

# **National Occupational Standards For Operating Engineers**

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## **TOWER CRANE OPERATOR**



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## **Introduction**

The Construction Sector Council (CSC) is one of 40 sector councils in Canada. Sector councils are industry-led, labour/management partnership organizations designed to address human resource development issues within specific industries.

The primary objective of the CSC is the development of a highly-skilled workforce and a safe workplace environment, contributing to the organizational productivity and individual prosperity of the members of the construction industry. The development of national occupational standards for operating engineer occupations is one of the many ways the CSC is meeting this objective.

The CSC acknowledges all of the subject matter experts who provided their valuable time and efforts toward the definition and validation of these national occupational standards. Without their combined contributions, the development of these occupational analyses (OAs) would not have been possible. A complete list of the subject matter experts can be found at the back of this document.

An OA has the following objectives:

- to identify and group the tasks performed by skilled workers in particular occupations
- to identify those tasks that are performed by skilled workers in every province and territory
- to develop instruments for use in the assessment and training leading to the certification of skilled workers
- to facilitate the mobility, in Canada, of trainees and skilled workers
- to supply employers and employees, and their associations, industries, training institutions, and governments with analysis of the tasks performed in particular occupations

Therefore, the standards define the skills, knowledge, and abilities required for an occupation and against which the qualifications of an individual in that occupation can be assessed.

The vision of the Construction Sector Council is to reach a point where operators who demonstrate the skills, knowledge, and abilities in the national occupational standards will possess the nationally recognized credentials and those credentials will assist the operator in obtaining employment anywhere in Canada.

## Foreword

Operating engineer occupations can be grouped into three broad areas—hoist and crane operators, construction heavy equipment operators, and industrial equipment operators. Within each of these broad categories, there are several operating engineer occupations.

### **1. *Hoist and Crane Operators***

Crane operators' work tends to be centred in the construction industry. Operators work on a broad range of building sites including high-rise residential, institutional, and commercial structures, as well as most large industrial sites and many types of heavy engineering projects. The Statistics Canada Labour Force Survey (LFS) identifies around 4,000 crane operators in the construction industry across Canada. There are cyclical variations in employment, with low levels below 3,000 jobs in the mid-1990s and peak levels near 5,000.

### **2. *Construction Heavy Equipment Operators***

Heavy equipment operators are largely concentrated in the construction industry. Operators work on a variety of jobs from residential, institutional, and commercial structures to most large industrial sites and most types of heavy engineering. The LFS identifies around 37,000 equipment operators employed in the construction industry across Canada. This occupation is one of the larger trades in the industry, comparable in size to the workforce for electricians, pipe trades, and masonry trades. There are cyclical variations in employment, with low levels below 27,000 jobs in the early 1990s and peak levels near 40,000.

### **3. *Industrial Equipment Operators***

Industrial equipment operators encompass a variety of occupations ranging from forklift operators and environmental workers to tractor trailer drivers. The demand for environmental workers is increasing as knowledge, awareness, and regulations proliferate. Forklift training has taken on added importance due to safety regulations that require trained or certified forklift operators.

The mobility and accessibility of operating engineers is difficult if not impossible if there are no jurisdictional agreements on national occupational standards. The project to develop occupational analyses for national occupational standards for 29 operating engineer occupations began in January 2004 and was completed in March 2005.

## **Development of the Occupational Analysis**

A draft analysis was developed by a knowledgeable team of consultants (process experts) who, with the assistance of a committee of subject matter experts in the field, identified all the tasks performed in the occupation. In order to facilitate an efficient and effective process, the 29 occupations were grouped according to commonalities. Profile meetings, with both process and subject matter experts, were held for each grouping between January and March 2004 in:

- Edmonton, Alberta
  - Excavating, Feb 5 & 6
  - Paving, Feb 9 & 10
- Morrisburg, Ontario
  - Grading, Feb 24 & 25
  - Crane and Hoisting, Mar 1 & 2
  - HAZMAT, Mar 3 & 4
  - Plant Operations, Mar 23 & 24
  - Concrete Pumping, Mar 25 & 26
- Montreal, Quebec
  - Hauling, Feb 26 & 27
- Vancouver, British Columbia
  - Utilities, Mar 16 & 17
  - Material Handling, Mar 18 & 19
- Quebec City, Quebec
  - Profile Completion Forum, Mar 29 – 31

The draft OAs were then distributed to more subject matter experts and stakeholders across Canada for review and input between June and September 2004. They were also posted on a website where subject matter experts were invited to provide feedback.

The combined input from the review was collated in October 2004. Recommendations were assessed and incorporated into the final draft, which included the identification of common core tasks performed in all occupations. Validation meetings were held for each grouping, with process and subject matter experts, between October 2004 and January 2005 in:

2004:

- Saskatoon, Saskatchewan
  - Utilities, Oct 20 – 22
  - Material Handling (including HAZMAT), Oct 26 – 29
- Halifax, Nova Scotia
  - Grading, Nov 2 – 5
- St John's, Newfoundland
  - Crane and Hoisting (including Concrete Pump), Nov 15 – 19
- Winnipeg, Manitoba
  - Excavating, Nov 23 – 25
  - Hauling, Nov 30 – Dec 3

2005:

- Vancouver, British Columbia
  - Paving, Jan 5 – 7
  - Plant Operations, Jan 10 – 12
- Victoria, British Columbia
  - Validation Forum, Feb 21 – 23

The OAs were then edited, translated, and published in both official languages.

## **Scope of the Occupational Analysis**

This occupational analysis identifies all of the tasks that a qualified operator must be able to perform. The performance of these tasks is dependent on a range of related activities, described in the body of the analysis as subtasks. The analysis is composed mainly of tasks that operators perform frequently, including such tasks as cleaning, driving, and maintenance.

Most operators have a range of experience on different types of equipment. Regardless of the type of equipment, the duties of the operator remain relatively constant. Accomplishment of the operator's tasks depends largely on knowledge of the equipment and its components, experience in a wide variety of situations, and an ability to determine the most appropriate means of proceeding with the work.

Though not described in the analysis, other important attributes of operators include mechanical aptitude, mathematical ability, excellent vision, and a high degree of physical coordination. Operators are also often called upon to perform their jobs in extremely difficult conditions.

Although this analysis is not a training document, it is worthwhile noting that aspiring operators may find it useful to reflect on their own abilities to deal with lengthy periods of physical restriction and isolation coupled with frequent subjection to pressures of time and productivity. Operators are often required to demonstrate the ability to concentrate for long periods of time while enduring physical discomfort and inclement weather conditions.

Heavy equipment is used in virtually every facet of the construction sector. In some cases, an operator may work for years on a single site, such as a plant, and may, during that time, operate only one type of equipment and therefore perform similar and relatively constant tasks. Operators who work for contractors may rarely work on the same site more than once and may perform a tremendous variety of tasks using a wide range of equipment types and sizes. The work of an operator often overlaps with that of other equipment operators.

## **Structure of the Occupational Analysis**

To facilitate the understanding of the nature of the occupation, the work performed is divided into the following divisions:

- A. BLOCK**            the largest division within the analysis and reflects a distinct operation relevant to the occupation
- B. TASK**             the distinct activity that, combined with others, makes up the logical and necessary steps the operator is required to perform to complete a specific assignment within a BLOCK
- C. SUBTASK**        the smallest distinct, measurable, and observable activities into which it is practical to divide any work activity; combined with other SUBTASKS, these fully describe the logical steps required to complete a TASK

The importance of a task describes the benefits that operators, employers, and the public receive as a result of an operator's ability to perform the task.

*Trends* are any shifts or changes that are occurring in the industry and affect the task.

*Supporting Knowledge and Abilities* are the elements of skill and knowledge that an individual must acquire to perform the task adequately.

*Tools and Supplies* are those items that are needed to perform the skill.



**BLOCK A      PROFESSIONALISM**  
**Task 1        Acts Professionally**

This task is important because it helps to:

- present positive image of industry
- demonstrate personal integrity and competence
- instill confidence and maintain relations with general public, site personnel, owners/clients, and their clients
- maintain employment and advance in industry

Trends:

- Employers and employees are placing more emphasis on company/personnel fit in relation to attitudes and values.
- There is less tolerance for unprofessional behaviour, including workplace violence, substance abuse, and harassment.
- There is increased awareness of the importance of a balanced lifestyle.
- There is an increasing demand for knowledgeable and experienced operators that have the interpersonal skills and desire to advance to supervisory and management levels.
- Individuals need to continually upgrade their knowledge and skills because of technological advances and new methodologies.

Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
1.01	Demonstrates work ethic  Knowledge of: <ul style="list-style-type: none"> <li>• principles of work ethic and expectations, such as be punctual, prepared for work, co-operative, honest, productive, and respectful</li> </ul> Ability to: <ul style="list-style-type: none"> <li>• follow principles of work ethic in all situations</li> </ul>	
1.02	Is aware of factors affecting personal health  Knowledge of: <ul style="list-style-type: none"> <li>• factors affecting personal health</li> <li>• own current mental, emotional, and physical state</li> <li>• own limitations</li> <li>• factors/situations/conditions that cause stress in professional and personal life</li> <li>• working conditions on construction site</li> <li>• impact of fatigue on job performance</li> </ul>	
1.03	Resolves problems or disagreements with others  Knowledge of: <ul style="list-style-type: none"> <li>• company policies and procedures</li> <li>• applicable legislation, such as harassment</li> <li>• conflict resolution techniques</li> </ul>	

Ability to:

- communicate effectively
- use calm approach
- be open-minded and flexible
- determine cause of problem or disagreement
- discuss and resolve issues
- walk away from conflict if necessary

1.04 Participates in professional development

Knowledge of:

- industry trends
- areas requiring ongoing learning, such as new equipment, technologies, techniques, and industry practices

Ability to:

- assess own knowledge and skills
- acquire information about training opportunities
- learn through various methods, such as on-the-job training, reading, courses, co-workers

1.05 Works with others

Knowledge of:

- own role and responsibilities
- roles and responsibilities of others in industry

Ability to:

- work as team member to achieve common goals
- keep open mind
- participate in workplace meetings
- communicate clearly and accurately
- co-ordinate job-related activities
- co-operate with others

1.06 Works independently

Knowledge of:

- company policies and procedures, such as work-alone plan
- applicable legislation, such as responsibilities of supervisor/owner and site personnel
- own role and responsibilities
- own capabilities and limitations
- work assignment, location, and working conditions

Ability to:

- confirm and clarify assignment
- take initiative, such as anticipate and prepare for next steps in job
- identify and resolve potential and actual problems
- communicate with other site personnel
- co-ordinate work with others
- complete assignment

**BLOCK A      PROFESSIONALISM**  
**Task 2        Uses Communication Skills**

This task is important because it helps to:

- work safely and efficiently
- reduce errors and miscommunication
- comply with applicable legislation and insurance requirements
- represent company and industry in professional manner
- summon help in emergency
- prevent injury, save lives, and limit damage to equipment and property

Trends:

- There is an increased use of communication devices to increase productivity and improve safety.
- There is an increasing legislative requirement for documentation and participation in job site meetings.

Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
2.01	<p>Speaks and listens effectively</p> <p>Knowledge of:</p> <ul style="list-style-type: none"> <li>• importance of effective communication</li> <li>• industry terms</li> <li>• roles of individuals on job site, such as supervisor, inspector, other tradespeople</li> </ul> <p>Ability to:</p> <ul style="list-style-type: none"> <li>• listen carefully to what is said</li> <li>• confirm understanding, such as repeat or paraphrase instructions</li> <li>• communicate message clearly and accurately to others</li> <li>• exchange information with others, such as supervisor, signaller, general public, inspectors, other operators and tradespeople</li> </ul>	
2.02	<p>Uses documentation</p> <p>Knowledge of:</p> <ul style="list-style-type: none"> <li>• company policies and procedures</li> <li>• applicable legislation, such as Access to Information Act</li> <li>• own role and responsibilities</li> <li>• types of documentation required, such as log books, safety reports, maintenance reports, inspection reports, time cards</li> <li>• importance of complete, legible, and accurate documentation</li> <li>• where documentation is stored</li> <li>• industry terms</li> </ul>	

Ability to:

- access and store documents as required
- provide complete, legible, and accurate information in documents in timely manner
- read and interpret equipment inspection documentation from previous shifts before conducting pre-operational inspection

2.03 Communicates using signals

Knowledge of:

- company policies and procedures
- applicable legislation
- role and responsibilities of signallers
- signallers on job site
- audible and warning signals used on job site
- hand signals

Ability to:

- identify and work with signallers
- communicate using audible signals, such as back-up alarm, site emergency horn
- communicate using hand signals

2.04 Uses electronic communication equipment

Knowledge of:

- manufacturers' specifications and operating instructions
- company policies and procedures
- applicable legislation
- types of communication equipment used on job site

Ability to:

- check communication devices to verify operating condition, such as complete radio check
- deliver and receive messages using communication equipment
- follow communication protocol

*Communication devices*

**BLOCK B SAFETY**  
**Task 3 Interprets Applicable Legislation and Policies**

This task is important because it helps to:

- ensure health and safety of workers and public
- comply with applicable legislation
- prevent damage to property and environment
- decrease potential of litigation

Trends:

- There is an increasing amount of training and documentation required by amended and new legislation.
- There is an increasing demand for standardized national legislation to reduce confusion and duplication caused by differences between jurisdictions. Lack of standardized legislation may lead to fatalities and accidents, and to damage of equipment, property, and the environment.
- There is an increasing expectation that operators will be knowledgeable about relevant legislation.

Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
3.01 Interprets federal, provincial/territorial, and municipal legislation	Knowledge of: <ul style="list-style-type: none"> <li>• applicable federal, provincial/territorial, and municipal legislation, such as Highway Traffic Act, Occupational Health and Safety Act</li> <li>• where relevant legislation can be located</li> </ul> Ability to: <ul style="list-style-type: none"> <li>• locate relevant sections in legislation</li> <li>• read legislation</li> <li>• seek clarification of legislation</li> </ul>	
3.02 Interprets permits, licences, and insurance requirements	Knowledge of: <ul style="list-style-type: none"> <li>• applicable permits, licences, and insurance requirements</li> <li>• authorities having jurisdiction</li> </ul> Ability to: <ul style="list-style-type: none"> <li>• locate permits, licences, and insurance documentation, such as over-dimensional permits, ground disturbance permits, air emissions permits, water use permits</li> <li>• read permits, licences, and insurance documentation</li> <li>• seek clarification on permits, licences, and insurance documentation</li> </ul>	<i>Permits, licences, insurance documentation</i>

3.03 Interprets environmental legislation

Knowledge of:

- relevant environmental legislation
- authorities having jurisdiction, such as department of fisheries, ministry of environment, municipality
- potential environmental damage caused by construction activities

Ability to:

- locate applicable permits on job site
- read environmental legislation
- seek clarification of environmental legislation

3.04 Interprets company policies and procedures

Knowledge of:

- where copies of company policies and procedures can be located

Ability to:

- read company policies and procedures
- stay current with company policies and procedures
- seek clarification on company policies and procedures

**BLOCK B SAFETY**  
**Task 4 Works Safely**

This task is important because it helps to:

- protect self and others from injury or death
- comply with applicable legislation
- prevent damage to equipment and environment
- reduce unscheduled downtime

Trends:

- Legislation relating to PPE and training is frequently being amended to protect employees, employers, the environment, and the general public.
- The industry is involved in improving safety on job sites to reduce accidents.

Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
4.01 Uses personal protective equipment (PPE)	<p>Knowledge of:</p> <ul style="list-style-type: none"> <li>• company policies and procedures</li> <li>• applicable legislation</li> <li>• PPE required/recommended by manufacturers' manuals</li> <li>• PPE required for construction sites, such as footwear, hard hats, safety vests, safety glasses</li> <li>• PPE required for specific conditions, such as breathing apparatus for hazardous breathing conditions, dielectric boots and gloves for protection from electrical shock</li> <li>• inspection, care, and use of PPE</li> </ul> <p>Ability to:</p> <ul style="list-style-type: none"> <li>• identify PPE required for job site and situation</li> <li>• ensure PPE meets safety standard requirements, such as Canadian Standards Association (CSA)</li> <li>• inspect PPE for damage, and repair or replace as necessary</li> <li>• ensure PPE fits correctly</li> </ul>	<p><i>Steel-toed footwear, hard hat, safety gloves, appropriate safety glasses, high visibility vest, hearing protection, breathing apparatus, fall protection, and other applicable PPE</i></p>
4.02 Completes required health and safety training	<p>Knowledge of:</p> <ul style="list-style-type: none"> <li>• manufacturers' specifications, such as recommended operating procedures</li> <li>• company policies and procedures</li> <li>• applicable legislation</li> </ul>	



Ability to:

- take required health and safety training, such as confined space entry, Workplace Hazardous Materials Information System (WHMIS), first aid, cardiopulmonary resuscitation (CPR)

**BLOCK B SAFETY**  
**Task 5 Complies with Site Emergency Plan**

This task is important because it helps to:

- protect self
- prevent property damage
- ensure safety of public and job site personnel
- evacuate and secure area efficiently and effectively

Trends:

- Emergency exercises and preparedness activities are becoming more common.

Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
5.01 Prepares for emergencies	<p>Knowledge of:</p> <ul style="list-style-type: none"> <li>• manufacturers' specifications, such as equipment emergency shut-down procedure</li> <li>• company policies and procedures</li> <li>• site emergency response plan, such as evacuation routes, procedures, contact protocol</li> <li>• types of fires, i.e., Class A, B, C, and D</li> <li>• types of extinguishers</li> <li>• potential and actual hazards on work site</li> <li>• location of fire extinguishers and first aid stations (on equipment and site) and how to use them</li> <li>• inspection requirements for safety equipment and supplies, such as fire extinguisher, first aid kit</li> </ul> <p>Ability to:</p> <ul style="list-style-type: none"> <li>• take emergency response training, such as emergency response exercises, first aid, CPR</li> </ul>	<p><i>Site emergency response plan, fire extinguishers, fire blankets, respirators, masks, fire hoses, first aid kits, stretchers, WHMIS book, and other related tools and gear</i></p>
5.02 Responds to emergencies	<p>Knowledge of:</p> <ul style="list-style-type: none"> <li>• manufacturers' specifications, such as equipment emergency shut-down procedure</li> <li>• company policies and procedures</li> <li>• site emergency response plan, such as evacuation routes, procedures, contact protocol</li> <li>• types of fires, i.e., Class A, B, C, and D</li> <li>• types of extinguishers</li> <li>• potential and actual hazards on work site</li> <li>• location of fire extinguishers and first aid stations (on equipment and site) and how to use them</li> </ul>	<p><i>Fire extinguishers, fire blankets, respirators, masks, fire hoses, first aid kits, stretchers, and other related tools and gear</i></p>

- inspection requirements for safety equipment and supplies, such as fire extinguisher, first aid kit

Ability to:

- follow emergency plan
- communicate or follow instructions
- assess risks and determine course of action
- operate emergency equipment and supplies

**Block C      EQUIPMENT**  
**Task 6      Describes Equipment and Attachments**

This task is important because it helps to:

- use equipment and attachments properly and safely
- enable operation of different types of tower cranes
- communicate with others using correct terms
- ensure that tower crane is appropriate for task

Trends:

- There is an increase in the types and versatility of tower cranes.
- There is an increase in the use of technology when operating tower cranes.

Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
6.01 Describes types and sizes of tower cranes	Knowledge of: <ul style="list-style-type: none"> <li>• different structures of tower cranes, such as fixed jib (also known as hammerhead, flat top, saddle jib), self-erecting crane (also known as fast-erecting crane), luffing jib</li> <li>• different sizes of tower cranes</li> <li>• how tower cranes move, such as that fixed jib swings horizontally, luffing jib swings horizontally and moves up and down</li> </ul>	<i>Manufacturers' manuals and literature</i>
6.02 Describes types of bases used for tower crane	Knowledge of: <ul style="list-style-type: none"> <li>• common types of bases, such as rails, fixed, crawler, outriggers</li> </ul>	<i>Manufacturers' manuals and literature</i>
6.03 Describes erection process for tower crane	Knowledge of: <ul style="list-style-type: none"> <li>• standard erection process for each type of base</li> </ul>	<i>Manufacturers' manuals and literature</i>
6.04 Describes types of climbing and lowering methods	Knowledge of: <ul style="list-style-type: none"> <li>• different methods of climbing and lowering tower cranes, such as internal climbing, top climbing, self-climbing</li> </ul>	<i>Manufacturers' manuals and literature</i>
6.05 Describes functions of tower crane components	Knowledge of: <ul style="list-style-type: none"> <li>• major components, such as mast, boom, jib, counterweights, hoist drums, ring gear, outrigger, hydraulic cylinders, trolley</li> <li>• operating systems, such as hydraulic, electrical, lubrication</li> <li>• functions of components, such as that jib serves to extend radius and support load</li> </ul>	<i>Manufacturers' manuals and literature</i>

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6.06	Describes capacities and capabilities of types and sizes of tower cranes	Knowledge of: <ul style="list-style-type: none"><li>• manufacturers' specifications for capacities and/or capabilities of common types and sizes</li><li>• most appropriate crane for job, such as that luffing jib is used when working in limited space</li></ul>	<i>Manufacturers' manuals and literature</i>
6.07	Describes attachments and purposes	Knowledge of: <ul style="list-style-type: none"><li>• common types of attachments, such as jib on luffing boom, tie-ins, top climbers</li><li>• manufacturers' specifications for application of attachments</li></ul>	<i>Manufacturers' manuals and literature</i>
6.08	Describes basic tools and supplies associated with tower crane	Knowledge of: <ul style="list-style-type: none"><li>• manufacturers' specifications for tools and supplies</li><li>• basic tools, such as hammer; rope; volt meter; grease gun; flashlight; various types of wrenches, screwdrivers, and pliers</li><li>• basic supplies, such as grease, rags</li></ul>	<i>Manufacturers' manuals and literature for tools and supplies</i>
6.09	Describes rigging equipment	Knowledge of: <ul style="list-style-type: none"><li>• types of rigging hardware, such as spreader bars, lifting and equalizing beams, chain spreaders, shackles</li><li>• types of slings, such as synthetic, wire rope, chain</li><li>• configuration of rigging, such as basket, multi-legged bridle, choking capacity</li><li>• appropriate use of rigging hardware</li></ul>	<i>Manufacturers' manuals and literature</i>

**Block D            MAINTENANCE**  
**Task 7             Performs Pre-operational Inspection and Daily Service with Engine/Power Off**

This task is important because it helps to:

- meet manufacturers’ specifications, company policies and procedures, and applicable legislation
- prevent damage to equipment
- reduce unscheduled downtime

Trend:

- Operators must deal with time constraints while ensuring that a proper pre-operational inspection is done.
- There is increased awareness of shared liability and accountability.
- Insurance companies are putting pressure on owners of cranes to ensure that equipment is in safe operating condition.

Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
7.01    Inspects and services lubrication system of self-erecting crane and engine-powered tower crane	<p>Knowledge of:</p> <ul style="list-style-type: none"> <li>• manufacturers’ specifications, such as correct engine oil</li> <li>• company policies and procedures</li> <li>• applicable legislation</li> <li>• lubrication system, components (such as oil, filters), and functions</li> <li>• normal operating conditions</li> <li>• spill kit procedures</li> </ul> <p>Ability to:</p> <ul style="list-style-type: none"> <li>• locate components to be inspected</li> <li>• identify service needs, defects, and hazardous conditions through visual inspection</li> <li>• select and use appropriate tools</li> <li>• perform basic service, such as add engine oil, tighten filter</li> <li>• arrange for or perform repairs or replacement of defective components</li> <li>• use spill kit</li> </ul>	<i>Manufacturers’ manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, engine oil</i>
7.02    Inspects and services electrical service system of self-erecting crane and engine-powered tower crane	<p>Knowledge of:</p> <ul style="list-style-type: none"> <li>• manufacturers’ specifications</li> <li>• company policies and procedures</li> <li>• applicable legislation</li> <li>• electrical system, components (such as lights, gauges), and functions</li> <li>• normal operating conditions</li> </ul>	<i>Manufacturers’ manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies</i>

Ability to:

- locate components to be inspected
- identify service needs, defects, and hazardous conditions through visual inspection
- select and use appropriate tools
- perform basic service, such as boost batteries, replace fuses
- perform or arrange for repair or replacement of defective components, such as alternator belt

7.03 Inspects and services hydraulic system

Knowledge of:

- manufacturers' specifications
- company policies and procedures
- applicable legislation
- hydraulic system, components (such as hydraulic fluid, filters, lines, pumps, fittings), and functions
- normal operating conditions
- spill kit procedures
- safety precautions when working with pressurized fluids

*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, spill kit*

Ability to:

- locate components to be inspected
- identify service needs, defects, and hazardous conditions through visual inspection
- read sight gauges, such as oil levels
- select and use appropriate tools
- perform basic service, such as adjust hydraulic oil levels, tighten fittings
- perform or arrange for repair or replacement of defective components, such as hydraulic fluid lines
- use spill kit

7.04 Inspects and maintains cooling system of self-erecting crane and engine-powered tower crane

Knowledge of:

- manufacturers' specifications, such as correct belt tension
- company policies and procedures
- applicable legislation
- cooling system, components (such as belts, hoses, radiator, coolant fluid), and functions
- spill kit procedures
- normal operating conditions

*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, testing equipment, coolant fluid*

		<p>Ability to:</p> <ul style="list-style-type: none"><li>• locate components to be inspected</li><li>• identify service needs, defects, and hazardous conditions through visual inspection</li><li>• select and use appropriate tools</li><li>• perform basic service, such as adjust belt tension, check coolant levels</li><li>• perform or arrange for repair or replacement of defective components, such as leaking or broken hoses and belts</li><li>• use spill kit</li></ul>	
7.05	Inspects and services air intake system of self-erecting crane and engine-powered tower crane	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• manufacturers' specifications</li><li>• company policies and procedures</li><li>• applicable legislation</li><li>• air intake system, components, (such as filters, turbo charger, intake hose), and functions</li><li>• normal operating conditions</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>• locate components to be inspected</li><li>• identify service needs, defects, and hazardous conditions through visual inspection</li><li>• select and use appropriate tools</li><li>• perform basic service, such as change air filters</li><li>• perform or arrange for repair or replacement of defective components, such as air intake hoses</li></ul>	<p><i>Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, air filters</i></p>
7.06	Inspects and services fuel systems of self-erecting crane	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• manufacturers' specifications</li><li>• company policies and procedures</li><li>• applicable legislation</li><li>• fuel systems, components (such as fuel pump, injector lines, fuel filters, water separator), and functions</li><li>• spill kit procedures</li><li>• normal operating conditions</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>• locate components to be inspected</li><li>• identify service needs, defects, and hazardous conditions through visual inspection</li><li>• select and use appropriate tools</li></ul>	<p><i>Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies</i></p>



## Tower Crane Operator Occupational Analysis

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		<ul style="list-style-type: none"><li>• perform basic service, such as refuel vehicle, drain fuel separator, change fuel filters</li><li>• perform or arrange for repair or replacement of defective components, such as defective lines, fuel pump</li><li>• use spill kit</li></ul>	
7.07	Inspects and services suspension system of self-erecting crane	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• manufacturers' specifications</li><li>• company policies and procedures</li><li>• applicable legislation</li><li>• suspension system, components (such as spring hangers, air bags, hydraulic cylinders), and functions</li><li>• normal operating conditions</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>• locate components to be inspected</li><li>• identify service needs, defects, and hazardous conditions through visual inspection</li><li>• select and use appropriate tools</li><li>• perform basic service, such as grease and change fittings</li><li>• perform or arrange for repair or replacement of defective components, such as springs, hydraulic lines</li></ul>	<i>Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies</i>
7.08	Inspects and services drive train of self-erecting crane	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• manufacturers' specifications</li><li>• company policies and procedures</li><li>• applicable legislation</li><li>• drive train, components (such as transmission, tires, rims, lugs, differential, drive line, transmission fluid), and functions</li><li>• spill kit procedures</li><li>• normal operating conditions</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>• locate components to be inspected</li><li>• identify service needs, defects, and hazardous conditions through visual inspection</li><li>• select and use appropriate tools</li><li>• perform basic service, such as adjust tire pressure, grease universal joints, maintain transmission fluid levels</li><li>• perform or arrange for repair or replacement of defective components, such as universal joints, O-rings, tires</li><li>• use spill kit</li></ul>	<i>Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies</i>

## ***Tower Crane Operator Occupational Analysis***

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7.09	Inspects and services carrier braking system of self-erecting crane	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• manufacturers' specifications</li><li>• company policies and procedures</li><li>• applicable legislation related to air brakes</li><li>• braking system, components (such as air pot, air lines, slack adjusters, compressor), and functions</li><li>• normal operating conditions</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>• locate components to be inspected</li><li>• identify service needs, defects, and hazardous conditions through visual inspection</li><li>• select and use appropriate tools</li><li>• perform basic service, such as adjust brakes</li><li>• perform or arrange for repair or replacement of defective components, such as hoses, air dryers</li></ul>	<i>Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies</i>
7.10	Inspects load-bearing structure	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• manufacturers' specifications</li><li>• company policies and procedures</li><li>• applicable legislation</li><li>• load-bearing structure, components (such as boom pins, pendant lines, boom hoist reeve or bridle, mast, base, undercarriage), and functions</li><li>• normal operating conditions</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>• locate components to be inspected</li><li>• identify service needs, defects, and hazardous conditions through visual inspection</li><li>• arrange for repair or replacement of defective components, such as bolts, sheaves</li></ul>	<i>Manufacturers' manuals and literature, equipment maintenance documentation, PPE</i>
7.11	Inspects and services operator station	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• manufacturers' specifications</li><li>• company policies and procedures</li><li>• applicable legislation</li><li>• operator station, components (such as seat, instrument panel, communication devices), and functions</li><li>• normal operating conditions</li><li>• housekeeping practices</li></ul>	<i>Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies</i>

Ability to:

- locate components to be inspected
- identify service needs, defects, and hazardous conditions through visual inspection
- select and use appropriate tools
- perform basic service, such as clean windows and mirrors, adjust mirrors, clean up debris
- perform or arrange for repair or replacement of defective components, such as controls

7.12 Inspects and services power system

Knowledge of:

- manufacturers' specifications
- company policies and procedures
- applicable legislation
- power system (i.e., electrical, fuel), components, and functions
- normal operating conditions
- spill kit procedures

*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies*

Ability to:

- locate components to be inspected
- identify service needs, defects, and hazardous conditions through visual inspection
- select and use appropriate tools
- perform basic service, such as refuel, clean electrical contact points, replace fuses
- perform or arrange for repair or replacement of defective components, such hoses, fuel pump, power supply cable
- use spill kit

7.13 Inspects and services operating control system

Knowledge of:

- manufacturers' specifications
- company policies and procedures
- operating control system (i.e., hydraulic, electrical, pneumatic), components, and functions
- normal operating conditions

*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies*

Ability to:

- locate components to be inspected
- identify service needs, defects, and hazardous conditions through visual inspection
- select and use appropriate tools
- perform basic service, such as adjust air flow pressure to controls, clean contact points

		<ul style="list-style-type: none"><li>perform or arrange for repair or replacement of defective components, such as hoses, O-rings, air compressor, hydraulic pump, electric motor</li></ul>	
7.14	Inspects and services jib/boom and mast	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>manufacturers' specifications</li><li>company policies and procedures</li><li>applicable legislation</li><li>jib/boom and mast, components (such as jib/boom sections, connecting bolts and pins, mast), and functions</li><li>normal operating conditions</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>locate components to be inspected</li><li>identify service needs, defects, and hazardous conditions through visual inspection</li><li>select and use appropriate tools</li><li>perform basic maintenance, such as grease heel pins and sheaves</li><li>perform or arrange for repair or replacement of defective components, such as welds, wear pads</li></ul>	<i>Manufacturers' manuals and literature, equipment maintenance documentation, PPE</i>
7.15	Inspects and services hoisting system	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>manufacturers' specifications</li><li>company policies and procedures</li><li>applicable legislation</li><li>hoisting systems, components (such as wire rope, fittings, drums, hook, sheaves, winch mount), and functions</li><li>normal operating conditions</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>locate components to be inspected</li><li>identify service needs, defects, and hazardous conditions through visual inspection</li><li>select and use appropriate tools</li><li>perform basic service, such as change fittings and blocks</li><li>perform or arrange for repair or replacement of defective components, such as wire rope, sheaves</li></ul>	<i>Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies</i>

7.16	Inspects and services stabilizing system	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• manufacturers' specifications</li><li>• company policies and procedures</li><li>• applicable legislation</li><li>• stabilizing systems, components (such as counterweights, outriggers, outrigger beams, pads, outrigger boxes, floats, mats, jacks), and functions</li><li>• normal operating conditions</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>• locate components to be inspected</li><li>• identify service needs, defects, and hazardous conditions through visual inspection</li><li>• select and use appropriate tools</li><li>• perform basic service, such as grease outrigger components</li><li>• perform or arrange for repair or replacement of defective components, such as pins, bolts</li></ul>	<i>Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies</i>
7.17	Inspects and services attachments	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• manufacturers' specifications</li><li>• company policies and procedures</li><li>• applicable legislation</li><li>• attachments (such as jib on luffing boom, tie-ins, top climbers), components, and functions</li><li>• normal operating conditions</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>• locate components to be inspected</li><li>• identify service needs, defects, and hazardous conditions through visual inspection</li><li>• select and use appropriate tools</li><li>• perform basic service, such as grease heel pins and sheaves</li><li>• perform or arrange for repair or replacement of defective components, such as lacings, sheaves</li></ul>	<i>Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies</i>

**Block D            MAINTENANCE**  
**Task 8             Performs Pre-operational Inspection and Daily Service with Engine/Power On**

This task is important because it helps to:

- meet manufacturers’ specifications, company policies and procedures, and applicable legislation
- identify problems not evident when engine or power is off
- ensure that equipment is safe and ready to operate
- prolong equipment life
- prevent unscheduled downtime

Trend:

- Operators must deal with time constraints while ensuring that a proper pre-operational inspection is done.
- There is increased awareness of shared liability and accountability.
- Insurance companies are putting pressure on owners of cranes to ensure that equipment is in safe operating condition.

Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
8.01     Starts engine or turns on power	<p>Knowledge of:</p> <ul style="list-style-type: none"> <li>• manufacturers’ specifications</li> <li>• company polices and procedures</li> <li>• monitoring and warning systems, components, and functions</li> <li>• battery-boosting procedures</li> </ul> <p>Ability to:</p> <ul style="list-style-type: none"> <li>• engage ignition</li> <li>• interpret information from gauges, lights, and sensors</li> <li>• assist with boosting batteries if required</li> <li>• select and use appropriate tools</li> <li>• adjust start up according to weather conditions, such as use starting aids, e.g., block heater, fuel heater</li> <li>• perform or arrange for repair or replacement of defective components, such as gauges</li> </ul>	<p><i>Manufacturers’ manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies</i></p>
8.02     Warms up electric engine/motor	<p>Knowledge of:</p> <ul style="list-style-type: none"> <li>• manufacturers’ specifications</li> <li>• warm-up procedures</li> <li>• impact of weather and seasonal conditions on equipment functions and fluids</li> </ul> <p>Ability to:</p> <ul style="list-style-type: none"> <li>• monitor gauges to check that engine/motor systems are working properly</li> </ul>	<p><i>Manufacturers’ manuals and literature, PPE</i></p>

8.03	Cycles equipment functions	<ul style="list-style-type: none"><li>• adjust warm-up procedures to weather conditions</li></ul> <p>Knowledge of:</p> <ul style="list-style-type: none"><li>• manufacturers' specifications</li><li>• applicable legislation, such as air brakes</li><li>• operating systems, components (such as alarms, limit switches, operating controls, emergency shut-down devices, remotes), and functions</li><li>• types of operating controls, such as wireless remote, remote with umbilical cord, local (i.e., in cab)</li><li>• normal operating characteristics</li><li>• impact of weather and seasonal conditions</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>• ensure that remote control batteries are charged</li><li>• activate all functions, such as brakes, steering, lights, wipers, hydraulic functions, operating controls</li><li>• activate emergency shut-down devices</li><li>• identify service needs, defects, and hazardous conditions through sensory inspections</li><li>• select and use appropriate tools</li><li>• perform basic service, such as clean remote control</li><li>• perform or arrange for repair or replacement of defective components</li><li>• perform operational tests, such as test limit switches, conduct overload test</li></ul>	<i>Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies</i>
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**BLOCK D      MAINTENANCE**  
**Task 9        Complies with Scheduled Maintenance Requirements**

This task is important because it helps to:

- ensure continuous and safe operation of equipment
- validate manufacturers' equipment warranties
- prevent damage to equipment
- reduce unscheduled downtime

Trends:  
 N/A

Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
9.01    Arranges for or performs scheduled maintenance	<p>Knowledge of:</p> <ul style="list-style-type: none"> <li>• manufacturers' specifications for scheduled maintenance</li> <li>• company policies and procedures</li> <li>• applicable legislation</li> <li>• factors that affect scheduled maintenance, such as where equipment is being used, number and characteristics of loads being lifted and moved</li> </ul> <p>Ability to:</p> <ul style="list-style-type: none"> <li>• comply with safety requirements</li> <li>• read indicators that signal need for replacement of components, such as air filter</li> <li>• read maintenance records and documentation relating to service, such as log books</li> <li>• perform scheduled maintenance, such as grease sheaves and ring gear</li> <li>• assist with scheduled maintenance, such as torque bolts</li> </ul>	<p><i>Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies</i></p>



**BLOCK E      OPERATING PROCEDURES**  
**Task 10      Plans Work Procedures**

This task is important because it helps to:

- ensure proper pick up and placement of load
- prevent damage to load and equipment
- ensure efficient use of time and equipment

Trends:

N/A

Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
10.01    Assesses site hazards	<p>Knowledge of:</p> <ul style="list-style-type: none"> <li>• manufacturers' and engineering specifications</li> <li>• company policies and procedures</li> <li>• applicable legislation, such as Occupational Health and Safety</li> <li>• authorities having jurisdiction</li> <li>• factors that affect equipment stability, such as ground and supporting conditions</li> <li>• actual and potential hazards, such as overhead utilities and guide wires, other equipment, personnel, vehicular traffic</li> </ul> <p>Ability to:</p> <ul style="list-style-type: none"> <li>• inspect site visually</li> <li>• identify unsafe site practices</li> <li>• find information regarding ground and other supporting conditions</li> <li>• communicate with site personnel and authorities having jurisdiction</li> </ul>	<i>Manufacturers' manuals and literature, PPE</i>
10.02    Discusses environmental concerns with site personnel	<p>Knowledge of:</p> <ul style="list-style-type: none"> <li>• company policies and procedures</li> <li>• applicable legislation</li> <li>• environmental concerns</li> <li>• site characteristics and boundaries</li> </ul> <p>Ability to:</p> <ul style="list-style-type: none"> <li>• identify environmental concerns of site, such as proximity to water courses, allowable noise levels, fuel leaks, hazardous materials</li> <li>• communicate questions and concerns to employer, site personnel, and/or authorities having jurisdiction</li> </ul>	<i>PPE</i>

## ***Tower Crane Operator Occupational Analysis***

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10.03	Reviews job specifications and safety considerations with site personnel	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• job specifications</li><li>• applicable legislation</li><li>• actual and potential site hazards</li><li>• safe work practices</li><li>• other construction equipment on site</li><li>• roles of personnel on site, such as supervisor, inspector, other tradespeople</li><li>• hand signals and radio use</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>• communicate with site personnel to confirm job specifications and determine relevant safety information, such as job- or site-specific PPE needed, traffic patterns, procedures</li></ul>	<i>PPE, utility locate document</i>
10.04	Plans or confirms travel route for self-erecting crane	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• manufacturers' specifications</li><li>• job specifications</li><li>• applicable legislation</li><li>• traffic patterns, such as site access and egress points</li><li>• terrain (such as railway tracks, ramps, inclines), hazards, and obstructions, such as utilities</li><li>• warning signs and site markers</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>• plan or confirm route with consideration of hazards</li><li>• interpret warning signs and site markers</li></ul>	<i>Manufacturers' manuals and literature, PPE</i>
10.05	Assesses load	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• load characteristics, such as weight, dimensions, configuration, container type, centre of gravity, surface profile, state (i.e., gas, liquid, or solid)</li><li>• load contents, such as hazardous or explosive materials</li><li>• roles of riggers/signallers</li><li>• hand signals and radio use</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>• inspect load visually or communicate with designated riggers/signallers</li><li>• determine load weight by reading weigh bills or asking designated riggers/signallers</li></ul>	<i>Manufacturers' manuals and literature, PPE, capacity plates`</i>

## **Tower Crane Operator Occupational Analysis**

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		<ul style="list-style-type: none"><li>• use and respond to hand signals and radio instructions</li></ul>	
10.06	Determines best set-up location on site for self-erecting crane	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• manufacturers' specifications</li><li>• job specifications</li><li>• company policies and procedures</li><li>• applicable legislation</li><li>• radius requirements</li><li>• set-up requirements</li><li>• warning signs and site markers</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>• select set-up location with consideration of limitations, such as overhead and turning clearances, ground stability</li></ul>	<i>Manufacturers' manuals and literature, PPE</i>
10.07	Plans lifts and tasks	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• manufacturers' specifications</li><li>• company policies and procedures</li><li>• applicable legislation</li><li>• load assessment</li><li>• rigging requirements and techniques</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>• determine load weight</li><li>• select appropriate rigging</li><li>• read and interpret load charts to determine most efficient way to lift load</li><li>• participate in specialty-lift planning, such as multi-crane and engineered lifts</li></ul>	<i>Manufacturers' manuals and literature, PPE</i>
10.08	Determines work procedures	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• manufacturers' specifications</li><li>• job specifications, such as priority, number of lifts</li><li>• material scheduling requirements to co-ordinate with ground personnel</li><li>• hand signals and radio use</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>• schedule lifts and minimize downtime</li><li>• minimize number of set-ups (for self-erecting cranes)</li><li>• co-ordinate activities with other site personnel</li></ul>	<i>Manufacturers' manuals and literature, PPE</i>

**BLOCK E      OPERATING PROCEDURES**  
**Task 11      Operates Tower Crane**

This task is important because it helps to:

- prevent damage to loads, property, and equipment
- prevent injury to personnel
- fulfill job specifications
- co-ordinate tower crane operations with other construction activities on site

Trends:

- Technical innovations have improved operator-aid devices.
- Operators need training and upgrading to use technical innovations.

Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
11.01    Complies with safety requirements	<p>Knowledge of:</p> <ul style="list-style-type: none"> <li>• manufacturers' specifications</li> <li>• company policies and procedures</li> <li>• applicable legislation</li> <li>• safety controls and equipment, such as automatic limit switches, overload limit devices, fire extinguishers</li> <li>• caution, warning, and hazard decals, lights, and symbols</li> </ul> <p>Ability to:</p> <ul style="list-style-type: none"> <li>• use safety controls and equipment</li> <li>• respond to caution, warning, and hazard decals, lights, and symbols</li> <li>• activate emergency shut-off</li> </ul>	<i>Manufacturers' manuals and literature, PPE, fire extinguisher</i>
11.02    Checks set-up of fixed and luffing-jib crane	<p>Knowledge of:</p> <ul style="list-style-type: none"> <li>• manufacturers' and engineers' specifications</li> <li>• company policies and procedures</li> <li>• applicable legislation, such as Occupational Health and Safety</li> </ul> <p>Ability to:</p> <ul style="list-style-type: none"> <li>• ensure that proper documentation is in place</li> <li>• inspect set-up</li> <li>• perform operational tests, such as lift test blocks to test automatic limit switches and overload limit devices</li> </ul>	<i>Manufacturers' manuals and literature, PPE, approved drawings</i>
11.03    Sets up self-erecting tower crane	<p>Knowledge of:</p> <ul style="list-style-type: none"> <li>• manufacturers' specifications, such as required clearances</li> </ul>	<i>Manufacturers' manuals and literature, PPE</i>

- applicable legislation, such as permit requirements for barricades
- correct positioning of crane
- stability characteristics of crane
- hand signals and radio use

Ability to:

- position equipment correctly
- stabilize equipment, such as lock outriggers into position, install pads
- configure crane, such as erect mast, assemble boom, install counterweight
- perform operational tests, such as lift test blocks to test automatic limit switches and overload limit devices
- use and respond to hand signals and radio instructions

11.04 Assists with installation of attachments

Knowledge of:

- manufacturers' specifications for equipment and attachments
- job specifications
- installation procedures, such as top-climber installation procedures
- hand signals and radio use

*Manufacturers' manuals and literature, PPE, basic tools and supplies*

Ability to:

- select and use appropriate tools
- position equipment and attachments for installation
- follow installation procedures
- use and respond to hand signals and radio instructions

11.05 Uses safe rigging techniques

Knowledge of:

- manufacturers' specifications of rigging hardware and slings
- applicable legislation, such as Occupational Health and Safety, CSA Z248 Standard
- load assessment
- appropriate rigging hardware and slings for load
- rigging configurations
- load hook-up points

*Manufacturers' literature for rigging hardware and slings, PPE, basic tools and supplies*

Ability to:

- select appropriate rigging and slings for load

		<ul style="list-style-type: none"><li>• inspect rigging components for wear and defects</li><li>• identify best rigging configuration</li><li>• inspect hook-up points before lifting</li></ul>	
11.06	Performs hoisting operations	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• manufacturers' specifications</li><li>• applicable legislation</li><li>• hoisting operations, such as raising and lowering boom or load, slewing (also known as swinging), trolleying</li><li>• required information to input into computer program, such as boom length, radius, load weight, parts of line to be used</li><li>• lift plan</li><li>• operating controls in operator's station or on remote</li><li>• safe rigging techniques</li><li>• limitations of job site, such as ground stability</li><li>• multi-crane lift procedures</li><li>• hand signals and radio use</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>• operate boom and hoisting systems</li><li>• perform simultaneous hoisting operations</li><li>• follow lift plan</li><li>• place load at designated location</li><li>• ensure that load does not exceed limitations of placement location</li><li>• interpret computer readouts</li><li>• travel crane (for mobile bases, such as rails and crawlers) to perform pick and carry operations</li><li>• use and respond to hand signals and radio instructions</li></ul>	<i>Manufacturers' manuals and literature, PPE</i>
11.07	Relocates equipment with mobile base to new work location on site	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• manufacturers' specifications</li><li>• job specifications</li><li>• company policies and procedures</li><li>• applicable legislation, such as Occupational Health and Safety</li><li>• site conditions</li><li>• traffic patterns</li><li>• production work cycle</li></ul>	<i>Manufacturers' manuals and literature, PPE, site drawings, utility locate document</i>

## ***Tower Crane Operator Occupational Analysis***

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- terrain (such as railway tracks, ramps, inclines), hazards, and obstructions, such as utilities
- space requirements to manoeuvre equipment
- when to use signaller
- hand signals and radio use

Ability to:

- secure equipment with mobile base (such as rail, crawler, self-erecting crane) for relocation, such as retract mast, lock outriggers into position, disassemble boom, remove counterweight, store and secure pads
- follow designated route on work site
- use and respond to hand signals and radio instructions

11.08 Assists with raising and lowering of tower crane of fixed and luffing-jib crane

Knowledge of:

- manufacturers' specifications
- company policies and procedures
- raising and lowering methods
- hand signals and radio use

*Manufacturers' manuals and literature, PPE*

Ability to:

- monitor weather conditions
- co-ordinate activities with raising crew
- perform operational test, such as set limit switches, lift test blocks
- use and respond to hand signals and radio instructions

11.09 Performs specialty lifts

Knowledge of:

- manufacturers' specifications
- engineer's specifications
- job specifications
- company policies and procedures
- exact weight and maximum radius of load
- roles and responsibilities of other personnel
- hand signals and radio use

*Manufacturers' manuals and literature, PPE engineers' drawings*

Ability to:

- participate in planning of specialty lift with others
- follow lift plan
- co-ordinate activities with other equipment operators
- communicate with designated rigger/signaller

11.10	Monitors site activities	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• actual and potential site hazards, such as locations of roadways, walkways, other equipment, and pedestrians</li><li>• changing site conditions</li><li>• blind spots and when to use rigger/signaller</li><li>• hand signals and radio use</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>• observe and respond to movement of others around work area</li><li>• avoid collisions</li><li>• communicate with designated rigger/signaller</li></ul>	<i>PPE</i>
11.11	Optimizes equipment capabilities	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• manufacturers' specifications for equipment and attachments</li><li>• job specifications</li><li>• impact of load on equipment's capacity and capabilities</li><li>• principles of motion, balance, and stability, such as fulcrum points, leverage, centre of gravity, horizontal and vertical stability, effects of speed, centrifugal force, acceleration, dynamic loading</li><li>• safe rigging and hoisting techniques</li><li>• impact of weather conditions on capabilities of equipment</li><li>• impact of ground conditions on stability of equipment (for self-erecting cranes)</li></ul> <p>Ability to:</p> <ul style="list-style-type: none"><li>• follow planned work procedure and adjust as necessary</li><li>• optimize equipment's capabilities by adjusting to factors, such as characteristics of load, weather conditions</li><li>• use operating controls smoothly and simultaneously</li><li>• minimize swing</li></ul>	<i>Manufacturers' manuals and literature, PPE</i>
11.12	Responds to changes in weather conditions	<p>Knowledge of:</p> <ul style="list-style-type: none"><li>• manufacturers' specifications, such as capabilities and limitations of equipment</li><li>• company policies and procedures</li></ul>	<i>Manufacturers' manuals and literature, PPE, appropriate clothing</i>



- impact of weather conditions (such as strong or gusting wind, freezing rain, ice, extreme cold, electrical storm) on operation of equipment

Ability to:

- adjust operation to accommodate weather conditions, such as restrict swing rotation, select load with smaller sail area
- determine when to proceed or not proceed with lift or equipment operation

11.13 Monitors equipment performance on ongoing basis

Knowledge of:

- manufacturers' specifications
- normal operating characteristics
- gauges and symbols on equipment
- operator aid devices on equipment, such load moment indicators (LMI), anti-collision sensors

*Manufacturers' manuals and literature, PPE*

Ability to:

- read and interpret information from gauges, symbols, and operator aid devices
- use own senses to monitor equipment performance
- determine whether equipment is operating properly

11.14 Troubleshoots equipment problems

Knowledge of:

- manufacturers' specifications
- proper mechanical operation
- normal operating characteristics
- equipment systems

*Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, communication devices, flashlight*

Ability to:

- identify problems and possible solutions
- communicate problems accurately to others, such as maintenance personnel
- record equipment problems in equipment maintenance documentation, such as log book

**BLOCK E      OPERATING PROCEDURES**  
**Task 12      Follows Shut-down Procedures**

This task is important because it helps to:

- ensure that equipment is ready for next shift
- prevent unauthorized movement and vandalism of equipment
- keep equipment clean
- avoid injury to personnel

Trends:

- There is increased emphasis on housekeeping practices in manufacturers' specifications, company policies and procedures, and legislation.

Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
12.01    Performs housekeeping tasks	Knowledge of: <ul style="list-style-type: none"> <li>• manufacturers' specifications</li> <li>• company policies and procedures</li> <li>• housekeeping practices</li> </ul> Ability to: <ul style="list-style-type: none"> <li>• clean operator station, cat walks, and platforms</li> <li>• dispose of debris</li> </ul>	<i>Manufacturers' manuals and literature, PPE, basic tools and supplies</i>
12.02    Shuts down and secures equipment	Knowledge of: <ul style="list-style-type: none"> <li>• manufacturers' specifications, such as allowing crane to weather vane</li> <li>• company policies and procedures</li> </ul> Ability to: <ul style="list-style-type: none"> <li>• set in weather-vane position</li> <li>• shut off power supply and lock out</li> <li>• secure loose items</li> </ul>	<i>Manufacturers' manuals and literature, PPE, basic tools and supplies</i>
12.03    Conducts post-operational inspection	Knowledge of: <ul style="list-style-type: none"> <li>• manufacturers' specifications</li> <li>• company policies and procedures</li> </ul> Ability to: <ul style="list-style-type: none"> <li>• conduct walk-around visual inspection to check general condition of equipment, such as condition of bolts, tower sections, and ladders</li> <li>• document and communicate concerns to appropriate personnel, such as supervisor, mechanic</li> <li>• remove debris from crawlers or rails</li> </ul>	<i>Manufacturers' manuals and literature, equipment maintenance documentation, PPE, basic tools and supplies, broom, shovel</i>

**BLOCK F      TRANSPORTATION**  
**Task 13      Transports Self-erecting Crane on Public Roads**

This task is important because it helps to:

- ensure that equipment arrives safely
- ensure public safety
- comply with applicable transportation legislation

Trends:

- Innovations in technology have reduced the time required to prepare self-erecting cranes for transportation.

Subtasks	Supporting Knowledge and Abilities	Tools and Supplies
13.01    Prepares to transport self-erecting tower crane	<p>Knowledge of:</p> <ul style="list-style-type: none"> <li>• manufacturers' specifications for proper positioning of boom, attachments, and outriggers</li> <li>• company policies and procedures</li> <li>• applicable legislation, such as appropriate class of driver's licence; traffic laws; use of flashing lights, slow moving vehicle sign, oversize load sign, flags, and lights</li> <li>• route and destination</li> </ul> <p>Ability to:</p> <ul style="list-style-type: none"> <li>• secure equipment for transport, such as retract mast, lock outriggers into position, disassemble boom, remove counterweight, store and secure pads</li> <li>• clean equipment</li> <li>• attach oversize load signs, flags, and lights as required</li> <li>• check brakes, lights, and steering</li> <li>• assist with loading or hook-up if equipment is being transported</li> </ul>	<i>Manufacturers' manuals and literature, PPE</i>
13.02    Drives self-erecting tower crane on public roads	<p>Knowledge of:</p> <ul style="list-style-type: none"> <li>• manufacturers' specifications</li> <li>• applicable legislation, such as traffic laws, required class of driver's licence</li> <li>• road conditions</li> <li>• equipment's limitations</li> </ul> <p>Ability to:</p> <ul style="list-style-type: none"> <li>• read maps</li> <li>• follow route to destination</li> <li>• comply with traffic laws</li> </ul>	<i>PPE, maps, licence, permits</i>

## ***Tower Crane Operator Occupational Analysis***

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- adjust to road and weather conditions, such as adjust speed
- recognize potential hazards, such as overhead lines or overpass

### Tower Crane Operator DACUM Chart

Block	Task	Subtask					
<b>A. PROFESSIONALISM</b>	<b>1. Acts Professionally</b>	1.01 Demonstrates work ethic	1.02 Is aware of factors affecting personal health	1.03 Resolves problems or disagreements with others	1.04 Participates in professional development	1.05 Works with others	1.06 Works independently
	<b>2. Uses Communication Skills</b>	2.01 Speaks and listens effectively	2.02 Uses documentation	2.03 Communicates using signals	2.04 Uses electronic communication equipment		
<b>B. SAFETY</b>	<b>3. Interprets Applicable Legislation and Policies</b>	3.01 Interprets federal, provincial/territorial, and municipal legislation	3.02 Interprets permits, licenses, and insurance requirements	3.03 Interprets environmental legislation	3.04 Interprets company policies and procedures		
	<b>4. Works Safely</b>	4.01 Uses personal protective equipment (PPE)	4.02 Completes required health and safety training				
	<b>5. Complies with Site Emergency Plan</b>	5.01 Prepares for emergencies	5.02 Responds to emergencies				

### Tower Crane Operator DACUM Chart

Block	Task	Subtask					
<b>C. EQUIPMENT</b>	<b>6. Describes Equipment and Attachments</b>	6.01 Describes types and sizes of tower cranes	6.02 Describes types of bases used for tower crane	6.03 Describes erection process for tower crane	6.04 Describes types of climbing and lowering methods	6.05 Describes functions of tower crane components	6.06 Describes capacities and capabilities of types and sizes of tower cranes
		6.07 Describes attachments and purposes	6.08 Describes basic tools and supplies associated with tower crane	6.09 Describes rigging equipment			
<b>D. MAINTENANCE</b>	<b>7. Performs Pre-operational Inspection and Daily Service with Engine/Power Off</b>	7.01 Inspects and services lubrication system of self-erecting crane and engine-powered tower crane	7.02 Inspects and services electrical service system of self-erecting crane and engine-powered tower crane	7.03 Inspects and services hydraulic system	7.04 Inspects and maintains cooling system of self-erecting crane and engine-powered tower crane	7.05 Inspects and services air intake system of self-erecting crane and engine-powered tower crane	7.06 Inspects and services fuel system of self-erecting crane
		7.13 Inspects and services operating control system	7.14 Inspects and services jib/boom and mast	7.15 Inspects and services hoisting system	7.16 Inspects and services stabilizing system	7.17 Inspects and services attachments	
	<b>8. Performs Pre-operational Inspection and Daily Service with Engine/Power On</b>	8.01 Starts engine or turns on power	8.02 Warms up electric engine/motor	8.03 Cycles equipment functions			

### Tower Crane Operator DACUM Chart

Block	Task	Subtask						
<b>D. MAINTENANCE, cont'd</b>	<b>9. Complies with Scheduled Maintenance Requirements</b>	9.01 Arranges for or performs scheduled maintenance						
		<b>E. OPERATING PROCEDURES</b>	<b>10. Plans Work Procedures</b>	10.01 Assesses site hazards	10.02 Discusses environmental concerns with site personnel	10.03 Reviews job specifications and safety considerations with site personnel	10.04 Plans or confirms travel route for self-erecting crane	10.05 Assesses load
10.07 Plans lifts and tasks	10.08 Determines work procedures							
<b>11. Operates Tower Crane</b>	11.01 Complies with safety requirements			11.02 Checks set-up of fixed and luffing-jib crane	11.03 Sets up self-erecting tower crane	11.04 Assists with installation of attachments	11.05 Uses safe rigging techniques	11.06 Performs hoisting operations
	11.07 Relocates equipment with mobile base to new work location on site			11.08 Assists with raising and lowering of tower crane of fixed and luffing-jib crane	11.09 Performs specialty lifts	11.10 Monitors site activities	11.11 Optimizes equipment capabilities	11.12 Responds to changes in weather conditions

### Tower Crane Operator DACUM Chart

Block	Task	Subtask		
<b>E. OPERATING PROCEDURES, cont'd</b>	<b>11. Operates Tower Crane, cont'd</b>	11.13 Monitors equipment performance on ongoing basis	11.14 Troubleshoots equipment problems	
	<b>12. Follows Shut-down Procedures</b>	12.01 Performs housekeeping tasks	12.02 Shuts down and secures equipment	12.03 Conducts post-operational inspection
<b>F. TRANSPORTATION</b>	<b>13. Transports Self-erecting Crane on Public Roads</b>	13.01 Prepares to transport self-erecting tower crane	13.02 Drives self-erecting tower crane on public roads	



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Gary Snow, NL

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