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Red Seal Occupational Standard

Tower Crane Operator

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Tower Crane Operator

Title: Tower Crane Operator

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Foreword

The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this Red Seal Occupational Standard (RSOS) as the Red Seal standard for the Tower Crane Operator trade.

Background

The first National Conference on Apprenticeship in Trades and Industries, held in Ottawa in 1952, recommended that the federal government be requested to cooperate with provincial and territorial apprenticeship committees and officials in preparing analyses of a number of skilled occupations. Employment and Social Development Canada (ESDC) funds the Red Seal Program, which, under the guidance of the CCDA, develops a national occupational standard for each of the Red Seal trades.

Standards have the following objectives:

- to describe and group the tasks performed by skilled workers;
- to identify which tasks are performed in every province and territory;
- to develop instruments for use in the preparation of Interprovincial Red Seal Examinations and assessment tools for apprenticeship and certification authorities;
- to develop common tools for apprenticeship on-the-job and technical training in Canada;
- to facilitate the mobility of apprentices and skilled workers in Canada;
- to supply employers, employees, associations, industries, training institutions and governments with occupational standards.

Any questions, comments, or suggestions for changes, corrections, or revisions to this standard or any of its related products may be forwarded to:

Trades and Apprenticeship Division
Apprenticeship and Sectoral Initiatives Directorate
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Gatineau, Quebec K1A 0J9

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This standard was prepared by the Apprenticeship and Sectoral Initiatives Directorate of ESDC. The coordinating, facilitating and processing of this standard were undertaken by employees of the standards development team of the Trades and Apprenticeship Division and of Ontario, the host jurisdiction for this trade.

Structure of the Occupational Standard

This standard contains the following sections:

Methodology: an overview of the process for development, review, validation and weighting of the standard

Description of the Tower Crane Operator Trade: an overview of the trade's duties, work environment, job requirements, similar occupations and career progression

Trends in the Tower Crane Operator Trade: some of the trends identified by industry as being the most important for workers in this trade

Skills for Success Summary: an overview of how each of the skills for success (formerly called essential skills) is applied in this trade

Roles and Opportunities for Skilled Trades in a Sustainable Future: an overarching description of how in the context of climate change, skilled trades play a large role in implementing solutions and adjusting to changes in the world. In addition to highlighting the importance of this awareness, the standard may also contain more details on activities, skills and knowledge elements that are specific to the trade

Industry Expected Performance: description of the expectations regarding the level of performance of the tasks, including information related to specific codes, regulations and standards that must be observed

Language Requirements: description of the language requirements for working and studying in this trade in Canada

Pie Chart of Red Seal Examination Weightings: a graph which depicts the national percentages of exam questions assigned to the major work activities

Task Matrix and Weightings: a chart which outlines graphically the major work activities, tasks and sub-tasks of this standard and the national percentages of exam questions assigned to the major work activities and tasks

Harmonization of Apprenticeship Training: the aspects of apprenticeship training that participating provinces and territories have agreed upon to substantively align apprenticeship systems across Canada

Major Work Activity (MWA): the largest division within the standard that is comprised of a distinct set of trade activities

Task: distinct actions that describe the activities within a major work activity

Task Descriptor: a general description of the task

Sub-task: distinct actions that describe the activities within a task

Skills:

Performance Criteria: description of the activities that are done as the sub-task is performed

Evidence of Attainment: proof that the activities of the sub-task meet the expected performance of a tradesperson who has reached journeyperson level

Range of Variables: elements and examples (not all inclusive) that provide a more in-depth description of a term used in the performance criteria and evidence of attainment

Knowledge:

Learning Outcomes: describes what should be learned relating to a sub-task while participating in technical or in-school training

Learning Objectives: topics to be covered during technical or in-school training in order to meet the learning outcomes for the sub-task

Range of Variables: elements and examples (not all inclusive) that provide a more in-depth description of a term used in the learning outcomes and learning objectives

Appendix A – Acronyms: a list of acronyms used in the standard with their full name

Appendix B – Tools and Equipment / Outils et équipement: a bilingual non-exhaustive list of tools and equipment used in this trade

Appendix C – Glossary / Glossaire: bilingual definitions or explanations of selected technical terms used in the standard

Methodology

Development of the Standard

A draft standard is developed by a broad group of trade representatives, including tradespeople, instructors and employers at a National Workshop led by a team of facilitators. This draft standard breaks down all the tasks performed in the occupation and describes the knowledge and abilities required for a tradesperson to demonstrate competence in the trade.

Harmonization of Apprenticeship Training

An analysis of all provinces' and territories' apprenticeship programs is performed and recommendations are made on harmonizing the name of the trade, the hours of training required and the number of levels of training. Provinces and territories consult with their respective industry stakeholders on these elements and revisions are discussed until consensus is reached. Following the development of the workshop draft of the RSOS, participants discuss and come to consensus on the sequence of training topics, as expressed in the new standard. Their sequencing recommendations are reviewed by stakeholders in participating provinces and territories and further discussions are convened to reach consensus and to identify any exceptions.

Online Survey

Stakeholders are asked to review and validate the activities described in the new standard via an online survey. These stakeholders are invited to participate in this consultation through apprenticeship authorities, as well as national stakeholder groups.

Draft Review

The RSOS development team forwards a copy of the standard to provincial and territorial authorities who consult with industry representatives to review it. Their recommendations are assessed and incorporated into the standard.

Validation and Weighting

Participating provinces and territories also consult with industry to validate and weight the document for the purpose of planning the makeup of the Red Seal Interprovincial Examination for the trade. They validate and weight the major work activities (MWA), tasks and sub-tasks, of the standard as follows:

MWA	Each jurisdiction assigns a percentage of questions to each MWA for an examination that would cover the entire trade.
Tasks	Each jurisdiction assigns a percentage of exam questions to each task within a MWA.
Sub-tasks	Each jurisdiction indicates, with a "yes" or "no", whether or not each sub-task is performed by skilled workers within the occupation in its jurisdiction.

The results of this exercise are submitted to the RSOS development team who then analyzes the data and incorporates it into the document. The RSOS provides the individual jurisdictional validation results as well as the national averages of all responses. The national averages for MWA and task weighting guide the Interprovincial Red Seal Examination plan for the trade.

The validation of the RSOS is used to identify common core sub-tasks across Canada for the occupation. If at least 70% of the responding jurisdictions' industry performs a sub-task, it shall be considered common core. Interprovincial Red Seal Examination questions are limited to the common core sub-tasks identified through this validation process.

Definitions for Validation and Weighting

yes	sub-task performed by qualified workers in the occupation in that province or territory
no	sub-task not performed by qualified workers in the occupation in that province or territory
NV	standard Not Validated by that province or territory
ND	trade Not Designated in a province or territory
Not Common Core (NCC)	sub-task, task or MWA performed less than 70% of responding jurisdictions; these will not be tested by the Interprovincial Red Seal Examination for the trade
National Average %	average percentage of questions assigned to each MWA and task in Interprovincial Red Seal Examination for the trade

Provincial/Territorial Abbreviations

NL	Newfoundland and Labrador
NS	Nova Scotia
PE	Prince Edward Island
NB	New Brunswick
QC	Quebec
ON	Ontario
MB	Manitoba
SK	Saskatchewan
AB	Alberta
BC	British Columbia
NT	Northwest Territories
YT	Yukon Territory
NU	Nunavut

Description of the Tower Crane Operator Trade

“Tower Crane Operator” is this trade’s official Red Seal occupational title approved by the CCDA. This standard covers tasks performed by tower crane operators.

Tower crane operators operate tower cranes to lift, move, position and place materials and equipment. They perform pre-operational inspections. They calculate the crane’s lifting capacities according to the crane’s load chart and determine load weight, participate in setting up and dismantling cranes, and position and stabilize the crane before the lift. Tower crane operators work with other workers to make sure the load is placed exactly where they need it. They also perform regular inspections and do minor repairs and maintenance on the equipment.

Tower crane operators work in the heavy industrial, commercial, residential and civil sectors. They may be employed by construction, surface mining, shipbuilding, offshore drilling rigs, railway and crane rental companies. They work outdoors in all kinds of weather, at heights and in noisy environments. Tower crane operators may be required to work in remote job sites.

Tower cranes are used for specific worksite requirements, as they have a smaller footprint compared to mobile cranes and are productive on sites where they will be used for a lengthy period. Some tower cranes are constructed by bolting a base to a specially made concrete pad or a ballasted base, and then erecting a tower (mast) of latticed steel up from it. Engineered counterweights are used to provide stability. On a hammerhead crane, a boom or jib extends horizontally across the top of the crane. A crane cab where the operator sits is installed where the mast and boom meet. Some cranes may have remote control stations and cabs. Luffing tower cranes have a jib that can be raised and lowered. Self-erecting cranes are set on retractable outriggers for support, have a mast and boom, and they are designed to be more mobile and versatile on job sites.

The key attributes for tower crane operators are that they should be mechanically inclined, comfortable with working at heights and have good hand-eye coordination, hearing, vision and math skills. Safety is the number one priority for tower crane operators; they need to work cautiously and with extreme precision to ensure the safety of others. Communication skills are very important to effectively communicate with site personnel, supervisors, riggers, signallers and other tradespeople. Physical fitness and good balance are important as the job requires them to climb up great heights and the operation of some cranes and the handling of accessories are physically demanding. Operators need to be able to cope with the stress and long working hours that can be inherent in this type of work.

The skills of tower crane operators are transferable to operating other types of cranes and heavy equipment. With experience, tower crane operators may move into careers such as business owners, supervisors, trainers, crane erectors and job coordinators. As with other trades, the ability to mentor apprentices is extremely important to pass on the skills, knowledge and expertise of the trade.

Trends in the Tower Crane Operator Trade

Technology

There are advances in computer technology, metallurgy and other disciplines associated with the engineering of crane equipment. Equipment is becoming more specialized in both design and manufacturing. This applies to structural, mechanical and electrical components.

Due to technological advances in operator aids such as load moment indicators (LMI), tower crane operators are more aware of their crane's operation and its limitations. Other operator aids such as anti-collision, zone protection systems and camera systems are now required by regulation in some jurisdictions.

Flat-top and luffing tower cranes are becoming more common due to their practicality. Luffing tower cranes that operate hydraulically are being introduced. Boom angle indicators have expanded into luffing tower cranes (these are now mandatory in some provinces and territories). Most manufacturers include them - they have become a standard on most new models.

The use of self-erecting cranes is becoming more popular/common in the field (e.g., when lifting pre-formed wall forms, insulated concrete forms (ICF), and other prefabricated building components). Using these types of cranes has proved more efficient.

Some manufacturers of cranes are introducing full synthetic hoist lines to replace steel wire rope. Benefits include lighter weights and non-conductive properties of the lines. It is expected that this change may be more common in the coming years. Operators need to be aware of these changes when performing inspection and maintenance.

Steel bar pendants are now being used instead of wire rope pendants in some applications.

Old cranes utilize analog controls and switches, whereas newer equipment utilizes programmable logic controller (PLC) panels and digital technology.

Newer cranes are using variable frequency drives (VFD) instead of contactor driven drives. The controls with these drives are infinitely variable and allow for more precise control.

Simulators have improved and are more commonly incorporated into training programs.

Health and Safety

There is more due diligence required of the operators and personnel performing preventative maintenance.

Tower crane operators must have an increased awareness of equipment limitations and conditions that affect safe operation of the crane.

Specialized personal protective equipment (PPE) developed for working at heights and self-rescue kits are becoming more widely available.

The density of structures in urban settings (e.g., proximity to other buildings) and the height of the buildings may cause wind tunnels and increased winds.

Products/Materials

With the advances in high rise construction, materials and equipment being hoisted are becoming lighter making fly forms bigger and longer and thus creating more impact by the wind during the lift (e.g., spinning). Tower crane operators must be aware of this and its safety implications.

Historically, the operator primarily “operated the crane”. Nowadays, the operator is increasingly involved in coordination of hoisting operations (e.g., pouring concrete) and must understand the timing of the work involved.

It is increasingly important for operators to be aware of manufacturers’ specifications and tolerances that are engineered into its design so that they can perform inspections with an increased level of care.

Legislative and Regulatory

The regulatory environment in which Canada’s crane industry operates continues to grow more complex and more rigorous, covering issues such as licensing, due diligence and liability.

Canadian Standards Association (CSA) Z248 and jurisdictional regulations continue to evolve over time. Tower crane operators must stay current with these changes.

Counterweight blocks must be engineered, and their weights identified.

In some jurisdictions, the use of zoning devices and anti-collision systems are mandatory for tower cranes working in proximity to powerlines or configured in an overlap scenario with other cranes.

Skills for Success Summary

Skills for Success are needed in a quickly changing world for work, learning and life. They are foundational for building other skills and important for effective social interaction. Everyone benefits from having these skills as they help individuals get a job, progress at their current job and change jobs. They also help individuals become active members of their community and succeed in learning.

Through extensive research and consultations, the Government of Canada launched the new Skills for Success model renewing the previous Essential Skills framework to better reflect the needs of the current and future labour market.

The summary presented here is based on existing Essential Skills profiles and will be updated to align with the new Skills for Success model over time.

Reading

In their daily work, tower crane operators read and comprehend several types of text. These include safety and work procedures as well as more complex regulations and manufacturers' operating manuals.

Document Use

Tower crane operators use workplace documents such as logbooks, load charts, lift plans, hazard assessments and workplace policies and procedures to carry out their job. They must be familiar with regulations relating to hoisting, rigging and safe work environments. They must have the ability to read and interpret manufacturers' specifications and load charts for the model of crane they are using. Depending on site-specific requirements, they may obtain information from engineered and construction drawings and plans such as climbing schematics and schedules.

Writing

Tower crane operators use writing skills to record comments or notes in logbooks or work records. They write messages to colleagues or management to give work details or reply to requests for technical information. They may also write longer descriptions and explanations for various reporting and data collection forms.

Communication

Tower crane operators use oral communication skills to coordinate work with site crews. Clear communication of technical and complex information is very important to avoid injuries and promote efficiency. Tower crane operators also use communication skills instructing apprentices, co-workers and on-site work crews. Good listening and visual skills are also required to communicate with riggers, signallers and other operators during lifts. Tower crane operators use verbal communication (directly or by radio) and hand signals to communicate the pace of lift movements and precise positioning of loads.

Numeracy

Tower crane operators use a range of math skills in their daily work. These include mathematical and physics concepts such as conversions, geometry, algebraic calculations, measurement and calculating load and lift requirements. They use load charts and manufacturers' specifications to further determine procedures, limits, and the necessary equipment for rigging and hoisting.

Thinking

Tower crane operators must use decision making skills to perform work planning and prioritizing. The decisions they make about the sequence of work have implications for everyone on site. Tower crane operators require strong analytical skills to effectively use their equipment.

Tower crane operators use problem solving skills to choose set-up locations and crane configurations for specific jobs. During lifts, tower crane operators make operational decisions to start, stop and vary the speed and direction of lifts to ensure safe movement and placement of a load. They evaluate the safety of lifts before and during lifts and stop work if necessary.

Working with Others

To be effective, tower crane operators must establish close and ongoing job-task coordination with other workers on the job site. They work closely with clients and co-workers to plan lifts and ensure that their activities are coordinated with those of on-site crews. The operator may be located high in the operator's cab and physically removed from their co-workers; however, they are in close communication with riggers, signallers and supervisors to coordinate lifts and load placements. Tower crane operators work in close coordination with other operators when performing multiple crane lifts and when in proximity with other cranes and heavy equipment.

Digital Technology

Tower crane operators are increasingly required to interpret electronic data transmitted to them from load moment indicators (LMI), anemometers and electronic scales located on remote controls or in the cab of the crane. Controls for the tower crane may also involve computerized applications. They should familiarize themselves with digital technology used on cranes such as zone control, anti-collision devices and camera systems.

Continuous Learning

As construction methods and crane technology advance, tower crane operators must keep abreast of these developments. Regulatory changes may require additional certification such as for service work, erection and climbing, and ongoing learning to ensure compliance and safe working conditions.

Roles and Opportunities for Skilled Trades in a Sustainable Future

Climate change affects all of us. Trades play a large role in implementing solutions and adjusting to changes in the world.

Throughout this standard, there may be specific references to tasks, skills and knowledge that clearly show this trade's role in a more sustainable future. Each trade has different roles to play and contributions to make in their own way.

For example:

- Construction tradespeople need to consider the materials they are using, building methods, and improvements to mechanical and electrical installations. There are important changes to codes and standards to help meet the climate change goals and commitments set for 2030 and 2050. Retrofits and new construction of low-energy buildings provide enormous opportunities for workers in this sector. Concepts, such as energy efficiency and regarding buildings as systems are foundational.

- Automotive and mechanical trades are seeing a shift towards the electrification of vehicles and equipment. As a result, new skills and knowledge will be required for tradespeople working in this sector. There are mandates for sales of new light-duty zero-emission vehicles (ZEV) in Canada, with the goal of achieving 100% ZEV sales by 2035. Due to this mandate, the demand for these vehicles is growing quickly among consumers and fleets. With this escalating demand, the need for skilled workers to maintain and repair these vehicles is also increasing.

- In industrial and resource sectors, there is pressure to move towards increased electrification of industrial processes. Many industrial and commercial facilities are also being upgraded to improve energy efficiency in areas such as lighting systems, and new production processes and technologies. There are also opportunities in carbon capture, utilization and storage (CCUS), as well as the production and export of low-carbon hydrogen.

- Trades in the service sector may also need to be aware of responsible sourcing, as well as efficient use of products and materials. New ways of working better are always a part of the job.

There are fast-moving changes in guidelines, codes, regulations and specifications. Many are being implemented for the purpose of energy efficiency and climate change. Those that affect specific trades may be mentioned within the standard. Examples of these guidelines and legislation include:

- the National Energy Code of Canada for Buildings (NECB).
- the Canadian Net-Zero Emissions Accountability Act (CNZEAA).
- programs that encourage sustainable building design and construction such as Leadership in Energy and Environmental Design (LEED) and the Zero Carbon Building (ZCB) standards.
- the Montreal Protocol for phasing out R22 refrigerants.
- energy efficiency programs such as ENERGY STAR.
- principles of the United Nations Declaration for the Rights of Indigenous Peoples pertaining to energy sector development.

Apprentices and tradespeople need to increase their climate literacy and reinforce their own understanding of energy issues and environmental practices. It is important for them to understand why these changes are happening and their effect on trades' work. While individual tradespeople and apprentices may not be able to choose certain elements like; the architectural design of buildings, building material selection, regulatory requirements, use of electric vehicles and technologies, they must understand the impact of using these elements in their work. Impacts include using environmentally friendly products and following requirements related to the disposal and recycling of materials.

In apprenticeship, as well as in ongoing professional development, employers and instructors should encourage learning about these concepts, why they are important, how they are implemented, and the overarching targets they are aiming to achieve.

All in all, it's about doing the work better and building a better world.

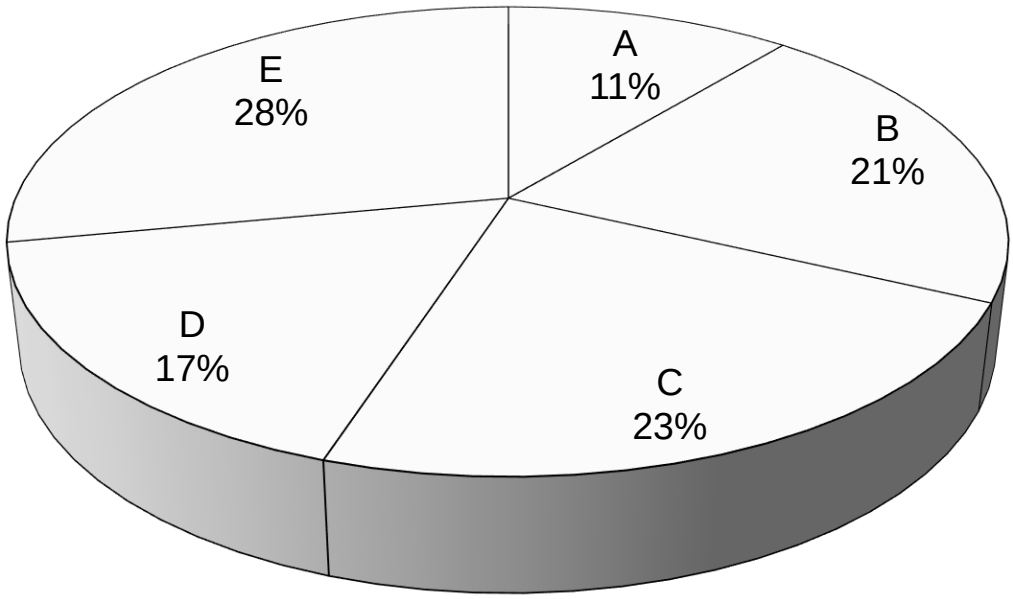
Industry Expected Performance

All tasks must be performed according to the applicable jurisdictional regulations and standards. All relevant health and safety standards must be respected and observed. Work should be performed efficiently and to a high quality without material waste or environmental damage. All requirements of employers, engineers, manufacturers, clients, and quality control policies must be met. At a journeyperson level of performance, all tasks must be done with minimal direction and supervision. As a journeyperson progresses in their career there is an expectation, they continue to upgrade their skills and knowledge to maintain pace with industry and promote continuous learning in their trade through mentoring of apprentices.

Language Requirements

It is expected that journeypersons are able to understand and communicate in either English or French, which are Canada's official languages. English or French are the common languages of business as well as languages of instruction in apprenticeship programs.

Pie Chart of Red Seal Examination and Weightings



MWA A	Performs common occupational skills	11%
MWA B	Inspects and maintains crane	21%
MWA C	Performs crane set-up, hoisting calculations and lift planning	23%
MWA D	Performs rigging	17%
MWA E	Operates crane	28%

This pie chart represents a breakdown of the interprovincial Red Seal examination. Percentages are based on the collective input from workers from the trade from across Canada. The Task Matrix on the next pages indicates the breakdown of tasks and sub-tasks within each Major Work Activity and the breakdown of questions assigned to the Tasks. The Interprovincial examination for this trade has 100 questions.

Tower Crane Operator
Task Matrix and Weightings

A – Performs common occupational skills — 11 %

Task A-1 **Performs safety-related functions** **69 %**	**A-1.01 Maintains safe work environment**	**A-1.02 Uses personal protective equipment (PPE) and safety equipment**	**A-1.03 Uses documentation**
Task A-2 **Uses communication and mentoring techniques** **31%**	**A-2.01 Uses communication techniques**	**A-2.02 Uses mentoring techniques**	

B – Inspects and maintains crane — 21%

Task B-3 **Performs pre-operational checks and regular inspections** **49%**	**B-3.01 Inspects structural components**	**B-3.02 Inspects mechanical components**	**B-3.03 Inspects lines, wire ropes and hoisting system components**
	B-3.04 Inspects hydraulic system components	**B-3.05 Inspects electrical system components**	**B-3.06 Inspects support components**
	B-3.07 Inspects track (rail) travel components	**B-3.08 Inspects cab components**	**B-3.09 Inspects safety and access components**
	B-3.10 Completes inspection documentation		

Task B-4 **Performs continual checks** **28%**	**B-4.01 Monitors weather conditions**	**B-4.02 Monitors site conditions**	**B-4.03 Monitors lines, wire ropes and hoisting system components**
	B-4.04 Monitors equipment performance and conditions	**B-4.05 Monitors structural and support components**	
Task B-5 **Performs minor crane maintenance** **23%**	**B-5.01 Maintains mechanical components**	**B-5.02 Lubricates wire ropes and crane components**	

C – Performs crane set-up, hoisting calculations and lift planning — 23%

Task C-6 **Participates in tower crane assembly, disassembly and transportation** **27%**	**C-6.01 Participates in crane assembly**	**C-6.02 Participates in crane disassembly**	**C-6.03 Transports self-erecting tower crane**
	C-6.04 Participates in assembly and disassembly of self-erecting tower cranes		
Task C-7 **Participates in tower crane climbing and reconfigurations** **35%**	**C-7.01 Participates in bottom-climbing procedures**	**C-7.02 Participates in top-climbing procedures**	**C-7.03 Participates in crane reconfiguration**
Task C-8 **Plans lifts** **38%**	**C-8.01 Determines load weights**	**C-8.02 Interprets load charts**	**C-8.03 Plans work procedures**
	C-8.04 Prepares for specialty lifts		

D – Performs rigging

17%

Task D-9 **Inspects, maintains and stores rigging equipment** **46%**	**D-9.01 Identifies deficiencies in slings and hardware**	**D-9.02 Lubricates slings and hardware**	**D-9.03 Stores rigging equipment**
Task D-10 **Follows rigging procedures** **54%**	**D-10.01 Selects required rigging equipment and configuration**	**D-10.02 Rigs load**	**D-10.03 Monitors rigging**

E – Operates crane

28%

Task E-11 **Performs pre-lift (warm-up) activities** **23%**	**E-11.01 Performs function test**	**E-11.02 Confirms limits**	
Task E-12 **Operates tower cranes** **37%**	**E-12.01 Moves trolley in and out**	**E-12.02 Booms (luffs) up and down**	**E-12.03 Swings (slews) jib**
	E-12.04 Hoists load	**E-12.05 Travels crane**	**E-12.06 Performs functions simultaneously**
Task E-13 **Performs specialty tower crane operations** **22%**	**E-13.01 Participates in multi-crane lifts**	**E-13.02 Operates in multi-crane site**	**E-13.03 Hoists personnel**
Task E-14 **Shuts down and secures tower cranes** **19%**	**E-14.01 Secures crane while leaving controls (short-term)**	**E-14.02 Secures crane while out of service**	

Harmonization of Apprenticeship Training

Provincial and territorial apprenticeship authorities are each responsible for their respective apprenticeship programs. In the spirit of continual improvement, and to facilitate mobility among apprentices in Canada, participating authorities have agreed to work towards harmonizing certain aspects of their programs where possible. After consulting with their stakeholders in the trade, they have reached consensus on the following elements. Note that implementation of these elements may vary from jurisdiction to jurisdiction, depending on their own circumstances. For more information on the implementation in any province and territory, please contact that jurisdiction's apprenticeship authority.

1. Trade name

The official Red Seal name for this trade is Tower Crane Operator.

2. Number of Levels of Apprenticeship

The number of levels of technical training recommended for this trade is two (2).

3. Total Training Hours

The total hours of training, including both on-the-job and in-school training for this trade is 3000.

4. Sequencing Topics and Related Sub-tasks

The topic titles in the table below are placed in a column for each apprenticeship level for technical training. Each topic is accompanied by the sub-tasks and their reference number. The topics in the grey shaded cells represent those that are covered "in context" with other training in the subsequent years.

Level 1	Level 2
	Context
	Safety-Related Functions
Safety-Related Functions 1.01 Maintains safe work environment 1.02 Uses personal protective equipment (PPE) and safety equipment 1.03 Uses documentation	
Communication Techniques 2.01 Uses communication techniques	**Mentoring Techniques** 2.02 Uses mentoring techniques

Pre-Operational Checks and Regular Inspections 3.01 Inspects structural components 3.02 Inspects mechanical components 3.03 Inspects lines, wire ropes and hoisting system components 3.04 Inspects hydraulic system components 3.05 Inspects electrical system components 3.06 Inspects support components 3.07 Inspects track (rail) travel components 3.08 Inspects cab components 3.09 Inspects safety and access components 3.10 Completes inspection documentation	**Pre-Operational Checks and Regular Inspections** 3.01 Inspects structural components 3.02 Inspects mechanical components 3.03 Inspects lines, wire ropes and hoisting system components 3.04 Inspects hydraulic system components 3.05 Inspects electrical system components 3.06 Inspects support components 3.07 Inspects track (rail) travel components 3.08 Inspects cab components 3.09 Inspects safety and access components 3.10 Completes inspection documentation
Continual Checks 4.01 Monitors weather conditions 4.02 Monitors site conditions 4.03 Monitors lines, wire ropes and hoisting system components 4.04 Monitors equipment performance and conditions 4.05 Monitors structural and support components	**Continual Checks** 4.01 Monitors weather conditions 4.02 Monitors site conditions 4.03 Monitors lines, wire ropes and hoisting system components 4.04 Monitors equipment performance and conditions 4.05 Monitors structural and support components
Minor Crane Maintenance 5.01 Maintains mechanical components 5.02 Lubricates wire ropes and crane components	**Minor Crane Maintenance** 5.01 Maintains mechanical components 5.02 Lubricates wire ropes and crane components
Tower Crane Assembly 6.01 Participates in crane assembly 6.02 Participates in crane disassembly 6.03 Transports self-erecting tower crane 6.04 Participates in assembly and disassembly of self-erecting tower cranes	**Tower Crane Assembly** 6.01 Participates in crane assembly 6.02 Participates in crane disassembly 6.03 Transports self-erecting tower crane 6.04 Participates in assembly and disassembly of self-erecting tower cranes
Tower Crane Climbing and Reconfigurations 7.01 Participates in bottom-climbing procedures 7.02 Participates in top-climbing procedures 7.03 Participates in crane reconfiguration	**Tower Crane Climbing and Reconfigurations** 7.01 Participates in bottom-climbing procedures 7.02 Participates in top-climbing procedures 7.03 Participates in crane reconfiguration
Lift Plan 8.01 Determines load weights 8.02 Interprets load charts 8.03 Plans work procedures 8.04 Prepares for specialty lifts	**Lift Plan** 8.01 Determines load weights 8.02 Interprets load charts 8.03 Plans work procedures 8.04 Prepares for specialty lifts
Rigging Equipment (Inspects, Maintains, Stores) 9.01 Identifies deficiencies in slings and hardware 9.02 Lubricates slings and hardware 9.03 Stores rigging equipment	**Rigging Equipment (Inspects, Maintains, Stores)** 9.01 Identifies deficiencies in slings and hardware 9.02 Lubricates slings and hardware 9.03 Stores rigging equipment
Rigging Procedures 10.01 Selects required rigging equipment and configuration 10.02 Rigs load 10.03 Monitors rigging	**Rigging Procedures** 10.01 Selects required rigging equipment and configuration 10.02 Rigs load 10.03 Monitors rigging

Pre-lift (warm-up) Activities 11.01 Performs function test 11.02 Confirms limits	**Pre-lift (warm-up) Activities** 11.01 Performs function test 11.02 Confirms limits
Tower Cranes (Operation) 12.01 Moves trolley in and out 12.02 Booms (luffs) up and down 12.03 Swings (slews) jib 12.04 Hoists load 12.05 Travels crane 12.06 Performs functions simultaneously	**Tower Cranes (Operation)** 12.01 Moves trolley in and out 12.02 Booms (luffs) up and down 12.03 Swings (slews) jib 12.04 Hoists load 12.05 Travels crane 12.06 Performs functions simultaneously
Specialty Tower Crane Operations 13.03 Hoists personnel	**Specialty Tower Crane Operations** 13.01 Participates in multi-crane lifts 13.02 Operates in multi-crane site
Tower Crane (Shut Down/Secure) 14.01 Secures crane while leaving controls temporarily (short term) 14.02 Secures crane while out of service	**Tower Crane (Shut Down/Secure)** 14.01 Secures crane while leaving controls temporarily (short term) 14.02 Secures crane while out of service

Major Work Activity A
Performs common occupational skills

Task A-1 Performs safety-related functions

Task Descriptor

Tower crane operators use personal protective equipment (PPE) and other safety equipment to comply with safety regulations. They maintain a safe work environment by assessing job site hazards and engaging in safe work practices. They document daily activities and reference documentation to ensure proper use of the tower crane. They may also provide input to incident reports as necessary.

A-1.01 Maintains safe work environment

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
A-1.01.01P	remove worn, damaged and defective ***tools and equipment*** from service	worn, damaged and defective ***tools and equipment*** are removed from service
A-1.01.02P	participate in toolbox talk and meetings with site superintendent	toolbox talk and meetings with site superintendent are held to be made aware of site-specific anomalies and ***irregularities***
A-1.01.03P	participate in risk assessment of worksite for ***safety hazards*** and ***environmental hazards***	risk assessment of worksite is partaken to identify ***safety hazards*** and ***environmental hazards***
A-1.01.04P	recognize, report and monitor potential ***safety hazards*** and ***environmental hazards***	potential ***safety hazards*** and ***environmental hazards*** are recognized, reported and monitored
A-1.01.05P	minimize hoisting or suspending loads over workplace personnel	hoisting or suspending loads over workplace personnel is minimized according to jurisdictional regulations
A-1.01.06P	suggest safe placement areas for loads to relieve congestion and facilitate a hazard-free environment	safe placement areas for loads are identified to relieve congestion and facilitate a hazard-free environment
A-1.01.07P	ensure loads are secure and free of loose debris	loads are secure and free of loose debris
A-1.01.08P	use approved engineered ***lifting devices***	approved engineered ***lifting devices*** are used

A-1.01.09P	verify and maintain limit of approach	limit of approach is verified and maintained according to ***regulations*** and ***obstacles***
A-1.01.10P	verify crane is grounded	crane is grounded according to manufacturers' specifications
A-1.01.11P	interpret and apply ***safety regulations*** and ***site-specific safety requirements***	***safety regulations*** and ***site-specific safety requirements*** are interpreted and applied
A-1.01.12P	operate within limits and use caution when operating tower crane in ***weather conditions***	limits are followed with due caution when operating tower crane in ***weather conditions*** according to manufacturers' specifications, Canadian Standards Association (CSA) Z248 and jurisdictional requirements
A-1.01.13P	secure placement of ***crane components***	placement of ***crane components*** is secured
A-1.01.14P	maintain cab for climate control and ***safe operation practices***	cab is maintained for climate control and ***safe operation practices***

Range of Variables

tools and equipment include: hand tools, power tools

irregularities include: changes in worksite that impact working radius of tower crane, damage to crane and security devices, injuries of workers

safety hazards include: chemicals, discharge/spills, fire, high tension wires, environmental conditions, heights, energy sources (hydraulic, electrical, pneumatic), overhead (power lines, cranes/other equipment, obstructions), mobile machinery (trucks, cranes, mobile equipment), rotating equipment (belts, pulleys, sheaves, sprockets, chains, pinch/crush points, guards), open excavations, oil spills on deck, guy wires, missing guard rails

environmental hazards include: oil leaks

lifting devices include: bins, bottle cages and spreader beams for specific lifting application and authorized by a professional engineer when required by a jurisdiction

regulations include: Power Line Hazards (PLH)

obstacles include: guy wires, buildings, other machinery

safety regulations include: Workplace Hazardous Materials Information System (WHMIS), Occupational Health and Safety (OH&S), company policies, CSA Z248

site-specific safety requirements include: evacuation and emergency procedures, company policies

weather conditions include: wind, rain, temperature (minimum and maximum according to manufacturer), snow, lightning, hoar frost, fog

crane components include: guard rails, ladders, platforms

safe operation practices include: cleanliness to avoid obstruction of controls or view

	Knowledge	
	Learning Outcomes	**Learning Objectives**
A-1.01.01L	demonstrate knowledge of safe work practices and procedures	describe safety policies, procedures and requirements
		identify potential ***safety hazards*** and describe safe work practices
		describe standard emergency procedures

		describe first aid practices
		describe procedures used to dispose of hazardous materials
		identify types of ***barriers*** used to control access to work area and when they are required
		describe ***operator's responsibilities*** in maintaining a safe working environment
A-1.01.02L	demonstrate knowledge of induced currents, power line hazards and high-voltage electrical equipment	define terminology associated with induced currents, power lines and high-voltage electrical equipment
		identify hazards and describe safe work practices when operating cranes near sources of induced currents, power lines and high-voltage electrical equipment
		describe jurisdictional limits of approach to power lines
		interpret signage related to high-voltage electrical equipment
		describe procedures used when contact occurs with high-voltage electrical equipment
A-1.01.03L	demonstrate knowledge of regulatory requirements pertaining to safety	identify and interpret workplace health regulations pertaining to safety

Range of Variables

safety hazards include: chemicals, discharge/spills, fire, high tension wires, environmental conditions, heights, energy sources (hydraulic, electrical, pneumatic), overhead (power lines, cranes/other equipment, obstructions), mobile machinery (trucks, cranes, mobile equipment), rotating equipment (belts, pulleys, sheaves, sprockets, chains, pinch/crush points, guards), open excavations, oil spills on deck, guy wires, missing guard rails

barriers include: barricade tape, pylons, concrete barriers

operator's responsibilities include: full control of equipment controls, hoist within limits, safe handling of loads, secure loads, inspecting and maintaining equipment, preventing falls from heights

A-1.02 Uses personal protective equipment (PPE) and safety equipment

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
A-1.02.01P	select ***PPE*** and ***safety equipment***	***PPE*** and ***safety equipment*** are selected according to task
A-1.02.02P	ensure proper fit of ***PPE***	***PPE*** is fit according to manufacturers' specifications
A-1.02.03P	recognize and replace worn, damaged and defective ***PPE*** and ***safety equipment***	worn, damaged and defective ***PPE*** and ***safety equipment*** are recognized and replaced
A-1.02.04P	apply ***PPE*** and ***safety equipment***	***PPE*** and ***safety equipment*** are applied according to task and manufacturers' specifications
A-1.02.05P	clean, maintain and store ***PPE*** and ***safety equipment***	***PPE*** and ***safety equipment*** is cleaned, maintained and stored according to manufacturers' specifications and site requirements

Range of Variables

PPE includes: safety boots, hard hats, safety glasses, safety vests, hearing protection, fall arrest equipment

safety equipment includes: first aid kits, fire extinguishers, spill kits, fall arrest equipment, self-rescue kits, safety guards

	Knowledge	
	Learning Outcomes	**Learning Objectives**
A-1.02.01L	demonstrate knowledge of ***PPE*** and ***safety equipment***, their applications, limitations, maintenance, storage and procedures for use	identify types of ***PPE*** and ***safety equipment*** and describe their applications, limitations, maintenance, storage and procedures for use
A-1.02.02L	demonstrate knowledge of inspection requirements for ***PPE*** and ***safety equipment***	describe importance of expiry dates on ***PPE*** and ***safety equipment***
		identify potential ***defects*** and adjustments with ***PPE*** and ***safety equipment***

A-1.02.03L	demonstrate knowledge of regulatory requirements pertaining to ***PPE*** and ***safety equipment***	describe ***standards*** and ***regulations*** pertaining to use of ***PPE*** and ***safety equipment***
		describe certification and training requirements for ***PPE*** and ***safety equipment***

Range of Variables

PPE includes: safety boots, hard hats, safety glasses, safety vests, hearing protection, fall arrest equipment

safety equipment includes: first aid kits, fire extinguishers, spill kits, fall arrest equipment, self-rescue kits, safety guards

defects include: abrasions, tears, cracks, deformations

standards include: CSA Z248, American Society of Mechanical Engineers (ASME), American National Standards Institute (ANSI)

regulations include: WHMIS, OH&S

A-1.03 Uses documentation

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

Skills

	Performance Criteria	Evidence of Attainment
A-1.03.01P	document lift responsibilities of personnel involved in lift on field level risk assessment (FLRA) or hazard assessment	lift responsibilities of personnel involved in lift are documented on FLRA or hazard assessment according to site and company policies
A-1.03.02P	review and update logbooks for ***activities***	logbooks for ***activities*** are reviewed and updated
A-1.03.03P	complete written statements for ***reports***	written statements for ***reports*** are completed
A-1.03.04P	locate and reference ***sources of information***	***sources of information*** are located and referenced
A-1.03.05P	interpret text and diagrams in ***documents***	text and diagrams in ***documents*** are interpreted
A-1.03.07P	check crane rigging and attachment documentation for certification, capacity and condition	crane rigging and attachment documentation is checked for certification, capacity and condition and removed from service and reported if deficient according to standards

Range of Variables

activities include: repairs, maintenance, daily inspections, incidents of damage

reports include: incident reports, lift studies (e.g., engineered lift, lift calculation), daily tasks performed

sources of information include: manufacturers' specifications, operating manual, safety information, load charts, crane certification, company policies and procedures

documents include: operating manual for crane operation and maintenance, load charts

	Knowledge	
	Learning Outcomes	**Learning Objectives**
A-1.03.01L	demonstrate knowledge of safety-related and ***work-related documentation*** and their applications	define terminology associated with safety-related and ***work-related documentation***
		identify types of safety-related and ***work-related documentation*** and describe their applications
A-1.03.02L	demonstrate knowledge of procedures used to interpret and prepare safety-related and ***work-related documentation***	explain responsibilities associated with completing safety-related and ***work-related documentation***
		describe procedures used to interpret and complete safety-related and ***work-related documentation***
A-1.03.03L	demonstrate knowledge of regulatory requirements pertaining to safety-related and ***work-related documentation***	identify ***standards and regulations*** pertaining to safety-related and ***work-related documentation***
		explain tower crane operator's jurisdictional legal responsibilities

Range of Variables

work-related documentation include: logbooks, engineered lift drawings, lift plan, manufacturers' specifications (load charts, operator manuals), permits, job scope analysis (JSA), site orientation, work orders, maintenance schedules and records, policies

standards and regulations include: CSA, OH&S, WHMIS, jurisdictional

Task A-2 Uses communication and mentoring techniques

Task Descriptor

Learning in the trades is done primarily in the workplace with tradespeople passing on their skills and knowledge to apprentices, as well as sharing knowledge among themselves. Apprenticeship is, and always has been about mentoring – learning workplace skills and passing them on. Because of the importance of this to the trade, this task covers the activities related to communication in the workplace and mentoring skills.

Tower crane operators need to be proficient in trade-specific communication methods to communicate with supervisors, riggers and other crane operators to coordinate their work to ensure a safe and efficient work environment.

A-2.01 Uses communication techniques

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
A-2.01.01P	demonstrate communication practices with individuals or in a group	instructions and messages are interpreted by all parties involved in communication
A-2.01.02P	listen using ***active listening*** practices	***active listening*** practices are utilized
A-2.01.03P	speak clearly using correct industry terminology to ensure understanding	understanding of message is confirmed by both parties
A-2.01.04P	receive and respond to instructions	response to instructions indicates understanding
A-2.01.05P	receive and respond to feedback on work completed or performed	response to feedback indicates understanding and corrective measures are taken
A-2.01.06P	explain and provide feedback	explanation and feedback is provided and task is carried out as directed
A-2.01.07P	use questioning to improve communication	questions enhance understanding, on-the-job training and goal setting
A-2.01.08P	participate in safety and information meetings	meetings are attended, information is relayed to workforce, and is applied

A-2.01.09P	send and receive ***electronic messages***	***electronic messages*** are sent and received using professionalism, plain language and clear expressions according to company policies
A-2.01.10P	use hand signals	hand signals are used and understood
A-2.01.11P	use ***radio communication when required***	radio communication is used when required
A-2.01.12P	coordinate lift responsibilities	lift responsibilities are coordinated with hoisting crew members and other tradespeople involved, when applicable

Range of Variables

active listening includes: hearing, interpreting, reflecting, responding, paraphrasing

electronic messages include: email, text messages

radio communication when required includes: in blind lifts, personnel basket lifts, multiple crane lifts, when vision is obscured, as per jurisdictional or client requirements

	Knowledge	
	Learning Outcomes	**Learning Objectives**
A-2.01.01L	demonstrate knowledge of trade terminology	define terminology used in trade
A-2.01.02L	demonstrate knowledge of effective communication practices	describe importance of using effective verbal and non-verbal communication with ***people in the workplace***
		identify ***sources of information*** to effectively communicate
		identify communication and ***learning styles***
		describe effective listening and speaking skills
		describe how to receive and give instructions effectively
		identify ***personal responsibilities and attitudes*** that contribute to on-the-job success
		identify value of equity, diversity and inclusion in workplace
		identify communication that constitutes bullying, ***harassment*** and ***discrimination***
		identify communication styles appropriate to different systems and applications of ***electronic messages***
		describe standard hand signals
		describe radio communication and when it should be used

	identify ***types of communication devices*** and describe their purpose and operation
	describe procedures used to communicate during hoisting operations
	explain purpose of site communication plan

Range of Variables

people in the workplace include: other tradespeople, colleagues, apprentices, supervisors, clients, jurisdictional representatives

sources of information include: regulations, codes, occupational health and safety requirements, jurisdictional requirements, prints, drawings, specifications, company and client documentation

learning styles include: visual, auditory, reading, writing, kinesthetic

personal responsibilities and attitudes include: asking questions, working safely, accepting constructive feedback, time management and punctuality, respect for authority, good stewardship of materials, tools and property, efficient work practice

harassment: as defined by the Canadian and jurisdictional Human Rights Commissions

discrimination: as defined by the Canadian Human Rights Act and jurisdictional human rights laws

electronic messages include: email, text messages

types of communication devices include: portable and stationary radios, mobile phones and mobility devices, computers, crane horn

A-2.02 Uses mentoring techniques

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
A-2.02.01P	identify and communicate learning objective and point of lesson	apprentice or learner can explain objective and point of lesson
A-2.02.02P	link lesson to other lessons and project	lesson order and unplanned learning opportunities are defined
A-2.02.03P	demonstrate performance of a skill to an apprentice or learner	***steps required to demonstrate a skill*** are performed
A-2.02.04P	set up conditions required for apprentice or learner to practice a skill	***practice conditions*** are set up so that skill can be practiced safely by apprentice or learner
A-2.02.05P	assess apprentice or learner's ability to perform tasks with increasing independence	performance of apprentice or learner improves with practice to a point where skill can be done with little supervision
A-2.02.06P	give supportive and corrective feedback	apprentice or learner adopts best practice after having been given supportive or corrective feedback

A-2.02.07P	support apprentices or learners in pursuing technical training opportunities	technical training is completed within timeframe prescribed by apprenticeship authority
A-2.02.08P	support anti-***harassment*** and anti-***discrimination*** practices in workplace	workplace is ***harassment*** and ***discrimination***-free
A-2.02.09P	assess apprentice or learner suitability to trade during probationary period	apprentice or learner is given constructive feedback that helps them identify their own strengths and weaknesses and suitability for the trade

Range of Variables

steps required to demonstrate a skill include: understanding who, what, where, when, why, and how, explaining, showing, giving encouragement, following up to ensure skill is performed correctly

practice conditions mean: guided, limited independence, full independence

harassment: as defined by the Canadian and jurisdictional Human Rights Commissions

discrimination: as defined by the Canadian Human Rights Act and jurisdictional human rights laws

	Knowledge	
	Learning Outcomes	**Learning Objectives**
A-2.02.01L	demonstrate knowledge of strategies for learning skills in workplace	describe importance of individual experience
		describe shared responsibilities for workplace learning
		determine one's own learning preferences and explain how these relate to learning new skills
		describe importance of different types of skills in workplace
		describe importance of ***skills for success (essential skills)*** in workplace
		identify different ***learning styles***
		identify different ***learning needs*** and strategies to meet them
		identify ***strategies to assist in learning a skill***
A-2.02.02L	demonstrate knowledge of strategies for ***teaching*** workplace ***skills***	identify different roles played by workplace mentor
		describe ***teaching skills***
		explain importance of identifying point of lesson
		identify how to choose a good time to present lesson
		explain importance of linking lessons
		identify context for learning skills

	describe considerations in setting up opportunities for skill practice
	explain importance of providing feedback
	identify techniques for giving effective feedback
	describe a skills assessment
	identify methods of assessing progress
	explain how to adjust lesson to different situations

Range of Variables

skills for success (essential skills) are: adaptability, collaboration, communication, creativity and innovation, digital, numeracy, problem solving, reading, writing

learning styles include: visual, auditory, reading, writing, kinesthetic

learning needs include: learning disabilities, learning preferences, language proficiency

strategies to assist in learning a skill include: understanding the basic principles of instruction, developing coaching skills, being mature and patient, providing feedback

teaching skills include: identifying point of lesson, linking lesson, demonstrating skill, providing practice, giving feedback, assessing skills and progress

Major Work Activity B
Inspects and maintains crane

Task B-3 Performs pre-operational checks and regular inspections

Task Descriptor

Inspections on tower cranes must be performed on a regular prescribed basis to ensure that the crane has been signed off by a professional engineer when required by a jurisdiction and has met safety, manufacturers' and company specifications. All inspection activities must be documented in a logbook to comply with regulations and to preserve machine history for future reference.

B-3.01 Inspects structural components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
B-3.01.01P	select and use ***tools and equipment***	***tools and equipment*** are selected and used according to task
B-3.01.02P	perform visual inspection of ***structural components***	visual inspection of ***structural components*** is performed to identify defects, ***deficiencies*** and ***conditions***
B-3.01.03P	verify that ***structural fasteners*** are in place and tightened	***structural fasteners*** are in place and tightened according to manufacturers' specifications and ***standards***
B-3.01.04P	verify that non-destructive testing (NDT) of ***structural components*** has been conducted	NDT of ***structural components*** has been conducted and proof of inspection is documented according to company policies, jurisdictional regulations and ***standards***
B-3.01.05P	check that base is in good ***condition***, visually checking for ***deficiencies***	base is in good ***condition***, and ***deficiencies*** are identified

B-3.01.06P	check that cab is secure and in good condition, visually checking for ***deficiencies***	cab is secure and in good condition, and ***deficiencies*** are identified
B-3.01.07P	check counterweight mounts and suspension devices for ***deficiencies*** and placement	counterweight mounts and suspension devices are checked for ***deficiencies*** and placement according to manufacturers' specifications
B-3.01.08P	verify that ***attachments*** are fastened securely	***attachments*** are fastened securely according to engineering specifications

Range of Variables

tools and equipment include: callipers, measuring tapes, temperature gauges, straight edges

structural components include: mast, jib, apex, gantry, counter jib, pendant lines, base, base components, climbing components, cab, anchor, tower bolts, jib pins, turntable, bolts, counterweights

deficiencies include: cracks, wear points, cracked welds, deformations, stretching, corrosion, missing fasteners

conditions include: free from standing water and ice, ground conditions, spalling concrete, outrigger placement, erosion, water damage

structural fasteners include: bolts, pins, retaining devices

standards include: CSA Z248

attachments include: signage, flags, lights, camera systems, load moment indicators (LMI)

	Knowledge	
	Learning Outcomes	**Learning Objectives**
B-3.01.01L	demonstrate knowledge of ***structural components***, their characteristics, applications and operation	identify ***structural components***, and describe their characteristics and applications
		identify ***types of counterweights***, and describe their characteristics and applications
		describe operating principles of ***structural components***
		interpret information pertaining to ***structural components*** found on drawings and manufacturers' specifications
B-3.01.02L	demonstrate knowledge of procedures to inspect ***structural components***	identify ***tools and equipment*** used to inspect ***structural components***, and describe their applications and procedures for use
		identify ***hazards*** and describe safe work practices to inspect ***structural components***
		describe procedures to inspect ***structural components***
		identify defects, ***deficiencies*** and ***conditions*** in ***structural components***

B-3.01.03L	demonstrate knowledge of training and certification requirements to inspect ***structural components***	identify training and certification requirements to inspect ***structural components***
B-3.01.04L	demonstrate knowledge of regulatory requirements pertaining to inspection of ***structural components***	identify ***standards*** and regulations pertaining to inspection of ***structural components***
		identify jurisdictional requirements for NDT

Range of Variables

structural components include: mast, jib, apex, gantry, counter jib, pendant lines, base, base components, climbing components, cab, anchor, tower bolts, jib pins, turntable, bolts, counterweights

types of counterweights include: fixed, stackable, removable, ballast

tools and equipment include: callipers, measuring tapes, temperature gauges, straight edges

hazards include: falling, electrocution, pinch/crush points, weather conditions, moving components

deficiencies include: cracks, wear points, cracked welds, deformations, stretching, corrosion, missing fasteners

conditions include: free from standing water and ice, ground conditions, spalling concrete, outrigger placement, erosion, water damage

standards include: CSA Z248

B-3.02 Inspects mechanical components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
B-3.02.01P	check ***fluid*** levels	***fluid*** levels are checked to ensure that level is according to manufacturers' specifications
B-3.02.02P	check ***fluids*** for contamination and colour of oil	***fluids*** are checked for contamination and colour of oil
B-3.02.03P	verify function of breather system for gear boxes	function of breather system for gear boxes is verified to ensure adequate air transfer
B-3.02.04P	perform visual inspection of ***mechanical components***	visual inspection of ***mechanical components*** is performed to identify defects and ***deficiencies***
B-3.02.05P	check hoist winch, luffing winch and trolley winch brakes	hoist winch, luffing winch and trolley winch brakes are checked for wear, contamination and adjustment according to manufacturers' specifications
B-3.02.06P	verify fasteners and hardware are intact and functional	fasteners and hardware are verified to be intact and functional according to manufacturers' specifications

B-3.02.07P	check operation of sheaves and wire rope drums	operation of sheaves and wire rope drums are checked for excessive wear, fleet angle and that wire rope is spooling correctly
B-3.02.08P	verify ***wire rope end connections*** are secure	***wire rope end connections*** are verified to be secure according to connection system and manufacturers' specifications

Range of Variables

fluids include: fuel, oil, coolant, hydraulic, gear oil

mechanical components include: winches, sheaves, swing motors, brakes, gear boxes, mechanical safety devices, trolley components

deficiencies include: leaks, worn points, broken mounting hardware, worn belts and hoses

wire rope end connections include: wedge and socket, clamps

	Knowledge	
	Learning Outcomes	**Learning Objectives**
B-3.02.01L	demonstrate knowledge of ***mechanical components***, their characteristics, applications and operation	identify ***mechanical components***, and describe their characteristics and applications
		describe operating principles of ***mechanical components***
		interpret information pertaining to ***mechanical components*** found on drawings and manufacturers' specifications
B-3.02.02L	demonstrate knowledge of procedures to inspect ***mechanical components***	identify tools and equipment used to inspect ***mechanical components***, and describe their applications and procedures for use
		identify ***hazards*** and describe safe work practices pertaining to inspection of ***mechanical components***
		describe procedures to inspect ***mechanical components***
		identify defects and ***deficiencies*** in ***mechanical components***
B-3.02.03L	demonstrate knowledge of regulatory requirements pertaining to inspection of ***mechanical components***	identify ***standards*** and ***regulations*** pertaining to inspection of ***mechanical components***

Range of Variables

mechanical components include: winches, sheaves, swing motors, brakes, gear boxes, mechanical safety devices, trolley components

hazards include: falling, electrocution, pinch/crush points, weather conditions, moving components

standards include: CSA Z248

regulations include: jurisdictional, WHMIS, OH&S

B-3.03 Inspects lines, wire ropes and hoisting system components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

Skills

	Performance Criteria	Evidence of Attainment
B-3.03.01P	measure diameter of wire rope	diameter of wire rope is measured using calipers and verified against CSA Z248 and manufacturers' specifications
B-3.03.02P	perform visual inspection of lines, wire ropes and ***hoisting system components***	visual inspection of lines, wire ropes and ***hoisting system components*** is performed to identify defects and ***deficiencies***
B-3.03.03P	verify line path for improper reeving, sheave alignment and obstructions	line path is verified for improper reeving, sheave alignment and obstructions
B-3.03.04P	check lubrication of wire rope	lubrication of wire rope is checked by examining for corrosion, contamination, bare spots and build-up
B-3.03.05P	check tension of trolley cable	tension of trolley cable is checked to ensure trolley operation
B-3.03.06P	verify that lines are spooling correctly on drum	lines are spooled correctly on drum
B-3.03.07P	check reeving of lines around sheaves	lines around sheaves are reeved according to manufacturers' specifications
B-3.03.08P	check end terminations	end terminations are visually checked according to ***standards*** and manufacturers' specifications
B-3.03.09P	inspect hook block and ball	hook block and ball are inspected for cracks and deformities according to manufacturers' specifications and instructions, and hook throat openings are within manufacturers' specifications
B-3.03.10P	measure sheave tolerances	sheave tolerances are measured
B-3.03.11P	check lubrication of sheaves and swivels	lubrication of sheaves and swivels are checked
B-3.03.12P	verify operation of hook latch and positive latch	hook latch and positive latch are operational
B-3.03.13P	verify that NDT of ***hoisting system components*** has been conducted	NDT of ***hoisting system components*** is verified to have been conducted, and documented proof of inspection is available according to jurisdictional regulations

Range of Variables

hoisting system components include: clutches, brakes, pumps, hook blocks, wedge sockets, clamps, sheaves, winches, motors, limit switch devices

deficiencies include: improper size, broken wires, abrasion, crushed strands, corrosion, kinks, bird caging, electric arc, metal fatigue, contamination

standards include: CSA Z248, ASME

	Knowledge	
	Learning Outcomes	**Learning Objectives**
B-3.03.01L	demonstrate knowledge of lines, wire ropes and ***hoisting system components***, their characteristics, applications and operation	identify types of lines, wire ropes and ***hoisting system components***, and describe their characteristics and applications
		describe operating principles of lines, wire ropes and ***hoisting system components***
		interpret information pertaining to lines, wire ropes and ***hoisting system components*** found on drawings and manufacturers' specifications
B-3.03.02L	demonstrate knowledge of procedures to inspect lines, wire ropes and ***hoisting system components***	identify tools and equipment used to inspect lines, wire ropes and ***hoisting system components***, and describe their procedures for use
		identify ***hazards*** and describe safe work practices pertaining to inspection of lines, wire ropes and ***hoisting system components***
		describe procedures to inspect lines, wire ropes and ***hoisting system components***
		describe defects, ***deficiencies*** and ***wire rope rejection criteria***
B-3.03.03L	demonstrate knowledge of regulatory requirements pertaining to inspection of lines and ***hoisting system components***	identify ***standards*** and ***regulations*** pertaining to inspection of lines and ***hoisting system components***

Range of Variables

hoisting system components include: clutches, brakes, pumps, hook blocks, wedge sockets, clamps, sheaves, winches, motors, limit switch devices

hazards include: falling, electrocution, pinch/crush points, weather conditions, moving components

deficiencies include: improper size, broken wires, abrasion, crushed strands, corrosion, kinks, bird caging, electric arc, metal fatigue, contamination

wire rope rejection criteria include: breakage, wear, broken wires, abrasion, crushed strands, corrosion, kinking, bird caging, electric arc, metal fatigue, contamination

standards include: CSA Z248, ASME

regulations include: jurisdictional, WHMIS, OH&S

B-3.04 Inspects hydraulic system components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
B-3.04.01P	perform visual inspection of ***hydraulic system components***	visual inspection of ***hydraulic system components*** is performed to identify ***failures and deficiencies***
B-3.04.02P	check hydraulic fluid levels	hydraulic fluid levels are checked to ensure that level is to manufacturers' specifications
B-3.04.03P	verify pump is working within pressure parameters	pump is verified to be working within pressure parameters by checking gauges when present and accessible

Range of Variables

hydraulic system components include: pumps, lines, hoses, cylinders, fluid reservoir, valves, pressure gauges, filter gauges

failures and deficiencies include: leaking seals, bent rams, broken mounting hardware, leaking hoses, cracks, wear, chafing, corrosion, incorrect oil level, cavitation, filter restriction, contamination, unusual noise in drive line, high temperatures

	Knowledge	
	Learning Outcomes	**Learning Objectives**
B-3.04.01L	demonstrate knowledge of ***hydraulic system components***, their characteristics, applications and operation	identify ***hydraulic system components*** and describe their characteristics and applications
		identify ***types of hydraulic pumps*** and describe their purpose, operation, characteristics and applications
		describe operating principles of ***hydraulic systems components***
		interpret information pertaining to ***hydraulic system components*** found on drawings and manufacturers' specifications

B-3.04.02L	demonstrate knowledge of procedures to inspect ***hydraulic system components***	identify tools and equipment used to inspect ***hydraulic system components***, and describe their applications and procedures for use
		identify ***hazards*** and describe safe work practices pertaining to inspection of ***hydraulic system components***
		describe procedures to inspect ***hydraulic system components***
		describe ***failures and deficiencies*** in ***hydraulic system components***
B-3.04.03L	demonstrate knowledge of regulatory requirements pertaining to inspection of ***hydraulic system components***	identify ***standards*** and ***regulations*** pertaining to inspection of ***hydraulic system components***

Range of Variables

hydraulic system components include: pumps, lines, hoses, cylinders, fluid reservoir, valves, pressure gauges, filter gauges

types of hydraulic pumps include: variable displacement, fixed displacement, gear, piston, vane

hazards include: falling, electrocution, pinch/crush points, weather conditions, moving components, high pressure fluids

failures and deficiencies include: leaking seals, bent rams, broken mounting hardware, leaking hoses, cracks, wear, chafing, corrosion, incorrect oil level, cavitation, filter restriction, contamination, unusual noise in drive line, high temperatures

standards include: CSA Z248, ASME

regulations include: jurisdictional, WHMIS, OH&S

B-3.05 Inspects electrical system components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
B-3.05.01P	perform visual inspection of ***electrical system components***	visual inspection of ***electrical system components*** is performed to identify ***deficiencies***
B-3.05.02P	check grounding of crane	grounding of crane is checked according to manufacturers' specifications and jurisdictional regulations
B-3.05.03P	ensure that ***electrical system components*** are secured and protected from water, humidity and pests	***electrical system components*** are secured and protected from water, humidity and pests

B-3.05.04P	verify power cable supply is not damaged	power cable supply is free of damage and stress
B-3.05.05P	verify function of ***electrical system components***	***electrical system components*** are tested and functional

Range of Variables

electrical system components include: limit switches, grounding, supply cables, disconnect switches, strain relief devices (power cable supports), power supply, zoning and anti-collision components

deficiencies include: damaged power supply cables, worn strain relief devices (power cable supports), disconnected cables, corroded parts

	Knowledge	
	Learning Outcomes	**Learning Objectives**
B-3.05.01L	demonstrate knowledge of ***electrical system components***, their characteristics, applications and operation	identify ***electrical system components***, and describe their characteristics and applications
		describe operating principles of ***electrical system components***
		interpret information pertaining to ***electrical system components*** found on drawings and manufacturers' specifications
B-3.05.02L	demonstrate knowledge of procedures to inspect ***electrical system components***	identify ***hazards*** and describe safe work practices pertaining to inspection of ***electrical system components***
		describe procedures to inspect ***electrical system components***
		describe ***deficiencies*** in ***electrical system components***
B-3.05.03L	demonstrate knowledge of regulatory requirements pertaining to inspection of ***electrical system components***	identify ***standards*** and ***regulations*** pertaining to inspection of ***electrical system components***

Range of Variables

electrical system components include: limit switches, grounding, supply cables, disconnect switches, strain relief devices (power cable supports), power supply, zoning and anti-collision components

hazards include: falling, electrocution, weather conditions, pinch/crush points

standards include: CSA Z248

regulations include: jurisdictional, OH&S

B-3.06 Inspects support components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

Skills

	Performance Criteria	Evidence of Attainment
B-3.06.01P	perform visual inspection of guy wires and anchorage points	visual inspection of guy wires and anchorage points is performed to identify deterioration and damage
B-3.06.02P	perform visual inspection of related ***support equipment for top-climbing cranes***	visual inspection of related ***support equipment for top-climbing cranes*** is performed to identify ***deficiencies***
B-3.06.03P	perform visual inspection of related ***support equipment for bottom-climbing cranes***	visual inspection of related ***support equipment for bottom-climbing cranes*** is performed to identify ***deficiencies***
B-3.06.04P	perform visual inspection of related ***support equipment for self-erecting cranes***	visual inspection of related ***support equipment for self-erecting cranes*** is performed to identify ***deficiencies***
B-3.06.05P	perform inspection of ground conditions around crane bases	inspection of ground conditions around crane bases is performed

Range of Variables

support equipment for top-climbing cranes include: support arms, tie-ins, anchor shoes, collar, hydraulic pump and cylinder

deficiencies (support equipment for top-climbing cranes) include: damaged pins, deformities, detachments from concrete

support equipment for bottom-climbing cranes include: beams, wedges, shoring, ladders, hydraulic pump and cylinder

deficiencies (support equipment for bottom-climbing cranes) include: damaged pins, deformities, inaccurate shoring, loose wedges

support equipment for self-erecting cranes include: outriggers, spindles, feet, pads (mats)

deficiencies (support equipment for self-erecting cranes) include: damaged pins, deformities

Knowledge

	Learning Outcomes	Learning Objectives
B-3.06.01L	demonstrate knowledge of ***support equipment***, their ***components*** characteristics, applications and operation	identify ***support equipment*** and their ***components***, and describe their characteristics and applications
		describe operating principles of ***support equipment*** and their ***components***
		interpret information pertaining to ***support equipment*** and their ***components*** found on drawings and manufacturers' specifications

B-3.06.02L	demonstrate knowledge of procedures to inspect ***support equipment*** and their ***components***	identify ***hazards*** and describe safe work practices pertaining to inspection of ***support equipment*** and their ***components***
		describe procedures to inspect ***support equipment*** and their ***components***
		describe procedures to inspect ground conditions
		describe ***deficiencies*** in ***support equipment*** and their ***components***
B-3.06.03L	demonstrate knowledge of regulatory requirements pertaining to inspection of ***support equipment*** and their ***components***	identify ***standards*** and ***regulations*** pertaining to inspection of ***support equipment*** and their ***components***

Range of Variables

support equipment includes: outriggers, arms, support mechanisms, beams, wedges, shoring, ladders, hydraulic pump, support arms, tie-ins, anchor shoes, collar

components include: guy wires, support arms (tie-in beams), collars, wedges, resting beams, bolts and pins, shoring, outriggers, bearing pads, base, ballast and base cross (crucifix base)

hazards include: falling, pinch/crush points, overhead debris, tripping

deficiencies (support equipment for top-climbing cranes) include: damaged pins, deformities, detachments from concrete

deficiencies (support equipment for bottom-climbing cranes) include: damaged pins, deformities, inaccurate shoring, loose wedges

deficiencies (support equipment for self-erecting cranes) include: damaged pins, deformities

standards include: CSA Z248

regulations include: jurisdictional, OH&S

B-3.07 Inspects track (rail) travel components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
B-3.07.01P	perform visual inspection of track (rail)	visual inspection of track (rail) is performed to identify obstructions, track condition and broken ties
B-3.07.02P	perform visual inspection of ***track (rail) travel components***	visual inspection of ***track (rail) travel components*** is performed to ensure they have been installed according to manufacturers' specifications

Range of Variables

track (rail) travel components include: stops, ballast, limit switches, structural supports, rail trucks (bogies), rail wheels, rail stops, ties, clamps, track, spikes, travelling undercarriage wheel brakes, wheel guards, electrical cable components, tie-downs

	Knowledge	
	Learning Outcomes	**Learning Objectives**
B-3.07.01L	demonstrate knowledge of ***track (rail) travel components***, their characteristics, applications and operation	identify ***track (rail) travel components*** and describe their characteristics and applications
		describe operating principles of ***track (rail) travel components***
		interpret information pertaining to ***track (rail) travel components*** found on drawings and manufacturers' specifications
B-3.07.02L	demonstrate knowledge of procedures to inspect ***track (rail) travel components***	identify tools and equipment used to inspect ***track (rail) travel components***, and describe their applications and procedures for use
		identify ***hazards*** and describe safe work practices pertaining to inspection of ***track (rail) travel components***
		describe procedures to inspect ***track (rail) travel components***
B-3.07.03L	demonstrate knowledge of regulatory requirements pertaining to inspection of ***track (rail) travel components***	identify ***standards*** and ***regulations*** pertaining to inspection of ***track (rail) travel components***

Range of Variables

track (rail) travel components include: stops, ballast, limit switches, structural supports, rail trucks (bogies), rail wheels, rail stops, ties, clamps, track, spikes, travelling undercarriage wheel brakes, wheel guards, electrical cable components, tie-downs

hazards include: falling, tripping, electrocution, pinch/crush points, weather conditions, moving components

standards include: CSA Z248, ASME

regulations include: jurisdictional, WHMIS, OH&S

B-3.08 Inspects cab components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

Skills

	Performance Criteria	Evidence of Attainment
B-3.08.01P	perform visual inspection of ***cab components***	visual inspection of ***cab components*** is performed to identify ***deficiencies***
B-3.08.02P	verify that load chart is secured and legible	load chart is secured and legible
B-3.08.03P	check condition of glass	condition of glass is checked for fractures, and it is secure
B-3.08.04P	check function of ***instrumentation***	function of ***instrumentation*** is checked
B-3.08.05P	check function of ***communication and warning devices***	function of ***communication and warning devices*** is checked
B-3.08.06P	check function of ***cab components***	function of ***cab components*** is checked

Range of Variables

cab components include: LMI, control levers, deadman controls, windows, foot pedals, anemometer, windshield wipers, gauges, cab door, heating and air conditioning

deficiencies include: unstable seat, cracks, corrosion, missing pins or components, broken windshield wipers, broken controls, inadequate ventilation, defective heating and air conditioning, defective instrumentation

instrumentation includes: anemometer, thermometer, LMI, control levers, deadman controls, windshield wipers, gauges, display for zoning and anti-collision system

communication and warning devices include: radio, horn, anti-collision

Knowledge

	Learning Outcomes	Learning Objectives
B-3.08.01L	demonstrate knowledge of ***cab components***, their characteristics, applications and operation	identify ***cab components***, and describe their characteristics and applications
		describe operating principles of ***cab components***
		interpret information pertaining to ***cab components*** found on drawings and manufacturers' specifications

B-3.08.02L	demonstrate knowledge of procedures to inspect ***cab components***	identify ***hazards*** and describe safe work practices pertaining to inspection of ***cab components***
		describe procedures to inspect ***cab components***
		describe defects and ***deficiencies*** in ***cab components***
B-3.08.03L	demonstrate knowledge of regulatory requirements pertaining to inspection of ***cab components***	identify ***standards*** and ***regulations*** pertaining to inspection of ***cab components***

Range of Variables

cab components include: LMI, control levers, deadman controls, windows, foot pedals, anemometer, windshield wipers, gauges, cab door, heating and air conditioning

hazards include: falling, electrocution, pinch/crush points, weather conditions, moving components

deficiencies include: unstable seat, cracks, corrosion, missing pins or components, broken windshield wipers, broken controls, inadequate ventilation, defective heating and air conditioning, defective instrumentation

standards include: CSA Z248, ASME

regulations include: jurisdictional, WHMIS, OH&S

B-3.09 Inspects safety and access components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
B-3.09.01P	perform visual inspection of ***safety and access components***	visual inspection of ***safety and access components*** is performed to identify defects and ***deficiencies***
B-3.09.02P	verify that ***fasteners*** are in place and tightened	***fasteners*** are in place and tightened to manufacturers' specifications
B-3.09.03P	check that access areas are clean and clear of obstructions	access areas are clean and clear of obstructions
B-3.09.04P	check condition of ***safety and access components***	condition of ***safety and access components*** is checked to identify hazards and functionality

Range of Variables

safety and access components include: ladders, hatches, platforms, railings, catwalks, anchorage points, guards over moving parts, fall restraint systems, safety alarms, latches, locks

deficiencies include: cracks, wear points, cracked welds, deformations, stretching, corrosion

fasteners include: bolts, pins, retaining devices

	Knowledge	
	Learning Outcomes	**Learning Objectives**
B-3.09.01L	demonstrate knowledge of ***safety and access components***, their characteristics, applications and operation	identify ***safety and access components*** and describe their characteristics and applications
		describe operating principles of ***safety and access components***
		interpret information pertaining to ***safety and access components*** found on drawings and manufacturers' specifications
B-3.09.02L	demonstrate knowledge of procedures to inspect ***safety and access components***	identify ***hazards*** and describe safe work practices pertaining to inspection of ***safety and access components***
		describe procedures to inspect ***safety and access components***
		describe defects and ***deficiencies*** in ***safety and access components***
B-3.09.03L	demonstrate knowledge of regulatory requirements pertaining to inspection of ***safety and access components***	identify ***standards*** and ***regulations*** pertaining to inspection of ***safety and access components***

Range of Variables

safety and access components include: ladders, hatches, platforms, railings, catwalks, anchorage points, guards over moving parts, fall restraint systems, safety alarms, latches, locks

hazards include: slippery ladders, falling, electrocution, pinch/crush points, weather conditions, moving components

deficiencies include: cracks, wear points, cracked welds, deformations, stretching, corrosion

standards include: CSA Z248, ASME

regulations include: jurisdictional, WHMIS, OH&S

B-3.10 Completes inspection documentation

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
B-3.10.01P	record inspection activities in logbook	inspection activities are recorded in logbook clearly and accurately at ***regular intervals*** according to manufacturers' specifications, company policies, ***standards*** and jurisdictional regulations
B-3.10.02P	report documented inspection and repair issues to ***authorities***	documented inspection and repair issues are reported to ***authorities*** according to company policies
B-3.10.03P	organize documentation	documentation is organized to ensure that it is complete, accurate and easily referenced

Range of Variables

regular intervals include: daily, weekly, monthly, yearly
standards include: CSA Z248, ASME
authorities include: superintendent, equipment owners

	Knowledge	
	Learning Outcomes	**Learning Objectives**
B-3.10.01L	demonstrate knowledge of inspection documentation, their characteristics and applications	identify inspection documentation, and describe their characteristics and applications
B-3.10.02L	demonstrate knowledge of procedures to complete inspection documentation	describe procedures to complete inspection documentation
		describe procedures and obligations to report inspection and repair issues to ***authorities***
B-3.10.03L	demonstrate knowledge of regulatory requirements pertaining to inspection documentation	identify ***standards*** and ***regulations*** pertaining to inspection documentation

Range of Variables

authorities include: superintendent, equipment owners
standards include: CSA Z248, ASME
regulations include: jurisdictional, WHMIS, OH&S

Task B-4 Performs continual checks

Task Descriptor

Weather and site conditions are constantly changing and will impact the crane's operation.

Tower crane operators must be constantly aware and monitor weather conditions, crane performance and condition.

B-4.01 Monitors weather conditions

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
B-4.01.01P	identify ***weather conditions*** that may be hazardous to crane operations	***weather conditions*** that may be hazardous to crane operations are identified using ***methods***
B-4.01.02P	determine changes to operator's access and egress to crane because of ***weather conditions***	changes to operator's access and egress to crane because of ***weather conditions*** are determined
B-4.01.03P	determine when crane operations should cease due to ***weather conditions***	crane operations will cease if deemed necessary due to ***weather conditions*** according to company policies, manufacturers' specifications, ***standards*** and ***regulations***

Range of Variables

weather conditions include: wind, rain, temperature, snow, lightning, hoar frost, fog
methods include: gauges, visual and auditory assessments, weather forecasts
standards include: CSA Z248
regulations include: OH&S

	Knowledge	
	Learning Outcomes	**Learning Objectives**
B-4.01.01L	demonstrate knowledge of ***weather conditions*** and their characteristics	identify ***weather conditions*** and describe their characteristics
B-4.01.02L	demonstrate knowledge of procedures to monitor ***weather conditions***	identify ***gauges*** used to monitor ***weather conditions***, and describe their procedures for use
		identify hazards and describe safe work practices pertaining to ***weather conditions***

		describe ***methods*** to monitor ***weather conditions***
		identify ***weather conditions*** that would cease crane operations
B-4.01.03L	demonstrate knowledge of regulatory requirements pertaining to monitoring of ***weather conditions***	identify ***standards*** and ***regulations*** pertaining to monitoring of ***weather conditions***

Range of Variables

weather conditions include: wind, rain, temperature, snow, lightning, hoar frost, fog
gauges include: anemometers, thermometers, lightning detectors
methods include: gauges, visual and auditory assessments, weather forecasts
standards include: CSA Z248
regulations include: OH&S

B-4.02 Monitors site conditions

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
B-4.02.01P	monitor activities of ground personnel in relation to activities of crane	activities of ground personnel in relation to activities of crane are monitored
B-4.02.02P	maintain awareness of ***changes to site***	***changes to site*** are observed
B-4.02.03P	evaluate ***ground conditions***	***ground conditions*** are evaluated
B-4.02.04P	determine changes to operator's access and egress to crane because of ongoing ***changes to site***	changes to operator's access and egress to crane because of ongoing ***changes to site*** are determined

Range of Variables

changes to site include: new equipment, height of obstructions, overhead obstructions, overlaps of other cranes, excavation of site
ground conditions include: bearing surface compaction, standing water, location of underground utilities, grade, possible ground disturbances, soil type, ground thaw

	Knowledge	
	Learning Outcomes	**Learning Objectives**
B-4.02.01L	demonstrate knowledge of site conditions and their characteristics	identify site conditions and describe their characteristics
		identify possible ***changes to site***
B-4.02.02L	demonstrate knowledge of procedures to monitor site conditions	describe methods to monitor site conditions
B-4.02.03L	demonstrate knowledge of regulatory requirements pertaining to site conditions	identify ***standards*** and ***regulations*** pertaining to site conditions

Range of Variables

changes to site include: new equipment, height of obstructions, overhead obstructions, overlaps of other cranes, excavation of site

standards include: CSA Z248

regulations include: OH&S

B-4.03 Monitors lines, wire ropes and hoisting system components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
B-4.03.01P	recognize indications (vibration, noise) of ***problematic conditions*** in ***hoisting system components***	indications (vibration, noise) of ***problematic conditions*** in ***hoisting system components*** are recognized
B-4.03.02P	perform visual inspection of lines, wire ropes and ***hoisting system components***	visual inspection of lines, wire ropes and ***hoisting system components*** is performed to identify defects and ***deficiencies***
B-4.03.03P	monitor tension of trolley cable	tension of trolley cable is monitored

Range of Variables

problematic conditions include: damage to wire rope, deviation from line path, improper spooling

hoisting system components include: clutches, brakes, pumps, hook blocks, wedge sockets, clamps, sheaves, winches, motors, limit switch devices

deficiencies include: improper size, broken wires, abrasion, crushed strands, corrosion, kinks, bird caging, electric arc, metal fatigue, contamination, damaged core due to shock load

	Knowledge	
	Learning Outcomes	**Learning Objectives**
B-4.03.01L	demonstrate knowledge of lines, wire ropes and ***hoisting system components***, their characteristics, applications and operation	identify types of lines, wire ropes and ***hoisting system components***, and describe their characteristics and applications
		describe operating principles of lines, wire ropes and ***hoisting system components***
		interpret information pertaining to lines, wire ropes and ***hoisting system components*** found on drawings and manufacturers' specifications
B-4.03.02L	demonstrate knowledge of procedures to monitor lines, wire ropes and ***hoisting system components***	identify tools and equipment used to monitor lines, wire ropes and ***hoisting system components***, and describe their procedures for use
		identify hazards and describe safe work practices to monitor lines, wire ropes and ***hoisting system components***
		describe procedures to monitor lines, wire ropes and ***hoisting system components***
		describe defects, ***deficiencies*** and ***wire rope rejection criteria***
B-4.03.03L	demonstrate knowledge of regulatory requirements pertaining to monitoring of lines, wire ropes and ***hoisting system components***	identify ***standards*** and ***regulations*** pertaining to monitoring of lines, wire ropes and ***hoisting system components***

Range of Variables

hoisting system components include: clutches, brakes, pumps, hook blocks, wedge sockets, clamps, sheaves, winches, motors, limit switch devices

deficiencies include: improper size, broken wires, abrasion, crushed strands, corrosion, kinks, bird caging, electric arc, metal fatigue, contamination, damaged core due to shock load

wire rope rejection criteria include: breakage, wear, broken wires, abrasion, crushed strands, corrosion, kinking, bird caging, electric arc, metal fatigue, contamination, shock load event

standards include: CSA Z248

regulations include: WHMIS, OH&S

B-4.04 Monitors equipment performance and conditions

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

Skills

	Performance Criteria	Evidence of Attainment
B-4.04.01P	interpret ***gauges and warning systems***	***gauges and warning systems*** are interpreted
B-4.04.02P	perform sensory inspection of equipment	sensory inspection of equipment is performed to detect ***malfunctions*** and changes

Range of Variables

gauges and warning systems include: fuel indicator, boom angle indicator, engine operating temperature gauge, LMI, anemometer, thermometer, zoning and anti-collision system

malfunctions include: overheating engine, electrical motor failure, debris build-up in sheaves, abnormal noises, ice and snow buildup, brake failure, defective electronic display

Knowledge

	Learning Outcomes	Learning Objectives
B-4.04.01L	demonstrate knowledge of equipment ***gauges and warning systems***, their characteristics, applications and operation	identify equipment ***gauges and warning systems***, and describe their characteristics and applications
		describe operating principles of equipment ***gauges and warning systems***
		interpret information pertaining to equipment ***gauges and warning systems*** found on drawings and manufacturers' specifications
B-4.04.02L	demonstrate knowledge of procedures to monitor equipment performance and conditions	identify ***hazards*** and describe safe work practices to monitor equipment performance and conditions
		describe procedures to monitor equipment performance and conditions

Range of Variables

gauges and warning systems include: fuel indicator, boom angle indicator, engine operating temperature gauge, LMI, anemometer, thermometer, zoning and anti-collision system

hazards include: falling, electrocution, pinch/crush points, weather conditions, moving components

B-4.05 Monitors structural and support components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

Skills

	Performance Criteria	Evidence of Attainment
B-4.05.01P	check pins, bolts and hardware on ***structural components***	pins, bolts and hardware on ***structural components*** are checked to ensure that they are intact and secure
B-4.05.02P	check ***support components***	***support components*** are checked by evaluating visually and by feeling for instability during crane movement
B-4.05.03P	verify level of self-erecting crane, and check outriggers and pads (mats)	level of self-erecting crane is verified using levels, and outriggers and pads (mats) are checked according to manufacturers' specifications
B-4.05.04P	check movement of counterweights	movement of counterweights is checked

Range of Variables

structural components include: mast, jib, apex, gantry, counter jib, pendant lines, base, base components, climbing components, cab, anchor, tower bolts, jib pins, turntable, bolts, counterweights, pins and keepers

support components include: guy wires, support arms (tie-in beams), collars, wedges, resting beams, bolts and pins, pins and keepers, shoring, outriggers, pads (mats), base, ballast and base cross (crucifix base)

Knowledge

	Learning Outcomes	Learning Objectives
B-4.05.01L	demonstrate knowledge of ***structural*** and ***support components***, their characteristics, applications and operation	identify ***structural*** and ***support components***, and describe their characteristics and applications
		describe operating principles of ***structural*** and ***support components***
		interpret information pertaining to ***structural*** and ***support components*** found on drawings and manufacturers' specifications

B-4.05.02L	demonstrate knowledge of procedures to monitor ***structural*** and ***support components***	identify tools and equipment used to monitor ***structural*** and ***support components***, and describe their procedures for use
		identify ***hazards*** and describe safe work practices to monitor ***structural*** and ***support components***
		describe procedures to monitor ***structural*** and ***support components***
B-4.05.03L	demonstrate knowledge of regulatory requirements pertaining to monitoring of ***structural*** and ***support components***	identify ***standards*** and ***regulations*** pertaining to monitoring of ***structural*** and ***support components***

Range of Variables

structural components include: mast, jib, apex, gantry, counter jib, pendant lines, base, base components, climbing components, cab, anchor, tower bolts, jib pins, turntable, bolts, counterweights, pins and keepers

support components include: guy wires, support arms (tie-in beams), collars, wedges, resting beams, bolts and pins, pins and keepers, shoring, outriggers, pads (mats), base, ballast and base cross (crucifix base)

hazards include: falling, pinch/crush points, tripping, weather conditions, moving components

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, OH&S

Task B-5 Performs minor crane maintenance

Task Descriptor

Tower crane operators perform minor maintenance activities to optimize the performance and safety of the crane. Larger maintenance activities are carried out by specifically trained technicians who may be assisted by the operator.

B-5.01 Maintains mechanical components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
B-5.01.01P	select and use ***tools and equipment***	***tools and equipment*** are selected and used according to task
B-5.01.02P	de-energize, lock out and tag out power supply and ***mechanical components***	power supply and ***mechanical components*** are de-energized, locked out and tagged out according to manufacturers' specifications and company policies
B-5.01.03P	verify brakes are adjusted	brake adjustments are verified according to manufacturers' specifications
B-5.01.04P	verify and top up ***fluid*** levels	***fluid*** levels are verified using dipstick and sight glass, and topped up according to manufacturers' specifications
B-5.01.05P	tighten and replace fasteners	fasteners are tightened and replaced as required

Range of Variables

tools and equipment include: adjustable wrenches, pliers, rags

mechanical components include: winches, sheaves, swing motors, brakes, gear boxes, mechanical safety devices, trolley components

fluids include: fuel, oil, coolant, hydraulic, gear oil

	Knowledge	
	Learning Outcomes	**Learning Objectives**
B-5.01.01L	demonstrate knowledge of ***mechanical components***, their characteristics, applications and operation	identify ***mechanical components*** and describe their characteristics and applications
		describe operating principles of ***mechanical components***
		interpret information pertaining to ***mechanical components*** found on drawings and manufacturers' specifications
B-5.01.02L	demonstrate knowledge of procedures to maintain ***mechanical components***	identify ***tools and equipment*** used to maintain ***mechanical components***, and describe their procedures for use
		identify ***hazards*** and describe safe work practices to maintain ***mechanical components***
		describe procedures to maintain ***mechanical components***
		describe impact of weather and seasonal conditions on equipment functions and ***fluids***
		describe procedures to lock out and tag out power supply and ***mechanical components***
B-5.01.03L	demonstrate knowledge of regulatory requirements pertaining to maintenance of ***mechanical components***	identify ***standards*** and ***regulations*** pertaining to maintenance of ***mechanical components***

Range of Variables

mechanical components include: winches, sheaves, swing motors, brakes, gear boxes, mechanical safety devices, trolley components

tools and equipment include: adjustable wrenches, pliers, rags

hazards include: falling, electrocution, pinch/crush points, weather conditions, moving components, high pressure fluids

fluids include: fuel, oil, coolant, hydraulic, gear oil

standards include: CSA Z248

regulations include: jurisdictional, WHMIS, OH&S

B-5.02 Lubricates wire ropes and crane components

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

Skills

	Performance Criteria	Evidence of Attainment
B-5.02.01P	select and use ***tools and equipment***	***tools and equipment*** are selected and used according to task
B-5.02.02P	identify need for lubrication	need for lubrication is identified according to changing operational conditions
B-5.02.03P	lubricate operator-serviceable crane components and wire ropes	operator-serviceable crane components and wire ropes are lubricated using product specified by manufacturer, and according to manufacturers' specifications, required service intervals and environmental conditions

Range of Variables

tools and equipment include: grease guns, caulking guns, sprayers, scrapers, brushes, rags, PPE, fall arrest equipment

Knowledge

	Learning Outcomes	Learning Objectives
B-5.02.01L	demonstrate knowledge of lubricants, their characteristics and applications	identify ***types of lubricants*** and describe their characteristics and applications
B-5.02.02L	demonstrate knowledge of procedures to lubricate wire ropes and crane components	identify ***tools and equipment*** used to lubricate wire ropes and crane components, and describe their procedures for use
		identify ***hazards*** and describe safe work practices to lubricate wire ropes and crane components
		describe procedures and ***methods*** to lubricate wire ropes and crane components
B-5.02.03L	demonstrate knowledge of regulatory requirements pertaining to lubrication of wire ropes and crane components	identify ***standards*** and ***regulations*** pertaining to lubrication of wire ropes and crane components

Range of Variables

types of lubricants include: grease, oils, open gear lubricant, wire rope lubricant

tools and equipment include: grease guns, caulking guns, sprayers, scrapers, brushes, rags, PPE, fall arrest equipment

hazards include: falling, electrocution, pinch/crush points, weather conditions, moving components, high pressure fluids

methods include: spraying, brushing, injecting

standards include: CSA Z248, ASME, ANSI

regulations include: WHMIS, OH&S

Major Work Activity C
Performs crane set-up, hoisting calculations and lift planning

Task C-6 Participates in tower crane assembly, disassembly and transportation

Task Descriptor

This task encompasses the assembly and disassembly of a tower crane. Tower crane operators have the competence to assist and coordinate with many other crew members to accomplish this task. Manufacturers' specifications and procedures must be strictly adhered to in order to safely assemble and disassemble tower cranes.

C-6.01 Participates in crane assembly

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
C-6.01.01P	select and use ***tools and equipment***	***tools and equipment*** are selected and used according to task
C-6.01.02P	participate in coordination of roles and responsibilities of ***crew members*** for assembly	roles and responsibilities with ***crew members*** for assembly are coordinated according to site, job and manufacturers' specifications and procedures
C-6.01.03P	inspect base	base is inspected to ensure it complies with manufacturers' specifications
C-6.01.04P	inspect ***components*** for ***deficiencies***	***components*** are inspected to identify ***deficiencies***

C-6.01.05P	erect ***components***	***components*** are erected according to manufacturers' specifications and procedures
C-6.01.06P	check fluids, ***operating systems*** and other components	fluids, ***operating systems*** and other components are checked as required by job specifications and manufacturers' specifications
C-6.01.07P	set and test limits	limits are set and tested according to manufacturers' specifications

Range of Variables

tools and equipment include: sledgehammers, adjustable wrenches, pin pullers, pliers, pry bars, hydraulic rams, come-alongs, saws, grease guns, rags, radios, mobile cranes, rigging and rigging hardware, fall arrest equipment

crew members include: erection crew, assist crane operators, crane supervisors

components include: mast sections, machine deck, turntable, apex, counter jib, jib, pendants, counterweights, outrigger, ballast, bolts, pins, trolley, hook, hydraulic cylinders, climbing unit, sheaves, cables, electrical components

deficiencies include: cracks, faulty welds, bends, dents, splices in power cable, broken wires

operating systems include: hydraulic, electrical, mechanical, lubrication

	Knowledge	
	Learning Outcomes	**Learning Objectives**
C-6.01.01L	demonstrate knowledge of cranes, their ***components***, characteristics, applications and operation	identify ***types of tower cranes*** and their ***components***, and describe their characteristics and applications
		identify ***operating systems***, and describe their characteristics and applications
		interpret information pertaining to cranes and their ***components*** found in specifications
C-6.01.02L	demonstrate knowledge of procedures for assembly of cranes	identify ***tools and equipment*** used to assemble cranes, and describe their procedures for use
		identify ***hazards*** and describe safe work practices pertaining to assembly of cranes
		describe procedures for assembly of cranes
		describe procedures to inspect crane ***components***
		describe roles of personnel involved in crane erection and assembly
		identify jurisdictional inspection and certification requirements, and ***documentation requirements***

C-6.01.03L	demonstrate knowledge of training and certification requirements pertaining to assembly of cranes	identify manufacturers' training and certification requirements pertaining to assembly of cranes
C-6.01.04L	demonstrate knowledge of regulatory requirements pertaining to assembly of cranes	identify ***standards*** and ***regulations*** pertaining to assembly of cranes

Range of Variables

components include: mast sections, machine deck, turntable, apex, counter jib, jib, pendants, counterweights, outrigger, ballast, bolts, pins, trolley, hook, hydraulic cylinders, climbing unit, sheaves, cables, electrical components

types of tower cranes include: flat top, hammerhead, luffing, self-erecting, articulating

operating systems include: hydraulic, electrical, mechanical, lubrication

tools and equipment include: sledgehammers, adjustable wrenches, pin pullers, pliers, pry bars, hydraulic rams, come-alongs, saws, grease guns, rags, radios, mobile cranes, rigging and rigging hardware, fall arrest equipment

hazards include: unlevelled ground, soft ground, underground utilities, pinch/crush points, availability and condition of blocking materials, other personnel in area, miscommunications, wind, improper assembly procedures

documentation requirements include: professional engineered drawings, inspection documents (e.g., pre-inspection, certified NDT, erection reports), safe work plans, electrical permits, work permits, transport permits, street use permits, foundation reports

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, OH&S

C-6.02 Participates in crane disassembly

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

Skills

	Performance Criteria	Evidence of Attainment
C-6.02.01P	select and use ***tools and equipment***	***tools and equipment*** are selected and used according to task
C-6.02.02P	participate in coordination of roles and responsibilities of ***crew members*** for disassembly	roles and responsibilities with ***crew members*** for disassembly are coordinated according to site, job and manufacturers' specifications and procedures
C-6.02.03P	disable ***operating systems***	***operating systems*** are disabled according to manufacturers' specifications and procedures

C-6.02.04P	unreeve wire ropes	wire ropes are unreeved
C-6.02.05P	dismantle ***components*** in sequence	***components*** are dismantled in sequence according to manufacturers' specifications and procedures
C-6.02.06P	participate in loading ***components*** onto transport trucks	***components*** are loaded onto transport trucks according to industry practices

Range of Variables

tools and equipment include: sledgehammers, adjustable wrenches, pin pullers, pliers, pry bars, hydraulic rams, come-alongs, saws, grease guns, rags, radios, mobile cranes, rigging and rigging hardware, fall arrest equipment

crew members include: erection crew, assist crane operators, crane supervisors

operating systems include: hydraulic, electrical, mechanical, lubrication

components include: mast sections, machine deck, turntable, apex, counter jib, jib, pendants, counterweights, outrigger, ballast, bolts, pins, trolley, hook, hydraulic cylinders, climbing unit, sheaves, cables, electrical components

	Knowledge	
	Learning Outcomes	**Learning Objectives**
C-6.02.01L	demonstrate knowledge of cranes, their ***components***, characteristics, applications and operation	identify ***types of tower cranes*** and their ***components***, and describe their characteristics and applications
		identify ***operating systems*** and describe their characteristics and applications
		interpret information pertaining to cranes and their ***components*** found in specifications
C-6.02.02L	demonstrate knowledge of procedures for disassembly of cranes	identify ***tools and equipment*** used to disassemble cranes, and describe their procedures for use
		identify ***hazards*** and describe safe work practices pertaining to disassembly of cranes
		describe procedures for disassembly of cranes
		describe roles of personnel involved in crane disassembly
C-6.02.03L	demonstrate knowledge of training and certification requirements pertaining to disassembly of cranes	identify manufacturers' training and certification requirements pertaining to disassembly of cranes
C-6.02.04L	demonstrate knowledge of regulatory requirements pertaining to disassembly of cranes	identify ***standards*** and ***regulations*** pertaining to disassembly of cranes

Range of Variables

components include: mast sections, machine deck, turntable, apex, counter jib, jib, pendants, counterweights, outrigger, ballast, bolts, pins, trolley, hook, hydraulic cylinders, climbing unit, sheaves, cables, electrical components

types of tower cranes include: flat top, hammerhead, luffing, self-erecting, articulating

operating systems include: hydraulic, electrical, mechanical, lubrication

tools and equipment include: sledgehammers, adjustable wrenches, pin pullers, pliers, pry bars, hydraulic rams, come-alongs, saws, grease guns, rags, radios, mobile cranes, rigging and rigging hardware, fall arrest equipment

hazards include: unlevelled ground, soft ground, underground utilities, pinch/crush points, availability and condition of blocking materials, other personnel in area, miscommunications, wind, improper disassembly procedures

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, OH&S

C-6.03 Transports self-erecting tower crane

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	no	ND	ND	ND

Skills

	Performance Criteria	Evidence of Attainment
C-6.03.01P	confirm route and location with crane owner or dispatcher	route and location are confirmed with crane owner or dispatcher
C-6.03.02P	secure crane	crane is secured according to manufacturers' specifications
C-6.03.03P	move carrier-mounted self-erecting crane on site and on public roads	carrier-mounted self-erecting crane is moved on site and on public roads according to jurisdictional regulations
C-6.03.04P	confirm job requirements and site conditions with site personnel	job requirements and site conditions are confirmed with site personnel

Knowledge

	Learning Outcomes	Learning Objectives
C-6.03.01L	demonstrate knowledge of self-erecting tower cranes, their components, characteristics, applications and operation	identify self-erecting tower cranes and their components, and describe their characteristics and applications
		describe operating principles of self-erecting tower cranes
		interpret information pertaining to self-erecting tower cranes and their components found in specifications

C-6.03.02L	demonstrate knowledge of procedures to transport self-erecting tower cranes	identify ***hazards*** and describe safe work practices to transport self-erecting tower cranes
		describe procedures to secure self-erecting tower cranes
		describe procedures to transport self-erecting tower cranes
		identify ***factors*** for selecting transportation routes
		interpret charts, drawings and ***specifications*** relating to self-erecting crane transportation
		identify types of ***map tools*** used for pre-trip planning, and describe their characteristics and applications
C-6.03.03L	demonstrate knowledge of training and certification requirements pertaining to transportation of self-erecting tower cranes	identify training and certification requirements pertaining to transportation of self-erecting tower cranes
C-6.03.04L	demonstrate knowledge of regulatory requirements pertaining to transportation of self-erecting tower cranes	identify standards, ***restrictions and regulations*** pertaining to transportation of self-erecting tower cranes

Range of Variables

hazards include: collisions, accidents, traffic, tight clearances, not following approved travel route

factors include: jurisdictional regulations and permits, travel times, lanes of traffic, rush hours, road conditions (grades, terrain, ice, mud), bridge capacities, clearances (tunnels, bridges), load types, turning radius

specifications include: transport configuration, weights and dimensions

map tools include: internet, Global Positioning System (GPS), printed map, permit map

restrictions and regulations include: weight, height, width and requirement for escort vehicles, hours of service, appropriate class of driver's licence, traffic laws, permits, use of flashing lights

C-6.04 Participates in assembly and disassembly of self-erecting tower cranes

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
C-6.04.01P	select and use ***tools and equipment***	***tools and equipment*** are selected and used according to task
C-6.04.02P	verify ground conditions for set-up	ground conditions for set-up are verified
C-6.04.03P	assess surroundings for obstructions and hazards	surroundings are assessed for obstructions and hazards
C-6.04.04P	verify power supply and ground crane	power supply is verified, and crane is grounded to meet requirements for assembly and according to manufacturers' specifications and jurisdictional regulations
C-6.04.05P	set outriggers and level crane	outriggers are set using blocking and outrigger pads (mats) according to jurisdictional regulations and ground conditions, and crane is levelled using ***methods*** and adjusted as required
C-6.04.06P	erect crane	crane is erected according to manufacturers' specifications and procedures
C-6.04.07P	set and test limits	limits are set and tested according to manufacturers' specifications
C-6.04.08P	dismantle crane	crane is dismantled according to manufacturers' specifications and procedures
C-6.04.09P	secure crane for transport	crane is secured for transport by ensuring locking pins and outriggers are in place according to manufacturers' specifications and procedures

Range of Variables

tools and equipment include: sledgehammers, adjustable wrenches, pin pullers, pliers, pry bars, hydraulic rams, come-alongs, saws, grease guns, rags, radios, assist equipment, rigging and rigging hardware

methods include: checking built-in level, putting spirit level on base and tower, adjusting air boosters in truck and dolly

	Knowledge	
	Learning Outcomes	**Learning Objectives**
C-6.04.01L	demonstrate knowledge of self-erecting tower cranes, their components, characteristics, applications and operation	identify self-erecting tower cranes and their components, and describe their characteristics and applications
		describe operating principles of self-erecting tower cranes
		interpret information pertaining to self-erecting tower cranes and their components found in specifications
C-6.04.02L	demonstrate knowledge of procedures for assembly and disassembly of self-erecting tower cranes	identify ***tools and equipment*** used to assemble and disassemble self-erecting tower cranes, and describe their procedures for use
		identify ***hazards*** and describe safe work practices to assemble and disassemble self-erecting tower cranes
		describe procedures to assemble and disassemble self-erecting tower cranes
		describe procedures to secure crane for transport
C-6.04.03L	demonstrate knowledge of training and certification pertaining to assembly and disassembly of self-erecting tower cranes	identify manufacturer-specific training and certification available for assembly and disassembly of self-erecting tower cranes
C-6.04.04L	demonstrate knowledge of regulatory requirements pertaining to assembly and disassembly of self-erecting tower cranes	identify ***standards*** and ***regulations*** pertaining to assembly and disassembly of self-erecting tower cranes

Range of Variables

tools and equipment include: sledgehammers, adjustable wrenches, pin pullers, pliers, pry bars, hydraulic rams, come-alongs, saws, grease guns, rags, radios, assist equipment, rigging and rigging hardware

hazards include: clearances and obstructions, unlevelled ground, soft ground, overhead and underground utilities, pinch/crush points, condition of blocking materials, other personnel in area, miscommunications, wind, improper assembly and disassembly procedures

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, OH&S

Task C-7 Participates in tower crane climbing and reconfigurations

Task Descriptor

Climbing cranes involves raising or lowering the working height of the upper works. Bottom-climbing is done by raising the entire crane and mast and supporting it on beams/collars resting on the surrounding building structure. Top-climbing involves hoisting new sections and adding them to the crane just below the upper works to extend the length of the mast. Reconfiguration refers to all other changes made to the tower crane to adapt to site requirements such as changing jib length and parts of line.

It is extremely important to follow engineering and manufacturers' directions and sequence for both bottom- and top-climbing procedures.

Regulatory bodies specify the responsibilities and accountabilities for crane climbing and reconfiguration procedures, which are done by a team of competent workers, including the tower crane operator, specialized crane erectors, the crane supervisor and an assembling/dismantling director.

C-7.01 Participates in bottom-climbing procedures

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
C-7.01.01P	check ***weather conditions*** before starting and continually monitor changing ***weather conditions***	***weather conditions*** are checked before starting and changing ***weather conditions*** are continually monitored during operations
C-7.01.02P	prepare for climbing by performing ***activities***	climbing preparations are done by performing ***activities*** according to engineering and manufacturers' specifications
C-7.01.03P	participate in assembly of climbing unit and equipment	climbing unit and equipment is assembled according to manufacturers' specifications
C-7.01.04P	ensure that climb path is unobstructed by ***materials***	climb path is unobstructed by ***materials***
C-7.01.05P	monitor climbing process	climbing process is monitored to ensure that bottom-climbing equipment ***components*** are performing as designed
C-7.01.06P	maintain radio/cell communication with erection crew	radio/cell communication is maintained with erection crew throughout climb
C-7.01.07P	maintain balance during climb	balance is maintained during climb by adjusting configuration of crane and changing radius with balancing weight by trolleying or luffing according to manufacturers' specifications

C-7.01.08P	rest crane on support beams	crane rests on support beams according to engineering and manufacturers' specifications
C-7.01.09P	secure crane structure plumb and level	crane structure is secured so that it is plumb by adjusting and securing top and bottom wedges, and by using level to assess

Range of Variables

weather conditions include: wind, freezing rain, temperature, snow, lightning, fog

activities include: preparing and installing support beams, ensuring adequate power cable and grounding is in place, placing shoring to support weight of crane, confirming adequate strength of building material (steel, concrete) to support crane upon engineering approval

materials include: formwork, reinforcing steel in slab

components include: mast sections, electrical components, climbing limit sensor, secured dogs, collars, beams, wedges, ladders, hydraulic rams, pumps and hoses

	Knowledge	
	Learning Outcomes	**Learning Objectives**
C-7.01.01L	demonstrate knowledge of bottom-climbing equipment and their ***components***, characteristics, applications and operation	identify types of bottom-climbing equipment and their ***components***, and describe their characteristics and applications
		describe operating principles of bottom-climbing equipment and their ***components***
		interpret information pertaining to bottom-climbing equipment and their ***components*** found on drawings, manufacturers' specifications and engineering specifications
C-7.01.02L	demonstrate knowledge of performing bottom-climbing procedures	identify ***tools and equipment*** used to perform bottom-climbing procedures, and describe their procedures for use
		identify ***hazards*** and describe safe work practices to perform bottom-climbing procedures
		describe pre-climbing ***activities***
		describe procedures to perform bottom-climbing
		explain importance of climbing sequence
		describe procedures to balance cranes
		describe effects of ***weather conditions*** on bottom-climbing operations

C-7.01.03L	demonstrate knowledge of training to perform bottom-climbing procedures	identify manufacturer-specific training available for bottom-climbing procedures
C-7.01.04L	demonstrate knowledge of regulatory requirements pertaining to bottom-climbing procedures	identify ***standards*** and ***regulations*** pertaining to bottom-climbing procedures

Range of Variables

components include: mast sections, electrical components, climbing limit sensor, secured dogs, collars, beams, wedges, ladders, hydraulic rams, pumps and hoses

tools and equipment include: sledgehammers, adjustable wrenches, pin pullers, pliers, pry bars, hydraulic rams, come-alongs, saws, grease guns, rags, radios

hazards include: changing weather, personnel in area, obstructions, tripping, falling, electrocution, pinch/crush points, tight working clearances, mechanical failure, poor lighting/visibility

activities include: preparing and installing support beams, ensuring adequate power cable and grounding is in place, placing shoring to support weight of crane, confirming adequate strength of building material (steel, concrete) to support crane upon engineering approval

weather conditions include: wind, freezing rain, temperature, snow, lightning, fog

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, OH&S

C-7.02 Participates in top-climbing procedures

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

Skills

	Performance Criteria	Evidence of Attainment
C-7.02.01P	verify engineering documentation regarding strength of building material (steel, concrete) to support crane	engineering documentation regarding building material (steel, concrete) is verified to be adequate to support crane
C-7.02.02P	check ***weather conditions*** before starting and continually monitor changing ***weather conditions***	***weather conditions*** are checked before starting and changing ***weather conditions*** are continually monitored during operations
C-7.02.03P	maintain radio/cell communication with erection crew	radio/cell communication is maintained with erection crew throughout climb
C-7.02.04P	confirm that shoring and tiebacks are in place and adequate to support weight of crane	shoring and tiebacks are in place and adequate to support weight of crane according to engineering and manufacturers' specifications
C-7.02.05P	confirm power cable and grounding are of sufficient length for climb needed	power cable and grounding are of sufficient length for climb needed
C-7.02.06P	align mast sections in front of crane	mast sections are aligned in front of crane to ensure that jib remains immobile during climb

C-7.02.07P	install climbing unit to mast	climbing unit is installed to mast according to manufacturers' specifications
C-7.02.08P	hoist mast section to climbing unit	mast section is hoisted to climbing unit according to manufacturers' specifications
C-7.02.09P	balance crane	crane is balanced by hoisting mast sections or approved balance weight, changing load radius, and making minor adjustments to swing according to manufacturers' procedures
C-7.02.10P	remove pins or bolts, and transfer weight of crane upper works to climbing frame	pins or bolts are removed so weight of crane upper works is transferred to climbing frame according to manufacturers' procedures
C-7.02.11P	climb upper works to create adequate clearance for new mast section to be installed	upper works is climbed to create adequate clearance for new mast section to be installed according to manufacturers' procedures
C-7.02.12P	pin or bolt in place new mast section and upper works	new mast section and upper works are pinned or bolted in place according to manufacturers' procedures
C-7.02.13P	install additional ***support components***	additional ***support components*** are installed as required and according to engineering and manufacturers' specifications and procedures
C-7.02.14P	complete climbing procedures by disconnecting climbing unit and removing or stowing	climbing procedures are completed by disconnecting climbing unit and removing or stowing according to manufacturers' specifications and procedures

Range of Variables

weather conditions include: wind, freezing rain, temperature, snow, lightning, fog
support components include: tiebacks, collars

	Knowledge	
	Learning Outcomes	**Learning Objectives**
C-7.02.01L	demonstrate knowledge of top-climbing equipment and their ***components***, characteristics, applications and operation	identify types of top-climbing equipment and their ***components***, and describe their characteristics and applications
		describe operating principles of top-climbing equipment and their ***components***
		interpret information pertaining to top-climbing equipment and their ***components*** found on drawings and engineering specifications

C-7.02.02L	demonstrate knowledge of performing top-climbing procedures	identify ***tools and equipment*** used to perform top-climbing procedures, and describe their procedures for use
		identify ***hazards*** and describe safe work practices to perform top-climbing procedures
		describe ***pre-climbing activities***
		describe procedures to perform top-climbing
		explain importance of climbing sequence
		describe procedures to balance cranes
		describe effects of ***weather conditions*** on top-climbing operations
C-7.02.03L	demonstrate knowledge of training to perform top-climbing procedures	identify manufacturer-specific training available for top-climbing procedures
C-7.02.04L	demonstrate knowledge of regulatory requirements pertaining to top-climbing procedures	identify ***standards*** and ***regulations*** pertaining to top-climbing procedures

Range of Variables

components include: climbing unit, secured dogs, electrical components, hydraulic rams and pumps, fall-arrest components, collars, beams

tools and equipment include: sledgehammers, adjustable wrenches, pin pullers, pliers, pry bars, hydraulic rams, come-alongs, saws, grease guns, rags, radios/cell phones

hazards include: changing weather, personnel in area, obstructions, tripping, falling, electrocution, pinch/crush points, tight working clearances, mechanical failure, poor lighting/visibility

pre-climbing activities include: top-climbing planning, conferring with climbing team and confirming climbing plan, preparing support beams, ensuring adequate power cable and grounding is in place, ensuring shoring is in place and adequate to support weight of crane, confirming adequate strength of building material (steel, concrete) to support crane upon engineering approval

weather conditions include: wind, freezing rain, temperature, snow, lightning, fog

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, OH&S

C-7.03 Participates in crane reconfiguration

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
C-7.03.01P	verify that configuration is acceptable	configuration is verified to be acceptable by crane manufacturer or professional engineer
C-7.03.02P	verify NDT inspection of additional components has been completed	NDT inspections of additional components are documented before operation of crane
C-7.03.03P	verify that permits have been obtained for reconfigurations	permits have been obtained for reconfigurations
C-7.03.04P	check ***weather conditions*** before starting and continually monitor changing ***weather conditions***	***weather conditions*** are checked before starting and changing ***weather conditions*** are continually monitored during operations
C-7.03.05P	maintain radio/cell communication with erection crew	radio/cell communication is maintained with erection crew throughout climb
C-7.03.06P	select and use ***tools and equipment***	***tools and equipment*** are selected and used according to task
C-7.03.07P	coordinate roles and responsibilities with ***crew members*** for reconfiguration	roles and responsibilities with ***crew members*** for reconfiguration are coordinated according to site, job and manufacturers' specifications and procedures
C-7.03.08P	inspect ***components*** for ***deficiencies***	***components*** are inspected to identify ***deficiencies***
C-7.03.09P	erect and dismantle ***components***	***components*** are erected and dismantled according to manufacturers' specifications and procedures
C-7.03.10P	check fluids, ***operating systems*** and other components	fluids, ***operating systems*** and other components are checked as required by job specifications and manufacturers' specifications
C-7.03.11P	reconfigure LMI, verify limits are set and test limits for new configuration	LMI is reconfigured, and limits are verified they are set and tested according to manufacturers' specifications for new configuration

Range of Variables

weather conditions include: wind, freezing rain, temperature, snow, lightning, fog

tools and equipment include: sledgehammers, adjustable wrenches, pin pullers, pliers, pry bars, hydraulic rams, come-alongs, saws, grease guns, rags, radios/cell phones, assist crane, fall arrest equipment

crew members include: erection crew, assist crane operators, crane supervisors

components include: mast sections, machine deck, turntable, apex, counter jib, jib, pendants, counterweights, outrigger, ballast, bolts, pins, trolley, hook, hydraulic cylinders, climbing unit, sheaves, cables, electrical components

deficiencies include: cracks, faulty welds, bends, dents, splices in power cable, broken wires

operating systems include: hydraulic, electrical, mechanical, lubrication

	Knowledge	
	Learning Outcomes	**Learning Objectives**
C-7.03.01L	demonstrate knowledge of tower cranes, their ***components***, characteristics, applications and operation	identify ***types of tower cranes*** and their ***components***, and describe their characteristics and applications
		describe operating principles of tower cranes and their ***components***
		interpret information pertaining to tower cranes and their ***components*** found on drawings and specifications
C-7.03.02L	demonstrate knowledge of performing crane reconfiguration	identify ***tools and equipment*** used to perform crane reconfiguration, and describe their procedures for use
		identify ***hazards*** and describe safe work practices to perform crane reconfiguration
		describe procedures to verify that reconfiguration is allowable by manufacturer or professional engineer
		describe procedures to perform crane reconfiguration
		describe effects of ***weather conditions*** on crane reconfiguration
C-7.03.03L	demonstrate knowledge of regulatory requirements pertaining to crane reconfiguration	identify ***standards*** and ***regulations*** pertaining to crane reconfiguration

Range of Variables

components include: mast sections, machine deck, turntable, apex, counter jib, jib, pendants, counterweights, outrigger, ballast, bolts, pins, trolley, hook, hydraulic cylinders, climbing unit, sheaves, cables, electrical components

types of tower cranes include: flat top, hammerhead, luffing, self-erecting, articulating

tools and equipment include: sledgehammers, adjustable wrenches, pin pullers, pliers, pry bars, hydraulic rams, come-alongs, saws, grease guns, rags, radios/cell phones, assist crane, fall arrest equipment

hazards include: changing weather, personnel in area, obstructions, tripping, falling, electrocution, pinch/crush points, tight working clearances, mechanical failure

weather conditions include: wind, freezing rain, temperature, snow, lightning, fog

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, OH&S

Task C-8 Plans lifts

Task Descriptor

Planning is required for every lift that a tower crane operator performs whether routine or specialty. This could mean a brief conversation with the rigger or a larger meeting with the entire crew and management. A tower crane operator must be able to calculate accurately the load weight and centre of gravity (CoG) of an object as it is vital to the safe operation of tower cranes.

C-8.01 Determines load weights

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
C-8.01.01P	determine weight of load to be lifted	weight of load to be lifted is determined according to ***source of load weight information***
C-8.01.02P	verify unit of measurement (metric or imperial) when missing or incorrect on ***source of load weight information***	unit of measurement (metric or imperial) is verified when missing or incorrect on ***source of load weight information***

C-8.01.03P	confirm weight of load to be lifted	it is verified that no adjustments, modifications or changes in conditions that may affect weight of load to be lifted have been made
C-8.01.04P	determine and apply formulas needed for object shape	formulas are determined and applied according to object shape
C-8.01.05P	perform ***calculation***	***calculation*** is performed according to formula
C-8.01.06P	compare load calculations to ***sources of load weight information***	load calculations are compared to ***sources of load weight information*** to confirm actual weight to be lifted
C-8.01.07P	verify load calculations	load calculations are verified by using crane's electronic scale if equipped

Range of Variables

sources of load weight information include: bills of lading, stamped weights, engineered drawings, previous lift history, blueprints

calculation is: volume times unit weight of material

	Knowledge	
	Learning Outcomes	**Learning Objectives**
C-8.01.01L	demonstrate knowledge of procedures used to identify weight of objects and ***basic shaped loads***	identify types of ***sources of load weight information***
		identify and apply formulas for conversion between imperial and metric systems
		identify ***factors contributing to load weight***
		interpret information pertaining to load weights found in engineering and manufacturers' specifications
C-8.01.02L	demonstrate knowledge of procedures used to calculate weight of objects and ***basic shaped loads***	explain importance of determining weight of an object and ***basic shaped load*** and its relevance in lifting operations
		describe procedures used to determine ***basic shaped loads***
		perform ***calculation*** and apply formula to calculate weight of objects and ***basic shaped loads***
		identify ***considerations*** used to determine weight of objects and ***basic shaped loads***

C-8.01.03L	demonstrate knowledge of CoG	describe conditions that affect CoG
		determine CoG of objects
		identify ***factors contributing to CoG***
		perform calculations to determine CoG in objects
C-8.01.04L	demonstrate knowledge of regulatory requirements pertaining to load weights	identify ***standards*** and ***regulations*** pertaining to load weights

Range of Variables

basic shaped loads include: cubes, cylinders, pyramid, rectangle, pipe

sources of load weight information include: bills of lading, stamped weights, engineered drawings, previous lift history, blueprints

factors contributing to load weight include: ice, water, mud, load frozen to ground, lifting in water, snow, crating, wind, incomplete demolition, friction, added components

calculation is: volume times unit weight of material

considerations include: volume of object, weight of material, weight of underhook equipment

factors contributing to CoG include: shifting liquids, ice, water, mud, load frozen to ground, lifting in water, snow, crating, wind, incomplete demolition, friction, component distribution

standards include: CSA Z248

regulations include: jurisdictional, OH&S

C-8.02 Interprets load charts

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
C-8.02.01P	locate warnings	warnings are located according to load charts, range diagrams and manufacturers' specifications
C-8.02.02P	define working radius	working radius is defined based on ***crane configuration***
C-8.02.03P	calculate gross load and net capacity	gross load and net capacity are calculated according to manufacturers' specifications
C-8.02.04P	de-rate crane gross capacity	crane gross capacity is de-rated using various site and regulatory restrictions, and manufacturers' specifications
C-8.02.05P	select load chart	load chart is selected based on ***crane configuration*** and ***lift requirements***
C-8.02.06P	set configuration of LMI	configuration of LMI is set according to job requirements and manufacturers' specifications

Range of Variables

crane configurations include: jib, parts per line, outrigger, counterweight, ballast, boom, mast height
lift requirements include: maximum radius, height

	Knowledge	
	Learning Outcomes	**Learning Objectives**
C-8.02.01L	demonstrate knowledge of load charts, their characteristics and applications	identify ***components of load charts***, and describe their characteristics and applications
C-8.02.02L	demonstrate knowledge of procedures to interpret load charts	interpret ***components of load charts*** required to plan lifts
		identify ***factors that influence crane capacity*** in lifting operations and describe their impact
		perform calculations to determine line pull, working load limit (WLL) and minimum parts of line
		perform calculations to determine maximum working radius
		perform calculations to determine capacity deductions found in manufacturers' notes
C-8.02.03L	demonstrate knowledge of lifting theory and forces	explain CoG of load and its impact on lifting
		identify units of measure and symbols pertaining to lifting plans and load charts
		identify and describe ***lift studies*** and lift plans
C-8.02.04L	demonstrate knowledge of regulatory requirements pertaining to load charts	identify ***standards*** and ***regulations*** pertaining to load charts

Range of Variables

components of load charts include: notes (factors affecting capacity), capacity charts, range diagram, technical data, parts of line, weights of deductions, quadrants of operation, crane configurations (on outriggers, counterweight, jib), notes/technical data (line weight calculation/deduction), jib length and radius, deflection

factors that influence crane capacity include: configurations, capacity deductions, manufacturers' notes (wind, temperature), engineered lifts

lift studies include: engineered lifts, lift calculations

standards include: CSA Z248

regulations include: jurisdictional, OH&S

C-8.03 Plans work procedures

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

Skills

	Performance Criteria	Evidence of Attainment
C-8.03.01P	coordinate roles and responsibilities with crew members	roles and responsibilities are coordinated with crew members according to site and job requirements
C-8.03.02P	sequence activities	activities are sequenced according to job requirements and ***weather conditions***
C-8.03.03P	identify load path procedures	load path procedures are identified
C-8.03.04P	ensure tasks are within working radius	tasks are confirmed to be within working radius by verifying load chart
C-8.03.05P	ensure rigging equipment required is available	rigging equipment required is available according to job requirements
C-8.03.06P	identify other equipment in vicinity of work location	other equipment in vicinity of work location is identified
C-8.03.07P	select ***crane configuration***	***crane configuration*** is selected according to lift requirements

Range of Variables

weather conditions include: wind, rain, temperature, snow, lightning, hoar frost, fog, ice build-up
crane configurations include: jib, parts per line, outrigger, counterweight, ballast, boom

Knowledge

	Learning Outcomes	Learning Objectives
C-8.03.01L	demonstrate knowledge of planning work procedures for lifts	describe procedures to plan lifts
		identify ***hazards*** and describe safe work practices to consider when planning work procedures for lifts
		identify sequence of job tasks to be performed
		identify ***lift conditions*** to be considered in pre-lift planning
		identify ***components of a pre-lift plan***
C-8.03.02L	demonstrate knowledge of regulatory requirements pertaining to pre-lift planning	identify company policies, ***standards*** and ***regulations*** pertaining to pre-lift planning

Range of Variables

hazards include: overhead obstructions, vehicular traffic, personnel, high voltage lines, other equipment, welding arcing

lift conditions include: environmental conditions, signalling responsibilities, load weight, tail swing, load path, clearances, ground conditions, lighting/visibility, crane configuration, location and setup

components of a pre-lift plan include: blocking and matting requirements, ground preparation, communication plan, personnel responsibilities, grounding and bonding requirements, load weight and location of center of gravity, rigging configuration, scheduling, tools and equipment, company and site policies, site drawing, load path procedures, load chart, crane selection, location and setup

standards include: CSA Z248

regulations include: jurisdictional, OH&S

C-8.04 Prepares for specialty lifts

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
C-8.04.01P	determine weight, size, CoG and shape of load	weight, size, CoG and shape of load are determined
C-8.04.02P	determine maximum radius allowed	maximum radius allowed is determined according to load weight and load chart
C-8.04.03P	determine other components and equipment needed for ***specialty lift***	other components and equipment needed for ***specialty lift*** are determined according to lift requirements
C-8.04.04P	coordinate roles and responsibilities with crew members	roles and responsibilities with crew members are coordinated according to site, job requirements and manufacturers' specifications
C-8.04.05P	sequence activities	activities are sequenced according to ***specialty lift*** requirements
C-8.04.06P	identify load path procedures	load path procedures are identified
C-8.04.07P	ensure ***specialty lift*** forms are completed	***specialty lift*** forms are completed according to ***standards***, jurisdictional regulations and company policies
C-8.04.08P	verify load calculations	load calculations are verified by using crane's electronic scale if equipped

Range of Variables

specialty lifts include: engineered, multi-crane, personnel, center of gravity change, over high energized lines, lifts where the length of sling changes

standards include: CSA Z248

	Knowledge	
	Learning Outcomes	**Learning Objectives**
C-8.04.01L	demonstrate knowledge of ***specialty lifts***, their characteristics and applications	identify types of ***specialty lifts*** and describe their characteristics and applications
C-8.04.02L	demonstrate knowledge of procedures to prepare for ***specialty lifts***	identify ***hazards*** and describe safe work practices to consider when preparing for ***specialty lifts***
		identify sequence of job tasks to be performed
		identify ***lift conditions*** to be considered in pre-lift planning
		identify ***components of a pre-lift plan***
		identify ***sources of load weight information***
C-8.04.03L	demonstrate knowledge of regulatory requirements pertaining to pre-lift planning	identify company policies, ***standards*** and ***regulations*** pertaining to pre-lift planning
		identify ***specialty lift*** form regulations and ***standards*** requirements

Range of Variables

specialty lifts include: engineered, multi-crane, personnel, center of gravity change, over high energized lines, lifts where the length of sling changes

hazards include: overhead obstructions, vehicular traffic, personnel, high voltage lines, other equipment, communication issues

lift conditions include: environmental conditions, signalling responsibilities, load weight, tail swing, load path, clearances, ground conditions, lighting/visibility, crane configuration, location and setup

components of a pre-lift plan include: blocking and matting requirements, ground preparation, communication plan, personnel responsibilities, grounding and bonding requirements, load weight and location of CoG, rigging configuration, scheduling, tools and equipment, company and site policies, site drawing, load path procedures, load chart, crane selection, location and setup

sources of load weight information include: bills of lading, stamped weights, engineered drawings, previous lift history, blueprints, known weights of materials, operator's calculations

standards include: CSA Z248

regulations include: jurisdictional, OH&S

Major Work Activity D
Performs rigging

Task D-9 Inspects, maintains and stores rigging equipment

Task Descriptor

Rigging equipment needs to be properly inspected, maintained and stored to ensure its integrity.

Tower crane operators are involved in rigging to ensure that it is done safely and properly. While tower crane operators may not be doing the rigging, they must possess knowledge of rigging procedures related to inspection, maintenance and storage of slings. Tower crane operators have the obligation to perform due diligence and refuse an unsafe lift.

D-9.01 Identifies deficiencies in slings and hardware

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
D-9.01.01P	perform visual inspection of ***slings***	visual inspection of ***slings*** is performed to identify ***damage***
D-9.01.02P	perform visual inspection of ***hardware***	visual inspection of ***hardware*** is performed to identify ***damage***
D-9.01.03P	remove and report damaged ***slings*** and ***hardware*** from service	damaged ***slings*** and ***hardware*** are removed from service and reported according to manufacturers' or jurisdictional rejection criteria and company policies

Range of Variables

slings include: wire rope, chain, synthetic (continuous, web and rope)

damages (of slings) include: broken wires, cuts, nicks, stretching, worn links, crushing, missing tags, kinking, imperfections, contamination

hardware includes: shackles, hooks, spreader bars, equaliser bars, chainfalls, material baskets, softeners

damages (of hardware) include: stretching, missing or damaged safety latches, pins not seating properly, links and hooks (cracked, kinked, stretched, worn), cables, broken wires, bird caging

	Knowledge	
	Learning Outcomes	**Learning Objectives**
D-9.01.01L	demonstrate knowledge of ***slings*** and ***hardware***, their characteristics, applications and operation	identify types of ***slings*** and ***hardware***, and describe their characteristics and applications
		describe capacity and configuration of sling rating tags and ***hardware***
		identify ***sling configurations*** and describe their characteristics and applications
		interpret information pertaining to ***slings*** and ***hardware*** found in manufacturers' specifications and company policies
D-9.01.02L	demonstrate knowledge of procedures to identify deficiencies in ***slings*** and ***hardware***	identify ***hazards*** and describe safe work procedures pertaining to inspection of ***slings*** and ***hardware***
		describe procedures to identify deficiencies in ***slings*** and ***hardware***
		describe procedures to inspect ***slings*** and ***hardware***
		identify types of ***damages*** found in ***slings*** and ***hardware***
		identify rejection criteria of ***slings*** and ***hardware***
		describe procedures to dispose of and report damaged ***slings*** and ***hardware***
D-9.01.03L	demonstrate knowledge of requirements pertaining to identification of deficiencies in ***slings*** and ***hardware***	identify training requirements pertaining to identification of deficiencies in ***slings*** and ***hardware***
D-9.01.04L	demonstrate knowledge of regulatory requirements pertaining to removal of damaged ***slings*** and ***hardware***	identify requirements pertaining to removal of damaged ***slings*** and ***hardware***

Range of Variables

slings include: wire rope, chain, synthetic (continuous, web and rope)

hardware includes: shackles, hooks, spreader bars, equaliser bars, chainfalls, material baskets, softeners

sling configurations include: basket, double basket, choke, double choke

hazards include: sling failure from improper angles, abrasive material, heat, shock loading, UV damage, mold and mildew, over-loaded slings, collapsing load

damages (of slings) include: broken wires, cuts, nicks, stretching, worn links, crushing, missing tags, kinking, imperfections, contamination

damages (of hardware) include: stretching, missing or damaged safety latches, pins not seating properly, links and hooks (cracked, kinked, stretched, worn), cables, broken wires, bird caging

D-9.02 Lubricates slings and hardware

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
D-9.02.01P	select and use ***tools and equipment***	***tools and equipment*** are selected and used according to task
D-9.02.02P	select lubricant	lubricant is selected considering ***factors***
D-9.02.03P	apply lubricant	lubricant is applied according to ***factors***

Range of Variables

tools and equipment include: brushes, rags, sprayers
factors include: application, environmental requirements, manufacturers' specifications

	Knowledge	
	Learning Outcomes	**Learning Objectives**
D-9.02.01L	demonstrate knowledge of ***slings*** and ***hardware***, their characteristics, applications and operation	identify types of ***slings*** and ***hardware***, and describe their characteristics and applications
		interpret information pertaining to ***slings*** and ***hardware*** found in manufacturers' specifications
D-9.02.02L	demonstrate knowledge of lubricants, their characteristics and applications	identify types of lubricants, and describe their characteristics and applications
D-9.02.03L	demonstrate knowledge of procedures to lubricate ***slings*** and ***hardware***	identify ***tools and equipment*** used to lubricate ***slings*** and ***hardware***, and describe their procedures for use
		identify ***hazards*** and describe safe work practices to lubricate ***slings*** and ***hardware***
		describe procedures to lubricate ***slings*** and ***hardware***
		identify ***factors*** to consider when selecting lubricants for ***slings*** and ***hardware***

Range of Variables

slings include: wire rope

hardware includes: shackles, hooks, snatch blocks

tools and equipment include: brushes, rags, sprayers

hazards include: improper grease not penetrating into cable, sticky lubricant causing debris to stick, environmental contamination

factors include: application, environmental requirements, manufacturers' specifications

D-9.03 Stores rigging equipment

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
D-9.03.01P	confirm dry storage area	dry storage area is confirmed to ensure it will prevent damage to ***rigging equipment*** from weather and other ***site factors***
D-9.03.02P	organize ***rigging equipment*** in designated storage area	***rigging equipment*** is organized in designated storage area considering ***factors***

Range of Variables

rigging equipment includes: slings (wire, synthetic, chain), shackles, spreader beams, chainfalls, material baskets

site factors include: concrete dust, UV damage, chemicals, extreme heat, corrosive environment, accessibility

factors include: pairing rigging equipment, non-inventoried rigging, expired certifications

	Knowledge	
	Learning Outcomes	**Learning Objectives**
D-9.03.01L	demonstrate knowledge of ***rigging equipment***, their characteristics, applications and operation	identify ***rigging equipment*** and describe their characteristics and applications
		describe limitations, capacities and configurations of ***rigging equipment***
		interpret information pertaining to ***rigging equipment*** found in manufacturers' specifications

D-9.03.02L	demonstrate knowledge of procedures to store ***rigging equipment***	identify ***hazards*** and describe safe work practices to store ***rigging equipment***
		describe procedures to store ***rigging equipment***
		describe procedures to inspect storage area for suitability of ***rigging equipment***
		identify ***site factors*** to consider when storing and protecting ***rigging equipment***

Range of Variables

rigging equipment includes: slings (wire, synthetic, chain), shackles, spreader beams, chainfalls, material baskets

hazards include: corrosive or damp environment, heavy objects, pinch/crush points, freezing

site factors include: concrete dust, UV damage, chemicals, extreme heat, corrosive environment, accessibility

Task D-10 Follows rigging procedures

Task Descriptor

Tower crane operators should verify that the rigging of the load is satisfactory.

Tower crane operators are involved in rigging to ensure that it is performed safely and properly. While tower crane operators may not be doing the rigging, they must possess knowledge of rigging procedures. Tower crane operators have the obligation to perform due diligence and refuse an unsafe lift.

D-10.01 Selects required rigging equipment and configuration

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
D-10.01.01P	determine rigging requirements to handle load	rigging requirements to handle load are determined according to ***factors***
D-10.01.02P	verify tags on ***rigging equipment***	tags on ***rigging equipment*** are verified to confirm equipment is adequate with ***configurations*** applied

Range of Variables

factors include: load weight, load dimensions, sharp edges, rigging equipment composition, swing area, height limitations, destination, load characteristics (e.g., hot metal, electrical conductivity from welding)

rigging equipment includes: slings (wire, synthetic, chain), bridles, shackles, spreader beams, chainfalls, material baskets

configurations include: basket, choker, hitches, multi-leg bridle, below-the-hook lifting devices, hardware

	Knowledge	
	Learning Outcomes	**Learning Objectives**
D-10.01.01L	demonstrate knowledge of ***rigging equipment***, their characteristics, applications and operation	identify ***rigging equipment*** and describe their characteristics and applications
		describe limitations, capacity and ***configurations*** of ***rigging equipment***
D-10.01.02L	demonstrate knowledge of procedures to select ***rigging equipment***	identify ***hazards*** and describe safe work practices to select ***rigging equipment***
		describe procedures to select required ***rigging equipment***
		identify ***factors*** to consider when selecting ***rigging equipment***
D-10.01.03L	demonstrate knowledge of rigging according to load and weight requirements	identify knowledge of rigging according to load and weight requirements
D-10.01.04L	demonstrate knowledge of regulatory requirements pertaining to rigging safety	identify standards and regulations pertaining to rigging safety

Range of Variables

rigging equipment includes: slings (wire, synthetic, chain), bridles, shackles, spreader beams, chainfalls, material baskets

configurations include: basket, choker, hitches, multi-leg bridle, below-the-hook lifting devices, hardware

hazards include: corrosive environment, sling failure from improper angles, abrasive material, heat, shock loading, over-loaded slings, collapsing load, sharp edges, pinch/crush points

factors include: load weight, load dimensions, sharp edges, rigging equipment composition, swing area, height limitations, destination, load characteristics (e.g., hot metal, electrical conductivity from welding)

D-10.02 Rigs load

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

Skills

	Performance Criteria	Evidence of Attainment
D-10.02.01P	locate CoG of load	CoG of load is located
D-10.02.02P	apply rigging to load	rigging is applied to load using ***configurations*** and ***components*** according to load requirements
D-10.02.03P	confirm rigging ***configuration***	rigging ***configuration*** is confirmed by taking on weight of load to ensure rigging is rendering properly
D-10.02.04P	lower load and make necessary adjustments to rigging	load is lowered and necessary adjustments to rigging are made
D-10.02.05P	check for ***loose debris and hazardous materials*** on, under and around load	***loose debris and hazardous materials*** are confirmed to be absent on, under and around load
D-10.02.06P	select tag lines and confirm they are positioned to facilitate control of load	tag lines are selected and are positioned to facilitate control of load as required

Range of Variables

configurations include: vertical, basket, hitches, choker, multi-leg bridle, below-the-hook lifting devices (e.g., spreader bar), hardware

components include: lifting bars, beams, slings, rigging hardware, shackles, hooks, softeners

loose debris and hazardous materials include: nails, dunnage, blocking, rocks

Knowledge

	Learning Outcomes	Learning Objectives
D-10.02.01L	demonstrate knowledge of rigging procedures and techniques	describe rigging procedures and techniques
		identify types of rigging and describe their characteristics and applications
		describe ***hazards*** and ***environmental conditions*** which may affect rigging
D-10.02.02L	demonstrate knowledge of lifting theory and forces	explain CoG of load and its impact on lifting
		identify units of measure and symbols pertaining to lifting plans and load charts
		identify and describe ***lift studies*** and lift plans

D-10.02.03L	demonstrate knowledge of procedures to rig loads	identify tools and equipment relating to rigging, and describe their applications and procedures for use
		describe procedures and ***configurations*** used to rig loads
		identify ***types of hitches*** and describe their characteristics and applications
		identify ***types of rigging hardware and replacement hardware***, and describe their characteristics and applications
D-10.02.04L	demonstrate knowledge of regulatory requirements pertaining to rigging	identify ***standards*** and ***regulations*** pertaining to rigging

Range of Variables

hazards include: acids, alkaline and other damaging substances, sharp edges, load slippage, pinch/crush points

environmental conditions include: temperature, UV, weather

lift studies include: engineered lifts, lift calculations

configurations include: vertical, basket, hitches, choker, multi-leg bridle, below-the-hook lifting devices (e.g., spreader bar), hardware

types of hitches include: vertical, choker, basket, multi-leg bridle, half-hitch

types of rigging hardware and replacement hardware include: spring clips, roll pins, shackles, softeners, clevises and hooks, spreader beams

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, WHMIS, OH&S

D-10.03 Monitors rigging

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
D-10.03.01P	identify rigging ***hazards***	rigging ***hazards*** are identified
D-10.03.02P	monitor tag lines and advise rigger to prevent ***hazards***	tag lines are monitored, and rigger is advised to prevent ***hazards***
D-10.03.03P	monitor lift for rigging ***hazards***	lift is monitored for rigging ***hazards***
D-10.03.04P	lower load and adjust rigging to address deficiencies	rigged load is lowered and adjusted to address deficiencies
D-10.03.05P	assess and communicate importance of rigger's role in a blind lift	importance of rigger's role in a blind lift is assessed and communicated to rigger

Range of Variables

hazards include: obstacles impacting clearances, overhead power lines, tangled and knotted tag lines, potential slippage, catching on other objects, electrical arcing, welding arcing, pinch/crush points, others in hoisting area, poor visibility, load shifting

	Knowledge	
	Learning Outcomes	**Learning Objectives**
D-10.03.01L	demonstrate knowledge of procedures to monitor rigging	describe procedures to monitor rigging
		identify possible rigging ***hazards***
D-10.03.02L	demonstrate knowledge of regulatory requirements pertaining to rigging	identify ***standards*** and ***regulations*** pertaining to rigging

Range of Variables

hazards include: obstacles impacting clearances, overhead power lines, tangled and knotted tag lines, potential slippage, catching on other objects, electrical arcing, welding arcing, pinch/crush points, others in hoisting area, poor visibility, load shifting

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, WHMIS, OH&S

Major Work Activity E
Operates crane

Task E-11 Performs pre lift (warm-up) activities

Task Descriptor

Daily function tests are essential to ensure that work can proceed.
Pre-lift activities using test blocks confirm that the safety limits are working.

E-11.01 Performs function test

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
E-11.01.01P	confirm calibration of LMI	LMI calibration is confirmed by comparing known load against LMI readings
E-11.01.02P	swing crane for functioning in all speeds and in both directions, and check swing limits and brakes	crane is swung for functioning in all speeds and in both directions, and swing limits and brakes are checked
E-11.01.03P	check slow down and final trolley limits	slow down and final trolley limits are checked by trolleying in and out on jib
E-11.01.04P	check high speed up, slow down, final up and down limit switches	high speed up, slow down, final up, and down limit switches are checked as required by hoisting up and down
E-11.01.05P	slow down and final luffing jib is maneuvered up and down to test limits	slow down and final luffing jib limit switches activate at minimum and maximum working radius
E-11.01.06P	test travel limits for track mounted tower crane	travel limits for track mounted tower crane are tested according to manufacturers' specifications
E-11.01.07P	function test crane under cold weather conditions	crane is function tested under cold weather conditions according to manufacturers' specifications

	Knowledge	
	Learning Outcomes	**Learning Objectives**
E-11.01.01L	demonstrate knowledge of function tests, their characteristics and applications	identify types of function tests, and describe their characteristics and applications
		interpret information pertaining to function tests found in specifications
		describe function and purpose of LMI and ***other indicators***
		identify and interpret regulations and manufacturers' specifications
E-11.01.02L	demonstrate knowledge of procedures to perform function tests	identify rigging and test block used to perform function tests, and describe their procedures for use
		identify ***hazards*** and describe safe work practices to perform function tests
		describe procedures to perform function tests
		describe warm-up techniques taking into consideration weather conditions
		identify function testing considerations for cold weather conditions
		describe procedures to record daily inspections in logbook
E-11.01.03L	demonstrate knowledge of regulatory requirements pertaining to function tests	identify ***standards*** and ***regulations*** pertaining to function tests

Range of Variables

other indicators include: radius indicators, load weight indicators, boom angle indicators, anemometers, visual and audible alarms

hazards include: failure of limiting devices, obstacles impacting clearances, power lines, electrical arcing, tangled and knotted tag lines, potential slippage, catching on other objects, pinch/crush points, others in hoisting area, miscommunication

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, OH&S

E-11.02 Confirms limits

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
E-11.02.01P	perform ***tests***	***tests*** are performed with known weight and according to manufacturers' specifications to verify limit cut outs
E-11.02.02P	pick up test block to test ***functions***	test block is picked up to test ***functions***
E-11.02.03P	pick up maximum weight test block to test gear capacity, hoist and brake functions	maximum weight test block is picked up to test gear capacity, hoist and brake functions

Range of Variables

tests include: trolley/luff, hoist, brakes

functions include: hoist, hoist brakes, maximum load limit at jib tip, scale, maximum line pull

	Knowledge	
	Learning Outcomes	**Learning Objectives**
E-11.02.01L	demonstrate knowledge of crane ***functions*** and limits	identify crane ***functions*** and limits
		interpret information pertaining to crane ***functions*** and limits found on drawings and specifications
E-11.02.02L	demonstrate knowledge of procedures to confirm crane limits	identify test block and rigging used to confirm crane limits, and describe their procedures for use
		identify ***hazards*** and describe safe work practices to confirm crane limits
		identify types of ***tests*** performed to test crane limits
		describe procedures to test crane limits
E-11.02.03L	demonstrate knowledge of regulatory requirements pertaining to ***function*** tests	identify ***standards*** and ***regulations*** pertaining to ***function*** tests

Range of Variables

functions include: hoist, hoist brakes, maximum load limit at jib tip, scale, maximum line pull

hazards include: dropping load, pinch/crush points, personnel in test area, incorrect test blocks, failure of limiting devices

tests include: trolley/luff, hoist, brakes

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, OH&S

Task E-12 Operates tower cranes

Task Descriptor

While there are different types of tower cranes such as hammerhead, luffing tower cranes and self-erecting cranes, their operations have many similarities.

Hammerhead cranes move loads by trolleying in and out, swinging, hoisting and travelling.

Luffing tower cranes differ in that they have a luffing jib that moves up or down to change the lift radius.

The unique characteristic of the self-erecting tower crane is that the erection and dismantling processes are much quicker than for the other tower cranes. Once erected, the working operations are the same as other tower cranes.

Note that crane climbing and reconfiguration operations may be done during crane operations. The skills and knowledge descriptions for these activities are covered in Major Work Activity C – Crane set-up hoisting, calculations and lift planning.

E-12.01 Moves trolley in and out

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
E-12.01.01P	move hook/trolley assembly in controlled fashion to designated hoisting location	hook/trolley assembly is moved in controlled fashion to designated hoisting location
E-12.01.02P	centre hook/trolley over load	hook/trolley is centred over load
E-12.01.03P	move suspended load in controlled fashion to designated location	suspended load is moved in controlled fashion to designated location
E-12.01.04P	decrease radius	radius is decreased (capacity increased, working range decreased)
E-12.01.05P	increase radius	radius is increased (working range increased, capacity decreased)
E-12.01.06P	adjust radius to avoid personnel or obstacles	radius is adjusted to avoid personnel or obstacles
E-12.01.07P	identify maximum trolley radius with load on hook	maximum trolley radius with load on hook is identified using load charts and without relying on limits to stop load
E-12.01.08P	manipulate trolley within maximum and minimum limits	trolley is manipulated within maximum and minimum limits according to manufacturer's specifications

	Knowledge	
	Learning Outcomes	**Learning Objectives**
E-12.01.01L	demonstrate knowledge of tower cranes, their ***components***, characteristics, applications and operation	identify ***types of tower cranes*** and their ***components***, and describe their characteristics and applications
		describe operating principles of tower cranes and their ***components***
		interpret information pertaining to tower cranes and their ***components*** found on drawings and specifications
E-12.01.02L	demonstrate knowledge of procedures to move trolley in and out	identify ***hazards*** and describe safe work practices to move trolley
		describe procedures to move trolley
		describe ***general physics principles***
		describe procedures used to maintain control of hook block in a safe manner during all ***functions***
		describe effects of ***weather conditions*** on craning operations
E-12.01.03L	demonstrate knowledge of regulatory requirements pertaining to operation of tower cranes	identify ***standards*** and ***regulations*** pertaining to operation of tower cranes

Range of Variables

components include: crane controls, jibs, trolley rollers, hook blocks, cab, electrical panels and connections

types of tower cranes include: flat top, hammerhead, luffing, self-erecting, articulating

hazards include: personnel in area or on boom, tripping, falling, electrocution, failure of limiting devices

general physics principles include: gravity, leverage, momentum, CoG

functions include: changing radius, using hoist, boom, swing and travel controls in combination

weather conditions include: wind, rain, temperature, snow, lightning, hoar frost, fog

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, OH&S

E-12.02 Booms (luffs) up and down

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

Skills

	Performance Criteria	Evidence of Attainment
E-12.02.01P	confirm jib angle indicator is functioning	jib angle indicator is functioning according to manufacturers' specifications
E-12.02.02P	centre hook and boom tip over load	hook and boom tip are centred over load
E-12.02.03P	move suspended load in controlled fashion to designated location	suspended load is moved in controlled fashion to designated location
E-12.02.04P	decrease radius	radius is decreased (capacity increased, working range decreased)
E-12.02.05P	increase radius	radius is increased (working range increased, capacity decreased)
E-12.02.06P	adjust radius to avoid personnel or obstacles	radius is adjusted to avoid personnel or obstacles
E-12.02.07P	manipulate jib within maximum and minimum limits	jib is manipulated within maximum and minimum limits according to manufacturers' specifications

Knowledge

	Learning Outcomes	Learning Objectives
E-12.02.01L	demonstrate knowledge of tower cranes, their ***components***, characteristics, applications and operation	identify ***types of tower cranes*** and their ***components***, and describe their characteristics and applications
		describe operating principles of tower cranes and their ***components***
		interpret information pertaining to tower cranes and their ***components*** found on drawings and specifications
E-12.02.02L	demonstrate knowledge of procedures to boom (luff) up and down	identify ***hazards*** and describe safe work practices to boom (luff) up and down
		describe procedures and methods to boom (luff) up and down
		describe ***general physics principles***

		describe procedures used to maintain control of hook block in a safe manner during all ***functions***
		describe effects of ***weather conditions*** on craning operations
E-12.02.03L	demonstrate knowledge of regulatory requirements pertaining to operation of tower cranes	identify ***standards*** and ***regulations*** pertaining to operation of tower cranes

Range of Variables

components include: crane controls, jibs, boom hoist package, pendants, stay cables, backstops, heel pin connections, hook blocks, cab, electrical panels and connections, LMI
types of tower cranes include: flat top, hammerhead, luffing, self-erecting, articulating
hazards include: personnel in area or on boom, tripping, falling, electrocution
general physics principles include: gravity, leverage, momentum, CoG
functions include: changing radius, using hoist, boom, swing and travel controls in combination
weather conditions include: wind, rain, temperature, snow, lightning, hoar frost, fog
standards include: CSA Z248, ASME, ANSI
regulations include: jurisdictional, OH&S

E-12.03 Swings (slews) jib

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
E-12.03.01P	swing crane to center jib tip or hook/trolley assembly over load to be hoisted	crane is swung so that jib tip or hook/trolley assembly is centred over load to be hoisted
E-12.03.02P	centre crane hook over CoG of load	crane hook is centred over CoG of load
E-12.03.03P	adjust radius to avoid personnel or obstacles	radius is adjusted to avoid personnel or obstacles
E-12.03.04P	slow and stop swing	swing is slowed and stopped according to manufacturers' procedures

	Knowledge	
	Learning Outcomes	**Learning Objectives**
E-12.03.01L	demonstrate knowledge of tower cranes, their ***components***, characteristics, applications and operation	identify ***types of tower cranes*** and their ***components***, and describe their characteristics and applications
		describe operating principles of tower cranes and their ***components***
		interpret information pertaining to tower cranes and their ***components*** found on drawings and specifications
E-12.03.02L	demonstrate knowledge of procedures to swing (slew) jib	identify ***hazards*** and describe safe work practices to swing (slew) jib
		describe procedures and methods to swing (slew) jib
		describe ***general physics principles***
		describe procedures used to maintain control of hook block in safe manner during all ***functions***
		describe effects of ***weather conditions*** on craning operations
E-12.03.03L	demonstrate knowledge of regulatory requirements pertaining to operation of tower cranes	identify ***standards*** and ***regulations*** pertaining to operation of tower cranes

Range of Variables

components include: crane controls, jibs, counterjibs, boom, swing motors and gears, slew bearing, pinion and gear, electrical panels and connections, slip rings, hook blocks, cab, LMI

types of tower cranes include: flat top, hammerhead, luffing, self-erecting, articulating

hazards include: personnel in area or on boom, obstructions, tripping, falling, electrocution

general physics principles include: gravity, leverage, momentum, CoG

functions include: changing radius, using hoist, boom, swing and travel controls in combination

weather conditions include: wind, rain, temperature, snow, lightning, hoar frost, fog

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, OH&S

E-12.04 Hoists load

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

Skills

	Performance Criteria	Evidence of Attainment
E-12.04.01P	confirm weight of load	weight of load is confirmed to ensure it is within load chart capacity
E-12.04.02P	position hook blocks over CoG of load	hook blocks are positioned over CoG of load
E-12.04.03P	attach rigging to hook or hook block	rigging is attached to hook or hook block
E-12.04.04P	lift load in controlled manner	load is lifted maintaining hoisting radius by adjusting trolley or luffing jib assembly to compensate for boom deflection
E-12.04.05P	move load in controlled manner	load is moved in controlled manner smoothly without shock loading
E-12.04.06P	place load in controlled manner	load is placed maintaining working radius by adjusting trolley or luffing jib assembly to compensate for boom deflection as load weight is removed from crane

Knowledge

	Learning Outcomes	Learning Objectives
E-12.04.01L	demonstrate knowledge of tower cranes, their ***components***, characteristics, applications and operation	identify ***types of tower cranes*** and their ***components***, and describe their characteristics and applications
		describe operating principles of tower cranes and their ***components***
		interpret information pertaining to tower cranes and their ***components*** found on drawings and specifications
E-12.04.02L	demonstrate knowledge of procedures to hoist loads	identify ***hazards*** and describe safe work practices to hoist loads
		describe procedures to hoist loads
		describe ***general physics principles***
		describe procedures used to maintain control of hook block in safe manner during all ***functions***
		describe effects of ***weather conditions*** on craning operations
E-12.04.03L	demonstrate knowledge of regulatory requirements pertaining to operation of tower cranes	identify ***standards*** and ***regulations*** pertaining to operation of tower cranes

Range of Variables

components include: jibs, boom, hoist line, heel pin connections, hook blocks, cab
types of tower cranes include: flat top, hammerhead, luffing, self-erecting, articulating
hazards include: personnel in area, obstructions, tripping, falling, electrocution, pinch/crush points, welding arcing
general physics principles include: gravity, leverage, momentum, CoG
functions include: changing radius, using hoist, boom, swing and travel controls in combination
weather conditions include: wind, rain, temperature, snow, lightning, hoar frost, fog
standards include: CSA Z248, ASME, ANSI
regulations include: jurisdictional, OH&S

E-12.05 Travels crane

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

Skills

	Performance Criteria	Evidence of Attainment
E-12.05.01P	consult operating manual for travel instructions	operating manual is consulted for travel instructions
E-12.05.02P	confirm travel path is clear and track is level	travel path is clear, and track is level according to site requirements
E-12.05.03P	release locking devices	locking devices are released according to manufacturers' procedures
E-12.05.04P	determine travel distance	travel distance is determined according to job requirements
E-12.05.05P	follow travel plan and allow for stopping distance	travel plan is followed and allows for stopping distance
E-12.05.06P	reinstall locking devices	locking devices are reinstalled to prevent unwanted movement according to manufacturers' procedures

Knowledge

	Learning Outcomes	Learning Objectives
E-12.05.01L	demonstrate knowledge of tower cranes, their ***components***, characteristics, applications and operation	identify ***types of tower cranes*** and their ***components***, and describe their characteristics and applications
		describe operating principles of tower cranes and their ***components***
		interpret information pertaining to tower cranes and their ***components*** found on drawings and specifications

E-12.05.02L	demonstrate knowledge of procedures to travel cranes	identify ***hazards*** and describe safe work practices to travel cranes
		describe procedures to hoist loads
		describe ***general physics principles***
		describe procedures used to maintain control of hook block in a safe manner during all ***functions***
		describe effects of ***weather conditions*** on travelling operations
		identify ***factors*** to consider when travelling cranes
E-12.05.03L	demonstrate knowledge of regulatory requirements pertaining to travelling cranes	identify ***standards*** and ***regulations*** pertaining to travelling cranes

Range of Variables

components include: travelling undercarriage, bogey wheel guards, locking devices, crane rails, ballast weights, travel stops

types of tower cranes include: flat top, hammerhead, luffing, self-erecting, articulating

hazards include: personnel in area, obstructions, tripping, falling, electrocution, track off-level

general physics principles include: gravity, leverage, momentum, CoG

functions include: changing radius, using hoist, boom, swing and travel controls in combination

weather conditions include: wind, rain, temperature, snow, lightning, hoar frost, fog

factors include: weights and dimensions, crane size, road width, bridge weight limits, overpass height restrictions, weather conditions, driving conditions

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, OH&S

E-12.06 Performs functions simultaneously

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

Skills

	Performance Criteria	Evidence of Attainment
E-12.06.01P	engage swing, trolley/luff, hoist and travel functions at various speeds in any given direction simultaneously	swing, trolley/luff, hoist and travel functions are engaged at various speeds in any given direction simultaneously
E-12.06.02P	maintain control of load during all ***functions***	control of load is maintained during all ***functions***
E-12.06.03P	bring ***functions*** to stop while maintaining control of load	***functions*** are brought to stop while maintaining control of load

Range of Variables

functions include: changing radius, using hoist, boom, swing and travel controls in combination

	Knowledge	
	Learning Outcomes	**Learning Objectives**
E-12.06.01L	demonstrate knowledge of tower cranes, their ***components***, characteristics, applications and operation	identify ***types of tower cranes*** and their ***components***, and describe their characteristics and applications
		describe operating principles of tower cranes and their ***components***
		interpret information pertaining to tower cranes and their ***components*** found on drawings and specifications
E-12.06.02L	demonstrate knowledge of procedures to perform ***functions*** simultaneously	identify ***hazards*** and describe safe work practices to perform ***functions*** simultaneously
		describe procedures to perform ***functions*** simultaneously
		describe ***general physics principles***
		describe procedures used to maintain control of hook block in safe manner during all ***functions***
		describe effects of ***weather conditions*** on craning operations
E-12.06.03L	demonstrate knowledge of regulatory requirements pertaining to operation of tower cranes	identify ***standards*** and ***regulations*** pertaining to operation of tower cranes

Range of Variables

components include: jibs, counterjibs, boom and hoist package, heel pin connections, hook blocks, cab, swing motors and gears, slew bearing, pinion and gear, electrical panels and connections, slip rings, trolley rollers, pendants, stay cables, backstops, travelling undercarriage, bogey wheel guards, locking devices, crane rails, ballast weights

types of tower cranes include: flat top, hammerhead, luffing, self-erecting, articulating

functions include: changing radius, using hoist, boom, swing and travel controls in combination

hazards include: personnel in area or on boom, obstructions, tripping, falling, electrocution, pinch/crush points, mechanical failure, track off-level

general physics principles include: gravity, leverage, momentum, CoG

weather conditions include: wind, rain, temperature, snow, lightning, hoar frost, fog, visibility

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, OH&S

Task E-13 Performs specialty tower crane operations

Task Descriptor

Tower crane operators participate in delicate tower crane operations such as multi-crane lifts, operating a tower crane in a multi-crane site and hoisting personnel. Tower crane operators must be well versed in emergency procedures. Hoisting personnel may be an activity that is restricted by jurisdictional regulations.

E-13.01 Participates in multi-crane lifts

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
E-13.01.01P	check ***weather conditions*** before starting and continually monitor changing ***weather conditions***	***weather conditions*** are checked before starting and changing ***weather conditions*** are continually monitored during operations
E-13.01.02P	review engineered lift plan for ***factors***	engineered lift plan is reviewed for ***factors***
E-13.01.03P	secure lift zone to ensure manoeuvrability of cranes	lift zone is secured to ensure manoeuvrability of cranes to avoid dangerous situations
E-13.01.04P	respond to instructions and maintain ***communication*** with designated signaller in charge of coordinating lift	instructions are responded to, and ***communication*** is maintained with designated signaller in charge of coordinating lift
E-13.01.05P	implement lift plan for multi-crane lifts	lift plan for multi-crane lifts is implemented according to company policies and jurisdictional regulations
E-13.01.06P	ensure integrity of crane by sustaining constant load control and maintaining vertical lift point	integrity of crane is ensured by sustaining constant load control and maintaining vertical lift point
E-13.01.07P	signal problem or emergency	problem or emergency is signalled using ***methods*** outlined in lift plan

Range of Variables

weather conditions include: wind, freezing rain, rain, temperature, snow, lightning, fog, visibility

factors include: weight of load, capacity of cranes, identification of cranes involved, sequence of activities, emergency contingency plan, means of communication with crew involved in lift

communication includes: radio, hand signals

methods include: air horn, crane horn, visual stop signal

	Knowledge	
	Learning Outcomes	**Learning Objectives**
E-13.01.01L	demonstrate knowledge of multi-crane lift operations, their characteristics and applications	identify ***hazards*** and ***safe work procedures*** pertaining to multi-crane lift operations
		interpret information pertaining to multi-crane lift operations found in engineered lift plans
E-13.01.02L	demonstrate knowledge of procedures to participate in multi-crane lifts	describe procedures to participate in multi-crane lifts
E-13.01.03L	demonstrate knowledge of regulatory requirements pertaining to multi-crane lift operations	identify ***standards*** and ***regulations*** pertaining to multi-crane lift operations

Range of Variables

hazards include: falling objects, miscommunication, pinch/crush points, changing weather, others in work area, mechanical failure, overload, uncoordinated movement, shifting CoG (rendering loads, who picks first and sets first), cranes of unequal capacity

safe work procedures include: pre-lift planning, communication, load sharing, lift calculations

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, OH&S

E-13.02 Operates in multi-crane site

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
E-13.02.01P	check documentation to confirm setup	documentation is checked to confirm setup complies with CSA Z248, jurisdictional regulations and company guidelines for multi-crane sites
E-13.02.02P	identify and confirm which cranes on site have overlapping or conflicting radii and rights-of-way	overlapping or conflicting radii and rights-of-way are identified for cranes on site according to jurisdictional regulations
E-13.02.03P	contact other crane operators within radius before conducting ***crane operations***	other crane operators within radius are contacted before conducting ***crane operations***

E-13.02.04P	maintain constant communication on dedicated closed channel with, and clear view of other crane operators	constant communication is maintained on dedicated closed channel, and clear view is maintained with other crane operators according to jurisdictional regulations
E-13.02.05P	observe limits of approach to other cranes using the anti-collision system (if equipped)	limits of approach are respected as per information from anti-collision system (if equipped)

Range of Variables

crane operations include: swinging, luffing, trolleying, travelling, hoisting

	Knowledge	
	Learning Outcomes	**Learning Objectives**
E-13.02.01L	demonstrate knowledge of procedures to operate in multi-crane sites	interpret information pertaining to multi-crane sites found in site work plans
		identify ***hazards*** and ***safe work practices*** pertaining to multi-crane site operations
		describe procedures to operate cranes in multi-crane sites
E-13.02.02L	demonstrate knowledge of regulatory requirements pertaining to multi-crane sites	identify ***standards*** and ***regulations*** pertaining to multi-crane sites
E-13.02.03L	demonstrate knowledge of anti-collision systems, their characteristics, applications and procedures for use	identify types of anti-collision systems and describe their characteristics, applications and procedures for use
E-13.02.04L	demonstrate knowledge of regulatory requirements pertaining to anti-collision systems	identify regulations pertaining to anti-collision systems

Range of Variables

hazards include: miscommunication, mechanical problems, personnel in work areas, overload conditions, uncoordinated movement, changing weather

safe work practices include: pre-lift planning, communication, no unintended movements

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, OH&S

E-13.03 Hoists personnel

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
E-13.03.01P	review lift plan for ***factors***	lift plan is reviewed for ***factors***
E-13.03.02P	inspect basket for defects, confirm it has been certified by a professional engineer when required by a jurisdiction, and ensure inspection report is current	basket is inspected for defects, confirmed to have been certified by a professional engineer when required by a jurisdiction, and inspection report is current
E-13.03.03P	confirm capacity of rigging used	capacity of rigging used conforms to safety factors outlined in ***standards*** and ***regulations***
E-13.03.04P	verify crew involved wear fall arrest equipment and tie off	crew involved wear fall arrest equipment and are tied off according to ***standards*** and ***regulations***
E-13.03.05P	conduct personnel hoisting	personnel hoisting is conducted according to company policies, ***standards*** and ***regulations***
E-13.03.06P	monitor and maintain communication with personnel in basket	communication with personnel in basket is monitored and maintained throughout lift
E-13.03.07P	review emergency and rescue protocols, and location of related equipment	emergency and rescue protocols, and location of related equipment are reviewed
E-13.03.08P	implement emergency evacuation and rescue procedures	emergency evacuation and rescue procedures are implemented

Range of Variables

factors include: number of people, weight of load, means of communication with crew involved in lift, radius of lift

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, OH&S

	Knowledge	
	Learning Outcomes	**Learning Objectives**
E-13.03.01L	demonstrate knowledge of personnel hoisting equipment, their characteristics and applications	identify types of personnel hoisting equipment, and describe their characteristics and applications
		interpret information pertaining to personnel hoisting equipment found on drawings and specifications

E-13.03.02L	demonstrate knowledge of procedures to hoist personnel	identify ***tools and equipment*** used to hoist personnel, and describe their procedures for use
		identify ***hazards*** and describe safe work practices to hoist personnel
		describe procedures to hoist personnel
E-13.03.03L	demonstrate knowledge of regulatory requirements pertaining to personnel hoisting equipment	identify ***standards*** and ***regulations*** pertaining to personnel hoisting equipment

Range of Variables

tools and equipment include: fall arrest equipment, communication equipment, rigging, hardware

hazards include: changing weather, falling objects, pinch/crush points, improper rigging procedures, personnel in area, miscommunication, surrounding environment

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, OH&S

Task E-14 Shuts down and secures tower cranes

Task Descriptor

Short term shutdowns are those when the tower crane operator must leave the controls unattended temporarily without leaving the crane during the work shift. Securing the crane while out of service is done when operator leaves the crane for longer term shutdowns.

E-14.01 Secures crane while leaving controls (short-term)

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
E-14.01.01P	ensure load is not left suspended from or supported by crane	load is not left suspended from or supported by crane
E-14.01.02P	ensure crane is positioned out of way of other operations	crane is positioned out of way of other operations in a safe manner
E-14.01.03P	disable crane controls (may include cab or remote)	crane controls (may include cab or remote) are disabled
E-14.01.04P	lock swing brake	swing brake is locked to ensure that crane does not swing into nearby obstructions
E-14.01.05P	communicate with ground personnel intent to leave controls	intent to leave controls is communicated to ground personnel

	Knowledge	
	Learning Outcomes	**Learning Objectives**
E-14.01.01L	demonstrate knowledge of procedures to secure crane while leaving controls	identify ***hazards*** and describe safe work procedure to secure crane while leaving controls
		interpret information pertaining to securing cranes found in manufacturers' specifications and company policies
		describe procedures to secure crane while leaving controls
E-14.01.02L	demonstrate knowledge of regulatory requirements pertaining to securing of cranes	identify ***standards*** and ***regulations*** pertaining to securing of cranes

Range of Variables

hazards include: unattended crane and crane controls, wind direction, other operations, obstructions
standards include: CSA Z248, ASME, ANSI
regulations include: jurisdictional, WHMIS, OH&S

E-14.02 Secures crane while out of service

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	NV	NV	NV	NV	yes	yes	yes	yes	yes	ND	ND	ND

	Skills	
	Performance Criteria	**Evidence of Attainment**
E-14.02.01P	communicate with ground personnel intent to leave controls	intent to leave controls is communicated to ground personnel
E-14.02.02P	remove load from hook block	load is removed from hook block
E-14.02.03P	raise hook block	hook block is raised to ensure hook will not contact obstructions and personnel
E-14.02.04P	position trolley for unattended crane status	trolley is placed at parking position for an unattended crane according to manufacturers' specifications
E-14.02.05P	position luffer jib	luffer jib is positioned according to manufacturers' specifications
E-14.02.06P	allow jib to weathervane	jib is set to weathervane according to manufacturers' specifications
E-14.02.07P	lock out remote control device	remote control device is locked out to prevent unauthorized use
E-14.02.08P	apply rail clamps on track mounted crane	rail clamps on track mounted crane are applied

E-14.02.09P	turn off crane	crane is turned off
E-14.02.10P	apply vandal guards	vandal guards are applied as required
E-14.02.11P	check that clearance lights and aviation beacons are functioning	clearance lights and aviation beacons are functioning according to jurisdictional regulations

	Knowledge	
	Learning Outcomes	**Learning Objectives**
E-14.02.01L	demonstrate knowledge of procedures to secure crane while out of service	identify ***hazards*** and describe safe work procedures to secure crane while out of service
		interpret information pertaining to securing cranes found in manufacturers' specifications and company policies
		describe procedures to secure crane while out of service
E-14.02.02L	demonstrate knowledge of regulatory requirements pertaining to securing of cranes	identify ***standards*** and ***regulations*** pertaining to securing of cranes

Range of Variables

hazards include: unattended crane and crane controls, wind direction, changing weather conditions, weather extremes, other operations, obstructions

standards include: CSA Z248, ASME, ANSI

regulations include: jurisdictional, WHMIS, OH&S

Appendix A
Acronyms

ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
CoG	centre of gravity
CSA	Canadian Standards Association
FLRA	field level risk assessment
GPS	Global Positioning System
ICF	insulated concrete forms
JSA	job scope analysis
LMI	load moment indicator
NDT	non-destructive testing
OH&S	Occupational Health and Safety
PLC	programmable logic controller
PLH	Power Line Hazards
PPE	personal protective equipment
SCBA	self-contained breathing apparatus
VFD	variable frequency drives
WHMIS	Workplace Hazardous Materials Information System
WLL	working load limit

Appendix B
Tools and Equipment / Outils et équipement

Personal Protective Equipment (PPE) and Safety Equipment / Équipement de protection individuelle (EPI) et équipement de sécurité

coveralls	combinaisons
earplugs and muffs	bouchons d'oreille et serres-tête antibruit
eye wash stations	douches oculaire
emergency rescue/repel devices	dispositifs de secours
face shields, safety glasses and goggles	écrans faciaux, lunettes de protection, lunettes étanches
fall arrest harnesses and lanyards	lanières et harnais antichute
fire blankets	couvertures ignifuges
fire extinguishers	extincteurs d'incendie
fire-retardant coveralls	combinaisons ignifuges
first aid kits	trousses de premiers soins
gloves	gants
hair nets	guédilles
hard hats	casques de construction
masks (particles, vapour)	masques (protection contre les poussières et les vapeurs)
reflectors	réflecteurs
respirators	respirateurs
road flares	fusées lumineuses
safety boots	bottes de sécurité
self-contained breathing apparatus (SCBA)	appareils respiratoire autonome (ARA)
spill kits	équipement requis contre les déversements
survival suits and personal floatation devices	combinaisons d'immersion et vêtements de flottaison individuels

Hand Tools / Outils à main

adjustable wrenches (various sizes)	clés à ouverture réglable (de diverses tailles)
anemometers	anémomètres
cable pullers	tires-câble
calculators	calculatrices
drift pins	tiges de dérive
flashlights	torches électrique
grease guns	pistolets graisseur
hammers (ball peen, claw, sledge, various sizes)	marteaux (à panne ronde ou fendue, à frapper devant, de tailles diverses)
hammer wrenches	clés-marteau
infrared thermometers	thermomètres infrarouge
levels	niveaux
line-up bar s	barres d'alignement
locking pliers	pinces-étaux
measuring tapes	rubans à mesurer
multimeters	multimètres
oilcans	burettes
pliers (needle nose, slip joint)	pinces (à bec de canard, à articulation coulissante)

pry bars	leviers
punches (knock-out type, various sizes)	poinçons (emporte-pièce de diverses tailles)
range finders	télémètre
ratchet sets	jeu de clés à rochet
scales	balances
scrapers (various sizes)	grattoirs (de diverses tailles)
screwdrivers (flat, Phillips, Robertson, various sizes)	tournevis (à embout plat, cruciforme et carré, de tailles diverses)
shovels	pelles
snips (heavy duty wire cutting)	cisailles (pour fil métallique de gros diamètre)
sockets and extensions	douilles et rallonges
sprayers	pulvérisateurs
spud wrenches	clés à mâchoires
squeegees	raclettes
tire pressure gauges	manomètres pour pneus
T-bars	barres en T
toolboxes	coffres à outils
torque wrenches and multipliers	multiplicateurs et clé dynamométrique
vernier callipers	pieds à coulisse
wear gauges (wire rope and sheave)	indicateurs d’usure (câble et poulies à gorge)
wire brushes	brosses métallique
wire rope cutters	coupe-câbles
wire rope winders	enrouleurs de câble
wrench sets (open and closed ends, both metric and imperial)	jeu de clés (ouvertes et fermées, SAE et métriques)

Power Tools / Outils mécaniques

air compressors	compresseurs d’air
angle grinders with attachments	rectifieuses avec dispositifs de fixation
electric drills	perceuses électriques
hand-held and stationary radios	postes de radio portatifs et fixes
headphones	écouteurs
hydraulic jacks	vérins hydraulique
hydraulic torque wrenches and pumps	clés dynamométrique hydraulique et pompes
impact wrenches (electric and pneumatic)	clés à chocs (électriques ou pneumatiques)
oxy-acetylene brazing torches	chalumeaux braseur oxyacétylénique
oxy-acetylene cutting torches	chalumeaux coupeur oxyacétylénique
propane torches	chalumeaux au propane
steam cleaners or power washers	nettoyeurs à vapeur ou laveuses à pression

Hoisting and Rigging Equipment / Équipement de levage et de gréage

aerial platforms (boom and scissor lifts)	plateformes élévatrices (girafe et à ciseaux)
becket points and wedge sockets	pointes du béquet et douilles à coin
blocks	blocs
cable clips	serre-câbles
chains	chaînes
chokers (wire rope, chain and synthetic)	attaches à étranglement (fil métallique, chaîne et synthétiques)
come-alongs (wire rope or chain)	pinces-câbles (câble métallique ou chaîne)
chain falls (manual or electric)	palans à chaîne (manuel ou électrique)
equalizer beams	poutres d'égalisation
eye bolts	boulons à œil
hooks	crochets
ladder jacks	vérins de calage
ladders	échelles
lines	câbles ordinaires
pulleys, sheaves and snatch blocks	poulies, poulies à gorge et galoches
rope guides	guides-câbles
shackles	manilles
slings	élingues
softeners	protecteurs d'élingues
spreader bars	barres d'écartement
swivels	pivots de rotation
tag lines	câbles stabilisateurs
turnbuckles	tendeurs

Appendix C
Glossary/Glossaire

anemometer	instrument for measuring and indicating the force or speed of the wind	**anémomètre**	instrument servant à mesurer et à indiquer la force ou la vitesse du vent
apex	point of the tower crane at the top where the pendants or top chords meet so that gravitational forces act on the tower, not on the jib or counter jib	**sommet**	pointe de la grue à tour au sommet où les tirants se rencontrent afin pour que les forces gravitationnelles agissent sur la tour, et non pas sur la fléchette ou la contre-fléchette
ballast	stabilizing component usually placed at the base of a tower crane; does not rotate when the crane swings	**lest**	composant stabilisateur habituellement placé à la base d'une grue à tour; cet élément ne tourne pas lorsque la grue pivote
becket	small eye for fastening hoist line	**béquet**	œil de petite taille servant à serrer le câble de levage
bird caging	form of deficiency in wire rope where the strands are separated from the core	**nid de fils brisés**	forme de défaut des fils métalliques où les torons sont séparés de l'âme
catwalk	accessible elevated walkway on the crane structure	**passerelle**	passerelle surélevée sur la structure de la grue
controls	all levers, brakes, dogs, switches, buttons, and other devices that the crane operator physically manipulates	**commandes**	ensemble des leviers, des freins, des dispositifs d'immobilisation, des interrupteurs, des boutons et des autres dispositifs que l'opérateur ou l'opératrice de grue est appelé à manipuler
counterjib	part of the crane that extends out from the tower to support counterweights and hoisting machinery	**contre-fléchette**	partie de la grue qui dépasse la tour pour supporter les contrepoids et les appareils de levage
counterweight	heavy metal or concrete attachments secured to the counter jib to offset the weight of the extended jib and load and increase lift capacity; it rotates when the crane swings	**contrepoids**	accessoires de métal lourd ou de béton fixés à la contre-fléchette pour contrebalancer le poids de la fléchette déployée et celui de la charge, et pour accroître la capacité de levage; ils tournent lorsque la grue pivote
drum	cylindrical component that is used to store and dispense line; the line is wound or spooled onto the drum when the operator causes the drum to rotate	**tambour**	composant cylindrique utilisé pour entreposer le câble et pour en faciliter l'utilisation; le câble de levage s'enroule autour du tambour lorsque l'opérateur ou l'opératrice active la rotation du tambour

gantry	component of a luffing tower crane that supports the jibs so that gravitational forces act on the tower, not on the jibs	**portique**	composant d'une grue à flèche relevable qui soutient les fléchettes afin que les forces gravitationnelles agissent sur la tour, et non pas sur les fléchettes
gross capacity	maximum amount of weight that a specific crane and boom configuration can lift	**capacité brute**	poids maximal qu'une grue et qu'une flèche données peuvent lever
gross load	weight of the load plus other items, such as the hook block, hoist lines and rigging	**charge brute**	poids de la charge auquel s'ajoute celui d'autres composants comme les moufles, les câbles de levage, les accessoires de gréage
hardware	usually refers to rigging hardware, which can be any of a wide range of bolts, hooks, chains, shackles, clamps and other mechanical devices used to secure or attach to loads in preparation for hoisting	**accessoires de gréage**	ensemble de boulons, de crochets, de chaînes, de manilles, d'attaches et d'autres organes mécaniques utilisés pour sécuriser ou pour fixer les charges en vue de leur levage
hoist line	a line that may be attached to a ball, lift hook or other assembly; the term hoist line may also be used to describe the compound assembly of lines running through the hook block	**câble de levage**	câble auquel peut être attaché un lest, un crochet de levage ou tout autre dispositif; le câble de levage peut aussi décrire l'ensemble des câbles qui passent dans la moufle
hoisting	act of manipulating the crane controls to raise or lower a load	**levage**	action de manœuvrer les commandes de la grue en vue du relevage ou de la descente d'une charge
hook block	heavy metal block containing sheaves or pulleys; the hook block is equipped with a hook for attachment of loads	**moufle**	ensemble métallique lourd composé de poulies à gorge et de poulies; la moufle est munie d'un crochet auquel les charges sont fixées
hydraulic system	any system that relies on pressurized hydraulic oil to make it function	**système hydraulique**	tout système dont le fonctionnement est assuré par de l'huile hydraulique sous pression
jib	part of the crane that extends out from the tower and supports the line or lines to which the load is attached	**fléchette**	partie de la grue qui dépasse vers l'extérieur de la tour et qui soutient le ou les câbles auxquels la charge est attachée
logbook	typically, a book in which the operator is required to record information, such as inspection, equipment certifications, maintenance, locations, hours worked, as well as damage and repair details	**carnet de bord**	registre dans lequel l'opérateur ou l'opératrice doit consigner des renseignements comme ceux portant sur l'inspection, les certifications d'équipement, l'entretien, les lieux de travail, les heures travaillées, les dommages et les réparations effectuées

multi-crane lifts	in some instances, it is impossible to accomplish certain lifts using only one crane; in these circumstances, two or more cranes may be attached to the same load, and they are used simultaneously to perform the task. Multi-crane lifts must have an engineered lift plan	**levage à plusieurs grues**	dans certains cas, il est impossible d'effectuer les levages prévus avec une seule grue; on peut alors fixer la même charge à deux grues ou plus qui soulèvent alors la charge simultanément. Le levage à plusieurs grues doit se faire à l'aide d'un plan de levage technique.
outriggers	supports that extend from the carrier vehicle to the ground to provide stability; outriggers are composed of beams and jacks	**stabilisateurs**	supports déployés depuis le transporteur de manière à prendre appui sur le sol pour assurer la stabilité de la grue; les stabilisateurs sont composés de poutres et de crics
pads (mats)	wood, metal, or synthetic assemblies that are placed under the adjustable ends of the outriggers or tracks; these items increase the amount of bearing and support given by the outriggers or the tracks to the crane	**coussinets (matelas)**	pièces de bois, de métal ou de matière synthétique placées sous les extrémités ajustables de stabilisateurs ou sous les rails; on utilise des cales pour accroître la portée et le support qu'offrent les stabilisateurs ou les rails à la grue
pendant	cable or steel bar which attaches the jib or counter jib to the apex or gantry	**tirant**	câble ou barre d'acier qui fixe la fléchette ou la contre-fléchette au sommet ou au portique
radius	horizontal distance from the centre of rotation of a crane to the CoG of a load	**rayon**	distance horizontale comprise entre l'axe de rotation d'une grue et le centre de gravité d'une charge
reeving	wire rope system in which wire rope travels around sheaves to gain a mechanical advantage	**mouflage**	méthode de câblage qui consiste à faire passer le câble dans les poulies à gorge pour obtenir un avantage mécanique
rigger	designated individual whose duty it is to ensure that loads are appropriately attached or rigged	**gréeur ou gréeuse**	ouvrier ou ouvrière dont la tâche est de s'assurer que les charges soient bien fixées ou gréées au câble de levage
rigging	components and actions used to secure and attach loads to be lifted	**gréage**	action de fixer une charge à un câble en vue de son levage; configuration des accessoires de gréage
self-erecting crane	tower crane in which tower and jib elements are not disassembled into component sections, and which can be transported between sites as a complete unit; the erection and dismantling processes are an inherent part of the crane's function	**grue à montage automatisé**	grue à tour dont la tour et la fléchette ne sont pas démontées en sections et qui peut être transportée entre les sites en un seul morceau; le montage et le démontage sont une partie intrinsèque de la fonction de cette grue

sheaves	pulleys located in a hook block, boom heads, or other parts of the crane jib on which the line runs	**poulies à gorge**	type de poulies montées sur une moufle ou accrochées à une tête de flèche ou à d’autres parties de la fléchette de la grue dans lesquelles les câbles circulent
shock loading	the effect of sudden weight change (release or application) that creates a “sudden shock” in the crane	**charge de choc**	l'effet d'un changement de poids soudain (relâchement ou application) qui crée un "coup de pied" dans la grue
signaller	designated individual who relays information to the crane operator	**signaleur ou signaleuse**	ouvrière ou ouvrier chargé de transmettre des consignes à l’opérateur ou à l’opératrice de grue
sling	any metal or synthetic flexible device used to cradle or support a load	**élingue**	tout dispositif flexible métallique ou synthétique utilisé pour entourer ou pour supporter une charge
spooling	process of winding line either onto or off of a drum on which it is stored	**enroulement**	procédé par lequel le câble est enroulé sur le tambour ou déroulé du tambour sur lequel il est entreposé
swing (slew)	rotating the upper works horizontally left or right	**rotation (orientation)**	mouvement horizontal d’une superstructure que l’on fait pivoter à gauche ou à droite
track (rail)	rail system on which a travelling undercarriage operates	**chemin de roulement (rails)**	système de transport sur rails sur lequel un châssis porteur se déplace
weathervaning	act of releasing slew brakes to allow the crane to free swing	**mise en girouette**	action de lâcher le frein du mécanisme de rotation pour permettre à la grue de pivoter librement
wire rope	often referred to as cable, this material is made of many extremely strong and flexible metal alloy wires wound in various configurations to suit a range of conditions	**câble métallique**	câble composé de plusieurs fils dans une variété d’alliage métallique flexible et très résistant enroulés de diverses façons pour répondre à des besoins variés