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Norwegian Embassy
Islamabad



HEAVY MACHINE OPERATOR



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CBT CURRICULUM

National Vocational Certificate Level 2

Version 1 - November, 2019



Implemented by
giz Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

Published by

National Vocational and Technical Training Commission
Government of Pakistan

Headquarter

Plot 38, Kirthar Road, Sector H-9/4, Islamabad, Pakistan
www.navttc.org

Responsible

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National Deputy Head, TVET Sector Support Programme, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Layout & design

SAP Communications

Photo Credits

TVET Sector Support Programme

URL links

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This document has been produced with the technical assistance of the TVET Sector Support Programme, which is funded by the European Union, the Federal Republic of Germany and the Royal Norwegian Embassy and has been commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ). The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH in close collaboration with the National Vocational and Technical Training Commission (NAVTTTC) as well as provincial Technical Education and Vocational Training Authorities (TEVTAs), Punjab Vocational Training Council (PVTC), Qualification Awarding Bodies (QABs)s and private sector organizations.

Document Version

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1. Introduction

In order to build the capacity of technical and vocational training institutes in Pakistan through provision of demand driven competency based trainings in construction sector the NAVTTTC, and TEVT Sector Support Program (TSSP) have joined hands together to develop qualifications for construction sector. These qualifications will not only build the capacity of existing workers of this sector but also support the youth to acquire skills best fit for this sector. The benefits and impact of development of these qualifications will be on both demand and supply side.

Based upon this demand of industry these competency-based qualifications for Heavy Machine Operator are developed under National Vocational Qualification Framework (NVQF) (Level 1 to 4). The qualifications mainly cover competencies along with related knowledge and professional skills which are essential for getting a job or self-employed.

The qualifications are also in line with the vision of Pakistan's National Skills Strategy (NSS), National TVET Policy and NVQF. This provides policy directions, support and an enabling environment to the public and private sectors to impart training for skills development to enhance social and economic profile. NAVTTTC has approved the nomination of a Qualification Development Committee (QDC). The QDC consists of experts from the relevant industries from different geographical locations across Pakistan and academicians who were consulted during the development process to ensure input and ownership of all the stakeholders. The National Competency Standards could be used as a referral document for the development of curricula to be used by training institutions.

1.1 Purpose of the training program:

The purpose of the training is to produce skilled manpower for improving the existing capacity of the construction sector. This training will equip trainees with the required skills to operate Heavy Machines. It will enable the participants to meet the challenges in the field of construction industry. Further, to improve the skill level of the Operators and prepare them for the construction industry to meet the market competition nationally and internationally. The core purpose of this qualification is to produce employable Heavy Machine Operators who could operate Heavy Machines according to national and international standards. In addition this qualification will prepare the youth to find employment in the construction sector.



1.2 Overall objectives of training program:

The Heavy Machine Operator qualification level 1-4 consists of theoretical and practical details required to learn operational techniques of Bulldozer, Wheel Loader, Excavator and Grader machines.

1.3 Competencies to be gained after completion of course:

The detail of the competency standards included in this qualification are given below:

National Vocational Certificate level 2, “Heavy Machine Operator” in (Construction Sector)

1. Comply with Personal Health and Safety Guidelines
2. Communicate the Workplace Policy and Procedure
3. Perform Basic Communication (Specific)
4. Perform Basic Computer Application (Specific)
5. Maintain Machine (with Engine Off)
6. Maintain Machine (with Engine Running)
7. Park Machines

1.4 Job opportunities:

Heavy Machine Operators (HMO) are in demand across the country and abroad. Their services are required for everything from road and bridge construction, bulldozing, loading and grading, to excavating and much, much more. This is a good career opportunity for a reliable and responsible individual with a strong work ethic. Heavy Machine Operators not only work on regular construction building jobs, but also on infrastructure projects (roads, bridges, canals, dams, railway lines and ports, otherwise called non-building construction), and in mining and timber operations.



1.5 Entry level of trainees:

The entry level for National Vocational Certificate level 2, in “Heavy Machine Operator” (Construction Sector) are given below:

Title	Entry requirements
National Vocational Certificate level 2 “Heavy Machine Operator”, in (Construction Sector)	Entry for assessment for this qualification is open. However, entry into formal training institute for this qualification is person having National Vocational Certificate level 1, Heavy Machine Operator in (Construction Sector) or middle.

1.6 Minimum qualification for teachers:

- Should have completed intermediate and equivalent qualifications.
- Must be a holder of G I certificate in relevant field or DAE in Civil Technology.
- Must be able to communicate effectively both orally and in written form.
- Must have at least two 2 years teaching experience.

1.7. Recommended trainer/trainee ratio

Generally, Trainer/Trainee ratio for CBT courses is 1:20

1.8 Medium of instruction:

English, Urdu, local language.



1.9 Duration of the course:

The proposed curriculum is composed of **07** modules that will be covered in **410** learning hours. It is proposed that the course may be delivered in Three Months period.

The distribution of contact hours is given below:

Total	-	410 hours.
Theory	-	82 hours (20%)
Practical	-	328 hours (80%)

1.10 Sequence of the modules

Following is the structure of the course:

NVQF Level	Module #	Title	Category	Theory (hours)	Practical (hours)	Total (hour)	Credits hours	Total Credit Hours
2	A	Comply with Personal Health and Safety Guidelines	Generic	06	24	30	3	41
	B	Communicate the Workplace Policy and Procedure	Functional	04	16	20	2	
	C	Perform Basic Communication (Specific)	Technical	06	24	30	3	
	D	Perform Basic Computer Application (Specific)	Generic	08	32	40	4	
	E	Maintain Machine (with Engine Off)	Technical	40	160	200	20	
	F	Maintain Machine (with Engine Running)	Technical	8	32	40	4	
	G	Park Machines	Technical	10	40	50	5	
			Total	82	328	410	41	
Percentage.				20%	80%			



2. Overview of the Curriculum for Heavy Machine Operator:

Module Title and Aim	Learning Units	Theory Days/hours	Workplace Days/hours	Timeframe of Modules
<p>Module A: Comply Personal Health and Safety Guidelines</p> <p>Aim: This Competency Standard identifies the competencies required to protect/apply occupational Safety, Health and Environment at workplace according to the industry's approved guidelines, procedures and interprets environmental rules/regulations. Trainee will be expected to identify and use Personal Protective Equipment (PPE) according to the work place requirements. The underpinning knowledge regarding Observe Occupational Safety and Health (OSH) will be sufficient to provide the basis for the job at workplace.</p>	<p>LU1: Identify Personal Hazards at work place</p> <p>LU2: Apply personal protective and safety equipment (PPE)</p> <p>LU3: Comply with occupational safety and health (OSH)</p> <p>LU4: Dispose of hazardous waste/materials from the designated area</p>	06	24	30
<p>Module B: Communicate the Workplace Policy and Procedure</p> <p>Aim: This unit describes the performance outcomes, skills and knowledge required to develop communication skills in the workplace. It covers gathering, conveying and receiving information, along with completing assigned written information under direct supervision.</p>	<p>LU1. Identify workplace communication procedures</p> <p>LU2. Communicate at workplace</p> <p>LU3. Draft Written Information</p> <p>LU4. Review Documents</p>	04	16	20



<p>Module C: Perform Basic Communication (Specific)</p> <p>Aim: This unit describes the skills and knowledge required to assist in the development of communication competence by providing information regarding different forms of communication and their appropriate use.</p>	<p>LU1. Communicate in a team to achieve intended outcomes</p> <p>LU2. Follow Supervisor's instructions as per organizational SOPs</p> <p>LU3. Develop Generic communication skills at workplace</p>	<p>06</p>	<p>24</p>	<p>30</p>
<p>Module D: Perform Basic Computer Application (Specific)</p> <p>Aim: This unit describes the skills and knowledge required to use spreadsheet to prepare a page of document, develops familiarity with Word, Excel, email, and computer graphics basics.</p>	<p>LU1. Create Word Documents</p> <p>LU2. Create Excel Documents</p> <p>LU3. Use internet for Browsing</p>	<p>08</p>	<p>32</p>	<p>40</p>
<p>Module E: Maintain Machine (with Engine Off)</p> <p>Aim: This module covers the skills and knowledge required to Inspect and service lubrication system, Inspect and service electrical system, Inspect and service hydraulic system, Inspect and service cooling system, Inspect and service air intake system, Inspect and service fuel system, Inspect and service suspension system, Inspect and service drive train, Inspect and service braking system, Inspect and service load bearing structure, Inspect and service operator station/cab, Inspect safety equipment, Inspect and service attachments and Inspect and service supporting pneumatic (air-filled) system</p>	<p>LU-1: Inspect and Service of lubrication system</p> <p>LU-2: Inspect and Service electrical system</p> <p>LU-3: Inspect and Service hydraulic system</p> <p>LU-4: Inspect and Service cooling system</p> <p>LU-5: Inspect and Service of air intake system</p> <p>LU-6: Inspect and Service of fuel system</p> <p>LU-7: Inspect and Service of suspension system</p> <p>LU-8: Inspect and Service of drive train</p> <p>LU-9: Inspect and Service of braking system</p> <p>LU-10: Inspect and Service of load bearing structure</p> <p>LU-11: Inspect and Service of operator station/Cab</p> <p>LU-12: Inspect Equipment safety</p> <p>LU-13: Inspect and Service of attachments</p> <p>LU-14: Inspect and Service of supporting pneumatic (Air-filled) system</p>	<p>40</p>	<p>160</p>	<p>200</p>



<p>Module F: Maintain Machine (with Engine Running) Aim: This module covers the skills and knowledge required to Start engine monitor warning systems, Warm up engine, Cycle equipment functions, comply with scheduled maintenance requirements and Maintain Logbook</p>	<p>LU-1: Monitor warning systems LU-2: Warm up engine LU-3: Cycle equipment functions LU-4: Scheduled Maintenance Requirements LU-5: Logbook</p>	<p>08</p>	<p>32</p>	<p>40</p>
<p>Module G: Park Machines Aim: This module covers the skills and knowledge required to Clean under carriage and attachments before parking, Park equipment in appropriate location, Shut down and secure equipment, Perform housekeeping tasks and Perform visual inspection.</p>	<p>LU-1: Clean under carriage and attachments before parking LU-2: Park equipment in appropriate location LU-3: Shut down and secure equipment LU-4: Housekeeping tasks LU-5: Visual inspection</p>	<p>10</p>	<p>40</p>	<p>50</p>
<p>TOTAL</p>		<p>82</p>	<p>328</p>	<p>410</p>

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Module-E
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Module E: Maintain Machine (with Engine Off)

Objective: This module covers the skills and knowledge required to Inspect and service lubrication system, Inspect and service electrical system, Inspect and service hydraulic system, Inspect and service cooling system, Inspect and service air intake system, Inspect and service fuel system, Inspect and service suspension system, Inspect and service drive train, Inspect and service braking system, Inspect and service load bearing structure, Inspect and service operator station/cab, Inspect safety equipment, Inspect and service attachments and Inspect and service supporting pneumatic (air-filled) system

Duration: 200 Hours

Theory: 40 Hours

Practice: 160 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU-1: Service of lubrication system	<ul style="list-style-type: none"> • Select appropriate tools • Identify components to be inspected • Identify low oil levels, • Clean dirty filler cap • Adjust oil levels • Identify and report leakages 	<ul style="list-style-type: none"> • Describe lubrication systems, their components and importance • Describe state of the lubrication components • Describe levels of lubricants to be maintained 	<p>Theory- 04 Hrs. Practical-16 Hrs. Total- 20 Hrs.</p>	<ul style="list-style-type: none"> • Engine oil • Hydraulic oil • Transmission oil • Differential oil • Brake oil • Oil filter 	Class Room and Workshop
LU-2:		<ul style="list-style-type: none"> • Describe electrical systems, their 	<p>Theory- 03 Hrs. Practical- 10 Hrs.</p>	<ul style="list-style-type: none"> • Fuses of all 	Class Room and Workshop



<p>Service of electrical system</p>	<ul style="list-style-type: none"> • Locate components to be inspected • Identify service needs, defects and hazardous conditions through visual/physical inspection • Select appropriate tools for rectification of minor defects • Check water level of batteries • Replace batteries. 	<p>components and importance</p> <ul style="list-style-type: none"> • Describe state of the electrical components and batteries 	<p>Total- 13 Hrs.</p>	<p>types</p> <ul style="list-style-type: none"> • Electrical leads • Insulation tape • Wire clips • Batteries • Distilled water for batteries • Electrolyte solution 	
<p>LU-3: Service of hydraulic system</p>	<ul style="list-style-type: none"> • Identify Hydraulic components • Identify service needs, defects and hazardous conditions through visual/physical inspection • Identify and report leakages and noise of the hydraulic system • Check hydraulic oil levels • Replace hoses/pipes 	<ul style="list-style-type: none"> • Describe hydraulic systems, their components and importance • Describe state of the hydraulic components • Describe levels of lubricants to be maintained • Describe leakage and overheating of components 	<p>Theory- 03 Hrs. Practical-12 Hrs. Total- 15 Hrs.</p>	<ul style="list-style-type: none"> • Hydraulic oil • Hydraulic filter • Hydraulic hoses 	<p>Class Room and Workshop</p>
			<p>Theory- 03 Hrs. Practical-12 Hrs.</p>	<ul style="list-style-type: none"> • Coolant 	<p>Class Room and Workshop</p>



<p>LU4. Service of cooling system</p>	<ul style="list-style-type: none"> • Adopt appropriate safety measures. • Ensure unobstructed airflow through radiator • Locate components to be inspected • Adjust coolant level • Replace belts and hoses 	<ul style="list-style-type: none"> • Describe cooling systems, their components and importance • Describe state of the cooling components • Describe levels of coolant to be maintained • Describe defects in cooling systems 	<p>Total- 15 Hrs.</p>	<ul style="list-style-type: none"> • Fan belt 	
<p>LU5. Service of air intake system</p>	<ul style="list-style-type: none"> • Identify air intake components • Check air service indicators • Select appropriate tools • Clean primary air filter. • Replace intake hoses and clamps 	<ul style="list-style-type: none"> • Describe air intake systems, their components and importance • Describe state of air intake systems • Describe defects in air intake systems 	<p>Theory – 03 Hrs. Practical – 10 Hrs. Total – 13 Hrs.</p>	<ul style="list-style-type: none"> • Air element • Intake hoses • Clamps 	<p>Class Room and workshop</p>
<p>LU6. Service of fuel</p>	<ul style="list-style-type: none"> • Identify fuel components • Identify and read fuel gauges 	<ul style="list-style-type: none"> • Describe fuel systems, their components and importance 	<p>Theory – 03 Hrs. Practical – 10 Hrs. Total – 13 Hrs.</p>	<ul style="list-style-type: none"> • Fuel filter • Fuel 	<p>Class Room and Workshop</p>



system	<ul style="list-style-type: none"> and level indicator Select appropriate tools Identify service needs, defects and hazardous conditions through visual/physical inspection Perform basic maintenance such as cleaning of fuel strainer Report fuel leakage 	<ul style="list-style-type: none"> Describe defects in fuel systems 			
LU7. Service of suspension system	<ul style="list-style-type: none"> Identify suspension components Select appropriate tools Check gashes or bulges and tires Grease, bearings, bush and pins Change damaged grease fittings 	<ul style="list-style-type: none"> Describe suspension systems, their components and importance Describe state of suspension systems Describe defects in suspension system 	<p>Theory – 04 Hrs. Practical – 10 Hrs. Total – 14 Hrs.</p>	<ul style="list-style-type: none"> Grease Bushes 	Class Room and workshop
LU8. Service of drive train	<ul style="list-style-type: none"> Identify drive train components Select appropriate tools 	<ul style="list-style-type: none"> Describe undercarriage systems, their components and importance 	<p>Theory – 02 Hrs. Practical – 10 Hrs. Total – 12 Hrs.</p>	<ul style="list-style-type: none"> Machine 	Class Room and Workshop



	<ul style="list-style-type: none"> Identify service needs, defects and hazardous conditions through visual/physical inspection Check wear, leaks and damage to components Identify defective undercarriage components 	<ul style="list-style-type: none"> Describe state of undercarriage Describe defects in undercarriage systems 			
LU9. Service of braking system	<ul style="list-style-type: none"> Identify braking components Select appropriate tools Identify service needs, defects and hazardous conditions through visual/physical inspection Top-up fluid reservoir Identify defective components of braking system 	<ul style="list-style-type: none"> Describe braking systems, their components and importance Describe state of braking Describe defects in braking systems Describe levels of brake oil/power oil to be maintained 	Theory – 02 Hrs. Practical – 10 Hrs. Total – 12 Hrs.	<ul style="list-style-type: none"> Brake fluid Brake oil filter 	Classroom and Workshop
LU10. Service of load bearing structure	<ul style="list-style-type: none"> Identify load bearing components Select appropriate tools 	<ul style="list-style-type: none"> Describe load bearing structures, their components and importance Describe state of load bearing structures 	Theory – 02 Hrs. Practical – 10 Hrs. Total – 12 Hrs.	<ul style="list-style-type: none"> Grease 	Class Room and Workshop



	<ul style="list-style-type: none"> Identify service needs, defects and hazardous conditions through visual/physical inspection Grease, bushes and pins 	<ul style="list-style-type: none"> Describe defects in load bearing structures 			
LU11. Service of operator station/cabin	<ul style="list-style-type: none"> Identify controls inside operator station/cabin Identify missing or defective components or controls Clean front/rear wind screen, windows and mirrors Adjust mirrors Replace broken mirror/frame Adjust seat and seat belt Check nobs of all lights and indicators 	<ul style="list-style-type: none"> Describe controls inside the operator station/cabin Describe defective controls Describe importance of controls and operating procedures 	Theory – 05 Hrs. Practical –22 Hrs. Total –27 Hrs.	<ul style="list-style-type: none"> Fuses Bulbs 	Class Room and Workshop
LU12. Equipment safety	<ul style="list-style-type: none"> Ensure safety equipment is securely mounted Replace expired fire extinguisher 	<ul style="list-style-type: none"> Describe safety equipment and their importance Describe defects in safety 	Theory – 02 Hrs. Practical – 08 Hrs. Total – 10 Hrs.	<ul style="list-style-type: none"> Fire extinguisher and refill materials 	Class Room and Workshop



	<ul style="list-style-type: none"> • Ensure wearing of PPE 	equipment			
LU13. Service of attachments	<ul style="list-style-type: none"> • Identify service needs, defects and hazardous conditions through visual/physical inspection • Select appropriate tools • Perform basic maintenance such as greasing, bushing and pins • Report worn teeth 	<ul style="list-style-type: none"> • Describe importance of service attachments • Describe defects of service attachments 	Theory – 02 Hrs. Practical – 10 Hrs. Total – 12 Hrs.	<ul style="list-style-type: none"> • Grease 	Class Room and Workshop
LU14. Service of supporting pneumatic (air-filled) system	<ul style="list-style-type: none"> • Identify pneumatic components • Select appropriate tools • Identify service needs, defects and hazardous conditions through visual/physical inspection • Perform basic maintenance, such as choked drain valves • Replace air lines 	<ul style="list-style-type: none"> • Describe importance of pneumatic parts (air-filled/operated) and systems • Describe defects of pneumatic parts (air-filled/operated) and systems 	Theory – 02 Hrs. Practical – 10 Hrs. Total – 12 Hrs.	<ul style="list-style-type: none"> • Machine 	Class Room and Workshop

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Module-F
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Module F: Maintain Machine (with Engine Running)

Objective: This module covers the skills and knowledge required to Start engine monitor warning systems, Warm up engine, Cycle equipment functions, Comply with scheduled maintenance requirements and Maintain Logbook

Duration: 40 Hours

Theory: 8 Hours

Practice: 32 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Monitor warning systems	<ul style="list-style-type: none"> Identify leaks and burnt lights Select appropriate tools Replace fuses and tighten loose fittings 	<ul style="list-style-type: none"> Describe basic warning indicators of machine 	Theory- 1.5 Hrs. Practical- 06 Hrs. Total- 7.5 Hrs.	<ul style="list-style-type: none"> Machine 	Class Room and Workshop
LU2. Warm up engine	<ul style="list-style-type: none"> Monitor instrument panel Warm up engine according to manufacturer's instructions 	<ul style="list-style-type: none"> Describe procedure of engine warming up and its importance 	Theory- 1.5 Hrs. Practical-06 Hrs. Total- 07.5 Hrs.	<ul style="list-style-type: none"> Machine 	Class Room and Workshop
LU3. Cycle equipment functions	<ul style="list-style-type: none"> Activate all functions, such as brakes, steering, lights, wipers and hydraulic functions Identify problems with functions 	<ul style="list-style-type: none"> Describe pre-work routine /cycle equipment functions and its importance 	Theory- 1.5 Hrs. Practical-06 Hrs. Total- 07.5 Hrs.	<ul style="list-style-type: none"> Machine 	Class Room and Workshop



	<ul style="list-style-type: none"> • Perform required service 				
LU4. Scheduled Maintenance	<ul style="list-style-type: none"> • Comply with safety requirements • Read indicators/warning signals and remove the problem • Maintain record and documentation • Perform scheduled maintenance 	<ul style="list-style-type: none"> • Describe maintenance and its importance • Describe types and techniques of scheduled maintenance 	Theory- 1.5 Hrs. Practical-08 Hrs. Total- 09.5 Hrs.	<ul style="list-style-type: none"> • Machine 	Class Room and Workshop
LU5. Logbook	<ul style="list-style-type: none"> • Record fuel consumption • Record oil change • Record time period/mileage of vehicle for schedule maintenance. 	<ul style="list-style-type: none"> • Describe log book and its parts • Describe procedure to maintain Logbook 	Theory- 02 Hrs. Practical-06 Hrs. Total- 08 Hrs.	<ul style="list-style-type: none"> • Writing instruments (pen) 	Class Room and Workshop

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Module-G
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Module G: Park Machines

Objective: This module covers the skills and knowledge required to Clean under carriage and attachments before parking, Park equipment in appropriate location, Shut down and secure equipment, Perform housekeeping tasks and Perform visual inspection.

Duration: 50 Hours

Theory: 10 Hours

Practice: 40 Hours

Learning Unit	Learning Outcomes	Learning Elements	Duration	Materials Required	Learning Place
LU1. Cleaning under carriage and attachments before parking	<ul style="list-style-type: none"> Clean machine body, wheels, & undercarriage Clean attachments according to manufacturer's specifications and company policy and procedure 	<ul style="list-style-type: none"> Describe importance of cleaning tracks, wheels, rollers, and attachments 	Theory- 02 Hrs. Practical- 12 Hrs. Total- 14 Hrs.	<ul style="list-style-type: none"> Cloth rag 	Class Room and Workshop
LU2. Equipment Parking at appropriate location	<ul style="list-style-type: none"> Identify appropriate parking location Park equipment according to company policy and procedure Lower the attachments to the ground level Put paddings under the attachment if the machine is to be parked for longer duration 	<ul style="list-style-type: none"> Describe suitable and safe parking locations, such as dry and clean surface, level, away from fuel storage or water courses, secure areas. 	Theory- 02 Hrs. Practical- 08 Hrs. Total- 10 Hrs.	<ul style="list-style-type: none"> Machine 	Class Room and work shop



<p>LU3. Shut down and secure equipment</p>	<ul style="list-style-type: none"> • Shut down equipment according to the manufacturer's specifications • Secure equipment against movement and damage 	<ul style="list-style-type: none"> • Describe parts and procedure of shutdown 	<p>Theory- 02 Hrs. Practical- 08 Hrs. Total- 10 Hrs.</p>	<ul style="list-style-type: none"> • Machine 	<p>Class Room and Workshop</p>
<p>LU4. Housekeeping</p>	<ul style="list-style-type: none"> • Clean wind shields, side rails, steps and instrument panel • Sweep floor • Remove garbage • Apply glass/mirror covers 	<ul style="list-style-type: none"> • Describe importance of housekeeping and its procedures 	<p>Theory- 02 Hrs. Practical- 07 Hrs. Total- 09 Hrs.</p>	<ul style="list-style-type: none"> • Cloth rags • Brooms • Glass cleaner 	<p>Class Room and Workshop</p>
<p>LU5. Visual inspection</p>	<ul style="list-style-type: none"> • Check parked equipment visually • Identify existing or potential problems • Communicate to appropriate personnel such as supervisor/mechanic 	<ul style="list-style-type: none"> • Describe importance of visual inspection/end shift routine and its procedures 	<p>Theory- 02 Hrs. Practical- 05 Hrs. Total- 07 Hrs.</p>	<ul style="list-style-type: none"> • Machine 	<p>Class Room and Workshop</p>



4. List of Tools and Equipment

(FOR A CLASS OF 25 STUDENTS)

Name of Trade		Heavy Machine Operator	
Duration of Course		Months	
Sr. #	Description	Quantity	
1.	Steel-Toed Footwear,	30	
2.	Hard Hat,	30	
3.	Safety Gloves,	30	
4.	Appropriate Safety Glasses,	30	
5.	High Visibility Vest,	30	
6.	Hearing Protection,	30	
7.	Breathing Apparatus,	04	
8.	De-Electric Boots And Gloves For Protection From Electrical Shock.	10	
9.	Fall Protection, And Other Applicable PPE	30	
10.	Site Emergency Response Plan,	30	
11.	Fire Extinguishers,	04	
12.	Fire Blankets,	04	
13.	Respirators, Masks,	30	
14.	Fire Hoses,	08	
15.	First Aid Kits, Stretchers, WHMIS Book, And Other Related Tools And Gear	04 sets	
16.	Basic Tools, Such as Grease Gun, Air Pump Etc.	25 sets	
17.	Hammer,	05	each size
18.	Screwdrivers,	05	each size
19.	Pliers,	05	each size
20.	Self-Locking Pliers,	05	each



		size
21.	Adjustable Wrench,	05 each size
22.	Assorted Other Wrenches, Measuring Tape(100m)	05 each size
23.	Basic Supplies, Such As Grease, Oil, Window Cleaner, Rags, Ice Scraper, Whisk Broom.	05 each
24.	Color-code cards, utility documentation. Logbooks Service Manuals, OHS Regulation,	10 sets
25.	MACHINES	
26	A. Bulldozer. Attachments: - 1. Blades. 2. Ripper	01 each
27	B. Excavator (Wheel & Crawler). Attachments: - 1. Buckets. 2. Grappler. 3. Coupler. 4. Thumbs. 5. Pulverize. 6. Lifter. 7. Rakes. 8. Chuck 9. Blades. 10. Ripper. 11. Forks. 12. Adapter. 13. Hammer. 14. Auger. 15. Compactor. 16. Stump Harvester. 17. Driller	01 each
28	C. Motor Grader. Attachments: - 1. Angle Blade. 2. Lift Group. 3. One way Plow. 4. Snow Gate. 5. Snow Wing. 6. Straight Blade, 7. UV Angle Blade. 8. V-Plow	01 each
29	D. Wheel Loader. Attachments: - 1. Coupler. 2. Dozer Blade. 3. Boom Poles. 4. Bucket. 5. Fork. 6. Grappler. 7. Snow Blade, 8. Trailer Hitches. 9. Rotary Sweeper. 10. Broadcast Spreader	01 each



5. Specification of Machines & Consumable

A. Bulldozer Specification & Consumable

S.#	Length (mm)	D50A-17	D65A-8	D85-18/D85A	D155A-1
1.	Overall Length	4765	5135	5750	6880
2.	Overall Width	2145	3970	3725	4130
3.	Overall Height	2900	3020	3395	3720
4.	Overall Op Weight	12240	15890	23510	33690
5.	Ground Clearance	315	400	400	500
6.	Track Shoes Width	460	460	560	560
7.	Grade Ability (degree)	30	30	30	30
8.	Ground Pressure (kg/cm ²)	0.62	0.67	0.62	0.77
9.	Horse Power	120	165	220	320
10.	Type of Dozer	Angle	Tilt	Tilt	Tilt
11.	Fuel (LT)	250	320	450	660
12.	Engine Oil-SAE 30 (LT)	30	30	43	71
13.	Hydraulic Oil (LT)	87	108	110	164
14.	Transmission Oil (LT)	18	52	122	185
15.	Cooling Water (LT)	52	63	79	165
16.	Steering Oil (LT)	63	70	Nil	Nil
17.	Final Drive Case Oil (LT)	52 (26 each side)	62 (31 each side)	72 (36 each side)	110 (55 each side)



B. Excavator Specification & Consumable.

S#	Specification	PC 120	PC 150	PC 200
1	Bucket Capacity (m ³)	0.50 m ³	0.55 m ³	0.7 m ³
2	Operating Weight (Kg)	12030 kg	14500 kg	18000 kg
3	Overall Length (mm)	7050	8350	9380
4	Overall Width (mm)	2500	2550	2740
5	Overall Height (mm)	2700	2900	2940
6	Swing Speed (rpm)	20	19.6	13
7	Travel Speed (Km/h)	3 km/h	3.2 km/h	3.5k m/h
8	Grade ability (Degree)	25 % to 30%	35%	35%
9	Ground Pressure (Kg/cm ²)	0.45 Kg/cm ²	0.47 Kg/cm ²	0.47 Kg/cm ²
10	Max. Excavation (mm)	3060	5400	6550
11	Max. Stockpile (mm)	4420 mm	5530 mm	6255 mm
12	Max. Stretch (mm)	7050 mm	8440 mm	9850 mm
13	Horsepower (HP)	85.4 HP	86 HP	106 HP
14	Fuel Capacity (LT)	230 LT	280 LT	540 LT
15	Engine Oil (LT)	11 LT	24 LT	24 LT
16	Hydraulic Oil (LT)	100 LT	250 LT	250 LT
17	Swing case Oil (LT)	2.5 LT	7 LT	8 LT
18	Water (Lt)	15.7 LT	24 LT	24 LT
19	Track Chain Pulley	20 to 25 mm	20 to 25 mm	60 to 100 mm
20	Final Drive	Each side	Each side	Each side
		2.5 LTR	2.5 LTR	7.4 LTR



C. Motor Grader Specification & Consumable.

S.#	Detail	MG 200	MG 330	MG 430	GD-605-A3
1.	Heaped Blade Capacity	3.06 m ³	3.9 m ³	1.01 m ³	3.9 m ³
2.	HP (Horse Power)	115 hp	135 hp	155 hp	145 hp
3.	Op/Weight	9885 kg	10920 kg	12220 kg	12870 kg
4.	Fuel	210 ltr	230 ltr	275 ltr	250 ltr
5.	Engine Oil	12 ltr	13 ltr	13 ltr	24 ltr
6.	Hydraulic Oil	70 ltr	67 ltr	67 ltr	60 ltr R/Fel
7.	Transmission	40 ltr	23 ltr	32 ltr	30 ltr
8.	Water	21 ltr	34 ltr	46 ltr	45 ltr
9.	Tire Pressure	2.25	1.8	2.6	2.45kg
10.	Gear Oil/Final Drive	2.5 ltr	3.4 ltr	3.5 ltr	26 CTR
11.	Tandem Oil	48 ltr	73 ltr	85 ltr	72 tr 36X36



D. Wheel Loader Specification & Consumable

S#	Items	WA 450	WA 320	WA 200	966 F cat	928 F cat
1	Horsepower (HP)	237	165	110	220	120
2	Operating Weight (Kg)	19100	13450	92100	20905	11148
3	Bucket Capacity (m ³)	3.5	2.8	1.7	3.8	2
4	Grade ability (Degree)	30	35	33	35	35
5	Speed/Hour	34-38	38	37	48	45
6	Fuel (LT)	330	228	170	304	189
7	Engine Oil (LT)	32	19.5	24	28	20
8	Hydraulic Oil (LT)	230	89	83	205	100
9	Transmission Oil (LT)	61	74	35	59	30
10	Cooling Water (LT)	65	20	38	48	41
11	F/R Axle oil (LT)	120	48	34	47	50
12	Tire Pressure (Kg/cm ²)	2.8	2.5	2.5	2.8	2.5



5. List of Stationary

Sr. #	Description
1.	Handbooks
2.	Design books
3.	Pencils
4.	Rubber
5.	Sharpeners
6.	Paper cutter
7.	Scissors
8.	Colours
9.	White charts
10.	Brown sheets
11.	White board markers
12.	Permanent markers
13.	File cover and files



6. Members of the Curriculum Development Committee

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