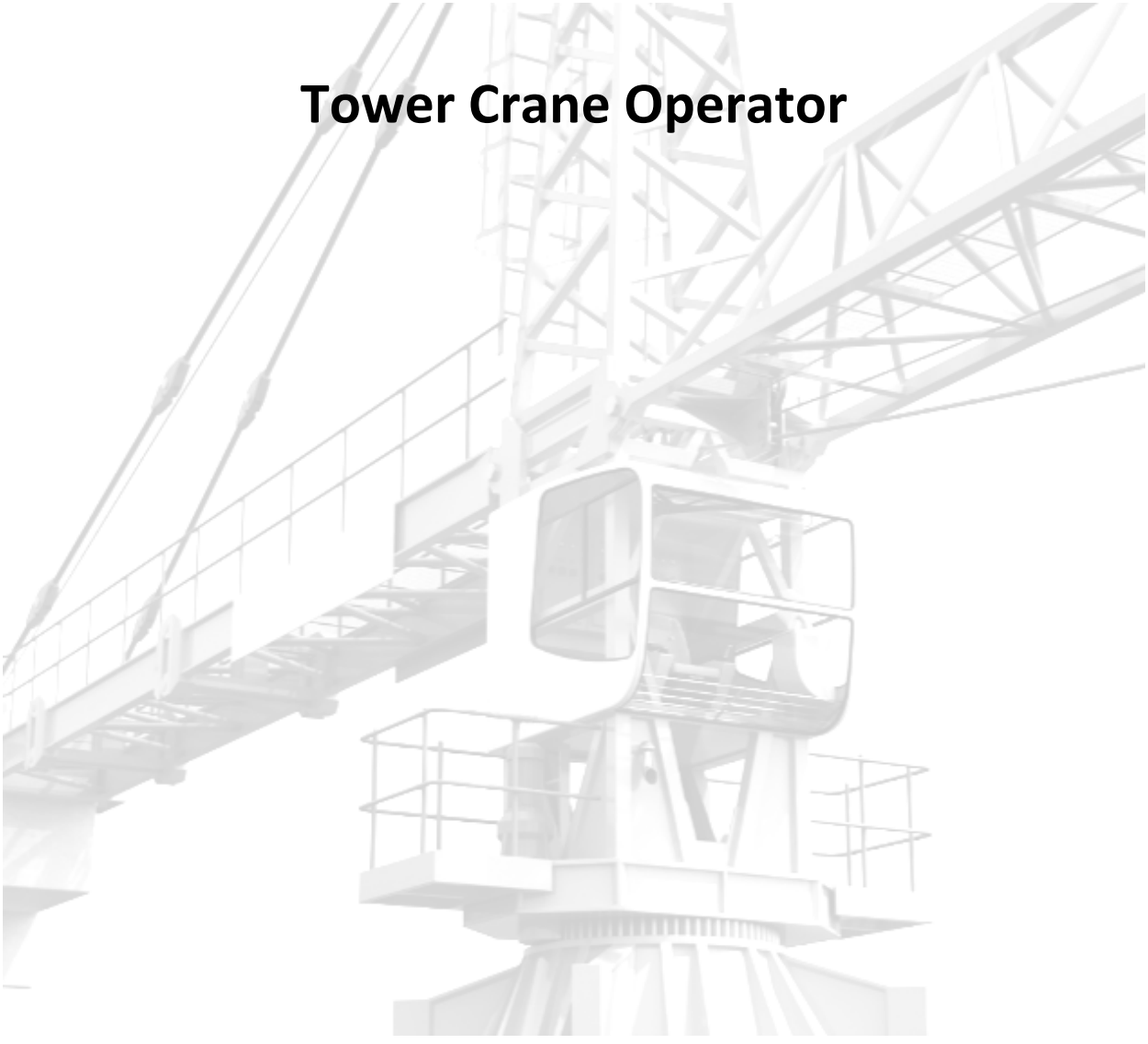
BC CRANE OPERATOR STANDARD

Tower Crane Operator



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Revision history				
Date	**Version**	**Description**	**Revised by**	**Approved by**
November 2016	1.0	Aligns with national harmonization standards	CC	FC
January 20, 2017	1.1	Incorporate BC crane industry updates	CC	FC
April 17, 2018	1.2	Incorporate boom deflection and range diagram content.	CC	FC

TOWER CRANE OPERATOR STANDARD

APPROVED BY INDUSTRY

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Developed by
BC Crane Safety
Province of British Columbia

TABLE OF CONTENTS

Section 1

INTRODUCTION

Tower Crane Operator

Foreword

This BC Association for Crane Safety (BC Crane Safety) Operator Standard is used to guide competency-based training of crane operators who operate Tower Cranes.

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

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

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

This Operator Standard 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.

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BC Crane Safety 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 Operator Standard 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	Trainees
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
OAC	Communicate the competencies that industry has defined as representing the scope of the occupation	Understand the competencies that a trainee is expected to demonstrate in order to achieve certification	View the competencies they will achieve as a result of program completion
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
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 a trainee	Provides detailed information on program content and performance expectations for demonstrating competency
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 a trainee 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

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 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
TYPES AND TERMINOLOGY **B**	Define types of cranes and classifications B1	Use crane terminology B2			
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
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
LIFT PLANNING **E**	Follow site assessment procedures E1	Determine load weights E2	Determine crane lifting capacity E3	Determine rigging requirements E4		

Category	Competency	Code	Level
CRANE OPERATIONS (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

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

Training Topics and Suggested Time Allocation

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 and classifications		✓	✓	
B2	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		✓	✓	

			% of Time Allocated to:		
		% of Time	Theory	Practical	Total
Line F	**CRANE OPERATIONS**	**35%**	**20%**	**80%**	**100%**
F1	Interpret operator manuals		✓	✓	
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 Level 1	**100%**			

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 TOWER CRANE**	**12%**	**30%**	**70%**	**100%**
K1	Conduct a site assessment for a luffing tower crane		✓	✓	
K2	Use a crane capacity chart for a luffing tower crane		✓	✓	
Line L	**LUFFING TOWER CRANE OPERATIONS**	**28%**	**20%**	**80%**	**100%**
L1	Interpret operating manuals for a luffing tower crane		✓	✓	
L2	Perform a pre-operational inspection for a luffing tower crane		✓	✓	
L3	Perform a pre-operational setup for a luffing tower crane		✓	✓	
L4	Perform hoisting techniques for a luffing tower crane		✓	✓	
L5	Operate a luffing tower crane		✓	✓	
L6	Leave a luffing tower crane unattended		✓	✓	
Line M	**SPECIALIZED OPERATIONS**	**15%**	**30%**	**70%**	**100%**
M1	Operate a crane with 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

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	CONTENT
1. Describe the format and general content of books, manuals and sources of information related to crane operations	• 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 • Safety warning decals
2. Locate specific items of information in documents related to crane operations	• Safe operating practices • Safety devices • Crane load charts • Crane setup instructions

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 worksite in accordance with Occupational Health and Safety Regulations and the training provider policy.

LEARNING TASKS	CONTENT

1. Describe unsafe workplace conditions, including hazards and obstructions	• Energy source hazards
	  o Hydraulic
	  o Electrical
	  o Pneumatic
	• Overhead hazards
	  o Power lines
	  o Cranes/other equipment
	  o Obstructions
	• Mobile machinery hazards
	  o Trucks
	  o Cranes
	  o Mobile equipment
	• Rotating equipment hazards
	  o Belts
	  o Pulleys
	  o Sheaves
	  o Sprockets
	  o Chains
	  o Pinch points
	  o Barriers

2. State the procedures for notifying local utilities when operating near utility lines or potential hazards	• WorkSafeBC regulations
3. Describe when barriers are required	• Swing hazards • Shear hazards • Traffic • Pedestrians
4. Explain the procedure for reporting incidents	• Report form completion • Report within allotted time
5. Describe operating procedures during different environmental conditions	• Load moment indicator • Operator aids • Slow operation

LEARNING TASKS	CONTENT
6. State the operator's responsibilities in maintaining a safe work environment	• Qualified operator • Full control of equipment controls • Hoist within limits • Safe handling of loads • Secure loads
7. Wear, maintain, and remove from service personal protective clothing and equipment as appropriate	• Hard hat • Boots • Eyewear • Hearing protection
8. Use the 3-point contact method when mounting and dismounting cranes and other heavy equipment	• Manufacturer specific access systems • Handholds and step ladders • Security of components • Safe access to equipment
9. Complete a report to record an incident	• Reporting procedures • Report within allotted time • OHS requirements • Employer requirements

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

1. Describe recommended fire safety procedures	• Fire extinguishers
	  o Types and capacities
	  o Servicing
	  o Use
	• Fighting electrical fires
	  o Power isolation
	  o Appropriate firefighting equipment
	• Fire emergency response and evacuation procedures in accordance with industry practice

2. Describe various types of firefighting equipment normally found on a worksite	• Fire extinguishers
	  o Types and capacities
	  o Servicing
	  o Use

3. State the requirements for fall protection training on the worksite	• WorkSafeBC regulations • Company policy
4. State the procedure for an emergency rescue from a crane (e.g., tower crane operator station, crane incident, fire)	• High angle rescue procedure • Dedicated emergency platform (DEP) • Call 911

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
1. State the procedures for operating in proximity of electrical sources	• Limits of approach • Required documentation • Assurance in writing • Lockout procedures • Tag lines
2. State safe limits of approach to electrical sources	• WorkSafeBC regulations
3. Describe the procedures recommended in the event of contact with high voltage	• Safe exit (if possible) • Remain at a safe distance • Contact proper authorities
4. State the procedure for reporting contact with high voltage	• WorkSafeBC regulations • Call owner of the power system
5. Interpret signage related to high voltage	• Limits of approach signage • Line voltage

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 worksite 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
1. Explain the requirements for a signaller	• Accurate descriptions • Identification and interpretation • Signal relaying for a blind lift
2. Describe personnel involved in crane operations	• Site supervisor • Crane operator • Rigger • Signal person • CSO – construction safety officer
3. Demonstrate and interpret standard hand signals used during crane operations	• WorkSafeBC regulations

4. Demonstrate the use of two-way electronic voice communication devices	• Basic functions of the radio communication devices
	• Language and terminology
	  o Short form words and phrases
	  o 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

5. Demonstrate effective oral communications	• Tact • Diplomacy • Assertiveness
6. Demonstrate effective written communications	• Report writing • Recording • Communication plan
7. Interpret worksite audio signals	• Horn signals

Line (GAC): B TYPES AND TERMINOLOGY

Competency: B1 Define types of cranes and classifications

Objectives

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

LEARNING TASKS	CONTENT
1. Identify various types of cranes	• Boom trucks • Mobile cranes • Tower cranes • Self-erect cranes
2. Categorize various types of cranes	• 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)

Line (GAC): B TYPES AND TERMINOLOGY

Competency: B2 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

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	• Suspension systems • Carbody • Wheels • Tires • Tracks
2. State the function of carrier/undercarriage components	• Propel equipment • Base for upperworks
3. Identify carrier/undercarriage components	• Suspension systems • Carbody • Wheels • Tires • Tracks
4. Recognize defects or malfunctions of the carrier/undercarriage	• 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	• 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	• Increase lifting capacity • Provide a stable base • Levelling

LEARNING TASKS	CONTENT
7. Identify outrigger and stabilizing equipment	• Outrigger beams • Outrigger jacks • Outrigger pads • Retaining pins for outrigger pads • Hydraulic hoses • Holding valves • Correct outrigger beam extension and marking(s)
8. Recognize defects or malfunctions of outrigger and stabilizing equipment	• Cracked welds • Bent beams • Damaged hoses • Damaged cylinders • Hydraulic oil leaks
9. List the components of a turntable and/or turret	• Swing circle • Bearings • Hook rollers • Bolts • Gears • Swing gear
10. State the function of turntable and/or turret components	• Base for mounting boom • Method of attaching upperworks to carrier • Enables upperworks to rotate
11. Identify the components of the turntable and/or turret	• Swing circle • Bearings • Hook rollers • Bolts • Gears • Swing gear
12. Recognize defects or malfunctions of the turntable and/or turret components	• Loose, cracked, missing bolts and/or incorrect bolts • Structural cracks • Gear wear • Bearing wear • Deformation and distortions • Worn components

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	• Block • Pistons • Connecting rods • Camshafts
2. State the function of the power plant components	• 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	• Block • Pistons • Connecting rods • Camshafts
4. Recognize defects or malfunctions of the power plant system	• 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	• Clutch • Transmission • Differentials • Power take-offs • Hydraulic motors • Drive lines
6. State the function of the drive system components	• Supply and/or transfer of power to drive systems

LEARNING TASKS	CONTENT
7. Identify the components of the drive system	• Clutch • Transmission • Differentials • Power take-offs • Hydraulic motors • Drive lines
8. Recognize defects or malfunctions of the drive system	• Loose, cracked, missing bolts and/or incorrect bolts • Structural cracks • Worn components • Oil leaks • Low operating oil pressure

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	• Brakes • Compressor • Governor • Horn • Seats • Boom pawl • Boom cut-out • Control levers
2. State the function of the pneumatic components	• Provide power to air systems • Provide a method of controlling air systems
3. Identify the components of the pneumatic system	• Brakes • Compressor • Governor • Horn • Seats • Boom pawls • Boom cut-out • Control levers
4. Recognize defects or malfunctions of the pneumatic system	• 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	• Hydraulic fluid • Filters • Lines • Pumps • Motors • Fittings

LEARNING TASKS	CONTENT
	• Control levers
6. State the function of the hydraulic system components	• Convert mechanical force to hydraulic power • Convert fluid energy to mechanical force • Convert fluid power into linear motion
7. Identify the components of the hydraulic systems	• Hydraulic fluid • Fluid reservoir • Filters • Lines • Pumps • Motors • Fittings • Control levers • Electric over hydraulic systems
8. Recognize defects and malfunctions of the hydraulic system	• Loose, cracked, missing bolts • Structural cracks • Worn components • Oil leaks • Low operating oil pressure • High operating temperature • Damaged hoses • Controls sticking
9. List the components of electrical systems	• Alternator • Starter • Regulator • Wiring • Fuses • Electric motor • Switches • Limit switches • Batteries
10. State the function of the electrical system components	• Provide power to electrical systems • Provide method of controlling electrical systems
11. Identify the components of the electrical system	• Alternator • Starter • Regulator • Wiring • Fuses

LEARNING TASKS	CONTENT
	• Electric motor • Switches • Limit switches • Batteries
12. Recognize defects or malfunctions of the electrical system	• Electrical shorts • Damaged fuses • Bare wires • Belt tension • Battery electrolyte level

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	• 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	• Manufacturers' manuals • Provide power to steering system • Provide method of controlling steering system
3. Identify the components of the steering system	• 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	• Loose, cracked, missing bolts • Structural cracks • Worn components • Oil leaks • Low operating pressure • Adjustment • Alignment • Lack of lubrication

LEARNING TASKS	CONTENT
5. List the components of the braking system	• Air compressor • Governor • Brake chambers • Drums • Brake bands • Brake shoes and pads • Slack adjusters • Parking brakes
6. State the function of the braking system components	• Provide power to braking system • Provide method of controlling braking system
7. Identify the components of the braking system	• Air compressor • Governor • Brake chambers • Drums • Brake bands • Brake shoes and pads • Slack adjusters • Parking brakes
8. Recognize defects or malfunctions of the braking systems	• 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

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	• Drums • Hook block/ball • Sheaves • Winch • Brakes and clutches • Trolley • Rollers • Hoist line
2. State the function of the hoisting system components	• Provide power to hoisting system • Provide method of controlling hoisting system
3. Identify the components of the hoisting system	• 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	• 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	• Boom extensions • Boom stabilizers • Jibs • Suspended work platforms • Heavy lift attachments

LEARNING TASKS	CONTENT
	• Dragline • Clamshell • Drilling unit • Pile driving unit (drop hammer, diesel hammer) • Extraction unit
6. State the function of each attachment	• Manufacturers' manuals
7. Identify the attachments	• Boom extensions • Boom stabilizers • Jibs • Suspended work platforms • Heavy lift attachments • Dragline • Clamshell • Drilling unit • Pile driving unit (drop hammer, diesel hammer) • Extraction unit
8. Recognize defects or malfunctions of an attachment	• Loose, cracked, missing bolts • Structural cracks • Worn components • Oil leaks • Damaged components • Damaged cable

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

1. List the safety components, devices, and aids for a variety of crane types	• Safety guards
	• Covers
	• Load weighing devices
	  o Load Moment Indicator (LMI)
	  o Load indicator
	  o Rated capacity indicator
	  o Rated capacity (load) limiter
	• Anti-two block devices
	• Boom length indicator
	• Boom angle indicator
	• Boom hoist limiter
	• Drum rotation indicator

2. State the function of safety components, devices, and aids for the crane	• Manufacturers' manuals • Prevent overloading of crane components
3. State the action to be taken when safety devices are not functioning	• Company policy • Manufacturer's recommendations • WorkSafeBC regulations

4. Identify the safety components, devices, and aids for the crane	• Safety guards
	• Covers
	• Load weighing devices
	  o Load Moment Indicator (LMI)
	  o Load indicator
	  o Rated capacity indicator
	  o Rated capacity (load) limiter
	• Anti-two block devices
	• Boom length indicator
	• Boom angle indicator
	• Boom hoist limiter
	• Drum rotation indicator

LEARNING TASKS	CONTENT
5. Identify on-board crane operator aids and ensure that they are applicable, legible, and current for the crane	• Load charts • Operator's manual • Log book
6. Program the LMI using appropriate crane configuration and lift data	• Counterweight configuration • Outrigger configuration • Boom length • Parts of line • Attachments
7. Recognize defects or malfunctions of safety devices, components, and aids for the crane	• Mounting configuration • Structural cracks • Damaged components • Electrical malfunction • Damaged wiring

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	CONTENT
1. List various types of wire rope	• Conventional construction wire rope • Anti-rotational wire rope • Types of cable construction • Slings • Duty cycle wire rope • Hoist line • Trolley line
2. State the characteristics of each type of wire rope	• Working load limit (WLL) of wire rope • Design factors
3. State the uses of each type of wire rope	• Slings • Duty cycle wire rope • Boom hoist line • Load hoist line
4. Identify various types of wire rope	• Conventional construction wire rope • Anti-rotational wire rope • Types of cable construction • Slings • Duty cycle wire rope • Hoist line • Trolley line

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	CONTENT

1. Describe procedures for installing wire rope on a hoist drum	• Winding direction (over/under)
	• Method of drum termination
	• Proper spooling on drum
	• Wire rope system components
	  o Rope guides
	  o Drums
	  o Blocks
	  o Hooks
	  o Sheaves

2. Describe reeving multi-part crane blocks	• Wedge and socket termination • Install wedge sockets • Reeving blocks
3. Identify hoisting system components	• Rope guides • Drums • Blocks • Hooks • Sheaves • Wedge and socket termination
4. Interpret manufacturers' certificate of origin	• Manufacturer's literature

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
1. Describe the inspection procedure for wire ropes	• WorkSafeBC regulations • Manufacturer's specifications • ASME standards
2. State the criteria to remove damaged or defective wire rope from service	• Lubrication • Excessive wear • Bird caging • Kinking • Flattening • Proper spooling • Broken wires • Distortion
3. State the process to remove damaged or defective wire rope from service	• Company policy • Manufacturer policy
4. Examine wire rope for defects	• Lubrication • Excessive wear • Bird caging • Kinking • Flattening • Proper spooling • Broken wires • Distortion
5. Examine drum for proper installation of the wire rope	• Winding direction (over/under) • Proper spooling on drum • Drum termination • Tension required
6. Record inspection and defects in log book	• Inspection recording • Documentation of defects
7. Report defects and deficiencies to appropriate personnel	• Requirements for reporting defects • Company policy • WorkSafeBC regulations

LEARNING TASKS	CONTENT
8. Describe the inspection procedure for slings and rigging hardware	• WorkSafeBC regulations • Manufacturer's specifications
9. State the criteria for removing slings and rigging hardware from service	• Lubrication • Excessive wear • Bird caging • Kinking • Flattening • Broken wires • Distortion • Missing components • Illegible capacity information
10. State the procedure for replacing various types of safety clips	• Manufacturer policy
11. State the process for removing slings and rigging hardware from service	• Company policy • Manufacturer policy
12. State when repair to slings and rigging hardware is acceptable	• Manufacturer policy • WorkSafeBC regulations
13. Examine slings and rigging hardware for defects	• Damage • Cracks • Safety clips • Lubrication • Excessive wear • Bird caging • Kinking • Flattening • Broken wires • Distortion • Missing components • Illegible capacity information
14. Report defects and deficiencies to appropriate personnel	• Requirements for reporting defects • Company policy

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
1. List the various slings	• Chain • Wire rope • Metal mesh • Synthetic web • Synthetic rope • Synthetic round
2. Describe the various hitch configurations	• Vertical • Choker • Basket • Bridle
3. State the use of slings	• Working load limit • Capacity required • Uses and limitations
4. Interpret specific information on slings from manufacturers' and rigging manuals	• Correct usage • Capacities • User warnings • Temperature restrictions
5. Identify a variety of slings used in crane operations	• Chain • Wire rope • Metal mesh • Synthetic web • Synthetic rope • Synthetic round
6. List the various rigging hardware	• Hooks • Shackles • Eye bolts • Hoist rings • Turnbuckles • Cable clamps • Softeners/sling protection • Lifting clamps

LEARNING TASKS	CONTENT
	• Lifting beams • Spreader bars • Equalizer beams
7. State the use of rigging hardware	• Manufacturers' manuals • Capacity required • Limitations
8. Interpret specific information on rigging hardware from manufacturers' and rigging manuals	• Correct usage • Capacities • User warnings • Temperature restrictions
9. Identify a variety of rigging hardware used in crane operations	• Hooks • Shackles • Eye bolts • Hoist rings • Turnbuckles • Cable clamps • Softeners/sling protection • Lifting clamps • Lifting beams • Spreader bars • Equalizer beams

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	CONTENT
1. Describe lifting theory and forces as they apply to lifting loads	• Centre of gravity • Tension on slings and hardware when used at an angle
2. Select appropriate slings and hardware for a load	• Weight of load • Size of load • Angle of loading (sling tension)
3. Establish safe and efficient rigging procedures for a lift	• Written lift plan • Critical lift plan • Company/site requirements

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	• Manufacturer policy • Company policy • Environmental conditions
2. Describe how to perform routine maintenance on various types of slings	• Manufacturer policy • Company policy • Environmental conditions
3. Describe how to perform routine maintenance on various types of rigging hardware	• Manufacturer policy • Company policy • Environmental conditions
4. State the criteria for lubricating wire rope	• Manufacturer policy • Company policy • Environmental conditions
5. Describe how to perform rigging hardware lubrication	• Manufacturer policy • Company policy • Environmental conditions
6. Describe procedures for cutting wire rope	• Manufacturer policy
7. State the criteria for storing wire rope	• Manufacturer policy • Company policy • Environmental conditions
8. State the criteria for storing slings and rigging hardware	• Manufacturer policy • Company policy • Environmental conditions
9. Identify wire ropes requiring lubrication	• Visual inspection
10. Lubricate wire rope using the appropriate application method	• Manufacturer policy • Company policy
11. Record the routine maintenance in the log book	• Manufacturer policy • Company policy • WorkSafeBC regulations

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	CONTENT
1. State the elements of a lift plan	• 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
2. State the purpose of site blueprints in preparing a lift plan	• 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
3. State the purpose of an engineered drawing in preparing a lift plan	• 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	CONTENT
4. Establish the location of the crane	• 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
5. Determine blocking/mats required for various load-bearing surfaces	• Proper blocking methods • Ground bearing capability • Suspended slab • Uneven supporting surface
6. Determine the requirement for communications, signal persons, signallers, traffic control, barriers, grounding and bonding	• WorkSafeBC regulations • Company policy • Operating clearance • Traffic control • Pedestrian traffic

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	CONTENT
1. Demonstrate the functions of a scientific calculator to perform mathematical calculations	• Manufacturer's instructions
2. Perform fundamental mathematical functions	• 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
3. Calculate load weights	• Volume of an object • Weight of a cubic unit of an object • Weight of components • Gross weight of a load
4. Verify load weights	• Engineer's drawing • Blueprint • Bill of lading • Calculation

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	• Class 1 lever • Class 2 lever • Class 3 lever • Centre of gravity
2. State the elements of a basic crane capacity chart	• Boom length • Boom angle • Attachments • Radius • Quadrant of operation • Operating notes • Deductions from capacity • Range diagram • Outrigger position • Counterweight configuration
3. Describe capacities	• Gross capacity • Net capacity
4. Describe load calculations	• Gross load • Net load
5. Determine whether the lift can be done within manufacturers' specifications	• Crane load chart • Crane configuration • Load weight • Load configuration • Weight of load handling devices
6. Establish optimum boom configurations	• Boom length • Boom angle • Radius • Hook height • Quadrants of operation
7. Locate the specific information from a basic crane capacity chart	• Boom length • Boom angle • Attachments

LEARNING TASKS	CONTENT
	• Radius • Quadrant of operation • Operating notes • Deductions from capacity • Range diagram • Outrigger position • Counterweight configuration
8. Select a configuration appropriate for lifting the load	• Radius • Parts of line • Height • Combined weight of the load and rigging
9. Verify the crane configuration is appropriate for the lift	• Crane load chart • Load weight • Load configuration • Weight of load handling devices • Quadrant of operation • Length of boom • Load radius • Attachments

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
1. State the criteria to select the appropriate slings and rigging hardware	• Weight of load • Size of load • Load configuration
2. State the criteria to select the appropriate safety devices	• WorkSafeBC regulations • Manufacturers' manuals • Company policy
3. Determine the load configuration	• Calculation • Visual
4. Verify characteristics of the load	• Height • Width • Length • Weight
5. Calculate/verify the centre of gravity of the load	• Stamped on load • Mathematical formula • Blueprint
6. Verify any special lift instructions	• Lift plan • Supplier specifications
7. Calculate the Working Load Limit (WLL) for slings and rigging hardware	• Manufacturers' manuals • Mathematical formulas
8. Calculate the load on slings and rigging hardware of equal and unequal lengths	• Manufacturers' manuals • Mathematical formulas

Line (GAC): F CRANE OPERATIONS

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	CONTENT
1. Locate specific information in a manufacturer's manual	• Inspection • Setup • Operation • Safety • Maintenance
2. Interpret specific information in a manufacturer's manual	• Inspection • Setup • Operation • Safety • Maintenance

Line (GAC): F CRANE OPERATIONS

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	• Manufacturer's manual
2. Verify that all the operator aids for the crane are in place	• Manufacturer's manual
3. Confirm that all reports are completed and filed	• Periodic inspections • Erection reports • WorkSafeBC regulations • Training provider
4. Confirm that all safety and emergency devices are in place and operational	• Manufacturers' manuals • WorkSafeBC regulations
5. Locate all controls and system gauges	• Manufacturers' manuals
6. Perform a pre-operational inspection for a crane	• Manufacturers' procedures • Company policy
7. Perform a function test on the operating controls	• Manufacturers' procedures
8. Perform basic repairs and maintenance	• Manufacturers' manuals • Company policy
9. Report any defects or deficiencies to the supervisor	• Manufacturers' manuals • Company policy • WorkSafeBC regulations
10. Record any defects or deficiencies in the crane log book	• Company policy • WorkSafeBC regulations
11. Record all repairs or maintenance in the appropriate crane log book	• Company policy • WorkSafeBC regulations

Line (GAC): F CRANE OPERATIONS

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	CONTENT
1. State the setup procedure	• Manufacturer's specifications • Safety device programming to ensure safety while lifting
2. Identify hazards in the lift area	• Overhead obstructions • Underground hazards • Electrical sources
3. Ensure that the supporting surface is sufficient	• Type of blocking and mats • Size of blocking and mats • Types of soil • Load bearing capacity
4. Program or adjust safety devices according to manufacturers' recommendations	• LMI (load monitoring and indicating systems) • Anti two block systems • Boom angle indicators • Manufacturers' manuals

Line (GAC): F CRANE OPERATIONS

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
1. Describe a pick and carry procedure	• Slow travel speed • Shortest boom length possible • Load as low as possible • Boom oriented as specified by the manufacturer • Load restrained from swinging
2. Describe the procedure for operating in the vicinity of high voltage equipment	• Assurance in writing • WorkSafeBC regulations • Limits of approach • Required documentation • Tag lines
3. Describe the procedures for doing a blind lift	• Use of radio when signal person not visible • Use of second signal person when one is not visible • Company policy
4. Describe the procedure for lifting a crane suspended work platform	• 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

5. Operate a crane with and without a load	• With a load
	  o Reference to load chart
	  o Use of outriggers/stabilizers
	  o Levelling crane
	  o Booming up and booming down
	  o Swinging/slewing clockwise

LEARNING TASKS	CONTENT
	and counterclockwise o Hoisting and lowering o Telescope or trolley in and out o Quadrants of operation o Picking and placing a load accurately and smoothly o Static/dynamic loading o Causes and consequences of overloading o Travelling on site (if allowed) • Without a load o Reference to load chart o Use of outriggers/stabilizers o Levelling crane o Booming up and booming down o Swinging/slewing clockwise and counterclockwise o Hoisting and lowering o Telescope or trolley in and out o Quadrants of operation o Travelling on site (if allowed)
6. Adjust procedures according to environmental conditions	• Operator aids • Slow operation
7. Maintain control of the hook block in a safe manner during all functions	• Booming up/down • Swinging/slewing • Travelling with a load
8. Perform a pick and carry lift	• Slow travel speed • Shortest boom length possible • Load as low as possible • Boom oriented as specified by the manufacturer • Load restrained from swinging
9. Perform a lift in proximity to simulated high voltage equipment	• Assurance in writing • WorkSafeBC regulations • Limits of approach • Required documentation • Tag lines • Safety watcher

LEARNING TASKS	CONTENT
10. Perform a blind lift	• Use of radio when signal person not visible • Use of second signal person when one is not visible • Company policy

Line (GAC): F CRANE OPERATIONS

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	CONTENT

1. Plan the lift	• 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
	  o Lift supervisor
	  o Operator
	  o Rigger
	  o Signal person
	• Crane capacity sufficient for load throughout the lift
	• Critical lift
	• Tandem lift
	• Signalling and barrier signage

2. Assess the lift site	• Assessment of area and soil condition • Assessment of hazards • Assessment of obstacles • Overhead hazards • Underground utilities • Travel path
3. Perform a pre-operational inspection of the crane	• Accurate inspection • Place, location and verification of operator aids • Inspection and erection reports
4. Set up the crane	• Manufacturer's manuals • Overhead obstructions and underground hazards

LEARNING TASKS	CONTENT
	• 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
5. Rig the load	• 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 WLL when used at an angle
6. Hoist/lower the load	• Safe hoisting/lowering procedures • Procedures for operating in the vicinity of high voltage equipment • Blind lift
7. Monitor equipment performance	• Unusual noises/vibrations • Operator aids
8. Troubleshoot equipment problems	• Manufacturers' manuals
9. Move the load to the intended destination	• Safe load lifting and placement • Secure load before unhooking
10. Perform a post-operational procedure	• Company policy

Line (GAC): F CRANE OPERATIONS

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	CONTENT

1. Plan the lift	• 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
	  o Lift supervisor
	  o Operator
	  o Rigger
	  o Signal person
	• Crane capacity sufficient for load throughout the lift
	• Critical lift
	• Tandem lift
	• Signalling and barrier signage

2. Assess the lift site	• Assessment of area • Assessment of hazards • Assessment of obstacles • Travel path
3. Perform a pre-operational inspection of the crane	• Accurate inspection • Place, location and verification of operator aids • Inspection and erection reports
4. Rig the load	• 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

LEARNING TASKS	CONTENT
	loading calculations • Reduction of sling and rigging hardware WLL when used at an angle
5. Hoist/lower the load	• Safe hoisting/lowering procedures • Procedures for operating in the vicinity of high voltage equipment • Blind lift
6. Monitor equipment performance	• Unusual noises/vibrations • Operator aids
7. Troubleshoot equipment problems	• Manufacturers' manuals
8. Move the load to the intended destination	• Safe load lifting and placement • Secure load before unhooking
9. Perform a post-operational procedure	• Company policy

Line (GAC): F CRANE OPERATIONS

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	CONTENT
1. State the procedure for leaving a crane unattended for short periods of time (e.g. lunch breaks)	• 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)
2. State the procedure for leaving a crane unattended for long periods of time (e.g. overnight, weekends)	• 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
3. Perform shutdown procedure	• 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

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

1. Locate related sections of the Commercial Transport Regulations	• Criteria for special permits
	  o Over height
	  o Over weight
	  o Over length
	  o Gross vehicle weight

2. Interpret related sections of the Commercial Transport Regulations	• Criteria for special permits
	  o Over height
	  o Over weight
	  o Over length
	  o Gross vehicle weight

3. State the criteria that would warrant special permits for travel or transport of a crane on public roads	• Over height • Over length • Over width • Over weight

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	CONTENT

1. Determine the procedure to prepare a rubber-tired truck crane for travel	• Requirements
	  o Flags
	  o Lights
	  o Permits
	  o Security of components
	• Procedure
	  o Boom retraction
	  o Outrigger beam retraction and pinning
	  o Outrigger pad removal
	  o Swing brake/lock application (if applicable)
	  o Securement of block/ball
	• Correct and serviceable signage and signals
	  o Commercial Transport Regulations
	  o Flags
	  o Flashers
	  o Warning signs
	• Permits required
	• Manufacturer's manual

2. Secure the components and/or load on a rubber-tired truck crane to prevent shifting during travel	• Recommended securement procedures • Commercial Transport Regulations
3. Verify that all permits are in order for travel on a public highway	• Commercial Transport Regulations • Municipal 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

1. Describe the requirements of a transporter to transport a crane on public roads	• Safe loading and securing of the crane and components for transporter travel
	  o Manufacturer's manual
	  o Commercial Transport Regulations
	  o Security of components
	• Capacity of trailer
	• Length of trailer
	• Width of trailer

2. Describe the procedure for preparing a crane for transporter travel	• Manufacturer's manual • Commercial Transport Regulations
3. Ensure the transporter is suitable to transport the crane and components	• Capacity of trailer • Length of trailer • Width of trailer • Valid certification
4. Load and secure the crane and components on a transporter	• Manufacturer's manual • Commercial Transport Regulations
5. Ensure that all flags, flashers and warning signs are in place and serviceable	• Colour of flags • Size of flags • Legible signs
6. Verify that all permits are in order for the crane and transporter	• Commercial Transport Regulations • Municipal regulations
7. Unload the crane and components from the transporter	• Proper lifting devices • Attachment points • Sufficient crane capacity • Qualified personnel

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	CONTENT
1. Describe assembly/disassembly procedures as recommended by the manufacturer	• 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
2. Ensure area to be used for assembly or disassembly is secure and free of obstructions	• Hazard assessment • Barricades
3. Position crane for assembly/disassembly	• Assembly/disassembly plan

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	CONTENT
1. List the tools required to perform basic maintenance	• Grease gun • Adjustable wrenches • Combination wrenches • Sockets • Mallets • Screwdrivers • Hammers • Vice grips • Pliers • Pry bars • Ladders • Measuring devices
2. State the function of the tools required for basic maintenance	• Manufacturer's manual • Supplier's information
3. Identify the tools required to perform basic maintenance	• Grease gun • Adjustable wrenches • Combination wrenches • Sockets • Mallets • Screwdrivers • Hammers • Vice grips • Pliers • Pry bars • Ladders • Measuring devices
4. Select the appropriate tools for an application	• Manufacturer's manual • Supplier's information

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
1. List factors that influence the operator's maintenance responsibilities	• Legalities • Location • Capabilities • Tool availability
2. Interpret maintenance information from manufacturers' manuals	• Inspection frequency • Servicing schedules
3. Select the correct fluids and lubricants	• Manufacturer's manual • Company policy
4. Perform preventative crane maintenance	• 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
5. Adjust control mechanisms	• Slack adjusters • Rollers • Cables • Brakes • Clutches
6. Perform structural maintenance	• Bolts • Wedges • Cotter keys • Cotter pins • Guard rails

LEARNING TASKS	CONTENT
7. Clean crane components	• Batteries • Cab • Windows • Wheels • Tracks
8. Repair or replace defective components	• Manufacturer's manual • Company policy
9. Report defects and deficiencies to supervisor	• WorkSafeBC regulations • Company policy
10. Record maintenance performed and requested in the log book	• WorkSafeBC regulations • Company policy • Manufacturer's manual

Level 2

Tower Crane Operator

Line (GAC): I LIFT PLANNING – HAMMERHEAD TOWER CRANE

Competency: I1 Conduct a site assessment for a hammerhead tower crane

Objectives

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

LEARNING TASKS	CONTENT
1. Establish the location of the lift	• Initial location of the load • Load placement • Obstructions in the area • Location of electrical power lines • Environmental conditions • Other potential hazards

2. Determine the requirement for communications, signaller, traffic control, barriers, grounding and bonding	• Type of lift
	• Pedestrian traffic
	• Electrical sources
	• Method of communication
	  o Audio
	  o Video
	  o Hand signals

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	• 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	• Jib/boom length • Attachments • Radius • Gear capacity • Parts of line • Range diagram
3. Locate the specific information from a crane capacity chart	• Jib/boom length • Attachments • Radius • Gear capacity • Parts of line • Range diagram
4. Determine whether the lift can be done within manufacturers' specifications	• Capacity chart for crane configuration • Weight of the load • Weight of the rigging • Line weight deduction (if applicable) • Gear capacity

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	CONTENT
1. Locate specific information in a manufacturer's manual	• Inspection • Setup • Operation • Safety • Maintenance
2. Interpret specific information in a manufacturer's manual	• Inspection • Setup • Operation • Safety • Maintenance

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	• Manufacturer's manual
2. Verify that all the operator aids for the crane are in place	• Manufacturer's manual
3. Confirm that all reports are completed and filed	• Periodic inspections • Erection reports • WorkSafeBC regulations • Company policy
4. Confirm that all safety and emergency devices are in place and operational	• Manufacturer's manual • WorkSafeBC regulations
5. Locate all controls and system gauges	• Manufacturer's manual
6. Perform a pre-operational inspection	• Manufacturer's procedures
7. Perform a function test on the operating controls	• Manufacturer's procedures
8. Perform basic repairs and maintenance	• Manufacturer's manual • Company policy
9. Report any defects or deficiencies to the supervisor	• Manufacturer's manual • Company policy • WorkSafeBC regulations
10. Record any defects or deficiencies in the crane log book	• Company policy • WorkSafeBC regulations
11. Record all repairs or maintenance in the appropriate crane log book	• Company policy • 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	CONTENT
1. State the setup procedure	• Manufacturer's specifications • Sufficient counterweight/ballast for crane configuration • Correct configuration for type of base • Sufficient parts of line
2. Identify hazards in the lift area	• Overhead obstructions • Underground hazards • Electrical sources
3. Ensure that the supporting surface is adequate	• 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
4. Program or adjust safety devices according to manufacturers' recommendations	• LMI (load monitoring and indicating systems) • Anti two block systems • Trolley limit switches • Manufacturers' manuals

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	CONTENT
1. Operate a crane with and without a load	• Trolley in and out • Slew clockwise and counterclockwise • Hoist up and down
2. Maintain control of the hook block during all functions	• Trolley in and out • Slew clockwise and counterclockwise • Hoist up and down • Boom deflection

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	CONTENT
1. Assess the lift site	• Assessment of area • Assessment of hazards • Assessment of obstacles • Travel path

2. Plan the lift	• 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
	  o Lift supervisor
	  o Operator
	  o Rigger
	  o Signal person
	• Crane capacity sufficient for load throughout the lift
	• Critical lift
	• Tandem lift
	• Signalling and barrier signage

3. Perform a pre-operational inspection of the crane	• Accurate inspection • Place, location and verification of operator aids • Limit devices/overload prevention • Test blocks • Inspection and erection reports
4. Monitor equipment performance	• Unusual noises/vibrations • Operator aids
5. Troubleshoot equipment problems	• Manufacturers' manuals

LEARNING TASKS	CONTENT
6. Move the load to the destination	• Safe load lifting and placement • Secure load before unhooking
7. Perform a post-operational procedure	• Company policy

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
1. State the procedure for leaving a crane unattended for short periods of time (e.g. lunch breaks)	• No load on the hook • Hook elevation • Power source turned off • Swing brake application (if applicable) • Weathervaning (if applicable)
2. State the procedure for leaving a crane unattended for long periods of time (e.g. overnight, weekends)	• No load on the hook • Hook elevation • Power source turned off • Swing brake application (if applicable) • Weathervaning (if applicable) • Access prevention to crane
2. Perform shutdown procedure	• Shut down and secure equipment as per manufacturer and site policy • Housekeeping tasks • Post-operational inspection

Line (GAC): K LIFT PLANNING – LUFFING TOWER CRANE

Competency: K1 Conduct a site assessment for a luffing tower crane

Objectives

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

LEARNING TASKS	CONTENT
1. Establish the location of the lift	• 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
2. Determine the requirement for communications, signaller, traffic control, barriers, grounding and bonding	• WorkSafeBC regulations • Company policy • Operating clearance • Traffic control • Pedestrian traffic

Line (GAC): K LIFT PLANNING – LUFFING TOWER CRANE

Competency: K2 Use a crane capacity chart for a luffing tower crane

Objectives

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

LEARNING TASKS	CONTENT
1. Establish the hook radius required to lift a load	• Crane load chart • Net weight of load • Gross weight of load
2. State the elements of a crane capacity chart	• Jib/boom length • Attachments • Radius • Parts of line • Range diagram
3. Locate the specific information from a crane capacity chart	• Jib/boom length • Attachments • Radius • Parts of line • Range diagram
4. Determine whether the lift can be done within manufacturers' specifications	• Capacity chart for crane configuration • Weight of the load • Weight of the rigging

Line (GAC): L LUFFING TOWER CRANE OPERATIONS

Competency: L1 Interpret operating manuals for a luffing 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 tower crane.

LEARNING TASKS	CONTENT
1. Locate specific information in a manufacturer's manual	• Inspection • Setup • Operation • Safety • Maintenance
2. Interpret specific information in a manufacturer's manual	• Inspection • Setup • Operation • Safety • Maintenance

Line (GAC): L LUFFING TOWER CRANE OPERATIONS

Competency: L2 Perform a pre-operational inspection for a luffing 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 tower crane in accordance with manufacturers' recommendations and WorkSafeBC regulations.

LEARNING TASKS	CONTENT
1. State the recommended sequence of inspection	• Manufacturer's manual
2. Verify that the operator aids for the crane are in place	• Manufacturer's manual
3. Confirm that all reports are completed and filed	• Periodic inspections • Erection reports • WorkSafeBC regulations • Company policy
4. Confirm that all safety and emergency devices are in place and operational	• Manufacturer's manual • WorkSafeBC regulations
5. Locate all controls and system gauges	• Manufacturer's manual
6. Perform a pre-operational inspection	• Manufacturer's procedures
7. Perform a function test on the operating controls	• Manufacturer's procedures
8. Perform basic repairs and maintenance	• Manufacturer's manual • Company policy
9. Report any defects or deficiencies to the supervisor	• Manufacturer's manual • Company policy • WorkSafeBC regulations
10. Record any defects or deficiencies in the crane log book	• Company policy • WorkSafeBC regulations
11. Record all repairs or maintenance in the appropriate crane log book	• Company policy • WorkSafeBC regulations

Line (GAC): L LUFFING TOWER CRANE OPERATIONS

Competency: L3 Perform a pre-operational setup for a luffing tower crane

Objectives

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

LEARNING TASKS	CONTENT
1. State the setup procedure	• Manufacturer's specifications • Safety device programming to ensure safety while lifting • Correct configuration for type of base • Sufficient parts of line
2. Identify hazards in the lift area	• Overhead obstructions • Underground hazards • Electrical sources
3. Ensure that the supporting surface is adequate	• Type of blocking and mats (if applicable) • Size of blocking and mats (if applicable) • Travelling base level (if applicable) • Types of soil
3. Program or adjust safety devices according to manufacturers' recommendations	• LMI (load monitoring and indicating systems) • Anti two block systems • Limit devices • Manufacturers' manuals

Line (GAC): L LUFFING TOWER CRANE OPERATIONS

Competency: L4 Perform hoisting techniques for a luffing tower crane

Objectives

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

LEARNING TASKS	CONTENT
1. Operate a crane with and without a load	• Luffing up and down • Slewing clockwise and counterclockwise • Hoisting up and down
2. Maintain control of the hook block in a safe manner during all functions	• Luffing up and down • Slewing clockwise and counterclockwise • Hoisting up and down • Boom deflection

Line (GAC): L LUFFING TOWER CRANE OPERATIONS

Competency: L5 Operate a luffing tower crane

Objectives

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

LEARNING TASKS	CONTENT
1. Assess the lift site	• Assessment of area • Assessment of hazards • Assessment of obstacles • Travel path

2. Plan the lift	• 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
	  o Lift supervisor
	  o Operator
	  o Rigger
	  o Signal person
	• Crane capacity sufficient for load throughout the lift
	• Critical lift
	• Tandem lift
	• Signalling and barrier signage

3. Perform a pre-operational inspection of the crane	• Accurate inspection • Place, location and verification of operator aids • Limit devices/overload prevention • Test blocks • Inspection and erection reports
4. Monitor equipment performance	• Unusual noises/vibrations • Operator aids
5. Troubleshoot equipment problems	• Manufacturers' manuals

LEARNING TASKS	CONTENT
6. Move the load to the destination	• Safe load lifting and placement • Secure load before unhooking
7. Perform a post-operational procedure	• Company policy

Line (GAC): L LUFFING TOWER CRANE OPERATIONS

Competency: L6 Leave a luffing tower crane unattended

Objectives

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

LEARNING TASKS	CONTENT
1. State the procedure for leaving a crane unattended for short periods of time (e.g. lunch breaks)	• No load on the hook • Hook elevation • Jib/boom angle • Power source turned off • Swing brake application (if applicable) • Weathervaning (if applicable)
2. State the procedure for leaving a crane unattended for long periods of time (e.g. overnight, weekends)	• No load on the hook • Hook elevation • Jib/boom angle • Power source turned off • Swing brake application (if applicable) • Weathervaning (if applicable) • Access prevention to crane
3. Perform shutdown procedure	• Shut down and secure equipment as per manufacturer and site policy • Housekeeping tasks • Post-operational inspection

Line (GAC): M SPECIALIZED OPERATIONS

Competency: M1 Operate a crane with a suspended work platform

Objectives

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

LEARNING TASKS	CONTENT
1. Describe the operating procedure with a suspended work platform	• WorkSafeBC regulations • Manufacturer's manual • Company policy • Trial lift • Safety factor of rigging • Fall protection requirements • Crane capacity to be downrated when lifting personnel • Platforms must be engineered to meet standard • Platform inspection documentation • Anti-two block system • Critical lift requirements
2. Assess the lift site	• Assessment of area • Assessment of soil conditions (if applicable) • Assessment of hazards • Assessment of obstacles • Overlapping zones • Vertical/lateral clearances • Underground utilities (if applicable) • Travel path
3. Plan the lift	• Assessment of area • Blocking/mats required • Assessment of hazards • Assessment of obstacles • Underground utilities • Travel path • Traffic control established • All-up weight of suspended work platform • PPE required

LEARNING TASKS	CONTENT

	• Rigging required, rigging certified
	• Qualified personnel
	  o Lift supervisor
	  o Operator
	  o Rigger
	  o Signal person
	• Crane capacity sufficient for load throughout the lift
	• Trial lift
	• Critical lift
	• Signalling and barrier signage

4. Complete a critical lift plan	• WorkSafeBC regulations • Company policy
5. Perform a pre-operational inspection of the crane	• Accurate inspection • Place, location and verification of operator aids • Inspection reports
6. Set up the crane	• 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
7. Attach the suspended work platform	• WorkSafeBC regulations • Manufacturer's specifications
8. Hoist the suspended work platform	• Trial lift
9. Move the work platform to the intended destination	• Critical lift plan

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	CONTENT
1. Describe the procedure for an engineered lift	• Written lift plan • Critical lift plan
2. Assess the lift site	• Assessment of area • Assessment of soil conditions (if applicable) • Assessment of hazards • Assessment of obstacles • Overlapping zones • Vertical/lateral clearances • Underground utilities • Travel path

3. Plan the lift	• 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
	• PPE required
	• Weight of load
	• Rigging required, rigging weight, rigging certified
	• Qualified personnel
	  o Lift supervisor
	  o Operator
	  o Rigger
	  o Signal person
	• Crane capacity sufficient for load throughout the lift

LEARNING TASKS	CONTENT
	• Trial lift • Critical lift • Signalling and barrier signage
4. Perform a pre-operational inspection of the crane	• Accurate inspection • Place, location and verification of operator aids • Inspection and erection reports
5. Set up the crane	• 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	• 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 WLL when used at an angle
7. Perform the engineered lift	• Written lift plan • Critical lift plan
8. Move the load to the intended destination	• Written lift plan • Critical lift plan

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
1. Describe the procedure for a multiple crane lift	• WorkSafeBC regulations • Company policy • Professional Engineer certification
2. Calculate the load on each crane during a multiple crane lift	• Attachment points • Centre of gravity • Mathematical formulas
3. Assess the lift site	• Assessment of area and soil condition • Assessment of hazards • Assessment of obstacles • Overlapping zones • Vertical/lateral clearances • Underground utilities • Travel path
4. Plan a variety of lifts	• Standing up a horizontal object • Laying down a vertical object • Lifting an object • Lift an object with offset centre of gravity
5. Perform a pre-operational inspection of the cranes	• Accurate inspection • Place, location and verification of operator aids • Inspection reports
6. Set up the cranes	• 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

LEARNING TASKS	CONTENT
7. Rig the load	• 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 WLL when used at an angle • Centre of gravity
8. Perform the lift	• Safe hoisting procedures • Procedures for operating in the vicinity of high voltage equipment • Critical lift plan
9. Move the load to the intended destination	• Written lift plan

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
1. Locate information in manufacturers' manuals	• Assembly and raising procedures • Erection procedure and sequence • Balancing requirements during raising • Inspection of raising components • Wind speed limitations
2. Interpret information in manufacturers' manuals	• Assembly and raising procedures • Erection procedure and sequence • Balancing requirements during raising • Inspection of raising components • Wind speed limitations
3. List the components of a bottom climbing tower crane	• Hydraulic components • Jacking components • Electrical system components • Tie-in assembly • Wedges • Safety devices
4. Describe the assembly procedures for a bottom climbing tower crane	• Manufacturer's manual • Erection procedure and sequence • Qualified personnel • Written procedure • Required inspection reports

5. List the function tests that are required prior to operation	• Limiting devices
	  o Trolley
	  o Hoist
	  o Overload
	• Load weighing devices
	• Operator aids
	• Safety devices

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
1. Locate information in manufacturers' manuals	• Assembly and raising procedures • Erection procedure and sequence • Balancing requirements during raising • Inspection of raising components • Wind speed limitations
2. Interpret information in manufacturers' manuals	• Assembly and raising procedures • Erection procedure and sequence • Balancing requirements during raising • Inspection of raising components • Wind speed limitations
3. List the components of a top climbing tower crane	• Climbing frame • Hydraulic components • Electrical system components • Tie-in assembly • Safety devices
4. Describe the assembly procedures for a top climbing tower crane	• Manufacturer's manual • Erection procedure and sequence • Qualified personnel • Written procedure • Required inspection reports

5. List the function tests that are required prior to operation	• Limiting devices
	  o Trolley
	  o Hoist
	  o Overload
	  o Boom cut-out
	• Load weighing devices
	• Operator aids
	• Safety devices

Section 4

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 for Level 1

- 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 of telescopic boom crane must be 20 tonnes
- Tower crane with cab-mounted controls

Minimum Crane Requirements for Level 2

- Tower crane with cab-mounted controls

Reference Materials

Recommended Resources

- Mobile Crane Manual, by Donald E. Dickie, P. Eng., D. H. Campbell, P. Eng.
  Publisher: Construction Safety Association of Ontario
- 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 the BC Association for Crane Safety (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).

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