuation procedures in accordance with industry practice
 • Fire extinguishers <ul style="list-style-type: none"> ○ Types and capacities ○ Servicing ○ Use
 • WorkSafeBC regulations • Company policy
 • High angle rescue procedure • Call 911 |
|--|---|

Achievement Criteria

<p>Performance</p> <p>Conditions</p> <p>Criteria</p>	<p>The individual will be able to:</p> <ul style="list-style-type: none"> • Describe fire safety equipment and procedures • Describe the requirements for fall protection • Describe emergency rescue procedures <p>To be assessed during technical training.</p> <p>The individual is able to demonstrate that he/she can follow emergency procedures and requirements in accordance with WorkSafeBC regulations and training provider policy.</p>
--	--

Line (GAC): **A SAFETY**
Competency: **A4 Be aware of power line hazards**

Objectives

To be competent in this area, the individual must be able to operate a crane around simulated high voltage equipment in accordance with Occupational Health and Safety Regulations, utility regulations, and other government legislation and the training provider policy.

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. State the procedures for operating in proximity of electrical sources
 2. State safe limits of approach to electrical sources
 3. Describe the procedures recommended in the event of contact with high voltage
 4. State the procedure for reporting contact with high voltage
 5. Interpret signage related to high voltage | <ul style="list-style-type: none"> • Limits of approach • Required documentation • Assurance in writing • Tag lines
 • WorkSafeBC regulations
 • Safe exit (if possible) • Remain at a safe distance • Contact proper authorities
 • WorkSafeBC regulations • Call owner of the power system
 • Limits of approach signage • Line voltage |
|--|---|

Achievement Criteria

Performance	The individual will be able to work safely around power line hazards and describe procedures in the event of contact with high voltage.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can follow procedures for working around power lines in accordance with WorkSafeBC regulations, utility regulations, and training provider policy.

Line (GAC): **A SAFETY**
Competency: **A5 Practice effective worksite communications**

Objectives

To be competent in this area, the individual must be able to communicate with the work site supervisor, colleagues and trade personnel using recommended signals or other communication devices in accordance with Occupational Health and Safety Regulations and the training provider policy.

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Explain the requirements for a signaller
 2. Describe personnel involved in crane operations
 3. Demonstrate and interpret standard hand signals used during crane operations
 4. Demonstrate the use of two-way electronic voice communication devices
 5. Demonstrate effective oral communications
 6. Demonstrate effective written communications
 7. Interpret worksite audio signals | <ul style="list-style-type: none"> • Accurate descriptions • Identification and interpretation • Signal relaying for a blind lift
 • Site supervisor • Crane operator • Rigger • Signal person • CSO – construction safety officer
 • WorkSafeBC regulations
 • Basic functions of the radio communication devices • Language and terminology <ul style="list-style-type: none"> ○ Short form words and phrases ○ Use of 12 o'clock (clock face positioning reference) to aid in direction giving and interpreting • Requirement to stop operation due to lost contact or interference
 • Tact • Diplomacy • Assertiveness
 • Report writing • Recording • Communication plan
 • Horn signals |
|--|---|

Achievement Criteria

Performance	The individual will be able to demonstrate proper oral, written, and hand signals.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can communicate effectively using all forms of workplace communication.

Line (GAC): **B TYPES AND TERMINOLOGY**
Competency: **B1 Define types of cranes**

Objectives

To be competent in this area, the individual must be able to identify common crane types.

LEARNING TASKS

1. Identify various types of cranes

CONTENT

- Boom trucks
- Mobile cranes
- Tower cranes
- Self-erect cranes

Achievement Criteria

Performance The individual will be able to identify types of cranes.
Conditions To be assessed during technical training.
Criteria The individual is able to demonstrate that he/she can identify various types of cranes.

Line (GAC): **B** **TYPES AND TERMINOLOGY**
Competency: **B2** **Define crane classifications**

Objectives

To be competent in this area, the individual must be able to categorize cranes using a variety of classifications.

LEARNING TASKS

1. Categorize various types of cranes

CONTENT

- Carrier types (e.g., crawler, rubber, tower, self-erect)
- Hoist mechanisms (e.g., hydraulic, friction, electrical)
- Boom types (e.g., lattice, hydraulic, folding/knuckle, luffing)
- Heavy lift cranes (e.g., super lift, ringer)

Achievement Criteria

Performance The individual will be able to categorize various types of cranes.

Conditions To be assessed during technical training.

Criteria The individual is able to demonstrate that he/she can categorize various types of cranes.

Line (GAC): **B** **TYPES AND TERMINOLOGY**
Competency: **B3** **Use crane terminology**

Objectives

To be competent in this area, the individual must be able to interpret crane terminology commonly used in the working environment.

LEARNING TASKS

1. Define terms related to craning

CONTENT

- Wire rope
- Fittings
- Drums
- Hooks
- Sheaves
- Winch
- Slew
- Hoist
- Luffing
- Capacity
- Gross Load
- Net load
- Boom length
- Boom angle
- Jibs
- Pick and carry

Achievement Criteria

Performance The individual will be able to use crane terminology.
Conditions To be assessed during technical training.
Criteria The individual is able to demonstrate that he/she can use proper crane terminology.

Line (GAC):	C	SYSTEMS AND COMPONENTS
Competency:	C1	Describe the components and functions of carrier systems, outrigger systems, and turntable assemblies

Objectives

To be competent in this area, the individual must be able to describe the carrier, outrigger, and turntable components on a variety of crane types.

LEARNING TASKS

CONTENT

1. List carrier/undercarriage components	<ul style="list-style-type: none"> • Suspension systems • Carbody • Wheels • Tires • Tracks
2. State the function of carrier/undercarriage components	<ul style="list-style-type: none"> • Propel equipment • Base for upperworks
3. Identify carrier/undercarriage components	<ul style="list-style-type: none"> • Suspension systems • Car body • Wheels • Tires • Tracks
4. Recognize defects or malfunctions of the carrier/undercarriage	<ul style="list-style-type: none"> • Cracked frame • Cracked welds • Broken drive line shafts • Damaged wheels • Damaged differentials • Loose/broken fasteners, bolts, washers • Worn components
5. List the outrigger and stabilizing equipment	<ul style="list-style-type: none"> • Outrigger beams • Outrigger jacks • Outrigger pads • Retaining pins for outrigger pads • Hydraulic hoses • Holding valves • Correct outrigger beam extension and marking(s) • Maintenance
6. State the function of outriggers and stabilizing equipment	<ul style="list-style-type: none"> • Increase lifting capacity • Provide a stable base • Levelling

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <p>7. Identify outrigger and stabilizing equipment</p> | <ul style="list-style-type: none"> • Outrigger beams • Outrigger jacks • Outrigger pads • Retaining pins for outrigger pads • Hydraulic hoses • Holding valves • Correct outrigger beam extension and marking(s) |
| <p>8. Recognize defects or malfunctions of outrigger and stabilizing equipment</p> | <ul style="list-style-type: none"> • Cracked welds • Bent beams • Damaged hoses • Damaged cylinders • Hydraulic oil leaks |
| <p>9. List the components of a turntable and/or turret</p> | <ul style="list-style-type: none"> • Swing circle • Bearings • Hook rollers • Bolts • Gears • Swing gear |
| <p>10. State the function of turntable and/or turret components</p> | <ul style="list-style-type: none"> • Base for mounting boom • Method of attaching upperworks to carrier • Enables upperworks to rotate |
| <p>11. Identify the components of the turntable and/or turret</p> | <ul style="list-style-type: none"> • Swing circle • Bearings • Hook rollers • Bolts • Gears • Swing gear |
| <p>12. Recognize defects or malfunctions of the turntable and/or turret components</p> | <ul style="list-style-type: none"> • Loose, cracked, missing bolts and/or incorrect bolts • Structural cracks • Gear wear • Bearing wear • Deformation and distortions • Worn components |

Achievement Criteria

Performance	The individual will be able to describe the components, functions, defects, and malfunctions of carrier systems, outrigger systems, and turntable assemblies.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she understands the components, functions, defects, and malfunctions of carrier systems, outrigger systems, and turntable assemblies.

Line (GAC): C **SYSTEMS AND COMPONENTS**
Competency: C2 **Describe the components and functions of power plants and drive systems**

Objectives

To be competent in this area, the individual must be able to describe the power plants and drive systems on a variety of crane types.

LEARNING TASKS	CONTENT
1. List the components of an electrical, diesel, and gas power plant system	<ul style="list-style-type: none"> • Block • Pistons • Connecting rods • Camshafts • Rotors • Stators
2. State the function of the power plant components	<ul style="list-style-type: none"> • Convert combustion energy to electrical power • Provide power to propel the crane • Provide power to operate the crane
3. Identify the components of the power plant systems	<ul style="list-style-type: none"> • Block • Pistons • Connecting rods • Camshafts • Rotors • Stators
4. Recognize defects or malfunctions of the power plant system	<ul style="list-style-type: none"> • Loose, cracked, missing bolts and/or incorrect bolts • Structural cracks • Worn components • Oil leaks • Low operating oil pressure
5. List the components of the drive system	<ul style="list-style-type: none"> • Clutch • Transmission • Differentials • Power take-offs • Hydraulic motors • Drive lines
6. State the function of the drive system components	<ul style="list-style-type: none"> • Supply and/or transfer of power to drive systems
7. Identify the components of the drive system	<ul style="list-style-type: none"> • Clutch

LEARNING TASKS

8. Recognize defects or malfunctions of the drive system

CONTENT

- Transmission
- Differentials
- Power take-offs
- Hydraulic motors
- Drive lines
- Loose, cracked, missing bolts and/or incorrect bolts
- Structural cracks
- Worn components
- Oil leaks
- Low operating oil pressure

Achievement Criteria

- Performance** The individual will be able to describe the components, functions, defects, and malfunctions of power plants and drive systems.
- Conditions** To be assessed during technical training.
- Criteria** The individual is able to demonstrate that he/she understands the components, functions, defects, and malfunctions of power plants and drive systems.

Line (GAC):	C	SYSTEMS AND COMPONENTS
Competency:	C3	Describe the components and functions of pneumatic systems, hydraulic systems, and electrical systems

Objectives

To be competent in this area, the individual must be able to describe pneumatic systems, hydraulic systems, and electrical systems used in crane operations.

LEARNING TASKS

CONTENT

1. List the components of the pneumatic system	<ul style="list-style-type: none"> • Brakes • Compressor • Governor • Horn • Seats • Boom pawl • Boom cut-out • Control levers
2. State the function of the pneumatic components	<ul style="list-style-type: none"> • Provide power to air systems • Provide a method of controlling air systems
3. Identify the components of the pneumatic system	<ul style="list-style-type: none"> • Brakes • Compressor • Governor • Horn • Seats • Boom pawls • Boom cut-out • Control levers
4. Recognize defects or malfunctions of the pneumatic system	<ul style="list-style-type: none"> • Loose, cracked, missing bolts • Structural cracks • Leakage • Low operating air pressure • Moisture in air system • Oil in air system
5. List the components of the hydraulic systems	<ul style="list-style-type: none"> • Hydraulic fluid • Filters • Lines • Pumps • Motors • Fittings

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <p>6. State the function of the hydraulic system components</p> <p>7. Identify the components of the hydraulic systems</p> <p>8. Recognize defects and malfunctions of the hydraulic system</p> <p>9. List the components of electrical systems</p> <p>10. State the function of the electrical system components</p> <p>11. Identify the components of the electrical system</p> | <ul style="list-style-type: none"> • Control levers • Convert mechanical force to hydraulic power • Convert fluid energy to mechanical force • Convert fluid power into linear motion • Hydraulic fluid • Fluid reservoir • Filters • Lines • Pumps • Motors • Fittings • Control levers • Loose, cracked, missing bolts • Structural cracks • Worn components • Oil leaks • Low operating oil pressure • High operating temperature • Damaged hoses • Controls sticking • Alternator • Starter • Regulator • Wiring • Fuses • Electric motor • Switches • Limit switches • Batteries • Provide power to electrical systems • Provide method of controlling electrical systems • Alternator • Starter • Regulator • Wiring • Fuses • Electric motor |
|---|--|

LEARNING TASKS

12. Recognize defects or malfunctions of the electrical system

CONTENT

- Switches
- Limit switches
- Batteries
- Electrical shorts
- Damaged fuses
- Bare wires
- Belt tension
- Battery electrolyte level

Achievement Criteria

Performance	The individual will be able to describe the components, functions, defects, and malfunctions of pneumatic systems, hydraulic systems, and electrical systems.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she understands the components, functions, defects, and malfunctions of pneumatic systems, hydraulic systems, and electrical systems.

Line (GAC):	C	SYSTEMS AND COMPONENTS
Competency:	C4	Describe the components and functions of steering systems and braking systems

Objectives

To be competent in this area, the individual must be able to describe steering systems and braking systems used on a variety of crane types.

LEARNING TASKS

CONTENT

1. List the components of a steering system	<ul style="list-style-type: none"> • Axles • Tie rods • Steering box • Sliding jaw clutch • Ball joints • Steering pump • Motors • Hoses • Operating controls
2. State the function of the steering system components	<ul style="list-style-type: none"> • Manufacturers' manuals • Provide power to steering system • Provide method of controlling steering system
3. Identify the components of the steering system	<ul style="list-style-type: none"> • Axles • Tie rods • Steering box • Sliding jaw clutch • Ball joints • Steering pump • Motors • Hoses • Operating controls
4. Recognize defects or malfunctions of the steering system components	<ul style="list-style-type: none"> • Loose, cracked, missing bolts • Structural cracks • Worn components • Oil leaks • Low operating pressure • Adjustment • Alignment • Lack of lubrication
5. List the components of the braking system	<ul style="list-style-type: none"> • Air compressor

LEARNING TASKS

CONTENT

- 6. State the function of the braking system components
- 7. Identify the components of the braking system
- 8. Recognize defects or malfunctions of the braking systems

- Governor
- Brake chambers
- Drums
- Brake bands
- Brake shoes and pads
- Slack adjusters
- Parking brakes
- Provide power to braking system
- Provide method of controlling braking system
- Air compressor
- Governor
- Brake chambers
- Drums
- Brake bands
- Brake shoes and pads
- Slack adjusters
- Parking brakes
- Brake adjustment
- Loose, cracked, missing bolts and/or incorrect bolts
- Structural cracks
- Low operating pressure
- Worn components
- Air leaks
- Moisture in air system
- Out of adjustment

Achievement Criteria

- Performance** The individual will be able to describe the components, functions, defects, and malfunctions of steering systems and braking systems.
- Conditions** To be assessed during technical training.
- Criteria** The individual is able to demonstrate that he/she understands the components, functions, defects, and malfunctions of steering systems and braking systems.

Line (GAC):	C	SYSTEMS AND COMPONENTS
Competency:	C5	Describe the components and functions of hoisting systems and attachments

Objectives

To be competent in this area, the individual must be able to describe hoisting systems and attachments used on a variety of crane types.

LEARNING TASKS

CONTENT

1. List the components of the hoisting system	<ul style="list-style-type: none"> • Drums • Hook block/ball • Sheaves • Winch • Brakes and clutches • Trolley • Rollers • Hoist line
2. State the function of the hoisting system components	<ul style="list-style-type: none"> • Provide power to hoisting system • Provide method of controlling hoisting system
3. Identify the components of the hoisting system	<ul style="list-style-type: none"> • Drums • Hook block/ball • Sheaves • Winch • Brakes and clutches • Trolley • Rollers • Hoist line
4. Recognize defects or malfunctions of the components of a hoisting system	<ul style="list-style-type: none"> • Loose, cracked, missing bolts and/or incorrect bolts • Structural cracks • Worn components • Security of components • Oil leaks • Low operating pressure
5. List a variety of attachments	<ul style="list-style-type: none"> • Boom extensions • Boom stabilizers • Jibs • Suspended work platforms • Heavy lift attachments

LEARNING TASKS

CONTENT

6. State the function of each attachment
7. Identify the attachments

8. Recognize defects or malfunctions of an attachment

- Dragline
- Clamshell
- Drilling unit
- Pile driving unit (drop hammer, diesel hammer)
- Extraction unit

- Manufacturers' manuals
- Boom extensions
- Boom stabilizers
- Jibs
- Suspended work platforms
- Heavy lift attachments
- Dragline
- Clamshell
- Drilling unit
- Pile driving unit (drop hammer, diesel hammer)
- Extraction unit

- Loose, cracked, missing bolts
- Structural cracks
- Worn components
- Oil leaks
- Damaged components
- Damaged cable

Achievement Criteria

- | | |
|-------------|---|
| Performance | The individual will be able to describe the components, functions, defects, and malfunctions of hoisting systems and attachments. |
| Conditions | To be assessed during technical training. |
| Criteria | The individual is able to demonstrate that he/she understands the components, functions, defects, and malfunctions of hoisting systems and attachments. |

Line (GAC): C **SYSTEMS AND COMPONENTS**
Competency: C6 **Describe the functions of safety components, devices, and aids**

Objectives

To be competent in this area, the individual must be able to describe various safety components, devices, and aids for a variety of crane types.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. List the safety components, devices, and aids for a variety of crane types
 2. State the function of safety components, devices, and aids for the crane
 3. State the action to be taken when safety devices are not functioning
 4. Identify the safety components, devices, and aids for the crane
 5. Identify on-board crane operator aids and ensure that they are applicable, legible, and current for the crane | <ul style="list-style-type: none"> • Safety guards • Covers • Load weighing devices <ul style="list-style-type: none"> ○ Load Moment Indicator (LMI) ○ Load indicator ○ Rated capacity indicator ○ Rated capacity (load) limiter • Anti-two block devices • Boom length indicator • Boom angle indicator • Boom hoist limiter • Drum rotation indicator • Manufacturers' manuals • Prevent overloading of crane components • Company policy • Manufacturers' recommendations • WorkSafeBC regulations • Safety guards • Covers • Load weighing devices <ul style="list-style-type: none"> ○ Load Moment Indicator (LMI) ○ Load indicator ○ Rated capacity indicator ○ Rated capacity (load) limiter • Anti-two block devices • Boom length indicator • Boom angle indicator • Boom hoist limiter • Drum rotation indicator • Load charts • Operator's manual • Log book |
|---|---|

LEARNING TASKS

6. Program the Load Moment Indicator (LMI) using appropriate crane configuration and lift data

7. Recognize defects or malfunctions of safety devices, components, and aids for the crane

CONTENT

- Counterweight configuration
- Outrigger configuration
- Boom length
- Parts of line
- Attachments

- Mounting configuration
- Structural cracks
- Damaged components
- Electrical malfunction
- Damaged wiring

Achievement Criteria

Performance	The individual will be able to describe the types, functions, defects, and malfunctions of safety components, devices, and aids.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she understands the types, functions, defects, and malfunctions of safety components, devices, and aids.

Line (GAC): **D WIRE ROPE AND RIGGING**
Competency: **D1 Specify types of wire rope and their uses**

Objectives

To be competent in this area, the individual must be able to describe various types of wire rope used in crane operations.

LEARNING TASKS

1. List various types of wire rope

2. State the characteristics of each type of wire rope

3. State the uses of each type of wire rope

4. Identify various types of wire rope

CONTENT

- Conventional construction wire rope
- Anti-rotational wire rope
- Types of cable construction
- Slings
- Duty cycle wire rope
- Hoist line
- Trolley line

- Working load limit (WLL) of wire rope
- Design factors

- Slings
- Duty cycle wire rope
- Boom hoist line
- Load hoist line

- Conventional construction wire rope
- Anti-rotational wire rope
- Types of cable construction
- Slings
- Duty cycle wire rope
- Hoist line
- Trolley line

Achievement Criteria

Performance The individual will be able to describe the types, characteristics, and uses of wire rope.
Conditions To be assessed during technical training.
Criteria The individual is able to demonstrate that he/she understands the various types of wire ropes and their uses.

Line (GAC): D **WIRE ROPE AND RIGGING**
Competency: D2 **Follow wire rope installation procedures**

Objectives

To be competent in this area, the individual must be able to ensure that the wire rope is installed in accordance with manufacturers' recommendations.

LEARNING TASKS

1. Describe procedures for installing wire rope on a hoist drum
2. Describe reeving multi-part crane blocks
3. Identify hoisting system components
4. Interpret manufacturers' certificate of origin

CONTENT

- Winding direction (over/under)
- Method of drum termination
- Proper spooling on drum
- Wire rope system components
 - Rope guides
 - Drums
 - Blocks
 - Hooks
 - Sheaves
- Wedge and socket termination
- Install wedge sockets
- Reeving blocks
- Rope guides
- Drums
- Blocks
- Hooks
- Sheaves
- Wedge and socket termination
- Manufacturer's literature

Achievement Criteria

Performance The individual will be able to identify hoisting system components and install wire rope.
Conditions To be assessed during technical training.
Criteria The individual is able to demonstrate that he/she can install wire rope in accordance with manufacturers' recommendations.

Line (GAC): D **WIRE ROPE AND RIGGING**
Competency: D3 **Inspect wire rope, slings, and rigging hardware**

Objectives

To be competent in this area, the individual must be able to inspect wire rope, slings, and rigging hardware in accordance with manufacturers' recommendations and WorkSafeBC regulations.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Describe the inspection procedure for wire ropes
 2. State the criteria to remove damaged or defective wire rope from service
 3. State the process to remove damaged or defective wire rope from service
 4. Examine wire rope for defects
 5. Examine drum for proper installation of the wire rope
 6. Record inspection and defects in log book
 7. Report defects and deficiencies to appropriate personnel | <ul style="list-style-type: none"> • WorkSafeBC regulations • Manufacturers' specifications • ASME standards
 • Lubrication • Excessive wear • Bird caging • Kinking • Flattening • Proper spooling • Broken wires • Distortion
 • Company policy • Manufacturer policy
 • Lubrication • Excessive wear • Bird caging • Kinking • Flattening • Proper spooling • Broken wires • Distortion
 • Winding direction (over/under) • Proper spooling on drum • Drum termination • Tension required
 • Inspection recording • Documentation of defects
 • Requirements for reporting defects • Company policy • WorkSafeBC regulations |
|---|---|

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <p>8. Describe the inspection procedure for slings and rigging hardware</p> | <ul style="list-style-type: none"> • Manufacturers' specifications • WorkSafeBC regulations • Manufacturers' specifications |
| <p>9. State the criteria for removing slings and rigging hardware from service</p> | <ul style="list-style-type: none"> • Lubrication • Excessive wear • Bird caging • Kinking • Flattening • Broken wires • Distortion • Missing components • Illegible capacity information |
| <p>10. State the procedure for replacing various types of safety clips</p> | <ul style="list-style-type: none"> • Manufacturer policy |
| <p>11. State the process for removing slings and rigging hardware from service</p> | <ul style="list-style-type: none"> • Company policy • Manufacturer policy |
| <p>12. State when repair to slings and rigging hardware is acceptable</p> | <ul style="list-style-type: none"> • Manufacturer policy • WorkSafeBC regulations |
| <p>13. Examine slings and rigging hardware for defects</p> | <ul style="list-style-type: none"> • Damage • Cracks • Safety clips • Lubrication • Excessive wear • Bird caging • Kinking • Flattening • Broken wires • Distortion • Missing components • Illegible capacity information |
| <p>14. Report defects and deficiencies to appropriate personnel</p> | <ul style="list-style-type: none"> • Requirements for reporting defects • Company policy |

Achievement Criteria

Performance	The individual will be able to: <ul style="list-style-type: none">• Inspect wire rope, slings, and rigging hardware and remove damaged or defective parts from service if required• Follow proper recording and reporting procedures
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can inspect wire rope, slings, and rigging hardware in accordance with manufacturers' recommendations and WorkSafeBC regulations.

Line (GAC): D **WIRE ROPE AND RIGGING**
Competency: D4 **Specify types of slings, rigging hardware, and their uses**

Objectives

To be competent in this area, the individual must be able to describe slings and rigging hardware used in crane operations.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. List the various slings
 2. Describe the various hitch configurations
 3. State the use of slings
 4. Interpret specific information on slings from manufacturers' and rigging manuals
 5. Identify a variety of slings used in crane operations
 6. List the various rigging hardware | <ul style="list-style-type: none"> • Chain • Wire rope • Metal mesh • Synthetic web • Synthetic rope • Synthetic round
 • Vertical • Choker • Basket • Bridle
 • Working load limit (WWL) • Capacity required • Uses and limitations
 • Correct usage • Capacities • User warnings • Temperature restrictions
 • Chain • Wire rope • Metal mesh • Synthetic web • Synthetic rope • Synthetic round
 • Hooks • Shackles • Eye bolts • Hoist rings • Turnbuckles • Cable clamps • Softeners/sling protection • Lifting clamps |
|---|---|

LEARNING TASKS

7. State the use of rigging hardware

8. Interpret specific information on rigging hardware from manufacturers' and rigging manuals

9. Identify a variety of rigging hardware used in crane operations

CONTENT

- Lifting beams
- Spreader bars
- Equalizer beams
- Manufacturers' manuals
- Capacity required
- Limitations
- Correct usage
- Capacities
- User warnings
- Temperature restrictions
- Hooks
- Shackles
- Eye bolts
- Hoist rings
- Turnbuckles
- Cable clamps
- Softeners/sling protection
- Lifting clamps
- Lifting beams
- Spreader bars
- Equalizer beams

Achievement Criteria

- Performance** The individual will be able to:
- Identify slings and rigging hardware and state their function
 - Interpret specific information on slings and rigging hardware from manuals
- Conditions** To be assessed during technical training.
- Criteria** The individual is able to demonstrate that he/she can identify and use slings and rigging hardware.

Line (GAC): **D WIRE ROPE AND RIGGING**
Competency: **D5 Use rigging techniques**

Objectives

To be competent in this area, the individual must be able to assemble appropriate rigging for a load in accordance with manufacturers' recommendations.

LEARNING TASKS

1. Describe lifting theory and forces as they apply to lifting loads
2. Select appropriate slings and hardware for a load
3. Establish safe and efficient rigging procedures for a lift

CONTENT

- Centre of gravity
- Tension on slings and hardware when used at an angle
- Weight of load
- Size of load
- Angle of loading (sling tension)
- Written lift plan
- Critical lift plan
- Company/site requirements

Achievement Criteria

Performance	The individual will be able to select appropriate slings and rigging hardware and use proper rigging techniques
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can assemble appropriate rigging for a load in accordance with manufacturers' recommendations.

Line (GAC): D **WIRE ROPE AND RIGGING**
Competency: D6 **Maintain and store wire rope, slings, and rigging hardware**

Objectives

To be competent in this area, the individual must be able to maintain and store wire rope, slings, and rigging hardware in accordance with manufacturers’ recommendations.

LEARNING TASKS	CONTENT
1. Describe how to perform routine maintenance on various types of wire ropes	<ul style="list-style-type: none"> • Manufacturer policy • Company policy • Environmental conditions
2. Describe how to perform routine maintenance on various types of slings	<ul style="list-style-type: none"> • Manufacturer policy • Company policy • Environmental conditions
3. Describe how to perform routine maintenance on various types of rigging hardware	<ul style="list-style-type: none"> • Manufacturer policy • Company policy • Environmental conditions
4. State the criteria for lubricating wire rope	<ul style="list-style-type: none"> • Manufacturer policy • Company policy • Environmental conditions
5. Describe how to perform rigging hardware lubrication	<ul style="list-style-type: none"> • Manufacturer policy • Company policy • Environmental conditions
6. Describe procedures for cutting wire rope	<ul style="list-style-type: none"> • Manufacturer policy
7. State the criteria for storing wire rope	<ul style="list-style-type: none"> • Manufacturer policy • Company policy • Environmental conditions
8. State the criteria for storing slings and rigging hardware	<ul style="list-style-type: none"> • Manufacturer policy • Company policy • Environmental conditions
9. Identify wire ropes requiring lubrication	<ul style="list-style-type: none"> • Visual inspection
10. Lubricate wire rope using the appropriate application method	<ul style="list-style-type: none"> • Manufacturer policy • Company policy
11. Record the routine maintenance in the log book	<ul style="list-style-type: none"> • Manufacturer policy • Company policy • WorkSafeBC regulations

Achievement Criteria

Performance	The individual will be able to: <ul style="list-style-type: none">• Properly maintain and store wire ropes, slings, and rigging hardware• Record maintenance in the log book
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can maintain and store wire rope, slings, and rigging hardware in accordance with manufacturers' recommendations.

Line (GAC): E **LIFT PLANNING**
Competency: E1 **Follow site assessment procedures**

Objectives

To be competent in this area, the individual must be able to inspect a job site to ensure a safe and efficient operation in accordance with a pre-lift plan.

LEARNING TASKS

1. State the elements of a lift plan

2. State the purpose of site blueprints in preparing a lift plan

3. State the purpose of an engineered drawing in preparing a lift plan

CONTENT

- Routine to move load
- Crane capacity requirements to pick, move and place the load
- Maximum allowable travel grade according to crane manufacturer specifications
- Travel path
- Signal person
- Rigging required
- Signed by operator
- Signed by supervisor
- Signed by rigger
- Critical lift
- Tandem lift

- Placement of load
- Placement of crane
- Grade to be travelled on
- Ground bearing capacity of the area
- Operating hazards
- Underground services
- Overhead obstructions
- Sufficient room for assembly

- Placement of load
- Placement of crane
- Grade to be travelled on
- Ground bearing capacity of the area
- Operating hazards
- Underground services
- Overhead obstructions
- Load details
- Routine to move load
- Crane capacity requirements to pick, move and place the load

LEARNING TASKS

4. Establish the location of the crane

5. Determine blocking/mats required for various load-bearing surfaces

6. Determine the requirement for communications, signal persons, signallers, traffic control, barriers, grounding and bonding

CONTENT

- Rigging required
- Accessibility of site
- Grade of the site
- Soil conditions
- Distance to embankments
- Where the load is initially located
- Where the load is to be placed
- Proximity to other equipment
- Overhead obstructions
- Distance to electrical power sources
- Known underground hazards
- Environmental conditions
- Other potential hazards
- Proper blocking methods
- Ground bearing capability
- Suspended slab
- Uneven supporting surface
- WorkSafeBC regulations
- Company policy
- Operating clearance
- Traffic control
- Pedestrian traffic

Achievement Criteria

- Performance** The individual will be able to:
- Understand the purpose of various documentation required to prepare lift plans
 - Determine requirements for location, blocking/mats, and communications
- Conditions** To be assessed during technical training.
- Criteria** The individual is able to demonstrate that he/she can inspect a job site to ensure a safe and efficient operation in accordance with a pre-lift plan.

Line (GAC): E **LIFT PLANNING**
Competency: E2 **Determine load weights**

Objectives

To be competent in this area, the individual must be able to calculate the combined weight of the crane’s gross load for a lift.

LEARNING TASKS

1. Demonstrate the functions of a scientific calculator to perform mathematical calculations
2. Perform fundamental mathematical functions

3. Calculate load weights

4. Verify load weights

CONTENT

- Manufacturers’ instructions

- Rounding off of numbers
- Add and convert fractions to decimals
- Convert between metric and imperial units of measure
- Determine circumference of a circle
- Determine the perimeter of an object
- Calculate the surface area of an object
- Calculate the sine of an angle
- Use the Pythagorean theorem

- Volume of an object
- Weight of a cubic unit of an object
- Weight of components
- Gross weight of a load

- Engineer’s drawing
- Blueprint
- Bill of lading
- Calculation

Achievement Criteria

Performance The individual will be able to perform mathematical calculations to calculate load weights
Conditions To be assessed during technical training.
Criteria The individual is able to demonstrate that he/she can calculate the combined weight of the crane’s gross load for a lift.

Line (GAC): E **LIFT PLANNING**
Competency: E3 **Determine crane lifting capacity**

Objectives

To be competent in this area, the individual must be able to determine that the lifting capacity of the crane is sufficient when the required configuration is considered.

LEARNING TASKS	CONTENT
1. Explain the fundamentals of leverage as they apply to crane operations	<ul style="list-style-type: none"> • Class 1 lever • Class 2 lever • Class 3 lever • Centre of gravity
2. State the elements of a basic crane capacity chart	<ul style="list-style-type: none"> • Boom length • Boom angle • Attachments • Radius • Quadrant of operation • Operating notes • Deductions from capacity • Range diagram • Outrigger position • Counterweight configuration
3. Describe capacities	<ul style="list-style-type: none"> • Gross capacity • Net capacity
4. Describe load calculations	<ul style="list-style-type: none"> • Gross load • Net load
5. Determine whether the lift can be done within manufacturers' specifications	<ul style="list-style-type: none"> • Crane load chart • Crane configuration • Load weight • Load configuration • Weight of load handling devices
6. Establish optimum boom configurations	<ul style="list-style-type: none"> • Boom length • Boom angle • Radius • Hook height • Quadrants of operation
7. Locate the specific information from a basic crane capacity chart	<ul style="list-style-type: none"> • Boom length • Boom angle • Attachments

LEARNING TASKS

CONTENT

- 8. Select a configuration appropriate for lifting the load

- 9. Verify the crane configuration is appropriate for the lift

- Radius
- Quadrant of operation
- Operating notes
- Deductions from capacity
- Range diagram
- Outrigger position
- Counterweight configuration

- Radius
- Parts of line
- Height
- Combined weight of the load and rigging

- Crane load chart
- Load weight
- Load configuration
- Weight of load handling devices
- Quadrant of operation
- Length of boom
- Load radius
- Attachments

Achievement Criteria

- | | |
|-------------|--|
| Performance | The individual will be able to: <ul style="list-style-type: none"> • Determine whether the lift can be done within manufacturers' specifications based on capacities, fundamentals of leverage, and load calculations • Select and verify the appropriate configuration for lifting the load |
| Conditions | To be assessed during technical training. |
| Criteria | The individual is able to demonstrate that he/she can determine that the lifting capacity of the crane is sufficient when the required configuration is considered. |

Line (GAC): E **LIFT PLANNING**
Competency: E4 **Determine rigging requirements**

Objectives

To be competent in this area, the individual must be able to select slings and rigging hardware to safely lift a load in accordance with manufacturers' recommendations and WorkSafeBC regulations.

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. State the criteria to select the appropriate slings and rigging hardware 2. State the criteria to select the appropriate safety devices 3. Determine the load configuration 4. Verify characteristics of the load 5. Calculate/verify the centre of gravity of the load 6. Verify any special lift instructions 7. Calculate the Working Load Limit (WLL) for slings and rigging hardware 8. Calculate the load on slings and rigging hardware of equal and unequal lengths | <ul style="list-style-type: none"> • Weight of load • Size of load • Load configuration • WorkSafeBC regulations • Manufacturers' manuals • Company policy • Calculation • Visual • Height • Width • Length • Weight • Stamped on load • Mathematical formula • Blueprint • Lift plan • Supplier specifications • Manufacturers' manuals • Mathematical formulas • Manufacturers' manuals • Mathematical formulas |
|---|--|

Achievement Criteria

Performance	The individual will be able to: <ul style="list-style-type: none">• Select the appropriate slings, rigging hardware, and safety devices• Calculate working load limit (WLL), load on slings and rigging hardware, and centre of gravity• Verify characteristics of the load and special lift instructions
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can select slings and rigging hardware to safely lift a load in accordance with manufacturers' recommendations and WorkSafeBC regulations.

Line (GAC): F **CRANE APPLICATIONS**
Competency: F1 **Interpret operator manuals**

Objectives

To be competent in this area, the individual must be able to apply inspection, setup, operating, and maintenance information from the manufacturers' manuals.

LEARNING TASKS

1. Locate specific information in a manufacturer's manual

2. Interpret specific information in a manufacturer's manual

CONTENT

- Inspection
- Setup
- Operation
- Safety
- Maintenance

- Inspection
- Setup
- Operation
- Safety
- Maintenance

Achievement Criteria

Performance The individual will be able to locate and interpret specific information in a manufacturer's manual

Conditions To be assessed during technical training.

Criteria The individual is able to demonstrate that he/she can apply inspection, setup, operating, and maintenance information from the manufacturers' manuals.

Line (GAC): F **CRANE APPLICATIONS**
Competency: F2 **Perform a pre-operational inspection**

Objectives

To be competent in this area, the individual must be able to safely and efficiently perform a pre-operational inspection in accordance with manufacturers’ recommendations, WorkSafeBC regulations, and training provider policy.

LEARNING TASKS	CONTENT
1. State the sequence of inspection procedures recommended for a crane	<ul style="list-style-type: none"> • Manufacturers’ manuals
2. Verify that all the operator aids for the crane are in place	<ul style="list-style-type: none"> • Manufacturers’ manuals
3. Confirm that all reports are completed and filed	<ul style="list-style-type: none"> • Periodic inspections • Erection reports • WorkSafeBC regulations • Training provider
4. Confirm that all safety and emergency devices are in place and operational	<ul style="list-style-type: none"> • Manufacturers’ manuals • WorkSafeBC regulations
5. Locate all controls and system gauges	<ul style="list-style-type: none"> • Manufacturers’ manuals
6. Perform a pre-operational inspection for a crane	<ul style="list-style-type: none"> • Manufacturers’ procedures • Company policy
7. Perform a function test on the operating controls	<ul style="list-style-type: none"> • Manufacturers’ procedures
8. Perform basic repairs and maintenance	<ul style="list-style-type: none"> • Manufacturers’ manuals • Company policy
9. Report any defects or deficiencies to the supervisor	<ul style="list-style-type: none"> • Manufacturers’ manuals • Company policy • WorkSafeBC regulations
10. Record any defects or deficiencies in the crane log book	<ul style="list-style-type: none"> • Company policy • WorkSafeBC regulations
11. Record all repairs or maintenance in the appropriate crane log book	<ul style="list-style-type: none"> • Company policy • WorkSafeBC regulations

Achievement Criteria

Performance	The individual will be able to ensure all components are in place and operational prior to crane operation.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can safely and efficiently perform a pre-operational inspection in accordance with manufacturers’ recommendations, WorkSafeBC regulations, and training provider policy.

Line (GAC): F **CRANE APPLICATIONS**
Competency: F3 **Perform a pre-operational setup**

Objectives

To be competent in this area, the individual must be able to set up a crane in accordance with manufacturers' recommendations.

LEARNING TASKS

1. State the setup procedure
2. Identify hazards in the lift area
3. Ensure that the supporting surface is sufficient
4. Program or adjust safety devices according to manufacturers' recommendations

CONTENT

- Manufacturers' specifications
- Safety device programming to ensure safety while lifting
- Overhead obstructions
- Underground hazards
- Electrical sources
- Type of blocking and mats
- Size of blocking and mats
- Types of soil
- Load bearing capacity
- LMI (load monitoring and indicating systems)
- Anti-two block systems
- Boom angle indicators
- Manufacturers' manuals

Achievement Criteria

Performance The individual will be able to check the supporting surface, identify hazards, and program or adjust safety devices.
Conditions To be assessed during technical training.
Criteria The individual is able to demonstrate that he/she can set up a crane in accordance with manufacturers' recommendations.

Line (GAC): F **CRANE APPLICATIONS**
Competency: F4 **Demonstrate hoisting techniques**

Objectives

To be competent in this area, the individual must be able to perform hoisting operations in a safe and efficient manner in accordance with the manufacturers' recommendations.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Describe a pick and carry procedure
 2. Describe the procedure for operating in the vicinity of high voltage equipment
 3. Describe the procedures for doing a blind lift
 4. Describe the procedure for lifting a crane suspended work platform
 5. Operate a crane with and without a load | <ul style="list-style-type: none"> • Slow travel speed • Shortest boom length possible • Load as low as possible • Boom oriented as specified by the manufacturer • Load restrained from swinging • Assurance in writing • WorkSafeBC regulations • Limits of approach • Required documentation • Tag lines • Use of radio when signal person not visible • Use of second signal person when one is not visible • Company policy • Trial lift • Safety factor of rigging • Fall protection requirements • Crane capacity to be downrated when lifting personnel (safety factor required) • Platforms must be engineered to meet standard • Anti-two block system • Critical lift requirements • WorkSafeBC regulations • Manufacturers' manuals • With a load <ul style="list-style-type: none"> ○ Reference to load chart ○ Use of outriggers/stabilizers ○ Levelling crane ○ Booming up and booming down ○ Swinging/slewing clockwise and counterclockwise |
|---|---|

LEARNING TASKS

CONTENT

- 6. Adjust procedures according to environmental conditions
 - 7. Maintain control of the hook block in a safe manner during all functions
 - 8. Perform a pick and carry lift
 - 9. Perform a lift in proximity to simulated high voltage equipment
 - 10. Perform a blind lift
- Hoisting and lowering
 - Telescope or trolley in and out
 - Quadrants of operation
 - Picking and placing a load accurately and smoothly
 - Travelling on site (if allowed)
 - Without a load
 - Reference to load chart
 - Use of outriggers/stabilizers
 - Levelling crane
 - Booming up and booming down
 - Swinging/slewing clockwise and counterclockwise
 - Hoisting and lowering
 - Telescope or trolley in and out
 - Quadrants of operation
 - Picking and placing a load accurately and smoothly
 - Travelling on site (if allowed)
 - Operator aids
 - Slow operation
 - Booming up/down
 - Swinging/slewing
 - Travelling with a load
 - Slow travel speed
 - Shortest boom length possible
 - Load as low as possible
 - Boom oriented as specified by the manufacturer
 - Load restrained from swinging
 - Assurance in writing
 - WorkSafeBC regulations
 - Limits of approach
 - Required documentation
 - Tag lines
 - Safety watcher
 - Use of radio when signal person not visible
 - Use of second signal person when one is not visible
 - Company policy

Achievement Criteria

Performance	The individual will be able to perform hoisting techniques while maintaining control of the hook block.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can perform hoisting operations in a safe and efficient manner in accordance with the manufacturers' recommendations.

Line (GAC):	F	CRANE APPLICATIONS
Competency:	F5	Operate a 20-80 tonne telescoping boom crane

Objectives

To be competent in this area, the individual must be able to lift a load using a 20-80 tonne telescoping boom crane in accordance with manufacturers' recommendations.

LEARNING TASKS

1. Plan the lift

2. Assess the lift site

3. Perform a pre-operational inspection of the crane

4. Set up the crane

CONTENT

- Assessment of area and soil condition
- Blocking/mats required
- Assessment of hazards
- Assessment of obstacles
- Underground utilities
- Travel path
- Traffic control established
- Load weight
- Rigging required, rigging weight, rigging certified
- Qualified personnel
 - Lift supervisor
 - Operator
 - Rigger
 - Signal person
- Crane capacity sufficient for load throughout the lift
- Critical lift
- Tandem lift
- Signalling and barrier signage
- Assessment of area and soil condition
- Assessment of hazards
- Assessment of obstacles
- Overhead hazards
- Underground utilities
- Travel path
- Accurate inspection
- Place, location and verification of operator aids
- Inspection and erection reports
- Manufacturers' manuals
- Overhead obstructions and underground hazards

LEARNING TASKS

CONTENT

5. Rig the load

6. Hoist/lower the load

7. Monitor equipment performance

8. Troubleshoot equipment problems

9. Move the load to the intended destination

10. Perform a post-operational procedure

- Sufficient supply of blocking/mats considering the load requirements and surface conditions to level the crane
- Safety device programming and adjustment to ensure accuracy and safety while lifting
- Load weight determination
- Selection of hitch and sling arrangement
- Use of correct hitch configuration
- Working load limit (WLL) calculations of slings and rigging hardware
- Sling and rigging hardware angle loading calculations
- Reduction of sling and rigging hardware Working load limit (WLL) when used at an angle
- Safe hoisting/lowering procedures
- Procedures for operating in the vicinity of high voltage equipment
- Blind lift
- Unusual noises/vibrations
- Operator aids
- Manufacturers' manuals
- Safe load lifting and placement
- Secure load before unhooking
- Company policy

Achievement Criteria

- | | |
|-------------|---|
| Performance | The individual will be able to use proper inspection, setup, rigging, and hoisting techniques to safely operate a 20-80 tonne telescoping boom crane. |
| Conditions | To be assessed during technical training. |
| Criteria | The individual is able to demonstrate that he/she can lift a load using a 20-80 tonne telescoping boom crane in accordance with manufacturers' recommendations. |

Line (GAC): F **CRANE APPLICATIONS**
Competency: F6 **Operate a tower crane**

Objectives

To be competent in this area, the individual must be able to lift a load using a tower crane in accordance with manufacturers' recommendations.

LEARNING TASKS

1. Plan the lift

2. Assess the lift site

3. Perform a pre-operational inspection of the crane

4. Rig the load

CONTENT

- Assessment of area
- Assessment of hazards
- Assessment of obstacles
- Travel path
- Traffic control established
- Load weight
- Rigging required, weight of rigging, rigging certified
- Qualified personnel
 - Lift supervisor
 - Operator
 - Rigger
 - Signal person
- Crane capacity sufficient for load throughout the lift
- Critical lift
- Tandem lift
- Signalling and barrier signage
- Assessment of area
- Assessment of hazards
- Assessment of obstacles
- Travel path
- Accurate inspection
- Place, location and verification of operator aids
- Inspection and erection reports
- Load weight determination
- Selection of hitch and sling arrangement
- Use of correct hitch configuration
- Working load limit (WLL) calculations of slings and rigging hardware
- Sling and rigging hardware angle loading calculations
- Reduction of sling and rigging hardware

LEARNING TASKS

5. Hoist/lower the load
6. Monitor equipment performance
7. Troubleshoot equipment problems
8. Move the load to the intended destination
9. Perform a post-operational procedure

CONTENT

- working load limit (WLL) when used at an angle
- Safe hoisting/lowering procedures
- Procedures for operating in the vicinity of high voltage equipment
- Blind lift
- Unusual noises/vibrations
- Operator aids
- Manufacturers' manuals
- Safe load lifting and placement
- Secure load before unhooking
- Company policy

Achievement Criteria

- | | |
|-------------|--|
| Performance | The individual will be able to use proper inspection, rigging, and hoisting techniques to safely operate a tower crane. |
| Conditions | To be assessed during technical training. |
| Criteria | The individual is able to demonstrate that he/she can lift a load using a tower crane in accordance with manufacturers' recommendations. |

Line (GAC): F **CRANE APPLICATIONS**
Competency: F7 **Leave a crane unattended**

Objectives

To be competent in this area, the individual must be able to prepare a crane to be left unattended for short or long periods of time in accordance with manufacturers' recommendations.

LEARNING TASKS

1. State the procedure for leaving a crane unattended for short periods of time (e.g. lunch breaks)

2. State the procedure for leaving a crane unattended for long periods of time (e.g. overnight, weekends)

3. Perform shutdown procedure

CONTENT

- No load on the hook
- Hook elevation
- Ignition off and removal of key
- Power source turned off
- Swing brake application (if applicable)
- Swing lock application (if applicable)

- No load on the hook
- Boom lowered to blocking or in cradle
- Boom angle
- Telescoping boom retracted
- Hook elevation
- Ignition off and removal of key
- Power source turned off
- Swing brake application (if applicable)
- Swing lock application (if applicable)
- Weathervaning

- Clean wheels/tracks and attachments
- Park equipment in appropriate location
- Shut down and secure equipment as per manufacturer and site policy
- Housekeeping tasks
- Post-operational inspection

Achievement Criteria

Performance The individual will be able to perform the shutdown procedure and leave the crane unattended for both short and long periods of time.

Conditions To be assessed during technical training.

Criteria The individual is able to demonstrate that he/she can prepare a crane to be left unattended for short or long periods of time in accordance with manufacturers' recommendations.

Line (GAC): G **TRANSPORTING A CRANE**
Competency: G1 **Define Commercial Transport Regulations**

Objectives

To be competent in this area, the individual must be able to state the criteria for the travel or transport of a crane on public roads in accordance with Commercial Transport Regulations.

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <p>1. Locate related sections of the Commercial Transport Regulations</p> | <ul style="list-style-type: none"> • Criteria for special permits <ul style="list-style-type: none"> ○ Over height ○ Over weight ○ Over length ○ Gross vehicle weight |
| <p>2. Interpret related sections of the Commercial Transport Regulations</p> | <ul style="list-style-type: none"> • Criteria for special permits <ul style="list-style-type: none"> ○ Over height ○ Over weight ○ Over length ○ Gross vehicle weight |
| <p>3. State the criteria that would warrant special permits for travel or transport of a crane on public roads</p> | <ul style="list-style-type: none"> • Over height • Over length • Over width • Over weight |

Achievement Criteria

Performance	The individual will be able to interpret related sections of the Commercial Transport Regulations and state the criteria that would warrant special permits for travel or transport of a crane on public roads.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can state the criteria for the travel or transport of a crane on public roads in accordance with Commercial Transport Regulations.

Line (GAC): **G TRANSPORTING A CRANE**
Competency: **G2 Prepare a crane for travel**

Objectives

To be competent in this area, the individual must be able to prepare a rubber-tired truck crane for travel in accordance with manufacturers’ recommendations and Commercial Transport Regulations.

LEARNING TASKS

1. Determine the procedure to prepare a rubber-tired truck crane for travel

2. Secure the components and/or load on a rubber-tired truck crane to prevent shifting during travel

3. Verify that all permits are in order for travel on a public highway

CONTENT

- Requirements
 - Flags
 - Lights
 - Permits
 - Security of components
- Procedure
 - Boom retraction
 - Outrigger beam retraction and pinning
 - Outrigger pad removal
 - Swing brake/lock application (if applicable)
 - Securement of block/ball
- Correct and serviceable signage and signals
 - Commercial Transport Regulations
 - Flags
 - Flashers
 - Warning signs
- Permits required
- Manufacturers’ manuals
- Recommended securement procedures
- Commercial Transport Regulations
- Commercial Transport Regulations
- Municipal regulations

Achievement Criteria

Performance The individual will be able to prepare a rubber-tired truck crane for travel, ensuring all permits are in order for travel on a public highway.

Conditions To be assessed during technical training.

Criteria The individual is able to demonstrate that he/she can prepare a rubber-tired truck crane for travel in accordance with manufacturers’ recommendations and Commercial Transport Regulations.

Line (GAC): **G TRANSPORTING A CRANE**
Competency: **G3 Prepare a crane for transport**

Objectives

To be competent in this area, the individual must be able to prepare a crane for travel on a transporter in accordance with manufacturers’ recommendations, municipal regulations, and Commercial Transport Regulations.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Describe the requirements of a transporter to transport a crane on public roads
 2. Describe the procedure for preparing a crane for transporter travel
 3. Ensure the transporter is suitable to transport the crane and components
 4. Load and secure the crane and components on a transporter
 5. Ensure that all flags, flashers and warning signs are in place and serviceable
 6. Verify that all permits are in order for the crane and transporter
 7. Unload the crane and components from the transporter | <ul style="list-style-type: none"> • Safe loading and securing of the crane and components for transporter travel <ul style="list-style-type: none"> ○ Manufacturers’ manuals ○ Commercial Transport Regulations ○ Security of components • Capacity of trailer • Length of trailer • Width of trailer
 • Manufacturers’ manuals • Commercial Transport Regulations
 • Capacity of trailer • Length of trailer • Width of trailer • Valid certification
 • Manufacturers’ manuals • Commercial Transport Regulations
 • Colour of flags • Size of flags • Legible signs
 • Commercial Transport Regulations • Municipal regulations
 • Proper lifting devices • Attachment points • Sufficient crane capacity • Qualified personnel |
|--|--|

Achievement Criteria

Performance	The individual will be able to: <ul style="list-style-type: none">• Prepare a crane for travel on a transporter, ensuring all components are in place and permits are in order.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can prepare a crane for travel on a transporter in accordance with manufacturers' recommendations, municipal regulations, and Commercial Transport Regulations.

Line (GAC): **G TRANSPORTING A CRANE**
Competency: **G4 Assemble and disassemble a crane**

Objectives

To be competent in this area, the individual must be able to assemble and disassemble a crane in accordance with manufacturers’ recommendations.

LEARNING TASKS

1. Describe assembly/disassembly procedures as recommended by the manufacturer

2. Ensure area to be used for assembly or disassembly is secure and free of obstructions

3. Position crane for assembly/disassembly

CONTENT

- Installation/removal of crane components
- Installation/removal of attachments
- Boom sections
- Adjust undercarriage (where applicable)
- Attach boom dolly (where applicable)
- Pre-operational inspection
- Inspection after assembly

- Hazard assessment
- Barricades

- Assembly/disassembly plan

Achievement Criteria

Performance The individual will be able to assemble and disassemble a crane in a secure area free of obstructions.

Conditions To be assessed during technical training.

Criteria The individual is able to demonstrate that he/she can assemble and disassemble a crane in accordance with manufacturers’ recommendations.

Line (GAC): H CRANE MAINTENANCE
Competency: H1 Use tools for basic crane maintenance

Objectives

To be competent in this area, the individual must be able to select appropriate tools to perform basic maintenance on a crane in accordance with manufacturers' recommendations.

LEARNING TASKS

1. List the tools required to perform basic maintenance

2. State the function of the tools required for basic maintenance

3. Identify the tools required to perform basic maintenance

4. Select the appropriate tools for an application

CONTENT

- Grease gun
- Adjustable wrenches
- Combination wrenches
- Sockets
- Mallets
- Screwdrivers
- Hammers
- Vice grips
- Pliers
- Pry bars
- Ladders
- Measuring devices
- Manufacturers' manual
- Supplier's information
- Grease gun
- Adjustable wrenches
- Combination wrenches
- Sockets
- Mallets
- Screwdrivers
- Hammers
- Vice grips
- Pliers
- Pry bars
- Ladders
- Measuring devices
- Manufacturers' manual
- Supplier's information

Achievement Criteria

Performance	The individual will be able to identify and select the appropriate tools for an application.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can select appropriate tools to perform basic maintenance on a crane in accordance with manufacturers' recommendations.

Line (GAC): **H** **CRANE MAINTENANCE**
Competency: **H2** **Perform basic crane maintenance**

Objectives

To be competent in this area, the individual must be able to perform basic maintenance on a crane in accordance with manufacturers’ recommendations and WorkSafeBC regulations.

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. List factors that influence the operator’s maintenance responsibilities
 2. Interpret maintenance information from manufacturers’ manuals
 3. Select the correct fluids and lubricants
 4. Perform preventative crane maintenance

 5. Adjust control mechanisms

 6. Perform structural maintenance

 7. Clean crane components | <ul style="list-style-type: none"> • Legalities • Location • Capabilities • Tool availability
 • Inspection frequency • Servicing schedules • Manufacturers’ manuals • Company policy • Grease fittings • Lubricate open gears • Add fluids • Adjust or replace belts • Check tire pressure • Service oil reservoir venting systems • Perform outrigger and stabilizer maintenance • Perform boom maintenance • Perform steering system maintenance • Drain air tanks • Slack adjusters • Rollers • Cables • Brakes • Clutches • Bolts • Wedges • Cotter keys • Cotter pins • Guard rails • Batteries • Cab |
|---|--|

LEARNING TASKS

CONTENT

8. Repair or replace defective components

- Windows
- Wheels
- Tracks

9. Report defects and deficiencies to supervisor

- Manufacturers' manuals
- Company policy
- WorkSafeBC regulations
- Company policy

10. Record maintenance performed and requested in the log book

- WorkSafeBC regulations
- Company policy
- Manufacturers' manuals

Achievement Criteria

Performance The individual will be able to:

- Perform maintenance and adjustments to crane components
- Repair or replace components as required
- Record maintenance and report defects and deficiencies

Conditions To be assessed during technical training.

Criteria The individual is able to demonstrate that he/she can perform basic maintenance on a crane in accordance with manufacturers' recommendations and WorkSafeBC regulations.

Level 2

Tower Crane Operator

Line (GAC):	I	LIFT PLANNING – HAMMERHEAD TOWER CRANE
Competency:	II	Conduct a site assessment for a hammerhead tower crane

Objectives

To be competent in this area, the individual must be able to inspect a work site to ensure a safe and efficient operation in accordance with a pre-lift plan.

LEARNING TASKS

1. Establish the location of the lift

2. Determine the requirement for communications, signaller, traffic control, barriers, grounding and bonding

CONTENT

- Initial location of the load
- Load placement
- Obstructions in the area
- Location of electrical power lines
- Environmental conditions
- Other potential hazards

- Type of lift
- Pedestrian traffic
- Electrical sources
- Method of communication
 - Audio
 - Video
 - Hand signals

Achievement Criteria

Performance	The individual will be able to assess the site and determine the requirement for communications, signaller, traffic control, barriers, grounding and bonding.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can inspect a work site to ensure a safe and efficient operation in accordance with a pre-lift plan.

Line (GAC):	I	LIFT PLANNING – HAMMERHEAD TOWER CRANE
Competency:	I2	Use a crane capacity chart for a hammerhead tower crane

Objectives

To be competent in this area, the individual must be able to use a hammerhead tower crane capacity chart to determine the gross capacity and net capacity considering the configuration required for a lift.

LEARNING TASKS

CONTENT

1. Establish the hook radius required to lift a load	<ul style="list-style-type: none"> • Crane load chart • Net weight of load • Gross weight of load • Parts of line • Gear capacity
2. State the elements of a crane capacity chart	<ul style="list-style-type: none"> • Jib length • Attachments • Radius • Gear capacity • Parts of line
3. Locate the specific information from a crane capacity chart	<ul style="list-style-type: none"> • Jib length • Attachments • Radius • Gear capacity • Parts of line
4. Determine whether the lift can be done within manufacturers’ specifications	<ul style="list-style-type: none"> • Capacity chart for crane configuration • Weight of the load • Weight of the rigging • Line weight deduction (if applicable) • Gear capacity

Achievement Criteria

Performance	The individual will be able to: <ul style="list-style-type: none"> • Select and verify the configuration for the lift • Locate information on a crane capacity chart to determine whether the lift can be done within manufacturers’ specifications.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can use a hammerhead tower crane capacity chart to determine the gross capacity and net capacity considering the configuration required for a lift.

Line (GAC): J **HAMMERHEAD TOWER CRANE OPERATIONS**
Competency: J1 **Interpret operating manuals for a hammerhead tower crane**

Objectives

To be competent in this area, the individual must be able to apply inspection and operating information from the manufacturers’ manuals of a hammerhead tower crane.

LEARNING TASKS

1. Locate specific information in a manufacturer’s manual

2. Interpret specific information in a manufacturer’s manual

CONTENT

- Inspection
- Setup
- Operation
- Safety
- Maintenance

- Inspection
- Setup
- Operation
- Safety
- Maintenance

Achievement Criteria

Performance The individual will be able to locate and interpret specific information in a manufacturer’s manual.

Conditions To be assessed during technical training.

Criteria The individual is able to demonstrate that he/she can apply inspection and operating information from the manufacturers’ manuals of a hammerhead tower crane.

Line (GAC):	J	HAMMERHEAD TOWER CRANE OPERATIONS
Competency:	J2	Perform a pre-operational inspection for a hammerhead tower crane

Objectives

To be competent in this area, the individual must be able to safely and efficiently perform a pre-operational inspection of a hammerhead tower crane in accordance with manufacturers' recommendations and WorkSafeBC regulations.

LEARNING TASKS

CONTENT

1. State the recommended sequence of inspection	<ul style="list-style-type: none"> • Manufacturer's manual
2. Verify that all the operator aids for the crane are in place	<ul style="list-style-type: none"> • Manufacturer's manual
3. Confirm that all reports are completed and filed	<ul style="list-style-type: none"> • Periodic inspections • Erection reports • WorkSafeBC regulations • Company policy
4. Confirm that all safety and emergency devices are in place and operational	<ul style="list-style-type: none"> • Manufacturer's manual • WorkSafeBC regulations
5. Locate all controls and system gauges	<ul style="list-style-type: none"> • Manufacturer's manual
6. Perform a pre-operational inspection	<ul style="list-style-type: none"> • Manufacturer's procedures
7. Perform a function test on the operating controls	<ul style="list-style-type: none"> • Manufacturer's procedures
8. Perform basic repairs and maintenance	<ul style="list-style-type: none"> • Manufacturer's manual • Company policy
9. Report any defects or deficiencies to the supervisor	<ul style="list-style-type: none"> • Manufacturer's manual • Company policy • WorkSafeBC regulations
10. Record any defects or deficiencies in the crane log book	<ul style="list-style-type: none"> • Company policy • WorkSafeBC regulations
11. Record all repairs or maintenance in the appropriate crane log book	<ul style="list-style-type: none"> • Company policy • WorkSafeBC regulations

Achievement Criteria

Performance	The individual will be able to ensure all components are in place and operational prior to crane operation.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can safely and efficiently perform a pre-operational inspection of a hammerhead tower crane in accordance with manufacturers' recommendations and WorkSafeBC regulations.

Line (GAC): J **HAMMERHEAD TOWER CRANE OPERATIONS**
Competency: J3 **Perform a pre-operational setup for a hammerhead tower crane**

Objectives

To be competent in this area, the individual must be able to perform a pre-operational setup for a hammerhead tower crane in accordance with manufacturers’ recommendations.

LEARNING TASKS

1. State the setup procedure
2. Identify hazards in the lift area
3. Ensure that the supporting surface is adequate
4. Program or adjust safety devices according to manufacturers’ recommendations

CONTENT

- Manufacturer’s specifications
- Sufficient counterweight/ballast for crane configuration
- Sufficient parts of line
- Overhead obstructions
- Underground hazards
- Electrical sources
- Type of blocking and mats (if applicable)
- Size of blocking and mats (if applicable)
- Travelling base level (if applicable)
- Types of soil
- Engineer’s report
- LMI (load monitoring and indicating systems)
- Anti two block systems
- Trolley limit switches
- Manufacturers’ manuals

Achievement Criteria

Performance The individual will be able to check the supporting surface, identify hazards, and program or adjust safety devices.
Conditions To be assessed during technical training.
Criteria The individual is able to demonstrate that he/she can perform a pre-operational setup for a hammerhead tower crane in accordance with manufacturers’ recommendations.

Line (GAC): J **HAMMERHEAD TOWER CRANE OPERATIONS**
Competency: J4 **Perform hoisting techniques for a hammerhead tower crane**

Objectives

To be competent in this area, the individual must be able to use a hammerhead tower crane to perform lift operations in a safe and efficient manner in accordance with manufacturers' recommendations.

LEARNING TASKS

1. Operate a crane with and without a load

2. Maintain control of the hook block during all functions

CONTENT

- Trolley in and out
- Slew clockwise and counterclockwise
- Hoist up and down

- Trolley in and out
- Slew clockwise and counterclockwise
- Hoist up and down

Achievement Criteria

Performance The individual will be able to perform hoisting techniques while maintaining control of the hook block.

Conditions To be assessed during technical training.

Criteria The individual is able to demonstrate that he/she can use a hammerhead tower crane to perform lift operations in a safe and efficient manner in accordance with manufacturers' recommendations.

Line (GAC):	J	HAMMERHEAD TOWER CRANE OPERATIONS
Competency:	J5	Operate a hammerhead tower crane

Objectives

To be competent in this area, the individual must be able to operate a hammerhead tower crane to lift a load in accordance with the lift instructions and the manufacturers' recommendations.

LEARNING TASKS

1. Assess the lift site

2. Plan the lift

3. Perform a pre-operational inspection of the crane

4. Monitor equipment performance

5. Troubleshoot equipment problems

6. Move the load to the destination

CONTENT

- Assessment of area
- Assessment of hazards
- Assessment of obstacles
- Travel path
- Assessment of area
- Assessment of hazards
- Assessment of obstacles
- Travel path
- Traffic control established
- Load weight
- Rigging required, weight of rigging, rigging certified
- Qualified personnel
 - Lift supervisor
 - Operator
 - Rigger
 - Signal person
- Crane capacity sufficient for load throughout the lift
- Critical lift
- Tandem lift
- Signalling and barrier signage
- Accurate inspection
- Place, location and verification of operator aids
- Limit devices/overload prevention
- Test blocks
- Inspection and erection reports
- Unusual noises/vibrations
- Operator aids
- Manufacturers' manuals
- Safe load lifting and placement

LEARNING TASKS

7. Perform a post-operational procedure

CONTENT

- Secure load before unhooking
- Company policy

Achievement Criteria

Performance The individual will be able to plan the lift and safely operate a hammerhead tower crane.

Conditions To be assessed during technical training.

Criteria The individual is able to demonstrate that he/she can operate a hammerhead tower crane to lift a load in accordance with the lift instructions and the manufacturers' recommendations.

Line (GAC):	J	HAMMERHEAD TOWER CRANE OPERATIONS
Competency:	J6	Leave a hammerhead tower crane unattended

Objectives

To be competent in this area, the individual must be able to prepare a hammerhead tower crane to be left unattended for short or long periods of time, in accordance with manufacturers' recommendations.

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. State the procedure for leaving a crane unattended for short periods of time (e.g. lunch breaks) 2. State the procedure for leaving a crane unattended for long periods of time (e.g. overnight, weekends) | <ul style="list-style-type: none"> • No load on the hook • Hook elevation • Power source turned off • Swing brake application (if applicable) • Weathervaning (if applicable) |
| <ol style="list-style-type: none"> 2. Perform shutdown procedure | <ul style="list-style-type: none"> • No load on the hook • Hook elevation • Power source turned off • Swing brake application (if applicable) • Weathervaning (if applicable) • Access prevention to crane • Shut down and secure equipment as per manufacturer and site policy • Housekeeping tasks • Post-operational inspection |

Achievement Criteria

Performance	The individual will be able to perform the shutdown procedure and leave the crane unattended for both short and long periods of time.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can prepare a hammerhead tower crane to be left unattended for short or long periods of time, in accordance with manufacturers' recommendations.

Line (GAC):	K	LIFT PLANNING – LUFFING JIB TOWER CRANE
Competency:	K1	Conduct a site assessment for a luffing jib tower crane

Objectives

To be competent in this area, the individual must be able to inspect a work site to ensure a safe and efficient luffing jib tower crane operation, in accordance with a pre-lift plan.

LEARNING TASKS

1. Establish the location of the lift

2. Determine the requirement for communications, signaller, traffic control, barriers, grounding and bonding

CONTENT

- Accessibility of the site
- Initial location of the load
- Load placement
- Obstructions in the area
- Location of electrical power lines
- Known underground hazards
- Environmental conditions
- Other potential hazards

- WorkSafeBC regulations
- Company policy
- Operating clearance
- Traffic control
- Pedestrian traffic

Achievement Criteria

Performance	The individual will be able to assess the site and determine the requirement for communications, signaller, traffic control, barriers, grounding, and bonding.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can inspect a work site to ensure a safe and efficient luffing jib tower crane operation, in accordance with a pre-lift plan.

Line (GAC): **K** **LIFT PLANNING – LUFFING JIB TOWER CRANE**
Competency: **K2** **Use a crane capacity chart for a luffing jib tower crane**

Objectives

To be competent in this area, the individual must be able to use a luffing jib tower crane capacity chart to determine the gross capacity and net capacity for hoisting applications.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Establish the hook radius required to lift a load
 2. State the elements of a crane capacity chart
 3. Locate the specific information from a crane capacity chart
 4. Determine whether the lift can be done within manufacturers' specifications | <ul style="list-style-type: none"> • Crane load chart • Net weight of load • Gross weight of load
 • Boom length • Attachments • Radius • Parts of line
 • Boom length • Attachments • Radius • Parts of line
 • Capacity chart for crane configuration • Weight of the load • Weight of the rigging |
|---|---|

Achievement Criteria

Performance	The individual will be able to locate information on a crane capacity chart and determine whether the lift can be done within manufacturers' specifications.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can use a luffing jib tower crane capacity chart to determine the gross capacity and net capacity for hoisting applications.

Line (GAC): L **LUFFING JIB TOWER CRANE OPERATIONS**
Competency: L1 **Interpret operating manuals for a luffing jib tower crane**

Objectives

To be competent in this area, the individual must be able to apply inspection and operating information from manufacturers' manuals for a luffing jib tower crane.

LEARNING TASKS

1. Locate specific information in a manufacturer's manual

2. Interpret specific information in a manufacturer's manual

CONTENT

- Inspection
- Setup
- Operation
- Safety
- Maintenance

- Inspection
- Setup
- Operation
- Safety
- Maintenance

Achievement Criteria

Performance The individual will be able to locate and interpret specific information in a manufacturer's manual.

Conditions To be assessed during technical training.

Criteria The individual is able to demonstrate that he/she can apply inspection and operating information from manufacturers' manuals for a luffing jib tower crane.

Line (GAC): L **LUFFING JIB TOWER CRANE OPERATIONS**
Competency: L2 **Perform a pre-operational inspection for a luffing jib tower crane**

Objectives

To be competent in this area, the individual must be able to safely and efficiently perform a pre-operational inspection of a luffing jib tower crane in accordance with manufacturers’ recommendations and WorkSafeBC regulations.

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. State the recommended sequence of inspection 2. Verify that the operator aids for the crane are in place 3. Confirm that all reports are completed and filed 4. Confirm that all safety and emergency devices are in place and operational 5. Locate all controls and system gauges 6. Perform a pre-operational inspection 7. Perform a function test on the operating controls 8. Perform basic repairs and maintenance 9. Report any defects or deficiencies to the supervisor 10. Record any defects or deficiencies in the crane log book 11. Record all repairs or maintenance in the appropriate crane log book | <ul style="list-style-type: none"> • Manufacturer’s manual • Manufacturer’s manual • Periodic inspections • Erection reports • WorkSafeBC regulations • Company policy • Manufacturer’s manual • WorkSafeBC regulations • Manufacturer’s manual • Manufacturer’s procedures • Manufacturer’s procedures • Manufacturer’s manual • Company policy • Manufacturer’s manual • Company policy • WorkSafeBC regulations • Company policy • WorkSafeBC regulations • Company policy • WorkSafeBC regulations |
|---|--|

Achievement Criteria

Performance The individual will be able to ensure all components are in place and operational prior to crane operation.

Conditions To be assessed during technical training.

Criteria The individual is able to demonstrate that he/she can safely and efficiently perform a pre-operational inspection of a luffing jib tower crane in accordance with manufacturers’ recommendations and WorkSafeBC regulations.

Line (GAC): L LUFFING JIB TOWER CRANE OPERATIONS
Competency: L3 Perform a pre-operational setup for a luffing jib tower crane

Objectives

To be competent in this area, the individual must be able to perform a pre-operational setup for a luffing jib tower crane in accordance with manufacturers’ recommendations.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. State the setup procedure
 2. Identify hazards in the lift area
 3. Ensure that the supporting surface is adequate
 3. Program or adjust safety devices according to manufacturers’ recommendations | <ul style="list-style-type: none"> • Manufacturer’s specifications • Safety device programming to ensure safety while lifting • Sufficient parts of line • Overhead obstructions • Underground hazards • Electrical sources • Type of blocking and mats (if applicable) • Size of blocking and mats (if applicable) • Travelling base level (if applicable) • Types of soil • LMI (load monitoring and indicating systems) • Anti two block systems • Limit devices • Manufacturers’ manuals |
|--|--|

Achievement Criteria

Performance	The individual will be able to check the supporting surface, identify hazards, and program or adjust safety devices.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can perform a pre-operational setup for a luffing jib tower crane in accordance with manufacturers’ recommendations.

Line (GAC): L **LUFFING JIB TOWER CRANE OPERATIONS**
Competency: L4 **Perform hoisting techniques for a luffing jib tower crane**

Objectives

To be competent in this area, the individual must be able to use a luffing jib tower crane to perform lift operations in a safe and efficient manner in accordance with manufacturers' recommendations.

LEARNING TASKS

1. Operate a crane with and without a load

2. Maintain control of the hook block in a safe manner during all functions

CONTENT

- Luffing up and down
- Slewing clockwise and counterclockwise
- Hoisting up and down

- Luffing up and down
- Slewing clockwise and counterclockwise
- Hoisting up and down

Achievement Criteria

Performance The individual will be able to perform hoisting techniques while maintaining control of the hook block.

Conditions To be assessed during technical training.

Criteria The individual is able to demonstrate that he/she can use a luffing jib tower crane to perform lift operations in a safe and efficient manner in accordance with manufacturers' recommendations.

Line (GAC):	L	LUFFING JIB TOWER CRANE OPERATIONS
Competency:	L5	Operate a luffing jib tower crane

Objectives

To be competent in this area, the individual must be able to operate a luffing jib tower crane to lift a load in accordance with the lift instructions and manufacturers' recommendations.

LEARNING TASKS

1. Assess the lift site

2. Plan the lift

3. Perform a pre-operational inspection of the crane

4. Monitor equipment performance

5. Troubleshoot equipment problems

6. Move the load to the destination

CONTENT

- Assessment of area
- Assessment of hazards
- Assessment of obstacles
- Travel path

- Assessment of area
- Assessment of hazards
- Assessment of obstacles
- Travel path
- Traffic control established
- Load weight
- Rigging required, weight of rigging, rigging certified
- Qualified personnel
 - Lift supervisor
 - Operator
 - Rigger
 - Signal person
- Crane capacity sufficient for load throughout the lift
- Critical lift
- Tandem lift
- Signalling and barrier signage

- Accurate inspection
- Place, location and verification of operator aids
- Limit devices/overload prevention
- Test blocks
- Inspection and erection reports

- Unusual noises/vibrations
- Operator aids

- Manufacturers' manuals

- Safe load lifting and placement

LEARNING TASKS

7. Perform a post-operational procedure

CONTENT

- Secure load before unhooking
- Company policy

Achievement Criteria

Performance The individual will be able to plan the lift and safely operate a luffing jib tower crane.
Conditions To be assessed during technical training.
Criteria The individual is able to demonstrate that he/she can operate a luffing jib tower crane to lift a load in accordance with the lift instructions and manufacturers' recommendations.

Line (GAC): L **LUFFING JIB TOWER CRANE OPERATIONS**
Competency: L6 **Leave a luffing jib tower crane unattended**

Objectives

To be competent in this area, the individual must be able to prepare a luffing jib tower crane to be left unattended for short or long periods of time in accordance with manufacturers' recommendations.

LEARNING TASKS

1. State the procedure for leaving a crane unattended for short periods of time (e.g. lunch breaks)

2. State the procedure for leaving a crane unattended for long periods of time (e.g. overnight, weekends)

3. Perform shutdown procedure

CONTENT

- No load on the hook
- Hook elevation
- Boom angle
- Power source turned off
- Swing brake application (if applicable)
- Weathervaning (if applicable)

- No load on the hook
- Hook elevation
- Boom angle
- Power source turned off
- Swing brake application (if applicable)
- Weathervaning (if applicable)
- Access prevention to crane

- Shut down and secure equipment as per manufacturer and site policy
- Housekeeping tasks
- Post-operational inspection

Achievement Criteria

Performance The individual will be able to perform the shutdown procedure and leave the crane unattended for both short and long periods of time.

Conditions To be assessed during technical training.

Criteria The individual is able to demonstrate that he/she can prepare a luffing jib tower crane to be left unattended for short or long periods of time in accordance with manufacturers' recommendations.

LEARNING TASKS

CONTENT

	required
	<ul style="list-style-type: none"> • Rigging required, rigging certified • Qualified personnel <ul style="list-style-type: none"> ○ Lift supervisor ○ Operator ○ Rigger ○ Signal person • Crane capacity sufficient for load throughout the lift • Trial lift • Critical lift • Signalling and barrier signage • WorkSafeBC regulations • Company policy • Accurate inspection • Place, location and verification of operator aids • Inspection reports • Manufacturer’s manuals • Overhead obstructions and underground hazards • Sufficient supply of blocking/mats considering the load requirements and surface conditions to level the crane • Safety device programming and adjustment to ensure accuracy and safety while lifting • WorkSafeBC regulations • Manufacturer’s specifications • Trial lift • Critical lift plan
4. Complete a critical lift plan	
5. Perform a pre-operational inspection of the crane	
6. Set up the crane	
7. Attach the suspended work platform	
8. Hoist the suspended work platform	
9. Move the work platform to the intended destination	

Achievement Criteria

Performance	The individual will be able to move the platform to the intended destination.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can operate a tower crane with a suspended work platform in a safe and efficient manner in accordance with the lift instructions, manufacturers’ procedures, and WorkSafeBC regulations.

Line (GAC): M **SPECIALIZED OPERATIONS**
Competency: M2 **Perform engineered lifts**

Objectives

To be competent in this area, the individual must be able to perform an engineered lift in a safe and efficient manner in accordance with the lift instructions, manufacturers’ recommendations, and WorkSafeBC regulations.

LEARNING TASKS

1. Describe the procedure for an engineered lift

2. Assess the lift site

3. Plan the lift

CONTENT

- Written lift plan
- Critical lift plan

- Assessment of area
- Assessment of soil conditions (if applicable)
- Assessment of hazards
- Assessment of obstacles
- Overlapping zones
- Vertical/lateral clearances
- Underground utilities
- Travel path

- Assessment of area
- Assessment of soil conditions (if applicable)
- Blocking/mats required
- Assessment of hazards
- Assessment of obstacles
- Underground utilities (if applicable)
- Travel path
- Traffic control established
- All-up weight of suspended work platform
- Personal Protective Equipment (PPE) required
- Weight of load
- Rigging required, rigging weight, rigging certified
- Qualified personnel
 - Lift supervisor
 - Operator
 - Rigger
 - Signal person
- Crane capacity sufficient for load

LEARNING TASKS

CONTENT

	throughout the lift
	<ul style="list-style-type: none"> • Trial lift • Critical lift • Signalling and barrier signage
4. Perform a pre-operational inspection of the crane	<ul style="list-style-type: none"> • Accurate inspection • Place, location and verification of operator aids • Inspection and erection reports
5. Set up the crane	<ul style="list-style-type: none"> • Manufacturer's manuals • Overhead obstructions and underground hazards • Sufficient supply of blocking/mats considering the load requirements and surface conditions to level the crane • Safety device programming and adjustment to ensure accuracy and safety while lifting
6. Rig the load	<ul style="list-style-type: none"> • Load weight determination • Selection of hitch and sling arrangement • Use of correct hitch configuration • Working load limit (WLL) calculations of slings and rigging hardware • Sling and rigging hardware angle loading calculations • Reduction of sling and rigging hardware Working load limit (WLL) when used at an angle
7. Perform the engineered lift	<ul style="list-style-type: none"> • Written lift plan • Critical lift plan
8. Move the load to the intended destination	<ul style="list-style-type: none"> • Written lift plan • Critical lift plan

Achievement Criteria

Performance	The individual will be able to move the load to the intended destination.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she can perform an engineered lift in a safe and efficient manner in accordance with the lift instructions, manufacturers' recommendations, and WorkSafeBC regulations.

Line (GAC): M **SPECIALIZED OPERATIONS**
Competency: M3 **Perform multiple crane lifts**

Objectives

To be competent in this area, the individual must be able to perform a multiple crane lift in a safe and efficient manner in accordance with the lift instructions, manufacturers' procedures, and WorkSafeBC regulations.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Describe the procedure for a multiple crane lift
 2. Calculate the load on each crane during a multiple crane lift
 3. Assess the lift site
 4. Plan a variety of lifts
 5. Perform a pre-operational inspection of the cranes
 6. Set up the cranes
 7. Rig the load | <ul style="list-style-type: none"> • WorkSafeBC regulations • Company policy • Professional Engineer certification
 • Attachment points • Centre of gravity • Mathematical formulas
 • Assessment of area and soil condition • Assessment of hazards • Assessment of obstacles • Overlapping zones • Vertical/lateral clearances • Underground utilities • Travel path
 • Standing up a horizontal object • Laying down a vertical object • Lifting an object • Lift an object with offset centre of gravity
 • Accurate inspection • Place, location and verification of operator aids • Inspection reports
 • Manufacturer's manuals • Overhead obstructions and underground hazards • Sufficient supply of blocking/mats considering the load requirements and surface conditions to level the crane • Safety device programming and adjustment to ensure accuracy and safety while lifting
 • Load weight determination • Selection of hitch and sling arrangement • Use of correct hitch configuration |
|--|--|

LEARNING TASKS

CONTENT

8. Perform the lift

- Working load limit (WLL) calculations of slings and rigging hardware
- Sling and rigging hardware angle loading calculations
- Reduction of sling and rigging hardware Working load limit (WLL) when used at an angle
- Centre of gravity
- Safe hoisting procedures
- Procedures for operating in the vicinity of high voltage equipment
- Critical lift plan
- Written lift plan

9. Move the load to the intended destination

Achievement Criteria

Performance The individual will be able to perform the procedures for a multiple crane lift to move a load to the intended destination.

Conditions To be assessed during technical training.

Criteria The individual is able to demonstrate that he/she can perform a multiple crane lift in a safe and efficient manner in accordance with the lift instructions, manufacturers' recommendations, and WorkSafeBC regulations.

Line (GAC):	N	CLIMBING CRANES
Competency:	N1	Follow assembly and raising procedures for a bottom climbing tower crane

Objectives

To be competent in this area, the individual must be able to describe the procedures to assemble and raise a bottom climbing tower crane in accordance with manufacturers' specifications.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Locate information in manufacturers' manuals
 2. Interpret information in manufacturers' manuals
 3. List the components of a bottom climbing tower crane
 4. Describe the assembly procedures for a bottom climbing tower crane
 5. List the function tests that are required prior to operation | <ul style="list-style-type: none"> • Assembly and raising procedures • Erection procedure and sequence • Balancing requirements during raising • Inspection of raising components • Wind speed limitations
 • Assembly and raising procedures • Erection procedure and sequence • Balancing requirements during raising • Inspection of raising components • Wind speed limitations
 • Hydraulic components • Jacking components • Electrical system components • Tie-in assembly • Wedges • Safety devices
 • Manufacturer's manual • Erection procedure and sequence • Qualified personnel • Written procedure • Required inspection reports
 • Limiting devices <ul style="list-style-type: none"> ○ Trolley ○ Hoist ○ Overload • Load weighing devices • Operator aids • Safety devices |
|--|--|

Achievement Criteria

Performance	The individual will be able to interpret information in manufacturers' manuals and describe the procedures for assembling and raising a bottom climbing tower crane.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she understands the procedures for assembling and raising a bottom climbing tower crane in accordance with manufacturers' specifications.

Line (GAC): N **CLIMBING CRANES**
Competency: N2 **Follow assembly and raising procedures for a top climbing tower crane**

Objectives

To be competent in this area, the individual must be able to describe the procedures to assemble and raise a top climbing tower crane in accordance with manufacturers' specifications.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Locate information in manufacturers' manuals
 2. Interpret information in manufacturers' manuals
 3. List the components of a top climbing tower crane
 4. Describe the assembly procedures for a top climbing tower crane
 5. List the function tests that are required prior to operation | <ul style="list-style-type: none"> • Assembly and raising procedures • Erection procedure and sequence • Balancing requirements during raising • Inspection of raising components • Wind speed limitations
 • Assembly and raising procedures • Erection procedure and sequence • Balancing requirements during raising • Inspection of raising components • Wind speed limitations
 • Climbing frame • Hydraulic components • Electrical system components • Tie-in assembly • Safety devices
 • Manufacturer's manual • Erection procedure and sequence • Qualified personnel • Written procedure • Required inspection reports
 • Limiting devices <ul style="list-style-type: none"> ○ Trolley ○ Hoist ○ Overload ○ Boom cut-out • Load weighing devices • Operator aids • Safety devices |
|--|--|

Achievement Criteria

Performance	The individual will be able to interpret information in manufacturers' manuals and describe the procedures for assembling and raising a top climbing tower crane.
Conditions	To be assessed during technical training.
Criteria	The individual is able to demonstrate that he/she understands the procedures for assembling and raising a top climbing tower crane in accordance with manufacturers' specifications.

Section 4

ASSESSEMENT GUIDELINES

Assessment Guidelines – Level 1

Level 1 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:		MOBILE CRANE OPERATOR AND TOWER CRANE OPERATOR LEVEL 1	
LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
A	Safety	20%	20%
B	Types and Terminology	10%	10%
C	Systems and Components	10%	10%
D	Wire Rope and Rigging	20%	20%
E	Lift Planning	23%	23%
F	Crane Applications	7%	7%
G	Transporting a Crane	5%	5%
H	Crane Maintenance	5%	5%
	Total	100%	100%
Calculated by the Training Provider Mobile Crane Operator and Tower Crane Operator level 1 in-school theory & practical subject competency weighting		60%	40%
Training Provider enters final in-school mark into SkilledTradesBC Portal		100%	

All apprentices who complete Level 1 of the Mobile Crane Operator and Tower Crane Operator program with a FINAL level mark of 70% or greater will write the Mobile Crane Operator and Tower Crane Operator SkilledTradesBC Level 1 Standardized Written Exam as their final assessment.

SkilledTradesBC will enter the apprentices' Mobile Crane Operator and Tower Crane Operator SkilledTradesBC Level 1 Standardized Written Exam mark in SkilledTradesBC Portal. A minimum mark of 70% on the examination is required for a pass.

Section 5

TRAINING PROVIDER STANDARDS

Facility Requirements

Classroom Area

- 400 square feet of classroom space (40 square feet per student).
- Temperature, noise, ventilation, and lighting are maintained at appropriate levels.
- Storage space is functional and sufficient for instructional materials, supplies, and equipment.
- Facilities have adequate floor area and ceiling height.
- Lighting control (windows and fixtures) for screen viewing.
- Tables, comfortable chairs.
- Whiteboards with marking pens and erasers.

Shop Area

- Has access to sufficient land necessary to operate multiple pieces of equipment at the same time (suggested minimum of 10 acres).
- A safety review of the program's facility and equipment is conducted annually and meets applicable safety standards/regulations.
- Clear of all hazards (power lines, underground services, etc.)

Lab Requirements

- This section does not apply.

Student Facilities

- Facilities shall offer a safe and productive learning environment.
- Meets applicable zoning bylaws for technical instruction and education.
- Meets WorkSafeBC requirements.
- Meets Private Training Institutions Branch (PTIB) requirements.

Instructor's Office Space

- Meets applicable zoning bylaws for technical instruction and education.
- Meets WorkSafeBC requirements.

Other

- This section does not apply.

Tools and Equipment

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

Personal Protective Equipment (PPE)

- Ear plugs
- Coveralls
- Face shields
- Safety glasses
- Gloves
- Hard hat
- Masks (particle/vapour)
- Safety boots
- High visibility vest

Safety Equipment

- Fire extinguishers
- First aid kit
- Spill kit
- Eyewash station

Hand Tools

- Adjustable wrench
- Combination wrenches
- Ratchet and socket set
- Pliers (various types)
- Screwdrivers (various types)
- Vice grips
- Hammers
- Pry bar
- Grease gun
- Tire pressure gauge
- Wear gauge (wire rope & sheave)
- Wire brush
- Cable cutter
- Shovel

Miscellaneous Props for Training

- Two-way radios
- Objects to lift
- Slings (various types)
- Rigging hardware (various types)
- Tag line
- Tape measure
- Carpenter level

Minimum Crane Requirements

- Minimum of three cranes, of which one must be:
 - Telescopic boom (of which one must be telescopic truck crane or rough terrain crane)
- Minimum lifting capacity 20-80 tonnes
- Tower crane with cab-mounted controls

Reference Materials

Recommended Resources

- Rigging Manual, by Donald E. Dickie, P. Eng.
Publisher: Construction Safety Association of Ontario
- IHSA Hoisting and Rigging Safety Manual <http://www.ihsa.ca/>
- Mobile Craning Today
Publisher: Operating Engineers Training Institute of Ontario, <http://www.oetio.com>
- IPT's Crane and Rigging Handbook, by Ronald G. Garby
Publisher: IPT Publishing and Training Ltd. <http://www.iptbooks.com>
- IPT's Crane and Rigging Training Manual, by Ronald G. Garby
Publisher: IPT Publishing and Training Ltd. <http://www.iptbooks.com>
- WorkSafeBC Occupational Health and Safety Regulation (OHSR)
- CAN/CSA Z150 Safety Code for Mobile Cranes
- CSA Standard Z248, Code for Tower Cranes
- ANSI Standard ANSI/ASME B30.5, Mobile and Locomotive Crane or ANSI/ASME B30.22 Articulating Boom Crane
- ANSI Standard ANSI/ASME B30.9 Slings
- ANSI Standard ANSI/ASME B30.10 Hooks
- ANSI Standard ANSI/ASME B30.20 Below-the-Hook Lifting Devices

Instructor Requirements

Occupation Qualification

The instructor must possess:

- Unrestricted Proof of Competence from BC Crane Safety and/or Interprovincial Red Seal Certificate 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).