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Interprovincial Program Guide

2012

Mobile Crane Operator (Hydraulic)

Human Resources and Social Development Canada
Ressources humaines et Développement social Canada

Canada

Interprovincial Program Guide

Mobile Crane Operator (Hydraulic)

2012

Trades and Apprenticeship Division	Division des métiers et de l'apprentissage
Labour Market Integration Directorate	Direction de l'intégration au marché du travail
National Occupational Classification:	7371
Disponible en français sous le titre :	Opérateur/opératrice de grue automotrice (hydraulique)

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PDF
Cat. No.: HS42-2/25-2012E-PDF
ISBN: 978-1-100-21543-3

Foreword

The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this Interprovincial Program Guide (IPG) as the national curriculum for the occupation of Mobile Crane Operator (Hydraulic).

Jurisdictions have long recognized the benefit of pooling resources in the development and maintenance of apprenticeship training standards. A successful example of this is the Interprovincial Standards Red Seal Program itself. Essential to the establishment of standards is the development of suitable training systems and programs which enable tradespeople to acquire certification based on these standards. While certification is the responsibility of Apprenticeship administrators throughout Canada, the development and delivery of technical training is the responsibility of jurisdictions.

In 1999, work to develop common training for apprenticeship programs within the Atlantic Provinces began. To date, 22 Curriculum Standards have been developed through the Atlantic Standards Partnership (ASP) project to assist programming staff and instructors in the design and delivery of technical training. Similarly, the CCDA embarked on a process for the development of national IPGs for the Boilermaker, Carpenter and Sprinkler System Installer trades. At its January 2005 strategic planning session, the CCDA identified developing common training standards as one of the key activities in moving towards a more cohesive apprenticeship system.

With the support of Human Resources and Skills Development Canada (HRSDC), several provinces and territories have partnered to build on the ASP and the CCDA processes to further develop IPGs to be used across the country. This partnership will create efficiencies in time and resources and promote consistency in training and apprentice mobility.

Acknowledgements

The CCDA and the IPG Committee wishes to acknowledge the contributions of the following industry and instructional representatives who participated in the development of this document.

Rick Anderson	British Columbia
Kelly Avery	Saskatchewan
Brian Burgess	Nova Scotia
Carson Dares	Nova Scotia
Shawn Robertson	Saskatchewan
David Taylor	New Brunswick

In addition to the representatives above, various federal, provincial and territorial representatives contributed to the development of this document including the host province of Saskatchewan.

As this program guide will be amended periodically, comments or suggestions for improvement should be directed to:

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User Guide

According to the Canadian Apprenticeship Forum, the IPG is: "a list of validated technical training outcomes, based upon those sub-tasks identified as common core in the National Occupational Analysis (NOA), and validated by industry in the provinces and territories as incorporating the essential tasks, knowledge and skills associated with a given trade."

Learning outcomes contained in the IPG represent the minimum common core content for the development of jurisdictional training standards and outlines. IPGs are developed based on the NOAs and extensive industry consultation. The IPG is intended to assist program development staff in the design of jurisdictional plans of training. Each jurisdiction has the flexibility to add additional content.

The IPG was deliberately constructed for ease of use and flexibility of structure in order to adapt to all delivery requirements. It details units of training, unit outcomes and objectives. It does not impose a delivery model or teaching format.

Jurisdictions and/or training providers will select and develop delivery materials and techniques that accommodate a variety of learning styles and delivery patterns. The IPG does not dictate study materials, textbooks or learning activities to be used in delivery.

The IPG document includes a recommended leveling structure to facilitate mobility for apprentices moving from one jurisdiction to another. Because of difference in jurisdictional regulations and program durations, levels are offered as suggestions only.

Structure

The IPG is divided into units. The unit codes are used as a means of identification and are not intended to convey the order of delivery. Prerequisites have not been detailed. Each unit consists of *Learning Outcomes* and *Objectives and Content.*

The *Learning Outcomes* are the specific performances that must be evaluated. Wording of the learning outcomes, "Demonstrate knowledge of…" acknowledges the broad spectrum of ways in which knowledge can be shown. It is at the discretion of each jurisdiction to determine the manner in which learning outcomes are evaluated; theoretically, practically or a combination of both.

The *Objectives and Content* for the unit details the information to be covered in order to achieve the performances specified in the *Learning Outcomes*. These objectives can be either theoretical or practical in nature, based on the requirements identified through the industry consultation process. The learning activities used to cover the objectives are at the discretion of the jurisdiction; however, practically worded objective statements have been used where industry indicated a need for the apprentices to receive exposure to performing the task or skill outlined while attending technical training. For example, this exposure could be done through instructor demonstration or individual or group performance of the skill or task. This practical training will help to reinforce the theoretical component of the technical training.

Detailed content for each objective has not been developed. Where detail is required for clarity, content has been provided. The content listed within the IPG document is **not** intended to represent an inclusive list; rather, it is included to illustrate the intended direction for the objective. Content may be added or extended in jurisdictional training plans as required.

Jurisdictions are free to deliver the IPG units one at a time or concurrently, provided that all *Learning Outcomes* are met. The IPG does not indicate the amount of time to be spent on a particular unit as the length of time required to deliver the *Learning Outcomes* successfully will depend upon the learning activities and teaching methods used.

IPG Glossary of Terms

These definitions are intended as a guide to how language is used in the IPGs.

ADJUST	To put in good working order; regulate; bring to a proper state or position.
APPLICATION	The use to which something is put and/or the circumstance in which you would use it.
CHARACTERISTIC	A feature that helps to identify, tell apart, or describe recognizably; a distinguishing mark or trait.
COMPONENT	A part that can be separated from or attached to a system; a segment or unit.
DEFINE	To state the meaning of (a word, phrase, etc.).
DESCRIBE	To give a verbal account of; tell about in detail.
EXPLAIN	To make plain or clear; illustrate; rationalize.
IDENTIFY	To point out or name objectives or types.
INTERPRET	To translate information from observation, charts, tables, graphs, and written material.
MAINTAIN	To keep in a condition of good repair or efficiency.
METHOD	A means or manner of doing something that has procedures attached to it.
OPERATE	How an object works; to control or direct the functioning of.
PROCEDURE	A prescribed series of steps taken to accomplish an end.
PURPOSE	The reason for which something exists or is done, made or used.

TECHNIQUE	Within a procedure, the manner in which technical skills are applied.
TEST	v. To subject to a procedure that ascertains effectiveness, value, proper function, or other quality. n. A way of examining something to determine its characteristics or properties, or to determine whether or not it is working correctly.
TROUBLESHOOT	To follow a systematic procedure to identify and locate a problem or malfunction and its cause.

Essential Skills Profiles

Essential Skills are the skills needed for work, learning and life. They provide the foundation for learning all the other skills that enable people to evolve within their jobs and adapt to workplace change.

Over the past several years, the Government of Canada has conducted research examining the skills people use at work. From this research, Essential Skills Profiles have been developed for various occupations.

For more information regarding Essential Skills and to access Essential Skills Profiles for specific occupations, visit Human Resources and Skills Development Canada's Essential Skills website at:

http://www.hrsdc.gc.ca/eng/workplaceskills/LES/profiles/profiles.shtml

Profile Chart

OCCUPATIONAL SKILLS			
CRA-005 Safety	MCO-100 Introduction to Mobile Cranes	CRA-010 Communications for Hoisting Operations	CRA-015 High Voltage Electrical Fundamentals
CRA-020 Trade Related Documents	CRA-025 Tools and Equipment	CRA-030 Fasteners and Retaining Devices	CRA-075 Introduction to Computerized Operational Aids
CRA-080 Job Planning			
HOISTING CALCULATIONS			
CRA-050 Load Weight Calculations I	CRA-055 Sling Configurations	CRA-070 Load Charts I	CRA-090 Load Weight Calculations II
MCO-250 Load Charts II			
CRANE INSPECTION AND MAINTENANCE			
MCO-200 Engines and Drive Systems	MCO-205 Mechanical Systems	MCO-210 Hydraulic Systems	MCO-260 Continual Checks
RIGGING			
CRA-035 Wire Rope	CRA-040 Rigging Hardware	CRA-045 Introduction to Rigging and Hoisting	CRA-060 Lifting Theory and Forces
CRA-085 Advanced Rigging and Hoisting	MCO-230 Reeving Operations		
LIFT PLANNING, SITE PREPARATION AND CRANE SETUP			
MCO-215 Crane Setup	MCO-240 Pre-lift Planning	MCO-245 Worksite Preparation	
CRANE ASSEMBLY, DISASSEMBLY AND TRANSPORT			
MCO-220 Assembly and Disassembly (Lattice Boom Crane)	MCO-225 Assembly and Disassembly (Telescopic Boom Crane)	MCO-235 Transportation	

Profile Chart *(continued)*

CRANE OPERATION			
CRA-065 Introduction to Crane Operations	MCO-255 Multi-Crane Lifts	MCO-265 Hydraulic Telescopic Boom Operation	MCO-270 Hydraulic Drive Lattice Boom Operation
MCO-280 Specialty Crane Operations			

Recommended Level Structure

CRA = Common Units to Mobile Crane Operator, Mobile Crane Operator (Hydraulic) and Tower Crane Operator IPGs.
MCO = Specific Units to Mobile Crane Operator (Hydraulic) IPG.

LEVEL 1					
Unit Code	**Title**	**Page**	**Unit Code**	**Title**	**Page**
CRA-005	Safety	21	CRA-045	Introduction to Rigging and Hoisting	33
MCO-100	Introduction to Mobile Cranes	22	CRA-050	Load Weight Calculations I	35
CRA-010	Communications for Hoisting Operations	24	CRA-055	Sling Configurations	36
CRA-015	High Voltage Electrical Fundamentals	25	CRA-060	Lifting Theory and Forces	37
CRA-020	Trade Related Documents	27	CRA-065	Introduction to Crane Operations	38
CRA-025	Tools and Equipment	28	CRA-070	Load Charts I	40
CRA-030	Fasteners and Retaining Devices	29	CRA-075	Introduction to Computerized Operational Aids	42
CRA-035	Wire Rope	30	CRA-080	Job Planning	43
CRA-040	Rigging Hardware	31			
LEVEL 2					
Unit Code	**Title**	**Page**	**Unit Code**	**Title**	**Page**
MCO-200	Engines and Drive Systems	45	MCO-245	Worksite Preparation	61
MCO-205	Mechanical Systems	47	CRA-085	Advanced Rigging and Hoisting	62
MCO-210	Hydraulic Systems	49	CRA-090	Load Weight Calculations II	63
MCO-215	Crane Setup	51	MCO-250	Load Charts II	64
MCO-220	Assembly and Disassembly (Lattice Boom Crane)	52	MCO-255	Multi-Crane Lifts	66
MCO-225	Assembly and Disassembly (Telescopic Boom Crane)	54	MCO-260	Continual Checks	67
MCO-230	Reeving Operations	56	MCO-265	Hydraulic Telescopic Boom Operation	68
MCO-235	Transportation	57	MCO-270	Hydraulic Drive Lattice Boom Operation	70
MCO-240	Pre-lift Planning	59	MCO-280	Specialty Crane Operations	72

2012 NOA Sub-task to IPG Unit Comparison

NOA Sub-task		IPG Unit	
Task 1 – Performs safety-related functions.			
1.01	Maintains a safe work environment.	CRA-005	Safety
1.02	Uses personal protective equipment (PPE) and safety equipment.	CRA-005	Safety
		CRA-015	High Voltage Electrical Fundamentals
Task 2 – Organizes work.			
2.01	Communicates with others.	CRA-010	Communications for Hoisting Operations
2.02	Uses documentation.	CRA-020	Trade Related Documents
		CRA-080	Job Planning
		MCO-240	Pre-lift Planning
Task 3 – Determines load weights.			
3.01	Identifies the weight.	CRA-050	Load Weight Calculations I
		CRA-090	Load Weight Calculations II
3.02	Calculates weight.	CRA-050	Load Weight Calculations I
		CRA-090	Load Weight Calculations II
Task 4 – Calculates crane capacity.			
4.01	Determines radius and crane configuration.	CRA-070	Load Charts I
4.02	Interprets load charts.	CRA-070	Load Charts I
		MCO-250	Load Charts II
Task 5 – Performs rigging calculations.			
5.01	Performs sling angle calculations.	CRA-055	Sling Configurations
5.02	Performs working load limit (WLL) calculations.	CRA-050	Load Weight Calculations I
		CRA-090	Load Weight Calculations II
		CRA-055	Sling Configurations
Task 6 – Performs pre-operational checks and regular inspections.			
6.01	Inspects engine systems.	MCO-100	Introduction to Mobile Cranes
		MCO-200	Engines and Drive Systems
6.02	Inspects air systems.	MCO-100	Introduction to Mobile Cranes
		MCO-205	Mechanical Systems
6.03	Inspects electrical systems.	MCO-205	Mechanical Systems

NOA Sub-task		IPG Unit	
6.04	Inspects hydraulic systems.	MCO-210	Hydraulic Systems
6.05	Inspects chassis/car body and running gear components.	MCO-205	Mechanical Systems
6.06	Inspects outriggers and counterweights.	MCO-215	Crane Setup
6.07	Inspects boom components and attachments.	MCO-100	Introduction to Mobile Cranes
6.08	Inspects hoisting systems.	CRA-040	Rigging Hardware
		CRA-035	Wire Rope
Task 7 – Performs operational and continual checks.			
7.01	Checks operating controls.	MCO-205	Mechanical Systems
7.02	Inspects monitoring and warning systems.	MCO-205	Mechanical Systems
7.03	Monitors running lines, hoist lines and standing ropes.	MCO-260	Continual Checks
7.04	Monitors gauges and warning systems.	MCO-260	Continual Checks
Task 8 – Performs minor crane maintenance.			
8.01	Changes oil and filters.	CRA-025	Tools and Equipment
		MCO-100	Introduction to Mobile Cranes
8.02	Greases crane.	CRA-025	Tools and Equipment
		MCO-100	Introduction to Mobile Cranes
8.03	Lubricates wire ropes.	CRA-025	Tools and Equipment
		MCO-100	Introduction to Mobile Cranes
		CRA-035	Wire Rope
8.04	Makes minor adjustments and replacements.	CRA-025	Tools and Equipment
		MCO-100	Introduction to Mobile Cranes
Task 9 – Inspects maintains and stores slings and hardware.			
9.01	Lubricates slings and hardware.	CRA-040	Rigging Hardware
		CRA-035	Wire Rope
9.02	Identifies deformities in slings and hardware.	CRA-040	Rigging Hardware
		CRA-035	Wire Rope
9.03	Disposes of damaged slings and hardware.	CRA-040	Rigging Hardware
		CRA-035	Wire Rope

NOA Sub-task		IPG Unit	
9.04	Stores slings and hardware.	CRA-040	Rigging Hardware
		CRA-035	Wire Rope
Task 10 – Follows rigging procedures.			
10.01	Selects required rigging.	CRA-045	Introduction to Rigging and Hoisting
		CRA-060	Lifting Theory and Forces
		MCO-230	Reeving Operations
		CRA-085	Advanced Rigging and Hoisting
10.02	Rigs load.	CRA-045	Introduction to Rigging and Hoisting
		CRA-060	Lifting Theory and Forces
		MCO-230	Reeving Operations
		CRA-085	Advanced Rigging and Hoisting
10.03	Monitors rigging.	CRA-045	Introduction to Rigging and Hoisting
		CRA-085	Advanced Rigging and Hoisting
Task 11 – Performs pre-lift planning.			
11.01	Participates in routine, engineered and specialty lift planning.	CRA-080	Job Planning
		MCO-240	Pre-lift Planning
11.02	Evaluates risks and hazards.	CRA-005	Safety
		CRA-015	High Voltage Electrical Fundamentals
		MCO-240	Pre-lift Planning
Task 12 – Sets up crane.			
12.01	Performs final site inspection.	MCO-240	Pre-lift Planning
		MCO-245	Worksite Preparation
12.02	Positions crane.	MCO-240	Pre-lift Planning
		MCO-215	Crane Setup
12.03	Completes setup.	MCO-240	Pre-lift Planning
		MCO-215	Crane Setup
Task 13 – Loads and unloads components for transport.			
13.01	Loads crane and components.	MCO-235	Transportation
13.02	Unloads crane and components.	MCO-235	Transportation
Task 14 – Drives cranes on public roadways.			
14.01	Performs pre-trip planning.	CRA-080	Job Planning

NOA Sub-task		IPG Unit	
14.02	Prepares crane for transport.	MCO-235	Transportation
14.03	Drives cranes.	MCO-235	Transportation
Task 15 – Assembles and disassembles hydraulically driven lattice boom cranes.			
15.01	Installs tracks on car body (lattice boom).	CRA-035	Fasteners and Retaining Devices
		MCO-220	Assembly and Disassembly (Lattice Boom Crane)
15.02	Installs house (lattice boom).	CRA-030	Fasteners and Retaining Devices
		MCO-220	Assembly and Disassembly (Lattice Boom Crane)
15.03	Installs outrigger boxes (lattice boom).	CRA-030	Fasteners and Retaining Devices
		MCO-220	Assembly and Disassembly (Lattice Boom Crane)
15.04	Installs boom base (lattice boom).	CRA-030	Fasteners and Retaining Devices
		MCO-220	Assembly and Disassembly (Lattice Boom Crane)
15.05	Assembles boom and jib (lattice boom).	MCO-220	Assembly and Disassembly (Lattice Boom Crane)
15.06	Installs counterweights (lattice boom).	CRA-030	Fasteners and Retaining Devices
		MCO-220	Assembly and Disassembly (Lattice Boom Crane)
15.07	Installs hoist lines, hook blocks and overhaul ball (lattice boom).	CRA-030	Fasteners and Retaining Devices
		MCO-220	Assembly and Disassembly (Lattice Boom Crane)
15.08	Removes hoist lines, hook blocks and overhaul ball (lattice boom).	CRA-030	Fasteners and Retaining Devices
		MCO-220	Assembly and Disassembly (Lattice Boom Crane)
15.09	Disassembles boom and jib (lattice boom).	MCO-220	Assembly and Disassembly (Lattice Boom Crane)
15.10	Removes counterweights (lattice boom).	CRA-030	Fasteners and Retaining Devices

NOA Sub-task		IPG Unit	
		MCO-220	Assembly and Disassembly (Lattice Boom Crane)
15.11	Removes boom base (lattice boom).	CRA-030	Fasteners and Retaining Devices
		MCO-220	Assembly and Disassembly (Lattice Boom Crane)
15.12	Removes house (lattice boom).	CRA-030	Fasteners and Retaining Devices
		MCO-220	Assembly and Disassembly (Lattice Boom Crane)
15.13	Removes tracks from car body (lattice boom).	CRA-030	Fasteners and Retaining Devices
		MCO-220	Assembly and Disassembly (Lattice Boom Crane)
15.14	Removes outrigger boxes (lattice boom).	CRA-030	Fasteners and Retaining Devices
		MCO-220	Assembly and Disassembly (Lattice Boom Crane)
Task 16 – Assembles and disassembles hydraulic telescopic boom cranes.			
16.01	Installs outrigger boxes (telescopic boom).	CRA-030	Fasteners and Retaining Devices
		MCO-225	Assembly and Disassembly (Telescopic Boom Crane)
16.02	Installs main boom (telescopic boom).	CRA-030	Fasteners and Retaining Devices
		MCO-225	Assembly and Disassembly (Telescopic Boom Crane)
16.03	Installs hoist lines, hook blocks and overhaul ball (telescopic boom).	CRA-030	Fasteners and Retaining Devices
		MCO-225	Assembly and Disassembly (Telescopic Boom Crane)
16.04	Installs counterweights (telescopic boom).	CRA-030	Fasteners and Retaining Devices
		MCO-225	Assembly and Disassembly (Telescopic Boom Crane)
16.05	Installs swing-away jibs and inserts (telescopic boom).	CRA-030	Fasteners and Retaining Devices

NOA Sub-task		IPG Unit	
		MCO-225	Assembly and Disassembly (Telescopic Boom Crane)
16.06	Removes swing-away jibs and inserts (telescopic boom).	CRA-030	Fasteners and Retaining Devices
		MCO-225	Assembly and Disassembly (Telescopic Boom Crane)
16.07	Removes counterweights (telescopic boom).	CRA-030	Fasteners and Retaining Devices
		MCO-225	Assembly and Disassembly (Telescopic Boom Crane)
16.08	Removes hoist lines, hook blocks and overhaul ball (telescopic boom).	CRA-030	Fasteners and Retaining Devices
		MCO-225	Assembly and Disassembly (Telescopic Boom Crane)
16.09	Removes main boom (telescopic boom).	CRA-030	Fasteners and Retaining Devices
		MCO-225	Assembly and Disassembly (Telescopic Boom Crane)
16.10	Removes outrigger boxes (telescopic boom).	CRA-030	Fasteners and Retaining Devices
		MCO-225	Assembly and Disassembly (Telescopic Boom Crane)
Task 17 – Assembles and disassembles specialty equipment and attachments.			
17.01	Assembles specialty equipment and attachments.	MCO-220	Assembly and Disassembly (Lattice Boom Crane)
		MCO-225	Assembly and Disassembly (Telescopic Boom Crane)
17.02	Disassembles specialty equipment and attachments.	MCO-220	Assembly and Disassembly (Lattice Boom Crane)
		MCO-225	Assembly and Disassembly (Telescopic Boom Crane)
Task 18 – Performs common craning operations.			
18.01	Configures load moment indicator (LMI).	CRA-075	Introduction to Computerized Operational Aids
		MCO-270	Hydraulic Drive Lattice Boom Operation

NOA Sub-task		IPG Unit	
		MCO-265	Hydraulic Telescopic Boom Operation
18.02	Mobilizes crane on jobsite.	CRA-065	Introduction to Crane Operations
		MCO-270	Hydraulic Drive Lattice Boom Operation
		MCO-265	Hydraulic Telescopic Boom Operation
Task 19 – Operates lattice boom (hydraulic) cranes.			
19.01	Operates crawler-mounted lattice boom (hydraulic) cranes.	MCO-270	Hydraulic Drive Lattice Boom Operation
19.02	Operates truck-mounted lattice boom (hydraulic) cranes.	MCO-270	Hydraulic Drive Lattice Boom Operation
Task 20 – Operates hydraulic telescopic boom cranes.			
20.01	Operates crawler-mounted hydraulic telescopic cranes.	MCO-265	Hydraulic Telescopic Boom Operation
20.02	Operates truck-mounted hydraulic telescopic cranes.	MCO-265	Hydraulic Telescopic Boom Operation
Task 21 – Performs specialty craning operations.			
21.01	Operates piledriver.	MCO-280	Specialty Crane Operations
21.02	Performs duty cycle operations.	MCO-280	Specialty Crane Operations
21.03	Operates cranes on barges.	MCO-280	Specialty Crane Operations
21.04	Performs multi-crane lifts.	MCO-255	Multi-Crane Lifts
		MCO-280	Specialty Crane Operations
21.05	Uses personnel hoisting equipment.	MCO-280	Specialty Crane Operations
Task 22 – Secures crane.			
22.01	Secures crane for short term.	CRA-065	Introduction to Crane Operations
22.02	Secures crane for long term.	CRA-065	Introduction to Crane Operations

LEVEL 1

CRA-005 Safety

Learning Outcomes:

- Demonstrate knowledge of safety equipment, their applications, maintenance and procedures for use.
- Demonstrate knowledge of safe work practices.
- Demonstrate knowledge of regulatory requirements pertaining to safety.

Objectives and Content:

1. Identify types of personal protective equipment (PPE) and clothing and describe their applications and limitations.

2. Describe the procedures used to care for and maintain PPE.

3. Identify hazards and describe safe work practices.
   - i) personal
   - ii) workplace
     - job hazard assessment procedures
     - energy state awareness (electrical and mechanical)
     - isolation and de-energizing procedures
     - lockout/tagout
     - confined space awareness
     - fire
     - heights (fall prevention and fall arrest)
     - first aid
   - iii) environmental
     - discharge/spills
     - weather conditions

4. Identify and describe workplace safety and health regulations.
   - i) federal
     - Workplace Hazardous Material Information System (WHMIS)
     - Transportation of Dangerous Goods (TDG)
     - Canadian Standards Association (CSA)
   - ii) provincial/territorial
     - Occupational Health and Safety (OH&S)
   - iii) municipal

MCO-100 Introduction to Mobile Cranes

Learning Outcomes:

- Demonstrate knowledge of mobile cranes, their characteristics and applications.

Objectives and Content:

1. Define terminology associated with mobile cranes.

2. Identify hazards and describe safe work practices pertaining to mobile cranes.

3. Identify codes, standards and regulations pertaining to mobile cranes.

4. Identify types of mobile cranes and describe their characteristics and applications.
   - i) hydraulic boom
     - truck mounted
     - all-terrain (AT)
     - rough-terrain (RT)
     - crawler
   - ii) lattice boom
     - truck mounted
     - crawler
     - friction/hydraulic
   - iii) boom truck
     - telescopic boom
     - articulating boom

5. Identify crane components and describe their characteristics and applications.
   - i) outriggers
   - ii) pendant lines
   - iii) boom
   - iv) jib
   - v) counterweight
   - vi) hoist lines
   - vii) hook blocks
   - viii) overhaul ball
   - ix) operating controls

x) house
xi) carrier/car body
xii) power source

6. Describe the procedures used to inspect and maintain mobile cranes.

CRA-010 Communications for Hoisting Operations

Learning Outcomes:

- Demonstrate knowledge of effective communication practices.
- Demonstrate knowledge of communication devices, their purpose and operation.
- Demonstrate knowledge of the procedures used to communicate during hoisting operations.

Objectives and Content:

1. Identify audiences and describe techniques for effective verbal and non-verbal communication.
   i) apprentices
   ii) other tradespersons
   iii) colleagues
   iv) supervisors
   v) clients
   vi) general public
   vii) inspectors/investigators
   viii) emergency responders

2. Identify and interpret applicable hand signals used during craning operations.

3. Identify types of communication devices and describe their purpose and operation.
   i) portable and stationary radios
   ii) mobile phones and mobility devices
   iii) computers
   iv) crane horn

4. Describe the procedures used to communicate during hoisting operations.

5. Explain the purpose of a site communication plan.

6. Describe the importance of communicating job requirements.

CRA-015 High Voltage Electrical Fundamentals

Learning Outcomes:

- Demonstrate knowledge of induced currents, power line hazards and high voltage electrical equipment.
- Demonstrate knowledge of the procedures used to operate cranes near high voltage electrical equipment.
- Demonstrate knowledge of the procedures used when contact occurs with high voltage electrical equipment.

Objectives and Content:

1. Define terminology associated with induced currents, power lines and high voltage electrical equipment.

2. Identify hazards and describe safe work practices when operating cranes near sources of induced currents, power lines and high voltage electrical equipment.
   i) personal
      - PPE
   ii) workplace
      - transmission towers
      - overhead conductors
      - underground conductors
      - limits of approach
      - grounding factors
   iii) environmental
      - lightning
      - induced currents

3. Interpret codes, standards and regulations pertaining to operating cranes near high voltage electrical equipment.

4. Interpret signage related to high voltage electrical equipment.

5. Describe the procedures used to operate cranes near high voltage electrical equipment.

6. Describe the procedures used when contact occurs with high voltage electrical equipment.

CRA-020 Trade Related Documents

Learning Outcomes:

- Demonstrate knowledge of trade related documents and their use.
- Demonstrate knowledge of the procedures used to complete documentation.

Objectives and Content:

1. Identify types of trade related documents and describe their applications.
   - i) manufacturers' specifications
     - load charts
     - manuals
   - ii) codes and standards
     - federal
     - provincial
     - municipal
   - iii) reference materials
   - iv) work orders
   - v) drawings
   - vi) permits
   - vii) maintenance schedules
   - viii) maintenance records
   - ix) log books
   - x) lift plans
   - xi) policies
     - site
     - company
   - xii) job hazard assessment

2. Describe the procedures used to prepare and/or complete applicable trade related documents.

CRA-025 Tools and Equipment

Learning Outcomes:

- Demonstrate knowledge of tools and equipment, their applications, maintenance and procedures for use.

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to the use of tools and equipment.

2. Identify types of hand tools and describe their applications and procedures for use.

3. Describe the procedures used to inspect, maintain and store hand tools.

4. Identify types of power tools and describe their applications and procedures for use.
   i) electric
   ii) hydraulic
   iii) pneumatic
   iv) fuel powered

5. Describe the procedures used to inspect, maintain and store power tools.

6. Identify types of torches and describe their applications and procedures for use.
   i) oxyacetylene
   ii) propane

7. Describe the procedures used to inspect, maintain, hoist and store torches.

8. Identify types of measuring equipment and describe their applications and procedures for use.

9. Describe the procedures used to inspect, maintain and store measuring equipment.
   i) calibration

CRA-030 Fasteners and Retaining Devices

Learning Outcomes:

- Demonstrate knowledge of fasteners and retaining devices, their applications and procedures for use.

Objectives and Content:

1. Define terminology associated with fasteners and retaining devices.

2. Identify hazards and describe safe work practices pertaining to fasteners and retaining devices.

3. Identify tools and equipment relating to fasteners and retaining devices and describe their applications and procedures for use.

4. Identify types and grades of fasteners and describe their applications.
   i) bolts
   ii) nuts
   iii) washers
      - lock
      - flat
   iv) pins

5. Identify types of retaining devices and describe their applications.
   i) cotter pins
   ii) snap rings
   iii) R clips

6. Describe the procedures used to remove and install fasteners and retaining devices.

7. Explain torque values and their applications.
   i) manufacturers' specifications
      - lubricated
      - dry

CRA-035 Wire Rope

Learning Outcomes:

- Demonstrate knowledge of wire ropes, their applications, limitations and procedures for use.
- Demonstrate knowledge of the procedures used to install, monitor, inspect, maintain, store and dispose of wire ropes.

Objectives and Content:

1. Define terminology associated with wire ropes.

2. Identify hazards and describe safe work practices pertaining to wire ropes.

3. Identify tools and equipment relating to wire ropes and describe their applications and procedures for use.

4. Interpret codes, standards and regulations pertaining to wire ropes.

5. Identify types of wire ropes and describe their applications, limitations and procedures for use.
   i) rope construction
   ii) standing
   iii) running

6. Describe the procedures used to select, install and connect wire ropes.

7. Describe the procedures used to monitor wire ropes during lifting operations.

8. Describe the procedures used to troubleshoot wire rope issues.

9. Describe the procedures used to inspect, maintain and store wire ropes.

10. Describe the procedures used to dispose of damaged wire ropes.

CRA-040 Rigging Hardware

Learning Outcomes:

- Demonstrate knowledge of rigging hardware, their applications, limitations and procedures for use.
- Demonstrate knowledge of the procedures used to install, monitor, inspect, maintain, troubleshoot, store and dispose of rigging hardware.

Objectives and Content:

1. Define terminology associated with rigging hardware.

2. Identify hazards and describe safe work practices pertaining to rigging hardware.

3. Identify tools and equipment relating to rigging hardware and describe their applications and procedures for use.

4. Interpret codes, standards and regulations pertaining to rigging hardware.

5. Identify types of rigging hardware and describe their applications, limitations and procedures for use.
   i) hooks
   ii) tag lines
   iii) shackles
   iv) slings
   v) spreader bars
   vi) equalizer beams
   vii) specialized lifting devices

6. Describe the procedures used to select, install and connect rigging hardware.

7. Describe the procedures used to monitor rigging hardware during lifting operations.

8. Describe the procedures used to troubleshoot rigging hardware.

9. Describe the procedures used to inspect, maintain and store rigging hardware.

10. Describe the procedures used to dispose of damaged rigging hardware.

CRA-045 Introduction to Rigging and Hoisting

Learning Outcomes:

- Demonstrate knowledge of rigging and hoisting applications.
- Demonstrate knowledge of basic rigging and hoisting techniques.

Objectives and Content:

1. Define terminology associated with rigging and hoisting.

2. Identify hazards and describe safe work practices pertaining to rigging and hoisting.

3. Identify codes, standards and regulations pertaining to rigging and hoisting.
   i) training and certification requirements

4. Interpret information pertaining to rigging and hoisting found on drawings and specifications.
   i) lift plans
   ii) manufacturers' specifications

5. Identify types of knots, hitches and splices used with fibre ropes and describe their applications and the procedures used to tie them.

6. Identify types of hitches used with slings and describe their applications and ~~the~~ procedures for use.
   i) Diameter to diameter (D to d) ratio with wire rope slings

7. Describe the procedures used to ensure the work area is safe for hoisting.
   i) supervision of lift
   ii) securing work area
   iii) communication

8. Identify the factors to consider when rigging material/equipment for hoisting.
   i) load characteristics

ii) workplace environment
- chemical hazards
- grounding requirements

iii) weather conditions

CRA-050 Load Weight Calculations I

Learning Outcomes:

- Demonstrate knowledge of the weight of basic shaped loads.
- Demonstrate knowledge of centre of gravity.

Objectives and Content:

1. Define terminology associated with determining the weight of basic shaped loads.

2. Explain the importance of determining the weight of a basic shaped load and its relevance in lifting operations.

3. Identify the considerations used to determine the weight of basic shaped loads.
   i) volume of object
   ii) weight of material
   iii) weight of rigging

4. Perform calculations to determine load weights for basic shapes.
   i) cubes and boxes
   ii) cylinders and pipes

5. Describe the procedures used to determine the centre of gravity in basic shaped loads.

CRA-055 Sling Configurations

Learning Outcomes:

- Demonstrate knowledge of sling configurations, their characteristics and applications.
- Demonstrate knowledge of working load limits (WLL).

Objectives and Content:

1. Define terminology associated with slings.

2. Identify hazards and describe safe work practices pertaining to slings.

3. Identify types of sling configurations and describe their characteristics and applications.

4. Explain sling angles and their effect on sling capacities.

5. Describe the procedures used to determine sling angle.

6. Perform calculations to interpret the load on slings used at an angle.
   i) equal length
   ii) bridles

7. Describe the procedures used to determine the appropriate sling size for a given load.

8. Identify the considerations used to determine WLLs.
   i) manufacturers' specifications
   ii) codes and standards
   iii) rigging applications

9. Perform calculations to determine WLLs of slings.
   i) wire rope
   ii) chains
   iii) synthetic web
   iv) synthetic fibre

CRA-060 Lifting Theory and Forces

Learning Outcomes:

- Demonstrate knowledge of lifting theory and forces.
- Demonstrate knowledge of units of measure and symbols relating to lifting plans and load charts.

Objectives and Content:

1. Define terminology associated with lifting and forces.
   i) forces exerted on the crane
   ii) forces exerted by the crane
   iii) forces exerted on the load

2. Explain the principles of leverage and describe the mechanical advantage.

3. Identify types of leverage systems used in craning operations.
   i) class 1 lever
   ii) class 2 lever
   iii) class 3 lever

4. Explain the relationship between leverage and crane stability.

5. Identify units of measure and symbols pertaining to lifting plans and load charts.

6. Explain the centre of gravity of the load and its impact on lifting.

7. Identify and describe lift studies and lift plans.

8. Perform leverage calculations.

CRA-065 Introduction to Crane Operations

Learning Outcomes:

- Demonstrate knowledge of basic crane operations and their applications.
- Demonstrate knowledge of the procedures used to perform pre- and post-operational inspections.
- Demonstrate knowledge of the procedures to perform basic crane operations.

Objectives and Content:

1. Define terminology associated with crane operations.

2. Identify hazards and describe safe work practices pertaining to crane operations.
   i) personnel
   ii) equipment
   iii) environmental

3. Interpret codes, standards and regulations pertaining to crane operations.

4. Interpret charts, drawings and specifications pertaining to crane operations.
   i) manufacturers' specifications

5. Identify basic crane operations and describe their characteristics and applications.
   i) raising/lowering load
   ii) swinging crane
   iii) raising/lowering boom
   iv) operating telescopic boom
   v) outriggers
   vi) extendable counterweights
   vii) travelling
   viii) functioning simultaneously
   ix) travelling trolley

6. Identify the considerations and requirements for selecting cranes and their associated components and accessories.

7. Identify and describe lift studies and lift plans.

8. Identify and describe the procedures used to perform operational inspections.
   i) function tests

9. Describe the procedures used to achieve repairs and maintenance.

10. Describe the procedures used to perform basic craning operations.

11. Describe the effects of weather conditions on crane operations.

12. Describe the procedures used to secure cranes before leaving them unattended.
   i) short-term
   ii) long-term

CRA-070 Load Charts I

Learning Outcomes:

- Demonstrate knowledge of basic load charts, their characteristics and applications.
- Demonstrate knowledge of crane capacity, crane component capacity and working radius for basic lifting operations.

Objectives and Content:

1. Define terminology associated with load charts.
   - i) gross capacity
   - ii) net capacity
   - iii) gross load
   - iv) net load

2. Identify codes, standards and regulations pertaining to load charts.

3. Identify parts of a load chart and describe their characteristics and applications.
   - i) notes
     - factors affecting capacity
   - ii) capacity charts
     - radius
     - boom length
     - boom angle
     - between listed values
   - iii) range diagram
   - iv) technical data

4. Interpret data from load charts required to plan lifts.
   - i) parts of line
   - ii) quadrants of operation
   - iii) capacity reductions for various configurations

5. Identify factors that influence crane capacity in basic lifting operations and describe their impact.
   - i) temperature

ii) wind conditions
iii) crane configuration

6. Interpret basic load chart data and determine crane capacities for various configurations.

CRA-075 Introduction to Computerized Operational Aids

Learning Outcomes:

- Demonstrate knowledge of crane computers, their applications and procedures for use.
- Demonstrate knowledge of integrated computerized components, their applications and procedures for use.

Objectives and Content:

1. Define terminology associated with computerized operational aids and integrated computerized components.

2. Identify hazards and describe safe work practices pertaining to the use of computerized operational aids and integrated computerized components.

3. Identify types of computerized operational aids and integrated computerized components and describe their applications and procedures for use.
   i) computer assisted safety devices
   ii) load moment indicators (LMI)
      - central unit
      - load transducers or load cells
      - boom length and angle transducers
      - anti-two block
      - display (inside cab)
   iii) load-monitoring devices
   iv) maintenance monitors
   v) range limiting devices

4. Describe the procedures used to set up computerized operational aids for crane operation.
   i) manufacturers' specifications

CRA-080 Job Planning

Learning Outcomes:

- Demonstrate knowledge of the procedures used to plan and organize job tasks.

Objectives and Content:

1. Identify sources of information relevant to job task planning.
   - i) supervisor
   - ii) documentation
     - lift plans
   - iii) drawings
   - iv) related professionals
   - v) clients
   - vi) manufacturers

2. Identify codes, standards and regulations pertaining to job planning.

3. Describe the considerations to plan and organize job tasks.
   - i) permits
   - ii) personnel
   - iii) risk assessment
   - iv) scheduling
   - v) tools and equipment
   - vi) load weights
   - vii) company/site policy

4. Identify the sequence of job tasks to be performed.

LEVEL 2

MCO-200 Engines and Drive Systems

Learning Outcomes:

- Demonstrate knowledge of engines and drive systems, their purpose and operation.
- Demonstrate knowledge of engine and drive system components, their characteristics and applications.
- Demonstrate knowledge of the procedures used to inspect, maintain and troubleshoot engines and drive systems.

Objectives and Content:

1. Define terminology associated with engines and drive systems.

2. Identify hazards and describe safe work practices pertaining to engines, drive systems and their components.
   i) lockout/tagout
   ii) de-energize

3. Interpret codes, standards and regulations pertaining to engines and drive systems.

4. Identify tools and equipment relating to engines, drive systems and their components and describe their applications and procedures for use.

5. Identify types of engine and drive systems and describe their purpose and operation.
   i) gas
   ii) diesel
   iii) propane
   iv) automatic
   v) manual
   vi) hydraulic
   vii) mechanical
   viii) electrical

6. Identify engine and drive system components and describe their characteristics and applications.

7. Describe the procedures used to troubleshoot engines, drive systems and their components.

8. Describe the procedures used to maintain engines, drive systems and their components.

9. Describe the procedures used to inspect engines, drive systems and their components.

MCO-205 Mechanical Systems

Learning Outcomes:

- Demonstrate knowledge of mechanical systems, their purpose and operation.
- Demonstrate knowledge of mechanical system components, their characteristics and applications.
- Demonstrate knowledge of procedures used to inspect, maintain and troubleshoot mechanical systems and their components.

Objectives and Content:

1. Define terminology associated with mechanical systems.

2. Identify hazards and describe safe work practices pertaining to mechanical systems and their components.
   i) lockout/tagout
   ii) de-energize

3. Interpret codes, standards and regulations pertaining to mechanical systems.

4. Identify tools and equipment relating to mechanical systems and components and describe their applications and procedures for use.

5. Identify types of mechanical systems and describe their purpose and operation.
   i) air
   ii) electrical
   iii) monitoring and warning
   iv) steering
   v) hoisting
      - hydraulic
      - friction
   vi) travel systems
   vii) outriggers
   viii) travel brakes

6. Identify mechanical system components and describe their applications.

7. Describe the procedures used to troubleshoot mechanical systems and their components.

8. Describe the procedures used to maintain mechanical systems and their components.

9. Describe the procedures used to inspect mechanical systems and their components.

MCO-210 Hydraulic Systems

Learning Outcomes:

- Demonstrate knowledge of hydraulic systems, their purpose and operation.
- Demonstrate knowledge of hydraulic system components, their characteristics and applications.
- Demonstrate knowledge of the procedures used to inspect, maintain and troubleshoot hydraulic systems and their components.

Objectives and Content:

1. Define terminology associated with hydraulic systems.

2. Identify hazards and describe safe work practices pertaining to hydraulic systems and their components.
   i) lockout/tagout
   ii) de-energize

3. Interpret codes, standards and regulations pertaining to hydraulic systems.

4. Identify tools and equipment relating to hydraulic systems and their components and describe their applications and procedures for use.

5. Explain the power transfer principles of hydraulic systems.

6. Identify types of hydraulic systems and describe their purpose and operation.
   i) closed centre
   ii) open centre

7. Identify hydraulic system components and describe their characteristics and applications.
   i) hoses
   ii) pumps
   iii) motors
   iv) filters
   v) tanks
   vi) cylinders
   vii) valves

8. Describe the procedures used to troubleshoot hydraulic systems and their components.

9. Describe the procedures used to maintain hydraulic systems and their components.

10. Describe the procedures used to inspect hydraulic systems and their components.

MCO-215 Crane Setup

Learning Outcomes:

- Demonstrate knowledge of positioning, blocking and leveling operations and their applications.
- Demonstrate knowledge of the tools and equipment used for positioning, blocking and leveling operations and their applications.

Objectives and Content:

1. Define terminology associated with positioning, blocking and leveling operations.

2. Identify hazards and describe safe work practices pertaining to positioning, blocking and leveling operations.

3. Identify tools and equipment relating to positioning, blocking and leveling operations and describe their applications and procedures for use.

4. Describe the procedures used to perform positioning, blocking and leveling operations.

5. Describe the procedures used to troubleshoot issues pertaining to positioning, blocking and leveling operations.

MCO-220 Assembly and Disassembly (Lattice Boom Crane)

Learning Outcomes:

- Demonstrate knowledge of lattice boom cranes and their associated components.
- Demonstrate knowledge of the procedures used for the assembly and disassembly of lattice boom cranes and their components.

Objectives and Content:

1. Define terminology associated with the assembly and disassembly of lattice boom cranes.

2. Identify hazards and describe safe work practices pertaining to the assembly and disassembly of lattice boom cranes.

3. Interpret codes, standards and regulations pertaining to the assembly and disassembly of lattice boom cranes.
   i) jurisdictional requirements

4. Interpret charts, drawings and specifications relating to the assembly and disassembly of lattice boom cranes.
   i) manufacturers' specifications

5. Identify tools and equipment relating to the assembly and disassembly of lattice boom cranes and describe their applications and procedures for use.

6. Identify lattice boom crane components requiring assembly and disassembly.
   i) tracks
   ii) car body
   iii) carrier
   iv) house
   v) outrigger boxes
   vi) boom base
   vii) boom and jib
   viii) counterweights
   ix) hoist lines, hook blocks and overhaul balls

7. Describe the procedures used to assemble lattice boom cranes and their components.
   i) crawler-mounted
   ii) truck-mounted

8. Describe the procedures used to disassemble lattice boom cranes and their components.
   i) crawler-mounted
   ii) truck-mounted

9. Describe the procedures used for the assembly and disassembly of specialty equipment and their attachments.

MCO-225 Assembly and Disassembly (Telescopic Boom Crane)

Learning Outcomes:

- Demonstrate knowledge of telescopic boom cranes and their associated components.
- Demonstrate knowledge of the procedures used for the assembly and disassembly of telescopic boom cranes and their components.

Objectives and Content:

1. Define terminology associated with the assembly and disassembly of telescopic boom cranes.

2. Identify hazards and describe safe work practices pertaining to the assembly and disassembly of telescopic boom cranes.

3. Interpret codes, standards and regulations pertaining to the assembly and disassembly of telescopic boom cranes.
   i) jurisdictional requirements

4. Interpret charts, drawings and specifications relating to the assembly and disassembly of telescopic boom cranes.
   i) manufacturers' specifications

5. Identify tools and equipment relating to the assembly and disassembly of telescopic boom cranes and describe their applications and procedures for use.

6. Identify telescopic boom crane components requiring assembly and disassembly.
   i) outrigger boxes
   ii) hoist lines, hook blocks and overhaul balls
   iii) counterweights
   iv) swing-away extension and jib
   v) boom and boom inserts
   vi) boom dolly

7. Describe the procedures used to assemble telescopic boom cranes and their components.
   i) AT
   ii) RT
   iii) truck-mounted
   iv) crawler-mounted

8. Describe the procedures used to disassemble telescopic boom cranes and their components.
   i) AT
   ii) RT
   iii) truck-mounted
   iv) crawler-mounted

9. Describe the procedures used for the assembly and disassembly of specialty equipment and their attachments.

MCO-230 Reeving Operations

Learning Outcomes:

- Demonstrate knowledge of reeving operations.
- Demonstrate knowledge of the methods and equipment used for reeving operations.

Objectives and Content:

1. Define terminology associated with reeving operations.

2. Identify hazards and describe safe work practices pertaining to reeving operations.

3. Interpret codes, standards and regulations pertaining to reeving operations.
   i) manufacturer's specifications

4. Explain the reduction of torque values of multiple layered drums.

5. Identify tools and equipment relating to reeving operations and describe their applications and procedures for use.

6. Identify types of reeving operations and describe their applications.
   i) lacing
   ii) square reeving
   iii) skip reeving
   iv) boom hoist reeving

7. Explain the relationship between sheave ratio and wire rope diameter.

8. Describe the procedures used to determine the parts of line required for reeving operations.

MCO-235 Transportation

Learning Outcomes:

- Demonstrate knowledge of the procedures used to prepare cranes for transport.
- Demonstrate knowledge of the procedures used to transport cranes, their components and accessories.

Objectives and Content:

1. Define terminology associated with crane transportation.

2. Identify hazards and describe safe work practices pertaining to crane transportation.

3. Interpret codes, standards and regulations pertaining to crane transportation.
   i) jurisdictional requirements

4. Interpret charts, drawings and specifications relating to crane transportation.
   i) manufacturers' specifications

5. Identify tools and equipment relating to crane transportation and describe their applications and procedures for use.

6. Identify the considerations for selecting transportation routes.
   i) bridge capacities
   ii) clearances
   iii) road conditions
   iv) load types
   v) permits

7. Identify the requirements and describe the procedures used to prepare cranes for transport.
   i) truck-mounted
   ii) crawler-mounted
   iii) RT
   iv) AT

8. Describe the procedures used to load cranes and components for transport travel.
   i) truck and trailer
   ii) train
   iii) ship

9. Describe the procedures used to travel cranes.
   i) public roadways
   ii) jobsite

10. Describe the procedures used to unload cranes, their components and accessories.

MCO-240 Pre-lift Planning

Learning Outcomes:

- Demonstrate knowledge of the steps required for pre-lift planning.
- Demonstrate knowledge of the procedures used to determine crane positioning and setup.

Objectives and Content:

1. Define terminology associated with pre-lift planning.

2. Identify hazards and describe safe work practices pertaining to pre-lift planning.

3. Interpret codes, standards and regulations pertaining to pre-lift planning.

4. Interpret information pertaining to lifting operations found on drawings and specifications.
   i) lift plans
   ii) manufacturers' specifications
   iii) engineered drawings

5. Identify tools and equipment relating to pre-lift planning and describe their applications and procedures for use.

6. Identify the considerations and requirements for completing pre-lift planning.
   i) risk assessment
   ii) site assessment
      - site/soil conditions
      - crane access
      - obstructions
      - electrical hazards
   iii) permits

7. Identify the components of a pre-lift plan.
   i) crane selection, location and setup
   ii) blocking and matting requirements
   iii) ground preparation
   iv) on-site mobility requirements

v) communication plan
vi) personnel responsibilities
vii) barrier requirements
viii) grounding and bonding requirements
ix) load weight and location
x) rigging configuration

8. Describe the procedures used to determine crane location and setup.

9. Describe the procedures used to determine blocking and matting requirements.
   i) ground bearing capacity

MCO-245 Worksite Preparation

Learning Outcomes:

- Demonstrate knowledge of worksite preparation practices.
- Demonstrate knowledge of the procedures used to prepare worksite for crane operations.

Objectives and Content:

1. Define terminology associated with worksite preparation.

2. Identify hazards and describe safe work practices pertaining to worksite preparation.

3. Interpret codes, standards and regulations pertaining to worksite preparation.

4. Interpret information pertaining to worksite preparation found on drawings and specifications.
   i) lift plans
   ii) manufacturers' specifications
   iii) utilities locations
   iv) engineered drawings

5. Identify tools and equipment relating to worksite preparation and describe their applications and procedures for use.

6. Identify the considerations when completing worksite preparation.

7. Describe the procedures used to prepare worksite for crane operations.

8. Describe the procedures used to perform final site inspection.

CRA-085 Advanced Rigging and Hoisting

Learning Outcomes:

- Demonstrate knowledge of non-routine rigging and lifts, their applications, limitations and procedures.
- Demonstrate knowledge of non-routine rigging and lift techniques.

Objectives and Content:

1. Identify hazards and describe safe work practices pertaining to non-routine rigging and lifts.

2. Interpret codes, standards and regulations pertaining to non-routine rigging and lifts.

3. Identify types of non-routine rigging and lifts and describe their applications.

4. Identify types of non-routine lift attachments and describe their applications, limitations and procedures for use.

5. Describe the procedures used to determine the centre of gravity of a load.

6. Describe the procedures used to determine tension.
   i) snatch blocks
   ii) attachment points
   iii) unequal length slings

7. Describe the procedures used to perform non-routine lifts.

8. Describe the importance of critical lift plans.

CRA-090 Load Weight Calculations II

Learning Outcomes:

- Demonstrate knowledge of the procedure to determine weight of irregular shaped loads.
- Demonstrate knowledge of the procedure to determine centre of gravity.

Objectives and Content:

1. Define terminology associated with determining the weight of irregular shaped loads and centre of gravity of objects.

2. Explain the importance of determining the weight of irregular shaped loads and centre of gravity and their relevance in lifting operations.

3. Identify the considerations used to determine the weight of irregular shaped loads and their centre of gravity.
   i) volume of object
   ii) weight of materials
   iii) weight of rigging

4. Perform calculations to determine load weights for irregular shaped loads.

5. Perform calculations to determine centre of gravity in irregular shaped loads.

MCO-250 Load Charts II

Learning Outcomes:

- Demonstrate knowledge of load charts, their characteristics and applications.
- Demonstrate knowledge of crane capacity, crane component capacity and working radius for lift operations.

Objectives and Content:

1. Define terminology associated with load charts.

2. Identify parts of a load chart and describe their characteristics and applications.
   - i) working area diagram
   - ii) notes
   - iii) capacity charts
   - iv) range diagram
   - v) technical data

3. Interpret data from load charts required to plan lifts.
   - i) parts of line
   - ii) weights of deductions
   - iii) quadrants of operation
   - vi) crane configurations
     - on outriggers
     - on rubber
     - crawlers extended or retracted
     - counterweight
     - boom/jib
   - v) notes/technical data
     - line weight calculation/deduction
   - vi) boom length and radius

4. Perform calculations to determine crane's main boom configuration capacity.
   - i) gross
   - ii) net

5. Perform calculations to determine crane's jib or extension configuration capacity.
   i) gross
   ii) net

6. Perform calculations to determine the required parts of line and size of the hook block.

7. Perform calculations to determine maximum working radius.
   i) net load
   ii) gross load

8. Identify factors that influence crane capacity in lifting operations and describe their impact.

9. Describe the procedures used to select the best possible mobile crane configuration for the lift.

MCO-255 Multi-Crane Lifts

Learning Outcomes:

- Demonstrate knowledge of multi-crane lifts and their applications.
- Demonstrate knowledge of the procedures used for multi-crane lifts.

Objectives and Content:

1. Define terminology associated with multi-crane lifts.

2. Identify hazards and describe safe work practices pertaining to multi-crane lifts.
   i) communication plans
   ii) load sharing

3. Interpret codes, standards and regulations pertaining to multi-crane lifts.

4. Identify tools and equipment relating to multi-crane lifts and describe their applications and procedures for use.
   i) equalizer beam
   ii) triangle lifting device

5. Interpret charts, drawings and specifications pertaining to multi-crane lifts.
   i) lift plans
   ii) manufacturers' specifications
   iii) permits
   iv) engineering drawings

6. Perform calculations to determine loading on crane during multi-crane lift.

7. Identify crane configurations used in multi-crane lifts and describe their applications.

8. Describe the procedures used to perform multi-crane lifting operations.

MCO-260 Continual Checks

Learning Outcomes:

- Demonstrate knowledge of the procedures used to perform continual checks.

Objectives and Content:

1. Define terminology associated with continual checks.

2. Identify hazards and describe safe work practices pertaining to performing continual checks.

3. Identify tools and equipment relating to continual checks and describe their applications and procedures for use.

4. Explain continual checks, their purpose and applications.

5. Identify crane components requiring continual checks.

6. Describe the procedures used to perform continual checks.
   i) monitor
      - site conditions
      - running lines
      - hoist lines
      - standing ropes
      - gauges and warning systems
      - supporting base
      - weather conditions

7. Describe the procedures used to document deficiencies found during continual checks.

MCO-265 Hydraulic Telescopic Boom Operation

Learning Outcomes:

- Demonstrate knowledge of hydraulic telescopic boom cranes, their applications and operation.
- Demonstrate knowledge of the procedures used to operate telescopic boom cranes and their attachments.

Objectives and Content:

1. Define terminology associated with hydraulic telescopic boom crane operations.

2. Identify hazards and describe safe work practices pertaining to hydraulic telescopic boom crane operations.
   i) personnel
   ii) equipment
   iii) environmental

3. Interpret codes, standards and regulations pertaining to hydraulic telescopic boom crane operations.

4. Interpret charts, drawings and specifications pertaining to hydraulic telescopic boom crane operations.
   i) lift plans
   ii) manufacturers' specifications

5. Identify types of hydraulic telescopic boom cranes and describe their characteristics and applications.
   i) AT
   ii) RT
   iii) truck-mounted
   iv) boom trucks
   v) crawler-mounted

6. Describe the procedures used to operate hydraulic telescopic boom cranes and their attachments.
   i) without load
   ii) with load

iii) pick and carry
iv) free-fall

7. Describe the procedures used to inspect, maintain and troubleshoot hydraulic telescopic boom cranes.

MCO-270 Hydraulic Drive Lattice Boom Operation

Learning Outcomes:

- Demonstrate knowledge of hydraulic drive lattice boom cranes, their applications and operation.
- Demonstrate knowledge of the procedures used to operate hydraulic drive lattice boom cranes, hydraulic drive systems and their attachments.

Objectives and Content:

1. Define terminology associated with hydraulic drive lattice boom crane operations.

2. Identify hazards and describe safe work practices pertaining to hydraulic drive lattice boom crane operations.
   i) personnel
   ii) equipment
      - apply dogs (if applicable)
      - apply brake locks (if applicable)
   iii) environmental

3. Interpret codes, standards and regulations pertaining to hydraulic drive lattice boom crane operations.

4. Interpret charts, drawings and specifications pertaining to hydraulic drive lattice boom crane operations.
   i) lift plans
   ii) manufacturers' specifications

5. Identify types of hydraulic drive systems and describe their characteristics and applications.
   i) pumps
   ii) controls

6. Describe the procedures used to operate hydraulic drive lattice boom cranes and their attachments.
   i) without load
   ii) with load

iii) pick and carry
iv) free-fall
v) travel

7. Describe the procedures used to inspect, maintain and troubleshoot hydraulic drive lattice boom cranes.

MCO-280 Specialty Crane Operations

Learning Outcomes:

- Demonstrate knowledge of specialty crane operations, their characteristics and applications.
- Demonstrate knowledge of the procedures used to perform specialty crane operations.

Objectives and Content:

1. Define terminology associated with specialty crane operations.

2. Identify hazards and describe safe work practices pertaining to specialty crane operations.

3. Interpret codes, standards and regulations pertaining to specialty crane operations.

4. Identify tools and equipment relating to specialty crane operations and describe their applications and procedures for use.

5. Interpret charts, drawings and specifications pertaining to specialty crane operations.
   i) manufacturers' specifications

6. Identify specialty crane operations and describe their characteristics and applications.
   i) piledriving and extraction
   ii) clamshell
   iii) dragline
   iv) wrecking ball
   v) barge operations
   vi) magnet
   vii) heavy lift attachments
   viii) tower attachment and luffing jib
   ix) personnel hoisting
   x) drilling attachment

7. Describe the procedures used to attach equipment to cranes for specialty operations.

8. Describe the procedures used to perform specialty crane operations.