097.13 DPWH
01-15-2016

Republic of the Philippines
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
OFFICE OF THE SECRETARY
Manila

14 JAN 2016

DEPARTMENT ORDER)
)
NO. 11)
Series of 2015) 01.15.16

SUBJECT: Routine Maintenance For Service Vehicles and Most Commonly Used Equipment Manual

To ensure the road-worthiness, environment keeping and reliability of the Department's land-based equipment fleet throughout its life cycle, all concerned Offices and personnel are hereby instructed to strictly implement and use the procedures prescribed in this *Routine Maintenance for Service Vehicles and Most Commonly Used Equipment Manual*.

The *Handbook* standardizes the Daily Routine Maintenance activities for each equipment class, providing a quick guide for drivers, operators, mechanics and field personnel. Further, it defines the responsibilities of all equipment operators and maintenance personnel in conducting the maintenance checkpoints in a safe, efficient and effective manner.

The said Manual may be downloaded from the DPWH Intranet (http://dpwhweb).

This Order shall take effect immediately.

ROGELIO L. SINGSON
Secretary

Department of Public Works and Highways
Office of the Secretary
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Republic of the Philippines
DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
OFFICE OF THE SECRETARY
Manila

FOREWORD

In order to have a more systematic and efficient procedure in conducting the regular maintenance of the most commonly used equipment and service vehicles, the Bureau of Equipment has come up with various technical reference/guide manuals that are strategically useful to keep the entire DPWH equipment fleet in good operating condition on day-to-day activities.

This Handbook on Routine Maintenance, with its compact size, contains concise sequence of checkpoints, complete with the hazards involved and safety reminders. It shall serve as an effective ready reference and procedural handbook for our drivers, operators, mechanics and field personnel to properly undertake the daily maintenance activities by themselves.

With the adoption of this Manual, the Department expects to minimize man-hours on repairs and to prolong serviceable life of equipment.

ROGELIO L. SINGSON
Secretary

ROUTINE MAINTENANCE FOR SERVICE VEHICLES AND MOST COMMONLY USED EQUIPMENT MANUAL

December 2015

FOREWORD

In order to have a more systematic and efficient procedure in conducting the regular maintenance of the most commonly used equipment and service vehicles, the Bureau of Equipment has endeavoured to come up with various technical reference/guide manuals that are strategically useful, with intended purpose to keep the entire DPWH equipment fleet in good operationing condition on day-to-day activities.

This handbook on Routine Maintenance, with its compact size, contains concise sequence of checkpoints, replete with the hazards involved and safety reminders shall serve as an effective ready reference and procedural handbook for our drivers, operators, mechanics and field personnel to properly undertake the daily maintenance activities by themselves.

With the adoption of this Manual, the Department expects minimized man-hour on repairs and prolonged serviceable life of equipment.

ROGELIO L. SINGSON
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OBJECTIVES

Proper equipment operation and maintenance plays an important role in the successful implementation of the Department's infrastructure projects.

In the equipment preventive maintenance system, schedule and type of maintenance work to be carried out is planned and organized in advance. It is imperative that operators, drivers and mechanics are aware of the proper discipline in the performance of routine maintenance for service vehicles and some most commonly used equipment, in line with the Reiteration of Department Order Nos. 54 and 54-A, Series of 1991 dated November 10, 2014 to orient and train Heavy Equipment Operators and Drivers in performing daily maintenance and preventive maintenance (PM 1):

- To minimize breakdowns;
- To avoid accidents;
- To maximize the use of equipment; and
- To avoid faulty and unnecessary repairs, which end up in a considerable increase in cost.

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LEGEND

Visual Inspection-observe safety procedures.

Very Important! Regularly check these items.

Caution: Observe safety procedures at all times.

Report any unusual noise immediately.

1.0 SERVICE VEHICLE
Routine Maintenance to be performed by Driver with professional driver's license

1.0 Routine Maintenance to be performed by Driver with professional driver's license

Service Vehicle
DPWH Property Code: H1

Maintenance Activity: 1.1 Automatic transmission fluid level: check

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of unit	Material	No. of unit
1	The automatic transmission fluid (ATF) level must be rechecked using the "hot" range. Park the vehicle on level surface and set the parking brake.	2.0		Visual Inspection-observe safety procedures		
2	Start the engine then move the selector lower thru each gear range ending in "P".	2.0		Visual Inspection-observe safety procedures		
3	Check the fluid level with the engine idling.	0.5		Visual Inspection-observe safety procedures		
4	Remove the dipstick and wipe it clean.	0.5			Rag	1-pc
5	Re-insert the dipstick and note the reading.	0.25		Visual Inspection-observe safety procedures		
6	If the level is on the low side of the range, add fluid to the charging pipe. Do not overfill.	2.0			Funnel	1-pc
TOTAL		7.25				

1.0 Routine Maintenance to be performed by Driver with professional driver's license

Service Vehicle
DPWH Property Code: H1

Maintenance Activity: 1.2 Before engine warm-up: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Walk around inspection for leaks.	1.0		Visual Inspection-observe safety procedures		
2	Check for scratches, damages and missing parts.	0.5		Visual Inspection-observe safety procedures		
3	Check for tire wear, pressure and loose bolts.	0.5	Pressure gauge	1-pc		
4	Check for cooling system, engine oil level, fuel and air cleaner.	1.0		Visual Inspection-observe safety procedures		
5	Check the battery cables and electrolyte level.	1.0	Open wrench (10-12mm)	1-pc		
6	Check the belt and tension.	0.5		Visual Inspection-observe safety procedures		
7	Check the jack, spare tire, and tools.	0.5		Very Important! Regularly check these items.		
TOTAL		5.0				

1.0 Routine Maintenance to be performed by Driver with professional driver's license

Service Vehicle
DPWH Property Code: H1

Maintenance Activity: 1.3 Battery, electrolyte and cables clips: check

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of unit	Material	No. of unit
1	Open the hood of the vehicle.	0.5			Visual Inspection-observe safety procedures	
2	Inspect and check the battery cables, lugs and clamps.	0.5			Visual Inspection-observe safety procedures	
3	Tighten loose battery clamps.	1.0	Combination wrench (10-12mm)	1-pc		
4	Open the battery cover and check the electrolyte solution. Add or refill if necessary.	2.0	Adjustable wrench (8" long)	1-pc	Electrolyte solution	1 liter
5	Clean/remove any accumulated dirt on the battery terminals and clamps.	3.0	plier (8" long)	1-pc		
TOTAL		7.0				

1.0 Routine Maintenance to be performed by Driver with professional driver's license

Service Vehicle
DPWH Property Code: H1

Maintenance Activity: 1.4 Brake and clutch master cylinder oil level: top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Open the hood of the vehicle.	0.5				
2	Open the cover of the clutch master cylinder assembly.	0.5			Visual Inspection-observe safety procedures	
3	Check the fluid on the cylinder assembly.	0.5				
4	Add fluid on the cylinder if it is below minimum level.	1.0			DOT-3 fluid	1 liter
5	Close the cover of the cylinder.	0.5			Visual Inspection-observe safety procedures	
6	Step on the clutch pedal if its working and look if there is any leak on the cylinder.	3.0				
TOTAL		6.0				

1.0 Routine Maintenance to be performed by Driver with professional driver's license

Service Vehicle
DPWH Property Code: H1

Maintenance Activity: 1.5 During engine warm-up: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Walk around inspection for leaks.	1.0		Visual Inspection-observe safety procedures		
2	Check the engine for noise vibration and exhaust gas.	1.0		Report any unusual noise immediately.		
3	Check for the instruments and accessories, light, horn, wiper and oil pressure.	1.0		Visual Inspection-observe safety procedures		
4	Check the operation and clearance, clutch, brake and gear shift lube points.	2.0		Visual Inspection-observe safety procedures		
5	Record the result of checkpoints in the yellow book.	2.0	Yellow book	1 set		
TOTAL		7.0				

1.0 Routine Maintenance to be performed by Driver with professional driver's license

Service Vehicle
DPWH Property Code: H1

Maintenance Activity: 1.6 Engine coolant level: check/top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Check the coolant level in the reservoir tank when the engine is cold.	0.5		Visual Inspection-observe safety procedures		
2	If the coolant level is below minimum, add coolant to the maximum level.	1.0		Visual Inspection-observe safety procedures		
3	If the reservoir tank is empty, fill the radiator with coolant up to the filler opening and add lit to the reservoir tank to the maximum level.	3.0			Soft water 70% Anti-freeze solution 30%	
TOTAL		4.5				

1.0 Routine Maintenance to be performed by Driver with professional driver's license

Service Vehicle
DPWH Property Code: H1

Maintenance Activity: 1.7 Engine coolant: change

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Wait until the engine and radiator cool down.	3.0			Caution: Observe safety procedures at all times.	
2	Open the radiator cap and drain valve.	1.0			Drain pan	1-pc
3	Flush the cooling system by running fresh water thru the radiator.	3.0			Soft water	
4	Securely close the drain valve.	0.5				
5	Fill the radiator with the proper mixture of coolant and water. Fill the reservoir tank to level. Tightly close the radiator and reservoir tank.	3.0			Soft water 70% Anti-freeze solution 30%	
6	Start the engine and warm it up until it reaches normal temperature.	3.0			Caution: Observe safety procedures at all times.	
7	Check the drain valve for possible leaks.	0.5			Visual Inspection-observe safety procedures	
TOTAL		14.0				

1.0 Routine Maintenance to be performed by Driver with professional driver's license

Service Vehicle
DPWH Property Code: H1

Maintenance Activity: 1.8 Engine oil level: check/top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Turn on the engine until it reaches operating temperature.	3.0			Caution: Observe safety procedures at all times.	
2	Turn off the engine. Wait for a few minutes for the oil to drain back into the oil pan.	5.0				
3	Pull out the dipstick and wipe it with clean cloth.	0.5			Visual Inspection-observe safety procedures	
4	Insert the dipstick and pull it out again. It should be between the *High* and *Low* mark. If the oil is below the *Low* mark, remove the oil filler cap and pour recommended oil.	2.0	Screw driver	1-pc	SAE 30	1 liter
5	Recheck oil level with dipstick.	0.5			Visual Inspection-observe safety procedures	
TOTAL		11.0				

1.0 Routine Maintenance to be performed by Driver with professional driver's license

Service Vehicle
DPWH Property Code: H1

Maintenance Activity: 1.9 Power steering fluid level: check

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Turn off the engine and let it cool.	5.0		Caution: Observe safety procedures at all times.		
2	Check the fluid level in the reservoir.	0.5		Visual Inspection-observe safety procedures		
3	If the fluid level is below the minimum line, add fluid up to the maximum level.	1.5			Steering fluid	1 liter
TOTAL		7.0				

1.0 Routine Maintenance to be performed by Driver with professional driver's license5

Service Vehicle
DPWH Property Code: H1

Maintenance Activity : 1.10 Sediment and water in the fuel filter: drain

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	If the fuel warning light comes on while the engine is running, check the fuel filter, turn off the engine, then place a container under the fuel filter.	2.0			Container	1-pc
2	Loosen up the drain valve for 4 to 5 turns to drain sediment and water03.	2.0	Double end wrench (10mm)	1-pc		
3	If water does not drain properly, move the priming pump up and down.	2.0		Visual Inspection-observe safety procedures		
4	After the water has been completely drained, close the drain valve.	0.5			Rag	1
5	Bleed any air from the fuel system.	2.0				
TOTAL		8.5				

1.0 Routine Maintenance to be performed by Driver with professional driver's license

Service Vehicle
DPWH Property Code: H1

Maintenance Activity: 1.11 Turbocharger and intercooler operation: check

NOTE: *Turbo engine is a device that produces more power by supplying sufficient air into the combustion chamber by using the energy of exhaust gas.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Check the oil level and oil pressure. Before starting the engine, measure the crankcase oil level. As soon as the engine starts, check oil pressure indicator for normal rise.	1.5		Caution: Observe safety procedures at all times.		
2	Warm up the engine for 3 to 10 minutes and avoid sudden acceleration.	3.0				
TOTAL		4.5				

IMPORTANT: If running a vehicle without air cleaner filter, foreign material drawn can destroy engine and turbocharger. When you turn off an engine suddenly, it may damage bearings inside. To avoid affecting the turbocharger's moving parts, gradually turn off the engine.

2.0 DUMP TRUCK
Routine Maintenance to be performed by Driver with professional driver's license and classified restriction code no. 3

2.0 Routine Maintenance to be performed by Driver, with professional driver's license and classified restriction code no. 3

Dump Truck
DPWH Property Code: H3

Maintenance Activity: 2.1 Before engine warm-up: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Walk around inspection for leaks.	1.0			Visual Inspection-observe safety procedures	
2	Check for scratches, damages and missing parts.	0.5			Visual Inspection-observe safety procedures	
3	Check for tire wear, pressure and loose bolts.	0.5	Pressure gauge	1-pc		
4	Check for cooling system, engine oil level, fuel and air cleaner.	1.0			Visual Inspection-observe safety procedures	
5	Check the battery cables and electrolyte level.	1.0	Open wrench (10-12mm)	1-pc		
6	Check the belt and tension.	0.5			Visual Inspection-observe safety procedures	
7	Check the jack, spare tire, and tools.	0.5			Very Important! Regularly check these items.	
TOTAL		5.0				

2.0 Routine Maintenance to be performed by Driver, with professional driver's license and classified restriction code no. 3

Dump Truck
DPWH Property Code: H3

Maintenance Activity: 2.2 Brake and clutch master cylinder oil level: top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Open the hood of the vehicle.	0.5				
2	Open the cover of the clutch master cylinder assembly.	0.5			Visual Inspection-observe safety procedures	
3	Check the fluid on the cylinder assembly.	0.5			DOT-3 fluid	1 liter
4	Add fluid on the cylinder if it is below minimum level.	1.0				
5	Close the cover of the cylinder.	0.5			Visual Inspection-observe safety procedures	
6	Step on the clutch pedal if its working and look if there is any leak on the cylinder.	3.0				
TOTAL		6.0				

2.0 Routine Maintenance to be performed by Driver, with professional driver's license and classified restriction code no. 3

Dump Truck
DPWH Property Code: H3

Maintenance Activity: 2.3 During engine warm-up: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Walk around inspection for leaks.	1.0			Visual Inspection-observe safety procedures	
2	Check the engine for noise vibration and exhaust gas.	1.0			Report any unusual noise immediately.	
3	Check for the instruments and accessories, light, horn, wiper and air pressure.	1.0			Visual Inspection-observe safety procedures	
4	Check the operation and clearance, clutch, brake and gear shift lube points.	2.0			Visual Inspection-observe safety procedures	
5	Record the result of checkpoints in the yellow book.	2.0			Yellow book	1 set
TOTAL		7.0				

2.0 Routine Maintenance to be performed by Driver, with professional driver's license and classified restriction code no. 3

Dump Truck
DPWH Property Code: H3

Maintenance Activity: 2.4 Engine coolant: change

NOTE: *Wait until the engine and radiator cool down.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Open the heater water cock. Manual air conditioning: move the temperature control lever to maximum hot position. Automatic air conditioning: turn the ignition switch *On* and move the temperature control lever to the maximum hot position.	2.5 2.5		Caution: Observe safety procedures at all times.		
2	Open the radiator cap and drain valve. Open the drain plug on the engine block for the diesel engines.	5.0	Monkey wrench	1-pc	Drain pan	1-pc
3	Flush the cooling system by running fresh water through the radiator.	5.0	Pressurized water hose	1 assembly		
4	Securely close the drain valve (and drain plug for diesel engines).	1.0		Visual Inspection-observe safety procedures		
5	Fill the radiator with the proper mixture of coolant and water. Fill the reservoir tank up to the maximum level. Then install the radiator cap.	10.0				

2.0 Routine Maintenance to be performed by Driver, with professional driver's license and classified restriction code no. 3

Dump Truck
DPWH Property Code: H3

Maintenance Activity: 2.4 Engine coolant: change

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
6	Start the engine and warm it up until it reaches normal operating temperature. Then race the engine 2 or 3 times under no load. Watch the coolant temperature gauge for signs of overheating.	20.0				
7	Stop the engine after it completely cools down. Refill the radiator up to the filler opening. Fill the reservoir tank up to this maximum level.	15.0		Visual Inspection-observe safety procedures		
8	Check the drain valve (and drain plug for diesel engines) for any sign of leaks.	1.0				
TOTAL		62.0				

2.0 Routine Maintenance to be performed by Driver, with professional driver's license and classified restriction code no. 3

Dump Truck
DPWH Property Code: H3

Maintenance Activity: 2.5 Engine oil level: check

NOTE: *Position the vehicle on a level surface. The best time to check the oil level is before operating the engine or about 30 minutes after the engine stop.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Wipe the level gauge with a clean cloth, insert it into the level gauge guide and remove the gauge to check the oil level. The oil level should be between *Full* and *Low* inscribed lines.	1.0			Rag	1-pc
2	If the level is low, add engine oil through the filler cap.	1.5			EO SAE 30	1 liter
3	If contaminated engine oil is obvious when checking the oil level, replace the engine oil irrespective of the service intervals.	1.0		Visual Inspection-observe safety procedures		
TOTAL		3.5				

IMPORTANT: If the level oil is checked when the engine is stopped before sufficient rise of oil temperature, the detected level will be lower than the actual level because some oil accumulation in the engine does not flow back into the oil pan.

2.0 Routine Maintenance to be performed by Driver, with professional driver's license and classified restriction code no. 3

Dump Truck
DPWH Property Code: H3

Maintenance Activity: 2.6 Engine coolant level: check/top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Wait until the engine and radiator cool down.	3.0				
2	Open the radiator cap and drain valve.	1.0			Drain pan	1-pc
3	Flush the cooling system by running fresh water thru the radiator.	3.0			Soft water	
4	Securely close the drain valve.	0.5				
5	Fill the radiator with the proper mixture of coolant and water. Fill the reservoir tank to level. Tightly close the radiator and reservoir tank.	3.0			Soft water 70% Anti-freeze solution 30%	
6	Start the engine and warm it up until it reaches normal temperature.	3.0			Caution: Observe safety procedures at all times.	
7	Check the drain valve for possible leaks.	0.5			Visual Inspection-observe safety procedures	
TOTAL		14.0				

2.0 Routine Maintenance to be performed by Driver, with professional driver's license and classified restriction code no. 3

Dump Truck
DPWH Property Code: H3

Maintenance Activity: 2.7 Engine oil level: check/top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Turn on the engine until it reaches operating temperature.	3.0			Caution: Observe safety procedures at all times.	
2	Turn off the engine. Wait for a few minutes for the oil to drain back into the oil pan.	5.0			Visual Inspection-observe safety procedures	
3	Pull out the dipstick and wipe it with clean cloth.	0.5			Visual Inspection-observe safety procedures	
4	Insert the dipstick and pull it out again. It should be between the *High* and *Low* mark. If the oil is below the *Low* mark, remove the oil filler cap and pour recommended oil.	2.0	Screw driver	1-pc	SAE 30	1 liter
5	Recheck oil level with dipstick.	0.5			Visual Inspection-observe safety procedures	
TOTAL		11.0				

IMPORTANT: Oil level should be checked regularly. Operating with insufficient amount of oil can damage the engine, and such damage is not covered by warranty. If is normal to add some oil between oil changes or during the break-in period, depending on the severity of operating conditions.

2.0 Routine Maintenance to be performed by Driver, with professional driver's license and classified restriction code no. 3

Dump Truck
DPWH Property Code: H3

Maintenance Activity: 2.8 Power Steering fluid level: check

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Turn off the engine and let it cool.	5.0		Caution: Observe safety procedures at all times.		
2	Check the fluid level in the reservoir.	0.5		Visual Inspection-observe safety procedures		
3	If the fluid level is below the minimum line, add fluid up to the maximum level.	1.5			Steering fluid	1 liter
TOTAL		7.0				

2.0 Routine Maintenance to be performed by Driver, with professional driver's license and classified restriction code no. 3

Dump Truck
DPWH Property Code: H3

Maintenance Activity : 2.9 Sediment and water in the fuel filter: drain

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	If the fuel warning light comes on while the engine is running, check the fuel filter, turn off the engine, then place a container under the fuel filter.	2.0			Container	1-pc
2	Loosen up the drain valve for 4 to 5 turns to drain sediment and water03.	2.0	Double end wrench (10mm)	1-pc		
3	If water does not drain properly, move the priming pump up and down.	2.0		Visual Inspection-observe safety procedures		
4	After the water has been completely drained, close the drain valve.	0.5			Rag	1
5	Bleed any air from the fuel system.	2.0				
TOTAL		8.5				

2.0 Routine Maintenance to be performed by Driver, with professional driver's license and classified restriction code no. 3

Dump Truck
DPWH Property Code: H3

Maintenance Activity: 2.10 Turbocharger and intercooler operation: check

NOTE: *Turbo engine is a device that produces more power by supplying sufficient air into the combustion chamber by using the energy of exhaust gas.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Check the oil level and oil pressure. Before starting the engine, measure the crankcase oil level. As soon as the engine starts, check oil pressure indicator for normal rise.	1.5		Caution: Observe safety procedures at all times.		
2	Warm up the engine for 3 to 10 minutes and avoid sudden acceleration.	3.0				
TOTAL		4.0				

IMPORTANT: If running a vehicle without air cleaner filter, foreign material drawn can destroy engine and turbocharger. When you turn off an engine suddenly, it may damage bearings inside. To avoid affecting the turbocharger's moving parts, gradually turn off the engine.

3.0 EXCAVATOR
Routine Maintenance to be performed by Excavator Operator who had completed the TESDA core competencies standards for heavy equipment operation

3.0 Routine Maintenance to be performed by Excavator Operator who had completed the TESDA core competencies standards for heavy equipment operation

Excavator
DPWH Property Code: F16/F17

Maintenance Activity: 3.1 Accumulator: handling and releasing pressure

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Lower the attachment completely to the ground.	1.0				
2	Keep all the attachments, such as hammer, closed.	1.0				
3	After turning off the engine, turn the ignition key to running position.	1.0				
4	Move the control lockout lever up to unlock the hydraulic system.	1.0				
5	To release the pressure in the control circuits and accumulator, move the operating levers and pedals forward/reward and left/right to their respective end positions.	1.0	 		Caution: Observe safety procedures at all times. Visual Inspection- observe safety procedures	
6	Turn the ignition key to stop position.	1.0				
7	Move the control lockout lever down to lock the hydraulic system securely.	1.0				
8	To release the pressure completely, loosen the hose connection slowly when you disconnect the accumulator. Step aside in this case as oil should spurt out.	1.0				
	TOTAL	8.0				

IMPOTANT: The accumulator is charged with highly pressured nitrogen gas. Handle it with care. Otherwise, it can cause serious accidentals or injuries.

3.0 Routine Maintenance to be performed by Excavator Operator who had completed the TESDA core competencies standards for heavy equipment operation

Excavator
DPWH Property Code: F16/F17

Maintenance Activity: 3.2 Before starting: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Check oil and water leak.	1.0			Visual Inspection- observe safety procedures	
2	Check and retighten nuts and bolts.	3.0	Wrench	1-pc		
3	Check electric wiring.	3.0	Pliers, Electrical tape	1-pc		
4	Check and supply coolant.	3.0			DO3 fluid	
5	Check and supply engine oil.	3.0			Engine oil	
6	Check and supply fuel.	3.0				
7	Drain water and sediment of fuel tank.	3.0				
8	Check and supply brake fluid.	3.0				
9	Check steering wheel play.	1.0			Visual Inspection- observe safety procedures	
10	Check and adjust brake pedal travel.	5.0				
11	Check and adjust braking ability.	5.0				
12	Check and adjust parking brake lever travel.	5.0				
13	Check and adjust tire pressure.	5.0	Pressure gauge	1-pc		
14	Check dust indicator.	1.0				

3.0 Routine Maintenance to be performed by Excavator Operator who had completed the TESDA core competencies standards for heavy equipment operation

Excavator
DPWH Property Code: F16/F17

Maintenance Activity: 3.2 Before starting: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
15	Check lamps.	1.0				
16	Check horn.	1.0			Visual Inspection-observe safety procedures	
17	Check exhaust gas color.	1.0				
18	Check instruments.	1.0				
19	Check previous day's defects.	1.0	Log Book			
20	Check door lock.	3.0				
21	Check wiper, window washer and defroster.	2.0			Visual Inspection-observe safety procedures	
22	Inspect float position of water separator.	2.0				
	TOTAL	56.0				

3.0 Routine Maintenance to be performed by Excavator Operator who had completed the TESDA core competencies standards for heavy equipment operation

Excavator
DPWH Property Code: F16/F17

Maintenance Activity: 3.3 Engine oil level: check/top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Turn on the engine until it reaches operating temperature.	3.0			Caution: Observe safety procedures at all times.	
2	Turn off the engine. Wait for a few minutes for the oil to drain back into the oil pan.	5.0			Visual Inspection-observe safety procedures	
3	Pull out the dipstick and wipe it with clean cloth.	0.5			Visual Inspection-observe safety procedures	
4	Insert the dipstick and pull it out again. It should be between the *High* and *Low* mark. If the oil is below the *Low* mark, remove the oil filler cap and pour recommended oil.	2.0	Screw driver	1-pc	SAE 30	1 liter
5	Recheck oil level with dipstick.	0.5			Visual Inspection-observe safety procedures	
	TOTAL	11.0				

3.0 Routine Maintenance to be performed by Excavator Operator who had completed the TESDA core competencies standards for heavy equipment operation

Excavator
DPWH Property Code: F16/F17

Maintenance Activity: 3.4 Engine coolant: change

NOTE: *Wait until the engine and radiator cool down.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Open the heater water cock. Manual air conditioning: move the temperature control lever to maximum hot position. Automatic air conditioning: turn the ignition switch *On* and move the temperature control lever to the maximum hot position.	2.5 2.5		Caution: Observe safety procedures at all times.		
2	Open the radiator cap and drain valve. Open the drain plug on the engine block for the diesel engines.	5.0	Monkey wrench	1-pc	Drain pan	1-pc
3	Flush the cooling system by running fresh water through the radiator.	5.0	Pressurized water hose	1 assembly		
4	Securely close the drain valve (and drain plug for diesel engines).	1.0		Visual Inspection-observe safety procedures		
5	Fill the radiator with the proper mixture of coolant and water. Fill the reservoir tank up to the maximum level. Then install the radiator cap.	10.0				

3.0 Routine Maintenance to be performed by Excavator Operator who had completed the TESDA core competencies standards for heavy equipment operation

Excavator
DPWH Property Code: F16/F17

Maintenance Activity: 3.4 Engine coolant: change

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
6	Start the engine and warm it up until it reaches normal operating temperature. Then race the engine 2 or 3 times under no load. Watch the coolant temperature gauge for signs of overheating.	20.0				
7	Stop the engine after it completely cools down. Refill the radiator up to the filler opening. Fill the reservoir tank up to this maximum level.	15.0		Visual Inspection-observe safety procedures		
8	Check the drain valve (and drain plug for diesel engines) for any sign of leaks.	1.0				
	TOTAL	62.0				

3.0 Routine Maintenance to be performed by Excavator Operator who had completed the TESDA core competencies standards for heavy equipment operation

Excavator
DPWH Property Code: F16/F17

Maintenance Activity: 3.5 Engine coolant level: check/top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Wait until the engine and radiator cool down.	3.0				
2	Open the radiator cap and drain valve.	1.0			Drain pan	1-pc
3	Flush the cooling system by running fresh water thru the radiator.	3.0			Soft water	
4	Securely close the drain valve.	0.5				
5	Fill the radiator with the proper mixture of coolant and water. Fill the reservoir tank to level. Tightly close the radiator and reservoir tank.	3.0			Soft water 70% Anti-freeze solution 30%	
6	Start the engine and warm it up until it reaches normal temperature.	3.0			Caution: Observe safety procedures at all times.	
7	Check the drain valve for possible leaks.	0.5			Visual Inspection- observe safety procedures	
TOTAL		14.0				

3.0 Routine Maintenance to be performed by Excavator Operator who had completed the TESDA core competencies standards for heavy equipment operation

Excavator
DPWH Property Code: F16/F17

Maintenance Activity: 3.6 Fuel tank: drain

NOTE: *If the equipment runs with fuel of low quality, the fuel tank needs to be drained.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Place a suitable sized container under drain hose.	1.0			Drain pan	1-pc
2	Open the drain valve cap at the bottom of the tank.	2.0				
3	Open the filler cap.	0.5			Caution: Observe safety procedures at all times.	
4	Connect the drain hose and drain off any sediment.	4.0				
5	Disconnect the drain hose and install the valve cap again.	2.0			Visual Inspection- observe safety procedures	
6	Close the filler cap.	0.5				
TOTAL		10.0				

IMPORTANT: Take care of filters/oil/liquids in an environmentally safe way.

3.0 Routine Maintenance to be performed by Excavator Operator who had completed the TESDA core competencies standards for heavy equipment operation

Excavator
DPWH Property Code: F16/F17

Maintenance Activity: 3.7 Fuel system: air bleeding

NOTE: *Air must be bled out the fuel injection system whenever the machine runs out of fuel while the engine is running.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Turn priming pump counterclockwise to unlock the plunger.	1.0				
2	Push priming pump until a heavy resistance can be felt in the priming pump.	3.0				
3	Push priming pump fully and turn it clockwise to lock the plunger.	1.0			Caution: Observe safety procedures at all times.	
4	Start the engine and let it run idle for 3 minutes.	3.0			Visual Inspection- observe safety procedures	
5	If the engine is difficult to start, repeat (1) to (3)	5.0				
6	Check for any leaks.	1.0				
	TOTAL	14.0				

IMPORTANT: Do not attempt to start the engine under any circumstances until the air in the system has been bled out completely, otherwise the injection pump may be seriously damaged.

3.0 Routine Maintenance to be performed by Excavator Operator who had completed the TESDA core competencies standards for heavy equipment operation

Excavator
DPWH Property Code: F16/F17

Maintenance Activity: 3.8 Hydraulic system: releasing pressure

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Place attachment on the ground and shut down engine.	5.0				
2	After engine is shut down, turn ignition key to running position (Do not start engine).	0.25				
3	Keep the control lockout lever up (unlocked position) and move all control levers and pedals to release main system pressure from all lines.	1.0			Caution: Observe safety procedures at all times.	
4	Turn ignition key to off position. Remove the key and tag the machine to indicate that the unit is under service.	1.0			Visual Inspection- observe safety procedures	
5	Lower the control lockout lever (locked position).	1.0				
6	Press the pressure relief valve located on the hydraulic tank breather valve to release tank pressure.	1.0				
	TOTAL	9.25				

IMPORTANT: Release the internal pressure of the tank and hydraulic lines before removing any components of hydraulic system. Otherwise leakage may cause high pressure to build up in the hydraulic circuit. If the work cannot be completed within a short time after the system was released, the system pressure must be released again .

3.0 Routine Maintenance to be performed by Excavator Operator who had completed the TESDA core competencies standards for heavy equipment operation

Excavator
DPWH Property Code: F16/F17

Maintenance Activity: 3.9 Hydraulic oil level: check

NOTE: *When refilling the oil, use the same oil as the system is filled with.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Park the machine in service position.	1.0				
2	Move the control lockout lever down to lock the system securely and stop the engine.	1.0				
3	Open the side door on the right side of the machine and check the oil level in the sight gauge. If the level is in the center of the gauge, the level is correct.	2.0				
4	If the level if low, -press breather to release the internal pressure at the tank -unscrew the bolts -remove the cover and spring -top up the oil. Top up the oil efficiently press air breather again -check the level.	0.5 2.0 2.0 5.0 1.0	 		Caution: Observe safety procedures at all times. Visual Inspection-observe safety procedures	
5	If the level is normal, clean the dismantled parts and install.	0.25			Drain pan	1-pc
6	If the level is high, -place a suitable sized contained under the hydraulic tank -remove the protecting cap and attach drain hose which is the same hose as that used for draining engine oil -drain the oil into a container.	1.0 1.0 5.0				
TOTAL		21.75				

3.0 Routine Maintenance to be performed by Excavator Operator who had completed the TESDA core competencies standards for heavy equipment operation

Excavator
DPWH Property Code: F16/F17

Maintenance Activity: 3.10 Machine set-up for maintenance: primary work

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Park on firm, level ground.	2.0				
2	Lower bucket to ground.	1.0				
3	Allow engine to run at idle. If this is not done, heat surge may occur.	5.0			Caution: Observe safety procedures at all times.	
4	Shut engine down and remove the starter switch.	0.25			Visual Inspection-observe safety procedures	
5	Set level on lock position.	0.5				
6	Before starting maintenance work, hang up a tag on cap door or work lever.	1.0				
TOTAL		9.75				

3.0 Routine Maintenance to be performed by Excavator Operator who had completed the TESDA core competencies standards for heavy equipment operation

Excavator
DPWH Property Code: F16/F17

Maintenance Activity: 3.11 Radiator, oil cooler and condenser fins (cooling system): clean

NOTE: *Wear safety goggles or a face mask. Do not use steam to clean the air conditioner condenser.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Remove any mud or dust attached to the radiator fins and oil cooler fins with compressed air.	5.0	Pressurized air cleaner	1-pc		
2	Clean radiator and oil cooler with compressed air after detaching the clogging nets.	5.0	Pressurized air cleaner	1-pc		
3	Clean the gap between oil cooler and radiator with compressed air after opening engine hood.	5.0	Pressurized air cleaner	1-pc		
4	Clean the radiator with compressed air after detaching the air conditioner.	5.0	Pressurized air cleaner	1-pc		
5	Check the rubber hose for wear and cracks. If damaged, replace it. Check loose hose clamps.	5.0		Caution: Observe safety procedures at all times.		
TOTAL		25.0				

IMPORTANT: When using compressed air keep the nozzle at a safe distance from the fins to prevent any damage. If the fins are damaged, this may cause leakage or overheating. Under dusty environment conditions, check it more often regardless of the maintenance interval.

3.0 Routine Maintenance to be performed by Excavator Operator who had completed the TESDA core competencies standards for heavy equipment operation

Excavator
DPWH Property Code: F16/F17

Maintenance Activity: 3.12 Swing drive unit oil level: check

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Pull out oil dipstick and wipe it with a clean cloth.	1.0				
2	Insert the oil dipstick and pull it out again.	0.5				
3	Check the oil level. If the level is in the center of *C* mark, the level is correct.			Visual Inspection-observe safety procedures		
4	If the level is low, top up oil through oil fillet hole to the correct level.	3.0			SAE engine oil	1 liter
5	If the level is high, -place a suitable sized container under drain valve, -open the protection cap of drain valve, -attach drain hose and drain the oil to the correct level, -disconnect the drain hose, and -close the protecting cap.	3.0				
TOTAL		7.50				

IMPORTANT: Always clean around the oil level gauge before checking the oil level. Dirt in the oil damages the swing drive unit .

It is very important that the oil level is always correct and that it is checked at operating temperature.

Too little oil may lead to insufficient lubrication of the swing drive unit and cause costly damage.

Too much oil may lead to oil foaming, and cause the swing drive to overheat.

3.0 Routine Maintenance to be performed by Excavator Operator who had completed the TESDA core competencies standards for heavy equipment operation

Excavator
DPWH Property Code: F16/F17

Maintenance Activity: 3.13 Travel reduction device oil level: check

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Check machine is on firm level ground.	1.0				
2	Rotate the track until ports (1 thru 3) are in their proper position.	5.0				
3	Slightly loosen fill plug to allow pressurized air escape.	3.0				
4	Remove oil level plug.	1.0			Visual Inspection-observe safety procedures	
5	Check oil level. Oil should be near the bottom of the level plug opening.	0.5				
6	Add oil through the fill plug opening, if necessary.	1.0				
7	Clean and install oil and fill plugs.	3.0				
8	Repeat this procedure on the other travel reduction device.					
	TOTAL	14.50				

IMPORTANT: The gear oil is very hot after the operations. Shut all systems down and allow them to cool. Before fully removing any motor case inspection port plug etc., loosen the plug slightly to allow pressurized air to escape.

4.0 ROAD GRADER
Routine Maintenance to be performed by Road Grader Operator who had completed the TESDA core competencies standards for heavy equipment operation

4.0 Routine Maintenance to be performed by Road Grader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Road Grader
DPWH Property Code: N1

Maintenance Activity: 4.1 Before starting: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Check oil and water leak.	1.0		Visual Inspection- observe safety procedures		
2	Check and retighten nuts and bolts.	3.0	Wrench	1-pc		
3	Check electric wiring.	3.0	Pliers, Electrical tape	1-pc		
4	Check and supply coolant.	3.0			DO3 fluid	
5	Check and supply engine oil.	3.0			Engine oil	
6	Check and supply fuel.	3.0				
7	Drain water and sediment of fuel tank.	3.0				
8	Check and supply brake fluid.	3.0				
9	Check steering wheel play.	1.0		Visual Inspection- observe safety procedures		
10	Check and adjust brake pedal travel.	5.0				
11	Check and adjust braking ability.	5.0				
12	Check and adjust parking brake lever travel.	5.0				
13	Check and adjust tire pressure.	5.0	Pressure gauge	1-pc		
14	Check dust indicator.	1.0				

4.0 Routine Maintenance to be performed by Road Grader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Road Grader
DPWH Property Code: N1

Maintenance Activity: 4.1 Before starting: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
15	Check lamps.	1.0				
16	Check horn.	1.0		Visual Inspection- observe safety procedures		
17	Check exhaust gas color.	1.0				
18	Check instruments.	1.0				
19	Check previous day's defects.	1.0	Log Book			
20	Check door lock.	3.0				
21	Check wiper, window washer and defroster.	2.0		Visual Inspection- observe safety procedures		
22	Inspect float position of water separator.	2.0				
	TOTAL	56.0				

4.0 Routine Maintenance to be performed by Road Grader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Road Grader
DPWH Property Code: N1

Maintenance Activity: 4.2 Engine oil level: check

NOTE: *Position the vehicle on a level surface. The best time to check the oil level is before operating the engine or about 30 minutes after the engine stop.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Wipe the level gauge with a clean cloth, insert it into the level gauge guide and remove the gauge to check the oil level. The oil level should be between *Full* and *Low* inscribed lines.	1.0			Rag	1-pc
2	If the level is low, add engine oil through the filler cap.	1.5			EO SAE 30	1 liter
3	If contaminated engine oil is obvious when checking the oil level, replace the engine oil irrespective of the service intervals.	1.0			Visual Inspection-observe safety procedures	
TOTAL		3.5				

IMPORTANT: If the level oil is checked when the engine is stopped before sufficient rise of oil temperature, the detected level will be lower than the actual level because some oil accumulation in the engine does not flow back into the oil pan.

4.0 Routine Maintenance to be performed by Road Grader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Road Grader
DPWH Property Code: N1

Maintenance Activity: 4.3 Engine coolant: change

NOTE: *Wait until the engine and radiator cool down.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Open the heater water cock. Manual air conditioning: move the temperature control lever to maximum hot position. Automatic air conditioning: turn the ignition switch *On* and move the temperature control lever to the maximum hot position.	2.5 2.5		Caution: Observe safety procedures at all times.		
2	Open the radiator cap and drain valve. Open the drain plug on the engine block for the diesel engines.	5.0	Monkey wrench	1-pc	Drain pan	1-pc
3	Flush the cooling system by running fresh water through the radiator.	5.0	Pressurized water hose	1 assembly		
4	Securely close the drain valve (and drain plug for diesel engines).	1.0				
5	Fill the radiator with the proper mixture of coolant and water. Fill the reservoir tank up to the maximum level. Then install the radiator cap.	10.0		Visual Inspection-observe safety procedures		

4.0 Routine Maintenance to be performed by Road Grader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Road Grader
DPWH Property Code: N1

Maintenance Activity: 4.3 Engine coolant: change

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
6	Start the engine and warm it up until it reaches normal operating temperature. Then race the engine 2 or 3 times under no load. Watch the coolant temperature gauge for signs of overheating.	20.0				
7	Stop the engine after it completely cools down. Refill the radiator up to the filler opening. Fill the reservoir tank up to this maximum level.	15.0		Visual Inspection-observe safety procedures		
8	Check the drain valve (and drain plug for diesel engines) for any sign of leaks.	1.0				
TOTAL		62.0				

4.0 Routine Maintenance to be performed by Road Grader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Road Grader
DPWH Property Code: N1

Maintenance Activity: 4.4 Engine oil level: check/top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Turn on the engine until it reaches operating temperature.	3.0		Caution: Observe safety procedures at all times.		
2	Turn off the engine. Wait for a few minutes for the oil to drain back into the oil pan.	5.0		Visual Inspection-observe safety procedures		
3	Pull out the dipstick and wipe it with clean cloth.	0.5		Visual Inspection-observe safety procedures		
4	Insert the dipstick and pull it out again. It should be between the *High* and *Low* mark. If the oil is below the *Low* mark, remove the oil filler cap and pour recommended oil.	2.0	Screw driver	1-pc	SAE 30	1 liter
5	Recheck oil level with dipstick.	0.5		Visual Inspection-observe safety procedures		
TOTAL		11.0				

4.0 Routine Maintenance to be performed by Road Grader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Road Grader
DPWH Property Code: N1

Maintenance Activity: 4.5 Engine coolant level: check/top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Wait until the engine and radiator cool down.	3.0				
2	Open the radiator cap and drain valve.	1.0			Drain pan	1-pc
3	Flush the cooling system by running fresh water thru the radiator.	3.0			Soft water	
4	Securely close the drain valve.	0.5				
5	Fill the radiator with the proper mixture of coolant and water. Fill the reservoir tank to level. Tightly close the radiator and reservoir tank.	3.0			Soft water 70% Anti-freeze solution 30%	
6	Start the engine and warm it up until it reaches normal temperature.	3.0			Caution: Observe safety procedures at all times.	
7	Check the drain valve for possible leaks.	0.5			Visual Inspection- observe safety procedures	
TOTAL		14.0				

4.0 Routine Maintenance to be performed by Road Grader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Road Grader
DPWH Property Code: N1

Maintenance Activity: 4.6 Fuel tank: drain

NOTE: *If the machine is run with fuel of low quality, the fuel tank needs to be drained.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Place a suitable sized container under drain hose.	1.0			Drain pan	1-pc
2	Open the drain valve cap at the bottom of the tank.	2.0				
3	Open the filler cap.	0.5			Caution: Observe safety procedures at all times.	
4	Connect the drain hose and drain off any sediment.	4.0				
5	Disconnect the drain hose and install the valve cap again.	2.0			Visual Inspection- observe safety procedures	
6	Close the filler cap.	0.5				
TOTAL		10.0				

IMPORTANT: Take care of filters/oil/liquids in an environmentally safe way.

4.0 Routine Maintenance to be performed by Road Grader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Road Grader
DPWH Property Code: N1

Maintenance Activity: 4.7 Fuel system: air bleeding

NOTE: *Air must be bled out the fuel injection system whenever the machine runs out of fuel while the engine is running.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Turn priming pump counterclockwise to unlock the plunger.	1.0				
2	Push priming pump until a heavy resistance can be felt in the priming pump.	3.0				
3	Push priming pump fully and turn it clockwise to lock the plunger.	1.0			Caution: Observe safety procedures at all times.	
4	Start the engine and let it run idle for 3 minutes.	3.0			Visual Inspection- observe safety procedures	
5	If the engine is difficult to start, repeat (1) to (3)	5.0				
6	Check for any leaks.	1.0				
	TOTAL	14.0				

IMPORTANT: Do not attempt to start the engine under any circumstances until the air in the system has been bled out completely, otherwise the injection pump can be seriously damaged.

4.0 Routine Maintenance to be performed by Road Grader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Road Grader
DPWH Property Code: N1

Maintenance Activity: 4.8 Hydraulic system: releasing pressure

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Place attachment on the ground and shut down engine.	5.0				
2	After engine is shut down, turn ignition key to running position (Do not start engine).	0.25				
3	Keep the control lockout lever up (unlocked position) and move all control levers and pedals to release main system pressure from all lines.	1.0			Caution: Observe safety procedures at all times.	
4	Turn ignition key to off position. Remove the key and tag the machine to indicate that the unit is under service.	1.0			Visual Inspection- observe safety procedures	
5	Lower the control lockout lever (locked position).	1.0				
6	Press the pressure relief valve located on the hydraulic tank breather valve to release tank pressure.	1.0				
	TOTAL	9.25				

IMPORTANT: Release the internal pressure of the tank and hydraulic lines before removing any components of hydraulic system. Otherwise leakage may cause high pressure to build up in the hydraulic circuit. If the work cannot be completed within a short time after the system was released, the system pressure must be released again.

4.0 Routine Maintenance to be performed by Road Grader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Road Grader
DPWH Property Code: N1

Maintenance Activity: 4.9 Hydraulic oil level: check

NOTE: *When refilling the oil, use the same oil as the system is filled with.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Park the machine in service position.	1.0				
2	Move the control lockout lever down to lock the system securely and stop the engine.	1.0				
3	Open the side door on the right side of the machine and check the oil level in the sight gauge. If the level is in the center of the gauge, the level is correct.	2.0				
4	If the level if low, -press breather to release the internal pressure at the tank. -unscrew the bolts -remove the cover and spring -top up the oil. Top up the oil efficiently press air breather again -check the level.	0.5 2.0 2.0 5.0 1.0	 		Caution: Observe safety procedures at all times. Visual Inspection-observe safety procedures	
5	If the level is normal, clean the dismantled parts and install.	0.25			Drain pan	1-pc
6	If the level is high, -place a suitable sized contained under the hydraulic tank -remove the protecting cap and attach drain hose which is the same hose as that used for draining engine oil -drain the oil into a container.	1.0 1.0 5.0				
TOTAL		21.75				

4.0 Routine Maintenance to be performed by Road Grader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Road Grader
DPWH Property Code: N1

Maintenance Activity: 4.10 Machine set-up for maintenance: primary work

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Park on firm, level ground.	2.0				
2	Lower bucket to ground.	1.0				
3	Allow engine to run at idle. If this is not done, heat surge may occur.	5.0			Caution: Observe safety procedures at all times. Visual Inspection-observe safety procedures	
4	Shut engine down and remove the starter switch.	0.25				
5	Set level on lock position.	0.5				
6	Before starting maintenance work, hang up a tag on cap door or work lever.	1.0				
TOTAL		9.75				

4.0 Routine Maintenance to be performed by Road Grader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Road Grader
DPWH Property Code: N1

Maintenance Activity: 4.11 Radiator, oil cooler and condenser fins (cooling system): clean

NOTE: *Wear safety goggles or a face mask. Do not use steam to clean the air conditioner condenser.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Remove any mud or dust attached to the radiator fins and oil cooler fins with compressed air.	5.0	Pressurized air cleaner	1-pc		
2	Clean radiator and oil cooler with compressed air after detaching the clogging nets.	5.0	Pressurized air cleaner	1-pc		
3	Clean the gap between oil cooler and radiator with compressed air after opening engine hood.	5.0	Pressurized air cleaner	1-pc		
4	Clean the radiator with compressed air after detaching the air conditioner.	5.0	Pressurized air cleaner	1-pc		
5	Check the rubber hose for wear and cracks. If damaged, replace it. Check loose hose clamps.	5.0		Caution: Observe safety procedures at all times.		
TOTAL		25.0				

IMPORTANT: When using compressed air keep the nozzle at a safe distance from the fins to prevent any damage. If the fins are damaged, this may cause leakage or overheating. Under dusty environment conditions, check it more often regardless of the maintenance interval.

5.0 VIBRATORY ROLLER
Routine Maintenance to be performed by Vibratory Roller Operator who had completed the TESDA core competencies standards for heavy equipment operation

5.0 Routine Maintenance to be performed by Vibratory Roller Operator who had completed the TESDA core competencies standards for heavy equipment operation

Vibratory Roller
DPWH Property Code: Z18

Maintenance Activity: 5.1 Air filter cartridge: replace

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Switch off diesel engine and remove ignition key.	1.0				
2	Allow machine to cool down under a temperature of 30°C (86°F).	10.0		Caution: Observe safety procedures at all times.		
3	Fold up clip.	3.0				
4	Remove dust container.	3.0				
5	Clean the inside of the dust collector.	3.0	Pressurized air cleaner	1-unit		
6	Replace the air filter cartridge.	2.0			Air filter cartridge	1-pc
7	Re-assemble in reverse order.	5.0				
TOTAL		27.0				

5.0 Routine Maintenance to be performed by Vibratory Roller Operator who had completed the TESDA core competencies standards for heavy equipment operation

Vibratory Roller
DPWH Property Code: Z18

Maintenance Activity: 5.2 Before starting: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Check oil and water leak.	1.0		Visual Inspection-observe safety procedures		
2	Check and retighten nuts and bolts.	3.0	Wrench	1-pc		
3	Check electric wiring.	3.0	Pliers, Electrical tape	1-pc		
4	Check and supply coolant.	3.0			DO3 fluid	
5	Check and supply engine oil.	3.0			Engine oil	
6	Check and supply fuel.	3.0				
7	Drain water and sediment of fuel tank.	3.0				
8	Check and supply brake fluid.	3.0				
9	Check steering wheel play.	1.0		Visual Inspection-observe safety procedures		
10	Check and adjust brake pedal travel.	5.0				
11	Check and adjust braking ability.	5.0				
12	Check and adjust parking brake lever travel.	5.0				
13	Check and adjust tire pressure.	5.0	Pressure gauge	1-pc		
14	Check dust indicator.	1.0				

5.0 Routine Maintenance to be performed by Vibratory Roller Operator who had completed the TESDA core competencies standards for heavy equipment operation

Vibratory Roller
DPWH Property Code: Z18

Maintenance Activity: 5.2 Before starting: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
15	Check lamps.	1.0				
16	Check horn.	1.0				
17	Check exhaust gas color.	1.0			Visual Inspection-observe safety procedures	
18	Check instruments.	1.0				
19	Check previous day's defects.	1.0	Log Book			
20	Check door lock.	3.0				
21	Check wiper, window washer and defroster.	2.0			Visual Inspection-observe safety procedures	
22	Inspect float position of water separator.	2.0				
TOTAL		56.0				

5.0 Routine Maintenance to be performed by Vibratory Roller Operator who had completed the TESDA core competencies standards for heavy equipment operation

Vibratory Roller
DPWH Property Code: Z18

Maintenance Activity: 5.3 Engine coolant level: check/top-up

NOTE: *Correct coolant level: Centre of inspection glass on compensator tank.*

Only check the coolant level when the engine is cold.

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Switch off diesel engine and remove ignition key.	1.0				
2	In case of a lack of coolant, only fill up coolant in the specified concentration through filling opening at the compensator tank.				Visual Inspection-observe safety procedures	
3	In case of bigger coolant losses, troubleshoot to eliminate cause.					
TOTAL		1.0				

5.0 Routine Maintenance to be performed by Vibratory Roller Operator who had completed the TESDA core competencies standards for heavy equipment operation

Vibratory Roller
DPWH Property Code: Z18

Maintenance Activity: 5.4 Engine coolant: change

NOTE: *Correct coolant level: Centre of inspection glass on compensator tank.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Switch off diesel engine and remove ignition key.	1.0				
2	Open sealing cap at the compensator tank.	0.5		Visual Inspection-observe safety procedures		
3	Remove the drain plug from the radiator and discharge the coolant in a provide receptacle.	0.5				
4	Dismount lower coolant hose and discharge coolant into a provided receptacle.	1.0	Screw driver	1-pc	Drain pan	1-pc
5	Tighten drain plug and install coolant hose to the connection piece.	2.0	Screw driver	1-pc		
6	Loosen up vent screw on the radiator in 2 turns (do not remove).	1.0	Screw driver	1-pc		
7	Open the hollow-core screw of the bleed pipe at the engine block by 2 turns (do not remove).	1.0				
8	Fill in coolant in the compensator tank until coolant runs out of the vent screw.	3.0			Coolant	
9	Tighten vent screw at the radiator.	1.0	Screw driver			

5.0 Routine Maintenance to be performed by Vibratory Roller Operator who had completed the TESDA core competencies standards for heavy equipment operation

Vibratory Roller
DPWH Property Code: Z18

Maintenance Activity: 5.4 Engine coolant: change

Activity Number	Activity	Duration (minutes)	Tool		Materials	
			Tool Class	No. of Unit	Material	No. of unit
10	Fill in coolant in the compensator tank until it runs out of the hollow-core screw on the engine block.	2.0			Coolant	
11	Tighten the hollow-core screw.	1.0	Screw driver	1-pc		
12	Top-up coolant to the center of the inspection glass.	1.0			Coolant	
13	Close the filling opening with the sealing cap.	1.0			Sealing cap	1-pc
14	Start the diesel engine until it reaches operating temperature.	1.0				
15	Switch off diesel engine and remove ignition key.	1.0		Visual Inspection-observe safety procedures		
16	Check coolant level when the motor is cold. Fill up as necessary.	1.0				
TOTAL		19.0				

5.0 Routine Maintenance to be performed by Vibratory Roller Operator who had completed the TESDA core competencies standards for heavy equipment operation

Vibratory Roller
DPWH Property Code: Z18

Maintenance Activity: 5.5 Engine oil level: check

NOTE: *Position the vehicle on a level surface. The best time to check the oil level is before operating the engine or about 30 minutes after stop of engine.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Wipe the level gauge with a clean cloth, insert it into the level gauge guide and remove the gauge to check the oil level. The oil level should be between *Full* and *Low* inscribed lines.	1.0			Rag	1-pc
2	If the level is low, add engine oil through the filler cap.	1.5			EO SAE 30	1 liter
3	If contaminated engine oil is obvious when checking the oil level, replace the engine oil irrespective of the service intervals.	1.0			Visual Inspection-observe safety procedures	
TOTAL		3.5				

IMPORTANT: If the level oil is checked when the engine is stopped before sufficient rise of oil temperature, the detected level will be lower than the actual level because some oil accumulation in the engine does not flow back into the oil pan.

5.0 Routine Maintenance to be performed by Vibratory Roller Operator who had completed the TESDA core competencies standards for heavy equipment operation

Vibratory Roller
DPWH Property Code: Z18

Maintenance Activity: 5.6 Filter for sprinkling: clean

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Switch off diesel engine and remove ignition key.	1.0				
2	Unscrew filter head at the water tank and remove it together with the pressure spring (observe gasket ring on filter head).	5.0	Screw driver	1-pc		
3	Clean filter. Insert with pressure spring.	1.0				
4	Re-assemble in reverse order.	1.0				
TOTAL		8.0				

5.0 Routine Maintenance to be performed by Vibratory Roller Operator who had completed the TESDA core competencies standards for heavy equipment operation

Vibratory Roller
DPWH Property Code: Z18

Maintenance Activity: 5.7 Hydraulic oil level: check/fill

NOTE: *Check only when the engine is cooled down to approximately 20°C (68°F). Correct the oil level is on the center of inspection glass.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Switch off diesel engine and remove ignition key.	2.0				
	If the oil level is too low, fill in appropriate oil through filling opening.			Visual Inspection-observe safety procedures		
	In case of bigger oil losses, troubleshoot and eliminate the cause.					
TOTAL		2.0				

5.0 Routine Maintenance to be performed by Vibratory Roller Operator who had completed the TESDA core competencies standards for heavy equipment operation

Vibratory Roller
DPWH Property Code: Z18

Maintenance Activity: 5.8 Hydraulic oil and ventilation filter: change

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Switch off diesel engine and remove ignition key.	2.0				
2	Allow machine to cool down under a temperature of 30°C (86°F).	10.0				
3	Unscrew oil drain screw down on the oil tank and discharge the used oil. Drain into a provided receptacle.	2.0	Screw driver	1-pc		
4	Remove the ventilation filter and replace it with a new filter.	3.0			Ventilation filter	1-pc
5	Screw in oil drain screw and tighten.	2.0	Screw driver	1-pc		
6	Fill in specified oil through filling opening to the center of the inspection glass.	3.0			Hydraulic oil	
7	Start the diesel engine, actuate drive lever with low engine speed until the drive activates. Actuate the steering pipes and hoses that are filled with oil and purged.	5.0				
8	Check the oil level of the diesel engine with the engine at a standstill. If necessary, fill up to the center of the inspection glass.	2.0		Visual Inspection-observe safety procedures		
9	Check the hydraulic system for leaks.	1.0				
TOTAL		30.0				

5.0 Routine Maintenance to be performed by Vibratory Roller Operator who had completed the TESDA core competencies standards for heavy equipment operation

Vibratory Roller
DPWH Property Code: Z18

Maintenance Activity : 5.9 Pivoted bearing and steering cylinder bolt: lubricate

NOTE: *Secure machine against rolling away.*

Prior to maintenance work, apply the safety strut in the hazard area.

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Switch off diesel engine and remove ignition key.	2.0	Lubricating gun	1-pc		
2	Lubricate the lubrication nipple for pivoted bearing.	5.0	Lubricating gun	1-pc		
3	Lubricate the lubrication nipple for steering cylinder bolt (2 nipples).	5.0	 	Caution: Observe safety procedures at all times. Visual Inspection-observe safety procedures		
TOTAL		12.0				

5.0 Routine Maintenance to be performed by Vibratory Roller Operator who had completed the TESDA core competencies standards for heavy equipment operation

Vibratory Roller
DPWH Property Code: Z18

Maintenance Activity: 5.10 Radiator: check

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Switch of diesel engine and remove ignition key.	1.0				
2	Allow machine to cool down under a temperature of 30°C (86°F)	10.0		Visual Inspection-observe safety procedures		
3	Check the cooling fins of the radiator for contamination. If the cooling unit is contaminated, it must be cleaned thoroughly and immediately.	5.0				
4	Clean the radiator carefully with a high pressure cleaner.	5.0	Pressurized water cleaner	1-pc		
TOTAL		21.0				

5.0 Routine Maintenance to be performed by Vibratory Roller Operator who had completed the TESDA core competencies standards for heavy equipment operation

Vibratory Roller
DPWH Property Code: Z18

Maintenance Activity: 5.11 Spray nozzles: clean

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Switch off engine and remove ignition key.	1.0				
2	Loosen the cap nut and remove it together with sprinkler nozzle and filter.	1.0				
3	Remove the filter and the sprinkler nozzle from the cap nut and clean.	2.0				
4	Unscrew the cap nut.	1.0			Visual Inspection-observe safety procedures	
5	Remove valve insert and membrane.	1.0				
6	Flush the housing with the sprinkling system switched on.	3.0				
7	Re-assemble in reverse order.	5.0				
TOTAL		14.0				

5.0 Routine Maintenance to be performed by Vibratory Roller Operator who had completed the TESDA core competencies standards for heavy equipment operation

Vibratory Roller
DPWH Property Code: Z18

Maintenance Activity: 5.12 Water separator: drain

NOTE: *Risk of injury due to fire and explosion. Catch spilling fuel or water sump and do not allow to seep away into the ground.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Open drain valve.	1.0				
2	Allow water sump to drain off.	5.0			Drain pan	1-pc
3	Close drain valve.	1.0				
TOTAL		7.0				

IMPORTANT: To avoid damage to the diesel engine, the water separator must be drained at the drain valve depending on the water content in the fuel. If the fuel has a high water content, the water separator must be drained more often.

5.0 Routine Maintenance to be performed by Vibratory Roller Operator who had completed the TESDA core competencies standards for heavy equipment operation

Vibratory Roller
DPWH Property Code: Z18

Maintenance Activity: 5.13 Water sprinkling unit: clean

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Switch off engine and remove ignition key.	1.0				
2	Remove the valve. Insert the membrane as well as the sprinkler nozzles with filter in the sprinkler nozzle housing.	2.0				
3	Unscrew filter head at the water tank and remove it together with the pressure spring (observe gasket ring on filter head).	2.0	Screw driver	1-pc		
4	Pull the filter. Insert it from the water tank.	1.0				
5	Clean water tank thoroughly with pressure washer (if available) or water jet.	5.0	Pressurized water cleaner	1-pc		
6	Flush the sprinkler nozzle housings and the hoses.	3.0	Pressurized water cleaner	1-pc		
7	Re-assemble in reverse order.	5.0				
TOTAL		19.0				

6.0 LOADER
Routine Maintenance to be performed by Loader Operator who had completed the TESDA core competencies standards for heavy equipment operation

6.0 Routine Maintenance to be performed by Loader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Loader
DPWH Property Code: L2

Maintenance Activity: 6.1 Accumulator: handling and releasing pressure

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Lower the attachment completely to the ground.	1.0				
2	Keep all the attachments, such as hammer, closed.	1.0				
3	After turning off the engine, turn the ignition key to running position.	1.0				
4	Move the control lockout lever up to unlock the hydraulic system.	1.0				
5	To release the pressure in the control circuits and accumulator, move the operating levers and pedals forward/reward and left/right to their respective end positions.	1.0	 		Caution: Observe safety procedures at all times. Visual Inspection- observe safety procedures	
6	Turn the ignition key to stop position.	1.0				
7	Move the control lockout lever down to lock the hydraulic system securely.	1.0				
8	To release the pressure completely, loosen the hose connection slowly when you disconnect the accumulator. Step aside in this case as oil should spurt out.	1.0				
	TOTAL	8.0				

IMPOTANT: The accumulator is charged with highly pressured nitrogen gas. Handle it with care. Otherwise, it can cause serious accidentals or injuries.

6.0 Routine Maintenance to be performed by Loader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Loader
DPWH Property Code: L2

Maintenance Activity: 6.2 Before starting: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Check oil and water leak.	1.0			Visual Inspection- observe safety procedures	
2	Check and retighten nuts and bolts.	3.0	Wrench	1-pc		
3	Check electric wiring.	3.0	Pliers, Electrical tape	1-pc		
4	Check and supply coolant.	3.0			DO3 fluid	
5	Check and supply engine oil.	3.0			Engine oil	
6	Check and supply fuel.	3.0				
7	Drain water and sediment of fuel tank.	3.0				
8	Check and supply brake fluid.	3.0				
9	Check steering wheel play.	1.0			Visual Inspection- observe safety procedures	
10	Check and adjust brake pedal travel.	5.0				
11	Check and adjust braking ability.	5.0				
12	Check and adjust parking brake lever travel.	5.0				
13	Check and adjust tire pressure.	5.0	Pressure gauge	1-pc		
14	Check dust indicator.	1.0				

6.0 Routine Maintenance to be performed by Loader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Loader
DPWH Property Code: L2

Maintenance Activity: 6.2 Before starting: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
15	Check lamps.	1.0				
16	Check horn.	1.0			Visual Inspection-observe safety procedures	
17	Check exhaust gas color.	1.0				
18	Check instruments.	1.0				
19	Check previous day's defects.	1.0	Log Book			
20	Check door lock.	3.0				
21	Check wiper, window washer and defroster.	2.0			Visual Inspection-observe safety procedures	
22	Inspect float position of water separator.	2.0				
TOTAL		56.0				

6.0 Routine Maintenance to be performed by Loader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Loader
DPWH Property Code: L2

Maintenance Activity: 6.3 Engine oil level: check/top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Turn on the engine until it reaches operating temperature.	3.0			Caution: Observe safety procedures at all times.	
2	Turn off the engine. Wait for a few minutes for the oil to drain back into the oil pan.	5.0			Visual Inspection-observe safety procedures	
3	Pull out the dipstick and wipe it with clean cloth.	0.5			Visual Inspection-observe safety procedures	
4	Insert the dipstick and pull it out again. It should be between the *High* and *Low* mark. If the oil is below the *Low* mark, remove the oil filler cap and pour recommended oil.	2.0	Screw driver	1-pc	SAE 30	1 liter
5	Recheck oil level with dipstick.	0.5			Visual Inspection-observe safety procedures	
TOTAL		11.0				

6.0 Routine Maintenance to be performed by Loader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Loader
DPWH Property Code: L2

Maintenance Activity: 6.4 Engine coolant: change

NOTE: *Wait until the engine and radiator cool down.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Open the heater water cock. Manual air conditioning: move the temperature control lever to maximum hot position. Automatic air conditioning: turn the ignition switch *On* and move the temperature control lever to the maximum hot position.	2.5 2.5		Caution: Observe safety procedures at all times.		
2	Open the radiator cap and drain valve. Open the drain plug on the engine block for the diesel engines.	5.0	Monkey wrench	1-pc	Drain pan	1-pc
3	Flush the cooling system by running fresh water through the radiator.	5.0	Pressurized water hose	1 assembly		
4	Securely close the drain valve (and drain plug for diesel engines).	1.0				
5	Fill the radiator with the proper mixture of coolant and water. Fill the reservoir tank up to the maximum level. Then install the radiator cap.	10.0		Visual Inspection-observe safety procedures		

6.0 Routine Maintenance to be performed by Loader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Loader
DPWH Property Code: L2

Maintenance Activity: 6.4 Engine coolant: change

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
6	Start the engine and warm it up until it reaches normal operating temperature. Then race the engine 2 or 3 times under no load. Watch the coolant temperature gauge for signs of overheating.	20.0				
7	Stop the engine after it completely cools down. Refill the radiator up to the filler opening. Fill the reservoir tank up to this maximum level.	15.0		Visual Inspection-observe safety procedures		
8	Check the drain valve (and drain plug for diesel engines) for any sign of leaks.	1.0				
TOTAL		62.0				

6.0 Routine Maintenance to be performed by Loader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Loader
DPWH Property Code: L2

Maintenance Activity: 6.5 Engine coolant level: check/top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Wait until the engine and radiator cool down.	3.0				
2	Open the radiator cap and drain valve.	1.0			Drain pan	1-pc
3	Flush the cooling system by running fresh water thru the radiator.	3.0			Soft water	
4	Securely close the drain valve.	0.5				
5	Fill the radiator with the proper mixture of coolant and water. Fill the reservoir tank to level. Tightly close the radiator and reservoir tank.	3.0			Soft water 70% Anti-freeze solution 30%	
6	Start the engine and warm it up until it reaches normal temperature.	3.0			Caution: Observe safety procedures at all times.	
7	Check the drain valve for possible leaks.	0.5			Visual Inspection- observe safety procedures	
TOTAL		14.0				

6.0 Routine Maintenance to be performed by Loader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Loader
DPWH Property Code: L2

Maintenance Activity: 6.6 Fuel tank: drain

NOTE: *If the machine is run with fuel of low quality, the fuel tank needs to be drained.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Place a suitable sized container under drain hose.	1.0			Drain pan	1-pc
2	Open the drain valve cap at the bottom of the tank.	2.0				
3	Open the filler cap.	0.5			Caution: Observe safety procedures at all times.	
4	Connect the drain hose and drain off any sediment.	4.0				
5	Disconnect the drain hose and install the valve cap again.	2.0			Visual Inspection- observe safety procedures	
6	Close the filler cap.	0.5				
TOTAL		10.0				

IMPORTANT: Take care of filters/oil/liquids in an environmentally safe way.

6.0 Routine Maintenance to be performed by Loader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Loader
DPWH Property Code: L2

Maintenance Activity: 6.7 Fuel system: air bleeding

NOTE: *Air must be bled out the fuel injection system whenever the machine runs out of fuel while the engine is running.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Turn priming pump counterclockwise to unlock the plunger.	1.0				
2	Push priming pump until a heavy resistance can be felt in the priming pump.	3.0				
3	Push priming pump fully and turn it clockwise to lock the plunger.	1.0			Caution: Observe safety procedures at all times.	
4	Start the engine and let it run idle for 3 minutes.	3.0			Visual Inspection- observe safety procedures	
5	If the engine is difficult to start, repeat (1) to (3)	5.0				
6	Check for any leaks.	1.0				
TOTAL		14.0				

IMPORTANT: Do not attempt to start the engine under any circumstances until the air in the system has been bled out completely, otherwise the injection pump can be seriously damaged.

6.0 Routine Maintenance to be performed by Loader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Loader
DPWH Property Code: L2

Maintenance Activity: 6.8 Hydraulic system: releasing pressure

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Place attachment on the ground and shut down engine.	5.0				
2	After engine is shut down, turn ignition key to running position (Do not start engine).	0.25				
3	Keep the control lockout lever up (unlocked position) and move all control levers and pedals to release main system pressure from all lines.	1.0			Caution: Observe safety procedures at all times.	
4	Turn ignition key to off position. Remove the key and tag the machine to indicate that the unit is under service.	1.0			Visual Inspection- observe safety procedures	
5	Lower the control lockout lever (locked position).	1.0				
6	Press the pressure relief valve located on the hydraulic tank breather valve to release tank pressure.	1.0				
TOTAL		9.25				

IMPORTANT: Release the internal pressure of the tank and hydraulic lines before removing any components of hydraulic system. Otherwise leakage may cause high pressure to build up in the hydraulic circuit. If the work cannot be completed within a short time after the system was released, the system pressure must be released again.

6.0 Routine Maintenance to be performed by Loader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Loader
DPWH Property Code: L2

Maintenance Activity: 6.9 Hydraulic oil level: check

NOTE: *When refilling the oil, use the same oil as the system is filled with.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Park the machine in service position.	1.0				
2	Move the control lockout lever down to lock the system securely and stop the engine.	1.0				
3	Open the side door on the right side of the machine and check the oil level in the sight gauge. If the level is in the center of the gauge, the level is correct.	2.0				
4	If the level if low, -press breather to release the internal pressure at the tank -unscrew the bolts -remove the cover and spring -top up the oil. Top up the oil efficiently press air breather again -check the level.	0.5 2.0 2.0 5.0 1.0	 		Caution: Observe safety procedures at all times. Visual Inspection-observe safety procedures	
5	If the level is normal, clean the dismantled parts and install.	0.25			Drain pan	1-pc
6	If the level is high, -place a suitable sized contained under the hydraulic tank -remove the protecting cap and attach drain hose which is the same hose as that used for draining engine oil -drain the oil into a container.	1.0 1.0 5.0				
	TOTAL	21.75				

6.0 Routine Maintenance to be performed by Loader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Loader
DPWH Property Code: L2

Maintenance Activity: 6.10 Machine set-up for maintenance: primary work

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Park on firm, level ground.	2.0				
2	Lower bucket to ground.	1.0				
3	Allow engine to run at idle. If this is not done, heat surge may occur.	5.0			Caution: Observe safety procedures at all times. Visual Inspection-observe safety procedures	
4	Shut engine down and remove the starter switch.	0.25				
5	Set level on lock position.	0.5				
6	Before starting maintenance work, hang up a tag on cap door or work lever.	1.0				
	TOTAL	9.75				

6.0 Routine Maintenance to be performed by Loader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Loader
DPWH Property Code: L2

Maintenance Activity: 6.11 Radiator, oil cooler and condenser fins (cooling system): clean

NOTE: *Wear safety goggles or a face mask. Do not use steam to clean the air conditioner condenser.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Remove any mud or dust attached to the radiator fins and oil cooler fins with compressed air.	5.0	Pressurized air cleaner	1-pc		
2	Clean radiator and oil cooler with compressed air after detaching the clogging nets.	5.0	Pressurized air cleaner	1-pc		
3	Clean the gap between oil cooler and radiator with compressed air after opening engine hood.	5.0	Pressurized air cleaner	1-pc		
4	Clean the radiator with compressed air after detaching the air conditioner.	5.0	Pressurized air cleaner	1-pc		
5	Check the rubber hose for wear and cracks. If damaged, replace it. Check loose hose clamps.	5.0		Caution: Observe safety procedures at all times.		
TOTAL		25.0				

IMPORTANT: When using compressed air keep the nozzle at a safe distance from the fins to prevent any damage. If the fins are damaged, this may cause leakage or overheating. Under dusty environment conditions, check it more often regardless of the maintenance interval.

6.0 Routine Maintenance to be performed by Loader Operator who had completed the TESDA core competencies standards for heavy equipment operation

Loader
DPWH Property Code: L2

Maintenance Activity: 6.12 Travel reduction device oil level: check

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Check machine is on firm level ground.	1.0				
2	Rotate the track until ports (1 thru 3) are in their proper position.	5.0				
3	Slightly loosen fill plug to allow pressurized air escape.	3.0				
4	Remove oil level plug.	1.0		Visual Inspection-observe safety procedures		
5	Check oil level. Oil should be near the bottom of the level plug opening.	0.5				
6	Add oil through the fill plug opening, if necessary.	1.0				
7	Clean and install oil and fill plugs.	3.0				
8	Repeat this procedure on the other travel reduction device.					
TOTAL		14.50				

IMPORTANT: The gear oil is very hot after the operations. Shut all systems down and allow them to cool. Before fully removing any motor case inspection port plug etc., loosen the plug slightly to allow pressurized air to escape.

7.0 HYDRAULIC CRANE
Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.1 Air filter cartridge: replace

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Switch off diesel engine and remove ignition key.	1.0				
2	Allow machine to cool down under a temperature of 30°C (86°F).	10.0		Caution: Observe safety procedures at all times.		
3	Fold up clip.	3.0				
4	Remove dust container.	3.0				
5	Clean the inside of the dust collector.	3.0	Pressurized air cleaner	1-unit		
6	Replace the air filter cartridge.	2.0			Air filter cartridge	1-pc
7	Re-assemble in reverse order.	5.0				
TOTAL		27.0				

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.2 Accumulator: handling and releasing pressure

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Lower the attachment completely to the ground.	1.0				
2	Keep all the attachments, such as hammer, closed.	1.0				
3	After turning off the engine, turn the ignition key to running position.	1.0				
4	Move the control lockout lever up to unlock the hydraulic system.	1.0				
5	To release the pressure in the control circuits and accumulator, move the operating levers and pedals forward/reward and left/right to their respective end positions.	1.0	 		Caution: Observe safety procedures at all times. Visual Inspection- observe safety procedures	
6	Turn the ignition key to stop position.	1.0				
7	Move the control lockout lever down to lock the hydraulic system securely.	1.0				
8	To release the pressure completely, loosen the hose connection slowly when you disconnect the accumulator. Step aside in this case as oil should spurt out.	1.0				
	TOTAL	8.0				

IMPOTANT: The accumulator is charged with highly pressured nitrogen gas. Handle it with care. Otherwise, it can cause serious accidentals or injuries.

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.3 Battery: check

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Tighten battery cables and terminals.	0.5			Caution: Observe safety procedures at all times.	
2	Any evidence of corrosion around the battery posts or terminals should be removed using a solution of household baking soda and warm water.	2.0			Water and baking soda solution	
3	After the battery terminals are dry, cover it with a light coating of grease.	1.5			Grease	
	TOTAL	4.0				

IMPOTANT: Keep the battery clean. Keep the battery clean.
Do not allow battery acid to contact your skin eyes, clothing or paint finish.

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.4 Before starting: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Check oil and water leak.	1.0		Visual Inspection- observe safety procedures		
2	Check and retighten nuts and bolts.	3.0	Wrench	1-pc		
3	Check electric wiring.	3.0	Pliers, Electrical tape	1-pc		
4	Check and supply coolant.	3.0			DO3 fluid	
5	Check and supply engine oil.	3.0			Engine oil	
6	Check and supply fuel.	3.0				
7	Drain water and sediment of fuel tank.	3.0				
8	Check and supply brake fluid.	3.0				
9	Check steering wheel play.	1.0		Visual Inspection- observe safety procedures		
10	Check and adjust brake pedal travel.	5.0				
11	Check and adjust braking ability.	5.0				
12	Check and adjust parking brake lever travel.	5.0				
13	Check and adjust tire pressure.	5.0	Pressure gauge	1-pc		
14	Check dust indicator.	1.0				

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.4 Before starting: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
15	Check lamps.	1.0				
16	Check horn.	1.0		Visual Inspection- observe safety procedures		
17	Check exhaust gas color.	1.0				
18	Check instruments.	1.0				
19	Check previous day's defects.	1.0	Log Book			
20	Check door lock.	3.0				
21	Check wiper, window washer and defroster.	2.0		Visual Inspection- observe safety procedures		
22	Inspect float position of water separator.	2.0				
	TOTAL	56.0				

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.5 Brake and clutch master cylinder oil level: top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Open the hood of the vehicle.	0.5				
2	Open the cover of the clutch master cylinder assembly.	0.5			Visual Inspection-observe safety procedures	
3	Check the fluid on the cylinder assembly.	0.5			DOT-3 fluid	1 liter
4	Add fluid on the cylinder if it is below minimum level.	1.0				
5	Close the cover of the cylinder.	0.5			Visual Inspection-observe safety procedures	
6	Step on the clutch pedal if its working and look if there is any leak on the cylinder.	3.0				
TOTAL		6.0				

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.6 During engine warm-up: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Walk around inspection for leaks.	1.0		Visual Inspection-observe safety procedures		
2	Check the engine for noise vibration and exhaust gas.	1.0		Report any unusual noise immediately.		
3	Check for the instruments and accessories, light, horn, wiper and oil pressure.	1.0		Visual Inspection-observe safety procedures		
4	Check the operation and clearance, clutch, brake and gear shift lube points.	2.0		Visual Inspection-observe safety procedures		
5	Record the result of checkpoints in the yellow book.	2.0	Yellow book	1 set		
TOTAL		7.0				

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.7 Engine oil level: check/top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Turn on the engine until it reaches operating temperature.	3.0			Caution: Observe safety procedures at all times.	
2	Turn off the engine. Wait for a few minutes for the oil to drain back into the oil pan.	5.0			Visual Inspection-observe safety procedures	
3	Pull out the dipstick and wipe it with clean cloth.	0.5			Visual Inspection-observe safety procedures	
4	Insert the dipstick and pull it out again. It should be between the *High* and *Low* mark. If the oil is below the *Low* mark, remove the oil filler cap and pour recommended oil.	2.0	Screw driver	1-pc	SAE 30	1 liter
5	Recheck oil level with dipstick.	0.5			Visual Inspection-observe safety procedures	
TOTAL		11.0				

IMPORTANT: Oil level should be checked regularly. Operating with insufficient amount of oil can damage the engine, and such damage is not covered by warranty. If is normal to add some oil between oil changes or during the break-in period, depending on the severity of operating conditions.

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.8 Engine coolant level: check/top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Wait until the engine and radiator cool down.	3.0				
2	Open the radiator cap and drain valve.	1.0			Drain pan	1-pc
3	Flush the cooling system by running fresh water thru the radiator.	3.0			Soft water	
4	Securely close the drain valve.	0.5				
5	Fill the radiator with the proper mixture of coolant and water. Fill the reservoir tank to level. Tightly close the radiator and reservoir tank.	3.0			Soft water 70% Anti-freeze solution 30%	
6	Start the engine and warm it up until it reaches normal temperature.	3.0			Caution: Observe safety procedures at all times.	
7	Check the drain valve for possible leaks.	0.5			Visual Inspection-observe safety procedures	
TOTAL		14.0				

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.9 Engine coolant: change

NOTE: *Correct coolant level: Centre of inspection glass on compensator tank.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Switch off diesel engine and remove ignition key.	1.0				
2	Open sealing cap at the compensator tank.	0.5		Visual Inspection-observe safety procedures		
3	Remove the drain plug from the radiator and discharge the coolant in a provide receptacle.	0.5				
4	Dismount lower coolant hose and discharge coolant into a provided receptacle.	1.0	Screw driver	1-pc	Drain pan	1-pc
5	Tighten drain plug and install coolant hose to the connection piece.	2.0	Screw driver	1-pc		
6	Loosen up vent screw on the radiator in 2 turns (do not remove).	1.0	Screw driver	1-pc		
7	Open the hollow-core screw of the bleed pipe at the engine block by 2 turns (do not remove).	1.0				
8	Fill in coolant in the compensator tank until coolant runs out of the vent screw.	3.0			Coolant	
9	Tighten vent screw at the radiator.	1.0	Screw driver			

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.9 Engine coolant: change

Activity Number	Activity	Duration (minutes)	Tool		Materials	
			Tool Class	No. of Unit	Material	No. of unit
10	Fill in coolant in the compensator tank until it runs out of the hollow-core screw on the engine block.	2.0			Coolant	
11	Tighten the hollow-core screw.	1.0	Screw driver	1-pc		
12	Top-up coolant to the center of the inspection glass.	1.0			Coolant	
13	Close the filling opening with the sealing cap.	1.0			Sealing cap	1-pc
14	Start the diesel engine until it reaches operating temperature.	1.0				
15	Switch off diesel engine and remove ignition key.	1.0		Visual Inspection-observe safety procedures		
16	Check coolant level when the motor is cold. Fill up as necessary.	1.0				
TOTAL		19.0				

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.10 Fuel tank: drain

NOTE: *If the machine is run with fuel of low quality, the fuel tank needs to be drained.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Place a suitable sized container under drain hose.	1.0			Drain pan	1-pc
2	Open the drain valve cap at the bottom of the tank.	2.0				
3	Open the filler cap.	0.5			Caution: Observe safety procedures at all times.	
4	Connect the drain hose and drain off any sediment.	4.0			Visual Inspection- observe safety procedures	
5	Disconnect the drain hose and install the valve cap again.	2.0				
6	Close the filler cap.	0.5				
TOTAL		10.0				

IMPORTANT: Take care of filters/ oil/ liquids in an environmentally safe way.

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.11 Fuel system: air bleeding

NOTE: *Air must be bled out the fuel injection system whenever the machine runs out of fuel while the engine is running.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Turn priming pump counterclockwise to unlock the plunger.	1.0				
2	Push priming pump until a heavy resistance can be felt in the priming pump.	3.0				
3	Push priming pump fully and turn it clockwise to lock the plunger.	1.0			Caution: Observe safety procedures at all times.	
4	Start the engine and let it run idle for 3 minutes.	3.0			Visual Inspection- observe safety procedures	
5	If the engine is difficult to start, repeat (1) to (3)	5.0				
6	Check for any leaks.	1.0				
TOTAL		14.0				

IMPORTANT: Do not attempt to start the engine under any circumstances until the air in the system has been bled out completely, otherwise the injection pump can be seriously damaged.

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.12 Hydraulic system: releasing pressure

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Place attachment on the ground and shut down engine.	5.0				
2	After engine is shut down, turn ignition key to running position (Do not start engine).	0.25				
3	Keep the control lockout laver up (unlocked position) and move all control lavers and pedals to release main system pressure from all lines.	1.0			Caution: Observe safety procedures at all times.	
4	Turn ignition key to off position, remove the key and tag the machine to indicate that the unit -in under service.	1.0			Visual Inspection-observe safety procedures	
5	Lower the control lockout lever (locked position).	1.0				
6	Press the pressure relief valve located on the hydraulic tank breather valve to release tank pressure.	1.0				
TOTAL		9.25				

IMPORTANT: Release the internal pressure of the tank and hydraulic lines before removing any components of hydraulic system. Otherwise leakage may cause high pressure to build up in the hydraulic circuit. If the work cannot be completed within a short time after the system was released, the system pressure must be released again.

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.13 Hydraulic oil level: check

NOTE: *When refilling the oil, use the same oil as the system is filled with.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Park the machine in service position.	1.0				
2	Move the control lockout lever down to lock the system securely and stop the engine.	1.0				
3	Open the side door on the right side of the machine and check the oil level in the sight gauge. If the level is in the center of the gauge, the level is correct.	2.0				
4	If the level if low, -press breather to release the internal pressure at the tank. -unscrew the bolts -remove the cover and spring -top up the oil. Top up the oil efficiently press air breather again -check the level.	0.5 2.0 2.0 5.0 1.0	 		Caution: Observe safety procedures at all times. Visual Inspection-observe safety procedures	
5	If the level is normal, clean the dismantled parts and install.	0.25			Drain pan	1-pc
6	If the level is high, -place a suitable sized contained under the hydraulic tank -remove the protecting cap and attach drain hose which is the same hose as that used for draining engine oil -drain the oil into a container.	1.0 1.0 5.0				
TOTAL		21.75				

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.14 Hydraulic oil and ventilation filter: change

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Switch off diesel engine and remove ignition key.	2.0				
2	Allow machine to cool down under a temperature of 30˚C (86˚F).	10.0				
3	Unscrew oil drain screw down on the oil tank and discharge the used oil. Drain into a provided receptacle.	2.0	Screw driver	1-pc		
4	Remove the ventilation filter and replace it with a new filter.	3.0			Ventilation filter	1-pc
5	Screw in oil drain screw and tighten.	2.0	Screw driver	1-pc		
6	Fill in specified oil through filling opening to the center of the inspection glass.	3.0			Hydraulic oil	
7	Start the diesel engine, actuate drive lever with low engine speed until the drive activates. Actuate the steering pipes and hoses that are filled with oil and purged.	5.0				
8	Check the oil level of the diesel engine with the engine at a standstill. If necessary, fill up to the center of the inspection glass.	2.0			Visual Inspection-observe safety procedures	
9	Check the hydraulic system for leaks.	1.0				
TOTAL		30.0				

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.15 Machine set-up for maintenance: primary work

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Park on firm, level ground.	2.0				
2	Lower bucket to ground.	1.0				
3	Allow engine to run at idle. If this is not done, heat surge may occur.	5.0			Caution: Observe safety procedures at all times.	
4	Shut engine down and remove the starter switch.	0.25				
5	Set level on lock position.	0.5			Visual Inspection-observe safety procedures	
6	Before starting maintenance work, hang up a tag on cap door or work lever.	1.0				
TOTAL		9.75				

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.16 Power Steering fluid level: check

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Turn off the engine and let it cool.	5.0		Caution: Observe safety procedures at all times.		
2	Check the fluid level in the reservoir.	0.5		Visual Inspection- observe safety procedures		
3	If the fluid level is below the minimum line, add fluid up to the maximum level.	1.5			Steering fluid	1 liter
TOTAL		7.0				

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.17 Radiator, oil cooler and condenser fins (cooling system): clean

NOTE: *Wear safety goggles or a face mask. Do not use steam to clean the air conditioner condenser.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Remove any mud or dust attached to the radiator fins and oil cooler fins with compressed air.	5.0	Pressurized air cleaner	1-pc		
2	Clean radiator and oil cooler with compressed air after detaching the clogging nets.	5.0	Pressurized air cleaner	1-pc		
3	Clean the gap between oil cooler and radiator with compressed air after opening engine hood.	5.0	Pressurized air cleaner	1-pc		
4	Clean the radiator with compressed air after detaching the air conditioner.	5.0	Pressurized air cleaner	1-pc		
5	Check the rubber hose for wear and cracks. If damaged, replace it. Check loose hose clamps.	5.0		Caution: Observe safety procedures at all times.		
TOTAL		25.0				

IMPORTANT: When using compressed air keep the nozzle at a safe distance from the fins to prevent any damage. If the fins are damaged, this may cause leakage or overheating. Under dusty environment conditions, check it more often regardless of the maintenance interval.

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.18 Radiator: check

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Switch of diesel engine and remove ignition key.	1.0				
2	Allow machine to cool down under a temperature of 30°C (86°F)	10.0		Visual Inspection- observe safety procedures		
3	Check the cooling fins of the radiator for contamination. If the cooling unit is contaminated, it must be cleaned thoroughly and immediately.	5.0				
4	Clean the radiator carefully with a high pressure cleaner.	5.0	Pressurized water cleaner	1-pc		
TOTAL		21.0				

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.19 Swing drive unit oil level: check

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Pull out oil dipstick and wipe it with a clean cloth.	1.0				
2	Insert the oil dipstick and pull it out again.	0.5				
3	Check the oil level. If the level is in the center of *C* mark, the level is correct.			Visual Inspection- observe safety procedures		
4	If the level is low, top up oil through oil fillet hole to the correct level.	3.0			SAE engine oil	1 liter
5	If the level is high, -place a suitable sized container under drain valve, -open the protection cap of drain valve, -attach drain hose and drain the oil to the correct level, -disconnect the drain hose, and -close the protecting cap.	3.0				
TOTAL		7.50				

IMPORTANT: Always clean around the oil level gauge before checking the oil level. Dirt in the oil damages the swing drive unit .

It is very important that the oil level is always correct and that it is checked at operating temperature.

Too little oil may lead to insufficient lubrication of the swing drive unit and cause costly damage.

Too much oil may lead to oil foaming, and cause the swing drive to overheat.

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity : 7.20 Sediment and water in the fuel filter: drain

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	If the fuel warning light comes on while the engine is running, check the fuel filter, turn off the engine, then place a container under the fuel filter.	2.0			Container	1-pc
2	Loosen up the drain valve for 4 to 5 turns to drain sediment and water03.	2.0	Double end wrench (10mm)	1-pc		
3	If water does not drain properly, move the priming pump up and down.	2.0		Visual Inspection-observe safety procedures		
4	After the water has been completely drained, close the drain valve.	0.5			Rag	1
5	Bleed any air from the fuel system.	2.0				
TOTAL		8.5				

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.21 Turbocharger and intercooler operation: check

NOTE: *Turbo engine is a device that produces more power by supplying sufficient air into the combustion chamber by using the energy of exhaust gas.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Check the oil level and oil pressure. Before starting the engine, measure the crankcase oil level. As soon as the engine starts, check oil pressure indicator for normal rise.	1.5				
2	Warm the engine up. After the engine starts, avoid sudden acceleration or sudden start. Enough RPM is needed before starting engine until the engine is warm for 3 to 10 minutes.	3.0		Caution: Observe safety procedures at all times.		
3	No staring suddenly and No accelerating heavily. If you accelerate heavily, start suddenly or when you turnoff the engine suddenly it may damage to the engine and turbocharger parts.	0.5				
TOTAL		5.0				

7.0 Routine Maintenance to be performed by Hydraulic Crane Operator who had completed the TESDA core competencies standards for heavy equipment operation

Hydraulic Crane
DPWH Property Code: F4/F5

Maintenance Activity: 7.22 Water separator: drain

NOTE: *Risk of injury due to fire and explosion.*
Do not smoke. No open fire.
Do not breathe in fuel vapors.
Catch spilling fuel or water sump, do not allow to seep away into the ground.

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Open drain valve.	1.0				
2	Allow water sump to drain off.	5.0			Drain pan	1-pc
3	Close drain valve.	1.0				
TOTAL		7.0				

IMPORTANT: To avoid damage to the diesel engine, the water separator must be drained at the drain valve depending on the water content in the fuel. If the fuel has a high water content, the water separator must be drained more often.

8.0 CRAWLER TRACTOR
Routine Maintenance to be performed by Crawler Tractor Operator who had completed the TESDA core competencies standards for heavy equipment operation

8.0 Routine Maintenance to be performed by Crawler Tractor Operator who had completed the TESDA core competencies standards for heavy equipment operation

Crawler Tractor
DPWH Property Code: L1

Maintenance Activity: 8.1 Accumulator: handling and releasing pressure

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Lower the attachment completely to the ground.	1.0				
2	Keep all the attachments, such as hammer, closed.	1.0				
3	After turning off the engine, turn the ignition key to running position.	1.0				
4	Move the control lockout lever up to unlock the hydraulic system.	1.0				
5	To release the pressure in the control circuits and accumulator, move the operating levers and pedals forward/reward and left/right to their respective end positions.	1.0	 		Caution: Observe safety procedures at all times. Visual Inspection- observe safety procedures	
6	Turn the ignition key to stop position.	1.0				
7	Move the control lockout lever down to lock the hydraulic system securely.	1.0				
8	To release the pressure completely, loosen the hose connection slowly when you disconnect the accumulator. Step aside in this case as oil should spurt out.	1.0				
	TOTAL	8.0				

IMPOTANT: The accumulator is charged with highly pressured nitrogen gas. Handle it with care. Otherwise, it can cause serious accidentals or injuries.

8.0 Routine Maintenance to be performed by Crawler Tractor Operator who had completed the TESDA core competencies standards for heavy equipment operation

Crawler Tractor
DPWH Property Code: L1

Maintenance Activity: 8.2 Before starting: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Check oil and water leak.	1.0			Visual Inspection- observe safety procedures	
2	Check and retighten nuts and bolts.	3.0	Wrench	1-pc		
3	Check electric wiring.	3.0	Pliers, Electrical tape	1-pc		
4	Check and supply coolant.	3.0			DO3 fluid	
5	Check and supply engine oil.	3.0			Engine oil	
6	Check and supply fuel.	3.0				
7	Drain water and sediment of fuel tank.	3.0				
8	Check and supply brake fluid.	3.0				
9	Check steering wheel play.	1.0			Visual Inspection- observe safety procedures	
10	Check and adjust brake pedal travel.	5.0				
11	Check and adjust braking ability.	5.0				
12	Check and adjust parking brake lever travel.	5.0				
13	Check and adjust tire pressure.	5.0	Pressure gauge	1-pc		
14	Check dust indicator.	1.0				

8.0 Routine Maintenance to be performed by Crawler Tractor Operator who had completed the TESDA core competencies standards for heavy equipment operation

Crawler Tractor
DPWH Property Code: L1

Maintenance Activity: 8.2 Before starting: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
15	Check lamps.	1.0				
16	Check horn.	1.0				
17	Check exhaust gas color.	1.0	Visual Inspection-observe safety procedures			
18	Check instruments.	1.0				
19	Check previous day's defects.	1.0	Log Book			
20	Check door lock.	3.0				
21	Check wiper, window washer and defroster.	2.0	Visual Inspection-observe safety procedures			
22	Inspect float position of water separator.	2.0				
	TOTAL	56.0				

8.0 Routine Maintenance to be performed by Crawler Tractor Operator who had completed the TESDA core competencies standards for heavy equipment operation

Crawler Tractor
DPWH Property Code: L1

Maintenance Activity: 8.3 Engine coolant: change

NOTE: *Wait until the engine and radiator cool down.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Open the heater water cock. Manual air conditioning: move the temperature control lever to maximum hot position. Automatic air conditioning: turn the ignition switch *On* and move the temperature control lever to the maximum hot position.	2.5 2.5		Caution: Observe safety procedures at all times.		
2	Open the radiator cap and drain valve. Open the drain plug on the engine block for the diesel engines.	5.0	Monkey wrench	1-pc	Drain pan	1-pc
3	Flush the cooling system by running fresh water through the radiator.	5.0	Pressurized water hose	1 assembly		
4	Securely close the drain valve (and drain plug for diesel engines).	1.0				
5	Fill the radiator with the proper mixture of coolant and water. Fill the reservoir tank up to the maximum level. Then install the radiator cap.	10.0	Visual Inspection-observe safety procedures			

8.0 Routine Maintenance to be performed by Crawler Tractor Operator who had completed the TESDA core competencies standards for heavy equipment operation

Crawler Tractor
DPWH Property Code: L1

Maintenance Activity: 8.3 Engine coolant: change

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
6	Start the engine and warm it up until it reaches normal operating temperature. Then race the engine 2 or 3 times under no load. Watch the coolant temperature gauge for signs of overheating.	20.0				
7	Stop the engine after it completely cools down. Refill the radiator up to the filler opening. Fill the reservoir tank up to this maximum level.	15.0			Visual Inspection-observe safety procedures	
8	Check the drain valve (and drain plug for diesel engines) for any sign of leaks.	1.0				
TOTAL		62.0				

8.0 Routine Maintenance to be performed by Crawler Tractor Operator who had completed the TESDA core competencies standards for heavy equipment operation

Crawler Tractor
DPWH Property Code: L1

Maintenance Activity: 8.4 Engine coolant level: check/top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Wait until the engine and radiator cool down.	3.0				
2	Open the radiator cap and drain valve.	1.0			Drain pan	1-pc
3	Flush the cooling system by running fresh water thru the radiator.	3.0			Soft water	
4	Securely close the drain valve.	0.5				
5	Fill the radiator with the proper mixture of coolant and water. Fill the reservoir tank to level. Tightly close the radiator and reservoir tank.	3.0			Soft water 70% Anti-freeze solution 30%	
6	Start the engine and warm it up until it reaches normal temperature.	3.0			Caution: Observe safety procedures at all times.	
7	Check the drain valve for possible leaks.	0.5			Visual Inspection-observe safety procedures	
TOTAL		14.0				

8.0 Routine Maintenance to be performed by Crawler Tractor Operator who had completed the TESDA core competencies standards for heavy equipment operation

Crawler Tractor
DPWH Property Code: L1

Maintenance Activity: 8.5 Engine oil level: check

NOTE: *Check the oil level when the central warning lamp blinks and buzzer sounds. Check the oil level every 50 hours. If the oil level is between high and low, it is normal, if the oil level is low, refill the oil to proper level through filler port.*

Activity Number	Activity	Duration (minutes)	Tool		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Open the engine hood.	0.5				
2	Push it in and pull it out again.	1.0				
TOTAL		1.5				

8.0 Routine Maintenance to be performed by Crawler Tractor Operator who had completed the TESDA core competencies standards for heavy equipment operation

Crawler Tractor
DPWH Property Code: L1

Maintenance Activity: 8.6 Fuel tank: drain

NOTE: *Drain the sediment when required. If the machine is run with fuel of low quality, the fuel tank needs to be drain more.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Place a suitable sized container under drain hose.	1.0			Drain pan	1-pc
2	Open the drain valve cap at the bottom of the tank.	2.0				
3	Open the filler cap.	0.5				
4	Connect the drain hose and drain off any sediment.	4.0				
5	Disconnect the drain hose and install the valve cap again.	2.0				
6	Close the filler cap.	0.5				
TOTAL		10.0				

Caution: Observe safety procedures at all times.

Visual Inspection- observe safety procedures

IMPORTANT: Take care of filters/oil/liquids in an environmentally safe way.

8.0 Routine Maintenance to be performed by Crawler Tractor Operator who had completed the TESDA core competencies standards for heavy equipment operation

Crawler Tractor
DPWH Property Code: L1

Maintenance Activity: 8.7 Fuel system: air bleeding

NOTE: *Air must be bled out the fuel injection system whenever the machine runs out of fuel while the engine is running.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Turn priming pump counterclockwise to unlock the plunger.	1.0				
2	Push priming pump until a heavy resistance can be felt in the priming pump.	3.0				
3	Push priming pump fully and turn it clockwise to lock the plunger.	1.0			Caution: Observe safety procedures at all times.	
4	Start the engine and let it run idle for 3 minutes.	3.0			Visual Inspection- observe safety procedures	
5	If the engine is difficult to start, repeat (1) to (3)	5.0				
6	Check for any leaks.	1.0				
	TOTAL	14.0				

IMPORTANT: Do not attempt to start the engine under any circumstances until the air in the system has been bled out completely, otherwise the injection pump can be seriously damaged.

8.0 Routine Maintenance to be performed by Crawler Tractor Operator who had completed the TESDA core competencies standards for heavy equipment operation

Crawler Tractor
DPWH Property Code: L1

Maintenance Activity: 8.8 Hydraulic system: releasing pressure

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Place attachment on the ground and shut down engine.	5.0				
2	After engine is shut down, turn ignition key to running position (Do not start engine).	0.25				
3	Keep the control lockout lever up (unlocked position) and move all control levers and pedals to release main system pressure from all lines.	1.0			Caution: Observe safety procedures at all times.	
4	Turn ignition key to off position. Remove the key and tag the machine to indicate that the unit is under service.	1.0			Visual Inspection- observe safety procedures	
5	Lower the control lockout lever (locked position).	1.0				
6	Press the pressure relief valve located on the hydraulic tank breather valve to release tank pressure.	1.0				
	TOTAL	9.25				

IMPORTANT: Release the internal pressure of the tank and hydraulic lines before removing any components of hydraulic system. Otherwise leakage may cause high pressure to build up in the hydraulic circuit. If the work cannot be completed within a short time after the system was released, the system pressure must be released again .

8.0 Routine Maintenance to be performed by Crawler Tractor Operator who had completed the TESDA core competencies standards for heavy equipment operation

Crawler Tractor
DPWH Property Code: L1

Maintenance Activity: 8.9 Hydraulic oil level: check

NOTE: *When refilling the oil, use the same oil as the system is filled with.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Park the machine in service position.	1.0				
2	Move the control lockout lever down to lock the system securely and stop the engine.	1.0				
3	Open the side door on the right side of the machine and check the oil level in the sight gauge. If the level is in the center of the gauge, the level is correct.	2.0				
4	If the level if low, -press breather to release the internal pressure at the tank. -unscrew the bolts -remove the cover and spring -top up the oil. Top up the oil efficiently press air breather again -check the level.	0.5 2.0 2.0 5.0 1.0	 		Caution: Observe safety procedures at all times. Visual Inspection-observe safety procedures	
5	If the level is normal, clean the dismantled parts and install.	0.25			Drain pan	1-pc
6	If the level is high, -place a suitable sized contained under the hydraulic tank -remove the protecting cap and attach drain hose which is the same hose as that used for draining engine oil. -drain the oil into a container.	1.0 1.0 5.0				
TOTAL		21.75				

8.0 Routine Maintenance to be performed by Crawler Tractor Operator who had completed the TESDA core competencies standards for heavy equipment operation

Crawler Tractor
DPWH Property Code: L1

Maintenance Activity: 8.10 Machine set-up for maintenance: primary work

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Park on firm, level ground.	2.0				
2	Lower bucket to ground.	1.0				
3	Allow engine to run at idle. If this is not done, heat surge may occur.	5.0			Caution: Observe safety procedures at all times.	
4	Shut engine down and remove the starter switch.	0.25				
5	Set level on lock position.	0.5			Visual Inspection-observe safety procedures	
6	Before starting maintenance work, hang up a tag on cap door or work lever.	1.0				
TOTAL		9.75				

8.0 Routine Maintenance to be performed by Crawler Tractor Operator who had completed the TESDA core competencies standards for heavy equipment operation

Crawler Tractor
DPWH Property Code: L1

Maintenance Activity: 8.11 Radiator, oil cooler and condenser fins (cooling system): clean

NOTE: *Wear safety goggles or a face mask. Do not use steam to clean the air conditioner condenser.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Remove any mud or dust attached to the radiator fins and oil cooler fins with compressed air.	5.0	Pressurized air cleaner	1-pc		
2	Clean radiator and oil cooler with compressed air after detaching the clogging nets.	5.0	Pressurized air cleaner	1-pc		
3	Clean the gap between oil cooler and radiator with compressed air after opening engine hood.	5.0	Pressurized air cleaner	1-pc		
4	Clean the radiator with compressed air after detaching the air conditioner.	5.0	Pressurized air cleaner	1-pc		
5	Check the rubber hose for wear and cracks. If damaged, replace it. Check loose hose clamps.	5.0		Caution: Observe safety procedures at all times.		
TOTAL		25.0				

IMPORTANT: When using compressed air keep the nozzle at a safe distance from the fins to prevent any damage. If the fins are damaged, this may cause leakage or overheating. Under dusty environment conditions, check it more often regardless of the maintenance interval.

8.0 Routine Maintenance to be performed by Crawler Tractor Operator who had completed the TESDA core competencies standards for heavy equipment operation

Crawler Tractor
DPWH Property Code: L1

Maintenance Activity: 8.12 Travel reduction device oil level: check

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Check machine is on firm level ground.	1.0				
2	Rotate the track until ports (1 thru 3) are in their proper position.	5.0				
3	Slightly loosen fill plug to allow pressurized air escape.	3.0				
4	Remove oil level plug.	1.0		Visual Inspection-observe safety procedures		
5	Check oil level. Oil should be near the bottom of the level plug opening.	0.5				
6	Add oil through the fill plug opening, if necessary.	1.0				
7	Clean and install oil and fill plugs.	3.0				
8	Repeat this procedure on the other travel reduction device.					
TOTAL		14.50				

IMPORTANT: The gear oil is very hot after the operations. Shut all systems down and allow them to cool. Before fully removing any motor case inspection port plug etc., loosen the plug slightly to allow pressurized air to escape.

9.0 SHUTTLE BUS
Routine Maintenance to be performed by Driver with professional driver's license and classified restriction code no.3

9.0 Routine Maintenance to be performed by Driver, with Professional driver's license and classified restriction code no.3

Shuttle Bus
DPWH Property Code: H12

Maintenance Activity: 9.1 Battery: check

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Tighten battery cables and terminals.	0.5	⚠ Caution: Observe safety procedures at all times.			
2	Any evidence of corrosion around the battery posts or terminals should be removed using a solution of household baking soda and warm water.	2.0			Water and baking soda solution	
3	After the battery terminals are dry, cover it with a light coating of grease.	1.5			Grease	
TOTAL		4.0				

IMPOTANT: Keep the battery clean. Do not allow battery acid to contact your skin eyes , clothing or paint finish.

9.0 Routine Maintenance to be performed by Driver, with Professional driver's license and classified restriction code no.3

Shuttle Bus
DPWH Property Code: H12

Maintenance Activity: 9.2 Before starting: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Check oil and water leak.	1.0			Visual Inspection- observe safety procedures	
2	Check and retighten nuts and bolts.	3.0	Wrench	1-pc		
3	Check electric wiring.	3.0	Pliers, Electrical tape	1-pc		
4	Check and supply coolant.	3.0			DO3 fluid	
5	Check and supply engine oil.	3.0			Engine oil	
6	Check and supply fuel.	3.0				
7	Drain water and sediment of fuel tank.	3.0				
8	Check and supply brake fluid.	3.0				
9	Check steering wheel play.	1.0			Visual Inspection- observe safety procedures	
10	Check and adjust brake pedal travel.	5.0				
11	Check and adjust braking ability.	5.0				
12	Check and adjust parking brake lever travel.	5.0				
13	Check and adjust tire pressure.	5.0	Pressure gauge	1-pc		
14	Check dust indicator.	1.0				

9.0 Routine Maintenance to be performed by Driver, with Professional driver's license and classified restriction code no.3

Shuttle Bus
DPWH Property Code: H12

Maintenance Activity: 9.2 Before starting: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
15	Check lamps.	1.0				
16	Check horn.	1.0			Visual Inspection- observe safety procedures	
17	Check exhaust gas color.	1.0				
18	Check instruments.	1.0				
19	Check previous day's defects.	1.0	Log Book			
20	Check door lock.	3.0				
21	Check wiper, window washer and defroster.	2.0			Visual Inspection- observe safety procedures	
22	Inspect float position of water separator.	2.0				
	TOTAL	56.0				

9.0 Routine Maintenance to be performed by Driver, with Professional driver's license and classified restriction code no.3

Shuttle Bus
DPWH Property Code: H12

Maintenance Activity: 9.3 Brake and clutch master cylinder oil level: top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Open the hood of the vehicle.	0.5				
2	Open the cover of the clutch master cylinder assembly.	0.5		Visual Inspection-observe safety procedures		
3	Check the fluid on the cylinder assembly.	0.5			DOT-3 fluid	1 liter
4	Add fluid on the cylinder if it is below minimum level.	1.0				
5	Close the cover of the cylinder.	0.5		Visual Inspection-observe safety procedures		
6	Step on the clutch pedal if its working and look if there is any leak on the cylinder.	3.0				
TOTAL		6.0				

9.0 Routine Maintenance to be performed by Driver, with Professional driver's license and classified restriction code no.3

Shuttle Bus
DPWH Property Code: H12

Maintenance Activity: 9.4 During engine warm-up: checkpoints

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Walk around inspection for leaks.	1.0		Visual Inspection-observe safety procedures		
2	Check the engine for noise vibration and exhaust gas.	1.0		Report any unusual noise immediately.		
3	Check for the instruments and accessories, light, horn, wiper and oil pressure.	1.0		Visual Inspection-observe safety procedures		
4	Check the operation and clearance, clutch, brake and gear shift lube points.	2.0		Visual Inspection-observe safety procedures		
5	Record the result of checkpoints in the yellow book.	2.0	Yellow book	1 set		
TOTAL		7.0				

9.0 Routine Maintenance to be performed by Driver, with Professional driver's license and classified restriction code no.3

Shuttle Bus
DPWH Property Code: H12

Maintenance Activity: 9.5 Engine coolant: change

NOTE: *Wait until the engine and radiator cool down.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Open the heater water cock. Manual air conditioning: move the temperature control lever to maximum hot position. Automatic air conditioning: turn the ignition switch *On* and move the temperature control lever to the maximum hot position.	2.5 2.5		Caution: Observe safety procedures at all times.		
2	Open the radiator cap and drain valve. Open the drain plug on the engine block for the diesel engines.	5.0	Monkey wrench	1-pc	Drain pan	1-pc
3	Flush the cooling system by running fresh water through the radiator.	5.0	Pressurized water hose	1 assembly		
4	Securely close the drain valve (and drain plug for diesel engines).	1.0		Visual Inspection-observe safety procedures		
5	Fill the radiator with the proper mixture of coolant and water. Fill the reservoir tank up to the maximum level. Then install the radiator cap.	10.0				

9.0 Routine Maintenance to be performed by Driver, with Professional driver's license and classified restriction code no.3

Shuttle Bus
DPWH Property Code: H12

Maintenance Activity: 9.5 Engine coolant: change

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
6	Start the engine and warm it up until it reaches normal operating temperature. Then race the engine 2 or 3 times under no load. Watch the coolant temperature gauge for signs of overheating.	20.0		Visual Inspection-observe safety procedures		
7	Stop the engine after it completely cools down. Refill the radiator up to the filler opening. Fill the reservoir tank up to this maximum level.	15.0				
8	Check the drain valve (and drain plug for diesel engines) for any sign of leaks.	1.0				
TOTAL		62.0				

9.0 Routine Maintenance to be performed by Driver, with Professional driver's license and classified restriction code no.3

Shuttle Bus
DPWH Property Code: H12

Maintenance Activity: 9.6 Engine oil level: check/top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Turn on the engine until it reaches operating temperature.	3.0			Caution: Observe safety procedures at all times.	
2	Turn off the engine. Wait for a few minutes for the oil to drain back into the oil pan.	5.0			Visual Inspection-observe safety procedures	
3	Pull out the dipstick and wipe it with clean cloth.	0.5			Visual Inspection-observe safety procedures	
4	Insert the dipstick and pull it out again. It should be between the *High* and *Low* mark. If the oil is below the *Low* mark, remove the oil filler cap and pour recommended oil.	2.0	Screw driver	1-pc	SAE 30	1 liter
5	Recheck oil level with dipstick.	0.5			Visual Inspection-observe safety procedures	
TOTAL		11.0				

IMPORTANT: Oil level should be checked regularly. Operating with insufficient amount of oil can damage the engine, and such damage is not covered by warranty. If is normal to add some oil between oil changes or during the break-in period, depending on the severity of operating conditions.

9.0 Routine Maintenance to be performed by Driver, with Professional driver's license and classified restriction code no.3

Shuttle Bus
DPWH Property Code: H12

Maintenance Activity: 9.7 Engine coolant level: check/top-up

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Wait until the engine and radiator cool down.	3.0				
2	Open the radiator cap and drain valve.	1.0			Drain pan	1-pc
3	Flush the cooling system by running fresh water thru the radiator.	3.0			Soft water	
4	Securely close the drain valve.	0.5				
5	Fill the radiator with the proper mixture of coolant and water. Fill the reservoir tank to level. Tightly close the radiator and reservoir tank.	3.0			Soft water 70% Anti-freeze solution 30%	
6	Start the engine and warm it up until it reaches normal temperature.	3.0			Caution: Observe safety procedures at all times.	
7	Check the drain valve for possible leaks.	0.5			Visual Inspection-observe safety procedures	
TOTAL		14.0				

9.0 Routine Maintenance to be performed by Driver, with Professional driver's license and classified restriction code no.3

Shuttle Bus
DPWH Property Code: H12

Maintenance Activity: 9.8 Power Steering fluid level: check

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Turn off the engine and let it cool.	5.0			Caution: Observe safety procedures at all times.	
2	Check the fluid level in the reservoir.	0.5			Visual Inspection-observe safety procedures	
3	If the fluid level is below the minimum line, add fluid up to the maximum level.	1.5			Steering fluid	1 liter
TOTAL		7.0				

9.0 Routine Maintenance to be performed by Driver, with Professional driver's license and classified restriction code no.3

Shuttle Bus
DPWH Property Code: H12

Maintenance Activity : 9.9 Sediment and water in the fuel filter: drain

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	If the fuel warning light comes on while the engine is running, check the fuel filter, turn off the engine, then place a container under the fuel filter.	2.0			Container	1-pc
2	Loosen up the drain valve for 4 to 5 turns to drain sediment and water03.	2.0	Double end wrench (10mm)	1-pc		
3	If water does not drain properly, move the priming pump up and down.	2.0			Visual Inspection-observe safety procedures	
4	After the water has been completely drained, close the drain valve.	0.5			Rag	1
5	Bleed any air from the fuel system.	2.0				
TOTAL		8.5				

9.0 Routine Maintenance to be performed by Driver, with Professional driver's license and classified restriction code no.3

Shuttle Bus
DPWH Property Code: H12

Maintenance Activity: 9.10 Turbocharger and intercooler operation: check

NOTE: *Turbo engine is a device that produces more power by supplying sufficient air into the combustion chamber by using the energy of exhaust gas.*

Activity Number	Activity	Duration (minutes)	Tools		Materials	
			Tool Class	No. of Unit	Material	No. of unit
1	Check the oil level and oil pressure. Before starting the engine, measure the crankcase oil level. As soon as the engine starts, check oil pressure indicator for normal rise.	1.5		Caution: Observe safety procedures at all times.		
2	Warm up the engine for 3 to 10 minutes and avoid sudden acceleration.	3.0				
TOTAL		4.5				

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- DX225LCA Crawler Excavator, DOOSAN
- EN145B wheel Excavator, Volvo Construction Equipment
- Super 1100-2/1300-2 Road Paver, Vogele/Wirtgen
- H10 VV / H12 VV Tandem Roller, HAMM/Wirtgen
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- Heavy Duty Trucks, Hyundai Motor Company
- GDS11A-1 Motor Grader, Komatsu
- D21 Series Wagon and Pick-up, Nissan
- Lovol B and 1000 Series Diesel Engine , Tianjin Lovol Co.

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