SKILLEDTRADESBC

PROGRAM OUTLINE

Heavy Equipment Operator

SKILLED TRADES BC

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SKILLED TRADES BC

HEAVY EQUIPMENT OPERATOR

PROGRAM OUTLINE

October 2010

Developed By:
SkilledTradesBC
Province of British Columbia

SKILLED TRADES BC

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INTRODUCTION

Heavy Equipment Operator

FOREWORD

This Program Outline is used as a guide for instructors in the one hundred and sixty hours of the core classroom and lab portions of technician training as well as by trainers and employers in the machine-specific endorsement phase.

Practical demonstration and student participation should always be integrated with classroom sessions. There are two industry routes – civil or logging. The training program contains approximately 50% theoretical training covering all pieces of equipment while the practical portion of the course covers specific pieces of heavy equipment determined by Industry.
In School Mandatory Practical Lab Equipment Pieces By Industry:

Civil	***Logging***
Articulated haul truck	Feller buncher
Loader	Either track or wheel skidder
Dozer	Dangle Head Processor
Excavator	Log loader

Practical training for the remaining equipment will be optional. Training to be provided by the employer.

Heavy equipment:

- Articulated haul truck
- Loader
- Backhoe
- Dozer
- Excavator
- Grader

The following Endorsements are unavailable pending further consultation.

- Feller Buncher
- Wheel Skidder
- Track Skidder
- Dangle Head Processor
- Grapple Yarder
- Log Loader

Safe working practices, though not always specified in each of the competencies and learning tasks, are an implied part of the program and should be stressed throughout the training.

SAFETY ADVISORY
Be advised that references to the WorkSafeBC safety regulations contained within these materials do not/may not reflect the most recent Occupational Health and Safety Regulation (the current Standards and Regulation in BC can be obtained on the following website: http://www.worksafebc.com. Please note that it is always the responsibility of any person using these materials to inform him/herself about the Occupational Health and Safety Regulation pertaining to his/her work.

ACKNOWLEDGEMENTS

The Core HEO Program Outline was prepared with the advice and direction from an industry Steering Committee convened by the British Columbia Road Builders and Heavy Construction Association with funding support from Service Canada and SkilledTradesBC, including:

Jack Davidson	*BCRBHCA*
Kent Orrock	*BCRBHCA*
Ken Day, Interoute Construction	*Interoute Construction (Chair, HR Committee)*
Tom Johnson	*JJM Group*
Scott Jacob	*JJM Group*
Paul Wearmouth	*Peter Kiewit Sons*
Doug Bjornson	*Mainroad Holdings Ltd.*
Joe Wroebel	*AEL Paving*
Robert Schmidt	*Christian Labour Association of Canada*
Greg Tolliday	*Chair*
Richard Debeck	*Service Canada (Observer)*

SkilledTradesBC would like to acknowledge the dedication and hard work of the industry representatives appointed to identify the training requirements of Heavy Equipment Operator.

Industry Representatives

John La Pierre	*Peter Kiewit Sons*
Peter Palm	*Pacific Group of Companies*
Sean Frost	*Bel Contracting*
Ken Kelly	*Interior Roads Ltd.*
Bruce Dyke	*Chew Excavating Ltd*
Bill Hecimovic	*LaFarge Northwest Division*
Bob Vanlerberg	*HMC Services Inc.*
Cade Fox	*Fox Driver Training School*
Ed Claggett	*Lafarge Northwest Division*
Frank Margitan	*Peter Kiewit Sons*
Jim Andersen	*Malaspina University-College*
Leon Bohmer	*Mainroad Contracting*
Craig Desautels	*Finning Canada*
Charlie Macdonald	*VSA Highway Maintenance*
Dean Riggs	*Peter Kiewit Sons*
Paul Richards	*Lafarge Northwest Division*

Facilitators

Kent Orrock	BC Road Builders and Heavy Construction Association
Dan Wood	Douglas College
Lee Middleton	Fulford Harbour Consulting Ltd.
Greg Bell	Douglas College
Bob McConkey	Douglas College
Miriam Mari	Douglas College

Logging Expertise

The Logging section of the Program Outline was prepared with the advice and direction of an industry steering committee convened by the BC Logging Worker Training Needs Committee

Industry subject matter experts:

Jeff Mackenzie	Ed Smith
Roy Killand	Darol Smith
Jon Peachey	Todd Nowicki
Bill Black	Jack William
Wayne Scott	Peter Thomson

Logging Worker Training Needs Committee Members:

LWTNC Chair	Greg Tolliday ex-officio
Service Canada Rep	Rick Roberts ex-officio
BC Forest Safety Council Rep	Suzanne Christensen ex-officio
SkilledTradesBC Reps	TBA ex-officio
RITO Rep	Doug MacLaren ex-officio
Truck Loggers Association Rep	Colin Wong ex-officio
Truck Loggers Association	Dave Lewis
Truck Loggers Association	Thomas Olsen
Interior Logging Association	Wayne Lintott
Interior Logging Association	Ed Smith
Steelworkers Local 2171	Darol Smith
TOLKO	Mark Tamas
Central Interior Logging Association	Tim Menning
Central Interior Logging Association	TBA
North West Loggers Association	Bill Sauer
Council of Forest Industries	Chris Lear

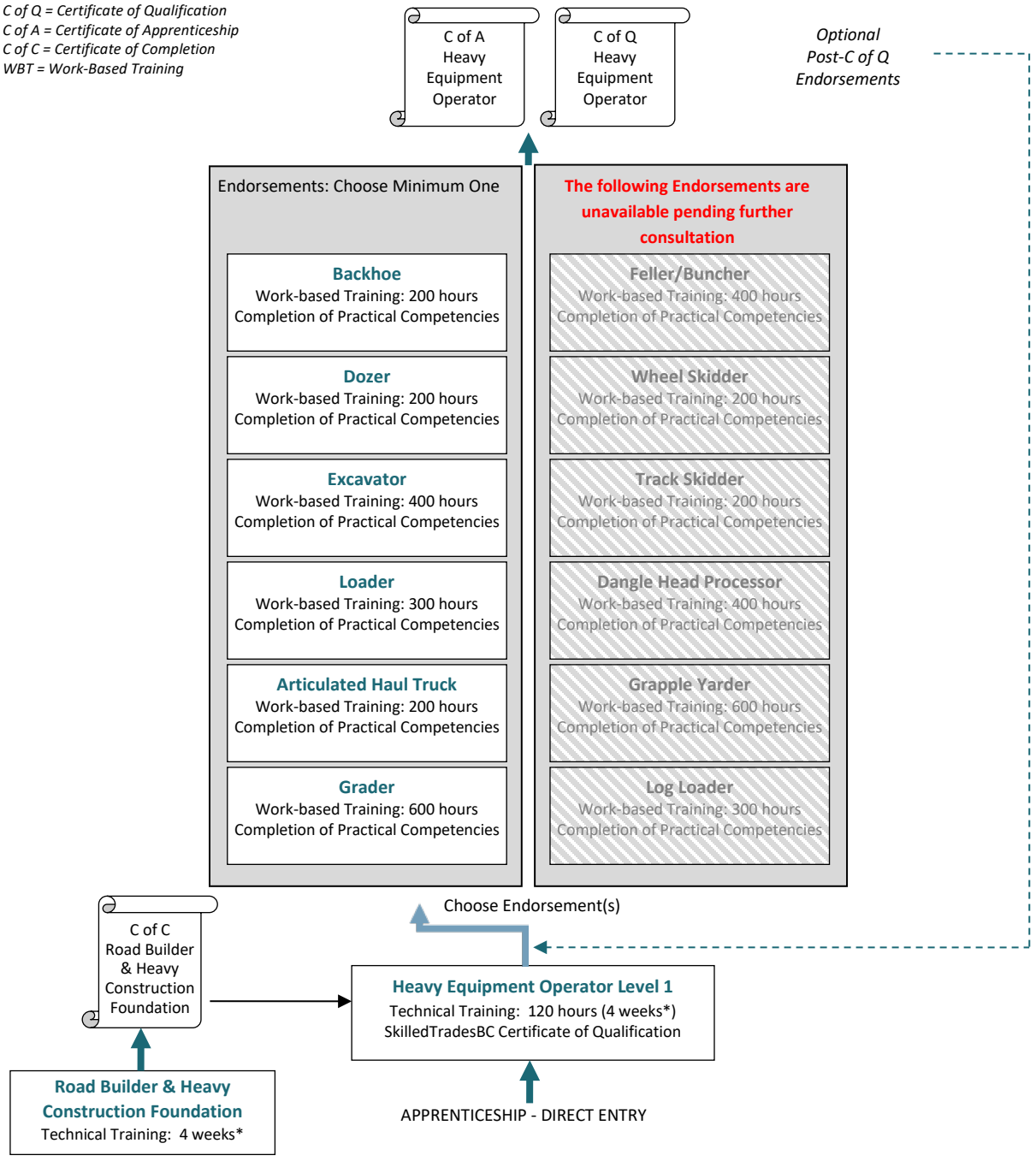
Section 2

PROGRAM OVERVIEW

Heavy Equipment Operator

Apprenticeship Pathway

This graphic provides an overview of the Heavy Equipment Operator apprenticeship pathway.



CROSS-PROGRAM CREDITS

Individuals who hold the credentials listed below are entitled to receive partial credit toward the completion requirements of this program

None

OCCUPATIONAL ANALYSIS CHART
HEAVY EQUIPMENT OPERATOR

Note: Lines A through E describe competencies that are also included in the Road Builder and Heavy Construction Foundation Program, in which content is designed to apply to heavy construction in general. The Heavy Equipment Operator Program builds on the RBHC Foundation Program by adding detail and application that is specific to heavy equipment. Refer to the curriculum for the RBHC Foundation Program to avoid duplication. Lines F through Q include operating objectives that apply to both the practical 'hands on' component of the HEO Core Program, and the longer endorsement process leading to certification.

K = Knowledge Unit (including practical Lab) **W = Workplace Unit**

A. Worksite Health and Safety Practices	**A1 K** Describe factors affecting health and safety in the workplace	**A2 K** Interpret and apply Occupational Health & Safety Regulations	**A3 K** Interpret and apply general worksite and employer safety rules	**A4 K** Use personal protective equipment (PPE)	**A 5 K** Describe safety certifications common to the heavy equipment industry (including COR, WHMIS, TDG, etc.)	**A6 K** Identify relevant jurisdictional authorities, and describe their roles (including BC1Call, WorkSafeBC, etc)
	A7 K Communicate using audible and visual signals, 'radio' protocols	**A8 K** Describe and use safe rigging practices	**A9 K** Assess typical worksite hazards:			
B. Essential heavy equipment knowledge	**B1 K** Describe common types of heavy equipment and their respective capabilities, advantages, limitations	**B2 K** Describe common attachments for heavy equipment and their purposes and capabilities	**B3 K** Describe basic tools, supplies, and lubricants associated with heavy equipment	**B4 K** Define common heavy equipment and industry terminology	**B5 K** Describe heavy equipment mechanical systems (general)	**B6 K** Describe heavy equipment inspection and maintenance (general)
	B7 K Describe common types of logging equipment and their respective capabilities, advantages, limitations	**B8 K** Describe common attachments for logging equipment and their purposes and capabilities				

C. Employability Skills and Professional Practices

C1 K
Describe general employability skills

C2 K
Describe human rights, respect in the workplace, labour relations

D. Job Control and Engineering Basics

D1 K
Define engineering and survey terminology

D2 K
Use simple grade checking instruments and techniques

D3 K
Describe expressions of slopes and grade

D4 K
Use job control and layout: grade stakes, ribbon trails and Codes

D5 K
Describe utilities

D6 K
Describe soils

D7 K
Describe common aggregates

D8 K
Describe bulking and settlement of materials

D9 K
Describe compaction practices and equipment

D10 K
Interpret drawings and plans

D11 K
Describe the elements of a Logging Plan

D12 K
Identify environmental concerns, issues and regulatory compliance

D13 K
Interpret Maps and implement Logging Plan: Identify concerns and hazards

D14 K
Describe process and benefits of "Walking the Block"

E. Environmental awareness, protection, and enhancement

E1 K
Describe common environmental issues pertaining to heavy construction/excavating

E2 K
Demonstrate spill control techniques

E3 K
Demonstrate job site techniques to control sediment, and minimize environmental damage

F. Operate Articulating Haul Truck

F1 K
Describe and comply with safety requirements

F2 K
Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance

F3 K
Perform daily maintenance tasks

F4 K
Describe mechanical components, perform troubleshooting, basic repairs and maintenance

F5 K
Perform basic operator functions

F6 W
Haul and dump materials

G. Operate Loader

G1 K
Describe and comply with safety requirements

G2 K
Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance

G3 K
Perform daily maintenance tasks

G4 K
Describe mechanical components, troubleshooting, basic repairs and maintenance

G5 K
Perform basic operator functions

G6 W
Dig, carry (tram) and stockpile materials

G7 W
Place, spread, and grade material in lifts

G8 W
Backfill trenches and excavations

G9 W
Load trucks

G10 W
Service processing plants (screening and crushing systems) ***optional***

G11 W
Install and use attachments ***optional***

G12 W
Remove snow and ice ***optional***

H. Operate Backhoe

H1 K
Describe and comply with safety requirements

H2 K
Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance

H3 K
Perform daily maintenance tasks

H4 K
Describe mechanical components, troubleshooting, basic repairs and maintenance

H5 W
Perform basic operator functions

H6 W
Dig, carry (tram) and stockpile materials

H7 W
Place, spread, and grade material in lifts

H8 W
Excavate trenches, ditches

H9 W
Backfill trenches, excavations

H10 W
Service utilities crew (Place bedding, hoist objects, backfill in lifts, hoe pack, etc.)

H11 W
Load trucks

H12 W
Drive on public roads

H13 W
Handle debris, brush, cleanup tasks with four-in-one bucket

optional

H14 W
Install and use attachments

optional

I. Operate Dozer

I1 K
Describe and comply with safety requirements

I2 K
Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance

I3 K
Perform daily maintenance tasks

I4 K
Describe mechanical components, troubleshooting, basic repairs and maintenance

I5 K
Perform basic operator functions

I6 W
Strip and stockpile surface materials / organics

I7 W
Cut and fill material

I8 W
Create slopes

I9 W
Create ditches

I10 W
Spread ballast

I11 W
Place aggregates to specified elevations ("finish grading")

I12 W
Rip dense materials

optional

I13 W
Clear land

optional

I14 W
Push scraper

optional

J. Operate Excavator

J1 K
Describe and comply with safety requirements

J2 K
Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance

J3 K
Perform daily maintenance tasks

J4 K
Describe mechanical components, perform troubleshooting, basic repairs and maintenance

J5 K
Perform basic operator functions

J6 W
Excavate and backfill trenches

J7 W
Cut and fill material

J8 W
Strip and stockpile surface materials / organics

J9 W
Create mass excavation

J10 W
Create slopes

J11 W
Load trucks

J12 W
Create side cast road

(road building on sloping terrain)

J13 W
Service pipe crew

(e.g., Place bedding, hoist objects, backfill in lifts, hoe pack, shoring cages)

J14 W
Place riprap

optional

J15 W
Clear land

optional

J16 W
Perform demolition tasks

optional

J17 W
Use attachments

optional

K. Operate Grader	K1 K Describe and comply with safety requirements	K2 K Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance	K3 K Perform daily maintenance tasks	K4 K Describe mechanical components, perform troubleshooting, basic repairs and maintenance	K5 K Perform basic operator functions	K6 W Describe and apply grading fundamentals
	K7 W Form and handle windrows	K8 W Strip surface materials	K9 W Cut and fill material	K10 W Maintain access roads	K11 W Maintain public roads	K12 W Create slopes
	K13 W Create ditches	K14 W Shouldering	K15 W Form road base (sub-grade)	K16 W Place aggregates to specified elevations ("finish grading")	K17 W Clear snow and ice *optional*	K18 W Use common attachments *optional*

The following Lines L to Q are unavailable pending further consultation

L. Operate Feller / Buncher	L1 K Describe and comply with safety requirements	L2 K Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance	L3 K Perform daily maintenance tasks	L4 K Describe mechanical components, perform troubleshooting, basic repairs and maintenance	L5 K Perform basic operator functions	L6 W Identify Species for Felling
	L7 W Determine Block & Slope Orientation - Soil Conditions -Ground Limitations	L8 W Communicate with Skidding Team				

M. Operate Wheel Skidder

M1 K
Describe and comply with safety requirements

M2 K
Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance

M3 K
Perform daily maintenance tasks

M4 K
Describe mechanical components, perform troubleshooting, basic repairs and maintenance

M5 K
Perform basic operator functions

M6 W
Haul logs

M7 W
Manoeuvre over a variety of terrain

M9 W
Communicate with feller/buncher and work as an effective team

N. Operate Track Skidder

N1 K
Describe and comply with safety requirements

N2 K
Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance

N3 K
Perform daily maintenance tasks

N4 K
Describe mechanical components, perform troubleshooting, basic repairs and maintenance

N5 W
Perform basic operator functions

N6 W
Haul logs

N7 W
Manoeuvre over a variety of terrain

N9 W
Communicate with feller/buncher and work as an effective team

O. Operate Grapple Yarder

O1 K
Describe and comply with safety requirements

O2 K
Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance

O3 K
Perform daily maintenance tasks

O4 K
Describe mechanical components, perform troubleshooting, basic repairs and maintenance

O5 K
Perform basic operator functions

O6 W
Describe Yarder Crew Roles and Responsibilities

O7 W
Describe Inspections
- Cables
- Guy Lines

O8 W
Determine Block / Slope Orientation
- Soil Conditions
-Ground Limitations

P. Operate Dangle Head Processor

P1 K
Describe and comply with safety requirements

P2 K
Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance

P3 K
Perform daily maintenance tasks

P4 K
Describe mechanical components, perform troubleshooting, basic repairs and maintenance

P5 K
Perform basic operator functions

P6 W
Set computerized controls for desired cut lengths

P7 W
Position machine for greatest safety, efficiency and productivity

P8 W
Understand and follow log quality specifications

Q. Operate Log Loader

Q1 K
Describe and comply with safety requirements

Q2 K
Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance

Q3 K
Perform daily maintenance tasks

Q4 K
Describe mechanical components, perform troubleshooting, basic repairs and maintenance

Q5 K
Perform basic operator functions

Q6 W
Explain features and benefits of Clam, Butt ‘n top, Live heel

Q7 W
Communicate with log truck driver

Q8 W
Operate clam

Q9 W
Operate Butt ‘n Top

Q10 W
Operate Live Heel

SUGGESTED SCHEDULE OF TIME ALLOTMENTS

A: Core – Worksite Health & Safety Practices

Line A	Core: Worksite Health and Safety Practices	% of Time 8	Theory	Practical
A1	Describe factors affecting health and safety in the workplace		✓	
A2	Interpret and apply Occupational Health & Safety Regulations		✓	✓
A3	Interpret and apply general worksite and employer safety rules		✓	✓
A4	Use personal protective equipment (PPE)		✓	✓
A5	Describe safety certifications common to the heavy equipment industry (including COR, WHMIS, TDG, etc.)		✓	
A6	Identify relevant jurisdictional authorities, and describe their roles (including BC1Call, WorkSafeBC, etc)		✓	
A7	Communicate using audible and visual signals, 'radio' protocols		✓	✓
A8	Describe and use safe rigging practices		✓	✓
A9	Assess typical worksite hazards		✓	✓

Performance Objective for Competency 'A' Worksite Health and Safety Practices:
Given information on worksite health and safety practices, OH&S regulations and guidelines, the learner will correctly answer questions on a quiz covering content from this curriculum (passing grade is 70%), and will describe and apply worksite health and safety knowledge during practical training and on the job.

B: Core - Essential Heavy Equipment Knowledge

Line B	Core: Essential Heavy Equipment Knowledge	% Time 17	Theory	Practical
B1	Describe common types of heavy equipment and their respective capabilities, advantages, limitations		✓	
B2	Describe common attachments for heavy equipment and their purposes and capabilities		✓	
B3	Describe basic tools, supplies, and lubricants associated with heavy equipment		✓	
B4	Define common heavy equipment and industry terminology		✓	
B5	Describe heavy equipment mechanical systems (general)		✓	
B6	Describe heavy equipment inspection and maintenance (general)		✓	✓
B7	Describe common types of logging equipment and their respective capabilities, advantages, limitations		✓	
B8	Describe common attachments for logging equipment and their purposes and capabilities		✓	

Performance Objective for Competency 'B' Essential Heavy Equipment Knowledge:
Given information on essential knowledge of heavy equipment for road building/heavy construction and logging, the learner will correctly answer questions on a quiz covering content from this curriculum (passing grade is 70%), and will describe and apply common heavy equipment knowledge during practical training and on the job.

C: Core - Employability Skills and Professional Practices

Line C	Core: Employability Skills and Professional Practices	% of Time 2	Theory	Practical
C1	Describe general employability skills		✓	
C2	Describe human rights, respect in the workplace, labour relations		✓	

Performance Objective for Competency 'C' Employability Skills and Professional Practices:
Given information on employability skills and professional practices, the learner will correctly answer questions on a quiz covering content from this curriculum (passing grade is 70%), and will demonstrate these skills during practical training and on the job.

D: Core – Job Control & Engineering Basics

Line D	Core: Job Control and Engineering Basics	% of Time 18	Theory	Practical
D1	Define engineering and survey terminology		✓	
D2	Use simple grade checking instruments and techniques		✓	✓
D3	Describe expressions of slopes and grade		✓	
D4	Use job control and layout: grade stakes, ribbon trails and codes		✓	✓
D5	Describe utilities		✓	
D6	Describe soils		✓	
D7	Describe common aggregates		✓	
D8	Describe bulking and settlement of materials		✓	
D9	Describe compaction practices and equipment		✓	
D10	Interpret drawings and plans		✓	✓
D11	Describe Elements of Logging Plan:		✓	
D12	Identify environmental concerns, issues and regulatory compliance		✓	
D13	Interpret maps and implement Logging Plan; Identify concerns and hazards		✓	✓
D14	Describe process and benefits of “Walking the Block”		✓	

Performance Objective for Competency ‘D’ Job control and engineering basics:
Given information on job control and engineering basics, and planning and mapping the learner will correctly answer questions on a quiz covering content from this curriculum (passing grade is 70%), and will demonstrate these skills during practical training and on the job.

E: Core – Environmental Awareness, Protection & Enhancement

Line E	Core: Environmental Awareness, Protection, and Enhancement % of Time 5	Theory	Practical
E1	Describe common environmental issues pertaining to heavy construction/excavating	✓	
E2	Demonstrate spill control techniques	✓	✓
E3	Demonstrate job site techniques to control sediment, and minimize environmental damage	✓	✓

Performance Objective for Competency 'E' Environmental Awareness, Protection, and Enhancement:
Given information on environmental awareness, protection, and enhancement the learner will correctly answer questions on a quiz covering content from this curriculum (passing grade is 70%), and will describe and apply environmental awareness, protection, and enhancement knowledge during practical training and on the job.

F: Operate Articulated Haul Truck

Line F	Operate: HAUL TRUCK % of Time 10	Theory	Practical
F1	Describe and comply with safety requirements	✓	✓
F2	Perform pre start checks, start up/shutdown procedures, monitor performance	✓	✓
F3	Perform daily maintenance tasks	✓	✓
F4	Describe mechanical components, perform troubleshooting, basic repairs and maintenance	✓	✓
F5	Perform basic operator functions	✓	✓
F6	Haul and dump materials	✓	

Note:

1. Of the suggested 16 hours of in-school training time for this section, the practical lab component for F1-F5 will include a minimum of 3 hours of "seat time". The 3 hour "minimum" allotted seat time is based on those apprentices who may have experienced operating time on this machine previous to the course. It is in no way meant to limit seat time to 3 hours for any student.

It is strongly suggested that apprentices completing all theoretical and practical competencies for this section prior to the suggested allotment of time (16 hours), work on gaining the practical competencies on one of the other machines available through the course.

The remaining lab time could also be used for demonstrations, and observation of working equipment to instruct additional operating tips and fundamentals, and to introduce content from F6. At the discretion of instructors, this time could also be used to reinforce the practical 'hands on' content from grade stakes and instruments (D2, D4), and sediment control (E2, E3).

*Operators having previous experience operating the articulated haul truck need only demonstrate the competency skills listed below in order to complete the lab portion of this module. Instructors are strongly encouraged to utilize the 3 hour minimum seat time to evaluate a students competence before signing off on their skill level.

2. To complete the in school practical lab requirement for the articulated haul truck the learner must be able to demonstrate the following practical skills:

- Demonstrate the safe operation of equipment including observation of surroundings.
- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks.
- Perform basic moves with equipment including:
    - Move forward, stop, back up, stop (flat elevation).
    - Apply park brake, lock out transmission.
    - Raise and lower box (making sure to observe for wires and/or overhead objects).
    - Shift transmission.
    - Shift from 2 to 4 to 6 wheel drive.
    - Back up into a simulated and marked loading area without hitting pylons. Apprentice must back up within 1.5 meters of the back pylon without driving over the pylon or hitting the side pylons. (Pylons must be set to have a tolerance of 1.5 meters on each side of the articulated haul truck. Pylons must also be placed so they are visible to the driver).

G: Operate Loader

Line G	Operate: LOADER % of Time 10	Theory	Practical
G1	Describe and comply with safety requirements	✓	✓
G2	Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance	✓	✓
G3	Perform daily maintenance tasks	✓	✓
G4	Describe mechanical components, troubleshooting, basic repairs and maintenance	✓	✓
G5	Perform basic operator functions	✓	✓
G6	Dig, carry (tram) and stockpile materials	✓	✓
G7	Place, spread, and grade material in lifts	✓	
G8	Backfill trenches and excavations	✓	
G9	Load trucks	✓	
G10	Service processing plants (screening and crushing systems) *Optional*	✓	
G11	Install and use attachments *Optional*	✓	
G12	Remove snow and ice *Optional*	✓	

Note:

1. Of the suggested 16 hours of in-school training time for this section, the practical lab component for G1-G5 will include a minimum of 3 hours of "seat time". The 3 hour "minimum" allotted seat time is based on those apprentices who may have experienced operating time on this machine previous to the course. It is in no way meant to limit seat time to 3 hours for any student.

It is strongly suggested that apprentices completing all theoretical and practical competencies for this section prior to the suggested allotment of time (16 hours), work on gaining the practical competencies on one of the other machines available through the course.

The remaining lab time could also be used for demonstrations, and observation of working equipment to instruct additional operating tips and fundamentals, and to introduce content from G6-G12. At the discretion of instructors, this time could also be used to reinforce the practical 'hands on' content from grade stakes and instruments (D2, D4), and sediment control (E2, E3).

*Operators having previous experience operating the loader need only demonstrate the competency skills listed below in order to complete the lab portion of this module. Instructors are strongly encouraged to utilize the 3 hour minimum seat time to evaluate a students competence before signing off on their skill level.

2. To complete the in school practical lab requirement for the loader the learner must be able to demonstrate the following practical skills:

- Demonstrate the safe operation of equipment including observation of surroundings.
- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks.

Perform basic moves with equipment including:

- Move forward, stop, back up, stop (flat elevation).
- Apply park brake, lock out transmission.
- Shift transmission.
- Raise and lower bucket (making sure to observe for wires).
- Maintain bucket angle in scrape position not the gouge position (flat smooth to the surface).
- Load bucket and tram with minimal spillage to dump location 50 meters away.
- Load truck or simulation of truck and/or hopper.
- Keep working area clean.

H: Operate Backhoe (Optional In-School Practical Training)

Line H	Operate: BACKHOE % of Time 4	Theory	Practical
H1	Describe and comply with safety requirements	✓	Optional
H2	Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance	✓	Optional
H3	Perform daily maintenance tasks	✓	Optional
H4	Describe mechanical components, troubleshooting, basic repairs and maintenance	✓	Optional
H5	Perform basic operator functions	✓	Optional
H6	Dig, carry (tram) and stockpile materials	✓	Optional
H7	Place, spread, and grade material in lifts	✓	
H8	Excavate trenches, ditches	✓	Optional
H9	Backfill trenches, excavations	✓	Optional
H10	Service utilities crew (place bedding, hoist objects, backfill in lifts, hoe pack, etc.)	✓	
H11	Load trucks	✓	
H12	Drive on public roads	✓	
H13	Handle debris, brush, cleanup tasks with 4-in-one bucket *Optional*	✓	
H14	Install and use attachments *Optional*	✓	

Note:

Although the theory for the Backhoe remains within the Heavy Equipment Operator course the practical component is an option.
Industry has recommended that persons receiving practical instruction on the backhoe for the first time should be able to demonstrate the following competencies by the end of a one day training session.

1. The learner should be able to demonstrate the following practical skills:

- Demonstrate the safe operation of equipment including observation of surroundings.
- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks.

Perform basic moves with equipment including:

- Move forward, stop, back up, stop (flat elevation).
- Apply park brake, lock out transmission.
- Shift transmission.
- Raise and lower loader bucket (making sure to observe for wires).
- Maintain loader bucket angle in scrape position not the gouge position (flat smooth to the surface).
- Load bucket and tram with minimal spillage to dump location 50 meters away.
- Position stabilizers and loader buckets for dig positions
- Raise and lower boom (making sure to observe for wires).
- Extend and retract stick.
- Curl and dump bucket.
- Swing left and right.
- Lower bucket to the ground for lock out procedures.
- Know that you must call before you dig (Check for underground utilities).
- Excavate simple trench. Place materials from dig no less than 60 cm (2') from edge of dig area.
- Backfill trench using the materials taken from the excavated site.
- Use bucket to flatten and compress the dig site.

I: Operate Dozer

Line I	Operate: DOZER % of Time 10	Theory	Practical
I1	Describe and comply with safety requirements	✓	✓
I2	Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance	✓	✓
I3	Perform daily maintenance tasks	✓	✓
I4	Describe mechanical components, troubleshooting, basic repairs and maintenance	✓	✓
I5	Perform basic operator functions	✓	✓
I6	Strip and stockpile surface materials/ organics	✓	
I7	Cut and fill material	✓	
I8	Create slopes	✓	
I9	Create ditches	✓	
I10	Spread ballast	✓	
I11	Place aggregates to specified elevations ("finish grading")	✓	
I12	Rips dense materials *Optional*	✓	
I13	Clear land *Optional*	✓	
I14	Push scraper *Optional*	✓	

Note:

1. Of the suggested 16 hours of in-school training time for this section, the practical lab component for I1-I5 will include a minimum of 3 hours of "seat time". The 3 hour "minimum" allotted seat time is based on those apprentices who may have experienced operating time on this machine previous to the course. It is in no way meant to limit seat time to 3 hours for any student.

It is strongly suggested that apprentices completing all theoretical and practical competencies for this section prior to the suggested allotment of time (16 hours), work on gaining the practical competencies on one of the other machines available through the course.

The remaining lab time could also be used for demonstrations, and observation of working equipment to instruct additional operating tips and fundamentals, and to introduce content from I6-I14. At the discretion of instructors, this time could also be used to reinforce the practical 'hands on' content from grade stakes and instruments (D2, D4), and sediment control (E2, E3).

*Operators having previous experience operating the dozer need only demonstrate the competency skills listed below in order to complete the lab portion of this module. Instructors are strongly encouraged to utilize the 3 hour minimum seat time to evaluate a students competence before signing off on their skill level.

2. To complete the in school practical lab requirement for the dozer the learner must be able to demonstrate the following practical skills:

- Demonstrate the safe operation of equipment including observation of surroundings.
- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks.

Perform basic moves with equipment including:

- Move forward, stop, back up, stop, turn left and right stop (flat elevation).
- Apply park brake, lock out transmission.
- Shift transmission.
- Demonstrate control of blade by raising, lowering and changing the angle of the blade.
- Maintain blade angle in flat position (flat smooth to the surface).
- Move dozer into a simulated and marked parking area without hitting pylons. Apprentice must move dozer within 1 meter of the back pylon without driving over the pylon or hitting the side pylons. (Pylons must be set to have a tolerance of 1.5 meters on each side of the dozer. One 90 degree turn must be made on route to parking area. (Pylons must be placed so they are visible to the driver).
- Push tire 200 meters using the grader blade without losing it.
- Create a windrow of 100 meters without gouging or driving over it.

J: Operate Excavator

Line J	Operate: EXCAVATOR % of Time 12	Theory	Practical
J1	Describe and comply with safety requirements	✓	✓
J2	Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance	✓	✓
J3	Perform daily maintenance tasks	✓	✓
J4	Describe mechanical components, perform troubleshooting, basic repairs and maintenance	✓	✓
J5	Perform basic operator functions	✓	✓
J6	Excavate and backfill trenches	✓	✓
J7	Cut and fill material	✓	
J8	Strip and stockpile surface materials/ organics	✓	
J9	Create mass excavation	✓	
J10	Create slopes	✓	
J11	Load trucks	✓	
J12	Create side cast road (road building on sloping terrain)	✓	
J13	Service pipe crew (e.g., Place bedding, hoist objects, backfill in lifts, hoe pack, shoring cages)	✓	
J14	Place riprap *Optional*	✓	
J15	Clear land *Optional*	✓	
J16	Perform demolition tasks *Optional*	✓	
J17	Use attachments *Optional*	✓	

Note:

1. Of the suggested 19 hours of in-school training time for this section, the practical lab component for J1-J5 will include a minimum of 3 hours of "seat time". The 3 hour "minimum" allotted seat time is based on those apprentices who may have experienced operating time on this machine previous to the course. It is in no way meant to limit seat time to 3 hours for any student.

It is strongly suggested that apprentices completing all theoretical and practical competencies for this section prior to the suggested allotment of time (19 hours), work on gaining the practical competencies on one of the other machines available through the course.

The remaining lab time could also be used for demonstrations, and observation of working equipment to instruct additional operating tips and fundamentals, and to introduce content from J6-J17. At the discretion of instructors, this time could also be used to reinforce the practical 'hands on' content from grade stakes and instruments (D2, D4), and sediment control (E2, E3).

*Operators having previous experience operating the excavator need only demonstrate the competency skills listed below in order to complete the lab portion of this module. Instructors are strongly encouraged to utilize the 3 hour minimum seat time to evaluate a students competence before signing off on their skill level.
2. To complete the in school practical lab requirement for the excavator the learner must be able to demonstrate the following practical skills:

- Demonstrate the safe operation of equipment including observation of surroundings.
- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks.

Perform basic moves with equipment including:

- Move forward, stop, back up, stop (flat elevation).
- Apply park brake, lock out transmission.
- Shift transmission.
- Raise and lower boom (making sure to observe for wires).
- Extend and retract stick.
- Curl and dump bucket.
- Swing left and right.
- Lower bucket to the ground for lock out procedures.
- Identify that you must call before you dig (Check for underground utilities).
- Excavate simple trench 30 meters long by 1 meter deep. Keep trench straight. Place materials from dig no less than 60cm (2') from edge of dig area.
- Backfill trench using the materials taken from the excavated site.
- Use bucket to flatten and compress the dig site.
- Shows ability to split functions to operate tracks and digging functions simultaneously i.e. pulling up steep grades, clearing obstacles, push up turns, etc.
- Change buckets (quick change) in 10 minutes or less

K: Operate Grader (Optional In-School Practical Training)

Line K	Operate: GRADER % of Time 4	Theory	Practical
K1	Describe and comply with safety requirements	✓	Optional
K2	Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance	✓	Optional
K3	Perform daily maintenance tasks	✓	Optional
K4	Describe mechanical components, perform troubleshooting, basic repairs and maintenance	✓	Optional
K5	Perform basic operator functions	✓	Optional
K6	Describe and apply grading fundamentals	✓	Optional
K7	Form and handle windrows	✓	Optional
K8	Strip surface materials	✓	
K9	Cut and fill material	✓	
K10	Maintain construction access roads, logging roads	✓	
K11	Maintain public roads	✓	
K12	Create slopes	✓	
K13	Create ditches	✓	
K14	Shouldering	✓	
K15	Form road base (sub-grade)	✓	
K16	Place aggregates to specified elevations (“finish grading”)	✓	
K17	Clear snow and ice	✓	
K18	Use common attachments	✓	

Note:
Although the theory for the Grader remains within the Heavy Equipment Operator course the practical component is an option.
Industry has recommended that persons receiving practical instruction on the grader for the first time should be able to demonstrate the following competencies by the end of a two day training session.

1. The learner should be able to demonstrate the following practical skills:

- Demonstrate the safe operation of equipment including visual checks, constant awareness of space, position, clearance and safe movement of machine.
- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks.

Perform basic moves with equipment including:

- Move forward, stop, back up, stop (flat elevation).
- Apply park brake, lock out transmission.
- Operates with smooth and precise control of drive train, appropriate gear and engine speed.
- Manoeuvre through a prescribed path without running over pylons. The course will see the apprentice maintain a straight line of 100 meters moving forward and backward and a 90 degree turn to the left and to the right.
- Push tire 200 meters using the grader blade without losing it. Grader pathway should be designed as a large “S” pattern.
- Create a windrow of 100 meters without gouging or driving over it

This Time Allotment is unavailable pending further consultation

L: Operate Feller Buncher

Line L	Operate: FELLER BUNCHER	% of Time 12	Theory	Practical
L1	Describe and comply with safety requirements		✓	✓
L2	Perform pre start checks, start up/shutdown procedures, monitor performance of equipment		✓	✓
L3	Perform daily maintenance tasks		✓	✓
L4	Describe mechanical components, perform troubleshooting, basic repairs and maintenance		✓	✓
L5	Perform basic operator functions		✓	✓
L6	Identify Species for Felling		✓	
L7	Determine Block & Slope Orientation - Soil Conditions -Ground Limitations		✓	
L8	Communicate with Skidding Team		✓	

Note:

1. Of the suggested 19 hours of in-school training time for this section, the practical lab component for L1-L5 will include a minimum of 3 hours of "seat time". The 3 hour "minimum" allotted seat time is based on those apprentices who may have experienced operating time on this machine previous to the course. It is in no way meant to limit seat time to 3 hours for any student.

It is strongly suggested that apprentices completing all theoretical and practical competencies for this section prior to the suggested allotment of time (19 hours), work on gaining the practical competencies on one of the other machines available through the course.

The remaining lab time could also be used for demonstrations, and observation of working equipment to instruct additional operating tips and fundamentals, and to introduce content from L6-L8. At the discretion of instructors, this time could also be used to reinforce the practical 'hands on' content from grade stakes and instruments (D2, D4), and sediment control (E2, E3).

*Operators having previous experience operating the feller buncher need only demonstrate the competency skills listed below in order to complete the lab portion of this module. Instructors are strongly encouraged to utilize the 3 hour minimum seat time to evaluate a students competence before signing off on their skill level.

2. To complete the in school practical lab requirement for the articulated feller buncher the learner must be able to demonstrate the following practical skills:

- Demonstrate the safe operation of equipment including observation of surroundings.
- Perform pre-start checks, start-up/shutdown procedures and monitor equipment.
- Perform daily maintenance tasks.

Perform basic moves with equipment including:

- Move forward, stop, back up, stop (flat elevation).
- Apply park brake, lock out transmission.
- Shift transmission.
- Use buncher head to assist in turns.
- Successfully move through a simple obstacle course without contacting pylons. Pylons will be used to simulate stumps or protected trees which must not be hit by the machine. Obstacle course will be on a grade of not more than 15 percent and not less than 10 percent. The learner will be required to move both up and down this grade.
- Cut tree using the buncher head.
- Maintain a controlled fall of tree.
- Place tree into bundle.

This Time Allotment is unavailable pending further consultation

M: Operate Wheel Skidder

Line M	Logging: Operate Wheel Skidder	% of Time 12	Theory	Practical
M1	Describe and comply with safety requirements		✓	✓
M2	Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance		✓	✓
M3	Perform daily maintenance tasks		✓	✓
M4	Describe mechanical components, perform troubleshooting, basic repairs and maintenance		✓	✓
M5	Perform basic operator functions		✓	✓
M6	Haul logs		✓	✓
M7	Manoeuvre over a variety of terrain		✓	✓
M8	Communicate with feller/buncher and work as an effective team		✓	

Note:

1. Of the suggested 19 hours of in-school training time for this section, the practical lab component for M1-M5 will include a minimum of 3 hours of "seat time". The 3 hour "minimum" allotted seat time is based on those apprentices who may have experienced operating time on this machine previous to the course. It is in no way meant to limit seat time to 3 hours for any student.
It is strongly suggested that apprentices completing all theoretical and practical competencies for this section prior to the suggested allotment of time (19 hours), work on gaining the practical competencies on one of the other machines available through the course.
The remaining lab time could also be used for demonstrations, and observation of working equipment to instruct additional operating tips and fundamentals, and to introduce content from M6-M8. At the discretion of instructors, this time could also be used to reinforce the practical 'hands on' content from grade stakes and instruments (D2, D4), and sediment control (E2, E3).
*Operators having previous experience operating the wheel skidder need only demonstrate the competency skills listed below in order to complete the lab portion of this module. Instructors are strongly encouraged to utilize the 3 hour minimum seat time to evaluate a students competence before signing off on their skill level.

2. In-school training requires practical training on either the Wheel Skidder or the Tracked Skidder. Should the Wheel Skidder be chosen the training provider must provide the apprentices with theoretical knowledge and conversation with regard to N1-N9.

3. To complete the in school practical lab requirement for the loader the learner must be able to demonstrate the following practical skills:

- Demonstrate the safe operation of equipment including observation of surroundings.
- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks.

Perform basic moves with equipment including:

- Move forward, stop, back up, stop (flat elevation).
- Apply park brake, lock out transmission.
- Shift transmission.
- Pick up a turn of 4-6 logs and move through an obstacle course. Course must have two right angle turns. The course ends by having the student place the turn on the ground and pushing into place using the blade.

This Time Allotment is unavailable pending further consultation

N: Operate Track Skidder

Line N	Logging: Operate Track Skidder	% of Time 12	Theory	Practical
N1	Describe and comply with safety requirements		✓	✓
N2	Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance		✓	✓
N3	Perform daily maintenance tasks		✓	✓
N4	Describe mechanical components, perform troubleshooting, basic repairs and maintenance		✓	✓
N5	Perform basic operator functions		✓	✓
N6	Haul logs		✓	✓
N7	Manoeuvre over a variety of terrain		✓	✓
N9	Communicate with feller buncher and work as an effective team		✓	

Note:

1. Of the suggested 19 hours of in-school training time for this section, the practical lab component for N1-N5 will include a minimum of 3 hours of "seat time". The 3 hour "minimum" allotted seat time is based on those apprentices who may have experienced operating time on this machine previous to the course. It is in no way meant to limit seat time to 3 hours for any student.

It is strongly suggested that apprentices completing all theoretical and practical competencies for this section prior to the suggested allotment of time (19 hours), work on gaining the practical competencies on one of the other machines available through the course.

The remaining lab time could also be used for demonstrations, and observation of working equipment to instruct additional operating tips and fundamentals, and to introduce content from N6-N9. At the discretion of instructors, this time could also be used to reinforce the practical 'hands on' content from grade stakes and instruments (D2, D4), and sediment control (E2, E3).

*Operators having previous experience operating the tracked skidder need only demonstrate the competency skills listed below in order to complete the lab portion of this module. Instructors are strongly encouraged to utilize the 3 hour minimum seat time to evaluate a students competence before signing off on their skill level.

2. In-school training requires practical training on either the Tracked Skidder or the Wheel Skidder. Should the Tracked Skidder be chosen the training provider must provide the apprentices with theoretical knowledge and conversation with regard to M1-M8.

3. To complete the in school practical lab requirement for the wheel skidder the learner must be able to demonstrate the following practical skills:

- Demonstrate the safe operation of equipment including observation of surroundings.
- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks.

Perform basic moves with equipment including:

- Move forward, stop, back up, stop (flat elevation).
- Apply park brake, lock out transmission.
- Shift transmission.
- Pick up a turn of 4-6 logs and move through an obstacle course. Course must have two right angle turns. The course ends by having the student place the turn on the ground and pushing into place using the blade.

This Time Allotment is unavailable pending further consultation

O: Operate Grapple Yarder (Optional In-School Practical Training)

Line O	Logging: Operate Grapple Yarder	% of Time 4	Theory	Practical
O1	Describe and comply with safety requirements – man checks		✓	✓
O2	Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance		✓	✓
O3	Perform daily maintenance tasks		✓	✓
O4	Describe mechanical components, perform troubleshooting, basic repairs and maintenance		✓	✓
O5	Perform basic operator functions		✓	✓
O6	Describe Yarder Crew Roles and Responsibilities		✓	
O7	Describe Inspections - Cables - Guy Lines		✓	
O8	Determine Block / Slope Orientation - Soil Conditions - Ground Limitations		✓	

Note:

1. The practical lab component for O1-O5 will include a site visit to observe a Grapple Yarder in operation. Given the expense and complexity of these machines, the lab time should be used for demonstrations, and observation of working equipment to instruct additional operating tips and fundamentals, and to introduce content from O6 to O8.
Although the theory for the Grapple Yarder remains within the Heavy Equipment Operator course the practical component is an option.
Industry has recommended that persons receiving practical instruction on the grapple yarder for the first time should be able to demonstrate the following competencies by the end of a two day training session.

2. The learner should be able to demonstrate the following practical skills:

- Demonstrate the safe operation of equipment including visual checks, constant awareness of space, position, clearance and safe movement of machine.
- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks.

Perform basic moves with equipment including:

- Run grapple out to log
- Take hold of log with grapple and lift
- Move log and drop in the deck (length of log)

This Time Allotment is unavailable pending further consultation

P: Operate Dangle Head Processor

Line P	Logging: Operate Dangle Head Processor	% of Time 12	Theory	Practical
P1	Describe and comply with safety requirements – man checks		✓	✓
P2	Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance		✓	✓
P3	Perform daily maintenance tasks		✓	✓
P4	Describe mechanical components, perform troubleshooting, basic repairs and maintenance		✓	✓
P5	Perform basic operator functions		✓	✓
P6	Set computerized controls for desired length		✓	✓
P7	Position machine for greatest safety, efficiency and productivity		✓	✓
P8	Understand and follow log quality specifications		✓	

Note:

1. Of the suggested 19 hours of in-school training time for this section, the practical lab component for P1-P5 will include a minimum of 3 hours of "seat time". The 3 hour "minimum" allotted seat time is based on those apprentices who may have experienced operating time on this machine previous to the course. It is in no way meant to limit seat time to 3 hours for any student.

It is strongly suggested that apprentices completing all theoretical and practical competencies for this section prior to the suggested allotment of time (19 hours), work on gaining the practical competencies on one of the other machines available through the course.

The remaining lab time could also be used for demonstrations, and observation of working equipment to instruct additional operating tips and fundamentals, and to introduce content from P6-P8. At the discretion of instructors, this time could also be used to reinforce the practical 'hands on' content from grade stakes and instruments (D2, D4), and sediment control (E2, E3).

*Operators having previous experience operating the dangle head processor need only demonstrate the competency skills listed below in order to complete the lab portion of this module. Instructors are strongly encouraged to utilize the 3 hour minimum seat time to evaluate a students competence before signing off on their skill level.

2. To complete the in school practical lab requirement for the Dangle Head Processor the learner must be able to demonstrate the following practical skills:

- Demonstrate the safe operation of equipment including observation of surroundings.
- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks.

Perform basic moves with equipment including:

- Move forward, stop, back up, stop (flat elevation).
- Apply park brake, lock out transmission.
- Shift transmission.
- Raise and lower boom (making sure to observe for obstructions).
- Position the machine safely into the correct working area of the deck.
- Grab full length log from deck using the processing attachment.
- De-limb and cut log to prescribed length.
- Sort to species and length.

This Time Allotment is unavailable pending further consultation

Q: Operate Log Loader

Line Q	Operate Log Loader	% of Time 10	Theory	Practical
Q1	Describe and comply with safety requirements		✓	✓
Q2	Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance		✓	✓
Q3	Perform daily maintenance tasks		✓	✓
Q4	Describe mechanical components, perform troubleshooting, basic repairs and maintenance		✓	✓
Q5	Perform basic operator functions		✓	✓
Q6	Explain features and benefits of • Clam • Butt 'n top • Live heel		✓	
Q7	Communicate with log truck driver		✓	
Q8	Operate Clam		✓	
Q9	Operate Butt 'n Top		✓	
Q10	Operate Live Heel		✓	

Note:

1. Of the suggested 16 hours of in-school training time for this section, the practical lab component for Q1-Q5 will include a minimum of 3 hours of "seat time". The 3 hour "minimum" allotted seat time is based on those apprentices who may have experienced operating time on this machine previous to the course. It is in no way meant to limit seat time to 3 hours for any student.

It is strongly suggested that apprentices completing all theoretical and practical competencies for this section prior to the suggested allotment of time (16 hours), work on gaining the practical competencies on one of the other machines available through the course.

The remaining lab time could also be used for demonstrations, and observation of working equipment to instruct additional operating tips and fundamentals, and to introduce content from Q6-Q10. At the discretion of instructors, this time could also be used to reinforce the practical 'hands on' content from grade stakes and instruments (D2, D4), and sediment control (E2, E3).

*Operators having previous experience operating the log loader need only demonstrate the competency skills listed below in order to complete the lab portion of this module. Instructors are strongly encouraged to utilize the 3 hour minimum seat time to evaluate a students competence before signing off on their skill level.

2. To complete the in school practical lab requirement for the Log Loader the learner must be able to demonstrate the following practical skills:

- Demonstrate the safe operation of equipment including visual checks, constant awareness of space, position, clearance and safe movement of machine.
- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks.

Perform basic moves with equipment including:

- Move forward, stop, back up, stop (flat elevation).
- Apply park brake, lock out transmission.
- Operates with smooth and precise control of drive train, appropriate gear and engine speed.
- Manoeuvre through a prescribed path without running over pylons.

Perform basic operating tasks including:

- Position log loader to unload trailer.
- Successfully attach trailer to truck.
- Build a cradle of bunch logs.

Section 3

PROGRAM CONTENT

Heavy Equipment Operator

LINE A: WORKSITE HEALTH AND SAFETY PRACTICES

Competency: A1 Describe Factors Affecting Health and Safety in the Workplace

Learning Objectives:

1 The learner will describe the main categories of hazards in the workplace and common injuries and hazards specific to heavy equipment.
2 The learner will demonstrate safe working practices.

LEARNING TASKS	CONTENT
1 Describe general safety knowledge	• safety is first priority • responsible for personal safety and the safety of others • preview content of A2 to A8 – emphasis on appreciation of safety issues • recent statistics on fatalities and lost time accidents
2 Describe main categories of hazards	• chemical: inhalation (e.g. carbon monoxide, hydrogen sulphide, welding fumes, asbestos), ingestion, absorption, injection (i.e. high pressure fluids) • sensory: noise, vibration, heat, cold • environmental: bacteria, micro organisms, viruses • physical: repetitive strain, strains and sprains, back injuries, trauma, etc.

3	Describe common injuries and hazards specific to heavy equipment	• the most common cause of injury (slips and falls) • equipment rollovers, slides • hearing loss: gradual exposure (long term) or traumatic injury (explosion, impact noises) – hearing damage can begin at 85 decibels, chain saws 110, lawnmower 90, heavy equipment 90 to 105 or more • crushing/ impact– block elevated equipment, stay clear of operating machinery, use parking brakes • stability of excavations and trenches (sloping and shoring) • loss of control of heavy lifts (machine capacity, under footing/ground stability, rigging, proximity of load) • underground and overhead services and hazards (BC hydro 7 steps, and BC 1Call) • motor vehicle accidents are common in the workplace • burns from hot substances or objects • batteries, tires, pressurised hydraulic and fuel systems • confined space • inexperience and lack of training – working beyond your limits • complacency, boredom, inattention, lack of focus on safety • drugs and alcohol

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will demonstrate safe practices during practical training and on the job

LINE A: WORKSITE HEALTH AND SAFETY PRACTICES

Competency: A2 Interpret and apply Occupational Health & Safety Regulations

Learning Objectives:

1 The learner will find, interpret and apply key occupational health and safety regulations from the Workers Compensation Act and OH&S regulations.

LEARNING TASKS	CONTENT
1 Describe rights and responsibilities regarding safety	• OH&S regulations part 3: rights and responsibilities • Workers Compensation Act Part 3 Division 3 : General Duties of Employers, Workers, and Others • The Board (WCB) has authority to: enter, conduct inspection, investigations, access records, take samples, take photographs, make orders, establish standards, stop work, require persons to attend, assess fines - mostly anything they need to carry out their duties - may collect compensation payable to injured worker from the employer • Employers must: ensure the health and safety; comply, remedy, establish policies and programs, establish joint safety committee, hold safety meetings, provide protective equipment/ devices/ clothing, information, instruction, training, and supervision to ensure safe practices, provide first aid and emergency services, investigate, report. …Must not take or threaten discriminatory action against a worker regarding safety issue, refusal to work etc., confidentiality • Employees have the right to refuse work for safety concerns, and are protected by law (Sec.3.12,3.13) • Employees must: take reasonable care, comply, work in accordance with, use/wear PPE, devices, equipment. …Not do anything that may endanger yourself or others; not impaired by alcohol, drugs or other causes, report contraventions, absence or defect, hazards etc; must report an injury • Employers and employees can be convicted of an offence with penalties including both

		fines and imprisonment for contravening regulations…
2	Describe regulations and guidelines with general application to industry	• Personal Protective Clothing and Equipment- Part 8 • Confined Spaces – Part 9 • Fall Protection – Part 11 • First aid requirements – Part 3.15 – 3.21
3	Describe regulations and guidelines specific to heavy equipment	• Rigging – part 15 • Mobile Equipment – Part 16 (lights, controls, protective structures, guards, seat belts, blocking elevated equipment, securing loads, etc.) • Traffic Control – Part 18 • Excavations – Part 20.78 to 20.95
4	Summarize key regulations	• Employee rights and responsibilities • PPE • Sloping and shoring requirements • Summarize fatality statistics and discuss typical and maximum fines and penalties

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will demonstrate safe practices during practical training and on the job

LINE A: WORKSITE HEALTH AND SAFETY PRACTICES

Competency: A3 Interpret and apply general worksite and employer safety rules

Learning Objectives:

1 The learner will discuss and interpret general worksite policy and safety rules not specifically covered by WCB.

LEARNING TASKS	CONTENT
1 Describe general, common safety rules and tips	• tips and practices not specifically regulated - examples include: jumping clear of sliding or rolling equipment not recommended, don't rush into an accident scene without assessing the scene for potential hazards, 3 point contact rule for entering and exiting machinery, etc
2 Describe employer safety rules and policies	• developed to govern the work of all employees • based on: WCB regulations and guidelines, company philosophy, experience, safety record • often tied to discipline policies i.e. zero tolerance for certain violations (drugs, violence, etc.) • often go beyond OH&S regulations – e.g. insistence on seatbelt use in **all** situations, safety glasses worn at all times while on company site, etc • training and supervision - monitor, correct, inspect - formal safety programs, safety committee, safety orientations, safety meetings, accident investigations
3 Describe motivation underlying safety programs	• motivated by regulations • motivated by ethics, legitimate concern • motivated by cost of lost time and injury claims, increased WCB premiums • motivated by liability – legal concept of due diligence, all reasonable care, etc.

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will demonstrate safe practices during practical training and on the job

LINE A: WORKSITE HEALTH AND SAFETY PRACTICES

Competency: A4 Use personal protective equipment (PPE)

Learning Objectives:

1 The learner will describe appropriate personal protective equipment and its usage.
2 The learner will demonstrate the use of personal protective equipment throughout the program.

LEARNING TASKS	CONTENT
1 Describe responsibilities of workers and employers	• workers are required to use PPE, inspect • workers are responsible to provide general purpose gloves, safety footwear, hard hat • employers are responsible for providing all other safety items • employers must ensure that PPE is properly worn when required, and is cleaned, inspected, maintained • employers must ensure that workers are adequately trained: correct use, limitations, maintenance
2 Describe PPE types, function	• head protection (hardhats, ATV helmets) • lung protection (respirators, gas masks, breathing apparatus) • eye protection (glasses, goggles, shields) • hearing protection (plugs, earmuffs) • hand protection (gloves –appropriate type to task) • foot protection (CSA approval indicated by green triangle : 8” high, steel shanks, steel toe) also non slip, caulks, chemical resistant • limb and body protection (heavy aprons, chain saw leg protection, etc) • Hi Vis: vest or hi vis markings on coveralls, jackets, shirts, etc. • flame resistant clothing • fall protection system (harnesses, lifeline, etc) • buoyancy equipment (life jackets) • gas detection

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will demonstrate safe practices during practical training and on the job

LINE A: WORKSITE HEALTH AND SAFETY PRACTICES

Competency: A5 Describe safety certifications common to the heavy equipment industry

Learning Objectives:

1 The learner will describe general safety certifications common to the heavy equipment industry.

LEARNING TASKS	CONTENT
1 Traffic Control	• Construction Safety Network Flag person Certification • summary of training content
2 First aid certification	• summary of training content for level 1 (soft tissue; priority action approach; airway, respiratory, and circulatory interventions, medical emergencies) • describe level 1 - one day course • describe level 2 - 36 hour course • describe level 3 - 70 hr course • certifications are valid for 2 yrs • required levels of 1st aid certification and supplies, equipment and facilities for different worksites are determined by 1st aid assessments (hazard ratings, travel time to hospitals, # of workers)
3 WHMIS	• stands for: Workplace Hazardous Materials Information System • hazards, protection, emergency procedures, information on controlled products • WHMIS includes MSDS Material Safety Data Sheets
4 COR	• Certificate of Recognition – program offering employers assistance, incentives, and recognition to promote safety
5 TDG	• Transport of Dangerous Goods • training in handling and transporting dangerous goods including emergency procedures and symbols identifying goods in transport
6 Others	• forklift, crane, faller, blasting, wastewater, H2S, etc

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE A: WORKSITE HEALTH AND SAFETY PRACTICES

Competency: A6 Identify relevant jurisdictional authorities, and describe their roles

Learning Objectives:

1 The learner will discuss and interpret the roles and responsibilities of the various jurisdictional authorities and the potential for overlap between these authorities.

	LEARNING TASKS	CONTENT
1	WorkSafeBC	• roles, responsibilities, authority • including: inspections, fines and enforcement, orders to eliminate hazards or stop work
2	BC1Call	• roles, responsibilities • provide a service to improve safety by coordinating efforts of BC Hydro, municipal governments, gas companies, other owners of infrastructure and services
3	Gas companies	• roles, responsibilities, authority • including: in the event of gas leaks
4	BC Hydro	• roles, responsibilities, authority • including: in the event of contact or damage to power lines
5	Ministry of Health	• roles, responsibilities, authority • including: water, sewer, sanitary conditions, food service, etc
6	Provincial Emergency Program	• roles, responsibilities, authority • including: emergency management
7	Other agencies have authority in emergencies:	• Ministry of Forests in event of fires • local fire departments in event of fire, gas leaks • police in event of accidents, emergencies, etc
8	Forest Safety Council	• SAFE Companies Certification

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will demonstrate safe practices during practical training and on the job

LINE A: **WORKSITE HEALTH AND SAFETY PRACTICES**

Competency: **A7** **Communicate using audible and visual signals, 'radio' protocols**

Learning Objectives:

1 The learner will describe and demonstrate correct audible and visual signals
2 The learner will describe common radio protocols

LEARNING TASKS	CONTENT
1 Describe relevance of effective communication to safety	• consequences of miscommunication • professionalism as part of "safety first" culture
2 Describe hoisting signals	• review audible and visual hoisting signals with emphasis on those likely to be used for HEO
3 Describe loading and hauling signals	• one 'beep': stop (unless truck is already stopped in which case most people use one beep to mean "you're loaded") • two beeps: back up • three beeps: go ahead • can be memorized by counting syllables i.e. stop is 1 syllable = 1 beep; go- a- head is 3
4 Describe radio protocols	• sender and receiver identified • clear voice, clear language • don't forget the button, appropriate distance from mouth and volume of voice • haul road convention is to check in with location and direction at start, arrival, and pre determined call-in points along the way… direction is identified as "empty" or "loaded" and refers to direction of travel – not status of your load - i.e. empty pickup travelling towards the dump site identifies direction as "loaded" • everyone must stop all radio communication in event of an accident on the job site to allow complete availability for 1st aid and other emergency responders even if it means stopping work/travel • important to know the location of your work site (specific, detailed, understandable by others)

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will demonstrate safe practices during practical training and on the job

LINE A: WORKSITE HEALTH AND SAFETY PRACTICES

Competency: A8 Describe and use safe rigging practices

Learning Objectives:

1 The learner will describe and demonstrate a safe practical understanding of applications common to heavy equipment rigging practices.
2 The learner will describe rigging terminology and definitions.

LEARNING TASKS	CONTENT
1 Describe rigging terminology, definitions, types, materials	• terms • hitches • types of slings (different materials and configurations) • wire rope, chain, hardware including hooks, shackles, cinches, eye bolts, spreader bars, sheaves, thimbles, cable clamps, etc.
2 Describe rigging selection	• assess material to be lifted, weight, configuration of load, center of gravity • capacity, working limits, factor of safety, labelling and stamping of capacity info • condition • need for tag lines, blocking, padding
3 Use rigging	• center of gravity • rigging protection from cutting, slipping • use of dunnage (blocking) • assess conditions (wind, temp., surfaces) • use of tag lines • correct use & alignment of shackles, hooks, saddles, eye bolts • effect of rigging angles on capacity • never work under a suspended load • beware of overhead obstacles
4 Describe rigging terminology, definitions, types, materials	• assess condition (damaged, defective, worn) • identify conditions requiring replacement, types of damage • correct storage • maintenance, repair

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will demonstrate safe practices during practical training and on the job

LINE A: WORKSITE HEALTH AND SAFETY PRACTICES

Competency: A9 Assess typical worksite hazards

Learning Objectives:

1 The learner will decribe typical hazards that might be found on the jobsite or while working a block and will show understanding as to what makes it a hazard.

2 The learner will walk the jobsite or block and point out typical worksite hazards.

LEARNING TASKS	CONTENT
1 Steep terrain	• Centre of gravity depending on the machine/ being level • Rocky ground • Big stumps • Time of year (soft or frozen ground) • Descent (deciding when to go “head” first or in reverse)
2 Terrain stability	• Soft or frozen • Traction related issues • How you approach obstacles in terrain (like logs and solid rock, versus sandy rock or gravel) • Placing machine securely not just sitting there, but when using the attachment – there can be a false sense of security created if you are sitting secure, but then starting the job will change things.
3 Overhead wires and obstacles	• High voltage wires • Overhangs • Demolition
4 Dangerous trees	• All snags have to be taken down. If a snag will fall into the block, it has to come down. A snag is any dry standing tree. • Huge fines if the trees are left standing. • These are usually flagged, but everyone is responsible. • Identifying snags
5 Wildlife	• Osprey nest, etc. are usually marked on the map. If not, stop everything and let someone know. • You try not to bother the wildlife. A bear in a den – leave the trees around it.

6	Fire	• In fire season, every machine has designated fire equipment. Either automatic fire suppression, or hand extinguishers. Standardized equipment: piss can, automatic suppression on the machine, or equivalent fire fighting capabilities, shovel and Pulaski. This equipment is for when a fire starts while on site. • In fire watch, fire trucks are ready to go. • Humidity is higher than the temp. insurance is ok. Crosspoint is when the humidity crosses the temp (is becoming lower than the temp) than operation shuts down. Degree of hazard depends on the level of humidity versus temp.
7	Map orientation	• Maps are extremely detailed and they outline hazards, rocks, construction, pipelines, boundaries, powerlines, soft ground, quarries, tree lines, etc. • Pre-work gets done with each employee before they go in a block covers all the issues and terrain of an area and look at the map. Slope percentages, etc. Employee signs off on the pre-work knowledge.

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a final exam including questions covering content from each learning task.
- Students will demonstrate safe practices during practical training and on the job

LINE B: **ESSENTIAL HEAVY EQUIPMENT KNOWLEDGE**

Competency: **B1** **Describe common types of heavy equipment and their respective capabilities, advantages, limitations**

Learning Objectives:

1 The learner will describe common types of heavy equipment.along with their respective capabilities, advantages and limitations.

	LEARNING TASKS	CONTENT
1	Describe compaction equipment	capabilities, advantages, limitations of: • rubber tire rollers • sheep's foot and smooth drum rollers • jumping jack • plate / reversing plate • hoe pack
2	Describe Trucks	capabilities, advantages, limitations of: • articulated rock trucks • tandem with trailers: pup, pony, end dump, belly dump, transfer box, etc • steel vs. aluminium boxes • equipment transport: tilt trailer, low bed • others : mixer, roll off bins, slinger, water, crane, Hiab, tanker, etc
3	Describe Excavators	capabilities, advantages, limitations of: • variety of sizes • special configurations: long reach, boring, pile driving, forestry, demolition, wide track, rubber tire carrier • many attachments
4	Describe Loaders	capabilities, advantages, limitations of: • wheeled, tracked • skid steer
5	Describe Scrapers	capabilities, advantages, limitations
6	Describe Graders	capabilities, advantages, limitations
7	Describe Dozers	capabilities, advantages, limitations

8	Describe other equipment types	Brief summaries of capabilities, advantages, limitations of other common equipment possibly including: • rock drills • cranes, pile driving • aggregate processing plants, concrete batch plants, asphalt • cable shovels, draglines • skidders, forestry specialty machines • etc.

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE B: **ESSENTIAL HEAVY EQUIPMENT KNOWLEDGE**

Competency: **B2** **Describe common attachments for heavy equipment and their purposes and capabilities**

Learning Objectives:

1 The learner will describe common attachments for heavy equipment

LEARNING TASKS	CONTENT
1 Describe buckets & blades	• dozer blades: 'U', 'V', conventional angle, 6way, etc • grader blades: conventional, front plough, wing blade • loader buckets: general purpose, rock or digging, light material or chip • excavator buckets: general purpose, digging, extreme duty (rock), clean out, light material (oversize cleanout)
2 Describe common attachments	• quick change systems • rippers, scarifiers • hydraulic thumb • hoe pack • cutting wheel • breaker/hammer • logging grapples • material grapples (orange peel, fork grappler, etc) • forks • sweeper
3 Describe specialty attachments	• concrete muncher, crusher/pulveriser • shear • stump grinder, grinders • cable/pipeline plough • auger • pile driver • side boom • feller buncher • harvester, processor, delimber (stroker) • etc.

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE B: ESSENTIAL HEAVY EQUIPMENT KNOWLEDGE

Competency: **B3** **Describe basic tools, supplies, and lubricants associated with heavy equipment**

Learning Objectives:

1 The learner will describe basic common hand held and gas powered tools that are commonly used with heavy equipment.

2 The learner will decribe basic common lubricants and supplies commonly used to maintain heavy equipment.

LEARNING TASKS	CONTENT
1 Describe mechanic's tools	• common tools • specialty tools e.g.: pullers, valve grinders, brake tools, spring compressors, multi testers, inspection mirrors, pick up magnets, 'easy outs', dial gauges, torque wrenches, taps & dies, filter cutters, and more… • hammers, drifts, bars, chisels, files • tools for 'heavier work' e.g.: ¾ " drive, snipes, multipliers • line boring, track press, "porta power", etc, • chain block, 'come along', jack • air tools (pneumatic): impact wrench, ratchets, die grinder, greaser, and more
2 Describe welding equipment & supplies	• stick welding, wire feed, brazing • oxy acetylene cutting systems • 'tiger torch' • welding helmet, cutting goggles • chipping hammer, wire brush, chalk, tip cleaner • grinder, drill, cut off saw • air tools (pneumatic): flux chippers, die grinders, grinders, drills, and more…
3 Describe gas powered tools	• vice, cutting table • cut off saw • chain saw (danger, need for training/ experience) • 2 stroke vs. 4 stroke - mixed gas vs. straight gas • pressure washers • compressors (gas or electric) • generators (gas or diesel)

4	Describe lubricants	• grease • common oils: engine, gear, hydraulic • Viscosity and other basic properties and classifications • API classifications for engine oil – "S' for spark, "C" for compression • specialty oils: 2 stroke oil, chain oil, air tool & compressor oil, cutting lubes, invert, open gear lube, spray lubes including penetrant, rust, 'WD40", etc…
5	Describe common supplies	• De-icer, methyl hydrate, starting fluid (ether), antifreeze, brake cleaner • duct tape, insulating tape, 'hay' wire (mechanic's wire), 'zip' straps (cable ties), tie downs • fasteners: nuts & bolts, washers, screws, rivets, pins, hose clamps • O – rings, seals, grease nipples, pipe fittings, grommets

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE B: **ESSENTIAL HEAVY EQUIPMENT KNOWLEDGE**

Competency: **B4** **Define common heavy equipment and industry terminology**

Learning Objectives:

1 The learner will describe common industry terminology.

LEARNING TASKS	CONTENT
1 Define road building/heavy construction terminology	• civil engineering and surveying terms and definitions • aggregates terms and definitions • mechanical systems terms and definitions • general excavating terms and definitions
2 Define logging terminology	• species identification • civil engineering and surveying terms and definitions (this is related to map orientation as the terms are referenced in the legend) • bucking specifications • ground based or cable based logging as it relates to mechanical terms. • Machine specific descriptions and operation terms and definition

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE B: **ESSENTIAL HEAVY EQUIPMENT KNOWLEDGE**

Competency: **B5** **Describe heavy equipment mechanical systems (general)**

Learning Objectives:

1 The learner will descibe the basic mechanical systems used in heavy equipment and show a basic mechanical understanding for how each system works.

LEARNING TASKS	CONTENT
1 Describe engines	• basic theory, basic parts and their function, compression vs. spark • lubrication theory, systems • cooling systems • fuel systems • air induction & exhaust (incl. air filtration, blowers, turbochargers)
2 Describe hydraulic systems	• basic theory including pressure/area/flow, basic parts and their function, variable vs. fixed displacement, pilot systems • pumps, motors • cylinders • lines • spool valves, pressure relief, rotary manifolds, accumulators
3 Describe drive systems	• basic theory including reduction/multiplication • direct drive; fluid drive • transmissions, differentials, swing gear cases, final drives, etc.
4 Describe track systems (undercarriage)	• pads, chains (rails), idler, sprocket, bottom and top (carrier) rollers, recoil mechanism, track adjuster
5 Describe braking systems	• air • hydraulic • air/hydraulic • engine braking systems (compression, exhaust)

6	Describe electrical systems	• basic theory • 12V and 24 V systems • alternators, starters • batteries • other systems including lights, heater motors, auxiliary equipment
7	Describe ground engaging tools/ systems	• components of blades, buckets, attachments, booms, c-frames

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE B: **ESSENTIAL HEAVY EQUIPMENT KNOWLEDGE**

Competency: **B6** **Describe heavy equipment inspection and maintenance (general)**

Learning Objectives:

1 The learner will describe the major mechanical components of heavy equipment and how to maintain the equipment

2 The learner will describe common potential component failures and will have a basic understanding of possible symptoms of these failures.

LEARNING TASKS	CONTENT
1 Describe major mechanical components	• identify components "on the machinery" and describe function
2 Describe potential failures, symptoms and indicators of failure	• thorough visual inspections with intent and understanding; awareness of common problems, common loose hardware, common location of cracks • symptoms: noise, vibration, smell, leaks, cracks, lack of power and /or improper function, exhaust color…. • appropriate responses: service required, immediate repair required, immediate removal from service, OR scheduled for later with assessment of priority
3 Describe pre start procedures	• detailed pre start procedures are included for each machine in operating goals F to K • general procedures include visual checks for loose, damaged or leaking components, fluid levels, operational checks to confirm proper operation of all systems
4 Describe maintenance procedures	• greasing • adding fluids as required • draining fuel sumps and water separators • tightening loose hardware • adjusting belt tension • repairing leaks, replacing o- rings, replacing hoses • replacing filters, especially air and fuel – including bleeding air from fuel system • adjusting track tension • maintaining tire pressure • cleaning and maintaining batteries

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE B: **ESSENTIAL HEAVY EQUIPMENT KNOWLEDGE**

Competency: **B7** **Describe common types of logging equipment and their respective capabilities, advantages, limitations**

Learning Objectives:

1 The learner will describe common types of heavy equipment used in logging along with their respective capabilities, advantages and limitations.

LEARNING TASKS	CONTENT
1 Describe feller bunchers	• Describe feller bunchers - different types and their uses - *flat bottom (no tilt option – excavator style configuration) used in less extreme ground conditions, tilter style (house pivots, same body style as flat bottom - designed for steep terrain), rubber tire (VERY uncommon) used for small jobs. Different types of heads hot saw (faster, more productive smaller types of wood) and intermittent saw (safer, more control for larger wood and for new operators). • Operation - *to fall wood and to pile in small manageable “bunches” for log forwarding (done by the grapple yarder, skidder, hoe chucker etc.) • Advantages - *over hand falling is it’s much safer and way more volume/efficient • Limitations - *extremely steep rocky ground, very large trees (they can do max 90 cm) and extremely soft, wet ground limited by operator ability - *Note: hand fallers can do bigger trees, and operate in steeper, more variable terrain
2 Describe wheel skidders	• Describe wheel skidders - Different types and their uses - *line skidder (use: some steep application or smaller field operation for private use), grapple skidder (mainstay of the industry. Used in most skidder operations, more often frozen ground and in conjunction with bunchers),

		swing boom (more extreme terrain (steeper, softer), more selective logging, leave stands), clam bunk (frozen, very stable ground, and log skids), forwarders (for stump processed wood) • Operation - *to forward felled or processed wood to the loading site, road or landing • Advantages - *fast, efficient, reliable, and safe method of forwarding trees from the stump to the processing site • Limitations - *Soft ground, steep ground, very deep snow, and operator ability
3	Describe track skidders	• Describe track skidders - Different types and their uses - *line skidder (use: some steep application or smaller field operation for private use), grapple skidder (mainstay of the industry. Used in most skidder operations, more often frozen ground and in conjunction with bunchers), swing boom (more extreme terrain (steeper, softer), more selective logging, leave stands), clam bunk (frozen, very stable ground, and log skids), hoe chuckers (use: steeper, softer, rocky or more sensitive ground. Where the track skidder cannot go, a hoe chucker can) • Operation - *to forward felled or processed wood to the loading site, road or landing • Advantages - *more traction, less chance of loss of traction in slipperier or steeper terrain. Still considered a fast, efficient, reliable, and safe method of forwarding trees from the stump to the processing site • Limitations - *more expensive, (undercarriage is expensive and wears out more frequently), softer ground, extreme slopes, very deep snow, and operator ability

4	Describe grapple yarders	• Describe grabble yarders - Different types and their uses - *tower (almost obsolete, only used in very special circumstances), grapple yarder (different makes), snorkel and super snorkel (like a fishing line, way higher boom, casts the line out and catch it and bring it back) • Operation - *track or rubber mounted (tires) machine closely resembling a crane. • Advantages - *totally adept for steep and extremely sensitive or soft ground. No machine is required to damage the terrain. • Limitations - *Limited by road construction (machines are always parked on the road because they are very heavy – upwards of 100 tonnes), limited by places to tie blocks to
5	Describe dangle head processors	• Describe dangle head processors - different types and their uses - *stroke delimber (use: to measure and quickly delimb and sort to different sawmill specs), butt-plate style (use: processes wood in uniform length) mobile slasher deck style (almost obsolete, but it's use is a bucking machine) computerized measuring wheel (use: wood is measured electronically when being fed through by hydraulic rollers) • Operation - *measures, delimbs, sorts trees to desired mill specifications and capable of felling standing timber • Advantages - *less on-the-ground man power. Fast, efficient, reliable, and safe method of bucking • Limitations - *Operator ability, large old growth wood (anything over 90cm) - *stroke de-limber is higher maintenance and hard to transport, uses are limited in many situations

6	Describe log loaders	• Describe log loaders - different types and their uses - *wheel loader (use: they are rarely used for loading trucks in the field, but are often used in a dry land sort), self-loaders (use: independent loading machine able to load, unload and haul itself with no other machines required. This is because it's a logging truck with a log loader attached to it.), heel boom (used for hoe chucking or loading – multi-purpose. The log is held in greater balance), Butt 'n' top (use: most versatile method of loading logging trucks), clam or bypass grapple (use: piling, brush piling, loading trucks, unloading trucks) • Operation - *to load any transportation mode with cut to length or full-length trees • Advantages - *self-loader: versatility in block clean up, independence from the need of other machines • Limitations - *self-loader: more expensive, heavier than a logging truck (net payload is less), the reach is boom is less
7	Describe other logging equipment	• Describe other logging equipment - Spider-leg machine (new technology) - Power saws/ chain saws - Short loggers (logging trucks) - Multi-trailered logging trucks

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a final exam including questions covering content from each learning task.

LINE B: **ESSENTIAL HEAVY EQUIPMENT KNOWLEDGE**

Competency: **B8** **Describe common attachments for logging equipment and their purposes and capabilities**

Learning Objectives:

1 The learner will describe common attachments used for heavy equipment in the logging industry

	LEARNING TASKS	CONTENT
1	Describe attachments for feller bunchers	•Hot saw, intermittent saw
2	Describe attachments for wheel skidders	•winch, blade, chokers, main line; arch & boom;
	Forwarder	•clam bunk, attached log loader
3	Describe attachments for track skidders	•winch, blade, chokers, main line; arch & boom;
	Hoe chucker	•heel boom
	Forwarder	•clam bunk, attached log loader
4	Describe attachments for grapple yarders NOTE: more content required	•Chokers, grapples
5	Describe attachments for dangle head processors	•Stroke de-limber, dangle head (two different types of measuring systems available: butt-plate style & computerized measuring wheel, some makes have both)
6	Describe attachments for log loaders	•Hydraulic cab riser, heel boom, butt 'n' top, clam or bypass

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a final exam including questions covering content from each learning task.
- Students will describe and apply basic equipment knowledge during practical training and on the job

LINE C: EMPLOYABILITY SKILLS AND PROFESSIONAL PRACTICES

Competency: C1 Describe general employability skills

Learning Objectives:

1 The learner will describe how to obtain employment in the heavy equipment industry and the basic personal skills and attributes employers expect once employed.

LEARNING TASKS	CONTENT
1 Describe "how to get a job"	• present yourself well; speak well; resume writing skills; interview skills • job search resources include: internet (there are many job search sites – some are for specific industries and regions); newspapers; employment centers; job fairs • yellow pages are available in public libraries for all parts of the country; show a lot of good info. – often give website addresses, contact names, description of type of work done and size of operation • do not ignore the potential of personal networks of family, friends, acquaintances, former co-workers • show up in person to offices, job sites (repeat), try to find out the name of relevant people, phone (repeat), follow up phone calls with visits (repeat)
2 Describe "how to keep a job"	• Researchers have found that 90 to 95% of the people who lose their jobs do so because they cannot get along with other people on the job. Only 5 to 10% of the people lose their jobs because they cannot do the work • define and discuss passive, aggressive, and assertive behaviour • conflict resolution, coping with angry people

3	Describe skills and attributes sought by employers	• Competency, knowledge, skill and experience are important – but 'soft' skills/ interpersonal skills are even more important • Business Council of BC survey results: 5 important attributes sought by employers: 1. accountable/ responsible 2. honest/ ethical 3. high performance standards 4. enthusiastic/ positive attitudes 5. customer service oriented 5 important skills sought by employers: 1. teamwork 2. interpersonal 3. speaking and listening 4. problem solving 5. leadership • Conference Board of Canada reports that workers need: 1. academic skills and skills specific to their job 2. personal skills 3. cooperative or teamwork skills (social skills)

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE C: EMPLOYABILITY SKILLS AND PROFESSIONAL PRACTICES

Competency: C2 Describe human rights, respect in the workplace, labour relations

Learning Objectives:

1 Describe basic human rights in the workplace and the labour relation issues and jurisdictional authorities that deal with this topic.

LEARNING TASKS	CONTENT
1 Describe human rights	• define and describe: discrimination based on: race, gender, sexual orientation, age • describe implications for legal liability, labour relations grievances/arbitration
2 Describe respect in the workplace	• sexual harassment, sexual equality • respect for cultural differences • respect for differing views, levels of experience, value everyone's opinions • implications/responsibilities for employers, supervisors, employees • effects on productivity, team building, morale • define and discuss passive, aggressive, and assertive behaviour • conflict resolution, coping with angry people
3 Describe general labour relations	• union and non union operations • agreements, contracts • bargaining • seniority, job security • grievance and arbitration • roles and responsibilities of: shop steward, bargaining committee, business agent
4 Identify relevant jurisdictional authorities	• roles, responsibilities, authority of: • Ministry of Labour (employment standards act) • Labour Relations Board (independent administrative tribunal) • The Courts

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE D: JOB CONTROL AND ENGINEERING BASICS

Competency: D1 Define engineering and survey terminology

Learning Objectives:

1 The learner will understand and define common engineering and surveying terminology.

LEARNING TASKS	CONTENT
1 Define terminology	• Understanding terminology is the necessary foundation of understanding and applying essential engineering concepts • Refer to Glossary of Terms

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will describe and apply job control and basic engineering knowledge during practical training and on the job

Note: Instructors may choose to meet this objective by instructing it as part of D2 to D9 – describing terms as they come up in the context of other learning tasks

LINE D: JOB CONTROL AND ENGINEERING BASICS

Competency: D2 Use simple grade checking instruments and techniques

Learning Objectives:

1 The learner will describe common instruments and techniques used to check for grade
2 The learner will demonstrate the use of basic common grade checking equipment including but not limited to dumpy level, eye level, clinometers and compass

LEARNING TASKS	CONTENT
1 Describe common instruments	Describe features, benefits, common uses. Demonstrate procedures to set up and use the following instruments; have students practise – possibly as a small group exercise. Reinforce proper care – expense and fragility of instruments. • Dumpy level (builders level, 'transit', engineers level) • eye level (hand levels) • rotary laser; receivers for grader blades, excavators • pipe lasers • tripods, rods • electronic measurement systems • chains, nylon and metal tapes • clinometers (Suunto) • compass: orient construction to drawings, use to set out angles, allow for magnetic declination
2 Use instruments for common layout and control tasks	Lead exercises to reinforce the following skills. • choose instrument and technique for various tasks • establish elevation of instrument relative to benchmarks and perform calculations to specified elevations. For example: set up laser to dig excavation at specified grade from a bench mark • re-establish set up after instrument has been removed and replaced • determine elevations of existing structures • transfer elevations • common grade checking (e.g. check level of excavation), control cut and fill elevations, trenching grade, road building, installation of structures

- create offset layout from existing layout; re establish “lost” or damaged layout
- layout right angles using compass bearings and/or engineer’s level
- use pipe laser for vertical and horizontal control of pipe installation
- using instruments to control the creation of slopes is part of the content for D3

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will describe and apply job control and basic engineering knowledge during practical training and on the job

Note: It is recommended that rotary lasers, GPS, and tripod and rod systems are also covered within this section but due to the cost, varying systems and changing technology it will not be required.

LINE D: **JOB CONTROL AND ENGINEERING BASICS**

Competency: **D3** **Describe expression of slopes and grade**

Learning Objectives:

1 The learner will identify expressions of slope using angle, percentage and ratio.
2 The learner will demonstrate ability to create a specified slope.

LEARNING TASKS	CONTENT
1 Define expression of slope	Lead class exercises to reinforce concepts. Have students calculate the expression of slope when given dimensions of rise and run; identify 45 degree angles as ratio and percent, identify 1:1, 2:1, 3:1 slopes as percent. • percent expression of slope: rise ÷ run x 100 , used to express vertical alignment of centerline (road grade), cross fall, crown, pipe, topography • ratio expression of slope: run to rise expressed as a ratio to 1, used to express slope of cuts or fills, embankments • angular measurement in degrees • typical/common slopes: 2% crown, 2% sanitary, 8% public roadway, 20% heavy haul road, ¾:1 minimum slope of trench walls in Class A soil, 2:1 typical cut & fill, 3:1 typical for mowers
2 Identify slope	Lead class exercises: Have students identify slope of existing works. (Examples: roadway, cut and fill slopes, roof line, culvert, etc.) • Use different techniques to identify slopes: 1. Direct measurement with Suunto clinometer 2. Determine distance and elevations with instruments, calculate expression of slope 3. Approximate with common sense approach as appropriate for task i.e. eye level and pacing or tape measure

3	Control the creation of slope	Lead class exercise: Have students create specified slopes. Examples: simply lean a 2x4 against a building “on grade”, lay a piece of pipe on grade where students can achieve specification with minor hand digging, possibly create layout (install stakes), if time and resources permit – work with machinery to fill, cut, trench “on grade”. • Use different techniques to control construction/installation of slopes: 1. Direct measurement with Suunto clinometer 2. Determine distance and elevations with instruments and calculate expression of slope 3. Approximate with common sense approach as appropriate for task i.e. eye level and pacing or tape measure 4. Pipe laser for vertical and horizontal alignment of pipe

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will describe and apply job control and basic engineering knowledge during practical training and on the job

LINE D: JOB CONTROL AND ENGINEERING BASICS

Competency: D4 Use job control and layout: grade stakes, ribbon trails and Codes
Learning Objectives:

1 The learner will interpret common types of stakes, ribbons and associated abbreviations for each.
2 The learner will use layout stakes to complete a practical exercise in job control.

LEARNING TASKS	CONTENT
1 Describe abbreviations used on stakes	Abbreviations commonly used on stakes: • B/M bench mark • C cut • C/B catch basin • SMH sanitary manhole • Elv or EL elevation • F/G finish grade • P/L property line • R/W right of way • San or S sanitary • Mon monument • G gas • PVC poly vinyl chloride • F fill • Stm or St storm • TBM temporary bench mark • Centerline • M/H manhole • STMH storm manhole • E/P edge of pavement • S/G sub grade • IP iron pin • RP reference point • W or W/L waterline • O/S offset • CMP corrugated metal pipe

2	Interpret stakes	Interpret common types of staking: • property line, iron pins • center line, stationing • offset • cut, fill • grade • slope • reference points • bench marks, temporary bench marks: geodetic and referenced to assumed elevations • survey monuments: geodetic, precise, permanent, protected by law • cross-heads • location of works e.g.: manholes, catch basins, headwalls, etc
3	Use layout to control work	• Use layout (stakes) to complete an exercise: measuring elevations, slopes of existing structures with reference to given benchmarks; creating structures from layout; simply identifying the info given by layout…

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will use job control and basic staking knowledge to complete a simple practical exercise. The exercise will have students staking out a simple “mock” roadway and sidewalk. The student will place stakes in the ground to signify bench mark, center line, property pins, slope, catch basins, sanitary and/or storm manholes, gas, the edge of pavement, and any monuments.
- Due to varying practical training sites, schools will be responsible for creating a job plan and schematic that meets these practical training needs and match the working area of their own facilities..

LINE D: JOB CONTROL AND ENGINEERING BASICS

Competency: D5 Describe utilities

Learning Objectives:

1 The learner will describe typical utilities and the common placement each utility type
2 The learner will describe techniques to expose existing utilities.

LEARNING TASKS	CONTENT
1 Describe common utilities	• water: pressurized systems - implications of this for installation/ maintenance/leakage/thrust blocks/retainers etc., sources, purification, testing and monitoring of quality, pumping stations, flushing for maintenance of existing systems, chlorination and flushing and testing of quality and leakage for installation of new systems, certification of maintenance personnel, common components and material types, procedures in event of damage • sanitary: health implications, alignment specifications (bends, vertical and horizontal alignment, minimum slope), treatment plants, testing for installation, common components and material types, procedures in event of damage • storm: introduction to engineering concepts relevant to design (i.e. catchment or watershed areas, flow estimates, design criteria – 20 or 100yr flood event estimates), common components and material types, procedures in event of damage. • Hydro/Tel: commonly used to refer to electrical and communication including telephone, cablevision, internet, fibre optics..., overhead and underground, installations include “hazard tape”, differentiate transmission and distribution systems, common components and material types, safety concerns and procedures in event of contact or damage.

- Gas: pressurized, naturally odourless (an additive is used for 'rotten egg' smell), dangerous due to several things: flammable/explosive, leaks can go undetected, toxic, high pressure flow is significant hazard in event of rupture…rupturing gas lines is potentially deadly, often generates large fines, and is always expensive…procedures in event of damage or leaks.

2 Describe typical location of utilities

- Use drawings from engineering specs to show standards and typical engineering specifications:
- water main is 2m offset from road centerline (opposite side of center than storm and sanitary) with valve boxes (Nelson Boxes) for main and hydrants flush with paved surface; corp stops threaded into mains, curb stop and water meter on municipal boulevard just outside property line
- storm main 1.5m and sanitary 2m offset from centerline, manholes provided at intervals with cast iron access flush with paved surface; storm water is collected from building services, open drainage, and catch basins with grates in parking areas and the curb lines of roadways; sanitary and storm services for vacant lots end in a capped 'T' at property line with clean out extending to surface
- Hydro Tel is overhead or underground in boulevard usually .75m deep, except street lighting services which are often much shallower, service lines run to meters on buildings
- Gas is underground; in exposed area of boulevard – not under sidewalks; shallow – often less than .6m; service lines run to meters and valve at buildings

3	Describe techniques to expose existing utilities ("day-lighting")	• as built drawings and locater services are helpful but not reliable • differences in soil color, density and type can indicate previously disturbed ground – can be helpful in locating service trenches • bedding sand is obvious sign of service location – sometimes drain rock • requires patience, effective teamwork with labourer and precise control of machinery • in simplest terms: break up surface and start excavating with machinery only if confident as to location and potential risk; then labourer digs a narrow and shallow trench across the entire width of the 'old' trench perpendicular to the alignment of the service; labourer moves clear and watches as operator clears away material to a depth less than what was 'tested' by the labourer; repeated until labourer finds the line…

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE D: **JOB CONTROL AND ENGINEERING BASICS**

Competency: **D6** **Describe soils**

Learning Objectives:

1 The learner will describe the difference between organic and non organic soils, the 3 basic soil groups, the characteristics of each and how to classify them into basic terms.

	LEARNING TASKS	CONTENT
1	Describe soil types	• organic / non organic • 3 basic soil groups: cohesive / granular / organic • cohesive soils: (clay, silt); plastic when wet; stick together; water content critical for proper compaction; compacts poorly; poor load bearing • granular soils: sand and gravel; not plastic; low cohesion; drains well; easier to compact; excellent load bearing • organic soils: very poor load bearing; not compactable; water creates “problems!”
2	Distinguish different types and suitability for construction	• excavating professionals should be able to distinguish cohesive / granular / organic types; especially as it relates to load bearing ability and sensitivity to water content; whether to reject or use soils for different applications • practical experience can be assisted by common field tests for soil texture: feel test, moist cast test, ribbon test, taste test (for grit), shine test • wet cohesive soil feels smooth and greasy, not gritty, grains cannot be seen, can be rolled/ forms a cast • wet granular soil feels gritty, cannot be rolled/does not form a cast • jar test: organics dissolve, particle sizes are easier to see to help determine texture

3	Describe soil characteristics	• load bearing capacity (load without deflection/plasticity) • density: ratio of weight to volume • adhesion, cohesion, cohesiveness: extent that particles stick together • shearing resistance: determined by degree of cohesiveness • permeability, permeable, impervious: resistance to water flow through material, relates to porosity: volume of pore space/voids • plasticity, plastic limit (minimum moisture where soil will ribbon), liquid limit (moisture content at which soil flows); plastic soil can be rolled into a moist ribbon – granular soils will not ribbon/are not plastic • elasticity: deformation under load, return to original • gradation: distribution/ variation of particle sizes; soil consisting of wide range of particle sizes is said to be "well graded" and compacts more readily, poorly 'graded' soils have uniform sizes, do not compact as well
4	Describe soil classification	• texture: describes the relative portions (size distribution) of primary soil particles: clay, silt, sand; and rock fragments: gravel, cobbles, stones, boulders • structure: the way soil particles aggregate together; shape and arrangement • consistence: a measure of a soil's cohesion or resistance to breaking • colour: indicator of oxidation – water table; mottling, root levels • soil type classification is based primarily on texture (proportion of clay, silt, sand); with descriptions added for texture modifiers (proportion of gravel, cobbles, stones, and boulders); and descriptions of structure, consistence, colour and other properties • texture classes: clay, silty clay, sandy clay, silty clay loam, clay loam, sandy clay loam, silt, silt loam, loam, sandy loam, silty sand, loamy sand, sand

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE D: **JOB CONTROL AND ENGINEERING BASICS**

Competency: **D7** **Describe common aggregates**

Learning Objectives:

1 The learner will describe basic aggregate processing and the product characteristics and common uses.

LEARNING TASKS	CONTENT
1 Describe aggregate processing	• screening • crushing • washing
2 Describe characteristics	• permeability • load bearing • resistance to shearing • gradation • plastic limit • liquid limit
3 Describe common products and uses	• pit run • screened road base 3" minus • bedding sand • crushed road mulch • asphalt aggregates • drain rock • chips, driveway chips • recycled asphalt • concrete sand, C 33 • stucco sand

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE D: **JOB CONTROL AND ENGINEERING BASICS**

Competency: **D8** **Describe bulking and settlement of materials**

Learning Objectives:

1 The learner will demonstrate the use of bulking and settlement principles, swell and compaction factors.

LEARNING TASKS	CONTENT
1 Describe bulking and settlement principles	• Define bulking: occurs when soil structure is disturbed causing more and larger voids • Define settlement: decreased voids • Define bank volume • Explain why different materials bulk and settle in different proportions: gradation, cohesion, tendency of water to lubricate particles
2 Use swell factors and compaction factors	• a swell or bulking factor of 12% means that the excavated / loose volume will be 12% greater than the undisturbed bank volume • a compaction or settlement factor of 20% means that the compacted volume will be 20% less than the loose volume • note that swell factors are not identical to compaction factors: compaction factor is the inverse i.e. 1-(1÷(1+swell factor)) • note that the Cat performance handbook and other sources commonly list load factors which are the inverse of swell factors: L.F.= 1÷(1+swell) • determine whether volumes will increase or decrease in examples of excavating tasks • review simple calculations of area and volume • calculate volumes for examples using swell and compaction factors • common swell factors: granular soils 12%, cohesive soils 20%, organics 40%, blasted rock 25 to 40%

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will describe and apply job control and basic engineering knowledge during practical training and on the job

LINE D: **JOB CONTROL AND ENGINEERING BASICS**

Competency: **D9** **Describe compaction practices and equipment**

Learning Objectives:

1 The learner will describe compaction equipment, principles and effects of compaction on differing soils and techniques in compaction testing..

LEARNING TASKS	CONTENT
1 Describe soil compaction principles	• Why compact?: decreased voids; increases load bearing capacity; reduces settlement; provides stability; decreases swelling and contraction, frost heaving, water absorption and retention • Types of compaction: vibration (frequency and amplitude), impact, kneading, pressure (static and vibratory forces) • cohesive soils generally need high impact, kneading, thinner lifts • granular soils generally need vibration • well sorted (i.e. poor gradation) materials reach max. density with little or no compaction effort • define gradation (distribution/variation of particle sizes), density(ratio of weight to volume), cohesiveness (tendency to stick together) • effects of moisture content: dry soils resistant to compaction, water acts as lubricant to help overcome the cohesive nature of soil particles, increases density – transmits energy/vibration, optimum moisture content. Soil needs to have an optimum amount of moisture to achieve maximum density. • pre loading technique (static, pressure) • lift depth: must be appropriate to equipment used and degree of compaction required; too deep and a layer within the lift will not be compacted; typically 4” for small plate, 8 to 16” for larger, possibly 18 to 24” for large hoe pack • patterns and number of passes to apply equipment for effective compaction

2	Describe compaction equipment	• water trucks (tank, pump, water distribution bars), hoses, nozzles, sprinklers • plates • rollers • hoe packs • 'jumping jacks' (rammers) • tamping bars • dynamic compaction (heavy tamping)
3	Describe compaction testing	• determination of density – relates to load bearing characteristics, resistance to settling • proctor, modified proctor specification systems: lab tests determine maximum density of soil, effects of moisture – optimum moisture content. Modified proctor is done with more force in the lab than proctor. Testing results are expressed as a percentage of the ideal or maximum that was determined under the controlled lab conditions (relative density – 95% and 98% are common standards). • nuclear density testing: involves a radiation source from a probe and a meter that measures how much radiation is absorbed by the soil. Dense soil absorbs more radiation than loose soil. • sand cone test • water volume (similar to sand) • probing • cone penetrometer (California Bearing Ratio CBR, Cone Index CI) • deflectometer • Clegg Impact Soil Tester • Load testing/Roll test (visually assessing deflection under load)

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will describe and apply job control and basic engineering knowledge during practical training and on the job

LINE D: JOB CONTROL AND ENGINEERING BASICS

Competency: D10 Interpret drawings and plans

Learning Objectives:

1 The learner will apply basic knowledge of profile and plan view drawings and will determine basic characteristics and reference points on drawings

2 The learner will calculate basic cut and fill volumes using profile drawings.

LEARNING TASKS	CONTENT
1 Apply basic knowledge underlying drawings	• Metric and imperial measurement • Scale • Abbreviations, symbols common to civil drawings • Distinguish horizontal distance from slope distance
2 Describe types of drawings	• Plan view: drawing with the view from overhead • Profile view: drawing of side view with the vertical scale exaggerated, usually 10x the horizontal scale; showing original ground and design grades of roads, pipe, manholes, culverts, bridges; cuts and fills shown are at the centerline only; often on the same page as a plan view aligned on the same horizontal scale, • Section: drawing of a 'slice' of works at right angle to the centerline with the same horizontal and vertical scale • Additional features of drawings: scale, north orientation, legends, creation and revision dates, "created by" info, detail drawing insertions
3 Interpret drawings for civil works	• Determine cuts and fills of road construction at specified centerline points on profile • Determine depth of pipe at specified points • Calculate the volume of aggregate types allowing for settlement i.e. road base or pipe bedding • Create material lists i.e. pipe, valves, etc

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will describe and apply job control and basic engineering knowledge during practical training and on the job

LINE D: JOB CONTROL AND ENGINEERING BASICS

Competency: D11 Describe the Elements of a Logging Plan

Learning Objectives:

1 The learner will describe the purpose of the logging plan, who is responsible for the plan, issues common and consequences and penalties for not following the plan..

LEARNING TASKS	CONTENT
1 Explain what a logging plan is and why it is used	• The logging plan is engineered, designed and agreed approach that lays out the priorities of the licensee, the contractor, the environment and the regulatory bodies (including First Nations and government agencies). It provides essential and relevant direction for the removal of the resource. • It is used to advise on issues that can or will arise during the logging process. • The execution of the logging plan is the responsibility of the Prime Contractor – the essential contact point for the public, and by any other industry or governing body wanting clearance to do work in the area. This is a matter of safety and legality.
2 Creation of the logging plan	• The drafting of the logging plan is the role of the engineers for the owner of the resource or wood or land
3 Describe the role of pre-work in the implementation of a logging plan	• Pre-work is the communication of any vital concerns of the logging plan between the foreman and the operators
4 Explain consequences and/or penalties of deviation from the logging plan or even accidental variation of set parameters	• Understand flagging and ground markers and how they relate to map: Colour coded flagging is used to identify boundary location, falling corners, road right of way, etc. Be aware that these can change from operation to operation • The other thing that everyone is responsible for is noticing snags. Snags are trees that are dried up and a safety hazard. It's mandatory that they are taken down. If left behind the company can be charged LARGE fines. If the snag is outside the block then it is cut down by hand.

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a final exam including questions covering content from each learning task.

LINE D: **JOB CONTROL AND ENGINEERING BASICS**

Competency: **D12 Identify environmental concerns, issues & regulatory compliance**

Learning Objectives:

1 The learner will identify environmental concern, common issues and list regulatory compliance that commonly affect the logging plan.

2 The learner will apply basic job planning and mapping skills by walking the block and marking any environmental issues or concerns on a map

LEARNING TASKS	CONTENT
1 Responsibility for the resource	• In order to reap gains from the resource in the future, it needs to be treated in such a way for it to be regenerated. • Managing environmental degradation by maintaining or exceeding the standards set out in operator procedures, environmental agencies and logging plans (i.e. **The Forests Practices Code**)
2 Operator's responsibilities	•Keep breakage to a minimum because waste will be assessed and the contractor can be fined or charged for potential loss of revenue to the government. Applicable to crown land & TFL: anything left in the field over 8ft at 20 cm will be assessed and charged against the logging contract •Clean up as you go (understand the necessity or they will have to repeat the effort unless it's done as you go). •Every single metre of wood that goes across the weigh scale the licensee pays stumpage on • . So if you leave potentially merchantable wood behind, the contract will be charged for it. •Don't leave human litter •Try to contain any fluid spills (esp anti-freeze) – amounts for each fluid are outlined in the Forest Practices Code (Water Act). Don't leave hoses, cables, any mechanical parts •Do not leave standing water. If a rut contains water, it has to be drained (filled in) and returned to original state as best possible.

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a final exam including questions covering content from each learning task.
- Students will apply job planning and mapping knowledge during practical training and on the job. They will walk the block and mark any environmental issues or concerns onto a topographic map provided of the area.

LINE D: **JOB CONTROL AND ENGINEERING BASICS**

Competency: **D13** **Interpret Maps and Implement Logging Plan: Identify Concerns and Hazards**

Learning Objectives:

1 The learner will interpret relevant symbols and notation found in map legends.
2 The learner will walking the block, identify and mark any hazards or concerns on a map

LEARNING TASKS	CONTENT
1 Interpret maps	• Details of map are critically important and all relevant symbols and notations can be found in the map legends (some legend items are defined in the Glossary of Terms, others are specific to the company generating the map and/or the work area and will be learned on the job)
2 Identify how to respond to concerns and hazards in a logging plan	• A machine operator in the field, might find a discrepancy between what exists on the ground versus what it says on the map. The appropriate response would be to stop operation immediately. A foreman or supervisor is contacted and he/she determines what further action is required, including contacting the Prime Contractor or regulatory body (side note: the Prime Contractor may in turn decide to contact the related government agency or land owner)
3 Identify types of hazards and concerns in the field	• Pre-work: foreman communicates any issues or hazards that are noted on the map. • Types of hazards: environmental, sensitive soils, steep slopes, rocky sites, deep snow, any issues related to public or First Nations

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a final exam including questions covering content from each learning task.
- Students will describe and apply job planning and mapping knowledge during practical training and on the job. They will walk the block and mark any hazards or concerns onto a topographic map provided of the area

LINE D: **JOB CONTROL AND ENGINEERING BASICS**

Competency: **D14 Describe process and benefits of Walking the Block**

Learning Objectives:

1 The learner will walk the block and show an understanding of how this action correlates with the creation of the Logging Plan and map. The learner will mark any hazards, concerns and environmental issues onto a topographic map.

Note: Engineers perform this task – not operators. Walking the Block takes considerable time. It would be helpful, but most people don't do it. If the terrain is tricky, a machine operator might walk that specific area to get an idea of how to approach it. The map really circumvents any need for a machine operator to walk the block. The work has already been done for them and the map is really detailed and almost always 100% accurate.

If it's not on the map, it's covered during the pre-work sessions. There are a couple scenarios where a machine operator will need to make a call based on his observations of the block: if there is a cabin, a bear's den, an osprey nest, then everything stops and it's reassessed. The other thing that everyone is responsible for is noticing snags. Snags are trees that are dried up and a safety hazard. It's mandatory that they are taken down. If left behind the company can be charged LARGE fines. If the snag is outside the block then it is cut down by hand.

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a final exam including questions covering content from each learning task.
- Students will describe and apply job planning and mapping knowledge during practical training and on the job

LINE E: **ENVIRONMENTAL AWARENESS, PROTECTION AND ENHANCEMENT**

Competency: **E1** **Describe common environmental issues pertaining to heavy construction/excavating**

Learning Objectives:

1 The learner will describe general environmental values, impacts and concerns pertaining to heavy construction and the environment.

	LEARNING TASKS	CONTENT
1	Assess legal, political, and public perception implications of environmental impact	cumulative effects of poor practices: • protests, resistance to development, public pressure against industry and construction • public perception drives politics. Politicians approve budgets, set policy, make laws, that affect the health of the heavy construction industry • violations of environmental law can result in criminal convictions, large penalties and wide spread publicity
2	Describe general environmental values	• aesthetics • habitat and ecological values: fish resources, wildlife • impacts and potential hazards to humans: water quality, turbidity • endangered species • archaeological, historical
3	Describe general environmental impacts	• global warming, carbon emissions • pollution (chemical, petroleum, bacteria and viruses from sewage) • sedimentation: effects on fish, interference with photosynthesis – plant life; build up of sediment in rivers • dust • habitat reduction • habitat degradation

4	Describe environmental concerns relating to fish	• basic fish biology; life cycle of salmonids • effect of silt; suffocation of eggs in gravel, juveniles reared in streams, and aquatic insects; interference with photosynthesis – the base of the food chain; sediment deposits changing flow characteristics • effect of water temperature on oxygen content • effect of increased flows • shelter from high currents: woody debris, boulders • riparian zones, leave strips, buffer zones • all drainage has the potential to affect fish bearing waters • Federal Fisheries Act: provides extensive powers to DFO personnel, provides penalties and remedies including large fines and power to order restoration of habitat/ stop work/ change project schedules and design, generally provides for the emphasis and priority to favour fish values over all others, each additional day is a new offence at law, any substance or practise that may alter fish habitat is a potential violation.

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE E: **ENVIRONMENTAL AWARENESS, PROTECTION AND ENHANCEMENT**

Competency: **E2** **Demonstrate spill control techniques**

Learning Objectives:

1 The learner will describe basic common legal implications behind environmental regulations within the Federal Fisheries Act, the Migratory Birds Act and the Environmental Management Act.

2 The learner will identify common potential sources of spills and suggested spill control techniques.

LEARNING TASKS	CONTENT
1 Describe legal implications	• define a spill: A release, leakage or spillage of a contaminant into the environment where the situation creates or may create a hazard to human life or health, to other living organisms, or to the physical environment • due diligence is only defence: enforced compliance with specific operating policies, adequate training and orientation, equipment, reporting, maintenance • Federal Fisheries Act: provides extensive powers to DFO personnel, provides penalties and remedies including large fines and power to order restoration of habitat/ stop work/ change project schedules and design, generally provides for the emphasis and priority to favour fish values over all others, each additional day is a new offence at law, any substance or practise that may alter fish habitat is a potential violation. • Migratory Birds Convention Act • Environmental Management Act: Spill Cost Recovery Regulation; Spill Reporting Regulation: there are legal requirements to report spills – the quantities that require reporting vary depending on the Dangerous Goods Category – report all spills to your supervisor

2	Describe types and potential sources of spills	• broken lines/ mechanical failure (fuel, antifreeze, lubricants) • refuelling, fuel storage, storage of other products • sewage • concrete operations • water system chlorination and flushing
3	Describe measures to reduce risk of petroleum spills	• safe storage facilities including placing tanks within containment structures, providing security against vandalism, provision of spill control resources/materials/spill kits, spill response training • designated fuelling areas • spill kits on each piece of machinery • company policies regarding recovery and recycling of lubricants • high priority given to repair of machinery leaks
4	Describe spill control techniques	• protect human health first • protect area of incident, clear it, prevent entry • use appropriate protective equipment • control source • control spread/ movement of spill, prevent entry to catch basins, storm drains, ditches, creeks and rivers • contain and clean up • white absorbent pads are for oil only, float, do not absorb water • grey or yellow pads are for all liquids, do absorb water, will sink • booms: choose placement in area of slower flows, and if possible with good access and anchoring; set at angle to direction of flow and overlap booms with regard to flow direction to minimize escape

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will describe and apply job control and basic engineering knowledge during practical training and on the job

LINE E: **ENVIRONMENTAL AWARENESS, PROTECTION AND ENHANCEMENT**

Competency: **E3** **Demonstrate job site techniques to control sediment & minimize environmental damage**

Learning Objectives:

1 The learner will describe techniques to control sediment and soil stabilization.

LEARNING TASKS	CONTENT
1 Describe soil stabilization (minimize erosion)	• maintain existing vegetation and plant vegetation on disturbed areas (hydro seeding is often used – seed, fertilizer, mulch) • use erosion control blankets, nets, mulch and other products and materials • place rock on unstable slopes • riprap potential areas of erosion in streams, foreshore • disturb smallest possible area • leave buffer zones
2 Describe sediment control techniques	• divert water from exposed/ freshly excavated areas • build access roads with “good” material – a rock road will cause less sediment than a muddy, unstable road • provide filtration with silt fences/ filters: filter cloth (geo textile fabric) and/or hay bales are placed in ditches, at outflows of settling ponds, and at the base of stockpiles • apply surface protection i.e. mulch or straw spread on soil are examples that break up rain, reduce raindrop impact, preventing drip erosion; also used in conjunction with seeding to assist regeneration • apply erosion control blanket/matting • apply sod: expensive but effective • slow down flows with sediment settling basins/ponds, check dams, reduced slopes of drainage • rock armour of ditches reduces energy of water flow greatly reducing erosion, provides weight and stability to underlying soil • plan for flood events, high rainfall – don’t be caught off guard

- stop work as appropriate for conditions, soil types
- covering sensitive slopes and stockpiles with tarps is common practise
- consolidated fill and stockpiles absorb less water and are less prone to erosion

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE F: OPERATE HAUL TRUCK

Competency: F1 Describe and comply with safety requirements

Learning Objectives:

1. The learner will describe how to work safely while working on and around an articulated haul truck. This will include understanding key regulations, machine limitations, operating procedures and tasks and the use of PPE's
2. The learner will comply with safety requirements at all times during this course.

LEARNING TASKS	CONTENT
1 Use manuals to determine safe operating procedures/restrictions	• identify and discuss relevant sections of manual • identify and discuss Warning Labels/Stickers • identify and use dash displays, sensors, warning systems
2 Assess a variety of hauling tasks for potential hazards, and explain strategy to work safely.	• describe a variety of tasks and conditions, explore hazards and safe practices • stability issues are critical to safe operation of haul trucks • appropriate speeds for conditions
3 Identify key regulations that apply to given tasks and conditions.	• identify and discuss relevant sections of regulatory requirements • legal limitations for use on public roads: licensing, insurance, width, height and weight restrictions – permits for over dimensional loads, lighting, etc. • weight limitations (and possibly dimensions) apply to non-public roads as well i.e. load limits for bridges, etc.
4 Operate Articulated Haul Truck in compliance with regulatory requirements and safe practices.	• regulations: OH&S, Motor Vehicle including weight, dimension, licensing, lighting, etc. • company policies • general safe practices • safety-first attitude, awareness • vehicle limitations • limitations of structures (i.e. bridges, culverts); limitations of haul surfaces i.e. load bearing, plasticity, general effects of heavy loads to finished surfaces

5	Use Personal Protective Equipment (PPE).	• hardhat • hearing protection • high visibility apparel (Type 1 or 2) • eye protection as required • gloves as required • safety toed footwear (CSA Class 1)

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will achieve a minimum of 70% combined score on a practical assessment form and achieve a pass mark in all boxes marked pass/fail
- Demonstrated safe practices while operating machine

LINE F: **OPERATE HAUL TRUCK**

Competency: **F2** **Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance**

Learning Objectives:

1 The learner will perform pre start equipment checks

2 The learner will perform start up and shutdown procedures

3 The learner will monitor the performance of the equipment

LEARNING TASKS	CONTENT
1 Perform pre start checks (hands on) • first as a small group activity • individually before operating each machine • as a supervised and assessed exercise before completion of the core lab	• Comprehensive pre start check • Review hazards: pressurised systems, batteries, slips & falls, etc. • identify correct fluids for each component • add fluids as required • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, some transmissions) • general procedures include visual checks for loose, damaged or leaking components, fluid levels, operational checks to confirm proper operation of all systems
2 Perform start up procedures	• check for operation of gauges, warning systems • start and warm up engine at low idle • walk around, look for leaks, general check (noise, vibration, unusual exhaust or other condition) • warm up hydraulics and transmission before full load • check for proper operation of lights, wipers, seat belt, lockouts, parking brake, all controls and major systems (hydraulics, transmission, brakes, etc.)
3 Perform shutdown procedures	• position that allows access in case of mechanical trouble at start up • safe parking position, set parking brake • level position for checking of fluids • cool down before shut down • walk around, look for leaks, general check • secure machine, locks, etc

4	Monitor performance of equipment during operation	• gauges and warning systems • look, hear, feel, smell • Respond appropriately: is immediate shutdown required?

Suggested Assessment:

- An exercise with students performing pre start, start and shut down with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially checked, or thoroughly checked. Students must complete pre-check list, start-up and shut down procedures.

Achievement Criteria:

To complete the in school practical lab requirement for the articulated haul truck the learner must be able to demonstrate:

- All elements of pre start, start up and shut down. Once the student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, checking for leaks or loose hardware involves more than a “quick look”.

LINE F: **OPERATE HAUL TRUCK**

Competency: **F3** **Perform daily maintenance tasks**

Learning Objectives:

1 The learner will perform daily maintenance checks in accordance to a supplied check list.

	LEARNING TASKS	CONTENT
1	Service lubrication system (greasing)	• identify and lube all points • load grease gun **Note:** Point out that the appropriate amount of grease is debatable, employers differ, but the following guidelines are reasonable: - 2-3 shots for small areas: fan bearings, small u joints, linkages, hinges, etc. - 8 – 10 shots for common pins and bushings - 20 shots where one nipple feeds a large area • every pin must be showing excess grease regardless of how many shots you have counted • daily for most points / weekly for some • wipe off nipples before greasing to reduce abrasive particles entering pin/bushing
2	Service air intake system as required (air filters / pre cleaners)	• restriction indicators • pre cleaner service • cleaning vs. replacement, check employer policy (some insist on never using air – replace only) • use air only with reduced pressure
3	Drain fuel tank sump, water separator fuel filters if equipped (Racor or other)	• drain, assess • water, debris, scale, etc
4	Add fluids as required	• identify correct fluids for each component • add fluids as required • avoid contamination with dirt, water • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, transmissions)
5	Inspect and clean components as required	• radiator & oil cooler • filler plugs, dip sticks • battery terminals

6	Housekeeping	• garbage • excess grease • clean windows, sweep out cab, general cleanliness

Suggested Assessment:

- An exercise with students performing daily maintenance tasks with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially done, or thoroughly.

Achievement Criteria:

To complete the in school practical lab requirement for the articulated haul truck the learner must be able to demonstrate:

- All elements of daily maintenance. Once the student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, inspecting and cleaning components involves more than a "quick look".

LINE F: OPERATE HAUL TRUCK

Competency: F4 Describe mechanical components, troubleshooting, basic repairs and maintenance

Learning Objectives:

1 The learner will describe the basic components and functions of an articulated haul truck
2 The learner will describe basic troubleshooting signs and symptoms and appropriate responses for the operator

LEARNING TASKS	CONTENT
1 Describe major mechanical components	Identify major components from a checklist, and describe function • identify and describe function from list of major components
2 Describe potential failures, symptoms and indicators of failure	Discuss potential failures, symptoms • symptoms: noise, vibration, smell, leaks, cracks • respond appropriately: service required, immediate repair required, immediate removal from service
3 Describe basic maintenance	Supervise, demonstrate as required • remove and replace hydraulic hose, o-ring • re and re fuel filter, bleed air from fuel system • re and re air filter • engine oil change, lube filter • adjust belt tension • maintain tire air pressure • clean battery terminals, top up fluid • check and tighten assorted hardware

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE F: **OPERATE HAUL TRUCK**

Competency: **F5** **Perform basic operator functions**

Learning Objectives:

1 The learner will perform basic operator functions in accordance to the Heavy Equipment Operator Practical Assessment Form.

LEARNING TASKS	CONTENT
1 Perform basic moves	• move forward, stop, back up, stop • apply park brake, lockout transmission • raise and lower box • engage diff lock • shift transmission – probably stick to low speeds at this point
2 Drive truck through simple obstacle course	• possibly pylons or used tires outlining an obstacle course • hills and slopes • forwards and backwards
3 Simulate loading and hauling	• move into appropriate loading positions for several scenarios i.e. loader at pit face, excavator over the side, excavator over the end, back in, drive thru, etc. • haul over varied conditions, choose speeds appropriately, choose patterns i.e. turn outs, turn around empty when possible, give right of way to loaded trucks, efficient flows and patterns • move into dumping positions, and simulate dumping loads, use safe positions i.e. level • get loaded and repeat hauling over varied conditions

Suggested Assessment:

- Observe students performing learning tasks and assess competency using a pass/fail rating. Students should be able to achieve learning outcomes by the end of a one day session.
- Time and quantity as instructor deems appropriate – example: proficient student could simulate turning around empty, backing in a short distance to loading site, hauling 300m, moving into a dumping position, raise and lower box, and return in 10 minutes
- Successfully go through simple obstacle course without contacting pylons/tires (Obstacle course should consist of at least one right hand turn, one left hand turn and an area to back into to simulate a marked loading area (see below).

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, minimal tire spinning, avoids rocks/obstacles, shifts directions fully stopped and at idle
- Enters and exits machine safely (3 point contact, parking position, brake)

Specific to this task:

- Manoeuvre through obstacle course without running over pylons/tires

To complete the in school practical lab requirement for the articulated haul truck the learner must be able to demonstrate the following practical skills:

- Demonstrate the safe operation of equipment including observation of surroundings.
- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks.
- Perform basic moves with equipment including:
    - Move forward, stop, back up, stop (flat elevation).
    - Apply park brake, lock out transmission.
    - Raise and lower box (making sure to observe for wires and/or overhead objects).
    - Shift transmission.
    - Shift from 2 to 4 to 6 wheel drive.
    - Back up into a simulated and marked loading area without hitting pylons. Apprentice must back up within 1.5 meters of the back pylon without driving over the pylon or hitting the side pylons. (Pylons must be set to have a tolerance of 1.5 meters on each side of the articulated haul truck. Pylons must also be placed so they are visible to the driver).

LINE F: **OPERATE HAUL TRUCK**

Competency: **F6** **Haul and dump materials**

Learning Objectives:

1 The learner will carry out hauling and dumping tasks in a safe manner.

LEARNING TASKS	CONTENT
1 Use appropriate loading positions	• planned and efficient work flow • site traffic efficiency • material characteristics • loading equipment employed • examples of loading scenarios: loader at pit face, excavator over the side, excavator over the end, back in, drive thru, turn around empty, turn around loaded, etc. • truck placement for eye contact is preferred
2 Communicate	• horn signals are: one beep for stop (unless truck is already stopped in which case most people use one beep to mean “you’re loaded”), two beeps for back up, three beeps for go ahead. • communicate with loader personnel to confirm total weight, distribution of weight, and stability of load as required • communicate with loader and dump site personnel to plan for efficient positioning, traffic flow, loading pattern, dump positions/patterns, spread or pile, etc. • use radio communication as required
3 Haul material	• operate truck with consideration of: • safety first: stability, appropriate speeds for conditions, communication, traffic control personnel, awareness of space and clearance, awareness of other trucks and machinery • potential tire damage (avoid obstacles, rocks, excessive side loading, ,turn around empty when possible)

		• rolling over the box is common for articulated trucks, but avoidable and unacceptable. Exercise caution and maintain focus and awareness of box position while using turn outs and when dumping • handle transmission appropriately: correct gear to minimize torque converter heat, maximize braking effect of engine
4	Dump material	• communicate and coordinate with other operators • space loads, spread or pile as required • ensure slope of box will allow dumping with stability
5	Tow stuck equipment	• safety first: identify and manage hazards, communication/signals, soil stability issues, center of gravity/rollover considerations, avoid the potential of both machines 'getting in trouble' once they are hooked together • select appropriate rigging materials and techniques • select suitable attachment points • select suitable alignment, separation • ensure free movement i.e. avoid damaging components of 'stuck' equipment

Suggested Assessment:

- Observe apprentice performing learning tasks and assess competency.
- Time and quantity as instructor deems appropriate – example: proficient apprentice could haul and dump 6 loads per hour with a 300 m haul distance (highly variable due to specific conditions)

Achievement Criteria:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, minimal tire spinning, avoids rocks/obstacles, shifts directions fully stopped and at idle
- Enters and exits machine safely (3 point contact, parking position, brake)

Specific to this task:

- communication and co ordination
- traffic patterns, pullouts, turn around areas, loading and dumping positions for efficiency

LINE G: OPERATE LOADER

Competency: G1 Describe and comply with safety requirements.

Learning Objectives:

1 The learner will describe how to work safely while working on and around a loader. This will include understanding key regulations, machine limitations, operating procedures and tasks and the use of PPE's

2 The learner will comply with safety requirements at all times during this course.

	LEARNING TASKS	CONTENT
1	Use equipment manuals and specifications to determine safe operating procedures and operational restrictions of loader	Lecture, group discussion, Q&A • identify and discuss relevant sections of manual
2	Assess a variety of excavating tasks for potential hazards, and explain strategy and safe practices to work safely.	Lecture, group discussion, Q&A, possibly small group work • describe a variety of tasks and conditions • explore hazards and safe practices
3	Identify key regulations that apply to given tasks and conditions	Lecture, group discussion, Q&A, possibly small group work • identify and discuss relevant sections of regulation
4	Operate Loader in compliance with regulations and safe practices	Instruct and supervise hands on operating with constant attention to safe practices, review and application of previous safety instruction • regulations • company policies • general safe practices • safety-first attitude, awareness
5	Use Personal Protective Equipment	Supervise, insist, enforce • hardhat • hearing protection • high visibility • eye protection as required • gloves as required • steel toe footwear

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will achieve a minimum of 70% combined score on a practical assessment form and achieve a pass mark in all boxes marked pass/fail
- Demonstrated safe practices while operating machine

LINE G: OPERATE LOADER

Competency: G2 Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance

Learning Objectives:

1 The learner will perform pre start equipment checks
2 The learner will perform start up and shutdown procedures
3 The learner will monitor the performance of the equipment

LEARNING TASKS	CONTENT
1 Perform pre start checks (hands on): • first as a small group activity • individually before operating each machine • as a supervised and assessed exercise before completion of the core lab	• Comprehensive pre start check: • Review hazards: pressurised systems, batteries, slips & falls, etc. • identify correct fluids for each component • add fluids as required • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, transmissions) • general procedures include visual checks for loose, damaged or leaking components, fluid levels, operational checks to confirm proper operation of all systems
2 Perform start up procedures	• check for operation of gauges, warning systems • start and warm up at low idle • walk around, look for leaks, general check (noise, vibration, unusual exhaust or other condition) • hydraulics and transmission warm up before full load • check for proper operation of lights, wipers, seat belt, lockouts, parking brake, all controls and major systems (hydraulics, transmission, brakes, etc.

3	Perform shutdown procedures	• safe parking position, brake, lower bucket/attachments • position that allows access in case of mechanical trouble at start up • level position for checking of fluids • cool down before shut down • walk around, look for leaks, general check • secure machine, locks, etc
4	Monitor performance of equipment during operation	• gauges and warning systems • look, hear, feel, smell • Respond appropriately: is immediate shutdown required??

Suggested Assessment:

- An exercise with students performing pre start, start and shut down with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially checked, or thoroughly checked. Students must complete pre-checklist, start-up and shut down procedures.

Achievement Criteria:

To complete the in school practical lab requirement for the loader the learner must be able to demonstrate:

- All elements of pre start, start up and shut down. Once the student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, checking for leaks or loose hardware involves more than a “quick look”

LINE G: **OPERATE LOADER**

Competency: **G3** **Perform daily maintenance tasks**

Learning Objectives:

1 The learner will perform daily maintenance checks in accordance to a supplied check list.

	LEARNING TASKS	CONTENT
1	Service lubrication system (greasing)	• identify and lube all points • load grease gun **Note:** Point out that the appropriate amount of grease is debatable, employers differ, but the following guidelines are reasonable: • 2-3 shots for small areas: fan bearings, small u joints, linkages, hinges, etc. • 8 – 10 shots for common pins and bushings • 20 shots where one nipple feeds a large area • every pin must be showing excess grease regardless of how many shots you have counted • daily for most points / weekly for some • wipe off nipples before greasing to reduce abrasive particles entering pin/bushing
2	Service air intake system as required (air filters / pre cleaners)	• Use pictures or examples of restriction indicators and pre cleaner if your machine is not equipped • restriction indicators • pre cleaner service • cleaning vs. replacement, check employer policy (some insist on never using air – replace only) • use air only with reduced pressure

3	Drain air system reservoir daily (air tanks) if equipped	• Older models will have air brake systems while newer machines will have hydraulic systems. Discuss and encourage air brake certification • drain • assess amount of oil in reservoir – abnormal (compressor wear)
4	Drain fuel tank sump, water separator fuel filters if equipped (Racor or other)	• drain, assess • water, debris, scale, etc
5	Add fluids as required	• identify correct fluids for each component • add fluids as required • avoid contamination with dirt, water • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, transmissions)
6	Inspect and clean components as required	• radiator & oil cooler • filler plugs, dip sticks • battery terminals
7	Housekeeping	• garbage • excess grease • clean windows, sweep out cab, general cleanliness

Suggested Assessment:

- An exercise with students performing daily maintenance tasks with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially done, or thoroughly.

Achievement Criteria:

To complete the in school practical lab requirement for the loader the learner must be able to demonstrate:

- All elements of daily maintenance. Once the student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, inspecting and cleaning components involves more than a “quick look”.

LINE G: OPERATE LOADER

Competency: G4 Describe mechanical components, troubleshooting, basic repairs and maintenance

Learning Objectives:

1 The learner will describe the basic components and functions of a loader
2 The learner will describe basic troubleshooting signs and symptoms and appropriate responses for the operator

	LEARNING TASKS	CONTENT
1	Describe major mechanical components	Identify major components from a checklist, and describe function • identify and describe function from list of major components
2	Describe potential failures, symptoms and indicators of failure	Discuss potential failures, symptoms • symptoms: noise, vibration, smell, leaks, cracks • respond appropriately: service required, immediate repair required, immediate removal from service
3	Describe basic repairs and maintenance	Supervise, demonstrate as required • remove and replace hydraulic hose, o-ring • re and re fuel filter, bleed air from fuel system • re and re air filter • engine oil change, lube filter • adjust belt tension • maintain tire air pressure • clean battery terminals, top up fluid • check and tighten assorted hardware • replace bucket teeth

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE G: OPERATE LOADER

Competency: G5 Perform basic operator functions

Learning Objectives:

1 The learner will perform basic operator functions in accordance to the Heavy Equipment Operator Practical Assessment Form.

LEARNING TASKS	CONTENT
1 Perform basic moves	• raise & lower, curl & dump bucket • move forward, stop, back up, stop • lower bucket, apply park brake, lockout transmission
2 Drive loader through simple obstacle course	• possibly pylons or used tires outlining an obstacle course • hills and slopes • forwards and backwards
3 Push a large tire over uneven ground	• drive loader over uneven, hard packed ground, raise and lower bucket to keep moving tire without making contact with ground, maintain level bucket position

Suggested Assessment:

- Observe students performing learning tasks and assess competency using a pass/fail rating. Students should be able to achieve learning outcomes by the end of a one day session.
- Time and quantity as instructor deems appropriate – example: proficient student could load bucket without gouging, tram to a position 100m away, dump load and return to loading area in 5 minutes.
- Successfully go through simple obstacle course without contacting pylons/tires. Obstacle course should consist of at least one right hand turn, one left hand turn, an area to load the bucket and an area 100m away to dump the bucket (see below).

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, appropriate position of bucket, minimal impact
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, minimal tire spinning, avoids rocks/obstacles, shifts directions at idle
- Enters and exits machine safely (3 point contact, parking position, brake)

Specific to this task:

To complete the in school practical lab requirement for the loader the learner must be able to demonstrate the following practical skills:

- Demonstrate the safe operation of equipment including observation of surroundings.
- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks.
- Perform basic moves with equipment including:
    - Move forward, stop, back up, stop (flat elevation).
    - Apply park brake, lock out transmission.
    - Shift transmission.
    - Raise and lower bucket (making sure to observe for wires).
    - Maintain bucket angle in scrape position not the gouge position (flat smooth to the surface).
    - Load bucket and tram with minimal spillage to dump location 100 meters away.

LINE G: OPERATE LOADER

Competency: G6 Dig, carry (tram) and stockpile materials

Learning Objectives:

1 The learner will dig, fill bucket, tram and stockpile materials in a safe and smooth fashion with minimal spillage.

LEARNING TASKS	CONTENT
1 Fill bucket in loose material	• load bucket quickly, fully • no tire spinning
2 Carry a short distance	• maintain smooth running surface • minimize spillage • carry bucket low
3 Place material in a stockpile	• pile without gaps, graded top, consistent and tidy • pile to full dump height
4 Optional: repeat in hard digging conditions	• minimize impact • minimize tire spinning
5 Create a ramped pile at greater height	• compact, slope top to minimize water saturation • compact edges by running a front tire to the edge, at an angle – not parallel to the edge • smooth sides of pile with bottom of bucket to promote runoff of water

Achievement Criteria:

Suggested Assessment:

- Time and quantity as instructor deems appropriate – example: proficient student with a 3 cu. yd. loader could tram 300 cu. yards a distance of 30m, and place in a ramped stockpile in 8 hours
- In a period of 40 minutes the student will create a safe and effective one meter loading ramp with a 5:1 slope
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control, reduced 'wear and tear', minimal impact, minimal tire spinning
- Attention to stability, load height, center of gravity, slopes
- Carries loads with minimal spillage, raises loads without spillage
- Maintain smooth pit floor / running surface
- Loads bucket quickly, fully
- Creates a safe and effective ramp with the correct slope
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Consistent, tidy pile
- Compact, smooth, sloped to minimize water saturation
- Create a one meter ramp for the loader at a 5:1 slope (a proficient operator should be able to perform this task in approximately 30-40 minutes using a 3 yard bucket depending on the distance to stockpiled materials).

LINE G: **OPERATE LOADER**

Competency: **G7** **Place, spread, and grade material in lifts**

Learning Objectives:

1 The learner will place and spread materials to create a level working profile
2 Excess materials will be stockpiled according to grade

	LEARNING TASKS	CONTENT
1	Fill bucket of loose material	• load bucket quickly, fully • no tire spinning • exercise should include dense material (hard digging) when appropriate to student's level of competency
2	Carry a short distance	• maintain smooth running surface • minimize spillage • carry bucket low
3	Place material in a stockpile	• place accurately to minimize grading required • level machine = level cutting edge, approach uneven fill from a level position to cut • float and back-blading is only appropriate for smoothing of minor quantities. Do cuts and fills using forward motion from a level position and effective bucket angles • adjust bucket angles appropriately: – think of using a knife to cut hard wood, soft wood, spreading butter – steeper angle cuts more – shallower angle cuts less – hard conditions require different angles than soft – dragging back with steep angle moves more, shallow angle moves less, flatter angle 'spreads butter' • balance forward motion with down pressure and angle adjustment

Suggested Assessment:

- In a period of 1 hour a student using a 3cu. yd bucket should be able to create a level working profile of 50 square meters.
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control, reduced 'wear and tear', minimal impact, minimal tire spinning
- Attention to stability, load height, center of gravity, slopes
- Carries loads with minimal spillage, raises loads without spillage
- Maintain smooth pit floor / running surface
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Consistent, well graded placement of fill
- Create a level profile of 50 square meters for working area (a proficient operator should be able to perform this task in approximately 30-40 minutes using a 3 yard bucket depending on the terrain and distance to stockpiled materials).

LINE G: OPERATE LOADER

Competency: G8 Backfill trenches and excavations

Learning Objectives:

1 The learner will place bedding rock, backfill material and grade the area in a safe and appropriate manner so not to damage underground structures

	LEARNING TASKS	CONTENT
1	Place bedding, drain rock, etc. as required	• work to edge of trench/excavation without compromising the stability of trench/excavation, without posing a hazard to yourself or others • place material carefully and appropriately to avoid moving or damaging, pipe, concrete, or other services & structures • manage piles of imported aggregates (sand, rock, pit run, etc.) to minimize waste, avoid mixing with other material / contamination
2	Place backfill material	• place material carefully and appropriately to avoid moving or damaging, pipe, concrete, or other services & structures • place material in lifts with thickness appropriate for degree of compaction required and compaction equipment to be used • demonstrate awareness of the effects of the weight of the machine on loose fill – avoid damage to pipe, concrete, or other services & structures – wet material vs. dry material, green concrete vs. cured concrete
3	Grade work area to appropriate slope	• with regard to design grades & elevations, run off

Suggested Assessment:

- Time and quantity as instructor deems appropriate – example: proficient student with a 3 cu. yd. loader could place bedding, backfill, and clean up a 30 m x 1m deep trench in 2 1/2 hours
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control, reduced 'wear and tear', minimal impact, minimal tire spinning
- Attention to stability, load height, center of gravity, slopes
- Loads bucket quickly, fully and/or pushes material efficiently
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Place materials without risking damage or movement of pipe, concrete, etc
- Consistent, well graded placement of fill, smooth, sloped to minimize water saturation
- Pick up, carry and place bedding and/or other materials without contamination, minimal waste

LINE G: **OPERATE LOADER**

Competency: **G9** **Load trucks**

Learning Objectives:

1 The learner will use the loader to load trucks with materials and aggregates

LEARNING TASKS	CONTENT
1 Arrange the loading site	• efficient loading pattern, truck placement • consider: vision, trucks should turn around empty – not loaded, loader movement from bank to truck in a short V pattern is better than a longer L pattern, sun position & wind direction may be relevant, think about the long term movement thru the pile – not just the first few loads
2 Maintain the pit floor level, smooth, clear of rocks	• minimize spillage • clean up and grade area between loads and / or as loader moves in to fill bucket from bank • dig level
3 Load smoothly, gently	• dump first bucket gently, don't dump from excessive height or so quickly that you 'bounce' the truck, loading the rear axles first is generally preferable to loading the front of the box first, don't spill the driver's coffee!
4 Communicate	• truck placement for eye contact is preferred • horn signals are: one beep for stop (unless truck is already stopped in which case most people use one beep to mean "you're loaded"), two beeps for back up, three beeps for go ahead. • Help the driver by confirming closed tailgate before loading, watching for rocks you may have spilled on the truck that could fall off, looking for rocks pinched in the dual tires, mechanical problems, flat tires, etc.
5 Build a legal load	• This is the truck driver's responsibility, but he is also relying on your professionalism. Know what a legal load looks like – depends on material and the truck but is generally no higher than the side boards, against the front to 2/3 of the box height, and little or nothing touching the tailgate. For off hwy articulated – fill 'er up

Suggested Assessment:

- Time and quantity as instructor deems appropriate – example: proficient student with a 3 cu. yd. loader could load 6 loads per hour
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control, reduced 'wear and tear', minimal impact, minimal tire spinning
- Attention to stability, load height, center of gravity, slopes
- Carries loads with minimal spillage, raises loads without spillage
- Maintain smooth pit floor/ running surface
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Load smoothly: no bounce, no touch,
- Load accurately (legal load): centered, correct weight distribution between front and rear axles, no spillage
- Effective communication, visual, audible

LINE G: **OPERATE LOADER**

Competency: **G10** **Service processing plants (screening and crushing systems) (Optional)**

Learning Objectives:

1 The learner will service hoppers/screens/conveyors of aggregate processing plants (Tasks are similar to previous (G6-9) with the addition of the following:)

	LEARNING TASKS	CONTENT
1	Load hoppers	• efficient processing requires keeping hoppers from running empty • plan work to keep hoppers full, screens/ conveyor outflows clear
2	Move materials from under screens/conveyors and place in stockpiles	• never allow piles to interfere with screens/belts • plan work to keep hoppers full, screens/ conveyor outflows clear
3	Constant awareness of mechanical systems of processing plant	• processing plants are “high maintenance” !! • loader operator always shares the responsibility and is often the only person monitoring the processing plant
4		•

Suggested Assessment:

- Time and quantity as instructor deems appropriate – ex. keep up to the plant
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control, reduced ‘wear and tear’, minimal impact, minimal tire spinning
- Attention to stability, load height, center of gravity, slopes
- Carries loads with minimal spillage, raises loads without spillage
- Maintain smooth pit floor/ running surface
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Demonstrate understanding of mechanical systems of the plant, monitor performance
- Plan and conduct work to “keep up” to the plant, avoid empty hoppers, never allow outflow piles to grow to the point where belts or screens are running in the top of the piles
- Stockpiles should be consistent, tidy, compact, smooth, sloped to minimize water saturation

LINE G: OPERATE LOADER

Competency: G11 Install and use attachments (Optional)

Learning Objectives:

1 **The learner will install use and maintain attachments**
(This is an optional competency as many employers will have a heavy duty mechanic complete this task)

	LEARNING TASKS	CONTENT
1	Install	• options include: stinger, forks, grapple, sweeper, etc. • installation procedures specific to each attachment • including: avoid contamination of hydraulic systems when removing and replacing hydraulic connections
2	Use attachments	• operating procedures specific to each attachment • including: correct hydraulic flow rates are often less than 'wide open' or full engine speed • including: attachments can be damaged by improper techniques i.e. twisting, impact, using attachments for purposes not intended
3	Maintain attachments	• maintenance procedures specific to each attachment • including: most attachments require greasing of bearings at very short intervals during continuous use e.g. sweeper every 2 hrs, breakers every ¾ hr

Suggested Assessment:

- Time and quantity as instructor deems appropriate – ex. : change attachment based on the product manual suggested time allotment
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operating procedures specific to each attachment
- Installation procedures followed in accordance to operating manual
- Correct safety checks before operational use of the attachment

Specific to this task:

- criteria specific to each attachment used ex. no damage while using forks
- safe and efficient installation
- appropriate maintenance and operational checks
- Hoist & carry: controlled movements, safe rigging

LINE G: OPERATE LOADER

Competency: G12 Remove snow and ice (Optional)

Learning Objectives:

1 The learner will remove snow and ice using the loader

LEARNING TASKS	CONTENT
1 Remove snow & ice	• cold weather mechanical considerations (hard starting, fuel gelling, brittle metal and other materials, ice build up interfering with movement of components, etc.) • cold weather operating considerations: reduced traction, visibility, etc • hazards posed by hidden obstacles • potential damage to services, structures, etc. • stockpile or windrow placement: (what happens to melt water?, move windrows completely clear the first time, allow for traffic flow, etc.)

Suggested Assessment:

- Time and quantity as instructor deems appropriate
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control, reduced 'wear and tear', minimal impact, minimal tire spinning
- Attention to stability, load height, center of gravity, slopes
- Carries loads with minimal spillage, raises loads without spillage
- Loads bucket in a safe manner; fully where possible
- Plans and conducts work with minimal wasted movement and efficient movement paths
- Special attention to hidden obstacles and cars

Specific to this task:

- Efficiency, no damage, strategy applied to windrow placement, etc.

LINE H: OPERATE BACKHOE

Competency: H1 Describe and comply with safety requirements

Learning Objectives:

1 The learner will describe how to work safely while working on and around a backhoe. This will include understanding key regulations, machine limitations, operating procedures and tasks and the use of PPE's

2 The learner will comply with safety requirements at all times during this course.

	LEARNING TASKS	CONTENT
1	Use equipment manuals and specifications to determine safe operating procedures and operational restrictions of backhoe/loader	Lecture, group discussion, Q&A • identify and discuss relevant sections of manual
2	Assess a variety of excavating tasks for potential hazards, and explain strategy to work safely.	Lecture, group discussion, Q&A, possibly small group work • describe a variety of tasks and conditions, explore hazards and safe practices
3	Identify key regulations that apply to given tasks and conditions	Lecture, group discussion, Q&A, possibly small group work • identify and discuss relevant sections of regulation
4	Operate Backhoe/Loader in compliance with regulations and safe practices	Instruct and supervise hands on operating with constant attention to safe practices, review and application of previous safety instruction • regulations • company policies • general safe practices • safety-first attitude, awareness
5	Use Personal Protective Equipment	Supervise, insist, enforce • hardhat • hearing protection • hi visibility • eye protection as required • gloves as required • steel toe footwear

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will achieve a minimum of 70% combined score on a practical assessment form and achieve a pass mark in all boxes marked pass/fail
- Demonstrated safe practices while operating machine

LINE H: OPERATE BACKHOE

Competency: H2 **Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance**
(Optional In-School Practical Training – Theory Required)

Learning Objectives:

1 The learner will perform pre start equipment checks
2 The learner will perform start up and shutdown procedures
3 The learner will monitor the performance of the equipment

LEARNING TASKS	CONTENT
1 Perform pre start checks (hands on) • first as a small group activity • individually before operating each machine • as a supervised and assessed exercise before completion of the core lab	• Comprehensive pre start check • Review hazards: pressurised systems, batteries, slips & falls, fumes etc. • identify correct fluids for each component • add fluids as required • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, some transmissions) • general procedures include visual checks for loose, damaged or leaking components, fluid levels, operational checks to confirm proper operation of all systems
2 Perform start up procedures	• check for operation of gauges, warning systems • start and warm up engine at low idle • walk around, look for leaks, general check (noise, vibration, unusual exhaust or other condition) • warm up hydraulics and transmission before full load • check for proper operation of lights, wipers, seat belt, lockouts, parking brake, all controls and major systems (hydraulics, transmission, brakes, etc.

3	Perform shutdown procedures	• safe parking position, set parking brake, lower bucket/attachments • position that allows access in case of mechanical trouble at start up • level position for checking of fluids • cool down before shut down • walk around, look for leaks, general check • secure machine, locks, etc
4	Monitor performance of equipment during operation	• gauges and warning systems • look, hear, feel, smell • Respond appropriately: is immediate shutdown required?

Suggested Assessment:

- An exercise with students performing pre start, start and shut down with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially checked, or thoroughly checked. Students must complete pre-checklist, start-up and shut down procedures.

Achievement Criteria:

Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

- All elements of pre start, start up and shut down. Once a student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, checking for leaks or loose hardware involves more than a "quick look"

Note: The in-school practical training for this piece of equipment is optional. The theoretical training is required.

LINE H: OPERATE BACKHOE

Competency: H3 Perform daily maintenance tasks
(Optional In-School Practical Training – Theory Required)

Learning Objectives:

1 The learner will perform daily maintenance checks in accordance to a supplied check list.

LEARNING TASKS	CONTENT
1 Service lubrication system (greasing)	• identify and lube all points • load grease gun **Note:** Point out that the appropriate amount of grease is debatable, employers differ, but the following guidelines are reasonable: • 2-3 shots for small areas: fan bearings, small u joints, linkages, hinges, etc. • 8 – 10 shots for common pins and bushings • 20 shots where one nipple feeds a large area • every pin must be showing excess grease regardless of how many shots you have counted • daily for most points / weekly for some • wipe off nipples before greasing to reduce abrasive particles entering pin/bushing
2 Service air intake system as required (air filters / pre cleaners)	• restriction indicators • pre cleaner service • cleaning vs. replacement, check employer policy (some insist on never using air – replace only) • use air only with reduced pressure
3 Drain fuel tank sump, water separator fuel filters if equipped (Racor or other)	• drain, assess • water, debris, scale, etc
4 Add fluids as required	• identify correct fluids for each component • add fluids as required • avoid contamination with dirt, water • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, transmissions)
5 Inspect and clean components as required	• radiator & oil cooler • filler plugs, dip sticks • battery terminals

6	Housekeeping	• garbage • excess grease • clean windows, sweep out cab, general cleanliness

Suggested Assessment:

- An exercise with students performing daily maintenance tasks with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially done, or thoroughly.

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- All elements of daily maintenance. Once the student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, inspecting and cleaning components involves more than a "quick look".

Note: The in-school practical training for this piece of equipment is optional. The theoretical training is required.

LINE H: OPERATE BACKHOE

Competency: H4 Describe mechanical components, troubleshooting, basic repairs and maintenance

Learning Objectives:

1 The learner will describe the basic components and functions of a backhoe
2 The learner will describe basic troubleshooting signs and symptoms and appropriate responses for the operator

	LEARNING TASKS	CONTENT
1	Describe major mechanical components	Identify major components from a checklist, and describe function • identify and describe function from list of major components
2	Describe potential failures, symptoms and indicators of failure	Discuss potential failures, symptoms • symptoms: noise, vibration, smell, leaks, cracks • respond appropriately: service required, immediate repair required, immediate removal from service
3	Describe basic repairs and maintenance	Supervise, demonstrate as required • remove and replace hydraulic hose, o-ring • re and re fuel filter, bleed air from fuel system • re and re air filter • engine oil change, lube filter • adjust belt tension • maintain tire air pressure • clean battery terminals, top up fluid • check and tighten assorted hardware • replace bucket teeth

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE H: OPERATE BACKHOE

Competency: **H5** **Perform basic operator functions**
(Optional In-School Practical Training – Theory Required)

Learning Objectives:

1 The learner will perform basic operator functions in accordance to the Heavy Equipment Operator Practical Assessment Form

LEARNING TASKS	CONTENT
1 Perform basic moves	• raise & lower, curl & dump loader bucket • move forward, stop, back up, stop • lower bucket, apply park brake, lockout transmission • turn seat to rear, lower stabilizers, release boom lock • raise and lower backhoe boom, extend & retract stick, curl & dump bucket
2 Drive loader/backhoe through simple obstacle course	• possibly pylons or used tires outlining an obstacle course • hills and slopes • forwards and backwards
3 With loader: Push a large tire over uneven ground	• drive loader over uneven, hard packed ground, raise and lower bucket to keep moving tire without making contact with ground, maintain level bucket position
4 With backhoe: Scoop water and dump in well casing (or manhole barrel, large tire)	• split functions for smooth movements, shortest continuous path, simulate dig pattern and bucket angles • full buckets, avoid splashing & spilling • split functions to dump water “on target” – center of barrel, no spilling outside barrel
5 Change buckets	• choose appropriate bucket for task • demonstrate efficient and safe technique for change

Suggested Assessment:

- Time and quantity as instructor deems appropriate – example: proficient student could perform dig cycle in average time of 30 seconds

Achievement Criteria:

General:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, appropriate position of bucket, minimal impact
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, minimal tire spinning, avoids rocks/obstacles, shifts directions at idle
- Enters and exits machine safely (3 point contact, parking position, brake)

Specific to this task:

The learner should be able to demonstrate the following practical skills:
Perform basic moves with equipment including:

- Move forward, stop, back up, stop (flat elevation).
- Apply park brake, lock out transmission.
- Shift transmission.
- Raise and lower loader bucket (making sure to observe for wires).
- Maintain loader bucket angle in scrape position not the gouge position (flat smooth to the surface).
- Load bucket and tram with minimal spillage to dump location 50 meters away.
- Position stabilizers and loader buckets for dig positions
- Raise and lower boom (making sure to observe for wires).
- Extend and retract stick.
- Curl and dump bucket.
- Swing left and right.
- Lower bucket to the ground for lock out procedures.
- Know that you must call before you dig (Check for underground utilities).
- Excavate simple trench. Place materials from dig no less than 2' from edge of dig area.
- Backfill trench using the materials taken from the excavated site.
- Use bucket to flatten and compress the dig site.

Note: The in-school practical training for this piece of equipment is optional. The theoretical training is required.

LINE H: OPERATE BACKHOE

Competency: H6 Dig, carry (tram) and stockpile materials
(Optional In-School Practical Training – Theory Required)

Learning Objectives:

1 The learner will dig, fill bucket, tram and stockpile materials in a safe and smooth fashion with minimal spillage..

LEARNING TASKS	CONTENT
1 Fill bucket in loose material	• load bucket quickly, fully • no tire spinning
2 Carry a short distance	• maintain smooth running surface • minimize spillage • carry bucket low
3 Place material in a stockpile	• pile without gaps, graded top, consistent and tidy • pile to full dump height
Optional: repeat in hard digging conditions	• minimize impact • minimize tire spinning
Optional: create a ramped pile at greater height	• compact, slope top to minimize water saturation • compact edges by running a front tire to the edge, at an angle – not parallel to the edge • smooth sides of pile with bottom of bucket to promote runoff of water

Suggested Assessment:

- Time and quantity as instructor deems appropriate – example: proficient student could tram 200 cu. yards a distance of 30m, and place in a ramped stockpile in 8 hours

Achievement Criteria:

General:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control, reduced 'wear and tear', minimal impact, minimal tire spinning
- Attention to stability, load height, center of gravity, slopes
- Carries loads with minimal spillage, raises loads without spillage
- Maintain smooth pit floor / running surface
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Consistent, tidy stock pile
- Stockpile compact, smooth, sloped to minimize water saturation

Note: The in-school practical training for this piece of equipment is optional. The theoretical training is required.

LINE H: OPERATE BACKHOE

Competency: H7 Place, spread, and grade material in lifts

Learning Objectives:

1 The learner will place and spread materials to create a level working profile
2 Excess materials will be stockpiled according to grade

LEARNING TASKS	CONTENT
1 Fill loader bucket with loose material	• load bucket quickly, fully • no tire spinning
2 Carry a short distance	• maintain smooth running surface • minimize spillage • carry bucket low
3 Place, spread, and grade material in lifts with loader bucket	• level machine = level cutting edge, approach uneven fill from a level position to cut • float and back-blading is only appropriate for smoothing of minor quantities. Do cuts and fills using forward motion from a level position and effective bucket angles • adjust bucket angles appropriately: – think of using a knife to cut hard wood, soft wood, spreading butter – steeper angle cuts more – shallower angle cuts less – hard conditions require different angles than soft – dragging back with steep angle moves more, shallow angle moves less, flatter angle 'spreads butter' – balance forward motion with down pressure and angle adjustment

Suggested Assessment:

- In a period of one hour a student using a 2cu. yd bucket should be able to create a level working profile of 50 square meters.
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control, reduced 'wear and tear', minimal impact, minimal tire spinning
- Attention to stability, load height, center of gravity, slopes
- Carries loads with minimal spillage, raises loads without spillage
- Maintain smooth pit floor / running surface
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Consistent, well graded placement of fill
- Create a level profile of 50 square meters for working area (a proficient operator should be able to perform this task in approximately 30-40 minutes using a 2 yard bucket depending on the terrain and distance to stockpiled materials).
- final grading of work area to proficient standard (+/- 4")

LINE H: OPERATE BACKHOE

Competency: H8 **Excavate trenches, ditches**
(Optional In-School Practical Training – Theory Required)

Learning Objectives:

1 The learner will excavate and backfill shallow and deep trenches in a straight line, to a consistent depth.

	LEARNING TASKS	CONTENT
1	Excavate shallow trench	• suggested: 30m x 1m deep x 1bucket width • ramped at end for worker access • bottom & top edges smoothed off • consistent depth, straight • stable sides • spoil pile 2' minimum from edge, straight, consistent
2	Excavate deep trench	• suggested: 30 m x 1.8m deep x 1 bucket width wide and sloped at ¾ : 1 or as appropriate for soil type • bottom & top edges smoothed off • consistent depth, straight • stable sides, consistent slopes • spoil pile 2' minimum from edge, straight, consistent
3	Backfill	• tire pack fill • final grading of work area within 4" of level grade

Suggested Assessment:

Create a straight trench 30m x 1m deep (a proficient operator should be able to perform this task in approximately 2-3 hours depending on the hardness and type of terrain).

Achievement Criteria:

General:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control, reduced 'wear and tear', minimal impact, minimal tire spinning
- Attention to stability, load height, center of gravity, slopes, potential for collapse of trench sides
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths
- Proficient cycle of hoe bucket down, stabilizers up, loader bucket up, brake off, re-position machine with hoe, re set brake, loader bucket, stabilizer, brake.

Specific to this task:

- consistent depth and straight
- spoil pile min. 2 ft from edge, straight, consistent height and width
- trench bottom and top edges smoothed off
- safe for entry by workers: stable walls (sloped for deep trench), ramp for entry
- tire packed backfill
- final grading of work area to proficient standard (+/- 4")

Note: The in-school practical training for this piece of equipment is optional. The theoretical training is required.

LINE H: OPERATE BACKHOE

Competency: H9 **Backfill trenches, excavations**
(Optional In-School Practical Training – Theory Required)

Learning Objectives:

1 The learner will place bedding rock, backfill material and grade the area in a safe and appropriate manner so not to damage underground structures

LEARNING TASKS	CONTENT
1 Place bedding, drain rock, etc. as required	• work to edge of trench/excavation without compromising the stability of trench/excavation, without posing a hazard to yourself or others • place material carefully and appropriately to avoid moving or damaging, pipe, concrete, or other services & structures • manage piles of imported aggregates (sand, rock, pit run, etc.) to minimize waste, avoid mixing with other material / contamination
2 Place backfill material	• place material carefully and appropriately to avoid moving or damaging, pipe, concrete, or other services & structures • place material in lifts with thickness appropriate for degree of compaction required and compaction equipment to be used • demonstrate awareness of the effects of the weight of the machine on loose fill – avoid damage to pipe, concrete, or other services & structures – wet material vs. dry material, green concrete vs. cured concrete
3 Grade work area to appropriate slope	• with regard to design grades & elevations, run off

Suggested Assessment:

- Time and quantity as instructor deems appropriate – example: proficient student could place bedding, backfill, and clean up a 30 m x 1m deep trench in 3 ½ hours

Achievement Criteria:

General:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control, reduced 'wear and tear', minimal impact, minimal tire spinning
- Attention to stability, load height, center of gravity, slopes
- Loads bucket quickly, fully and/or pushes material efficiently
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Place materials without risking damage or movement of pipe, concrete, etc
- Consistent, well graded placement of fill, smooth, sloped to minimize water saturation
- Pick up, carry and place bedding and/or other materials without contamination, minimal waste

Note: The in-school practical training for this piece of equipment is optional. The theoretical training is required.

LINE H: **OPERATE BACKHOE**

Competency: **H10** **Service utilities crew (place bedding, hoist objects, backfill in lifts, hoe pack, etc.)**

Learning Objectives:

1 The learner will work closely with utilities crew to expose and remove existing structures, place bedding, structures, backfill and grade utilities.

LEARNING TASKS	CONTENT
1 Place bedding, drain rock, etc. as required	• work to edge of trench/excavation without compromising the stability of trench/excavation; without posing a hazard to yourself or others • place material carefully and appropriately to avoid moving or damaging, pipe, concrete, or other services & structures • manage piles of imported aggregates (sand, rock, pit run, etc.) to minimize waste, avoid mixing with other material / contamination
2 Place backfill material	• place material carefully and appropriately to avoid moving or damaging, pipe, concrete, or other services & structures • place material in lifts with thickness appropriate for degree of compaction required and compaction equipment to be used • demonstrate awareness of the effects of the weight of the machine on loose fill – avoid damage to pipe, concrete, or other services & structures – wet material vs. dry material, green concrete vs. cured concrete
3 Install and use attachments	• options include: forks, pavement cutting wheel , hoe pack, etc.
4 Hoist and carry objects	• pipe work materials (CB and manhole barrels, valves, hydrants, pipe, compactors, etc) • controlled movements, rigging techniques, safety • signals
5 Grade / cleanup work area	• with regard to design grades & elevations, run off

6	Excavate service trenches, etc	• on grade • set up and use grade checking instruments • sloping and shoring requirements/ techniques
7	Expose existing underground services	• controlled, precise movements • proficient teamwork and communication with labourer/pipe layer
8	Clean up debris, brush, broken concrete, pavement	• 4 in 1 if possible (see H13)
9	Load truck	• variety of materials incl. brush, concrete. etc

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control, reduced 'wear and tear', minimal impact, minimal tire spinning
- Attention to rigging, stability, load height and weight, center of gravity, slopes
- Loads bucket quickly, fully and/or pushes material efficiently
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Place materials without risking damage or movement of pipe, concrete, etc
- Consistent, well graded placement of fill, smooth, sloped to minimize water saturation
- Pick up, carry and place bedding and/or other materials without contamination, minimal waste
- For all tasks: effective communication, visual, audible
- Hoist & carry: controlled movements, safe rigging
- Trenching: straight, on grade, stable, safe for entry, etc. (see H8)
- Truck loading: legal load, smooth and accurate, no touch, no bounce, no spill (seeH11)
- Expose existing services without damage

LINE H: **OPERATE BACKHOE**

Competency: **H11 Load trucks**

Learning Objectives:

1 The learner will use the backhoe to load trucks with materials and aggregates

LEARNING TASKS	CONTENT
1 Arrange the loading site	• efficient loading pattern, truck placement • consider: position to allow eye contact, loader movement from bank to truck in a short V pattern is better than a longer L pattern, sun position & wind direction may be relevant, think about the long term movement thru the pile – not just the first few loads, trucks should turn around empty – not loaded
2 Maintain the pit floor level, smooth, clear of rocks	• minimize spillage • clean up and grade area between loads and / or as loader moves in to fill bucket from bank • dig level
3 Load smoothly, gently	• dump first bucket gently, don't dump from excessive height or so quickly that you 'bounce' the truck, loading the rear axles first is generally preferable to loading the front of the box first, don't spill the driver's coffee!
4 Communicate	• truck placement for eye contact is preferred • horn signals are: one beep for stop (unless truck is already stopped in which case most people use one beep to mean "you're loaded"), two beeps for back up, three beeps for go ahead. • Help the driver by confirming closed tailgate before loading, watching for rocks you may have spilled on the truck that could fall off, looking for rocks pinched in the dual tires, mechanical problems, flat tires, etc.

5	Build a legal load	• This is the truck driver's responsibility, but he is also relying on your professionalism. Know what a legal load looks like – depends on material and the truck but is generally no higher than the side boards, against the front to 2/3 of the box height, and little or nothing touching the tailgate. For off hwy articulated – fill 'er up

Suggested Assessment:

- Time and quantity as instructor deems appropriate (a proficient operator could load 4-5 trucks per hour
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control, reduced 'wear and tear', minimal impact, minimal tire spinning
- Attention to stability, load height, center of gravity, slopes
- Carries loads with minimal spillage, raises loads without spillage
- Maintain smooth pit floor / running surface
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Load smoothly: no bounce, no touch
- Load accurately (legal load): centered, correct weight distribution between front and rear axles, no spillage
- No contact with truck
- Effective communication, visual, audible

LINE H: OPERATE BACKHOE

Competency: H12 Drive on public roads

Learning Objectives:

1 The learner will drive the backhoe safely on public roads

LEARNING TASKS	CONTENT
1 Start with low traffic roads	• insurance, lights, signs as required • unloaded machine is light on front end creating a tendency to bounce, and effecting steering control • travel at speeds appropriate to conditions (traffic, roughness, grade, hazards) • exercise caution when travelling on shoulders: – driveway crossings and other rough areas can cause loss of control • exercise control over passing traffic: – If pulling onto shoulder will provide safe clearance for traffic to pass then do so BUT: – if pulling over will not provide safe clearance – then don't – sometimes better to stay in traveled portion to prevent passing, rather than encouraging passing when not safe due to inadequate width – Don't assume much intelligence or attention from other drivers • use appropriate gear for grade – lower gear for up or down steep hills
2 Highways, more traffic	• as above
3 City streets	• as above, but exercise extreme caution • stay focussed, aware of other vehicles, traffic patterns, clearance, signals

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement

Specific to this task:

- Rules of the road, traffic regulations
- Caution, appropriate speed, control

LINE H: OPERATE BACKHOE

Competency: **H13** **Handle debris, brush, cleanup tasks with 4-in-one bucket (Optional)**

Learning Objectives:

1 The learner will use the 4 in one bucket to clean up piles of debris and brush

	LEARNING TASKS	CONTENT
1	Pinch tires	• good exercise to start practising by pinching and picking up tires
2	Clean up small piles	• clean up small piles by positioning open 4 in 1 over the pile, closing with simultaneous curl and boom adjustment. Typical example is picking up left over bedding sand (less than 1 cu yd) from paved surface
3	Pick up debris	• typical examples: broken pavement chunks, construction waste (garbage) • take care not to twist 4 in 1 by pinching hard objects in one side of bucket; also not to bend back edge of “clam” • “build” bucket loads of debris that don’t spill, or fall apart. lift without posing a hazard to yourself or others • load roll off bins or dump trucks
4	Handle brush	• usually not equipped with brush guarding, so be reasonable/safe…not land clearing • take care not to twist 4 in 1 by pinching hard objects in one side of bucket…also not to bend back edge of “clam” • “build” bucket loads of brush that don’t spill, or fall apart. lift without posing a hazard to yourself or others • load roll off bins or dump trucks
5	Pinch a log (or other object) and ”sweep”	• pinched log or beam can work well to complete fine grading and/or to clean off pavement • large tire, mattress, or other soft material works well to sweep sand, topsoil from pavement

Achievement criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control, reduced 'wear and tear', minimal impact, minimal tire spinning
- Attention to stability, load height, center of gravity, slopes
- Carries loads with minimal spillage, raises loads without spillage
- Maintain smooth running surface
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Smooth, controlled and precise simultaneous movement of 4 in 1 components is required to "make it work"
- Stressing, bending, damaging 4 in 1 buckets is common. Minimizing this should be a key criteria.

LINE H: **OPERATE BACKHOE**

Competency: **H14 Install and use attachments (Optional)**

Learning Objectives: Install and use attachments available to you:

1 The learner will be able to install and use various backhoe attachments

LEARNING TASKS	CONTENT
1 Pavement cutting wheel	• secure mounting can be difficult for the type that mounts to the cutting edge by clamping bolt • straight, tidy cuts • multiple passes while maintaining control, straight • grease as required (every ½ hour)
2 Hoe Pack	• appropriate engine speed – less than full RPM • minimize twisting of rubber mounting blocks, no push ups of machine, controlled pressure • compact in appropriate pattern…once is never enough… multiple passes should be done with progressive pattern where 2nd pass is adjacent to a 1st – not adjacent to un packed material; 3rd pass is next to 2nd, etc • grease as required (interval no greater than 45 minutes between greasing)

3	Rock Breaker	• appropriate engine speed – much less than full RPM – check with manufacturer, determine hydraulic flow of machine and match to manufacturers recommendation • never pry with bit • force must be in line with bit, not sideways • control of down pressure, minimal side pressure • warm up before full load use • grease as required (interval no greater than 30 minutes), grease must be constantly visible flowing out of hammer and down bit • look for seams in rock, "read the rock", "bite off" quantity that will break efficiently, too big of a "bite" is a waste of time • plan your pattern to break efficiently, allow for removal of loose rock, minimize changes from breaker to bucket, provide working platforms for your machine, etc.
4	Possibly sweeper, forks, grinder, etc	• specific for each attachment

Suggested Assessment:

- Time and quantity assessed by instructor's observation
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- criteria as for previous objectives

Specific to this task:

- maintenance and monitoring of attachments
- operating techniques to minimize 'wear and tear' of attachments
- operating techniques specific to each attachment to accomplish tasks efficiently

LINE I: OPERATE DOZER

Competency: I1 Describe and comply with safety requirements

Learning Objectives:

1 The learner will describe how to work safely while working on and around a dozer. This will include understanding key regulations, machine limitations, operating procedures and tasks and the use of PPE's

2 The learner will comply with safety requirements at all times during this course.

	LEARNING TASKS	CONTENT
1	Use equipment manuals and specifications to determine safe operating procedures and operational restrictions of dozer	Lecture, group discussion, Q&A • identify and discuss relevant sections of manual
2	Assess a variety of excavating tasks for potential hazards, and explain strategy to work safely.	Lecture, group discussion, Q&A, possibly small group work • describe a variety of tasks and conditions, explore hazards and safe practices
3	Identify key regulations that apply to given tasks and conditions	Lecture, group discussion, Q&A, possibly small group work • identify and discuss relevant sections of regulation
4	Operate Dozer in compliance with regulations and safe practices	Instruct and supervise hands on operating with constant attention to safe practices, review and application of previous safety instruction • regulations • company policies • general safe practices • safety-first attitude, awareness
5	Use Personal Protective Equipment	Supervise, insist, enforce • hardhat • hearing protection • hi visibility • eye protection as required • gloves as required • steel toe footwear

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will achieve a minimum of 70% combined score on a practical assessment form and achieve a pass mark in all boxes marked pass/fail
- Demonstrated safe practices while operating machine

LINE I: **OPERATE DOZER**

Competency: **I2** **Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance**

Learning Objectives:

1 The learner will perform pre start equipment checks
2 The learner will perform start up and shutdown procedures
3 The learner will monitor the performance of the equipment

LEARNING TASKS	CONTENT
1 Perform pre start checks (hands on) • first as a small group activity • individually before operating each machine • as a supervised and assessed exercise before completion of the core lab	• Comprehensive pre start check • Review hazards: pressurised systems, batteries, slips & falls, fumes etc. • identify correct fluids for each component • add fluids as required • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, some transmissions) • general procedures include visual checks for loose, damaged or leaking components, fluid levels, operational checks to confirm proper operation of all systems
2 Perform start up procedures	• check for operation of gauges, warning systems • start and warm up engine at low idle • walk around, look for leaks, general check (noise, vibration, unusual exhaust or other condition) • warm up hydraulics and transmission before full load • check for proper operation of lights, wipers, seat belt, lockouts, parking brake, all controls and major systems (hydraulics, transmission, brakes, etc.

3	Perform shutdown procedures	• safe parking position, set parking brake, lower bucket/attachments • position that allows access in case of mechanical trouble at start up • level position for checking of fluids • cool down before shut down • walk around, look for leaks, general check • secure machine, locks, etc
4	Monitor performance of equipment during operation	• gauges and warning systems • look, hear, feel, smell • Respond appropriately: is immediate shutdown required?

Suggested Assessment:

- An exercise with students performing pre start, start and shut down with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially checked, or thoroughly checked. Students must complete pre-checklist, start-up and shut down procedures.
- A quiz for core lab content could be used including content of I1, I2, I3, and I4

Achievement Criteria:

To complete the in school practical lab requirement for the dozer the learner must be able to demonstrate:

- All elements of pre start, start up and shut down. Once a student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, checking for leaks or loose hardware involves more than a “quick look”

LINE I: **OPERATE DOZER**

Competency: **I3** **Perform daily maintenance tasks**

Learning Objectives:

1 The learner will perform daily maintenance checks in accordance to a supplied check list.

	LEARNING TASKS	CONTENT
1	Service lubrication system (greasing)	• identify and lube all points • load grease gun **Note:** Point out that the appropriate amount of grease is debatable, employers differ, but the following guidelines are reasonable: • 2-3 shots for small areas: fan bearings, small u joints, linkages, hinges, etc. • 8 – 10 shots for common pins and bushings • 20 shots where one nipple feeds a large area • every pin must be showing excess grease regardless of how many shots you have counted • daily for most points / weekly for some • wipe off nipples before greasing to reduce abrasive particles entering pin/bushing
2	Service air intake system as required (air filters/ pre cleaners)	Use pictures or examples of restriction indicators and pre cleaner if your machine is not equipped • restriction indicators • pre cleaner service • cleaning vs. replacement, check employer policy (some insist on never using air – replace only) • use air only with reduced pressure
3	Drain fuel tank sump, water separator fuel filters if equipped (Racor or other)	• drain, assess quantity and types of contaminants • water, debris, scale, etc

4	Add fluids as required	• identify correct fluids for each component • add fluids as required • avoid contamination with dirt, water • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, transmissions)
5	Inspect and clean components as required	• radiator & oil cooler • filler plugs, dip sticks • battery terminals
6	Adjust track tension as required	• determine 'slack' appropriate for task/ materials • correct procedures for measuring/assessing and adjusting
7	Housekeeping	• garbage • excess grease • clean windows, sweep out cab, general cleanliness

Suggested Assessment:

- And with students performing daily maintenance tasks with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially done, or thoroughly.

Achievement Criteria:

To complete the in school practical lab requirement for the loader the learner must be able to demonstrate:

- All elements of daily maintenance. Once the student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, inspecting and cleaning components involves more than a "quick look".

LINE I: **OPERATE DOZER**

Competency: **I4** **Describe mechanical components, troubleshooting, basic repairs and maintenance**

Learning Objectives:

1 The learner will describe the basic components and functions of a dozer
2 The learner will describe basic troubleshooting signs and symptoms and appropriate responses for the operator

	LEARNING TASKS	CONTENT
1	Describe major mechanical components	Identify major components from a checklist, and describe function • identify and describe function from list of major components
2	Describe potential failures, symptoms and indicators of failure	Discuss potential failures, symptoms • symptoms: noise, vibration, smell, leaks, cracks • respond appropriately: service required, immediate repair required, immediate removal from service
3	Describe basic repairs and maintenance	Supervise, demonstrate as required • remove and replace hydraulic hose, o-ring • re and re fuel filter, bleed air from fuel system • re and re air filter • engine oil change, lube filter • adjust belt tension • maintain track tension • clean battery terminals, top up fluid • check and tighten assorted hardware • replace corner bits, ripper teeth

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE I: OPERATE DOZER

Competency: I5 Perform basic operator functions

Learning Objectives:

1 The learner will perform basic operator functions in accordance to the Heavy Equipment Operator Practical Assessment Form

	LEARNING TASKS	CONTENT
1	Perform basic moves	• raise & lower, tilt blade (&angle for 6way blade) • move forward, stop, back up, stop • lower blade, apply park brake, lockout transmission
2	Drive dozer through simple obstacle course	• pylons or used tires outlining an obstacle course • hills and slopes • forwards and backwards
3	Push a large tire over uneven ground	• drive dozer over uneven, hard packed ground, raise and lower blade to keep moving tire without making contact with ground

Suggested Assessment:

- Observe students performing learning tasks and assess competency using a pass/fail rating. Students should be able to achieve learning outcomes by the end of a one day session.
- Time and quantity as instructor deems appropriate – example: proficient student could successfully push tire 50 meters without losing the tire either under the blade or off the side of the blade and continue through obstacle course within 10 minutes.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, appropriate position of blade, minimal impact
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle
- Enters and exits machine safely (3 point contact, parking position, brake)

Specific to this task:

To complete the in school practical lab requirement for the dozer the learner must be able to demonstrate the following practical skills:

- Demonstrate the safe operation of equipment including observation of surroundings.
- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks.

Perform basic moves with equipment including:

- Move forward, stop, back up, stop, turn left and right stop (flat elevation).
- Apply park brake, lock out transmission.
- Shift transmission.
- Demonstrate control of blade by raising, lowering and changing the angle of the blade.
- Maintain blade angle in flat position (flat smooth to the surface).
- Move dozer into a simulated and marked parking area without hitting pylons. Apprentice must move dozer within 1 meter of the back pylon without driving over the pylon or hitting the side pylons. (Pylons must be set to have a tolerance of 1.5 meters on each side of the dozer. One 90 degree right hand turn and one 90degree left hand turn must be made on route to parking area. (Pylons must be placed so they are visible to the driver).
- Push tire 50 meters without losing the tire either under the blade or off the side of the blade.

LINE I: **OPERATE DOZER**

Competency: **I6** **Strip and stockpile surface materials/ organics**

Learning Objectives:

1 The learner will strip and stockpile surface materials

LEARNING TASKS	CONTENT
1 Strip waste materials (usually organics)	• Review soil types, organic vs. structural soils • identify layers, distinguish waste layer from structural layer • thoroughly remove waste layer while minimizing removal and disturbance of underlying layer • "slot doze" thick layers moving full blade loads, then clean up windrows and any remaining waste material
2 Stockpile waste materials	• consider potential run off – possible high silt content from organics – minimize and control run off • consider potential saturation – sloped and consolidated (track packed) pile will absorb less water • use efficient piling/ramping techniques that reduce the number of blade loads that are pushed up steep grades

Suggested Assessment:

- Strip and stockpile surface materials (organics) – (a proficient operator using a D5 dozer with a 120", 6 way blade could strip and stockpile 250 cu. m. from a 50m x 20m square (.25 m deep) in 3 hours
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, appropriate position of blade, minimal impact
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, minimal track spinning
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, center of gravity, slopes
- Load blade quickly, match blade load with available power and traction
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Remove virtually all waste material (organics) while minimizing removal and disturbance of underlying layers
- Consistent, tidy pile of stripped material - compact, smooth, sloped to minimize water saturation

LINE I: **OPERATE DOZER**

Competency: **I7** **Cut and fill material**

Learning Objectives:

1 The learner will cut and fill surface materials to create an even level surface area

LEARNING TASKS	CONTENT
1 Plan the task	• visually estimate the 'height' of cuts and fills to accomplish finish grade – balance quantities • use grade checking instruments • plan effective patterns to minimize distance material is moved • take advantage of slopes to cut and carry downhill when possible
2 Cut 'highs'	• use effective techniques to cut hard material (while minimizing impact, spinning of tracks) – corner bits cut hard material more effectively than full width of blade – take advantage of extra power available downhill • create enough loose material to fill blade before pushing significant distance
3 Push to 'lows'	• fill blade quickly and keep it full - match blade load with available power and traction • take advantage of windrows – slot dozing
4 Grade area	• grade area to a level platform • eliminate windrows, clean up

Suggested Assessment:

- Time and quantity as instructor deems appropriate
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, appropriate position of blade, minimal impact
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, minimal track spinning
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, center of gravity, slopes
- Load blade quickly, match blade load with available power and traction
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Use grade checking instruments
- Grading of area to +/- 6”

LINE I: **OPERATE DOZER**

Competency: **I8** **Create slopes**

Learning Objectives:

1 The learner will plan cut and grade slopes to specification

LEARNING TASKS	CONTENT
1 Plan the task	• interpret stakes/ specifications; use grade checking instruments • 2 ½ or 3:1 • if slope is surveyed (staked) - cut the slope next to each row of stakes, then complete areas between • plan effective patterns to minimize distance material is moved; perform heavy cuts downhill if possible • assess the slope regarding stability, can work be done across slope (3:1) or only downhill 2:1 • if slope is too steep to back up easily, plan a route to return to top *(Describe "yo yo" technique – 2 machines with winch)*
2 Cut and grade slope	• match blade load with available power and traction • be aware of stability issues, apply safe practices • grade area to a uniform slope, eliminate windrows, clean up

Suggested Assessment:

- Time and quantity as instructor deems appropriate
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, appropriate position of blade, minimal impact
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, minimal track spinning
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, center of gravity, slopes
- Load blade quickly, match blade load with available power and traction
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Use grade checking instruments
- Grading of slopes to +/- 6”

LINE I: OPERATE DOZER

Competency: I9 Create ditches

Learning Objectives:

1 The learner will create ditches to specification

LEARNING TASKS	CONTENT
1 Create ditches	• v trench • flat bottomed trench • swale • permanent ditch to grade, specified shape and dimension • temporary site drainage
2 Stockpile or level spoil	• stockpile or blend in material, grade area, eliminate windrows, clean up

Suggested Assessment:

- Time and quantity as instructor deems appropriate – example: proficient student with a D5 & 6 way blade, in soft conditions, could cut a 100m, .75m deep v trench, grade and cleanup spoil, in 1 hour
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, appropriate position of blade, minimal impact
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, minimal track spinning
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, center of gravity, slopes
- Load blade quickly, match blade load with available power and traction
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Use grade checking instruments
- Grading and shaping to +/- 4” of specified slope, shape, dimensions

LINE I: **OPERATE DOZER**

Competency: **I10** **Spread Ballast**

Learning Objectives:

1 The learner will spread and grade ballast

LEARNING TASKS	CONTENT
1 Direct (supervise) trucks	• effective communication/signals • dumping location and pattern • have trucks spread or pile loads as appropriate to improve efficiency of dozer • turn outs, turn around areas
2 Spread	• Describe (demonstrate) techniques to sort larger material from fines • sort (grade) material as required i.e. larger rock placed low, finished with fines • match blade load with available power and traction
3 Grade	• adequately level and smooth • specified width, depth • possibly crowned, or sloped to inside • possibly grade checking devices

Suggested Assessment:

- Time and quantity as instructor deems appropriate – example: proficient student with a D5 & 6 way blade could spread and grade 100 cubic metres per hour
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, appropriate position of blade, minimal impact
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, minimal track spinning
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, center of gravity, slopes
- Load blade quickly, match blade load with available power and traction
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Communicate, direct (supervise) trucks
- Use grade checking instruments
- Levelling and smoothing to provide safe and efficient hauling

LINE I: OPERATE DOZER

Competency: I11 Place aggregates to specified elevations ("finish grading")

Learning Objectives:

1 The learner will perform finish grading within fine tolerance measurements

	LEARNING TASKS	CONTENT
1	Direct (supervise) trucks	• effective communication/signals • dumping location • spread or pile • turn outs, turn around areas
2	Spread and grade	• interpret drawings, specifications, grade stakes • use grade checking instruments • place material to specified elevation, slope, crown, dimensions – accurately • anticipate compaction (place higher than finish grade as appropriate)

Achievement Criteria:
Suggested Assessment:

- Time and quantity as instructor deems appropriate – example: proficient student with a D5 & 6 way blade could spread and grade to fine tolerances 35 to 40 cubic metres per hour
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:
General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, appropriate position of blade, minimal impact
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, minimal track spinning
- Enters and exits machine safely (3 point contact, parking position, brake)
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Communicate, direct (supervise) trucks
- Use grade checking instruments
- Place material accurately (+/- 1" or better) to specified elevation, slopes

LINE I: OPERATE DOZER

Competency: I12 Rip dense materials (Optional)

Learning Objectives:

1 Use ripper to loosen hard surface materials
2 Match depth and speed to the work plan and conditions of the materials

	LEARNING TASKS	CONTENT
1	Rip	• rip hard materials • balance ripper depth & load to available power and traction • minimize wear & tear, impact, track spinning
2	Cut and push	• remove ripped material

Suggested Assessment:

- Time and quantity as instructor deems appropriate – proficient student could rip 100 cu m. per hour using single ripper (highly variable depending on conditions)
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, appropriate position of blade, minimal impact
- Attention to stability, center of gravity, slopes
- Use ripper to rip through various hard materials
- Plans and conducts work with minimal wasted movement and efficient movement paths

LINE I: **OPERATE DOZER**

Competency: **I13** **Clear Land (Optional)**

Learning Objectives:

1 The learner will use the dozer to clear land of brush, trees, stumps and other unwanted materials separating dirt from brush

	LEARNING TASKS	CONTENT
1	Logging as required	• use winch, yard and pile merchantable logs
2	Clearing	• use effective techniques to remove stumps (adequate root removal, 'reading the stump', possibly splitting, etc.) • plan effective patterns, pile placement, build full blade loads, etc • clear area under piles – don't start piling on un cleared land • push wood into piles for burning • effective rake techniques include: lift, roll, skim – avoid pushing dirt – when dirt and wood is mixed, separation takes far longer than patiently doing it right the first time • minimize dirt in piles
3	Grubbing	• minimize dirt in piles • rake brush, limbs, chunks – separate from dirt
4	Burning	• minimize dirt in piles • think of lighting a camp fire: start with 'kindling' (dry, small pieces, split surfaces, cedar preferred, well placed) • air flow is helpful, especially during start • add larger pieces as heat builds, dry out large pieces (stumps) and add only when heat is well established • re start yesterday's fire as follows: break pile apart; rake ashes; re pile hot, dry pieces – will ignite on its own; separate small, dry pieces and add to pile; add larger pieces as heat builds

Suggested Assessment:

- Time and quantity as instructor deems appropriate – proficient student could clear, grub, burn 3/4 acre per day (highly variable depending on conditions)
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, appropriate position of blade, ripper or clearing rake
- Attention to stability, center of gravity, slopes
- Separate dirt from debris
- Effective stump removal
- Plans and conducts work with minimal wasted movement and efficient movement paths

LINE I: **OPERATE DOZER**

Competency: **I14** **Push Scraper (Optional)**

Learning Objectives:

1 The learner will work in tandem with the scraper to remove surface materials

LEARNING TASKS	CONTENT
1 Push scraper to assist loading	• effective communication, teamwork • balance engine power to load, traction • minimize wear & tear, impact, track spinning • assist, grade, level, remove obstacles/rocks, generally work to manage the site and improve efficiency

Suggested Assessment:

- Time and quantity as instructor deems appropriate
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- effective communication, teamwork
- maximum power with minimal impact, track spinning
- Operates with smooth and precise control of hydraulics, appropriate position of blade
- Attention to stability, center of gravity and contact with scraper
- Plans and conducts work with minimal wasted movement and efficient movement paths

LINE J: **OPERATE EXCAVATOR**

Competency: **J1** **Describe and comply with safety requirements**

Learning Objectives:

1 The learner will describe how to work safely while working on and around an excavator. This will include understanding key regulations, machine limitations, operating procedures and tasks and the use of PPE's

2 The learner will comply with safety requirements at all times during this course.

LEARNING TASKS	CONTENT
1 Use equipment manuals and specifications to determine safe operating procedures and operational restrictions of excavator	Lecture, group discussion, Q&A • identify and discuss relevant sections of manual
2 Assess a variety of excavating tasks for potential hazards, and explain strategy to work safely.	Lecture, group discussion, Q&A, possibly small group work • describe a variety of tasks and conditions • explore hazards and safe practices
3 Identify key regulations that apply to given tasks and conditions	Lecture, group discussion, Q&A, possibly small group work • identify and discuss relevant sections of regulation
4 Operate excavator in compliance with regulations and safe practices	Instruct and supervise hands on operating with constant attention to safe practices, review and application of previous safety instruction • regulations • company policies • general safe practices • safety-first attitude, awareness

5	Use Personal Protective Equipment	Supervise, insist, enforce • hardhat • hearing protection • high visibility • eye protection as required • gloves as required • steel toe footwear

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will achieve a minimum of 70% combined score on a practical assessment form and achieve a pass mark in all boxes marked pass/fail
- Demonstrated safe practices while operating machine

LINE J: **OPERATE EXCAVATOR**

Competency: **J2** **Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance**

Learning Objectives:

1 The learner will perform pre start equipment checks
2 The learner will perform start up and shutdown procedures
3 The learner will monitor the performance of the equipment

LEARNING TASKS	CONTENT
1 Perform pre start checks (hands on) • first as a small group activity • individually before operating each machine • as a supervised and assessed exercise before completion of the core lab	• Comprehensive pre start check • Review hazards: pressurised systems, batteries, slips & falls, fumes etc. • identify correct fluids for each component • add fluids as required • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, some transmissions) • general procedures include visual checks for loose, damaged or leaking components, fluid levels, operational checks to confirm proper operation of all systems
2 Perform start up procedures	• check for operation of gauges, warning systems • start and warm up engine at low idle • walk around, look for leaks, general check (noise, vibration, unusual exhaust or other condition) • warm up hydraulics before full load • check for proper operation of seat belt, hydraulic lockout, engine speed, all controls
3 Perform shutdown procedures	• safe parking position, lower bucket/attachments, engage hydraulic lockout, idle down engine • position that allows access in case of mechanical trouble at start up • level position for checking of fluids • cool down before shut down • walk around, look for leaks, general check • secure machine, locks, etc

4	Monitor performance of equipment during operation	• gauges and warning systems • look, hear, feel, smell • Respond appropriately: is immediate shutdown required?

Achievement Criteria:

To complete the in school practical lab requirement for the excavator the learner must be able to demonstrate:

- All elements of pre start, start up and shut down. Once a student can demonstrate a minimum of 80% efficiency using their checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, checking for leaks or loose hardware involves more than a "quick look"

LINE J: **OPERATE EXCAVATOR**

Competency: **J3** **Perform daily maintenance tasks**

Learning Objectives:

1 The learner will perform daily maintenance checks in accordance to a supplied check list.

LEARNING TASKS	CONTENT
1 Service lubrication system (greasing)	• identify and lube all points • load grease gun Point out that the appropriate amount of grease is debatable, employers differ, but the following guidelines are reasonable: • 2-3 shots for small areas: fan bearings, small u joints, linkages, hinges, etc. • 8 – 10 shots for common pins and bushings • 20 shots where one nipple feeds a large area • daily for most points / weekly for some • wipe off nipples before greasing to reduce abrasive particles entering pin/bushing
2 Service air intake system as required (air filters / pre cleaners)	• restriction indicators • pre cleaner service • cleaning vs. replacement, check employer policy (some insist on never using air – replace only) • use air only with reduced pressure
3 Drain fuel tank sump, water separator fuel filters if equipped (Racor or other)	• drain, assess • water, debris, scale, etc
4 Add fluids as required	• identify correct fluids for each component • add fluids as required • avoid contamination with dirt, water • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, transmissions)
5 Inspect and clean components as required	• radiator & oil cooler • filler plugs, dip sticks • battery terminals

6	Adjust track tension as required	• determine 'slack' appropriate for task/ materials • correct procedures for measuring/assessing and adjusting
7	Housekeeping	• garbage • excess grease • clean windows, sweep out cab, general cleanliness

Suggested Assessment:

- An exercise with students performing daily maintenance tasks with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially done, or thoroughly.

Achievement Criteria:

To complete the in school practical lab requirement for the excavator the learner must be able to demonstrate:

- All elements of daily maintenance. Once the student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, inspecting and cleaning components involves more than a "quick look".

LINE J: **OPERATE EXCAVATOR**

Competency: **J4** **Describe mechanical components, troubleshooting, basic repairs and maintenance**

Learning Objectives:

1 The learner will describe the basic components and functions of an excavator
2 The learner will describe basic troubleshooting signs and symptoms and appropriate responses for the operator

	LEARNING TASKS	CONTENT
1	Describe major mechanical components	Identify major components from a checklist, and describe function • identify and describe function from list of major components
2	Describe potential failures, symptoms and indicators of failure	Discuss potential failures, symptoms • symptoms: noise, vibration, smell, leaks, cracks • respond appropriately: service required, immediate repair required, immediate removal from service
3	Describe basic repairs and maintenance	Supervise, demonstrate as required • remove and replace hydraulic hose, o-ring • re and re fuel filter, bleed air from fuel system • re and re air filter • engine oil change, lube filter • adjust belt tension • maintain tire air pressure • clean battery terminals, top up fluid • check and tighten assorted hardware • replace bucket teeth

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE J: **OPERATE EXCAVATOR**

Competency: **J5** Perform basic operator functions

Learning Objectives:

1 The learner will perform basic operator functions in accordance to the Heavy Equipment Operator Practical Assessment Form

LEARNING TASKS	CONTENT
1 Perform basic moves	• raise & lower boom, extend & retract stick, curl & dump bucket, swing left & right • move forward, stop, back up, stop • perform basic skid turns in both directions (idlers front and idlers at rear) • park safely: swing to align bucket between track lines or slightly to the right of center (allows exit with track as first step, aligns handrails with step on track frame), lower bucket to ground, engage hydraulic lockout, idle down
2 Drive excavator through simple obstacle course	• possibly pylons or used tires outlining an obstacle course • skid turns for gradual turns on hard ground; push up turns for tight turns and/or for uneven or loose ground; forwards and backwards (idlers front and idlers at rear) • hills and slopes, steep slopes should be done with sprockets down slope (whether going up or down) to maintain tight track on bottom and slack on top • use simultaneous control of functions to: cross trench, smooth out the transitions at the top and bottom of steep hills, pull machine up very steep slope and carry machine down a very steep slope as in getting on and off a stockpile, climb on a lowbed (could be simulated with a log backfilled on the high side)

3	Scoop water and dump in well casing (or manhole barrel, large tire)	• split functions for smooth movements, shortest continuous path, simulate dig pattern and bucket angles • full buckets, avoid splashing & spilling • split functions to dump water "on target" – center of barrel, no spilling outside barrel
4	Change buckets	• choose appropriate bucket for task • demonstrate efficient and safe technique for change

Suggested Assessment:

- Observe students performing learning tasks and assess competency using a pass/fail rating. Students should be able to achieve learning outcomes by the end of the course.
- Time and quantity as instructor deems appropriate – example: proficient student could perform dig cycle in average time of 30 seconds

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, splitting functions to keep appropriate position of bucket and short efficient movement paths, minimal impact
- Operates with smooth and precise control of tracks; appropriate speed; avoids rocks/obstacles; avoids anything that tends to bend pads or puts a side load on tracks, clears tracks of loose material as required, uses simultaneous control of boom, stick, and bucket to minimize wear and tear of undercarriage i.e. pulling up steep hills, carries machine for obstacles, push up turns when appropriate, etc.
- Enters and exits machine safely (3 point contact, parking position, brake)

Specific to this task:

To complete the in school practical lab requirement for the excavator the learner must be able to demonstrate the following practical skills:

- Demonstrate the safe operation of equipment including observation of surroundings.
- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks.

Perform basic moves with equipment including:

- Move forward, stop, back up, stop (flat elevation).
- Apply park brake, lock out transmission.
- Shift transmission.
- Raise and lower boom (making sure to observe for wires).
- Extend and retract stick.
- Curl and dump bucket.
- Swing left and right.
- Lower bucket to the ground for lock out procedures.
- Know that you must call before you dig (Check for underground utilities).
- Excavate simple trench 30 meters long by 1 meter deep. Keep trench straight. Place materials from dig no less than 60 cm (2') from edge of dig area.
- Backfill trench using the materials taken from the excavated site.
- Use bucket to flatten and compress the dig site.
- Shows ability to split functions to operate tracks and digging functions simultaneously i.e. pulling up steep grades, clearing obstacles, push up turns, etc.
- Change buckets (quick change) in 10 minutes or less

LINE J: **OPERATE EXCAVATOR**

Competency: **J6** **Excavate and backfill trenches**

Learning Objectives:

1 The learner will excavate and backfill trenches in a straight line, to a consistent depth.

LEARNING TASKS	CONTENT
1 Excavate shallow trench	• suggested: 30m x 1m deep x 1 bucket width • ramped at end for worker access • trench bottom & top edges smoothed off • consistent depth, straight • stable sides • spoil pile 2' minimum from edge, straight, consistent
2 Excavate deep trench	• suggested: 30 m x 1.8m deep x 1 bucket width wide and sloped at ¾ : 1 or as appropriate for soil type • trench bottom & top edges smoothed off • consistent depth, straight • stable sides, consistent slopes • spoil pile 2' minimum from edge, straight, consistent
3 Backfill	• track pack fill • final grading of work area within 4" of level grade • backfilling in lifts, placing bedding, backfilling pipe, etc is covered in J13: service pipe crew

Suggested Assessment:

- Time and quantity as instructor deems appropriate – example: proficient student could excavate, backfill, and finish grade the area for a 30 m x 1m deep trench in 8 hours
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, splitting functions to keep appropriate position of bucket and short efficient movement paths, minimal impact
- Operates with smooth and precise control of tracks; appropriate speed; avoids rocks/obstacles; avoids anything that tends to bend pads or puts a side load on tracks, clears tracks of loose material as required, uses simultaneous control of boom, stick, and bucket to minimize wear and tear of undercarriage i.e. pulling up steep hills, carries machine for obstacles, push up turns when appropriate, etc.
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, load height, center of gravity, slopes, potential for collapse of trench sides
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- consistent depth
- straight
- spoil pile min. 2 ft from edge, straight, consistent height and width
- bottom and top edges smoothed off
- safe for entry by workers: stable walls (sloped for deep trench), ramp for entry
- track packed backfill
- final grading of work area to proficient standard (+/- 4”)

LINE J: **OPERATE EXCAVATOR**

Competency: **J7** **Cut and fill material**

Learning Objectives:

1 The learner will cut, fill and grade large working area with efficient movement and planning

LEARNING TASKS	CONTENT
1 Plan the task	• visually estimate the 'height' of cuts and fills to accomplish finish grade – balance quantities • use grade checking instruments • plan effective patterns to minimize distance material is moved • choose appropriate bucket
2 Cut 'highs'	• a level machine = a level cutting edge • use effective techniques to cut hard material: appropriate bucket angles; one or two teeth cut hard material more effectively than full width of bucket, etc • create enough loose material to fill bucket before swinging • level the area as you cut
3 Hoe chuck to 'lows'	• swing full buckets • first priority is to place material to extend working platform (where tracks will be) level, stable • hoe chucking large volumes involves: – progressive series of "steps" or platforms, width and height managed to keep digging at 'more or less' full reach and dumping at 'more or less' full reach. – be aware of stability issues when working on fresh, loose piles, (ensure stable under footing, and beware swinging full loads at full reach) – Piles may get so large that efficiency is improved by splitting the volumes into 2 or more passes to keep digging patterns efficient – it's easier to do finish grading from a low height • grade the area as you go

4 Grade area

- finish grading is accomplished by:

– level the machine, keep it level, prepare your working platform behind the machine as you work

– 'bulking out' volumes until minor quantity is left and then grading by shadowing previous bucket width i.e. the ¾ bucket width technique

– best pattern is usually starting at one side of 'reachable area', grading successive bucket passes towards the center, switching to the other side, and finishing the center last

– don't swing partially full buckets unnecessarily, do grading passes until there is a pile worth picking up

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, splitting functions to keep appropriate position of bucket and short efficient movement paths, minimal impact
- Operates with smooth and precise control of tracks; appropriate speed; avoids rocks/obstacles; avoids anything that tends to bend pads or puts a side load on tracks, clears tracks of loose material as required, uses simultaneous control of boom, stick, and bucket to minimize wear and tear of undercarriage i.e. pulling up steep hills, carries machine for obstacles, push up turns when appropriate, etc.
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, load height, center of gravity, slopes, potential for collapse of trench sides
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- track packed fill
- final grading of work area to proficient standard (+/- 4")
- hoe chucking techniques: arrangement of work to facilitate efficient movement i.e. digging at 'more or less' full reach and dumping at 'more or less' full reach; progressive platforms, grade as you go
- effective finish grading: level machine = level cutting edge; prepare working platform behind machine; ¾ bucket width technique
- swing full buckets

LINE J: **OPERATE EXCAVATOR**

Competency: **J8** **Strip and stockpile surface materials/ organics**

Learning Objectives:

1 The learner will strip and stockpile surface materials

LEARNING TASKS	CONTENT
1 Strip waste materials (usually organics)	• identify layers, distinguish waste layer from structural layer • thoroughly remove waste layer while minimizing removal and disturbance of underlying layer
2 Hoe chuck to stockpile	• swing full buckets • first priority is to place material to extend working platform (where tracks will be) level, stable • hoe chucking large volumes involves: – progressive series of "steps" or platforms, width and height managed to keep digging at 'more or less' full reach and dumping at 'more or less' full reach. – be aware of stability issues when working on fresh, loose piles, (ensure stable under footing, and beware swinging full loads at full reach) – Piles may get so large that efficiency is improved by splitting the volumes into 2 or more passes to keep digging patterns efficient • it's easier to do finish stripping passes from a lower height
3 Stockpile waste materials	• consider potential run off – possible high silt content from organics – minimize and control run off • consider potential saturation – sloped and consolidated (track packed) pile will absorb less water

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, splitting functions to keep appropriate position of bucket and short efficient movement paths, minimal impact
- Operates with smooth and precise control of tracks; appropriate speed; avoids rocks/obstacles; avoids anything that tends to bend pads or puts a side load on tracks, clears tracks of loose material as required, uses simultaneous control of boom, stick, and bucket to minimize wear and tear of undercarriage i.e. pulling up steep hills, carries machine for obstacles, push up turns when appropriate, etc.
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, load height, center of gravity, slopes, potential for collapse of trench sides
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Remove virtually all waste material (organics) while minimizing removal and disturbance of underlying layers
- Consistent, tidy pile of stripped material - compact, smooth, sloped to minimize water saturation
- hoe chucking techniques: arrangement of work to facilitate efficient movement i.e. digging at ‘more or less’ full reach and dumping at ‘more or less’ full reach; progressive platforms, grade as you go
- swing full buckets

LINE J: **OPERATE EXCAVATOR**

Competency: **J9** **Create mass excavation**

Learning Objectives:

1 The learner will create a mass excavation to a set standard

LEARNING TASKS	CONTENT
1 Plan the job	• laser location for line of sight as excavation progresses • fill placement: available space; strategy for backfill; possibly different types/layers in different locations i.e. topsoil in back corner; best structural fill close to garage • efficient patterns, short movement, ¼ swing better than ½ swing • ground water
2 Create excavation	• straight edges; stable sides • dig 'offset' from footing location - at least .75m (dig a hole bigger than the house) • level to very fine tolerance; use the partial bucket width technique: 1. keep the machine level 2. 'bulk out' volume until minor quantity remains 3. get a bucket width graded to desired elevation 4. start the next pass with about ¾ of bucket width applied to material to be cut, and the other ¼ shadowing the previous pass • stockpiles: smooth, sloped and consolidated piles will absorb less water • provide ramp for convenient access for workers

Suggested Assessment:

- Time and quantity as instructor deems appropriate. Example: proficient student with a 150 excavator (15000kg) could dig a 10m x 15m excavation at 1.7 m deep to +/- 2" in 8 hours if checking grade alone
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, splitting functions to keep appropriate position of bucket and short efficient movement paths, minimal impact
- Operates with smooth and precise control of tracks; appropriate speed; avoids rocks/obstacles; avoids anything that tends to bend pads or puts a side load on tracks, clears tracks of loose material as required, uses simultaneous control of boom, stick, and bucket to minimize wear and tear of undercarriage i.e. pulling up steep hills, carries machine for obstacles, push up turns when appropriate, etc.
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, load height, center of gravity, slopes, potential for collapse of trench sides
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- consistent and level depth:
  - +/- 6" is suggested minimum level of proficiency for students
  - +/- 2" is a good level of proficiency for students
- bottom edges of excavation must be straight, consistent, and adequately offset to allow installation of footings and perimeter drain
- safe, stable walls
- ramped for access
- stockpiles tidy, compact, smooth, sloped to minimize water saturation
- soil types should be separated and stockpiled to facilitate efficient backfill i.e. organics separated from mineral soils; material appropriate for structural fill placed 'within reach' of garage and driveway

LINE J: **OPERATE EXCAVATOR**

Competency: **J10** **Create Slopes**

Learning Objectives:

1 The learner will create slopes to set standard

LEARNING TASKS	CONTENT
1 Plan the job	• interpret stakes/ specifications; use grade checking instruments • 2:1 • will there be excess material? where's it going? • generally done with a cleanout bucket • if slope is surveyed (staked) - cut the slope next to each row of stakes, then complete areas between
2 Create slope	• if conditions allow (soft digging, stable under footing, and slope is within the reach dimensions of the machine) align the machine parallel to the slope so that you are digging 'over the side' • do not pull material into the tracks • fill slopes (i.e. sloping from above) are easiest when machine is positioned several meters away for a sight line parallel to the slope line • use the partial bucket width technique: 1. 'bulk out' volume until minor quantity remains 2. get a bucket width graded to desired slope 3. then start the next pass with about ¾ of bucket width applied to material to be cut, and the other ¼ shadowing the previous pass

- the angle of the slope is accomplished by precise control/splitting of the digging functions, HOWEVER, the alignment of the cutting edge to the horizontal plane of the slope is accomplished by precise positioning of the tracks relative to the required bucket position. E.g.: moving the machine to the left while keeping the bucket positioned raises the left side of the bucket
- it is common practice to make slight adjustments of the machine position to accomplish this.
- clean up excess material

Suggested Assessment:

- Time and quantity as instructor deems appropriate. Example: proficient operator could clean up a 50m long x 4m slope in 4 hrs
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, splitting functions to keep appropriate position of bucket and short efficient movement paths, minimal impact
- Operates with smooth and precise control of tracks; appropriate speed; avoids rocks/obstacles; avoids anything that tends to bend pads or puts a side load on tracks, clears tracks of loose material as required, uses simultaneous control of boom, stick, and bucket to minimize wear and tear of undercarriage i.e. pulling up steep hills, carries machine for obstacles, push up turns when appropriate, etc.
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, load height, center of gravity, slopes, potential for collapse of trench sides
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- consistent and smooth slope:
  - +/- 6” is suggested minimum level of proficiency for students
  - +/- 2” is a good level of proficiency for students
- slope on specified angle (suggested: 2:1)
- avoids pulling material into track

LINE J: **OPERATE EXCAVATOR**

Competency: **J11** **Load trucks**

Learning Objectives:

1 The learner will use the excavator to load trucks with materials and aggregates

LEARNING TASKS	CONTENT
1 Arrange the loading site	• efficient loading pattern, truck placement • consider: position to allow eye contact, trucks should turn around empty – not loaded, sun position & wind direction may be relevant, think about the long term movement thru the pile – not just the first few loads • short swings are much faster than longer swings – plan for ¼ swings and avoid ½ swings • almost always best to position the excavator on the material to be moved – sit on the pile; create a working platform that is stable and at the appropriate height for efficient loading – high enough for good site line, not so high as to lose adequate reach • truck placement with tailgate facing excavator is preferred, obviously not always practical • truck must be placed so that excavator never swings over the cab
2 Maintain the pit floor level, smooth, clear of rocks	• minimize spillage • clean up and grade area between loads • dig level
3 Load smoothly, gently	• dump first bucket gently over rear axle, don't dump from excessive height or so quickly that you 'bounce' the truck, don't spill the driver's coffee!

4	Communicate	• truck placement for eye contact is preferred • horn signals are: one beep for stop (unless truck is already stopped in which case most people use one beep to mean "you're loaded"), two beeps for back up, three beeps for go ahead. • Help the driver by confirming closed tailgate before loading, watching for rocks you may have spilled on the truck that could fall off, looking for rocks pinched in the dual tires, mechanical problems, flat tires, etc..
5	Build a legal load	• This is the truck driver's responsibility, but he is also relying on your professionalism. Know what a legal load looks like – depends on material and the truck but is generally no higher than the side boards, against the front to 2/3 of the box height, and little or nothing touching the tailgate. For off hwy articulated – fill 'er up

Suggested Assessment:

- Time and quantity as instructor deems appropriate – example: proficient student with a 150 (15,000kg) could load 8 loads per hour
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, splitting functions to keep appropriate position of bucket and short efficient movement paths, minimal impact
- Operates with smooth and precise control of tracks; appropriate speed; avoids rocks/obstacles; avoids anything that tends to bend pads or puts a side load on tracks, clears tracks of loose material as required, uses simultaneous control of boom, stick, and bucket to minimize wear and tear of undercarriage i.e. pulling up steep hills, carries machine for obstacles, push up turns when appropriate, etc.
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, load height, center of gravity, slopes, potential for collapse of trench sides
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Arrange the loading site/working platform for efficient loading and truck movement, no swinging over the truck cab
- Load smoothly: no bounce, no touch
- Load accurately (legal load): centered, correct weight distribution between front and rear axles, no spillage
- Effective communication, visual, audible
- Maintain smooth and level pit floor

LINE J: **OPERATE EXCAVATOR**

Competency: **J12** **Create side cast road (road building on sloping terrain)**

Learning Objectives:

1 The learner will build side cast roads using an excavator

LEARNING TASKS	CONTENT
1 Cut and fill	• cut material from bank and side cast to create a fill • balance quantities, dig to correct width, consistent centerline grade, stable angle of cut bank, slope road to inside
2 Minimize the task of cleaning up the "track pile"	• The natural digging pattern of excavators pulls material towards the machine, creating a pile in front of the tracks that takes time to clean up. Efficient management of this issue is important to proficient road building. Some tips follow: • avoid pulling material onto the tracks, especially when working up a significant grade; fill the bucket with a motion that reduces pulling material towards the machine • avoid sweeping the pile to move material sideways; pick up and bail material until pile is a manageable size (less than 2 cu yds) then over-excavate on the far side of pile, back up a short distance, and push the material into the 'hole'. If this is impractical – pick up and bail until quantity is very small (less than 1 cu yd) and then 'sweep' with care • make each "stage" as long as possible (building 100m of road in 20 'stages' is quicker than 30 'stages'); start each stage by digging at 'more or less' full reach and dumping at 'more or less' full reach to fill the farthest portion of the stage first • move ahead as far as possible on each stage before starting to dig
3 Clean up behind machine	• do clean up tasks, finish grading, possibly ditching, behind the machine

Suggested Assessment:

- Time and quantity as instructor deems appropriate – example: proficient student with a 150 (15,000kg) could build 100m of road into a 60% slope of 'easy digging' material in 8hrs
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, splitting functions to keep appropriate position of bucket and short efficient movement paths, minimal impact
- Operates with smooth and precise control of tracks; appropriate speed; avoids rocks/obstacles; avoids anything that tends to bend pads or puts a side load on tracks, clears tracks of loose material as required, uses simultaneous control of boom, stick, and bucket to minimize wear and tear of undercarriage i.e. pulling up steep hills, carries machine for obstacles, push up turns when appropriate, etc.
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, load height, center of gravity, slopes, potential for collapse of trench sides
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- consistent grade
- consistent width
- sloped to inside
- adequately graded
- cut slope on consistent and stable angle
- outside edge consolidated (track packed)

LINE J: **OPERATE EXCAVATOR**

Competency: **J13** **Service utility crew (e.g. place bedding, hoist objects, backfill in lifts, hoe pack, etc.)**

Learning Objectives:

1 The learner will work closely with utilities crew to expose and remove existing structures, place bedding, structures, backfill and grade utilities.

LEARNING TASKS	CONTENT
1 Excavate trenches	• set up and use grade checking instruments • dig on specified grade with minimal grade checking, and on-line • smooth bottom, smooth top edges • stable trench walls • slope trenches over 4 ft • use shoring cage (trench box) • placement of material in conventional windrow – at least 2 ft from trench edge • load material directly into trucks (over the side: centered, legal loads, no spill)
2 Place bedding, drain rock, etc. as required	• work to edge of trench/excavation without compromising the stability of trench/excavation; without posing a hazard to yourself or others • place material carefully and appropriately to avoid moving or damaging, pipe, concrete, or other services & structures • manage piles of imported aggregates (sand, rock, pit run, etc.) to minimize waste, avoid mixing with other material / contamination
3 Place backfill material	• place material carefully and appropriately to avoid moving or damaging pipe, concrete, or other services & structures • place material in lifts with thickness appropriate for degree of compaction required and compaction equipment to be used • demonstrate awareness of the effects of the weight of the machine on loose fill – avoid damage to pipe, concrete, or other services & structures – wet material vs. dry material, • green concrete vs. cured concrete

4	Install and use hoe pack	• appropriate engine speed – less than full RPM • minimize twisting of rubber mounting blocks - no push ups of machine - controlled pressure • compact in appropriate pattern…once is never enough… multiple passes should be done with progressive pattern where 2nd pass is adjacent to a 1st – not adjacent to un packed material; 3rd pass is next to 2nd, etc • grease as required (no more than 45 minutes)
5	Hoist objects	• pipe work materials (CB and manhole barrels, valves, hydrants, pipe, compactors, etc) • controlled movements, rigging techniques, safety • signals
6	Grade/cleanup work area	• with regard to design grades & elevations, run off • levelling to fine tolerances
7	Expose existing underground services	• controlled, precise movements • proficient teamwork and communication with labourer/pipe layer

Suggested Assessment:

- Time and quantity as instructor deems appropriate
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, splitting functions to keep appropriate position of bucket and short efficient movement paths, minimal impact
- Operates with smooth and precise control of tracks; appropriate speed; avoids rocks/obstacles; avoids anything that tends to bend pads or puts a side load on tracks, clears tracks of loose material as required, uses simultaneous control of boom, stick, and bucket to minimize wear and tear of undercarriage i.e. pulling up steep hills, carries machine for obstacles, push up turns when appropriate, etc.
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to rigging, stability, load height, weight, center of gravity, slopes, potential for collapse of trench sides
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Trenching: straight, on grade, stable, efficient
- Place materials without risking damage or movement of pipe, concrete, etc
- Pick up, carry and place bedding and/or other materials without contamination, minimal waste
- Hoist materials with controlled movements, safe practices
- Grading and levelling to fine tolerances
- Expose existing services without damage

LINE J: **OPERATE EXCAVATOR**

Competency: **J14** **Place riprap (Optional)**

Learning Objectives:

1 The learner will use the excavator to place riprap in a neat and coordinated fashion

LEARNING TASKS	CONTENT
1 Plan, arrange, prepare site	• create access as required • stockpile rock within reach • prepare slopes as required i.e. clean up debris, rough-in slope
2 Place rock	• use hydraulic thumb proficiently: minimum wear and tear, good control of 'load' • sorted, aligned and placed for stability • 'jig sawed' together for tight fit without gaps • structured to withstand flows, resist erosion, provide stability of underlying material
3 Clean up site	• excess rock, grading, general clean up

Suggested Assessment:

- Time and quantity as instructor deems appropriate – proficient student could place approx. 30 cu. m. per hour
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, splitting functions to keep appropriate position of bucket and short efficient movement paths, minimal impact
- Operates with smooth and precise control of tracks; appropriate speed; avoids rocks/obstacles; avoids anything that tends to bend pads or puts a side load on tracks, clears tracks of loose material as required, uses simultaneous control of boom, stick, and bucket to minimize wear and tear of undercarriage i.e. pulling up steep hills, carries machine for obstacles, push up turns when appropriate, etc.
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, load height, center of gravity, slopes, potential for collapse of trench sides
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- proficient use of thumb: minimal twisting, used for gripping – not pushing or prying, control of load
- structurally sound placement

LINE J: **OPERATE EXCAVATOR**

Competency: **J15** **Clear land (Optional)**

Learning Objectives:

1 The learner will use the excavator to clear land of brush, trees, stumps and other unwanted materials separating dirt from brush

LEARNING TASKS	CONTENT
1 Logging as required	• hoe chuck and pile merchantable logs
2 Clearing	• use effective techniques to remove stumps (adequate root removal, 'reading the stump', possibly splitting, etc.) • plan effective patterns for hoe chucking to piles, pile placement • clear area under piles – don't start piling on un cleared land • effective rake techniques include: lift, roll, skim – avoid pulling dirt – when dirt and wood is mixed, separation takes far longer than patiently doing it right the first time • minimize dirt in piles
3 Grubbing	• minimize dirt in piles • rake brush, limbs, chunks – separate from dirt
4 Burning	• minimize dirt in piles • think of lighting a camp fire: start with 'kindling' (dry, small pieces, split surfaces, cedar preferred, well placed) • air flow is helpful, especially during start • add larger pieces as heat builds, dry out large pieces (stumps) and add only when heat is well established • re start yesterday's fire as follows: break pile apart; rake ashes; re pile hot, dry pieces – will ignite on its own; separate small, dry pieces and add to pile; add larger pieces as heat builds

Suggested Assessment:

- Time and quantity as instructor deems appropriate – proficient student could clear, grub, burn ½ acre per day (highly variable depending on conditions)
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, splitting functions to keep appropriate position of bucket and short efficient movement paths, minimal impact
- Operates with smooth and precise control of tracks; appropriate speed; avoids rocks/obstacles; avoids anything that tends to bend pads or puts a side load on tracks, clears tracks of loose material as required, uses simultaneous control of boom, stick, and bucket to minimize wear and tear of undercarriage i.e. pulling up steep hills, carries machine for obstacles, push up turns when appropriate, etc.
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, load height, center of gravity, slopes, potential for collapse of trench sides
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- effective stump removal
- detailed, thorough removal of smaller brush, limbs, chunks
- effective burning techniques (fire starting, efficient burning, effective re-starting, thorough clean up of piles)
- wood burns – dirt does not
- proficient use of thumb: minimal twisting, used for gripping – not pushing or prying, control of load

LINE J: **OPERATE EXCAVATOR**

Competency: **J16** **Perform demolition tasks (Optional)**

Learning Objectives:

1 The learner will perform demolition and salvage operations of houses and other buildings

LEARNING TASKS	CONTENT
1 Demolish structure	• safely • strategically to facilitate material salvage, separation and sorting as required
2 Separate and sort materials	• salvage: sort for value, minimize damage • disposal: sort for different materials as per disposal facility policies: usually metal, clean wood, roofing, insulation, drywall, mixed garbage, contaminated/ toxic/ dangerous materials, concrete
3 Load materials	• roll off bins for disposal • dump trucks for concrete • flat decks for salvaged materials
4 Clean up site	• contaminated soils • levelling • general clean up

Suggested Assessment:

- Time and quantity as instructor deems appropriate – proficient student could demolish, separate materials, load, and clean up a typical house in 3 days
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, splitting functions to keep appropriate position of bucket and short efficient movement paths, minimal impact
- Operates with smooth and precise control of tracks; appropriate speed; avoids rocks/obstacles; avoids anything that tends to bend pads or puts a side load on tracks, clears tracks of loose material as required, uses simultaneous control of boom, stick, and bucket to minimize wear and tear of undercarriage i.e. pulling up steep hills, carries machine for obstacles, push up turns when appropriate, etc.
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, load height, center of gravity, slopes, potential for collapse of trench sides
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- safe and efficient demolition techniques
- separation and sorting of materials for disposal
- proficient use of thumb: minimal twisting, used for gripping – not pushing or prying, control of load

LINE J: **OPERATE EXCAVATOR**

Competency: **J17** **Use attachments (Optional)**

Learning Objectives:

1 The learner will install and use various attachments available to them

	LEARNING TASKS	CONTENT
1	Pavement cutting wheel	• secure mounting can be difficult for the type that mounts to the cutting edge by clamping bolt • straight, tidy cuts • multiple passes while maintaining control, straight • grease as required (every ½ hour)
2	Hoe Pack	• appropriate engine speed – less than full RPM • minimize twisting of rubber mounting blocks - no push ups of machine - controlled pressure • compact in appropriate pattern - once is never enough - multiple passes should be done with progressive pattern where 2nd pass is adjacent to a 1st – not adjacent to un packed material; 3rd pass is next to 2nd, etc • grease as required (interval no greater than 45 minutes)

3	Rock Breaker	• appropriate engine speed – much less than full RPM – check with manufacturer, determine hydraulic flow of machine and match to manufacturers recommendation • never pry with bit • force must be in line with bit, not sideways • control of down pressure, minimal side pressure • warm up before full load use • grease as required (interval no greater than 30 minutes) grease must be constantly visible flowing out of hammer and down bit • look for seams in rock, "read the rock", "bite off" quantity that will break efficiently, too big of a "bite" is a waster of time • plan your pattern to break efficiently, allow for removal of loose rock, minimize changes from breaker to bucket, provide working platforms for your machine, etc.
4	Possibly muncher, grapple, shear, ripper, grinder, etc	• specific for each attachment

Suggested Assessment:

- Time and quantity assessed by instructor's observation
- Observe students performing learning tasks and assess competency using a rating scale.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, splitting functions to keep appropriate position of bucket and short efficient movement paths, minimal impact
- Operates with smooth and precise control of tracks; appropriate speed; avoids rocks/obstacles; avoids anything that tends to bend pads or puts a side load on tracks, clears tracks of loose material as required, uses simultaneous control of boom, stick, and bucket to minimize wear and tear of undercarriage i.e. pulling up steep hills, carries machine for obstacles, push up turns when appropriate, etc.
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, load height, center of gravity, slopes, potential for collapse of trench sides
- Loads bucket quickly, fully
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- maintenance and monitoring of attachments
- operating techniques to minimize 'wear and tear' of attachments
- operating techniques specific to each attachment to accomplish tasks efficiently

LINE K: OPERATE GRADER

Competency: K1 Describe and comply with safety requirements

Learning Objectives:

1 The learner will describe how to work safely while working on and around a grader. This will include understanding key regulations, machine limitations, operating procedures and tasks and the use of PPE's

2 The learner will comply with safety requirements at all times during this course.

	LEARNING TASKS	CONTENT
1	Use equipment manuals and specifications to determine safe operating procedures and operational restrictions of grader	Lecture, group discussion, Q&A • identify and discuss relevant sections of manual
2	Assess a variety of grading tasks for potential hazards, and explain strategy to work safely.	Lecture, group discussion, Q&A, possibly small group work • describe a variety of tasks and conditions • explore hazards and safe practices
3	Identify key regulations that apply to given tasks and conditions	Lecture, group discussion, Q&A, possibly small group work • identify and discuss relevant sections of regulation
4	Operate grader in compliance with regulations and safe practices	Instruct and supervise hands on operating with constant attention to safe practices, review and application of previous safety instruction • regulations • company policies • general safe practices • safety-first attitude, awareness
5	Use Personal Protective Equipment	Supervise, insist, enforce • hardhat • hearing protection • high visibility • eye protection as required • gloves as required • steel toe footwear

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will achieve a minimum of 70% combined score on a practical assessment form and achieve a pass mark in all boxes marked pass/fail
- Demonstrated safe practices while operating machine

LINE K: OPERATE GRADER

Competency: K2 Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance
(Optional In-School Practical Training – Theory Required)

Learning Objectives:

1 The learner will perform pre start equipment checks
2 The learner will perform start up and shutdown procedures
3 The learner will monitor the performance of the equipment

LEARNING TASKS	CONTENT
1 Perform pre start checks (hands on) • first as a small group activity • individually before operating each machine • as a supervised and assessed exercise before completion of the core lab	• Comprehensive pre start check • Review hazards: pressurised systems, batteries, slips & falls, fumes etc. • identify correct fluids for each component • add fluids as required • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, some transmissions) • general procedures include visual checks for loose, damaged or leaking components, fluid levels, operational checks to confirm proper operation of all systems
2 Perform start up procedures	• check for operation of gauges, warning systems • start and warm up engine at low idle • walk around, look for leaks, general check (noise, vibration, unusual exhaust or other condition) • warm up hydraulics and transmission before full load • check for proper operation of lights, wipers, seat belt, lockouts, parking brake, all controls and major systems (hydraulics, transmission, brakes, etc.
3 Perform shutdown procedures	• safe parking position, set parking brake, lower blade/attachments • position that allows access in case of mechanical trouble at start up • level position for checking of fluids • cool down before shut down • walk around, look for leaks, general check secure machine, locks, etc

4	Monitor performance of equipment during operation	• gauges and warning systems • look, hear, feel, smell • Respond appropriately: is immediate shutdown req'd?

Suggested Assessment:

- An exercise with students performing pre start, start and shut down with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially checked, or thoroughly checked. Students must complete pre-checklist, start-up and shut down procedures.

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- All elements of pre start, start up and shut down. Once a student can demonstrate a minimum of 80% efficiency using their checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, checking for leaks or loose hardware involves more than a "quick look"

Note: The in-school practical training for this piece of equipment is optional. The theoretical training is required.

LINE K: **OPERATE GRADER**

Competency: **K3** **Perform Daily Maintenance Tasks**
(Optional In-School Practical Training – Theory Required)

Learning Objectives:

1 The learner will perform daily maintenance checks in accordance to a supplied check list.

LEARNING TASKS	CONTENT
1 Service lubrication system (greasing)	• identify and lube all points • load grease gun Note: Point out that the appropriate amount of grease is debatable, employers differ, but the following guidelines are reasonable: • 2-3 shots for small areas: fan bearings, small u joints, linkages, hinges, etc. • 8 – 10 shots for common pins and bushings • 20 shots where one nipple feeds a large area • daily for most points / weekly for some • wipe off nipples before greasing to reduce abrasive particles entering pin/bushing
2 Service air intake system as required (air filters/ pre cleaners)	Use pictures or examples of restriction indicators and pre cleaner if your machine is not equipped • restriction indicators • pre cleaner service • cleaning vs. replacement, check employer policy (some insist on never using air – replace only) • use air only with reduced pressure
3 Drain fuel tank sump, water separator fuel filters if equipped (Racor or other)	• drain, assess quantity and types of contaminants • water, debris, scale, etc
4 Add fluids as required	• identify correct fluids for each component • add fluids as required • avoid contamination with dirt, water • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, transmissions)

5	Inspect and clean components as required	• radiator & oil cooler • filler plugs, dip sticks • battery terminals
6	Housekeeping	• garbage • excess grease • clean windows, sweep out cab, general cleanliness

Suggested Assessment:

- An exercise with students performing daily maintenance tasks with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially done, or thoroughly.

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- All elements of daily maintenance. Once the student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, inspecting and cleaning components involves more than a "quick look".

Note: The in-school practical training for this piece of equipment is optional. The theoretical training is required.

LINE K: **OPERATE GRADER**

Competency: **K4** **Describe mechanical components, troubleshooting, basic repairs & maintenance**

Learning Objectives:

1 The learner will describe the basic components and functions of a grader
2 The learner will describe basic troubleshooting signs and symptoms and appropriate responses for the operator

	LEARNING TASKS	CONTENT
1	Describe major mechanical components	Identify major components from a checklist, and describe function • identify and describe function from list of major components
2	Describe potential failures, symptoms and indicators of failure	Discuss potential failures, symptoms • symptoms: noise, vibration, smell, leaks, cracks • respond appropriately: service required, immediate repair required, immediate removal from service
3	Describe basic repairs and maintenance	Supervise, demonstrate as required • remove and replace hydraulic hose, o-ring • re and re fuel filter, bleed air from fuel system • re and re air filter • engine oil change, lube filter • adjust belt tension • maintain tire pressure • clean battery terminals, top up fluid • check and tighten assorted hardware • replace cutting edges, ripper teeth, etc

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

LINE K: OPERATE GRADER

Competency: K5 Perform basic operator functions (Optional In-School Practical Training – Theory Required)

Learning Objectives:

1 The learner will perform basic operator functions in accordance to the Heavy Equipment Operator Practical Assessment Form

LEARNING TASKS	CONTENT
1 Perform basic moves	• operate each function of blade movement; simulate blade positioning changes typical for multi pass grading i.e. for forming windrows towards left, then towards right, then left side ditching, then right side ditching, sloping positions, tight blading, etc. • move forward, stop, back up, stop • lower blade (possibly positioning heel under steps), apply park brake, engage lockouts for transmission and hydraulics if equipped.
2 Drive grader through simple obstacle course	• pylons or used tires outlining an obstacle course • hills and slopes • forwards and backwards • turning around in 'tight' turn outs • performing tight turns with wheel lean
3 Push a large tire over uneven ground	• drive grader over uneven (not rough, but 'rolling' with slope changes), hard packed ground, blade in straight' bulldoze' position, adjust blade position to keep moving tire without making contact with ground
4 Move a 'windrow' of tires from side to side	• a row of 10 to 20 tires spaced approx. 5m apart will simulate a windrow allowing students to become familiar with the process without having to cut, place and finish material • start with a level and consistent working area

Suggested Assessment:

- Successfully go through obstacle course without contacting pylons/tires
- Create windrow of 100 meters without gouging or driving over windrow.

Achievement Criteria:

General:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, appropriate position of blade, minimal impact
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle
- Enters and exits machine safely (3 point contact, parking position, brake)

Specific to this task:

The learner should be able to demonstrate the following practical skills:

- Demonstrate the safe operation of equipment including visual checks, constant awareness of space, position, clearance and safe movement of machine.
- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks.

Perform basic moves with equipment including:

- Move forward, stop, back up, stop (flat elevation).
- Apply park brake, lock out transmission.
- Operates with smooth and precise control of drive train, appropriate gear and engine speed.
- Manoeuvre through a prescribed path without running over pylons. The course will see the apprentice maintain a straight line of 100 meters moving forward and backward and a 90 degree turn to the left and to the right.
- Push tire 200 meters without 'losing it'
- Create a windrow of 100 meters without gouging or driving over it.

Note: The in-school practical training for this piece of equipment is optional. The theoretical training is required.

LINE K: **OPERATE GRADER**

Competency: **K6** **Describe and apply grading fundamentals**

Learning Objectives:

1 The learner will describe grader mouldboarding fundamentals, wheel control and articulation as it applies to grader operation.

LEARNING TASKS	CONTENT
1 Describe terms used to describe the grader	• mouldboard, cutting edge, heel, toe, circle • wheel lean, circle shift, circle turn, mouldboard tip, mouldboard sideshift, articulation • linkbar, center hole, 1st, 2nd, 3rd hole • hydraulic float • blade position for road travel
2 Describe terms used to describe the work	• centerline, shoulder, travel surface • vee ditch, flat bottom ditch, backslope, foreslope • slope expressed as ratio and percent • crown, cross slope, super elevation
3 Describe and apply mouldboard fundamentals	• tipping the mouldboard effects cutting action, rolling action, tendency to compact material, can be used to adjust the elevation of the cutting edge along the entire length of the mouldboard with a single control; useful for feathering material at end of spreading pass • mouldboard angles at or near 0 degrees are used for 'bulldozing' material straight ahead (or straight back) • minimum mouldboard angles (10 to 30 degrees)can increase stability and reduce side to side motion; covers more area; appropriate for lighter blade loads and free flowing material • greater mouldboard angles (30 to 50 degrees) can improve rolling of wet, sticky materials; moving larger loads; ditching; minimizing 'hooking' on protruding rocks; application of power to smaller area

4	Describe and apply wheel lean control	• wheel lean can reduce turning radius • minimize side to side motion by counteracting side thrust of mouldboard • can adjust wheels to vertical when working on a slope or in ditch • can be used to adjust the elevation of the cutting edge along the entire length of the mouldboard with a single control
5	Describe and apply frame articulation fundamentals	• frame articulation can further reduce turning radius • can be used to keep drive wheels behind the load to increase power • can allow for application of more power to wider area with more stability instead of simply side shifting • can allow for placement of front tires on smooth surface (finished ground) while mouldboard and drive wheels are shifted to work area • can allow positioning of rear drive wheels outside of ditch while front steering wheels are in the ditch OR vice versa; similar application for sloping • useful for getting 'unstuck' • allows crab steering • generally can increase productivity by positioning the drive power behind the mouldboard while steering axle is offset; generally improves manoeuvrability, flexibility, productivity.
6	Choose gear and engine speed	• match gear and engine speed to load on blade, degree of control required, smoothness of terrain • lower travel speed for maximum control, more time to make adjustments to blade • higher travel speed for increased efficiency if operator can maintain blade control • lower gears for maximum power, heavy loads, rough conditions, hard material • higher gears for lighter loads, smooth conditions, softer material • increased engine speed for maximum power, and faster hydraulics

- decreased engine speed for decreasing speed in chosen gear, fuel economy, reduced wear and tear
- minimize tire spinning, slow down for rough ground, slow down for hard conditions – reduce impact

7 Apply "tips"

- cut to depth of potholes if possible – avoid filling holes with wet or loose material that will quickly be displaced; there are exceptions to this – don't cut so deep that the road base is disturbed
- keep the circle centered when practical (stability, control, strength, vision)
- form windrows either between or outside tires – not in the tire track – don't run tires on windrow
- form windrow just outside rear tire when practical; if windrow is being formed between tires be aware of potential tire wear and damage from rocks and material rolling under tires
- use articulation to improve stability, reduce bounce, reduce side shifting of blade
- start with mouldboard top several inches ahead of the fully back position
- tipping the mouldboard forward can help the edge to ride over obstructions rather than trying to cut
- serrated edges or carbide tipped edges improve penetration of hard material
- use the grader's ability to sort particle sizes
- avoid pushing material into ditches and/or unnecessarily widening roads
- think creatively – the grader is a very complex and versatile machine – many options for set up and approaches to tasks

Achievement Criteria:

- correct identification and description of components, terms
- ability to choose machine set up, blade position, wheel lean, articulation, gear and engine speed appropriate to tasks.
- Proficient steering, use of articulation, efficient patterns and windrow placement

LINE K: **OPERATE GRADER**

Competency: **K7** **Form and handle windrows**

Learning Objectives:

1 The learner will use appropriate engine speed, gear and blade positioning to form windrows

LEARNING TASKS	CONTENT
1 Choose gear and engine speed	• match gear and engine speed to load on blade, degree of control required, smoothness of terrain
2 Choose blade position	• top of mouldboard tilted for type and density (hardness) of material, normal position is mouldboard top 2 inches ahead of cutting edge • angled for hard cutting: approx. 50 degrees (approx 40 degrees for general work, 20 degrees for spreading/finishing/tight blading) • heel outside rear tires: far enough to prevent rocks/material from rolling under tires • match blade load with available power and traction • excessive down pressure will reduce steering control, increase bounce, impact and wear • load is only one consideration, ALSO: elevation/depth of cut; elevation/deck height of material being spread; rolling action desired; sorting of particle sizes; position desired for windrow placement; etc...
3 Cut material to form a windrow	• match blade load with available power and traction • start on smooth ground if possible and/or continue cutting highs and filling lows until a smooth and "on grade" pass can be completed for the first blade width • work from a finished blade width area to have front tires on finished smooth ground keeping blade frame stable, use circle and side shift or articulation if equipped to move windrow to the side
	• position blade and maintain correct blade load to keep material rolling off heel without

		spillage off toe – especially for finishing passes • if necessary, move large volume by using multiple passes, rolling large windrows off to side, returning for multiple passes until area is bulked out to grade, then perform finishing pass with smaller blade loads and no spillage off toe.
4	Move material back over area	• technique is as above with consideration of finished shape, elevation, slopes, and sorting of material. • moving cobbly material should result in a windrow of clean, sorted rock leftover

Suggested Assessment:

- Time and quantity as instructor deems appropriate. Example: Form and roll windrow over area equal to 5 blade widths, 100m long, over to one side, back again, to grade of +/- 3 inches, with small windrow of rocks sorted out, in 1.5 hours.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, effective position of blade
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, minimal tire spinning
- Wheel lean and articulation (if equipped) used effectively
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, center of gravity, slopes
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Grade area equal to 5 blade widths, 100m long, over to one side, back again, to grade of +/- 3 inches, with small windrow of rocks sorted out, in 1.5 hours.
- Sorting of rocks leaving a windrow of clean rock to one side of area

LINE K: **OPERATE GRADER**

Competency: **K8** **Strip surface materials**

Learning Objectives:

1 The learner will use the grader to strip waste material (organics) from surface area

LEARNING TASKS	CONTENT
1 Strip waste materials (usually organics)	• identify layers, distinguish waste layer from structural layer • thoroughly remove waste layer while minimizing removal and disturbance of underlying layer • form windrows of stripped material • maximize volume in each windrow for efficient loading by others, i.e. for a large area: roll windrows from both right and left to form fewer, larger windrows

Suggested Assessment:

- Time and quantity as instructor deems appropriate – example: proficient student could strip and windrow 250 cu. m. from a 100m x 10m area (.25 m deep) in 4 hours

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, effective position of blade
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, minimal tire spinning
- Wheel lean and articulation (if equipped) used effectively
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, center of gravity, slopes
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Remove virtually all waste material (organics) while minimizing removal and disturbance of underlying layers
- Consistent, tidy windrows of stripped material – large and few rather than many, small
- Suggested time and quantity – example: proficient student could strip and windrow 250 cu. m. from a 100m x 10m area (.25 m deep) in 2 hours

LINE K: **OPERATE GRADER**

Competency: **K9** **Cut and fill material**

Learning Objectives:

1 The learner will cut and fill surface materials using the grader

LEARNING TASKS	CONTENT
1 Plan the task	• visually estimate the 'height' of cuts and fills to accomplish finish grade – balance quantities • use grade checking instruments • plan effective patterns to minimize distance material is moved • plan effective patterns to work with the advantages and limitations of a grader i.e. grader works best when front tires are on even ground • take advantage of slopes to cut and carry downhill when possible
2 Cut 'highs'	• choose blade tilt, angle, position - use effective techniques to cut hard material (while minimizing impact, spinning of tracks) • match blade load to available power and traction
3 Move material to 'lows'	• try to place material on grade the first time BUT: don't waste too much time on finish grading until you are sure you are close to desired grade
4 Grade area	• grade area to desired profile/grade • eliminate windrows, clean up
5 Tips	• very uneven ground is generally a job for a dozer, however, often graders can be effective if task is planned to work with the advantages and limitations of the grader…be versatile and creative…may be best to 'rough in' an uneven area by first cutting the highest highs and filling the lowest lows…this will likely include some angled blade cutting with short passes, some straight blade 'bulldozing' with very short passes, and some conventional rolling of windrowed material over longer passes…

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, effective position of blade
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, minimal tire spinning
- Wheel lean and articulation (if equipped) used effectively
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, center of gravity, slopes
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Use grade checking instruments
- Suggested criteria - Grading of area to within +/- 3" of specified profile elevation, slope, crown, over an area of 2,000 square meters with limited random small scale irregularities.

LINE K: **OPERATE GRADER**

Competency: **K10** **Maintain construction access roads, logging roads**

Learning Objectives:

1 The learner will cut, windrow and reshape construction access, logging roads and ditches to specified profiles

LEARNING TASKS	CONTENT
1 Plan the task	• traffic issues, signs required, work pattern and windrow placement to allow traffic to continue • will you attempt to cut to bottom of potholes/washboard or will this create more problems than it solves • identify drainage structures, culverts, other obstacles • ascertaining if you need to pull material from ditch. If so will conditions allow you to put grader in ditch or do you have to reach for it? • patterns: do you anticipate 4,5,7 passes? don't get too hung up on so called 5 pass techniques… the number of passes is not the point – rather the pattern of material movement should be anticipated. • patterns: identify turnouts, areas available to turn around, how long will passes be? will it be more efficient to turn around or back up?
2 Cut, windrow, re shape	• choose blade position, wheel lean, articulation, gear, speed • generally the pattern is: 1. complete ditching requirements: re shape, recover material for the road surface, do what is necessary to ensure adequate drainage/flow 2. cut shoulders and move material to center or from one side to the other 3. cut to pothole or washboard depth if desired, cut as required to 'fix' elevation/profile problems 4. move the material you have cut and windrowed back over the road to establish desired road profile - sort

material as desired i.e. fines for road finishing, cobbles removed – feather out material to eliminate windrows

3 Tips

- tilting the top of the mouldboard forward can increase the tendency for the edge to ride over immovable rocks – less impact, less 'hooking'
- excessive down pressure reduces steering control, increases: sliding, impact, bouncing, side to side movement, cutting edge wear, potential damage

Suggested Assessment:

- Time and quantity as instructor deems appropriate – dependant on specific area available – example: 300m of 5 to 7m wide, hard packed haul road, with a turnout, simple foreslope clean up of one ditch, in 1 hour

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, effective position of blade
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, minimal tire spinning
- Wheel lean and articulation (if equipped) used effectively
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, center of gravity, slopes
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Maintain ditches for good drainage, clear flow, no damage or blockage of drainage structures
- Grading of construction access or logging roads making sure to remove potholes/washboard, windrow materials to desired profile and cut/clean shoulder area

LINE K: **OPERATE GRADER**

Competency: **K11 Maintain public roads**

Learning Objectives:

1 The learner will cut, windrow and reshape public roads and ditches to fine profile tolerance

LEARNING TASKS	CONTENT
1 Plan the task	• see content for K10: – traffic – obstacles, culverts, etc. – ditching requirements – anticipate patterns
2 Cut, windrow, re shape	• choose blade position, wheel lean, articulation, gear, speed • generally the pattern is: 1. complete ditching requirements: re shape, recover material for the road surface, do what is necessary to ensure adequate drainage/flow 2. cut shoulders and move material to center or from one side to the other 3. cut to pothole or washboard depth if desired, cut as required to 'fix' elevation/profile problems 4. move the material you have cut and windrowed back over the road to establish desired road profile – mix and sort material as required for gradation – feather out material to eliminate windrows
3 Tips	• see content for K10,K6 • precise shaping of the road profile is important for public roads – grade to fine tolerance i.e.+/- 1 ½ " or better for each detail of profile including slope and width of ditches, shoulders, traveled surfaces, cross slope, crown, super elevation.

Suggested Assessment:

- Time and quantity as instructor deems appropriate – dependant on specific area available – example: 300m of shouldered, crowned, straight 2 lane rural road with minor clean up of ditches in 2 hours

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, effective position of blade
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, minimal tire spinning
- Wheel lean and articulation (if equipped) used effectively
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, center of gravity, slopes
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Maintain ditches for good drainage, clear flow, no damage or blockage of drainage structures
- Precise grading of roadway to desired profile – fine tolerances i.e.+/- 2" or better for each detail of profile including slope and width of ditches, shoulders, traveled surfaces, cross slope, crown, super elevation.

LINE K: **OPERATE GRADER**

Competency: **K12** **Create slopes**

Learning Objectives:

1 The learner will create slopes to the desired profile using the grader

LEARNING TASKS	CONTENT
1 Plan the task	• high lift blade positions • wheel lean • articulation • patterns • identify the slope required; use grade checking instruments and/or stakes (layout) as required
2 Shape the slope	• choose blade position, wheel lean, articulation, gear, speed • smooth the area at the base of the slope for a smooth working platform – tilting the base towards the slope can help hold the grader against the slope • start with machine at base of slope, straight frame, position the blade up the slope (high lift), slow speed for maximum control • then use articulation to place front tires on slope, rear frame on level base to extend reach up slope, windrow placed between rear tires • working further up slope can be achieved by placing rear tires on slope with (possibly) downhill tire held by toe of slope, and uphill rear tire supported by windrow being deposited between rear tires…working on a slope in general is assisted by utilizing articulation, wheel lean, and using windrows to help support the machine and increase stability support • starting at the top of a slope can be a good option, especially for gentle slopes – use windrows to support the machine

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, effective position of blade
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, minimal tire spinning
- Wheel lean and articulation (if equipped) used effectively
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, center of gravity, slopes
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Precise grading of slope to desired profile
- Time and quantity as appropriate – example: 100m x 5m at 2 ½ :1 slope requiring only minor cutting (already roughed in) in ½ hour

LINE K: **OPERATE GRADER**

Competency: **K13 Create Ditches**

Learning Objectives:

1 The learner will cut and shape basic v-shaped and flat bottom ditches

LEARNING TASKS	CONTENT
1 Plan the task	• blade positions • wheel lean • articulation • patterns • identify the profile required; use grade checking instruments and/or stakes (layout) as required
2 Shape ditch	• choose blade position, wheel lean, articulation, gear, speed • v ditches, flat bottom ditch • typical pattern is as follows: 1. The first pass is simply a marking pass with accuracy improved by slow speed and very light load, shallow. 2. second pass with front wheel (and rear for non articulating machines) in ditch, cutting deeper and forming desired fore slope 3. repeat passes until material on shoulder interferes with tires or depth is achieved, then work with grader on running surface to move windrow away from shoulder (most likely straddling windrow, leaning wheels to counteract side thrust, depositing windrow outside rear tire, attempt to hold shoulder profile and straight edge) …can also clear shoulder windrow with articulation allowing front tires to be on road straddling windrow and rear tires in ditch

4. If backslope grading is required the pattern depends on whether the material is being rolled up the backslope or onto the road. Either way it generally involves having tires in the ditch and alternating passes on the backslope and the foreslope until material is removed and the slopes are correct
5. flat bottom ditches may be done with blade at very sharp angle and shifted with both heel and toe in ditch line
6. handle the material from the ditch to shape the shoulder (slope and edge alignment), shape and/or surfacing of the road surface if suitable, or windrow for disposal

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, effective position of blade
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, minimal tire spinning
- Wheel lean and articulation (if equipped) used effectively
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, center of gravity, slopes
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Precise grading of foreslope, backslope
- Straight and consistent alignment of shoulder edge and ditch centerline.
- Time and quantity as appropriate – example: 100m of .5m deep ditch in soft conditions in 1 hour

LINE K: **OPERATE GRADER**

Competency: **K14 Shouldering**

Learning Objectives:

1 The learner will construct roadside shouldering platforms

LEARNING TASKS	CONTENT
1 Plan the task	• blade positions • wheel lean • articulation • patterns
2 Construct shouldering	• Shoulder grading can be done in several ways but the following technique illustrates the versatility of the grader, and allows keeping the outside tires on the travelled surface for a smooth, consistent, and stable working platform. This allows precise control of blade, and visibility of the pavement edge 1. grader positioned with outer tires on pavement, inner tires just off pavement on shoulder 2. slow speed for precise control of blade and steering 3. wheel lean to counteract side thrust 4. mouldboard in high lift position 5. place on shoulder with angle sharp enough to deposit windrow just inside the rear tire(the inner tire that is on the shoulder), at the edge of the pavement 6. substantial forward tilt 7. move only enough material to pavement edge to dress the shoulder 8. roll the windrow back away from the pavement edge, shaping the shoulder accurately

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, effective position of blade
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, minimal tire spinning
- Wheel lean and articulation (if equipped) used effectively
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, center of gravity, slopes
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Precise grading of shoulder slope
- minimal contact with pavement
- Time and quantity as instructor deems appropriate – example: 500m of shoulder dressed in 1 hour

LINE K: **OPERATE GRADER**

Competency: **K15** **Form road base (sub-grade)**

Learning Objectives:

1 The learner will cut and fill road base (sub-grade) to form and shape pre ballast road systems

LEARNING TASKS	CONTENT
1 Plan the task	• patterns • grader set up, blade positions • visualize and anticipate cuts and fills to balance quantities • assess soils for load bearing capacity; suitability for subgrade • will grade checking instruments be required?
2 Cut and fill	• choose blade tilt, angle, position - use effective techniques to cut hard material (while minimizing impact, spinning of tracks) • match blade load to available power and traction • remove unsuitable material • cut and fill load bearing soils to create desired profile(• create elevation that allows for not only the minimum depth of ballast specified, but also adequate depth of ballast to “firm up” the subgrade if conditions and soil types are less than ideal • consider the need for consistent load bearing capacity; compaction requirements • in ideal soil conditions the subgrade profile will be shaped to allow for only the minimum specified amount of ballast • shape for drainage; ditch as required

Suggested Assessment:
A proficient operator will work to specification.
Achievement Criteria:
General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, effective position of blade
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, minimal tire spinning
- Wheel lean and articulation (if equipped) used effectively
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, center of gravity, slopes
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Profile created to minimize ballast requirements while providing load bearing ability
- Crowned, ditched, and generally shaped to provide drainage, avoid ponding

LINE K: **OPERATE GRADER**

Competency: **K16** **Place aggregates to specified elevations ("finish grading")**

Learning Objectives:

1 The learner will work with a grade checker or a computerized guidance system to finish grade a road bed

LEARNING TASKS	CONTENT
1 Plan the task	• blade positions • wheel lean • articulation • patterns • identify the profile required; use grade checking instruments and/or stakes (layout) as required
2 Manage the placement (dumping) of materials	• try to get the correct volume in the most efficient placement • position for efficient spreading: usually to one side, but not too close to edge or ditch; spaced to provide correct volume • correct volume: better to be a little short and bring in more than to have too much
3 Spread aggregates	• shift the circle and blade toward the piles • use articulation ('crab' configuration) to keep front tires on smooth subgrade and rear 'drivers' behind the toe to put the power behind the blade while reducing the up and down motion of the mainframe • cut out windrows only as large as the machine can handle without tire spinning… • …and spread to required grade – preferably correct the first time • tip the mouldboard as appropriate for task: top back for rolling a windrow out of the piles – top forward for spreading and compacting with precise control • angle the blade as appropriate: increased for rolling out material from piles – straighter for spreading and controlled placement

- consider gradation of material: it's possible to 'pull out' fines and/or sort out larger aggregates to your advantage (as in removing oversize rock) or to your disadvantage (as in ruining a good 'mix')
- use layout (stakes), instruments, laser control, a "good eye", and precise control, to achieve elevations and shape to very accurate tolerances (including as required: crown, cross slope, super elevation)

Suggested Assessment:
A proficient operator will work to specification
Achievement Criteria:
General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, effective position of blade
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, minimal tire spinning
- Wheel lean and articulation (if equipped) used effectively
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, center of gravity, slopes
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Effective placement of aggregates
- Mouldboard positioning is efficient and smooth
- Accurate shape and elevation to within. +/- 1" of specification

LINE K: **OPERATE GRADER**

Competency: **K17 Clear snow and ice (Optional)**

Learning Objectives:

1 The learner will use the grader to clear snow and ice from roads and lots

	LEARNING TASKS	CONTENT
1	Be prepared	• consider special preparation, equipment and supplies for working safely in winter conditions (especially in remote areas) including warm clothing and supplies to survive without relying on the grader for heat or transport
2	Describe attachments and equipment for snow removal	• chains: proper installation and use • front angle plow • v- plow • wing plow • skid shoes • wing gates
3	Describe special considerations	• techniques and equipment choices are affected by type of snow, moisture content, density, weight; depth of snow; underlying surface • weather • visibility • traffic • obstacles and hidden structures • windrow placement and the potential to block access, create hazards, block drainage…
4	Remove snow and ice	• higher speeds can help move snow across and off the blade(s) • using higher gears, momentum, and downgrades can aid traction and general efficiency • use of blade hydraulics, wheel lean and articulation can often help remove the grader from 'being stuck' • tire chains require careful use to avoid damage to the chains and the road surface – tire spinning with chains can quickly dig down and damage the surface

- blade float can be effective – allows blade to follow varying surface – requires a hard surface
- skid shoes can be very useful to protect the surface, allow more effective use of hydraulic float, prevent disturbance of gravel surfaces, reduce gravel in the windrow or ditch
- seat belts are particularly important for snow plowing
- beware of immovable obstacles – potential damage to machine, injury to yourself
- avoid damage to structures i.e. curbs, manholes, signs
- tipping the mouldboard forward can help ride over minor obstructions
- serrated or carbide edges can help penetrate hard packed snow and ice, and the rough surface created can be desirable for traction

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, effective position of blade
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, minimal tire spinning
- Wheel lean and articulation (if equipped) used effectively
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, center of gravity, slopes
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Use attachments and special configurations for snow removal
- Use momentum to move through snow
- Avoids damage to surfaces and structures

LINE K: OPERATE GRADER

Competency: K18 Use common attachments (Optional)

Learning Objectives:

1 The learner will install and use various attachments

LEARNING TASKS	CONTENT
1 Install and use attachments	• many attachments possible • brush cutters • rippers/scarifiers • rollers • front blade

Suggested Assessment:

- Time and quantity as instructor deems appropriate – dependant on specific area available
- rating scale

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, effective position of blade
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, minimal tire spinning
- Wheel lean and articulation (if equipped) used effectively
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, center of gravity, slopes
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- Use attachments

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE L: OPERATE FELLER BUNCHER

Competency: L1 Describe and comply with safety requirements

Learning Objectives:

1. The learner will describe how to work safely while working on and around an feller buncher. This will include understanding key regulations, machine limitations, operating procedures and tasks and the use of PPE's
2. The learner will comply with safety requirements at all times during this course.

LEARNING TASKS	CONTENT
1 Use manuals and live demonstrations to determine safe operating procedures/restrictions Incorporate map orientation and pre-work discussion as an essential assessment of worksite	• identify and discuss relevant sections of manual • identify and discuss Warning Labels/ Stickers • identify and use dash displays, sensors, warning systems • identify the relevant parts and systems of a feller buncher • identify start-up and shut down procedures • identify daily, weekly, monthly and other maintenance requirements and procedures
2 Assess a variety of machine tasks for potential hazards, and explain strategy to work safely.	• regulations: OH&S, Motor Vehicle including weight, dimension, lighting, etc. • general safe practices • personal protective equipment • safety-first attitude, awareness • describe a variety of tasks and conditions, explore hazards and safe practices - note the particular dangers and safety practices applied when working on extreme slopes • stability issues are critical to safe operation of feller bunchers • appropriate speeds for conditions
3 Identify key regulations that apply to given tasks and conditions.	• identify and discuss relevant sections of regulatory requirements
4 Operating a feller buncher in compliance with regulatory requirements and safe practices.	Discuss: • company policies • general safe practices

5	Use Personal Protective Equipment (PPE).	• safety-first attitude, awareness • vehicle limitations • hardhat • hearing protection • high visibility apparel (Type 1 or 2) • eye protection as required • gloves as required • safety toed footwear (CSA Class 1)

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will achieve a minimum of 70% combined score on a practical assessment form and achieve a pass mark in all boxes marked pass/fail
- Demonstrated safe practices while operating machine

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE L: OPERATE FELLER BUNCHER

Competency: **L2** **Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance**

Learning Objectives:

1. The learner will perform pre start equipment checks
2. The learner will perform start up and shutdown procedures
3. The learner will monitor the performance of the equipment

LEARNING TASKS	CONTENT
1 Perform pre start checks (hands on) •first as a small group activity •individually before operating each machine •as a supervised and assessed exercise before completion of the core lab	• Comprehensive pre start check • Review hazards: pressurised systems, batteries, slips & falls, etc. • identify correct fluids for each component • add fluids as required • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, some transmissions) • general procedures include visual checks for loose, damaged or leaking components, fluid levels, operational checks to confirm proper operation of all systems
2 Perform start up procedures	• Always beware of possible slips • Machine entry using three point entry system • check for operation of gauges, warning systems • start and warm up engine at low idle • walk around, look for leaks, general check (noise, vibration, unusual exhaust or other condition) • warm up hydraulics and transmission before full load • check for proper operation of lights, wipers, seat belt, lockouts, all controls and major systems (hydraulics, transmission, brakes, etc.)

3	Perform shutdown procedures	• position that allows access in case of mechanical trouble at start up • safe parking position, disengage hydraulic system, understand lockout procedure for service or maintenance • level position for checking of fluids • cool down before shut down • walk around, look for leaks, general check • secure machine, locks, etc • lockout • Some residual movement potential: accumulator system will load a rubber bladder a valve will hold the pressure behind it, but because of mechanical or electrical failure could cause the valve release the pressure, which could result in a movement of the hydraulic components (e.g. Measuring wheel, grab arms, saw returns).
4	Monitor performance of equipment during operation	• gauges and warning systems • look, hear, feel, smell • Respond appropriately: is immediate shutdown required?

Suggested Assessment:

- An exercise with students performing pre start, start and shut down with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially checked, or thoroughly checked. Students must complete pre-check list, start-up and shut down procedures.

Achievement Criteria:

To complete the in school practical lab requirement for this machine the learner must be able to demonstrate:

- All elements of pre start, start up and shut down. Once the student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, checking for leaks or loose hardware involves more than a “quick look”.

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE L: OPERATE FELLER BUNCHER

Competency: L3 Perform daily maintenance tasks

Learning Objectives:

1 The learner will perform daily maintenance checks in accordance to a supplied check list

	LEARNING TASKS	CONTENT
1	Service lubrication system (greasing)	•identify and lube all points •load grease gun •**Note:** Point out that the appropriate amount of grease is debatable, employers differ, but the following guidelines are reasonable: •2-3 shots for small areas: fan bearings, small u joints, linkages, hinges, etc. •8 – 10 shots for common pins and bushings •20 shots where one nipple feeds a large area •every pin must be showing excess grease regardless of how many shots you have counted •daily for most points / weekly for some •wipe off nipples before greasing to reduce abrasive particles entering pin/bushing
2	Service air intake system as required (air filters / pre cleaners)	•restriction indicators •pre cleaner service •cleaning vs. replacement, check employer policy (some insist on never using air – replace only) •use air only with reduced pressure
3	Drain fuel tank sump, water separator fuel filters if equipped (Racor or other)	•drain, assess •water, debris, scale, etc
4	Add fluids as required	•identify correct fluids for each component •add fluids as required •avoid contamination with dirt, water •describe 2 sided dipsticks with levels for stopped/idling (Cat engines, transmissions)
5	Inspect and clean components as required	•radiator & oil cooler •filler plugs, dip sticks

6	Housekeeping	•battery terminals •garbage •excess grease •clean windows (if equipped) , sweep out cab, general cleanliness

Suggested Assessment:

- An exercise with students performing daily maintenance tasks with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially done, or thoroughly.

Achievement Criteria:

To complete the in school practical lab requirement for the feller buncher the learner must be able to demonstrate:

- All elements of daily maintenance. Once the student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, inspecting and cleaning components involves more than a “quick look”.

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE L: OPERATE FELLER BUNCHER

Competency: L4 Describe mechanical components, troubleshooting, basic repairs and maintenance

Learning Objectives:

1 The learner will describe the basic components and functions of a feller buncher
2 The learner will describe basic troubleshooting signs and symptoms and appropriate responses for the operator

LEARNING TASKS	CONTENT
1 Describe major mechanical components	Identify major components from a checklist, and describe function
2 Describe potential failures, symptoms and indicators of failure	Discuss potential failures, symptoms •symptoms: noise, vibration, smell, leaks, cracks •respond appropriately: service required, immediate repair required, immediate removal from service
3 Describe basic repairs and maintenance	Supervise, demonstrate as required •remove and replace hydraulic hose, o-ring •re and re fuel filter, bleed air from fuel system •re and re air filter •engine oil change, lube filter •adjust belt tension •clean battery terminals, top up fluid •check and tighten assorted hardware

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE L: OPERATE FELLER BUNCHER

Competency: L5 Perform basic operator functions

Learning Objectives:

1 The learner will perform basic operator functions in accordance to the Heavy Equipment Operator Practical Assessment – (Logging) Form

	LEARNING TASKS	CONTENT
1	Perform basic moves	• raise and lower boom, retract and extend the stick and tilt head up and down, and side to side • Coordinate boom and stick movement. The head should stay at a consistent height above the ground • Walk the machine forward and backward, turn right and left • Rotate the house left and right and up and down if applicable (house should be level when the track is on a slope)
2	Drive through simple obstacle course	•possibly pylons or used tires outlining an obstacle course •hills and slopes •forwards and backwards •high and low speed
3	Simulate falling	•move into appropriate positions for several scenarios
4	Falling	•Fall straightforward, easier trees •Set them into bunches with butts in the same direction in preparation for skidding or forwarding

Suggested Assessment:

- Observe students performing learning tasks and assess competency using a pass/fail rating. Students should be able to achieve learning outcomes by the end of a one day session.
- Time and quantity as instructor deems appropriate
- Successfully move through simple obstacle course without contacting pylons/tires (Obstacle course should consist of at least one right hand turn and one left hand turn using the buncherhead to assist in the turn).

Achievement Criteria:

General:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions fully stopped and at idle
- Operates with smooth and precise control of hydraulics, appropriate position of boom, minimal impact
- Enters and exits machine safely (3 point contact, parking position, brake)

Specific to this task:

- Manoeuvre through obstacle course without running over pylons/tires
- Cut tree
- Maintain control of tree
- Place tree into a bundle

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE L: OPERATE FELLER BUNCHER

Competency: L6 Identify Species for Felling

Learning Objectives:

1 The learner will identify various species of trees

	LEARNING TASKS	CONTENT
1	Identify Coastal Species	Most prevalent: Douglas Fir Hemlock Cedar (Red & Yellow – called Cyprus) Spruce Pine Sometimes Cottonwood & Alder
2	Identify Southern Province & Kootenays Species	Most prevalent: Douglas Fir and Lodge Pole Pine (some areas) Hemlock Cedar (red & yellow) Sometimes Cottonwood & Alder
3	Identify Central Interior Species	Most prevalent: Lodge Pole Pine Douglas fir Hemlock Red Cedar Spruce Aspen Cottonwood
4	Identify Northern Species	Most Prevalent: Spruce Pine Cottonwood Aspen
5	Identify Protected Species	Arbutus Garry Oak

Suggested Assessment:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE L: OPERATE FELLER BUNCHER

Competency: L7 Determine Block & Slope Orientation

Learning Objectives:

1 The learner will walk the block and determine soil conditions, slope and machine limitations.

2 The learner will create strategy to commence work in orderly fashion.

LEARNING TASKS	CONTENT
1 Discuss Block	•Details outlined in pre-work •Open up boundary and set bunches up for skidder crew •Feller buncher commences work in rows leaving wood in piles with butt points toward the nearest road •Strategize how to lay wood so that you are moving as little as possible to lay them out in the bunch •Consider next phase of logging operation (skidding or forwarding)
2 Slope Orientation	•Soil conditions •ground limitations •rocky or steep terrain •discuss slope orientation as it affects the machines ability to fall trees and the strategy of the work to set up the next phase •use tilt function skills set if applicable

Suggested Assessment:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will demonstrate safe practices during practical training and on the job

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE L: OPERATE FELLER BUNCHER

Competency: L8 Communicate with Skidding/Forwarding Team

Learning Objectives:

1 The learner will demonstrate proper verbal communication with skidding/forwarding team using radio and hand signals.
2 The learner will demonstrate use of correct hand signals.

LEARNING TASKS	CONTENT
1 Demonstrate correct verbal instructions to skidder operator over radio.	• Since the noise level on most logging jobs requires communications other than verbal, signalling systems should be discussed at safety meetings with the entire crew. • No yarding (or skidding) line should be moved unless the machine operator has clearly received and understood the signal to do so. • All employees should work to reduce distraction during skidding operations. • Take extra precautions when working in unusual conditions. • Balance feller buncher's production with next phase of production. Split the workload to make it more efficient as a team. There is a crossover of roles.
2 Demonstrate hand signals	• • Used when verbal communication is not possible or practical • Use industry standard signals

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance
- Minimizes distractions
- Uses radio on correct channel with proper gain and volume settings

Specific to this Task:

To complete the in school practical lab requirement for this task, the learner must be able to demonstrate the following practical skills:

- Talk in person or on the radio to discuss how or where skidder/forwarder will be decking the wood and any challenges that can be assuaged through the feller buncher's production choices
- Feller buncher bunches the wood for the following potential machines: skidders, forwarders (clam bunk), hoe chucker, or grapple yarder (not as common)

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE M: OPERATE WHEEL SKIDDER

Competency: M1 Describe & comply with safety requirements

Learning Objectives:

1. The learner will describe how to work safely while working on and around an feller buncher. This will include understanding key regulations, machine limitations, operating procedures and tasks and the use of PPE's
2. The learner will comply with safety requirements at all times during this course.

LEARNING TASKS	CONTENT
1 Use manuals to determine safe operating procedures/restrictions	•identify and discuss relevant sections of manual •identify and discuss Warning Labels/Stickers •identify and use dash displays, sensors, warning systems
2 Assess a variety of machine tasks for potential hazards, and explain strategy to work safely.	•describe a variety of tasks and conditions, explore hazards and safe practices •stability issues are critical to safe operation of wheel skidders •appropriate speeds for conditions
3 Identify key regulations that apply to given tasks and conditions.	•identify and discuss relevant sections of regulatory requirements
4 Operate wheel skidder in compliance with regulatory requirements and safe practices.	•regulations: OH&S, Motor Vehicle including weight, dimension, lighting, etc. •company policies •general safe practices •safety-first attitude, awareness •vehicle limitations •limitations of structures (i.e. bridges, culverts); limitations of surfaces i.e. load bearing, plasticity, general effects of heavy loads on finished surfaces
5 Use Personal Protective Equipment (PPE).	•hardhat •hearing protection •high visibility apparel (Type 1 or 2) •eye protection as required •gloves as required •safety toed footwear (CSA Class 1)

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will achieve a minimum of 70% combined score on a practical assessment form and achieve a pass mark in all boxes marked pass/fail

- Demonstrated safe practices while operating machine

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE M: OPERATE WHEEL SKIDDER

Competency: M2 Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance

Learning Objectives:

1. The learner will perform pre start equipment checks
2. The learner will perform start up and shutdown procedures
3. The learner will monitor the performance of the equipment

LEARNING TASKS	CONTENT
1 Perform pre start checks (hands on) •first as a small group activity •individually before operating each machine •as a supervised and assessed exercise before completion of the core lab	• Comprehensive pre start check • Review hazards: pressurised systems, batteries, slips & falls, etc. • identify correct fluids for each component • add fluids as required • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, some transmissions) • general procedures include visual checks for loose, damaged or leaking components, fluid levels, operational checks to confirm proper operation of all systems
2 Perform start up procedures	• check for operation of gauges, warning systems • start and warm up engine at low idle • walk around, look for leaks, general check (noise, vibration, unusual exhaust or other condition) • warm up hydraulics and transmission before full load • check for proper operation of lights, wipers, seat belt, lockouts, parking brake, all controls and major systems (hydraulics, transmission, brakes, etc.)
3 Perform shutdown procedures	• position that allows access in case of mechanical trouble at start up • safe parking position, set parking brake • level position for checking of fluids • cool down before shut down • walk around, look for leaks, general check • secure machine, locks, etc

4	Monitor performance of equipment during operation	• gauges and warning systems • look, hear, feel, smell • Respond appropriately: is immediate shutdown required?

Suggested Assessment:

- An exercise with students performing pre start, start and shut down with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially checked, or thoroughly checked. Students must complete pre-check list, start-up and shut down procedures.

Achievement Criteria:
To complete the in school practical lab requirement for this machine the learner must be able to demonstrate:

- All elements of pre start, start up and shut down. Once the student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, checking for leaks or loose hardware involves more than a “quick look”.

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE M: OPERATE WHEEL SKIDDER

Competency: M3 Perform daily maintenance tasks

Learning Objectives:

1 The learner will perform daily maintenance checks in accordance to a supplied check list.

LEARNING TASKS	CONTENT
1 Service lubrication system (greasing)	• identify and lube all points • load grease gun • **Note:** Point out that the appropriate amount of grease is debatable, employers differ, but the following guidelines are reasonable: • 2-3 shots for small areas: fan bearings, small u joints, linkages, hinges, etc. • 8 – 10 shots for common pins and bushings • 20 shots where one nipple feeds a large area • every pin must be showing excess grease regardless of how many shots you have counted • daily for most points / weekly for some • wipe off nipples before greasing to reduce abrasive particles entering pin/bushing
2 Service air intake system as required (air filters / pre cleaners)	• restriction indicators • pre cleaner service • cleaning vs. replacement, check employer policy (some insist on never using air – replace only) • use air only with reduced pressure
3 Drain fuel tank sump, water separator fuel filters if equipped (Racor or other)	• drain, assess • water, debris, scale, etc
4 Add fluids as required	• identify correct fluids for each component • add fluids as required • avoid contamination with dirt, water • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, transmissions)
5 Inspect and clean components as required	• radiator & oil cooler • filler plugs, dip sticks

6	Housekeeping	• battery terminals • garbage • excess grease • clean windows (if equipped) , sweep out cab, general cleanliness

Suggested Assessment:

- An exercise with students performing daily maintenance tasks with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially done, or thoroughly.

Achievement Criteria:

To complete the in school practical lab requirement for the wheel skidder the learner must be able to demonstrate:

- All elements of daily maintenance. Once the student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, inspecting and cleaning components involves more than a “quick look”.

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE M: OPERATE WHEEL SKIDDER

Competency: M4 Describe mechanical components, troubleshooting, basic repairs & maintenance

Learning Objectives:

1 The learner will describe the basic components and functions of a wheel skidder
2 The learner will describe basic troubleshooting signs and symptoms and appropriate responses for the operator

LEARNING TASKS	CONTENT
1 Describe major mechanical components	Identify major components from a checklist, and describe function •identify and describe function from list of major components
2 Describe potential failures, symptoms and indicators of failure	Discuss potential failures, symptoms •symptoms: noise, vibration, smell, leaks, cracks •respond appropriately: service required, immediate repair required, immediate removal from service
3 Describe basic repairs and maintenance	Supervise, demonstrate as required •remove and replace hydraulic hose, o-ring •re and re fuel filter, bleed air from fuel system •re and re air filter •engine oil change, lube filter •adjust belt tension •clean battery terminals, top up fluid •check and tighten assorted hardware

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE M: OPERATE WHEEL SKIDDER

Competency: M5 Perform basic operator functions

Learning Objectives:

1 The learner will perform basic operator functions in accordance to the Heavy Equipment Operator Practical Assessment – (Logging) Form

LEARNING TASKS	CONTENT
1 Perform basic moves	• lift grapple and blade • disengage park brake • move forward, stop, back up, stop • apply park brake, lockout transmission • raise or lower arch, and move boom ahead or back • rotate grapple right or left, and open and close • engage diff lock • shift transmission – probably stick to low speeds at this point
2 Drive through simple obstacle course	• possibly pylons or used tires outlining an obstacle course • hills and slopes • forwards and backwards
3 Simulate falling	• move into appropriate positions for several scenarios

Suggested Assessment:

- Observe students performing learning tasks and assess competency using a pass/fail rating. Students should be able to achieve learning outcomes by the end of a one day session.
- Time and quantity as instructor deems appropriate
- Successfully pick up a turn of at least 6 logs and move through simple obstacle course without contacting pylons/tires. Obstacle course should consist of at least one right hand and one left hand turn requirement. Place turn on ground and push into place using skidder blade.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions fully stopped and at idle
- Enters and exits machine safely (3 point contact, parking position, brake)

Specific to this task:

- Pick up and carry turn of logs (suggested at least 6 logs)
- Manoeuvre through obstacle course without running over pylons/tires

- Place turn on ground and push into place using skidder blade

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE M: OPERATE WHEEL SKIDDER

Competency: M6 Haul Logs

Learning Objectives:

1 The learner will perform basic grapple functions to pick up trees in grapple
2 The learner will lift load off the ground to transport position
3 The learner will transport to decking site for processor phase

	LEARNING TASKS	CONTENT
1	Sequence of activities	• Skidder starts where the buncher finished off
2	Basic grapple functions	• perform basic grapple functions to pick up trees in grapple • Be aware that buncher may have piled wood on top of other wood, and key is to minimize fibre damage, remove the most recently felled trees first
3	Transport position	• Lift load off the ground to transport position • Transport to decking site for processor phase • Processor phase – measurements may vary, but pile should typically be 60 ft from the road. The processor will then forward wood to the road.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control, reduced 'wear and tear', minimal impact, minimal tire spinning
- Attention to stability, center of gravity, slopes
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- perform basic grapple functions to pick up trees in grapple
- lift load off the ground to transport position
- transport to decking site for processor phase
- Manoeuvre through rough terrain with turn of logs
- Place turn on ground and push into place using skidder blade
- Able to manoeuvre through full wooded area
- remove most recently felled trees first

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE M: OPERATE WHEEL SKIDDER

Competency: M7 Maneuver over a variety of terrain

Learning Objectives:

1 The learner will move through a variety of terrain as required to move forward bunches to the deck

LEARNING TASKS	CONTENT
1 Move efficiently to forward wood	• Strategize the moving of the machine through block or setting in such a way to avoid site damage. Maintain trail for ease of movement using minimal travel to avoid damage or rutting. • Plan that the final deck is the proper distance away from the road for the processing phase. • Continue skidding as required using caution around side slopes, soft ground and stumps (or other high hazards) • Forward bunches as directed • Deck as required

Suggested Assessment:

- move efficiently to forward wood
- perform site clean-up as required
- using caution around side slopes, soft ground and stumps (or other high hazards)
- Forward bunches as directed
- Deck as required
- Keep breakage to a minimum

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE M: OPERATE WHEEL SKIDDER

Competency: M8 Communicate with feller/buncher and work as an effective team

Learning Objectives:

1 The learner will communicate effectively with the feller buncher
2 The learner will work with the feller buncher as an effective team

LEARNING TASKS	CONTENT
1 Communicate	• Talk in person on the radio to discuss how or where they will be decking the wood and any challenges that can be assuaged through the feller bunchers production choices
2 Team work	• Balancing act between your production and next phase of production. Split the workload to make it more efficient as a team. There is a cross over of roles. • Feller buncher bunches the wood for the following potential machines: skidders, forwarders (clam bunk), hoe chucker, or grapple yarder (not as common)

Suggested Assessment:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will demonstrate safe practices during practical training and on the job

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE N: OPERATE TRACK SKIDDER

Competency: N1 Describe and comply with safety requirements

Learning Objectives:

1. The learner will describe how to work safely while working on and around an tracked skidder. This will include understanding key regulations, machine limitations, operating procedures and tasks and the use of PPE's
2. The learner will comply with safety requirements at all times during this course.

	LEARNING TASKS	CONTENT
1	Use manuals to determine safe operating procedures/restrictions	• identify and discuss relevant sections of manual • identify and discuss Warning Labels/Stickers • identify and use dash displays, sensors, warning systems
2	Assess a variety of machine tasks for potential hazards, and explain strategy to work safely.	• describe a variety of tasks and conditions, explore hazards and safe practices • stability issues are critical to safe operation of Track skidders • appropriate speeds for conditions
3	Identify key regulations that apply to given tasks and conditions.	• identify and discuss relevant sections of regulatory requirements
4	Operate Track skidder in compliance with regulatory requirements and safe practices.	• Regulations: OH&S, Motor Vehicle including weight, dimension, lighting, etc. • company policies • general safe practices • safety-first attitude, awareness • vehicle limitations • limitations of structures (i.e. bridges, culverts); limitations of surfaces i.e. load bearing, plasticity, general effects of heavy loads on finished surfaces
5	Use Personal Protective Equipment (PPE).	• hardhat • hearing protection • high visibility apparel (Type 1 or 2) • eye protection as required • gloves as required • safety toed footwear (CSA Class 1)

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

- Students will achieve a minimum of 70% combined score on a practical assessment form and achieve a pass mark in all boxes marked pass/fail
- Demonstrated safe practices while operating machine

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE N: OPERATE TRACK SKIDDER

Competency: N2 Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance

Learning Objectives:

1 The learner will perform pre start equipment checks

2 The learner will perform start up and shutdown procedures

3 The learner will monitor the performance of the equipment

	LEARNING TASKS	CONTENT
1	Perform pre start checks (hands on) •first as a small group activity •individually before operating each machine •as a supervised and assessed exercise before completion of the core lab	• Comprehensive pre start check • Review hazards: pressurised systems, batteries, slips & falls, etc. • identify correct fluids for each component • add fluids as required • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, some transmissions) • general procedures include visual checks for loose, damaged or leaking components, fluid levels, operational checks to confirm proper operation of all systems
2	Perform start up procedures	• check for operation of gauges, warning systems • start and warm up engine at low idle • walk around, look for leaks, general check (noise, vibration, unusual exhaust or other condition) • warm up hydraulics and transmission before full load • check for proper operation of lights, wipers, seat belt, lockouts, parking brake, all controls and major systems (hydraulics, transmission, brakes, etc.)
3	Perform shutdown procedures	• position that allows access in case of mechanical trouble at start up • safe parking position, set parking brake • level position for checking of fluids • cool down before shut down • walk around, look for leaks, general check • secure machine, locks, etc

4	Monitor performance of equipment during operation	• gauges and warning systems • look, hear, feel, smell • Respond appropriately: is immediate shutdown required?

Suggested Assessment:

- An exercise with students performing pre start, start and shut down with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially checked, or thoroughly checked. Students must complete pre-check list, start-up and shut down procedures.

Achievement Criteria:

To complete the in school practical lab requirement for this machine the learner must be able to demonstrate:

- All elements of pre start, start up and shut down. Once the student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, checking for leaks or loose hardware involves more than a “quick look”.

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE N: OPERATE TRACK SKIDDER

Competency: N3 Perform daily maintenance tasks

Learning Objectives:

1 The learner will perform daily maintenance checks in accordance to a supplied check list.

	LEARNING TASKS	CONTENT
1	Service lubrication system (greasing)	• identify and lube all points • load grease gun • **Note:** Point out that the appropriate amount of grease is debatable, employers differ, but the following guidelines are reasonable: • 2-3 shots for small areas: fan bearings, small u joints, linkages, hinges, etc. • 8 – 10 shots for common pins and bushings • 20 shots where one nipple feeds a large area • every pin must be showing excess grease regardless of how many shots you have counted • daily for most points / weekly for some • wipe off nipples before greasing to reduce abrasive particles entering pin/bushing
2	Service air intake system as required (air filters / pre cleaners)	• restriction indicators • pre cleaner service • cleaning vs. replacement, check employer policy (some insist on never using air – replace only) • use air only with reduced pressure
3	Drain fuel tank sump, water separator fuel filters if equipped (Racor or other)	• drain, assess • water, debris, scale, etc
4	Add fluids as required	• identify correct fluids for each component • add fluids as required • avoid contamination with dirt, water • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, transmissions)
5	Inspect and clean components as required	• radiator & oil cooler • filler plugs, dip sticks • battery terminals

6	Housekeeping	• garbage • excess grease • clean windows (if equipped) , sweep out cab, general cleanliness

Suggested Assessment:

- An exercise with students performing daily maintenance tasks with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially done, or thoroughly.

Achievement Criteria:

To complete the in school practical lab requirement for the wheel skidder the learner must be able to demonstrate:

- All elements of daily maintenance. Once the student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, inspecting and cleaning components involves more than a “quick look”.

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE N: OPERATE TRACK SKIDDER

Competency: N4 **Describe mechanical components, troubleshooting, basic repairs and maintenance**

Learning Objectives:

1 The learner will describe the basic components and functions of a track skidder
2 The learner will describe basic troubleshooting signs and symptoms and appropriate responses for the operator

LEARNING TASKS	CONTENT
1 Describe major mechanical components	Identify major components from a checklist, and describe function •identify and describe function from list of major components
2 Describe potential failures, symptoms and indicators of failure	Discuss potential failures, symptoms •symptoms: noise, vibration, smell, leaks, cracks •respond appropriately: service required, immediate repair required, immediate removal from service
3 Describe basic repairs and maintenance	Supervise, demonstrate as required •remove and replace hydraulic hose, o-ring •re and re fuel filter, bleed air from fuel system •re and re air filter •engine oil change, lube filter •adjust belt tension •clean battery terminals, top up fluid •check and tighten assorted hardware

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE N: OPERATE TRACK SKIDDER

Competency: N5 Perform basic operator functions

Learning Objectives:

1 The learner will perform basic operator functions in accordance to the Heavy Equipment Operator Practical Assessment – (Logging) Form

Learning Tasks	Content
1 Perform basic moves of track skidder	• lift grapple and blade • disengage park brake • move forward, stop, back up, stop • apply park brake, lockout transmission • raise or lower arch, and move boom ahead or back • rotate grapple right or left, and open and close • engage diff lock • shift transmission – probably stick to low speeds at this point • move forward, stop, back up, stop • raise or lower boom, extend or retract stick • rotate grapple right or left, and open and close • use low travel speed only at this point • watch for tail swing
2 Drive through simple obstacle course	• possibly pylons or used tires outlining an obstacle course • hills and slopes • forwards and backwards
3 Simulate skidding or tree forwarding	• move into appropriate positions for several scenarios

Suggested Assessment:

- Observe students performing learning tasks and assess competency using a pass/fail rating. Students should be able to achieve learning outcomes by the end of a one day session.
- Time and quantity as instructor deems appropriate
- Successfully pick up a turn of at least 6 logs and move through simple obstacle course without contacting pylons/tires. Obstacle course should consist of at least one right hand and one left hand turn requirement. Place turn on ground and push into place using skidder blade.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions fully stopped and at idle
- Enters and exits machine safely (3 point contact, parking position, brake)

Specific to this task:

- Pick up and carry turn of logs (suggested at least 6 logs)
- Manoeuvre through obstacle course without running over pylons/tires
- Place turn on ground and push into place using skidder blade

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE N: OPERATE TRACK SKIDDER

Competency: N6 Haul Logs

Learning Objectives:

1 The learner will perform basic grapple functions to pick up trees in grapple
2 The learner will lift load off the ground to transport position
3 The learner will transport to decking site for processor phase

LEARNING TASKS	CONTENT
1 Track Skidder	• Skidder starts where the buncher finished off • perform basic grapple functions to pick up trees in grapple • Be aware that buncher may have piled wood on top of other wood, and key is to minimize fibre damage, remove the most recently felled trees first • Lift load off the ground to transport position • Transport t\o decking site for processor phase • Processor phase – measurements may vary, but pile should typically be 60 ft from the road. The processor will then forward wood to the road.
2 Hoe-Chucker	• Loader/ Chucker starts where the buncher finished off • perform basic grapple functions to pick up trees in grapple • Be aware that buncher may have piled wood on top of other wood, and key is to minimize fibre damage, remove the most recently felled trees first • Forward wood to small decks and then move small decks ahead to roadside for processing phase to accomplish task. • These machines are used when conditions are not conducive for skidding operation • crossed up • • The distance the deck is placed from the roadside is of utmost importance

- Puncheon is used commonly to avoid creating ruts (damaging the ground) when manoeuvring the machine

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control, reduced 'wear and tear', minimal impact, minimal tire spinning
- Attention to stability, center of gravity, slopes
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this task:

- perform basic grapple functions to pick up trees in grapple
- lift load off the ground to transport position
- transport to decking site for processor phase
- Manoeuvre through rough terrain with turn of logs
- Place turn on ground and push into place using skidder blade
- Able to manoeuvre through full wooded area
- remove most recently felled trees first

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE N: OPERATE TRACK SKIDDER

Competency: N7 Manoeuvre over a variety of terrain

Learning Objectives:

1 The learner will move through a variety of terrain as required to move forward bunches to the deck

LEARNING TASKS	CONTENT
1 Move efficiently to forward wood	• Strategize the moving of the machine through block or setting in such a way to avoid site damage. Maintain trail for ease of movement using minimal travel to avoid damage or rutting. • Plan that the final deck is the proper distance away from the road for the processing phase. • Continue skidding as required using caution around side slopes, soft ground and stumps (or other high hazards) • Forward bunches as directed • Deck as required

Suggested Assessment:

- move efficiently to forward wood
- perform site clean-up as required
- using caution around side slopes, soft ground and stumps (or other high hazards)
- Forward bunches as directed
- Deck as required
- Keep breakage to a minimum

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE N: OPERATE TRACK SKIDDER

Competency: N8 Communicate with feller/buncher and work as an effective team

Learning Objectives:

1 The learner will communicate effectively with the feller buncher

The learner will work with the feller buncher as an effective team

LEARNING TASKS	CONTENT
1 Communicate	• Talk in person on the radio to discuss how or where they will be decking the wood and any challenges that can be assuaged through the feller bunchers production choices
2 Team work	• Balancing act between your production and next phase of production. Split the workload to make it more efficient as a team. There is a cross over of roles. • Feller buncher bunches the wood for the following potential machines: skidders, forwarders (clam bunk), hoe chucker, or grapple yarder (not as common)

Suggested Assessment:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will demonstrate safe practices during practical training and on the job

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE O: OPERATE GRAPPLE YARDER

Competency: O1 Describe and comply with safety requirements

Learning Objectives:

1 The learner will describe how to work safely while working on and around an grapple yarder. This will include understanding key regulations, machine limitations, operating procedures and tasks and the use of PPE's

2 The learner will comply with safety requirements at all times during this course.

	LEARNING TASKS	CONTENT
1	Use equipment manuals and specifications to determine safe operating procedures and operational restrictions of yarder	Lecture, group discussion, Q&A • identify and discuss relevant sections of manual
2	Assess a variety of tasks for potential hazards, and explain strategy to work safely.	Lecture, group discussion, Q&A, possibly small group work •describe a variety of tasks and conditions, explore hazards and safe practices
3	Identify key regulations that apply to given tasks and conditions	Lecture, group discussion, Q&A, possibly small group work •identify and discuss relevant sections of regulation
4	Operate machine in compliance with regulations and safe practices	Instruct and supervise hands on operating with constant attention to safe practices, review and application of previous safety instruction •regulations •company policies •general safe practices •safety-first attitude, awareness
5	Use Personal Protective Equipment	Supervise, insist, enforce •hardhat •hearing protection •hi visibility •eye protection as required •gloves as required •steel toe footwear

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

- Students will achieve a minimum of 70% combined score on a practical assessment form and achieve a pass mark in all boxes marked pass/fail
- Demonstrated safe practices while operating machine

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE O: OPERATE GRAPPLE YARDER

Competency: O2 Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance

Learning Objectives:

1 The learner will perform pre start equipment checks
2 The learner will perform start up and shutdown procedures
3 The learner will monitor the performance of the equipment

LEARNING TASKS	CONTENT
1 Perform pre start checks (hands on) •first as a small group activity •individually before operating each machine •as a supervised and assessed exercise before completion of the core lab	•Comprehensive pre start check •Review hazards: pressurised systems, batteries, slips & falls, fumes etc. • identify correct fluids for each component • add fluids as required •describe 2 sided dipsticks with levels for stopped/idling (Cat engines, some transmissions) •general procedures include visual checks for loose, damaged or leaking components, fluid levels, operational checks to confirm proper operation of all systems
2 Perform start up procedures	•check for operation of gauges, warning systems •start and warm up engine at low idle •walk around, look for leaks, general check (noise, vibration, unusual exhaust or other condition) •warm up hydraulics and transmission before full load •check for proper operation of lights, wipers, seat belt, lockouts, parking brake, all controls and major systems (hydraulics, transmission, brakes, etc.
3 Perform shutdown procedures	•safe parking position, set parking brake, •position that allows access in case of mechanical trouble at start up •level position for checking of fluids •cool down before shut down •walk around, look for leaks, general check •secure machine, locks, etc

4	Monitor performance of equipment during operation	•gauges and warning systems •look, hear, feel, smell •Respond appropriately: is immediate shutdown required?

Suggested Assessment:

- An exercise with students performing pre start, start and shut down with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially checked, or thoroughly checked. Students must complete pre-checklist, start-up and shut down procedures.

Achievement Criteria:

To complete the in school practical lab requirement for the grapple yarder the learner must be able to demonstrate:

- All elements of pre start, start up and shut down. Once a student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, checking for leaks or loose hardware involves more than a "quick look"

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE O: OPERATE GRAPPLE YARDER

Competency: O3 Perform daily maintenance tasks

Learning Objectives:

1 The learner will perform daily maintenance checks in accordance to a supplied check list.

	LEARNING TASKS	CONTENT
1	Service lubrication system (greasing)	•identify and lube all points •load grease gun **Note:** Point out that the appropriate amount of grease is debatable, employers differ, but the following guidelines are reasonable: •2-3 shots for small areas: fan bearings, small u joints, linkages, hinges, etc. •8 – 10 shots for common pins and bushings •20 shots where one nipple feeds a large area •every pin must be showing excess grease regardless of how many shots you have counted •daily for most points / weekly for some •wipe off nipples before greasing to reduce abrasive particles entering pin/bushing
2	Service air intake system as required (air filters/ pre cleaners)	Use pictures or examples of restriction indicators and pre cleaner if your machine is not equipped •restriction indicators •pre cleaner service •cleaning vs. replacement, check employer policy (some insist on never using air – replace only) •use air only with reduced pressure
3	Drain fuel tank sump, water separator fuel filters if equipped (Racor or other)	•drain, assess quantity and types of contaminants •water, debris, scale, etc
4	Add fluids as required	•identify correct fluids for each component •add fluids as required •avoid contamination with dirt, water •describe 2 sided dipsticks with levels for stopped/idling (Cat engines, transmissions)

5	Inspect and clean components as required	•radiator & oil cooler •filler plugs, dip sticks •battery terminals
6	Adjust track tension as required	•determine 'slack' appropriate for task/ materials •correct procedures for measuring/assessing and adjusting
7	Housekeeping	•garbage •excess grease •clean windows, sweep out cab, general cleanliness

Suggested Assessment:

- An with students performing daily maintenance tasks with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially done, or thoroughly.

Achievement Criteria:

To complete the in school practical lab requirement for the wheel skidder the learner must be able to demonstrate:

- All elements of daily maintenance. Once the student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, inspecting and cleaning components involves more than a "quick look".

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE O: OPERATE GRAPPLE YARDER

Competency: O4 Describe mechanical components, troubleshooting, basic repairs and maintenance

Learning Objectives:

1 The learner will describe the basic components and functions of a track skidder
2 The learner will describe basic troubleshooting signs and symptoms and appropriate responses for the operator

	LEARNING TASKS	CONTENT
1	Describe major mechanical components	Identify major components from a checklist, and describe function •identify and describe function from list of major components
2	Describe potential failures, symptoms and indicators of failure	Discuss potential failures, symptoms •symptoms: noise, vibration, smell, leaks, cracks •respond appropriately: service required, immediate repair required, immediate removal from service
3	Describe basic repairs and maintenance	Supervise, demonstrate as required •remove and replace hydraulic hose, o-ring •re and re fuel filter, bleed air from fuel system •re and re air filter •engine oil change, lube filter •adjust belt tension •maintain track tension •clean battery terminals, top up fluid •check and tighten assorted hardware •replace corner bits, ripper teeth

Suggested Assessment:

- An exercise with students identifying and describing major components, describing failures, identifying whether immediate shutdown is required, with instructor observing and grading according to a checklist.

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE O: OPERATE GRAPPLE YARDER

Competency: O5 Perform basic operator functions

Learning Objectives:

1 The learner will perform basic operator functions in accordance to the Heavy Equipment Operator Practical Assessment – (Logging) Form

LEARNING TASKS	CONTENT
1 Planning and developing a grapple yarder site	•removing danger trees •avoid natural obstacles •consideration of processing and loading operations •maximize operator line of sight •maintain sufficient deflection •never yard straight into machine •allow room for landing, processing and loading •Haul road layout ○ Built on edge ○ Not too narrow ○ Extend spur for visibility ○ Set spar properly ○ Avoid excessive grades •Use suitable anchors •Notch and secure stumps •Set proper backspar guylines •Consider weather and season •Backspar roads and equipment/stumps
2 Yarding procedures	•Spotting the grapple •Verbal signals •Standing in the clear •Working the draws and ridges •Night operations
3 Moving grapple yarder on site	•Overhead obstructions •Working with the lowbed – snubbing/pulling •Ensure stable travel surface
4 Yarding near other equipment	•Equipment clearance •Passing loaders
5 Radio and verbal signals	•Communications •Use recommended commands

Suggested Assessment:

- Observation of trainee performing basic functions of machine: rigging, guylines, communication with Hooktender, safe operating practices, production rate
- Successfully pluck log with grapple and drop safely onto the deck. (Deck or simulated deck should be the approximate length of the log and between 6-9 meters wide.

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics, effective position of cables and grapple
- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle, maintains proper deflection
- Enters and exits machine safely (3 point contact, parking position, brake)
- Attention to stability, center of gravity, slopes
- Plans and conducts work with minimal wasted movement and efficient movement paths
- Efficient placement of material for processing/loading

Specific to this task:

- Safely pluck and carry logs (suggested at least 5 logs per carry)
- Drop logs into designated drop area

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE O: OPERATE GRAPPLE YARDER

Competency: O6 Describe yarder crew roles and responsibilities

Learning Objectives:

1 The learner will describe the role of each of the crew member in the crew and their various functions

LEARNING TASKS	CONTENT
1 Hooktender's responsibility for safety	•Adhere to employer's safety rules •Follow OH&S regulations •Get proper training •Conduct inspections •Ensure landings are organized and free of debris •Be aware of site specific dangers
2 Yarding Hazards	•Root wads •Saplings •Runaways and siwashes •Steep ground with unbuckled or long logs •Danger trees on back or side lines
3 Safe yarding practices	•Communications •Choking logs •Notching Stumps •Hanging haulback blocks •Carrying blocks •Walking on metal •Splicing and cutting lines •Chainsaws
4 Operating the backspar	•Regular maintenance •Moving the backspar •Backspar roads •Adverse weather

Suggested Assessment:

Observation of trainee performing basic functions of machine: rigging, guylines, communication with Hooktender, safe operating practices, production rate

Achievement Criteria:

General:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

- **THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION**

LINE O: OPERATE GRAPPLE YARDER

Competency: O7 Describe Inspection of cables and guylines

Learning Objectives:

1 The learner will inspect grapple yarder setup, cables and grappling equipment prior to work
2 The learner will describe the inspection process of a grapple yarder
3 The learner will set and inspect guylines for the grapple yarder

LEARNING TASKS	CONTENT
1 Inspect worksite	•Manufacturer's requirements •Industry standards •OH&S compliance
2 Inspection tools	•PPE •Wire brush •Cable and sheave gauge •Knife
3 Machine setup	•Lattice boom •Hydraulic boom •Condition of sheaves •Bushings, bearings, pins •Wire rope connections, wedge sockets, etc
4 Inspect hardware	•Boom •Drums •A-frame •Wire rope •Pendants •Bails •Grapple

Suggested Assessment:

Observation of trainee performing basic inspection of machine: rigging, guylines, hardware
Use of proper tools and equipment

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Enters and exits machine safely (3 point contact)
- Plans and conducts work efficiently

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE O: OPERATE GRAPPLE YARDER

Competency: O8 Determine Block/Slope Orientation, Soil Conditions and Limitations

Learning Objectives:

1 The learner will walk the block and determine soil conditions, slope and machine limitations.
2 The learner will create strategy to commence work in orderly fashion.

	LEARNING TASKS	CONTENT
1	Type of terrain	•Non-clearcut prescriptions •Silviculture plan
3	Log landing areas	•Minimize site degradation •Guyline anchors
4	Corridors	•Wide enough to facilitate safe yarding •Clearcut and flared at landing •Slightly cross-sloped for uphill yarding
5	Cross slope movement of lines	•Minimize lines striking trees •No widow makers •Remove unstable 'rub' trees
6	Wind throw	•Wind speed shutdown criteria •Post wind-throw procedures
7	Riparian management zones	•Feathered edges •Danger trees
8	Trespass	•Over the line danger trees •Noted on logging plan

Suggested Assessment:

Review of site maps and logging plans, interpret company policies for wind limit, discuss and describe cutting of corridors, trespassing and riparian zone protection

Achievement Criteria:

General:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will demonstrate safe practices during practical training and on the job

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE P: OPERATE DANGLE HEAD PROCESSOR

Competency: P1 Describe and comply with safety requirements

Learning Objectives:

1 The learner will describe how to work safely while working on and around a dangle head processor. This will include understanding key regulations, machine limitations, operating procedures and tasks and the use of PPE's

2 The learner will comply with safety requirements at all times during this course.

	LEARNING TASKS	CONTENT
1	Use equipment manuals and specifications to determine safe operating procedures and operational restrictions of dangle head processor	Lecture, group discussion, Q&A •identify and discuss relevant sections of manual
2	Assess a variety of tasks for potential hazards, and explain strategy to work safely.	Lecture, group discussion, Q&A, possibly small group work •describe a variety of tasks and conditions • explore hazards and safe practices
3	Identify key regulations that apply to given tasks and conditions	Lecture, group discussion, Q&A, possibly small group work •identify and discuss relevant sections of regulation
4	Operate dangle head processor in compliance with regulations and safe practices	Instruct and supervise hands on operating with constant attention to safe practices, review and application of previous safety instruction •regulations •company policies •general safe practices •safety-first attitude, awareness
5	Use Personal Protective Equipment	Supervise, insist, enforce •hardhat •hearing protection •high visibility •eye protection as required •gloves as required •steel toe footwear

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

- Students will achieve a minimum of 70% combined score on a practical assessment form and achieve a pass mark in all boxes marked pass/fail
- Demonstrated safe practices while operating machine

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE P: OPERATE DANGLE HEAD PROCESSOR

Competency: P2 Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance

Learning Objectives:

1 The learner will perform pre start equipment checks
2 The learner will perform start up and shutdown procedures
3 The learner will monitor the performance of the equipment

LEARNING TASKS	CONTENT
1 Perform pre start checks (hands on) • first as a small group activity • individually before operating each machine • as a supervised and assessed exercise before completion of the core lab	• Comprehensive pre start check • Review hazards: pressurised systems, batteries, slips & falls, fumes etc. • identify correct fluids for each component • add fluids as required • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, some transmissions) • general procedures include visual checks for loose, damaged or leaking components, fluid levels, operational checks to confirm proper operation of all systems
2 Perform start up procedures	• check for operation of gauges, warning systems • start and warm up engine at low idle • walk around, look for leaks, general check (noise, vibration, unusual exhaust or other condition) • warm up hydraulics before full load • check for proper operation of seat belt, hydraulic lockout, engine speed, all controls
3 Perform shutdown procedures	• safe parking position, lower, engage hydraulic lockout, idle down engine • position that allows access in case of mechanical trouble at start up • level position for checking of fluids • cool down before shut down • walk around, look for leaks, general check • secure machine, locks, etc
4 Monitor performance of equipment during operation	• gauges and warning systems • look, hear, feel, smell • Respond appropriately: is immediate shutdown required?

Suggested Assessment:

- An exercise with students performing pre start, start and shut down with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially checked, or thoroughly checked. Students must complete pre-checklist, start-up and shut down procedures.

Achievement Criteria:

To complete the in school practical lab requirement for the processor the learner must be able to demonstrate:

- All elements of pre start, start up and shut down. Once a student can demonstrate a minimum of 80% efficiency using their checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, checking for leaks or loose hardware involves more than a "quick look"

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE P: OPERATE DANGLE HEAD PROCESSOR

Competency: P3 Perform daily maintenance tasks

Learning Objectives:

1 The learner will perform daily maintenance checks in accordance to a supplied check list.

LEARNING TASKS	CONTENT
1 Service lubrication system (greasing)	• identify and lube all points • load grease gun • Point out that the appropriate amount of grease is debatable, employers differ, but the following guidelines are reasonable: • 2-3 shots for small areas: fan bearings, small u joints, linkages, hinges, etc. • 8 – 10 shots for common pins and bushings • 20 shots where one nipple feeds a large area • daily for most points / weekly for some • wipe off nipples before greasing to reduce abrasive particles entering pin/bushing
2 Service air intake system as required (air filters / pre cleaners)	• restriction indicators • pre cleaner service • cleaning vs. replacement, check employer policy (some insist on never using air – replace only) • use air only with reduced pressure
3 Drain fuel tank sump, water separator fuel filters if equipped (Racor or other)	• drain, assess • water, debris, scale, etc
4 Add fluids as required	• identify correct fluids for each component • add fluids as required • avoid contamination with dirt, water • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, transmissions)
5 Inspect and clean components as required	• radiator & oil cooler • filler plugs, dip sticks • battery terminals

6	Adjust track tension as required	• determine 'slack' appropriate for task/ materials • correct procedures for measuring/assessing and adjusting
7	Housekeeping	• garbage • excess grease • clean windows, sweep out cab, general cleanliness

Suggested Assessment:

- An exercise with students performing daily maintenance tasks with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially done, or thoroughly.

Achievement Criteria:

To complete the in school practical lab requirement for the dangle head processor the learner must be able to demonstrate:

- All elements of daily maintenance. Once the student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, inspecting and cleaning components involves more than a "quick look".

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE P: OPERATE DANGLE HEAD PROCESSOR

Competency: **P4** **Describe mechanical components, troubleshooting, basic repairs and maintenance**

Learning Objectives:

1 The learner will describe the basic components and functions of a dangle head processor
2 The learner will describe troubleshooting signs and symptoms and the appropriate responses for the operator

	LEARNING TASKS	CONTENT
1	Describe major mechanical components	• Identify major components from a checklist, and describe function • identify and describe function from list of major components •
2	Describe potential failures, symptoms and indicators of failure	• Discuss potential failures, symptoms • symptoms: noise, vibration, smell, leaks, cracks • respond appropriately: service required, immediate repair required, immediate removal from service
3	Describe basic repairs and maintenance	• Supervise, demonstrate as required • remove and replace hydraulic hose, o-ring • re and re fuel filter, bleed air from fuel system • re and re air filter • engine oil change, lube filter • adjust belt tension • maintain tire air pressure • clean battery terminals, top up fluid • check and tighten assorted hardware • chain maintenance (sharpening in field and shop)

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE P: OPERATE DANGLE HEAD PROCESSOR

Competency: **P5** Perform basic operator functions

Learning Objectives:

1 The learner will perform basic operator functions in accordance to the Heavy Equipment Operator Practical Assessment – (Logging) Form

LEARNING TASKS	CONTENT
1 Understand automatic functions on heads (safety and productivity)	• computerized controls
2 Perform basic moves	• move forward, stop, back up, stop • raise or lower boom, extend or retract stick • use low travel speed only at this point • watch for tail swing
3 Head maintenance	• Chain sharpening in bush and on bench • Location and necessity of lubrication • Chain lubrication (fill oil tank) • Knife or de-limb edges kept sharp • Measuring wheel checked daily for bearing wear • Pin keeper bolts checked daily while greasing
4 Understand cutting problems	• Bent bars, worn bars, chain problems
5 Drive through simple obstacle course	• possibly pylons or used tires outlining an obstacle course • hills and slopes • forwards and backwards
6 Pick up tree, trim the butt and run variety of wood lengths	• move into appropriate positions for several scenarios

Suggested Assessment:

- An exercise with students identifying and describing major components, describing failures, identifying whether immediate shutdown is required.
- Safe operation of the dangle head processor. This will involve moving the processor safely into an acceptable working area of the deck, grabbing a full length log, de-limbing and cutting into a prescribed length, sort into species and length and place onto the deck accordingly.

Achievement Criteria:

General:

- correct identification and description of components
- sound decisions identifying whether problems call for immediate shutdown, or less urgency
- proficient use of tools and correct procedures
- understanding of appropriate torque
- avoid contamination
- safe operation

Specific to this task:

- Safe positioning of the dangle head processor into working area of the deck
- Grab full length log
- De-limb and cut to specified length
- Sort into species and length
- Place accordingly

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE P: OPERATE DANGLE HEAD PROCESSOR

Competency: P6 Set computerized controls for desired cut length

Learning Objectives:

1 The learner will set computerized controls of the processor to cut the desired length
2 The learner will describe causes of common variations in cut lengths and diameter

LEARNING TASKS	CONTENT
1 Set up computer	• understand automatic functions • Install basic cutting list • Understand saws • Understand use of tilt function to avoid splitting when bucking logs
2 Understand causes for variations in lengths	• Often different species and log diameters cause length variations • Weather/ temperature • Lengths need to be checked twice or three times per shift
3 Understanding Bucking Cards (or Mill specifications) More info in P8	• Quality considerations • Reasons for splits • Length and diameter • Knot sizes • Species of wood

Achievement Criteria:

- The learner must demonstrate the ability to enter into the computer a specified log length and is able to cut that log to the length required

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE P: OPERATE DANGLE HEAD PROCESSOR

Competency: P7 Position machine for greatest safety efficiency and productivity

Learning Objectives:

1 The leaner will use machine positioning to increase safety, efficiency and productivity
2 The Learner will follow the cut list to ensure that the most valuable log lengths and diameters are maximized

	LEARNING TASKS	CONTENT
1	Describe reason for deck position	• Room for sorting • Easy loading • Easy decking • Production
2	Safety	• Be aware of hitchhikers (a tree hitched onto another tree that could get pulled into the machine) • Position machine to avoid tail swing contact with either deck Describe when falling with a processor may be beneficial or productive

3	Efficiency and Productivity	• Positioning for:
		  • Safety
		  • Efficiency and Productivity
		• Lay of the land

4	Follow cut list (bucking card)	• Cut list is specific to block • Preferred (valuable) species • Preferred cut length

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics,
- Operates with smooth and precise control of tracks; appropriate speed; avoids rocks/obstacles; avoids anything that tends to bend pads or puts a side load on tracks, clears tracks of loose material as required, uses simultaneous control of boom, stick, and processor to minimize wear and tear of undercarriage
- Enters and exits machine safely (3 point contact, parking position, brake)
- Plans and conducts work with minimal wasted movement and efficient movement paths

- Determine best position for machine to pick logs from bunch, process and move to deck for loading
- Demonstrate understanding of relative position of machine to cut pile and other equipment
- Demonstrate proper positioning to location of cut logs for loading

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE P: OPERATE DANGLE HEAD PROCESSOR

Competency: P8 Understand and follow log quality specifications

Learning Objectives:

1 The learner will describe the use of the cut sheet (bucking card) in context of log quality specifications

LEARNING TASKS	CONTENT
1 Understand why quality specifications are set	• Value of the wood for selling • How the tree is bucked determines the potential value of the log • Out of spec lengths can cause jam ups in certain mill feeding systems
2 Understand bucking cards or other spec documents	• What the end product out of the mill is (i.e. plywood, veneer, timber, studs)

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE Q: OPERATE LOG LOADER

Competency: Q1 Describe and comply with safety requirements

Learning Objectives:

1 The learner will describe how to work safely while working on and around an grapple yarder. This will include understanding key regulations, machine limitations, operating procedures and tasks and the use of PPE's

2 The learner will comply with safety requirements at all times during this course.

	LEARNING TASKS	CONTENT
1	Use equipment manuals and specifications to determine safe operating procedures and operational restrictions of loader	Lecture, group discussion, Q&A •identify and discuss relevant sections of manual
2	Assess a variety of loading tasks for potential hazards, and explain strategy to work safely.	Lecture, group discussion, Q&A, possibly small group work •describe a variety of tasks and conditions • explore hazards and safe practices
3	Identify key regulations that apply to given tasks and conditions	Lecture, group discussion, Q&A, possibly small group work •identify and discuss relevant sections of regulation
4	Operate loader in compliance with regulations and safe practices	Instruct and supervise hands on operating with constant attention to safe practices, review and application of previous safety instruction •regulations •company policies •general safe practices •safety-first attitude, awareness
5	Use Personal Protective Equipment	Supervise, insist, enforce •hardhat •hearing protection •high visibility •eye protection as required •gloves as required •steel toe footwear

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

- Students will achieve a minimum of 70% combined score on a practical assessment form and achieve a pass mark in all boxes marked pass/fail
- Demonstrated safe practices while operating machine

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE Q: OPERATE LOG LOADER

Competency: Q2 Perform Pre Start Checks, Start Up/Shutdown Procedures, Monitor Performance

Learning Objectives:

1 The learner will perform pre start equipment checks
2 The learner will perform start up and shutdown procedures
3 The learner will monitor the performance of the equipment

LEARNING TASKS	CONTENT
1 Perform pre start checks (hands on) •first as a small group activity •individually before operating each machine •as a supervised and assessed exercise before completion of the core lab	• Comprehensive pre start check • Review hazards: pressurised systems, batteries, slips & falls, fumes etc. • identify correct fluids for each component • add fluids as required • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, some transmissions) • general procedures include visual checks for loose, damaged or leaking components, fluid levels, operational checks to confirm proper operation of all systems
2 Perform start up procedures	• check for operation of gauges, warning systems • start and warm up engine at low idle • walk around, look for leaks, general check (noise, vibration, unusual exhaust or other condition) • warm up hydraulics and transmission before full load • check for proper operation of lights, wipers, seat belt, lockouts, parking brake, all controls and major systems (hydraulics, transmission, brakes, etc.
3 Perform shutdown procedures	• safe parking position, set parking brake, • position that allows access in case of mechanical trouble at start up • level position for checking of fluids • cool down before shut down • walk around, look for leaks, general check • secure machine, locks, etc

4	Monitor performance of equipment during operation	• gauges and warning systems • look, hear, feel, smell • Respond appropriately: is immediate shutdown required?

Suggested Assessment:

- An exercise with students performing pre start, start and shut down with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially checked, or thoroughly checked. Students must complete pre-checklist, start-up and shut down procedures.

Achievement Criteria:

To complete the in school practical lab requirement for the loader the learner must be able to demonstrate:

- All elements of pre start, start up and shut down. Once a student can demonstrate a minimum of 80% efficiency using their checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, checking for leaks or loose hardware involves more than a "quick look"

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE Q: OPERATE LOG LOADER

Competency: Q3 Perform Daily Maintenance Tasks

Learning Objectives:

1 The learner will perform daily maintenance checks in accordance to a supplied check list.

	LEARNING TASKS	CONTENT
1	Service lubrication system (greasing)	• identify and lube all points • load grease gun Note: Point out that the appropriate amount of grease is debatable, employers differ, but the following guidelines are reasonable: • 2-3 shots for small areas: fan bearings, small u joints, linkages, hinges, etc. • 8 – 10 shots for common pins and bushings • 20 shots where one nipple feeds a large area • daily for most points / weekly for some • wipe off nipples before greasing to reduce abrasive particles entering pin/bushing
2	Service air intake system as required (air filters/ pre cleaners)	• Use pictures or examples of restriction indicators and pre cleaner if your machine is not equipped • restriction indicators • pre cleaner service • cleaning vs. replacement, check employer policy • use air only with reduced pressure
3	Drain fuel tank sump, water separator fuel filters if equipped (Racor or other)	• drain, assess quantity and types of contaminants • water, debris, scale, etc

4	Add fluids as required	• identify correct fluids for each component • add fluids as required • avoid contamination with dirt, water • describe 2 sided dipsticks with levels for stopped/idling (Cat engines, transmissions)
5	Inspect and clean components as required	• radiator & oil cooler • filler plugs, dip sticks • battery terminals
6	Housekeeping	• garbage • excess grease • clean windows, sweep out cab, general cleanliness

Suggested Assessment:

- An exercise with students performing daily maintenance tasks with instructor observing and grading according to a checklist that includes an assessment of whether items are missed entirely, partially done, or thoroughly.

Achievement Criteria:

To complete the in school practical lab requirement for the log loader the learner must be able to demonstrate:

- All elements of daily maintenance. Once the student can demonstrate a minimum of 80% efficiency using a checklist, their practical assessment form should be checked/completed.
- Proficiency includes understanding and thoroughness. For example, inspecting and cleaning components involves more than a "quick look".

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE Q: OPERATE LOG LOADER

Competency: **Q4** **Describe mechanical components, troubleshooting, basic repairs and maintenance**

Learning Objectives:

1 The learner will describe the basic components and functions of a dangle head processor
2 The learner will describe troubleshooting signs and symptoms and the appropriate responses for the operator

LEARNING TASKS	CONTENT
1 Describe major mechanical components	• Identify major components from a checklist, and describe function • identify and describe function from list of major components
2 Describe potential failures, symptoms and indicators of failure	• Discuss potential failures, symptoms • symptoms: noise, vibration, smell, leaks, cracks • respond appropriately: service required, immediate repair required, immediate removal from service
3 Describe basic repairs and maintenance	• Supervise, demonstrate as required • remove and replace hydraulic hose, o-ring • re and re fuel filter, bleed air from fuel system • re and re air filter • engine oil change, lube filter • adjust belt tension • maintain tire pressure • clean battery terminals, top up fluid • check and tighten assorted hardware •

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE Q: OPERATE LOG LOADER

Competency: Q5 Perform basic operator functions

Learning Objectives:

1 The learner will perform basic operator functions in accordance to the Heavy Equipment Operator Practical Assessment – (Logging) Form

LEARNING TASKS	CONTENT
1 Perform basic moves	• move forward, stop, back up, stop • raise or lower boom, extend or retract stick • rotate grapple right or left, and open and close • use low travel speed only at this point • watch for tail swing
2 Moving or sorting decked wood	• from one side of the road to the other • sort wood by species or by grade
3 Unload logging trailer from truck	• hook up to the hitch
4 Load the truck	• keeping weights even between truck and trailer as required by truck driver •

Suggested Assessment:

- Observe students performing learning tasks and assess competency using a pass/fail rating. Students should be able to achieve outcomes by the end of the course.

Achievement Criteria:

General:

- Operates with smooth and precise control of drive train, appropriate gear and engine speed, avoids rocks/obstacles, shifts directions at idle
- Enters and exits machine safely (3 point contact, parking position, brake)

Specific to this task:

To complete the in school practical lab requirement for the loader the learner must be able to demonstrate the following practical skills:

- Demonstrate the safe operation of equipment including visual checks, constant awareness of space, position, clearance and safe movement of machine.
- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks.

Perform basic moves with equipment including:

- Move forward, stop, back up, stop (flat elevation).
- Apply park brake, lock out transmission.
- Operates with smooth and precise control of drive train, appropriate gear and engine speed.
- Manoeuvre through a prescribed path without running over pylons.
- Position loader to safely unload trailer and successfully attach to truck.
- Build a cradle of bunch logs.

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE Q: OPERATE LOG LOADER

Competency: **Q6 Explain features and benefits of**

- **Clam**
- **Butt 'n top**
- **Live heel**

Learning Objectives:

1 The learner will describe and explain the features and benefits of each of the three types of log loaders

2 The learner will describe factors that determine which type of loader is used

LEARNING TASKS	CONTENT
1 Clam or bypass grapple	• decking behind skidders, and setting up processors; • piling, brush piling, • loading trucks, unloading trucks. • Can also be used for clean up and burning piles. • Can be used for stumping right of way
2 Live Heel or Heel Boom	• used for hoe chucking or loading – multi-purpose.
3 Butt 'n' Top	• most versatile method of loading logging trucks and sorting. • The log is held in greater balance • Can also be fitted with pulp grapples

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will demonstrate safe practices during practical training and on the job

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE Q: OPERATE LOG LOADER

Competency: Q7 Communicate with Log Truck Driver

Learning Objectives:

1 The learner will use horn to communicate effectively with the log truck driver
2 The learner will use radio to communicate effectively with the log truck driver

LEARNING TASKS	CONTENT
1 Type of Communication	• By radio • By horn – audible log signals: • Back up – two beep • Go ahead – three beep • Stop – one beep
2 Reasons for Communication	• To move driver to new pile of wood or to send him off

Achievement Criteria:

- Students will achieve a minimum grade of 70% on a quiz including questions covering content from each learning task.
- Students will demonstrate use of horn and radio to effectively communicate with the log truck driver

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE Q: OPERATE LOG LOADER

Competency: Q8 Operate clam

Learning Objectives:

1 The learner will demonstrate safe and efficient use of a clam loader
2 The learner will demonstrate proper positioning and set up for common clam loader tasks

LEARNING TASKS	CONTENT
1 Advantages over other types	• Better suited to piling and stumping than other machines • Great for setting up processors
2 Manoeuvre machine over typical terrain	• Positioning for most efficient movement
3 Sort, lift and place cut logs	• Piling and stumping

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics,
- Operates with smooth and precise control of tracks; appropriate speed; avoids rocks/obstacles; avoids anything that tends to bend pads or puts a side load on tracks, clears tracks of loose material as required, uses simultaneous control of boom, stick, and clam to minimize wear and tear of undercarriage
- Enters and exits machine safely (3 point contact, parking position, brake)
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this Task:

To complete the in school practical lab requirement for the clam loader, the learner must be able to demonstrate the following practical skills:

- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks according to supplied checklist.
- Perform basic moves with equipment including:
    - Manoeuvre machine over typical terrain
    - Determine best position for machine to sort, move and pile logs
    - Select, secure, lift swing and place logs onto deck or truck

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE Q: OPERATE LOG LOADER

Competency: Q9 Operate Butt 'n Top

Learning Objectives:

1 The learner will demonstrate safe and efficient use of a butt'n top loader
2 The learner will demonstrate proper positioning and setup for common Butt'n Top loader tasks

LEARNING TASKS	CONTENT
1 Advantages over other types	• Better suited to sorting – provides easier system for sorting wood •
2 Manoeuvre machine over typical terrain	• Positioning for most efficient movement
3 Sort, lift and place cut logs	• Precise positioning

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics,
- Operates with smooth and precise control of tracks; appropriate speed; avoids rocks/obstacles; avoids anything that tends to bend pads or puts a side load on tracks, clears tracks of loose material as required, uses simultaneous control of boom, stick, and Butt 'n Top attachment to minimize wear and tear of undercarriage
- Enters and exits machine safely (3 point contact, parking position, brake)
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this Task:

To complete the in school practical lab requirement for the Butt 'n Top loader, the learner must be able to demonstrate the following practical skills:

- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks according to supplied checklist.
- Perform basic moves with equipment including:
    - Manoeuvre machine over typical terrain
    - Determine best position for machine to sort, move and pile logs
    - Select, secure, lift swing and place logs onto deck or truck

THE PROGRAM CONTENT BELOW IS UNAVAILABLE PENDING FURTHER CONSULTATION

LINE Q: OPERATE LOG LOADER

Competency: Q10 Operate Live Heel

Learning Objectives:

1 The learner will demonstrate safe and efficient use of a Live Heel loader
2 The learner will demonstrate proper positioning and set up for common Live Heel loader tasks

LEARNING TASKS	CONTENT
1 Advantage over other equipment	• Best machine for hoe-chucking
2 Manoeuvre machine over typical terrain	• Precise positioning
3 Sort, lift and place cut logs	• Precise positioning

Achievement Criteria:

General:

- Visual checks, constant awareness of space, position, clearance, safe movement
- Operates with smooth and precise control of hydraulics,
- Operates with smooth and precise control of tracks; appropriate speed; avoids rocks/obstacles; avoids anything that tends to bend pads or puts a side load on tracks, clears tracks of loose material as required, uses simultaneous control of boom, stick, and Live Heel attachment to minimize wear and tear of undercarriage
- Enters and exits machine safely (3 point contact, parking position, brake)
- Plans and conducts work with minimal wasted movement and efficient movement paths

Specific to this Task:

To complete the in school practical lab requirement for the Live Heel loader, the learner must be able to demonstrate the following practical skills:

- Perform pre-start checks, start-up/shutdown procedures and monitor performance of the equipment.
- Perform daily maintenance tasks according to supplied checklist.
- Perform basic moves with equipment including:
    - Manoeuvre machine over typical terrain
    - Determine best position for machine to sort, move and pile logs
    - Select, secure, lift swing and place logs onto deck or truck
    - Demonstrate understanding of relative position of machine to cut pile and other equipment

SECTION 4

TRAINING PROVIDER STANDARDS

Training Provider Standards – Instructors

In the case of the Heavy Equipment Operator Technician program there are three categories of training 1) Theoretical Core Training, taught within a classroom setting; 2) Practical Core Equipment Labs, practical experience with equipment still within the school setting; 3) Field training with an employer, apprentice furthers his/her skills in a work setting, completing the requires time and competencies required to achieve a Certificate of Qualification.

Theoretical Core Training

Instructor's teaching the Theory part of this course need not hold a Certificate of Qualification upon meeting two conditions 1) The instructor is directly supervised by a person holding an HEO Certificate of Qualification; 2) The instructor has an appropriate amount of field experience directly related to the heavy equipment found in this course.
Instructors teaching the Theoretical Core Training must meet both conditions or hold a valid Certificate of Qualification for the Heavy Equipment Operator Technician apprenticeship program, issued by SkilledTradesBC of British Columbia.

Practical Core Equipment Labs

Instructor's teaching the HEO Practical Core Equipment Labs must hold a Certificate of Qualification for the Heavy Equipment Operator apprenticeship program with an endorsement for the appropriate piece of equipment being taught. (Example – A person holding a C of Q with an endorsement for the excavator could train others on the excavator but not the dozer.)

Field Training with an Employer

The apprentice will be expected to gain further practical skills in the field and will be expected to keep track of equipment hours and competencies within the HEO Logbook. The apprentice's supervisor will be permitted to sign off on any hours that the apprentice has gained on the heavy equipment. Competency sign off for equipment skills will require sign off by a person holding a Certificate of Qualification with an endorsement for that machine.
Persons holding an HEO Certificate of Qualification with 3 or more endorsements will be permitted to sign off the competency skills for all heavy equipment.

Purchased Field Training with an Approved HEO Training Provider
In many instances the apprentice will be given an opportunity to receive extended training, after the Heavy Equipment Operator Technician course, whether purchased or volunteered, by a heavy equipment training school. In these cases the training provider will be granted permission to sign off hours for the appropriate equipment. If the school is designated by SkilledTradesBC as an approved Heavy Equipment Operator Technician school, that school's instructor will also be granted authority to sign of on logbook equipment competency skills in the following categories:
1 – Work Safely
2 – Start-up and Shutdown Equipment
3 – Maintain and Monitor Equipment
4 – Apply Operating Fundamentals

Training Provider Standards – Facilities

Facilities shall offer a safe and productive Learning environment.	• Meets applicable zoning bylaws for technical instruction and education. • Has access to sufficient land necessary to operate multiple pieces of equipment at the same time (suggested minimum of 10 acres). • Conducts a safety review of the program's facility and equipment annually and meets applicable safety standards/regulations. • Suitable for the size of the class. • Temperature, noise, ventilation, light, and particulate control are maintained at appropriate levels.
Facilities shall be appropriate for delivery of instruction at each level of training.	• Storage space is functional and sufficient for instructional materials, supplies and equipment. • Instructor work stations are adequate and appropriately equipped. • Work Stations are adequate and appropriately equipped. • Facilities have adequate floor area and ceiling height. • Classroom theory and labs are heavily supported with a Power Point presentation for each section of the manuals. Classroom projection equipment with MS Power Point capabilities will be required.

Training Provider Standards – Tools and Equipment

RBHCA has identified the following as the minimum size standard for equipment that is reflective of that used in industry:

- Articulated Haul Trucks starting at 20 Tons but not larger than 30 Tons load capacity.
- Loader - Articulated with bucket size of 2 1/2 cu. Yds. or greater and weight class of 21,000lbs.
- Backhoe - 12,000lbs weight class or greater.
- Dozer - D3 Cat or equivalent weight class of 15,000lbs.
- Excavator - Hydraulic Excavator on tracks with an operating weight class over 21,000lbs.
- Grader - Graders are basically the same except for the Fly Wheel Horse Power
- Grapple Yarder
- Track Skidder
- Wheel Skidder
- Dangle Head Processor
- Feller Buncher
- Log Loader

Sections dealing with Health and Safety in the Workplace will require OH&S regulations and guidelines; Workers Compensation Act. Forest Safety BC, Motor Vehicle Act & Regulations, owners manuals etc..
Suggested:
WCB summaries of safety statistics, safety video suggestions: “A Deadly Silence” (drugs/alcohol), “A Bright Arc” (electrical), “Excavations” (shoring, etc), BC Hydro 7 steps to electrical safety info., BC One Call info
Sections dealing with Safe Rigging practices would be greatly enhanced by physically showing the student slings, chain, wire rope, chain, hardware including hooks, shackles, cinches, eye bolts, spreader bars, sheaves, thimbles, cable clamps, etc.
Road Building and Heavy Construction Foundations curriculum B3.1 offers illustration and guidance for this section.
Basic tools, supplies, and lubricants associated with heavy equipment. These would include common mechanic tools found at most worksites. Students understanding of the various greases, common oils, de-icer, methyl hydrate, starting fluid (ether), antifreeze and brake cleaners would be greatly improved by showing a variety of brand names.

The use of simple grade checking instruments and techniques is required in this course. A variety of the following equipment would be suggested.

- Dumpy level (builders level, ‘transit’, engineers level)
- eye level (hand levels)
- rotary laser; receivers for grader blades, excavators
- pipe lasers
- tripods, rods
- electronic measurement systems, (GPS)
- chains, nylon and metal tapes
- clinometers (Suunto)
  - compass to orient construction to drawings and set out angles
  - tape measures, rods, calculators

Engineering specifications and drawing will also be needed for civil works illustrations, Topographic maps of the area students will be responsible for map reading and identifying environmental issues will be required.

RECOMMENDED REFERENCE TEXTBOOKS AND OTHER RESOURCE MATERIAL

Heavy Equipment Operator Training: Student Participant Guide
One copy for each student will be required. As there are exercises and pages for notes within the guide, it is highly recommended that these guides become the property of the student. Student participant guides can be purchased on line through the Queen's Printers at:
www.crownpub.bc.ca
Type name of program or HEO in the search publications box and press enter.

Heavy Equipment Operator Training: Instructor Kit
One copy will be required for the instructional staff of this program. The Instructors Kit comes with Power Point Presentations covering Core HEO material, Civil Equipment Endorsement material and Logging Equipment Endorsement material. The Heavy Equipment Operator Training: Instructor Kit can be purchased on line through the Queen's Printers at:
www.crownpub.bc.ca
Type name of program or HEO in the search publications box and press enter.

Heavy Equipment Operator Logbook
Students will require logbooks to log hours on equipment and have their employer sponsor evaluate and sign off on equipment operation competency skills. Heavy Equipment Operator Logbook can be purchased on line through the Queen's Printers at:
www.crownpub.bc.ca

Operator And Service Manuals
Training providers must have operator manuals for any equipment type they will be using for the duration of this course. Various operator and service manuals can be purchased through your local dealers.

OHS Regulation & Related Materials
Occupational health and safety regulations and related materials can be accessed on line at:
www.worksafebc.com

Cat Operator e-Learning CDs
Cat e-Learning CDs
Hydraulic Excavators
Heavy Construction (320B-350) - TERV2004

Off-Highway Trucks
Heavy Construction (769C-775F) - TERV3018

Wheel Loaders
Heavy Construction (938F-980H) - TERV4004

Track-Type Tractors
Heavy Construction (D6T-D8T) - TERV6004

See your local Cat dealer for pricing or buy online:
https://www.catsimulators.com/c-36-operator-traininge-learning.aspx

Numerous videos, toolbox talks and safety tips and checklists can be found at:
www.safety.cat.com

John Deere Training Videos

Safety, Maintenance & Operation Series Videos for:
Articulated Dump Trucks, 4WD Loader, Dozer, Excavator, Motor Grader and
Series Skid Steers and Compact Track Loaders
Videos divided into three sections: 1) the pre-start walk-around and daily service, 2) the operator's station with its controls and safety systems, and 3) some safety tips when operating

Wheel Loader Operation: Tips From The Pros
This video provides tips on how to operate smoothly, efficiently and safely in a wide variety of working conditions.

Rigging and Lifting with Mobile Construction Equipment
This video provides easy to follow practical advice on correct rigging and handling of unusual loads with mobile construction equipment. (29:30)

See your local John Deere dealer or order online at:
http://www.johndeeretechinfo.com/

GLOSSARY OF TERMS

HEAVY EQUIPMENT OPERATOR

Abbreviations:

- BM or B/M: bench mark
- C: cut
- C: centerline
- CB or C/B: catch basin
- EL or Elv: elevation
- EP or E/P: edge of pavement
- F: fill
- FG or F/G: finish grade
- MH or M/H: manhole
- PL or P/L: property line
- Pvmt: pavement
- RW or R/W: right of way
- RP or R/P: reference point
- San: sanitary sewer
- SG or S/G: subgrade
- Stm or SS: storm sewer
- TBM: temporary bench mark
- W, WL or W/L: water line

Terms

Term	Definition
adhesion	a property of soil which causes the particles to stick together
aggregate	a mixture of sand and stone, often according to a specification of particle sizes at a specific distribution
amplitude	describes compactive effort; 'how much it goes up and down'; total vertical distance the vibrating drum or plate is displaced from a resting or neutral position from the eccentric movement
angle of repose	angle or slope of stability for loose material
articulating	refers to machinery that is pinned in the middle to 'bend' in the middle as in articulating loaders, trucks, and graders
backfill	material used to replace material removed, fill material placed in trenches or against structures; the act of placing material
ballast	material placed on subgrade to bring elevation to finish grade and provide load bearing capacity i.e. gravel or rock hauled in and placed
bank volume	measurement of material volume in it's undisturbed, natural state

Term	Definition
bench marks	a coordinate point indicating an elevation, may be geodetic or referenced to a convenient assumed elevation of zero somewhere on the site- abbrev.: **BM**
berm	a raised mound of earth; sometimes as a landscaping feature, sound barrier
binder	fines which fill voids and tend to hold gravel together
borrow pit	source of material for construction; location is planned and approved with regard to: • material specification (appropriate material for task) • location (haul distance, approved land use/ownership, environmental impacts and other considerations for jurisdictional approval)
boulders	accurately used to refer to rock fragments for soil classification purposes greater than 600mm (25")
cement	the powder used in concrete to bond aggregates together; pulverized limestone and clay
centerline	the middle of a road, and the high point of the crown
clay	soil texture classification with particles < .002 mm
cobbles	accurately used to refer to rock fragments for soil classification purposes of 76mm to 250mm (3/4" to 10")
cohesion, cohesive material	a property of soil describing its tendency for particles to stick together, soil having cohesive properties (fines); plastic
compaction, consolidation	reduced voids in material resulting in increased density; increased ratio of weight per volume
concrete	a mixture of cement, aggregate, water, additives
crown	refers to the slope from the middle of a road to the outside edges for drainage, shedding of water, prevention of ponding - usually 2%
culvert	drainage structure; typically to drain water from one side of road to the other; types include, corrugated metal pipe (CMP), box culvert (concrete – often pre-cast), wood (logs) are common in logging industry
curb stop	water valve in service line at property line
cut	1. a dimension referred to as a "cut" means <u>below the indicated point</u> (not necessarily below existing grade, and not necessarily requiring removal of material); 2. a task referred to as a "cut" means depth of excavation Abbreviation for stakes and drawings is **C**

Term	Definition
daylighting	term commonly used in excavating to refer to the work/technique of exposing existing utilities without damage
density	ratio of weight to volume
embankment	a fill higher than the adjoining surface
elasticity	a characteristic of soil referring to deformation under load and the degree to which it returns to its original configuration
fill	1. a dimension referred to as a "fill" means above the indicated point (not necessarily above existing grade, and not necessarily requiring placement of material) 2. a task referred to as a "fill" means depth of material placement Abbreviation for stakes and drawings is **F**
fines	small particles; clay or silt particles
finish grade	the final elevation specified/required
frequency	describes compactive effort; rotational speed of eccentric shaft; vibrations per minute
geodetic elevation	elevations referenced by height above sea level
grade	1. predetermined elevation, slope of road or pipe 2. "the grade" can mean the road under construction – a place; 3. grade can be a verb meaning the work of levelling material 4. grade can be a verb meaning to sort by size
gradation	distribution/ variation of particle sizes; soil consisting of wide range of particle sizes is said to be "well graded" and compacts more readily, poorly 'graded' soils have uniform sizes, do not compact as well
granular material	soil type made up of larger particles > .1mm ; no observable structure; not cohesive; not plastic; permeable; e.g. sand
gravel	commonly used to refer to load bearing aggregates; more accurately used to refer to rock fragments for soil classification purposes of 2mm to 76mm (3/4")
impervious	property of soil: resistant to movement of water
invert	the bottom inside of pipe, the bottom of the inner circumference; elevations of pipe and all drainage structures (manholes, tank outlets, culverts, etc) are designed, specified, and measured to the invert
lift	a layer of fill as spread or compacted; generally referring to layers placed intentionally thin to facilitate compaction
liquid limit	the water content at which soil passes from a plastic to a liquid state (starts to flow)
loam	a classification of soil containing a mixture of sand, silt, clay

Term	Definition
monument, survey monument	permanent geodetic bench marks, protected by law, a bronze, brass or aluminium circular plaque usually set in concrete; deliberate unauthorized removal is a criminal offence
offset	can refer to dimensions, stakes, or other control points or lines that are "offset" or placed to the side to a more convenient location usually to allow excavating without losing layout; also a verb. Abbreviation for stakes and drawings is **O/S**
optimum moisture content	the percentage of moisture at which the greatest density of a soil can be obtained by compaction
percent expression of slope	rise ÷ run x 100 , used to express vertical alignment of centerline, pipe, topography, e.g. road that rises 15m in 100m of length has a 15% slope
perimeter drain	perforated pipe that goes around the perimeter of a foundation to collect and divert ground water – usually covered by drainrock
permeability	a characteristic of soil referring to its ability to have water drain through it
plan view	drawing of a structure with the view from overhead
plastic	the ability of soil to be rolled into a thread when wet; easily shaped without crumbling; cohesive soils
plumb	exactly vertical and perpendicular
profile or profile view	drawing of side view with the vertical scale exaggerated, usually 10x the horizontal scale; showing original ground and design grades of roads, pipe, manholes, culverts, bridges; cuts and fills shown are at the centerline only; often on the same page as a plan view aligned on the same horizontal scale,
ratio expression of slope	run to rise expressed as a ratio to 1, used to express slope of cuts or fills, banks or embankments, e.g. a cut slope that rises 6m in a distance of 12m is a 2:1 slope
reference point	a control point from which other points are measured; often offset outside the right of way; indicated on stakes, blazed tree, or drawings by abbreviation **RP**
right – of –way	refers to the entire width of land designated for works including roadway, ditches, median, cut slope, fill embankment, and a buffer zone at both edges; usually involves legal entitlement i.e. ownership, or approved use - abbrev.: **R/W**
road base	an aggregate mixture for load bearing
sand	soil classification with particle sizes from .05 to 2mm
scarify	to break up the structure of a surface layer

Term	Definition
section or sectional view	drawing of a 'slice' of works at right angle to the centerline with the same horizontal and vertical scale
silt	soil classification with particle sizes from .002 to .05
simple curve	segment of a circle without transitions at entry and exit
slope	the slant or angle of a cut or fill: usually expressed as a ratio of run to rise e.g. 2:1
stones	accurately used to refer to rock fragments for soil classification purposes of 250mm to 600mm (10" to 25")
structure	the way soil particles aggregate together; shape and arrangement; is described as part of soil classification; examples: granular, platy, wedge, blocky, prismatic, columnar
subgrade	grade of material layer beneath finishing layers, generally used to refer to the layer of material beneath the road base material
Super-elevation	banking of a curve; change in cross fall of roadway from crown of straight segment to banking of curve to partially compensate the centrifugal force of a vehicle negotiating a curve
texture	describes the relative portions (size distribution) of primary soil particles: clay, silt, sand; is the basis for soil classification
texture modifiers	description added to soil classification indicating proportion of gravel, cobbles, stones, boulders
transitional curve	gradual change from straight alignment to simple curve