



Tower Crane Operator **Guide to Course Content**

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Recognition:

To promote transparency and consistency, this document has been adapted from the 2010 Tower Crane Operator National Occupational Analysis (Employment and Social Development Canada).

A complete version of the Occupational Analysis can be found at www.red-seal.ca

STRUCTURE OF THE GUIDE TO COURSE CONTENT

To facilitate understanding of the occupation, this guide to course content contains the following sections:

Description of the Tower Crane Operator trade: an overview of the trade's duties and training requirements.

Essential Skills Summary: an overview of how each of the nine essential skills is applied in this trade.

Elements of harmonization of apprenticeship training: includes adoption of Red Seal trade name, number of levels of apprenticeship, total training hours (on-the-job and in-school) and consistent sequencing of technical training content. Implementation for harmonization will take place progressively. Level one to be implemented in 2016/2017 and level two in 2017/2018.

Task Matrix: a chart which outlines graphically the major work activities, tasks and sub-tasks of this standard detailing the essential skills and the level of training where the content is covered.

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.

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

Training Profile Chart: a chart which outlines the model for Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training.

Technical Training Course Content for the Tower Crane Operator trade: a chart which outlines the model for SATCC technical training sequencing. For the harmonized level of training, a cross reference to the Harmonized apprenticeship technical training sequencing, at the learning outcome level, is provided.

Appendix A: Post Harmonization Training Profile Chart: a chart which outlines the finalized model for SATCC technical training sequencing with a cross reference to the Harmonized apprenticeship technical training sequencing, at the topic level.

DESCRIPTION OF THE TOWER CRANE OPERATOR TRADE

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.

Tower cranes are used for specific worksite requirements, as they have a smaller footprint 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 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. Luffer 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 jobsites.

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.

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, excellent eye sight, and math skills. Safety is the number one priority for tower crane operators. Tower crane operators need to work cautiously and with extreme precision to ensure the safety of others. 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. Another key attribute is communication skills to effectively communicate with site personnel, supervisors, riggers, signallers and other tradespeople.

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 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.

Training Requirements: To graduate from each level of the apprenticeship program, an apprentice must successfully complete the required technical training and compile enough on-the-job experience to total at least 1500 hours each year. Total trade time required is 3000 hours and at least 2 years in the trade. There are two levels of technical training delivered by the Western Trade Training Institute in various locations around the province:

Level One: 8 weeks

Level Two: 8 weeks

Examination required for proficiency certificates: boom truck operator "A"; boom truck operator "B".

The information contained in this guide to course content details the technical training delivered for each level of apprenticeship. An apprentice spends approximately 15% of their apprenticeship term in a technical training institute learning the technical and theoretical aspects of the trade. The hours and percentages of technical and practical training may vary according to class needs and progress.

The content of the technical training components is subject to change without notice.

Entrance Requirements for Apprenticeship Training

Your grade twelve transcripts (with no modified classes) or GED 12 is your guarantee that you meet the educational entrance requirements for apprenticeship in Saskatchewan. In fact, employers prefer and recommend apprentices who have completed high school. This ensures the individual has all of the necessary skills required to successfully complete the apprenticeship program, and receive journeyman certification.

Individuals with “modified” or “general” classes in math or science do not meet our entry requirements. These individuals are required to take an entrance assessment prescribed by the SATCC.

English is the language of instruction in all apprenticeship programs and is the common language for business in Saskatchewan. Before admission, all apprentices and/or “upgraders” must be able to understand and communicate in the English language. Applicants whose first language is not English must have a minimum Canadian Language Benchmark Assessment of six (CLB6).

Note: A CLB assessment is valid for a one-year period from date of issue.

| Designated Trade Name | Math Credit at the Indicated Grade Level ❶ | Science Credit at Grade Level |
|---|--|-------------------------------|
| Tower Crane Operator | Grade 10 | Grade 10 |
| <p>❶ - (One of the following) WA – Workplace and Apprenticeship; or F – Foundations; or P – Pre-calculus, or a Math at the indicated grade level (Modified and General Math credits are not acceptable.).</p> <p>*Applicants who have graduated in advance of 2015-2016, or who do not have access to the revised Science curricula will require a Science at the minimum grade level indicated by trade.</p> <p>For information about high school curriculum, including Math and Science course names, please see: http://www.curriculum.gov.sk.ca/#</p> <p>Individuals not meeting the entrance requirements will be subject to an assessment and any required training</p> | | |

ESSENTIAL SKILLS SUMMARY

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

Through extensive research, the Government of Canada and other national and international agencies have identified and validated nine essential skills. These skills are used in nearly every occupation and throughout daily life in different ways.

A series of CCDA-endorsed tools have been developed to support apprentices in their training and to be better prepared for a career in the trades. The tools can be used independently or with the assistance of a tradesperson, trainer, employer, teacher or mentor to:

- understand how essential skills are used in the trades;
- learn about individual essential skills strengths and areas for improvement; and
- improve essential skills and increase success in an apprenticeship program.

The tools are available online or for order at: www.esdc.gc.ca/eng/jobs/les/profiles/index.shtml

The application of these skills may be described throughout this document within the skills and knowledge which support each sub-task of the trade. The most important essential skills for each sub-task have also been identified. The following are summaries of the requirements in each of the essential skills, taken from the essential skills profile. A link to the complete essential skills profile can be found at www.red-seal.ca.

READING

In their daily work, Tower Crane Operators read and comprehend several types of texts. 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 log books, load charts, 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.

ORAL 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 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 close proximity with other cranes and heavy equipment.

DIGITAL TECHNOLOGY

Tower crane operators are increasingly required to interpret electronic data transmitted to them from LMI, anemometers and electronic scales located in the cab of the crane. Controls for the tower crane may also involve computerized applications.

CONTINUOUS LEARNING

As construction methods and crane technology are advancing, 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.

ELEMENTS OF HARMONIZATION FOR APPRENTICESHIP TRAINING

At the request of industry, the Harmonization Initiative was launched in 2013 to *substantively align* apprenticeship systems across Canada by making training requirements more consistent in the Red Seal trades. Harmonization aims to improve the mobility of apprentices, support an increase in their completion rates and enable employers to access a larger pool of apprentices.

As part of this work, the Canadian Council of the Directors of Apprenticeship (CCDA) identified four main harmonization priorities in consultation with industry and training stakeholders:

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 the Tower Crane Operator trade is two.

3. Total training hours during apprenticeship training

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

4. Consistent sequencing of training content (at each level) using the most recent occupational standard

Harmonization for the Tower Crane Operator trade has been fully implemented for each level of technical training. See the “Technical Training Course Content” section of this guide for more details.

White boxes are “Topics,” grey boxes are “In Context”. In context means learning that has already taken place and is being applied to the applicable task. Learning outcomes for in context topics are accomplished in other topics in that level.

| Level 1 (2016/2017 implementation) | Level 2 (2017/2018 implementation) |
|--|--|
| Safety | |
| Types and Terminology | |
| Systems and Components | |
| Wire Rope and Rigging | |
| Transporting a Crane | |
| Crane Maintenance | |
| Lift Planning | |
| Crane Applications | |
| | Lift Planning Hammerhead Tower Crane |
| | Lift Planning Luffing Jib Tower Crane |
| | Hammerhead Tower Crane Operations |
| | Luffing Jib Tower Crane Operations |
| | Specialty hoisting operations |
| | Climbing Cranes |

TOWER CRANE OPERATOR TASK MATRIX CHART

This chart outlines the major work activities, tasks and sub-tasks from the 2010 Tower Crane Operator National Occupational Analysis. Each sub-task details the corresponding essential skill and level of training where the content is covered. *

* Sub-tasks with numbers in the boxes is where the content will be delivered in training. Level one to be implemented in 2016/2017 and level two in 2017/2018.

A – COMMON OCCUPATIONAL SKILLS

| | | |
|---|---|---|
| Task A-1 Performs safety-related functions | 1.01 Maintains safe work environment 1, 2 | 1.02 Uses personal protective equipment (PPE) and safety equipment 1, 2 |
| Task A-2 Contributes to workplace organization | 2.01 Communicates with others 1, 2 | 2.02 Uses documentation 1, 2 |

B – CRANE INSPECTION AND MAINTENANCE

| | | | | | | |
|---|--|--|---|--|---|--|
| Task B-3 Performs pre-operational checks and regular inspections | 3.01 Inspects structural components 1, 2 | 3.02 Inspects mechanical components 1, 2 | 3.03 Inspects lines and wire ropes 1, 2 | 3.04 Inspects hydraulic system components 1, 2 | 3.05 Inspects electrical system components 1, 2 | 3.06 Inspects supports components 1, 2 |
| | 3.07 Inspects support components 1, 2 | 3.08 Inspects cab components 1, 2 | 3.09 Inspects cab components 1, 2 | 3.10 Completes inspection documentation 1, 2 | | |

| | | | | |
|--|--|---|--|--|
| Task B-4 Performs continual checks | 4.01 Monitors site conditions 1, 2 | 4.02 Monitors lines and wire ropes 1, 2 | 4.03 Monitors equipment performance and conditions 1,2 | 4.04 Monitors structural and support components 1, 2 |
| Task B-5 Performs minor crane maintenance | 5.01 Maintains mechanical components 1,2 | 5.02 Lubricates wire ropes and crane components 1,2 | | |

C – CRANE SET-UP, HOISTING CALCULATIONS AND LIFT PLANNING

| | | | | |
|--|---|--|---|---|
| Task C-6 Participates in tower crane assembly, disassembly and transportation | 6.01 Participates in crane assembly 1 | 6.02 Participates in crane disassembly 1 | 6.03 Transports self-erecting tower crane (Not common core) 1 | 6.04 Participates in assembly and disassembly of self-erecting tower cranes (Not common core) 1 |
| Task C-7 Plans lifts | 7.01 Interprets load charts 1, 2 | 7.02 Plans work procedures 1, 2 | 7.03 Prepares for specialty lifts 1,2 | |

D – RIGGING

| | | | |
|--|---|---|---|
| Task D-8 Inspects and maintains rigging equipment | 8.01 Identifies deficiencies in slings and hardware 1,2 | 8.02 Lubricates slings and hardware 1,2 | 8.03 Stores rigging equipment 1,2 |
| Task D-9 Manages rigging | 9.01 Selects required rigging equipment 1, 2 | 9.02 Rigs load 1, 2 | 9.03 Monitors rigging 1,2 |

E – CRANE OPERATIONS

| | | | | | | |
|--|---|---|--|-------------------------------------|---------------------------------------|--|
| Task E-10 Performs pre-lift (warm-up) activities | 10.01 Performs function test 1, 2 | 10.02 Confirms limits 1, 2 | | | | |
| Task E-11 Operates tower cranes | 11.01 Trolleys carriage 1, 2 | 11.02 Booms (luffs) up and down 1, 2 | 11.03 Swings (slews) jib 1,2 | 11.04 Hoists load 1,2 | 11.05 Travels crane 1,2 | 11.06 performs functions simultaneously 1, 2 |
| Task E-12 Climbs (raises) tower cranes | 12.01 Performs bottom-climbing procedures 1, 2 | 12.02 Performs top-climbing procedures 1, 2 | | | | |
| Task E-13 Performs specialty tower crane operations | 13.01 Participates in multi-crane lifts 2 | 13.02 Operates in multi-crane site 2 | 13.03 Hoists personnel 1 | | | |
| Task E-14 Shuts down and secures tower cranes | 14.01 Secures crane while leaving controls 1, 2 | 14.02 Secures crane while unattended 1, 2 | 14.03 Secures crane for extended periods 1,2 | | | |

TRAINING PROFILE CHART

This Training Profile Chart represents Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training at the topic level.

Tower Crane Operator technical training for levels 1 and 2 are provided in alternative delivery. This method uses a combination of in-class training and at-home course work between training sessions. As a result, hours are listed below for a specific training level, but not for individual courses.

Technical training for levels 1 and 2 are both equivalent to 8 weeks in length.

| Level One | Hours |
|----------------------------|-----------|
| Safety/Tools and Equipment | |
| Rigging | |
| Mobile Crane Operations | |
| Load Charts I | |
| Load Weight Calculations | |
| | 240 hours |

| Level Two | Hours |
|---|-----------|
| Rigging | |
| Load Weight Calculations II | |
| Load Charts II | |
| Tower Crane Setup | |
| Tower Crane Operations | |
| Pre-operational Checks, Inspections and Maintenance | |
| | 240 hours |

TECHNICAL TRAINING COURSE CONTENT

This chart outlines the model for Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training sequencing.

Harmonization for the Tower Crane Operator trade has been fully implemented for each level of technical training.

| Level One | 8 weeks | 240 hours |
|---|----------------|------------------|
| Safety/Tools and Equipment | | |
| <ul style="list-style-type: none">• safety• communications for hoisting• high voltage electrical fundamentals• trade related documents• tools and equipment• fasteners and retaining devices | | |
| Rigging | | |
| <ul style="list-style-type: none">• wire rope• rigging hardware• introduction to rigging and hoisting• sling configurations | | |
| Load Weight Calculations | | |
| <ul style="list-style-type: none">• load weight calculations I | | |
| Load Charts | | |
| <ul style="list-style-type: none">• load charts I | | |
| Tower Crane Operations | | |
| <ul style="list-style-type: none">• lifting theory and forces• introduction to crane operations• introduction to computerized operational aids• job planning• introduction to tower cranes | | |

Level Two

8 weeks

240 hours

Rigging

- advanced rigging and hoisting
-

Load Weight Calculations

- load weight calculations ii
-

Load Charts

- tower crane load charts
-

Pre-operational Checks, Inspections and Maintenance

- tower crane components
 - access equipment
 - hydraulic systems
 - electrical systems
 - mechanical systems
 - continual check
-

Tower Crane Set-up

- assembly and disassembly
 - positioning and stabilizing self-erecting tower cranes
 - climbing and lowering
-

Tower Crane Operations

- pre-lift activities
- hammerhead tower crane
- luffing jib tower crane
- self-erecting tower crane
- specialty crane operations

APPENDIX A: POST HARMONIZATION TRAINING PROFILE CHART

This chart which outlines the finalized model for SATCC technical training sequencing with a cross reference to the Harmonized apprenticeship technical training sequencing, at the topic level.

Harmonization for the Tower Crane Operator trade has been fully implemented for each level of technical training.

| SATCC Level One | Pan-Canadian Harmonized Level One |
|----------------------------|-----------------------------------|
| Safety/Tools and Equipment | Safety |
| Tower Crane Operations | Types and Terminology |
| | Systems and Components |
| | Transporting a Crane |
| | Crane Maintenance |
| Rigging | Wire Rope and Rigging |
| Load Weight Calculations | Lift Planning |
| Load Charts I | |
| Mobile Crane Operations | |
| Load Weight Calculations | Crane Applications |
| Load Charts I | |
| Mobile Crane Operations | |

| SATCC Level Two | Pan-Canadian Harmonized Level Two |
|--|---|
| Rigging | Lift Planning – Hammerhead Tower Crane |
| Load Weight Calculations II | Lift Planning – Luffing Jib Tower |
| Load Charts II | |
| Tower Crane Setup | |
| Pre-operations Checks, Inspections and Maintenance | Hydraulic Crane Operations (Basic and Advanced) |
| Rigging | Luffing Jib Tower Crane Operations |
| Load Weight Calculations II | Specialty Hoisting Applications |
| Load Charts II | Climbing Cranes |
| Mobile Crane Setup | |
| Mobile Crane Operations | |

Exceed Topics

Throughout this guide to course content there are topics which exceed the minimum scope of work as set out in the Tower Crane Operator NOA. Industry in Saskatchewan has deemed certain topics to fall within the scope of work of the Tower Crane Operator trade in Saskatchewan and therefore require technical training to cover these topics.