Skilled Trades Ontario | Métiers spécialisés Ontario

Apprenticeship Curriculum Standard

Heavy Equipment Operator – Tractor Loader Backhoe (TLB)

Heavy Equipment Operator – Excavator

Heavy Equipment Operator – Dozer

All Reportable Subjects
(Common Core and Trade Specific)
636A, 636B and 636C

Apprenticeship Pathway to a Certificate of Qualification

Submit Application for Apprenticeship Training through the on-line portal or to local Service Delivery Office

→ For on-line portal, please follow instructions for registration. You will need to create a *My Ontario* account to access online services.

Training agreement signed and registered by both apprentice and sponsor

Access your Apprenticeship Training Standard Logbook**
skilledtradesontario.ca/about-trades/trades-information

→ ** This is the official record of your training progress. You are responsible for keeping it up-to-date.

Complete on-the-job training

Demonstrate and receive sign-off on the competencies/skills in your Apprenticeship Training Standard Logbook

Complete in-school training

Attend and complete the in-class training set out in the Curriculum Training Standard

→ Apprentices eligible to apply for apprenticeship incentive grants (Red Seal trades) and loans.

Review and finalize your logbook with your sponsor

Submit proof of apprenticeship completion
via email, in-person or digital portal

→ Your Apprenticeship Training Standard Logbook details completion requirements. Submit the following:

- completed Apprenticeship Training Standard Logbook with signatures
- proof of hours

Certificate of Apprenticeship is issued

Trades without examination

CofA is the final step of the program

Trades with examination (compulsory and non-compulsory trades)*

Provisional Certificate of Qualification issued for a 12 month term

→ To prepare for the CofQ examination download the Provincial and/or Red Seal Exam preparation guides.

Make payment for your Certificate of Qualification examination

→ Call to make a payment (647-847-3000 or 1-855-299-0028)

Schedule a date to write your Examination

→ To schedule your examination, contact your local Service Delivery Office.

Pass Certificate of Qualification examination

→ Apprentices eligible to apply for Apprenticeship Completion Grant (Red Seal trades) or Apprentice Completion Bonus (non-Red Seal)

Certificate of Qualification is issued

→ Upon completion, Sponsors may be eligible for Apprenticeship grants, incentives, bonuses or tax credits

* For a list of trades subject to a certification examination, visit: skilledtradesontario.ca

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Revised 2022 (V300)

Preface

This new curriculum standard for the three Heavy Equipment Operator (HEO) trades; Heavy Equipment Operator – Tractor Loader Backhoe; Heavy Equipment Operator – Excavator; Heavy Equipment Operator - Dozer is based upon the on-the-job performance objectives, located in the industry-approved training standard.

The curriculum is organized into 15 reportable subjects. 12 of the 15 reportable subjects are common core units applicable to all three Heavy Equipment Operator Trades (636A, 636B and 636C). Three of the fifteen reportable subjects are non-common core and have a specific reportable subject for each of the three HEO Trades. An Apprentice would be required to complete each version of the trade specific non-common reportable subjects to obtain all three certificates. The Program Summary of reportable subjects charts (located on page 3) summarize the training hours for each reportable subject and each trade.

The curriculum identifies only the learning that takes place off-the-job. The in-school program focuses primarily on the theoretical knowledge and the essential skills required to support the performance objectives of the Apprenticeship Training Standards. Employers/Sponsors are expected to extend the apprentice's knowledge and skills through practical training on a work site. Regular evaluations of the apprentice's knowledge and skills are conducted throughout training to ensure that all apprentices have achieved the learning outcomes identified in the curriculum standard.

It is not the intent of the in-school curriculum to perfect on-the-job skills. The practical portion of the in-school program is used to reinforce theoretical knowledge. Skill training is provided on the job.

Please refer to Skilled Trades Ontario website (www.skilledtradesontario.ca) for the most accurate and up-to-date information about Skilled Trades Ontario. For information on *Building Opportunities in the Skilled Trades Act, 2021 (BOSTA)*) and its regulations, please visit
Building Opportunities in the Skilled Trades Act, 2021, S.O. 2021, c. 28 - Bill 288 (ontario.ca)

Pre-requisites

Pre-requisites have been set out for each reportable subject. Advancement to courses is only affected by the course pre-requisites and not by levels.

Hours Disclaimer

It is agreed that Training Delivery Agents (TDAs) may need to make slight adjustments (with cause) according to particular apprentice needs and may deviate from the unit sequencing and the prescribed practical and theoretical hours shown within the standard. However, all TDAs will comply with the hours at the reportable subject level.

Suggested Equipment for Training Delivery Agencies

For the three Heavy Equipment Operator trades, though it is accepted that there will be variation in the equipment brands used by each TDA for training/practical learning outcomes, it should be understood that each TDA is expected to meet all learning outcomes and objectives no matter the brand as well as provide the apprentice with sufficient knowledge to understand how to operate the equipment so they can adapt between brands. The summary of recommended equipment, materials and site requirements can be found on page 5.

Personal and Safety Equipment- Personal protective equipment is at the discretion of the TDA who must conform to Ontario Provincial Health and Safety Regulations.

Please note that all practices described in this standard must be performed according to the legislation/regulation and industry best practice.

Program Summary of Reportable Subjects – Heavy Equipment Operator Trades

*These reportable subjects are NOT common core

Number	Reportable Subjects	Hours Total	Hours Theory	Hours Practical
3270	Trade Documents	16	8	8
3271	Safety and trade practices	17	14	3
3272	Communications	4	4	0
3273	Introduction to the equipment	9	7	2
3274	Troubleshooting and repairs	8	6	2
3282 - TLB 3285 - Excavator 3288 - Dozer	Maintenance and pre-operations*	4	2	2
3283 - TLB 3286 - Excavator 3289 - Dozer	Operations*	162	6	156
3275	Post-operations	22	2	20
3284 - TLB 3287 - Excavator 3290 - Dozer	Attachments and implements*	5	2	3
3276	Environmental protection	4	4	0
3277	Soil fundamentals	8	4	4
3278	Surveys and grades	8	5	3
3279	Hoisting and rigging	16	6	10
3280	Industry sectors (specialized work)	8	7	1
3281	Transportation	9	3	6
	Total	**300**	**80**	**220**

Program Summary - Heavy Equipment Operator Trades
Summary of Common Core vs Non-Common Core Hours

	Hours Total		
Common Core Hours	129 hours		
Non-Common Core Hours	**171** hours TLB	**171** hours excavator	**171** hours dozer

Program Summary - Heavy Equipment Operator Trades
Pre-requisites and Co-requisites

Reportable Subject	Pre-requisite	Co-requisite
Trade Documents	n/a	n/a
Safety and trade practices	n/a	n/a
Communications	n/a	n/a
Introduction to the equipment	n/a	n/a
Troubleshooting and repairs	Introduction to the Equipment	n/a
Maintenance and Pre-Operations – TLB	Introduction to the Equipment	n/a
Maintenance and Pre-Operations – Excavator		
Maintenance and Pre-Operations - Dozer		
Operations - TLB	Introduction to the Equipment	n/a
Operations - Excavator		
Operations - Dozer		
Post-operations	Introduction to the Equipment Maintenance and Pre-Operations (relevant trade)	n/a
Attachments and Implements - TLB	Introduction to the Equipment	n/a
Attachments and Implements - TLB		
Attachments and Implements - TLB		
Environmental protection	n/a	Soil Fundamentals
Soil fundamentals	n/a	Environmental Protection
Surveys and grades	n/a	n/a
Hoisting and rigging	Introduction to the Equipment	n/a

Industry sectors (specialized work)	Introduction to the Equipment Attachments and Implements (relevant trade)	n/a
Transportation	Introduction to the Equipment	n/a

Program Summary - Heavy Equipment Operator Trades
Summary of Recommended Equipment, Materials and Site Requirements for Training Delivery Agents

Category	**Recommended Equipment, Materials and Site Requirements**		
	For the 3 HEO trades, seat time is critical to ensure knowledge and skill transfer. As a result, the ratio of equipment to student for the 3 HEO trades should be 1:1. If the TDA is running all three trades, the seat time could be distributed amongst the different pieces of equipment.		
	Excavator	**Tractor Loader Backhoe**	**Dozer**
Equipment	Minimum 10 ton excavator, steel tracked 1 excavator for every 1 student Float (Haul vehicle) Dump truck	Minimum 70 horsepower Tractor Loader backhoe (e.g. 310 John Deere, 410 CAT, 580 Case) 1 TLB for every 1 student Float (Haul vehicle) Dump truck	Minimum 60 horsepower, steel tracked, 6 way blades (e.g. D3 CAT, John Deere 450) 1 Dozer for every 1 student Float (Haul vehicle)
Attachments	Minimum: 90 cm (36 inch) wide excavation bucket with teeth Quick attach connect (at least 1 for demonstration purposes)	Minimum: front yard & ¼ bucket, 24 inch (60 cm) rear excavation bucket with teeth	1 out of every 2 dozers should have ripper attachment
Tools	Grease gun Hammer (sledge and regular) Scrapers Track shovels	Grease gun Hammer (sledge and regular) Scrapers Punches	Grease gun Hammer (sledge and regular) Scrapers Track shovels

	Punches Tape measure Measuring rod	Tape measure Measuring rod	Punches Tape measure Measuring rod Cross head Eye level
Materials	Wooden pickets Marker paint PVC pipe (for utility exposures) Operator's manual	Wooden pickets Marker paint PVC pipe (for utility exposures) Operator's manual	Wooden pickets Marker paint Operator's manual
Site requirements	Type 3 soil (OHSA) Minimum 1 machine distant apart from each other (approximately 5 meters) Lunch and classroom space	Type 3 soil (OHSA) Minimum 1 machine distant apart from each other (approximately 5 meters) Lunch and classroom space	Type 3 soil (OHSA) Minimum 1 machine distant apart from each other(approximately 5 meters) Lunch and classroom space
Other	Laser system	Laser system	GPS and laser system
Instructor/student ratio	1:6	1:6	1:6

Number: 3270.0
Title: Trade Documents
Duration: 16 Total Hours Theory: 8 Practical: 8
Common core: HEO-Tractor Loader Backhoe, HEO-Excavator, HEO-Dozer
Prerequisites: none
Co-requisites: none
Cross Reference to Training Standards: See mapping chart

General Learning Outcomes

Upon successful completion, the apprentice is able to explain how to use, apply and navigate the Occupational Health and Safety Act, Operator's manuals, Safety Bulletins, Employer and Site-Specific Policies and Procedures as well as explain how to use, apply and complete Reporting Documentation.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3270.01 Explain how to use, apply and navigate the Occupational Health and Safety Act (OHSA)

- Identify the sections of the OHSA
  - Act
  - Table of contents
  - Regulations
  - Conversion tables
  - Index
- Describe the content of the OHSA
  - Regulations
    - Construction projects
    - Mining
    - Industrial
    - Confined space
- Describe the purpose of the OHSA
- Describe the process for navigating the act and regulations
  - Definitions
  - Regulations
  - Sub-section
  - Sub-clause
- Navigate the act and regulations (practical outcome)

3270.02 Explain how to use, apply and navigate the operator's manual

- Identify location of the document
- Describe the procedures to locate information within the manual
- Describe and locate relevant sections of the operator's manual (practical outcome)
- Describe the process for navigating the operator's manual

3270.03 Explain how to use, apply and navigate safety bulletins

- Identify source and location of documents
- Describe the procedures for interpreting information in bulletins
- Locate information within safety bulletins (practical outcome)

3270.04 Explain how to use, apply and navigate employer and site-specific policies and procedures

- Identify types of employer and site-specific safety policies and procedures
  - Worksite policies
  - Standard or accepted practices/procedures
  - Supervisory responsibilities
  - Equipment operation and maintenance responsibilities
  - Facility or worksite policies
  - Hours of pay/work/benefits
  - Training and advancement
- Identify the location of employer and site-specific policies and procedures
- Describe the procedures for interpreting information in employer and site-specific policies and procedures
- Locate information within employer and site-specific policies and procedures (practical outcome)

3270.05 Explain how to use, apply and complete reporting documentation

- Identify common types of reports or documentation used by the operator
  - Job safety analysis
  - Pre-operation sheet
  - Logbook
  - Timecard
  - Accident incident report
- Identify the purpose of the reporting documentation
- Describe the procedures for completing reporting documentation
- Complete reporting documentation (practical outcome)

Practical Outcomes / Exercises

Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes. For the Trade Documents reportable subject, practical outcomes/exercises should focus on navigating the documents, locating information within those documents as well as completing reporting documentation.

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment
50%	30%	20%

Number:	3271.0
Title:	**Safety and Trade Practices**
Duration:	17 Total Hours Theory: 14 Practical: 3
Common core:	HEO-Tractor Loader Backhoe, HEO-Excavator, HEO-Dozer
Prerequisites:	none
Co-requisites:	none
Cross Reference to Training Standards:	See mapping chart

General Learning Outcomes

Upon successful completion, the apprentice is able to explain conditions, requirements and practices related to Fire safety, Personal safety, Safety devices (equipment), Hazards related to workplace environments/safe work environment, Ground stability, Machine stability and Safe limits of approach as well as demonstrate safety related practices including PPE assembly and adjustment, mounting and dismounting, lifting techniques and interpreting a locate sheet.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3271.01 Explain conditions, requirements and practices related to fire safety

- Identify conditions that lead to a fire (fire tetrahedron)
  - Fuel
  - Heat
  - Oxygen
  - Chemical chain reaction
- Identify the classes of fires
  - A
  - B
  - C
  - D
- Describe the selection requirements for fire safety equipment
  - PASS (Pull, Aim, Squeeze, Sweep) Technique
- Describe fire-fighting techniques
- Describe and identify fire hazards
  - Fueling in lubrication/storage area
  - Petrochemical facilities
  - Excavation around utilities
  - Underbrush/dry weather conditions
- Describe and identify fire prevention strategies
  - Avoid spillage
  - Open flame limitations
  - Company policies and procedures
- Describe procedures in event of a fire

3271.02 **Explain conditions, requirements and practices related to personal safety** including personal protective equipment (PPE), skin protection, ergonomics and back safety, mounting and dismounting (three-point contact) and weather extremes**.**

Personal Protective Equipment (PPE)

- Describe PPE used by Heavy Equipment Operators
  - Work boots
  - Hard hats
  - Vests
  - Skin protection
  - Hearing protection
  - Environmental protection
  - Specialized protection (industry specific)
- Describe the requirements for the use and care of PPE
- Identify the standards against which PPE is measured
  - Canadian Safety Authority (CSA)
  - Expiry dates
  - Wear and care
  - Types
- Identify types and classes of PPE
- Locate and identify the symbol (practical outcome)
  - CSA approved
- Identify the regulation/legislation that are specific to each type of PPE
- Interpret the regulation/legislation
- Describe the procedures for selecting, adjusting and fitting PPE
- Describe storage requirements for PPE
- Demonstrate PPE assembly and adjustment (practical outcome)

Skin Protection

- Identify hazards
  - Loose clothing
  - Loose cuffs
  - Torn or ragged clothing
  - Oily and greasy clothing/gloves/boots
  - Jewelry
  - Large bulky attire
  - Piercings
  - Synthetic fibres
- Identify wearable attire
  - Long pants
  - Shirt sleeves
  - Cotton

Ergonomics and Back Safety

- Identify lifting and carrying methods
    - Keeping close to centre of gravity
    - Keeping back straight
    - Using legs and hips to lift
    - Maintain contact with hands
    - Do not lift over shoulder height
- Demonstrate lifting techniques (practical outcome)

Mounting and Dismounting (three point contact)

- Describe the procedures to mount and dismount equipment
    - Ensure machine is stationary
    - Face machine
    - Maintain contact
    - Use caution in cold/slippery conditions
- Describe hazards associated with mounting and dismounting
- Locate safety decals, load charts (practical outcome)
- Demonstrate mounting and dismounting methods (practical outcome)

Weather extremes

- Identify the weather conditions that can impact personal safety
    - Cold
    - Heat
        - Humidity
- Identify the impacts of weather conditions on personal safety
    - Dehydration
    - UV/Skin burn
    - Frost bite
    - Hypothermia
    - Hyperthermia
    - Other

3271.03 Explain conditions, requirements and practices related to Safety Devices (Equipment)

- Identify and describe types of safety equipment
    - Hydraulic lock-out
    - Transmission lock
    - Brakes and parking brakes
    - Rollover Protection System/Structure (ROPS) and Falling Object Protection Systems/Structure (FOPS)
    - Seat belts
    - Foot holds
    - Machine guards and covers
    - Hydraulic cylinder locks
    - Safety warning labels
        - Describe the purpose and appearance
        - Types
    - Debris screens

  - Swing brake locks
  - Back-up travel alarms
  - Master switch
  - Four-way flashers
  - Rotating/strobe lights
  - Horns
- Describe the procedures related to the use of safety equipment

3271.04 Describe hazards associated with workplace environments and how to create safe work environments

- Describe the conditions of a safe work environment
- Identify conditions and factors that may cause unsafe or hazardous work environments
  - Traffic
  - Site congestion
  - Ground stability
  - Personnel clear of machine work area
  - Clean work and storage area (no debris)
  - Graded road ways
  - Open excavations
  - Barricades on open excavations
  - Wet areas
  - Soft ground
  - Dust
  - Rough roadways
  - Service holes
  - Utilities
  - Building overhangs
  - High walls
  - Cliff faces

3271.05 Explain the conditions, requirements and practices related to ground stability

- Identify soil types
- Describe the procedures for conducting soil evaluation
- Identify precautions needed for each soil type
- Describe the procedures for determining load bearing capabilities
  - Walk-around
  - Looking for obstructions
  - Determining soil type

3271.06 Explain the conditions, requirements and practices related to machine stability

- Define the terminology associated with machine stability
- Describe the factors that affect machine stability
  - Centre of gravity
  - Tipping axis/fulcrum
  - Forces of leverage
- Determine the centre of gravity for machines (practical outcome)

- Determine tipping axis (practical outcome)
- Describe the factors involved in leverage
    - Effort
    - Load
    - Fulcrum (where the lever pivots)
- Define leverage classes
    - Fulcrum between effort and load
    - Load between effort and fulcrum
    - Effort between fulcrum and load
- Identify the stages of machine stability in relation to the centre of gravity
    - Stable
    - Near tipping
    - Overturning

3271.07 Explain the requirements, conditions and practices related to safe limits of approach

- Identify examples of underground and above ground hazards
- Identify and interpret the applicable legislation/regulation
    - OHSA Reg. 213/91
    - Technical Standards and Safety Authority (TSSA) – Guideline for Utilities
- Identify the procedures related to notification prior to excavating
    - Call before dig
    - Notifying authorities when working near high voltage
    - Notifying authorities when contact made
- Identify the different types of authorities
    - Electrical company
    - Gas company
    - Telephone
    - Sewer and water
    - Cable
    - Qualified electrical contractors
- Identify utility locates
    - Line
    - Marker
    - Stake
    - Flag
- Describe the information on a utility locate
    - Location
    - Direction
    - Service identification
        - Hydro=red
        - Water=blue
        - Gas=yellow
        - Sewer=green
        - Communication=orange
        - Proposed excavation=white
        - Survey markings=pink

- Describe the information not on a utility locate
    - Depth
- Interpret a locate sheet (practical outcome)
- Identify the high voltage equipment used in overhead utilities
    - Transformers
    - Circuit breakers
    - Transmission lines (overhead and below ground)
    - Poles and towers
    - Items attached to building
- Identify the procedures when contact is made with overhead utilities
    - Fire – no three point contact to dismount, go to lowest point in machine, hop clear of machine, keep feet together, shuffle away, do not touch machine and ground at same time
    - No fire – break contact if possible, warn others to stay away, stay in seat until authorized
- Identify surface signs of underground obstructions
    - Trench depression
    - Transformer box
    - Pedestal box
    - Hydro poll
    - Gas meter/valve
    - Water valve box
    - Fire hydrant
    - Service hole
    - Marker/warning signs
    - Street lights
- Identify the signs of underground utilities while excavating
    - Excavating becomes easier
    - Colour of materials change
    - Evidence of packing materials like sand/stone
    - Caution tape is uncovered
    - Wooden planking/stakes unearth
    - Wire or piping exposed
    - Contact with solid object
    - Movement of ground adjacent to excavation/trench

Practical Outcomes / Exercises
Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

For the Safety and Trade Practices reportable subject, practical outcomes/exercises should focus on locating and interpreting documentation and symbols (e.g. locate sheets, safety decals), making calculations/determinations e.g. determining centre of gravity, tipping axis and performing demonstrations (e.g. lifting techniques and mounting/dismounting methods.)

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment
70%	20%	10%

Number:	3272.0
Title:	**Communications**
Duration:	4 Total Hours Theory: 4 Practical: 0
Common core:	HEO-Tractor Loader Backhoe, HEO-Excavator, HEO-Dozer
Prerequisites:	none
Co-requisites:	none
Cross Reference to Training Standards:	See mapping chart

General Learning Outcomes

Upon successful completion, the apprentice is able to describe signalling requirements and communication techniques.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3272.01 Describe signalling requirements

- Identify the requirements and duties of a signaller under the OHSA
- Identify situations where the signaller is required
- Identify types of stop signals
- Identify types of hand signals
  - International hand signals
- Identify meanings of different types of horn signals

3272.02 Describe communication techniques

- Identify barriers to communication
  - Language
  - Culture
  - Physiological
  - Psychological
  - Physical environment
- Identify communication methods/tools
  - Telecommunication
  - Written communication
- Describe the process for communicating effectively with co-workers, customers and other industry people
  - Clear and concise
  - Active listening
  - Questioning
- Explain the importance of the coaching and mentoring relationship between journeyperson and apprentice

Practical Outcomes / Exercises
Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

For the Communication reportable subject, there are no designated practical outcomes.

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment
80%	0%	20%

Number:	3273.0
Title:	**Introduction to the Equipment**
Duration:	9 Total Hours Theory: 7 Practical: 2
Common core:	HEO-Tractor Loader Backhoe, HEO-Excavator, HEO-Dozer
Prerequisites:	none
Co-requisites:	none
Cross Reference to Training Standards:	See mapping chart

General Learning Outcomes

Upon successful completion, the apprentice is able to explain the function, characteristics, applications and limitations of equipment components and systems and explain how to locate and determine machine specifications, dimensions and interpret load charts.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3273.01 Explain the function of equipment components

- Identify the components of the machine(s)
  - Excavator
  - Tractor Loader Backhoe
  - Dozer
- Describe the purpose and characteristics of each component

3273.02 Explain the characteristics, applications and limitations of equipment systems

- Identify and describe the parts and functions of machine (Excavator, Tractor Loader Backhoe and Dozer) systems
  - Air intake
  - Exhaust (tier 4 emission requirements)
  - Lubrication
  - Cooling
  - Fueling
  - Electrical
  - Drive-train
  - Hydraulic (braking and steering)
- Describe the characteristics, applications and limitations of each system

3273.03 Explain how to locate and determine machine specifications

- Locate, describe and determine machine specifications *(practical outcome)*
- Locate, describe and determine fluid capacity and type *(practical outcome)*
  - Engine

  - Hydraulic
  - Fuel
  - Coolant
- Locate, describe and determine operational capacity *(practical outcome)*
  - Attachment capacity (bucket or blade)
  - Lift capacity
  - Travel speed

3273.04 Explain how to determine dimensions and interpret load charts

- Describe how to determine machine dimensions
- Describe how to interpret load chart information
- Determine the dimensions of the machine *(practical outcome)*
  - Length
  - Width
  - Height
- Interpret load chart information *(practical outcome)*
  - Maximum height
  - Load height
  - Load reach
  - Radius
  - Dig depth

Practical Outcomes / Exercises

Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

For the Introduction to the Equipment reportable subject, practical outcomes/exercises should focus on locating information (e.g. machine specifications, fluid capacity and operational capacity), determining machine dimensions, and interpreting load chart information

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment
70%	10%	20%

Number:	3274.0
Title:	**Troubleshooting and Repairs**
Duration:	8 Total Hours Theory: 6 Practical: 2
Common core:	HEO-Tractor Loader Backhoe, HEO-Excavator, HEO-Dozer
Prerequisites:	Introduction to the equipment (3273)
Co-requisites:	none
Cross Reference to Training Standards: See mapping chart	

General Learning Outcomes

Upon successful completion, the apprentice is able to explain the procedures to troubleshoot and repair problems, describe system and equipment failures, symptoms and indicators of failure, interpret codes and warning symbols, change a grease cartridge and perform a minor repair.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3274.01 Explain the procedures to troubleshoot and repair problems

- Define the concepts of major and minor repair
- Describe the role of the operator regarding troubleshooting and repairs
    - Assist the technician as per request
    - Changing oil, air filters, maintaining fluid levels, adjusting tracks, replacing teeth, changing wiper blades, replacing fuses, changing grease fittings, checking air pressure, changing lights, changing cutting edge
- Identify the procedures for troubleshooting a minor or major problem with the machine
    - Inspect the machine
    - Check for cracks, leaks, noise, vibration, wear etc.
    - Test machine functions (operational tests)
        - Loss of performance
        - Unintended motions
        - Starting issues
    - Interpret codes and warning signs/symbols
    - Document the deficiency (e.g. logbook)
    - Report failures and issues to direct supervisor
    - Determine whether the repair must be done immediately or monitored
- Identify tools and equipment used to repair minor problems with the machine
    - Grease gun
    - Hammer
    - Pin driver
    - Hand tools

- Describe the procedure for relieving air locks in grease guns
- Change the grease cartridge *(practical outcome)*
- Identify the procedures for conducting minor repairs
- Perform a minor repair *(practical outcome)*
    - Change a tooth
    - Change a grease fitting
    - Change filters
    - Change wiper blades
    - Tighten fittings
    - Perform track adjustments
    - Check the tire pressure
- Describe the procedure used to tow vehicles
    - Check manual
    - Find towing procedure for the designated piece of equipment
    - Considerations: transmission type, tow points

3274.02 Describe equipment and system failures, symptoms and indicators of failure

- Identify potential failures, symptoms and indicators of failure
- Interpret codes and warning symbols *(practical outcome)*
    - Refer to manual
    - Find symbol or code in manual (list of trouble codes)
- Identify common causes of failures and other problems resulting from machine operation

Practical Outcomes / Exercises

Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

For the Troubleshooting and Repairs reportable subject, practical outcomes/exercises should focus on interpreting codes and warning symbols, changing a grease cartridge, performing minor repairs.

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment
70%	20%	10%

Number:	3282.0
Title:	**Maintenance and Pre-Operations – Tractor Loader Backhoe**
Duration:	4 Total Hours Theory: 2 Practical: 2
Common core:	No
Prerequisites:	Introduction to the equipment (3273)
Co-requisites:	none
Cross Reference to Training Standards: See mapping chart	

General Learning Outcomes

Upon successful completion, the apprentice is able to perform a warm-up, post check and pre-operation inspection for the Tractor Loader Backhoe as well as explain the maintenance procedures.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3282.01 Explain how to locate and identify maintenance and pre-operation information

- Describe the role of the operator's manual in maintenance
- Locate pre-operations and maintenance information in the operator's manual for the Tractor Loader Backhoe *(practical outcome)*

3282.02 Explain the procedures to perform a pre-operation inspection on a Tractor Loader Backhoe

- Identify the tools and equipment used for pre-operation inspection of a Tractor Loader Backhoe
- Describe the sequence of steps included in the pre-operations checklist for a Tractor Loader Backhoe
    - Approaching the Tractor Loader Backhoe
        - Check for damaged/broken/vandalized components
        - Fuel contamination
        - Slashes/punctures (e.g. drilling through hoses)
        - Check for wet spots (ground under machine) – fluid leaks
        - Dirt/debris
    - Engine compartment
        - Check for fluid levels, leaks, belt tension, contaminants, general condition, dirt/debris, connections for:
            - Lubrication system
            - Cooling system
            - Fuel system
            - Air intake system
            - Exhaust system
            - Electrical system
            - Hydraulic system
            - Def fluid system (emission)

- In the cab
  - Ensure throttle set to idle
  - Ensure controls are neutralized
  - Ensure brakes are applied
  - Check indicator lights on instrument panel (ensure key is inserted or turned on ON position)
  - Check windows and mirrors (alignment)
  - Adjust seat to required weight and elevation position
- Start up
  - Cold weather starts
  - Glow plugs, air intake heater (prior to cranking engine)
  - Starting fluid (ether) (prior to cranking engine – automatic or manual)
  - When or when not to use a starting aid (never with glow plugs or intake heater)
  - Excessive starting fluid can damage engine
  - Start up/warm up
    - Check oil pressure (ensure gauge/light turns off)
    - Volt/amp meter (ensure gauge/light turns off)
    - Throttle set (depending on weather)
    - Attachment positioned for inspection
- Walk around
  - Check for damage, wear, leaks and general condition in the following systems:
    - Attachments
    - Undercarriage
    - Hydraulic systems
    - Connections
- Walk around hydraulic systems
  - Check for hydraulic pumps, cylinders and valve bodies for rubbing hoses, flex hoses, metal collars, couplings, steel lines and brackets
- Walk around pre and post start fluid checks
  - Hydraulic and transmission fluids
- Return to cab
  - Check seat belt is conditioned and fastened
  - Check instruments read correctly
  - Conduct travel check
    - Check brakes for function
    - Check steering for function
    - Check travel alarms
  - Cycle test the attachments

- Describe the procedures to warm-up and post-check the hydraulic fluid
- Describe the procedures used to complete daily equipment logbook during the pre-operations

3282.03 **Perform a warm-up and post-check procedure** *(practical outcome)*

3282.04 **Perform the sequence of steps included in the pre-operations check list for Tractor Loader Backhoe** *(practical outcome)*

3282.05 **Explain the maintenance procedures on a Tractor Loader Backhoe**

- Describe the procedure to identify the systems that require maintenance on a TLB
- Describe the procedures to perform maintenance on a TLB:
  - Check, change and fill oils and fluids
  - Clean and change filters
  - Grease fittings
  - Rotate and change teeth and cutting edges

Practical Outcomes / Exercises

Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

For the Maintenance and Pre-Operations (HEO-TLB) reportable subject, practical outcomes/exercises should focus on performing the steps in the pre-operations checklist as well as performing the warm-up and post check procedures.

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment
30%	20%	50%

Number:	3285.0
Title:	**Maintenance and Pre-Operations - Excavator**
Duration:	4 Total Hours Theory: 2 Practical: 2
Common core:	No
Prerequisites:	Introduction to the equipment (3273)
Co-requisites:	none
Cross Reference to Training Standards: See mapping chart	

General Learning Outcomes

Upon successful completion, the apprentice is able to perform a warm-up, post check and pre-operation inspection for the Excavator as well as explain the maintenance procedures.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3285.01 Explain how to locate and identify maintenance and pre-operation information

- Describe the role of the operator's manual in maintenance
- Locate pre-operations and maintenance information in the operator's manual for the Excavator

3285.02 Explain the procedures to perform a pre-operation inspection on an Excavator

- Identify the tools and equipment used for pre-operation inspection of an Excavator
- Describe the sequence of steps included in the pre-operation's checklist for an Excavator
    - Approaching the Excavator
        - Check for damaged/broken/vandalized components
        - Fuel contamination
        - Slashes/punctures (e.g. drilling through hoses)
        - Check for wet spots (ground under machine) – fluid leaks
        - Dirt/debris
    - Engine compartment
        - Check for fluid levels, leaks, belt tension, contaminants, general condition, dirt/debris, connections for:
            - Lubrication system
            - Cooling system
            - Fuel system
            - Air intake system
            - Exhaust system
            - Electrical system

- Hydraulic system
- Def fluid system (emission)

- In the cab
  - Ensure throttle set to idle
  - Ensure controls are neutralized
  - Ensure brakes are applied
  - Check indicator lights on instrument panel (ensure key is inserted or turned on ON position)
  - Check windows and mirrors (alignment)
  - Adjust seat to required weight and elevation position
- Start up
  - Cold weather starts
  - Glow plugs, air intake heater (prior to cranking engine)
  - Starting fluid (ether) (prior to cranking engine – automatic or manual)
  - When or when not to use a starting aid (never with glow plugs or intake heater)
  - Excessive starting fluid can damage engine
  - Start up/warm up
    - Check oil pressure (ensure gauge/light turns off)
    - Volt/amp meter (ensure gauge/light turns off)
    - Throttle set (depending on weather)
    - Attachment positioned for inspection
- Walk around
  - Check for damage, wear, leaks and general condition in the following systems:
    - Attachments
    - Undercarriage
    - Hydraulic systems
    - Connections
- Walk around inspection of undercarriage
  - Inspect pads
    - Check for bending, cracking, broken, loose or missing bolts
  - Inspect sprockets
    - Check for signs of wear, broken teeth, rocks or other lodged items, loose or missing bolts
  - Inspect idlers
    - Check for signs of wear, leaks, cracks in the welds, loose or missing bolts, rocks or lodged items
  - Inspect rollers
    - Check for leaks, signs of wear, flat spots, loose or missing bolts
  - Inspect roller frame
    - Check for cracks
- Walk around hydraulic systems

        - Check for hydraulic pumps, swing reduction unit, cylinders and valve bodies for rubbing hoses, flex hoses, metal collars, couplings, steel lines and brackets
    - Walk around pre and post start fluid checks
        - Hydraulic and transmission fluids
    - Return to cab
        - Check seat belt is conditioned and fastened
        - Check instruments read correctly
        - Conduct travel check
            - Check brakes for function
            - Check steering for function
            - Check travel alarms
        - Cycle test the attachments
- Describe the procedures to warm-up and post-check the hydraulic fluid
- Describe the procedures used to complete daily equipment logbook during the pre-operations

3285.03 Perform the warm-up and post-check procedure *(practical outcome)*

3285.04 Perform the sequence of steps included in the pre-operations check list for the Excavator *(practical outcome)*

3285.05 Explain the maintenance procedures on an Excavator

- Describe the procedure to identify the systems that require maintenance on an excavator
- Describe the procedures to perform maintenance on an excavator:
    - Check, change and fill oils and fluids
    - Clean and change filters
    - Grease fittings
    - Rotate and change teeth and cutting edges

Practical Outcomes / Exercises

Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

For the Maintenance and Pre-Operations (HEO-Excavator) reportable subject, practical outcomes/exercises should focus on performing the steps in the pre-operations checklist as well as performing the warm-up and post check procedures.

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment
30%	20%	50%

Number: 3288.0
Title: Maintenance and Pre-Operations - Dozer
Duration: 4 Total Hours Theory: 2 Practical: 2
Common core: No
Prerequisites: Introduction to the equipment (3273)
Co-requisites: none
Cross Reference to Training Standards: See mapping chart

General Learning Outcomes

Upon successful completion, the apprentice is able to perform a warm-up, post check and pre-operation inspection for the Dozer as well as explain the maintenance procedures.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3288.01 Explain how to locate and identify maintenance and pre-operation information

- Describe the role of the operator's manual in maintenance
- Locate pre-operations and maintenance information in the operator's manual for the Dozer

3288.02 Explain the procedures to perform a pre-operation inspection on a Dozer

- Identify the tools and equipment used for pre-operation inspection of a Dozer
- Describe the sequence of steps included in the pre-operation's checklist for a Dozer
    - Approaching the Dozer
        - Check for damaged/broken/vandalized components
        - Fuel contamination
        - Slashes/punctures (e.g. drilling through hoses)
        - Check for wet spots (ground under machine) – fluid leaks
        - Dirt/debris
    - Engine compartment
        - Check for fluid levels, leaks, belt tension, contaminants, general condition, dirt/debris, connections for:
            - Lubrication system
            - Cooling system
            - Fuel system
            - Air intake system
            - Exhaust system
            - Electrical system
            - Hydraulic system
            - Def fluid system (emission)

- In the cab
  - Ensure throttle set to idle
  - Ensure controls are neutralized
  - Ensure brakes are applied
  - Check indicator lights on instrument panel (ensure key is inserted or turned on ON position)
  - Check windows and mirrors (alignment)
  - Adjust seat to required weight and elevation position
- Start up
  - Cold weather starts
  - Glow plugs, air intake heater (prior to cranking engine)
  - Starting fluid (ether) (prior to cranking engine – automatic or manual)
  - When or when not to use a starting aid (never with glow plugs or intake heater)
  - Excessive starting fluid can damage engine
  - Start up/warm up
    - Check oil pressure (ensure gauge/light turns off)
    - Volt/amp meter (ensure gauge/light turns off)
    - Throttle set (depending on weather)
    - Attachment positioned for inspection
- Walk around
  - Check for damage, wear, leaks and general condition in the following systems:
    - Attachments
    - Undercarriage
    - Hydraulic systems
    - Connections
- Walk around inspection of undercarriage
  - Inspect pads
    - Check for bending, cracking, broken, loose or missing bolts
  - Inspect sprockets
    - Check for signs of wear, broken teeth, rocks or other lodged items, loose or missing bolts
  - Inspect idlers
    - Check for signs of wear, leaks, cracks in the welds, loose or missing bolts, rocks or lodged items
  - Inspect rollers
    - Check for leaks, signs of wear, flat spots, loose or missing bolts
  - Inspect roller frame
    - Check for cracks
- Walk around hydraulic systems
  - Check for hydraulic pumps, cylinders and valve bodies for rubbing hoses, flex hoses, metal collars, couplings, steel lines and brackets

- Walk around pre and post start fluid checks
  - Hydraulic and transmission fluids
- Return to cab
  - Check seat belt is conditioned and fastened
  - Check instruments read correctly
  - Conduct travel check
    - Check brakes for function
    - Check steering for function
    - Check travel alarms
  - Cycle test the attachments

- Describe the procedures to warm-up and post-check the hydraulic fluid
- Describe the procedures used to complete daily equipment logbook during the pre-operations

3288.03 Perform warm-up and post-check procedure *(practical outcome)*

3288.04 Perform the sequence of steps included in the pre-operations check list for a Dozer *(practical outcome)*

3288.05 Explain the maintenance procedures on a Dozer

- Describe the procedure to identify the systems that require maintenance on a dozer
- Describe the procedures to perform maintenance on a dozer:
  - Check, change and fill oils and fluids
  - Clean and change filters
  - Grease fittings
  - Rotate and change teeth and cutting edges

Practical Outcomes / Exercises

Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

For the Maintenance and Pre-Operations (HEO-Dozer) reportable subject, practical outcomes/exercises should focus on performing the steps in the pre-operations checklist as well as performing the warm-up and post check procedures.

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment
30%	20%	50%

Number: 3283.0
Title: Operations – Tractor Loader Backhoe
Duration: 162 Total Hours Theory: 6 Practical: 156
Common core: No
Prerequisites: Introduction to the equipment (3273)
Co-requisites: none
Cross Reference to Training Standards: See mapping chart

General Learning Outcomes

Upon successful completion, the apprentice is able to demonstrate Tractor Loader Backhoe operations and Global Positioning System (GPS) functions.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3283.01 Describe the operations performed by the Tractor Loader Backhoe

- Identify and describe the tasks performed by the Tractor Loader Backhoe
  - Place material
  - Excavate trenches and ditches
  - Backfill trenches and excavations
  - Load trucks
  - Lift material
  - Stockpile material
  - Perform clean-up operations
  - Clear snow and ice
  - Perform the attachment specific task
  - Perform demolition
- Describe the procedures to perform the Tractor Loader Backhoe tasks
- Describe the functions of the controls of the Tractor Loader Backhoe

3283.02 Describe how to position the Tractor Loader Backhoe for work

- Describe the procedures to position the Tractor Loader Backhoe for work:
  - Travel to location
  - Orient the machine (depending on which bucket is being used)
  - Create working table/bench (level the machine)

3283.03 Demonstrate Tractor Loader Backhoe operations *(practical outcome)*

- Perform Tractor Loader Backhoe operations
  - Perform Tractor Loader backhoe primary operations
  - Perform a utility exposure simulation

3283.04 Demonstrate the functions of the Tractor Loader Backhoe's Global Positioning Systems (GPS) *(practical outcome)*

- Describe the purpose and uses of Global Positioning Systems (GPS) for the Tractor Loader Backhoe

Practical Outcomes / Exercises

Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

Recommended Assessment Methods should include:

- Use of equipment
- Mechanic simulation
- Electronic simulation

For the Operations (HEO-TLB) reportable subject, practical outcomes/exercises should focus on performing simulation and practical exercises in relation to the Tractor Loader Backhoe's primary functions based on the following guidelines:

- Main scenarios and exercises (simulated and practical) – 153 hours
- Utility exposure simulation – 2 hours
- GPS Function simulation – 1 hour

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment (theory and practical)
20%	10%	70%

Number: 3286.0
Title: Operations - Excavator

Duration: 162 Total Hours Theory: 6 Practical: 156

Common core: No
Prerequisites: Introduction to the equipment (3273)
Co-requisites: none
Cross Reference to Training Standards: See mapping chart

General Learning Outcomes

Upon successful completion, the apprentice is able to demonstrate Excavator operations and Global Positioning System (GPS) functions.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3286.01 Describe the operations performed by the Excavator

- Identify and describe the tasks performed by the Excavator
  - Excavate trenches and ditches
  - Backfill trenches and excavations
  - Create slopes
  - Create mass excavations
  - Clear land
  - Strip surface materials
  - Stockpile materials
  - Place material
  - Lift material
  - Load trucks
  - Perform demolition
  - Perform the attachment specific task
- Describe the procedures to perform the Excavator tasks
- Describe the functions of the controls of the Excavator

3286.02 Describe how to position the Excavator for work

- Describe the procedures to position the Excavator for work:
  - Travel to location
  - Orient tracks (idlers facing excavation)
  - Create working table/bench (level the machine)

3286.03 Demonstrate Excavator operations *(practical outcome)*

- Perform Excavator operations
  - Perform Excavator primary operations
  - Perform a utility exposure simulation

3286.04 Demonstrate the functions of the Excavator's Global Positioning Systems (GPS) *(practical outcome)*

- Describe the purpose and uses of Global Positioning Systems (GPS) for the Excavator

Practical Outcomes / Exercises

Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

Recommended Assessment Methods should include:

- Use of equipment
- Mechanic simulation
- Electronic simulation

For the Operations (HEO-Excavator) reportable subject, practical outcomes/exercises should focus on performing simulation and practical exercises in relation to the Excavator's primary functions based on the following guidelines:

- Main scenarios and exercises (simulated and practical) – 153 hours
- Utility exposure simulation – 2 hours
- GPS Function simulation – 1 hour

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment (theory and practical)
20%	10%	70%

Number: 3289.0
Title: Operations - Dozer

Duration: 162 Total Hours Theory: 6 Practical: 156

Common core: No
Prerequisites: Introduction to the equipment (3273)
Co-requisites: none
Cross Reference to Training Standards: See mapping chart

General Learning Outcomes

Upon successful completion, the apprentice is able to demonstrate Dozer operations and Global Positioning System (GPS) functions

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3289.01 Describe the operations performed by the Dozer

- Identify and describe the tasks performed by the Dozer
  - Moves mass material (slot dozing)
  - Strips surface material
  - Creates slopes and ditches
  - Spreads material
  - Clears land
  - Pushes scrapers
  - Backfills trenches and excavations
  - Perform demolition
  - Maintains dumpsite area
  - Perform the attachment specific task
- Describe the procedures to perform the Dozer tasks
- Describe the functions of the controls of the Dozer

3289.02 Describe how to position the Dozer for work

- Describe the procedure to position the Dozer for work:
  - Travel to location
  - Creating working table/bench (level the machine)

3289.03 Demonstrate Dozer operations *(practical outcome)*

- Perform Dozer operations
- Perform Dozer primary operations

3289.04 Demonstrate the functions of the Dozer's Global Positioning Systems (GPS) *(practical outcome)*

- Describe the purpose and uses of Global Positioning Systems (GPS) for the Dozer

Practical Outcomes / Exercises

Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

Recommended Assessment Methods should include:

- Use of equipment
- Mechanic simulation
- Electronic simulation

For the Operations (HEO-Dozer) reportable subject, practical outcomes/exercises should focus on performing simulation and practical exercises in relation to the Dozer's primary functions based on the following guidelines:

- Main scenarios and exercises (simulated and practical) – 155 hours
- GPS Function simulation – 1 hour

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment (theory and practical)
20%	10%	70%

Number:	3275.0
Title:	**Post-Operations**
Duration:	22 Total Hours Theory: 2 Practical: 20
Common core:	HEO-Tractor Loader Backhoe, HEO-Excavator, HEO-Dozer
Prerequisites:	Introduction to the equipment (3273), Maintenance and Pre-operations (3282, 3285 or 3288)
Co-requisites:	none

Cross Reference to Training Standards: See mapping chart

General Learning Outcomes

Upon successful completion, the apprentice is able to explain post-operations requirements including post-operation inspection, cleaning and parking/storing of equipment and attachments as well as perform the steps in a post-operations checklist.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3275.01 Explain post operation inspection and maintenance requirements

- Describe the sequence of steps included in the post-operations checklist
    - Visual inspection
        - Identify existing or potential problems
        - Communicate with required personnel
    - Verify access panels, fuel and hydraulic tanks are locked
- Describe the procedures used to complete logging requirements during the post-operations
    - Follow company policies and procedures
- Describe the procedure to identify the systems that require maintenance
    - Augment the log depending on problems/issues
- Describe the procedures to clean the equipment and/or attachments during post operation
    - Windshields, rails, steps, instrument panels, remove garbage, sweeping

3275.02 Perform the sequence of steps included in the post-operations checklist for each machine *(practical outcome)*

3275.03 Describe post operation requirements related to the cleaning, parking and storing of equipment and attachments

- Describe the procedures to shut down and secure equipment and attachments
- Describe the procedures to park/store equipment and attachments during post operation
    - Short term
    - Long term
    - Selection of location
    - Consideration of weather conditions
    - Safeguarding equipment and attachments
    - Vandalism covers (cab shields)
- Describes hazards related to the parking/ storage of equipment

Practical Outcomes / Exercises

Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

For the Post-Operations reportable subject, practical outcomes/exercises should focus on performing practical exercises in relation to the post operations sequence of steps.

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment
20%	10%	70%

Number: 3284.0
Title: Attachments and Implements – Tractor Loader Backhoe
Duration: 5 Total Hours Theory: 2 Practical: 3
Common core: No
Prerequisites: Introduction to the equipment (3273)
Co-requisites: none
Cross Reference to Training Standards: See mapping chart

General Learning Outcomes

Upon successful completion, the apprentice is able to describe the types and uses of standard Attachments and Implements for the Tractor Loader Backhoe, explain the procedures to install, remove and maintain those attachments as well as demonstrate the use of an attachment.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3284.01 Describe the types and uses of standard attachments and implements for the Tractor Loader Backhoe

- Identify standard attachments for a Tractor Loader Backhoe and their uses
    - Hammer
    - Packer
    - Bucket configurations
    - Thumb
    - Ripper
    - Forks
    - Sweepers
    - 4 in 1 buckets
    - Grapple
- Describe the types and uses of quick attach systems for the Tractor Loader Backhoe

3284.02 Explain the procedures to install, remove and maintain standard attachments and implements for the Tractor Loader Backhoe

- Describe the hazards and safe work practices for the installation, operation and removal of attachments
- Identify the tools and equipment used to install and remove attachments
- Describe the procedures to install and uninstall standard attachments
- Describe the procedures to operate standard attachments
- Describe the procedures to maintain standard attachments

3284.03 Demonstrate the installation and removal of an attachment *(practical outcome)*

Practical Outcomes / Exercises
Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

For the Attachments and Implements (TLB) reportable subject, practical outcomes/exercises should focus on performing practical exercises in relation to the installation and removal of attachments and implements.

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment
20%	10%	70%

Number:	3287.0
Title:	**Attachments and Implements - Excavator**
Duration:	5 Total Hours Theory: 2 Practical: 3
Common core:	No
Prerequisites:	Introduction to the equipment (3273)
Co-requisites:	none

Cross Reference to Training Standards: See mapping chart

General Learning Outcomes

Upon successful completion, the apprentice is able to describe the types and uses of standard Attachments and Implements for the Excavator, explain the procedures to install, remove and maintain those attachments as well as demonstrate the use of an attachment.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3287.01 Describe the types and uses of standard attachments and implements for the Excavator

- Identify standard attachments for an Excavator and their uses
  - Hammer
  - Packer
  - Bucket configurations
  - Thumb
  - Ripper
  - Brush cutters
  - Auger
- Describe the types and uses of quick attach systems for the Excavator

3287.02 Explain the procedures to install, remove and maintain standard attachments and implements for the Excavator

- Describe the hazards and safe work practices for the installation, operation and removal of attachments
- Identify the tools and equipment used to install and remove attachments
- Describe the procedures to install and uninstall standard attachments
- Describe the procedures to operate standard attachments
- Describe the procedures to maintain standard attachments

3287.03 Demonstrate the installation and removal of an attachment *(practical outcome)*

Practical Outcomes / Exercises
Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

For the Attachments and Implements (Excavator) reportable subject, practical outcomes/exercises should focus on performing practical exercises in relation to the installation and removal of attachments and implements.

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment
20%	10%	70%

Number: 3290.0
Title: Attachments and Implements - Dozer

Duration: 5 Total Hours Theory: 2 Practical: 3

Common core: No
Prerequisites: Introduction to the equipment (3273)
Co-requisites: none
Cross Reference to Training Standards: See mapping chart

General Learning Outcomes

Upon successful completion, the apprentice is able to describe the types and uses of standard Attachments and Implements for the Dozer, explain the procedures to install, remove and maintain those attachments as well as demonstrate the use of an attachment.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3290.01 Describe the types and uses of standard attachments and implements for the Dozer

- Identify standard attachments for a Dozer and their uses
  - Ripper
  - Winch
  - Blade

3290.02 Explain the procedures to install, remove and maintain standard attachments and implements for the Dozer

- Describe the hazards and safe work practices for the installation, operation and removal of attachments
- Identify the tools and equipment used to install and remove attachments
- Describe the procedures to install and uninstall standard attachments
- Describe the procedures to operate standard attachments
- Describe the procedures to maintain standard attachments

3290.03 Demonstrate the installation and removal of an attachment *(practical outcome) (e.g. changing out the shank of the ripper)*

Practical Outcomes / Exercises
Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

For the Attachments and Implements (Dozer) reportable subject, practical outcomes/exercises should focus on performing practical exercises in relation to the installation and removal of attachments and implements.

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment
20%	10%	70%

Number:	3276.0
Title:	**Environmental Protection**
Duration:	4 Total Hours Theory: 4 Practical: 0
Common core:	HEO-Tractor Loader Backhoe, HEO-Excavator, HEO-Dozer
Prerequisites:	none
Co-requisites:	Soil Fundamentals (3277)
Cross Reference to Training Standards:	See mapping chart

General Learning Outcomes

Upon successful completion, the apprentice is able to describe methods to minimize environmental impact, spill and sediment control techniques, soil stabilization procedures and sedimentation control procedures.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3276.01 Identify the terminology, authorities and legislation associated with environmental protection

- Identify the terms and definitions associated with environmental protection
  - Relevant legislation and authorities
    - Ministry of the Environment and Climate Change
    - Fisheries Act / Fisheries and Oceans Canada
    - Conservation authorities
  - Key terms:
    - Ground water
    - Surface water
    - Waterways
    - Open bodies of water
    - Sedimentation
    - Containment
    - Contamination
    - Remediation
    - Erosion
    - Environmentally sensitive areas / protected areas

3276.02 Describe environmental hazards and/or causes of environmental harms associated with heavy equipment operation

- Describe the characteristics, symptoms and causes of environmental hazards and harms
  - Emissions
  - Sedimentation
  - Spills
  - Leaks
- Identify types and sources of spills and leaks
  - Broken or leaking lines
  - Mechanical failures
  - Chemical
  - Biological
  - Improper storage and handling of fuels and oils
- Explain the environmental impacts / symptoms of heavy equipment use
  - Pollution / emissions
    - Soil
    - Air
    - Water
    - Noise
  - Sedimentation
    - Effects on plants and wildlife/fish
    - Effects on waterways
  - Spills
    - Fuel/oil
    - Contaminated sites

3276.03 Explain the procedures and requirements related to spill prevention

- Describe the procedures to prevent spills
- Describe the procedures to control spills
- Describe the procedures to clean up spills

3276.04 Explain procedures and approaches associated with soil stabilization

- Describe the procedures to stabilize soil
  - Maintain existing vegetation
  - Use erosion control blankets
  - Place rock on unstable slopes
  - Install riprap/gabions
  - Leave buffer zones

3276.05 Explain procedures and approaches associated with sediment control

- Describe the methods to control sediment
  - Divert water
  - Provide filtration
    - Silt fences
    - Filter cloths
    - Hay bales
  - Apply surface protection
    - Mulch/straw
    - Erosion control blankets

Practical Outcomes / Exercises

Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

For the Environmental Protection reportable subject, there are no practical outcomes.

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment
30%	0%	70%

Number:	3277.0
Title:	**Soil Fundamentals**
Duration:	8 Total Hours Theory: 4 Practical: 4
Common core:	HEO-Tractor Loader Backhoe, HEO-Excavator, HEO-Dozer
Prerequisites:	none
Co-requisites:	Environmental Protection (3276)
Cross Reference to Training Standards: See mapping chart	

General Learning Outcomes

Upon successful completion, the apprentice is able to describe soil and aggregate types, characteristics, categorizations and/or applications, explain swell and compaction principles and demonstrate soil identification and compaction techniques.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3277.01 Describe soil types and their application

- Identify different types of soils
  - Cohesive
    - Clay
    - Silt
  - Granular
    - Sand
    - Gravel
  - Organic
    - Top soil
- Identify the legislation/regulation pertaining to soil types
  - OHSA
- Describe the characteristics of different soil types
  - load bearing
  - density
  - adhesion/cohesion
  - shearing resistance
  - water resistance
  - plasticity
  - elasticity
  - gradation
  - texture
  - structure
  - consistency
  - colour
- Compare and contrast the application of different soil types

- Describe how to determine soil suitability
    - Feel
    - Visual
    - Smell
    - Soil report
    - Construction requirements / specifications

3277.02 Describe aggregate types, characteristics and classifications

- Identify aggregate classifications
    - Fine
    - Coarse
    - Specialty
- Identify types of aggregate
    - Limestone
    - Granite
    - Pit run
    - Shale
    - Sand
- Describe the characteristics and applications of different aggregate
- Compare and contrast the application of different aggregate

3277.03 Explain swell and compaction

- Explain swell and compaction factors
    - Mechanical / pressure (result of the machine)
    - Moisture level
    - Density
        - Coarse fine ratio
        - Smaller the particle, the better the compaction
    - Vibration
    - Kneading
- Describe the calculations associated with swell and compaction factors
- Describe the procedures to control water
    - Dams and berms
    - Ditches and swales
    - Pumps
- Demonstrate soil identification *(practical outcome)*

3277.04 Demonstrate compaction techniques *(practical outcome)*

Practical Outcomes / Exercises
Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

For the Soil Fundamentals reportable subject, practical outcomes/exercises should focus on soil identification exercises and the demonstration of compaction techniques.

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment
30%	20%	50%

Number:	3278.0
Title:	**Surveys and Grades**
Duration:	8 Total Hours Theory: 5 Practical: 3
Common core:	HEO-Tractor Loader Backhoe, HEO-Excavator, HEO-Dozer
Prerequisites:	none
Co-requisites:	none
Cross Reference to Training Standards:	See mapping chart

General Learning Outcomes

Upon successful completion, the apprentice is able to describe the principles, concepts, procedures and applications associated with grades, slopes, elevations, surveying, survey indicators and survey equipment as well as perform the set-up, inspection and calibration of equipment, demonstrate use of measuring devices and interpret survey indicator data.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3278.01 Describe principles, concepts and procedures associated with grades, slopes and elevations

- Identify terms and definitions in relation to slopes, grades and elevations
- Identify the symbols representing slopes, grades and elevations on drawings and specifications
- Describe the methods to read and interpret information pertaining to slopes, grades and elevations on drawings and specifications
- Describe the procedures to calculate slope ratios and percentages
- Describe the procedures to check grade

3278.02 Describe principles, concepts, procedures and applications associated with surveying, survey indicators and survey equipment

- Identify terms associated with surveying
- Identify and interpret abbreviations, symbols and markings pertaining to surveying found on stakes
    - Centerline
    - Offsets
    - Stations
    - Benchmarks
    - Geodetic station
- Identify types of measuring tools, grade checking and tracking instruments (measuring devices)
    - string line
    - auto level
        - laser levels
    - measuring tapes
    - surveyor’s level
    - hand/sight level

    - measuring tapes
    - boning rods
- Describe the applications of measuring tools, grade checking and tracking instruments
- Describe the procedure to set up measuring tools, grade checking and tracking instruments
- Describe the procedure to use measuring tools, grade checking and tracking instruments
- Identify types of stakes and their application
- Describe the procedures to verify survey grade elevation and location
    - Set up instrument
    - Establish instrument height
    - Transfer information at job site
- Interpret survey indicator data *(practical outcome)*
- Identify types of specialized measuring tools to establish grades
    - Global Positioning System (GPS)
    - emerging technologies
    - auto and laser levels
- Describe the applications and procedures for using specialized measuring tools
- Describe the procedures to read and record survey grade stake information
- Describe the procedures to transfer survey grade stake information
- Interpret drawings for device set up *(practical outcome)*

3278.03 Perform the set-up, inspection and calibration of equipment *(practical outcome)*

3278.04 Demonstrate use of measuring devices *(practical outcome)*

Practical Outcomes / Exercises
Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

For the Surveys and Grades reportable subject, practical outcomes/exercises should focus on interpreting survey indicator data and drawings for device set up as well as setting up the inspection, calibrating the equipment and using the measuring devices.

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment
70%	10%	20%

Number: 3279.0
Title: Hoisting and Rigging

Duration: 16 Total Hours Theory: 6 Practical: 10

Common core: HEO-Tractor Loader Backhoe, HEO-Excavator, HEO-Dozer
Prerequisites: Introduction to the Equipment (3273)
Co-requisites: none
Cross Reference to Training Standards: See mapping chart

General Learning Outcomes

Upon successful completion, the apprentice is able to describe hoisting and rigging types, characteristics, devices, configurations, explain the considerations and procedures associated with hoisting and rigging techniques as well as demonstrate how to hoist and rig a load.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3279.01 Describe hoisting and rigging types, characteristics, devices and configurations

- Identify terms and definitions associated with hoisting and rigging
- Identify types of rigging devices and hardware
- Identify types of rigging devices and hardware
    - slings
        - Wire ropes
        - Fibre ropes
        - Synthetics
        - chain
        - metal mesh
    - hardware
        - hooks
        - spreader bars
        - shackles
        - tag lines
        - swivels
        - eyebolts
- Describe the characteristics of each type of rigging devices
- Describe the configuration of each type of rigging device
- Describe the criteria for removal (taking out of service) of device and/or hardware
- Describe the applications and limitations of rigging devices and hardware

3279.02 Explain the considerations and procedures associated with hoisting and rigging techniques

- Describe hoisting and rigging techniques
- Identify the hazards associated with hoisting and rigging techniques
- Describe safe work practices pertaining to hoisting and rigging techniques

3279.03 Demonstrate how to hoist and rig a load

- Identify the factors to consider when selecting hoisting and rigging equipment
    - Load characteristics
    - Safe working load (Rated Strength)
    - Ultimate Strength (Breaking strength)
    - Placement of pick points
    - Environment
    - Safety factor
        - 5:1 (all rigging)
        - 10:1 (hoisting personnel)
- Describe the procedures for inspecting the equipment
- Describe the procedures to hoist and rig a load
    - Inspect all slings
    - Confirm capacity and configuration
    - Determine weight of load
    - Do **not** weld or modify hardware
    - Protect sling from sharp edges
    - Do **not** pull sling from under loads
    - Avoid bending slings near attached fittings or eye sections
- Select and inspect rigging devices *(practical outcome)*
- Read and interpret load charts *(practical outcome)*
- Hoist a load *(practical outcome)*

Practical Outcomes / Exercises

Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

For the Hoisting and Rigging reportable subject, practical outcomes/exercises should focus on selecting and inspecting rigging devices, reading and interpreting load charts and hoisting a load.

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment
50%	20%	30%

Number:	3280.0
Title:	**Industry Sectors - Specialized Work**
Duration:	8 Total Hours Theory: 7 Practical: 1
Common core:	HEO-Tractor Loader Backhoe, HEO-Excavator, HEO-Dozer
Prerequisites:	Introduction to the Equipment (3273), Attachments and Implements (3284, 3287 or 3290)
Co-requisites:	none

Cross Reference to Training Standards: See mapping chart

General Learning Outcomes

Upon successful completion, the apprentice is able to describe attachments associated with industry specializations and demonstrate the use of a specialized attachment.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3280.01 Describe the sectors in which heavy equipment is operated

- Identify the primary sectors where heavy equipment is operated
  - Pipeline
    - Mainline
    - Distribution
    - Maintenance
  - Heavy/civil
    - Sewer and watermain
    - Road building
    - Bridges
  - Industrial Commercial Institutional (ICI)
    - Foundations and piling
    - Drilling
  - Utilities
  - Mining
    - Surface
    - Sub-surface
  - Forestry
  - Residential
  - Landscaping
    - Hard
    - Soft
  - Landfills
  - Industrial
    - Scrapyards
    - Plant
  - Marine construction

  - Environmental clean-up
  - Remediation
  - Tunnelling
  - Demolition
  - Rental
- Describe how heavy equipment is used in those industries

3280.02 Describe the purpose, characteristics, installation and maintenance procedures for specialized attachments

- Identify industry / sector specific attachments and their uses
- Describe the hazards and safe work practices for the installation, operation and removal of industry / sector specific attachments
- Identify the tools and equipment used to install and remove industry / sector specific attachments
- Describe the types and uses of quick attach systems
- Describe the procedures to install and uninstall industry / sector specific attachments
- Describe the procedures to operate industry / sector specific attachments
- Describe the procedures to maintain industry / sector specific attachments

3280.03 Demonstrate the use of a specialized attachment *(practical outcome)*

Practical Outcomes / Exercises
Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

For the Industry Sectors (specialized work) reportable subject, practical outcomes/exercises should focus on demonstrating the use of specialized attachments.

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment
70%	10%	20%

Number: 3281.0
Title: Transportation

Duration: 9 Total Hours Theory: 3 Practical: 6

Common core: HEO-Tractor Loader Backhoe, HEO-Excavator, HEO-Dozer
Prerequisites: Introduction to the Equipment (3273)
Co-requisites: none
Cross Reference to Training Standards: See mapping chart

General Learning Outcomes

Upon successful completion, the apprentice is able to describe the procedures for loading, unloading, transporting and driving heavy equipment as well as demonstrate tie down procedures and perform float loading according to jurisdictional regulations.

Learning Outcomes and Content

Upon successful completion the apprentice is able to:

3281.01 Explain the requirements for assisting with the loading, unloading and transportation of heavy equipment, attachments and implements

- Identify the terms and definitions associated with assisting the loading, unloading and transportation of equipment, attachments and implements
- Identify legislative, regulatory and other requirements associated with the transportation of equipment, attachments and implements
  - licensing and permitting
  - road regulations/restrictions
  - signage
  - lighting
- Identify types of transportation equipment
  - Trailers/floats
  - Roll off beds
  - Barges
  - Other
- Describe the role of the operator in assisting the loading, unloading and transporting of equipment, attachments and implements

3281.02 Describe the hazards and safety procedures related to assisting with loading, unloading and transportation of heavy equipment, attachments and implements

- Identify the hazards associated with assisting the loading, unloading and transportation of equipment, attachments and implements
- Describe the procedures and safe work practices to reduce hazards associated with assisting the loading, unloading and transportation of equipment, attachments and implements

3281.03 Explain the procedures to assist with loading, unloading and transporting of heavy equipment, attachments and implements

- Identify considerations when preparing equipment, attachments and implements for transportation.
- Describe the procedures to prepare and position equipment, attachments and implements for transportation.
- Describe the procedures to load equipment, attachments, implements and components for transportation.
- Describe the procedures to assist in the securing of equipment, attachments, implements and components for transportation.
- Describe the procedures to assist in the unloading of equipment, attachments, implements and components

3281.04 Demonstrate tie down procedures *(practical outcome)*

- Describe tie down procedure steps

3281.05 Perform float loading *(practical outcome per machine)*

3281.06 Describe on road driving procedures

- Describe on road driving procedures for the Rubber tire excavator, Tractor Loader Backhoe
    - Highway traffic act requirements

Practical Outcomes / Exercises

Recommended practical exercises are flagged as practical outcomes throughout this document. Recommended practical hours should be assigned to those outcomes.

For the Transportation reportable subject, practical outcomes/exercises should focus on demonstrating tie down procedures and performing float loading.

Evaluation Structure		
Theory Testing	Practical Application Exercises	Final Assessment
70%	10%	20%

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Heavy Equipment Operator (Tractor-Loader-Backhoe)
Heavy Equipment Operator (Excavator)
Heavy Equipment Operator (Dozer)