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Driver and maintenance personnel must read and understand this manual before operating and maintaining this machine, otherwise, casualty accident may occur. This manual shall be properly kept for relevant personnel's query and reference.

## A38S HYDRAULIC EXCAVATOR OPERATION & MAINTENANCE MANUAL

2024-2 Version 1

ACHILLES AUSTRALIA SDLG SERIES

## Preface

Welcome to use hydraulic excavator produced by ACHILLES SDLG.

The manual can instruct you to correctly use and maintain the machine, which will be placed in the cab to be read by all relevant personnel at any time. If the manual cannot be read due to loss or damage, you will immediately contact our company or distributor to ask for a new manual.

When selecting working machine and tool, you will dismantle, install, replace and use them as per operation manuals of working machine and tool.

In addition, you shall carefully read technical documents related to operation, use, repair and maintenance of diesel and other functional parts installed on the machine.

The company has been dedicated to enhancement and improvement of our products so that our products will be more advanced and reliable. We will reserve the right for making these changes, but we don't promise that these changes will also be brought to delivered products. We also reserve the right for changing data and machine and instructions for maintenance and repair. Design change and change about instructions for repair and maintenance will be conducted without notification. As for latest information of machine or questions about the manual, you can consult our company.

If you discover any defect when using our products, please timely feed the information back to us so that we can constantly enhance product quality and better comply with your demands.

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## **∆** Warning

Only personnel with corresponding qualification through professional training can

operate, repair and maintain the machine.

Operators shall carefully read the manual before operating or maintaining the machine. Don't operate, maintain and repair the machine before reading and understanding the manual.

Operation instructions and prevention specified in the manual are only applicable to usage designated for the machine. If it is used in operations beyond the provision that are not prohibited, you must guarantee that this operation will not cause injury to you or others.

Operation and behavior that have been prohibited in the manual cannot be conducted under any circumstance.



# **Safety Matters**

Operators shall understand and abide by existing national and local safety provisions. If there are no national or local provisions, operators shall abide by safety instructions in the manual.

Most of accidents are caused as failing to abide by provisions on operation and maintenance of the machine. To avoid occurrence of accident, operators will read, understand and abide by all warning requirements and instructions in the manual and on the machine before operating and maintaining the machine.

As it is impossible to foresee all possible dangers, safety instructions in the manual and on the machine don't include all safety preventive measures. If steps and operations that are not recommended in the manual have been used, you must guarantee safety of you and others and will not damage the machine. If you cannot confirm safety of some operations, you can consult our company or distributor.

Preventive measures about operation and maintenance specified in the manual are just applicable to usage as per provision. If the machine is used in the scope that has not been listed in the manual, our company will not undertake any safety liability, safety liability in these operations will be undertaken by the user and operators.

Operations prohibited in the manual cannot be conducted under any circumstance.

The following markers are used to identify safety information in the manual:

 $\angle$ Danger—if it is not avoided, the dangerous consequence will cause serious injury or death. This word is also applicable that serious damage will be caused to the machine

if the danger is not avoided.

Warning—if it is not avoided, consequence of potential danger may cause serious injury or death. This word is also applicable that serious damage may be caused to the

machine if the danger is not avoided.

Attention—if it is not avoided, it may cause slight or intermediate injury. This word is also applicable that machine damage may be caused or lifetime of the machine

may be shortened if the danger is not avoided.



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# Chapter I Product introduction

## 1 Appearance and name of various parts

Appearance and name of main parts of the machine are indicated in this figure. In the manual, front, rear, left and right refer to traveling directions seen from the cab when the cab faces forward and the travel motor is in the rear of the machine.





2 Figures of overall dimension and

## operation dimension

2.1 Figure of overall dimension





	Item	Unit	Value
L	Overall length		4850
N	Overall width		1700
0	Overall height		2756
А	Width of upper structure assembly		1500
В	Overall chassis width (outer edge of track shoe)		1700
C	Overall height to cab roof		2756
J	Track shoe width		300
Ι	Track width		1400
K	Min. ground clearance	mm	220
D	Tail turning radius		850
G	Track wheelbase		1685
Н	Track length		2170
F	Ground clearance of upper structure assembly		575
Е	Overall height to hood top	-	1515
М	Total height of boom		-
Р	Blade width		-
Q	Blade height		-



## 2.2 Figure of operation dimension





	Item	Unit	Value
А	Max. digging radius		5340
В	Max. digging range		5220
С	Max digging depth		3100
D	Max. vertical digging depth		2570
E	Max. digging height		2100
F	Max. dumping height	mm	4700
G	Min. front slewing radius		3380
н	Max. bulldozer lifting height		2275
I	Max. bulldozer cutting depth		-
J	Max. digging radius		-



### 3 Nameplate

Nameplate of this machine is fixed on the front end of the upper frame, to show machine type, manufacturing year, product identification number, manufacturer, etc.

	HYDRAULIC EXCAVATOR	0
Operating Mass		kg
Rated Bucket Capacity		m <sup>3</sup>
Engine Power		kW
Dimension		mm
Manufacturing Year		
Product Identification	L	
Number		
SHANDONG LIN		
LINGONG INDUSTRY P DEVELOPMENT AR	ARK, ECONOMIC & TECHNOLOGICAL EA, LINYI, SHANDONG, P.R. CHINA 2636000638	0

### 4 Operating modes

This machine is a professional crawler-type hydraulic excavator. It is widely applied to small building construction, road maintenance, farmland improvement, underground construction of subway tunnels, excavation of foundation pits of water and electricity trenches, municipal works, environmental sanitation, landscaping and pipeline as well as other projects.

The appropriate working environment temperature for this machine is  $-20^{\circ}C \sim 45^{\circ}C$ , and the altitude is below 12,00 meters. If you need to carry out operation above this scope, please contact our company in advance to obtain relevant technical guidance and permission, or our company will not be responsible for the consequences caused due to that.

#### **5** Characteristics

- It is equipped with powerful engine with high reliability, thus guaranteeing good working performance of the whole machine. With the advantages of low emission and low noise, it is particularly suitable for operation in noise-sensitive areas and at night.
- It adopts the hydraulic system with reliable performance. Operation and slewing adopt pilot



control, which makes the operation simple and convenient. Traveling, dozer blade and boom slewing adopt mechanical control, which makes the operation more efficient and reliable. High-pressure doublespeed travel motor makes the whole machine have high tractive force and traveling speed.

- With super-strong structural design upon computer optimization and three-dimensional finite element analysis, the key parts adopt high strength steel sheet, thus improving the whole machine's ability to adapt to severe operating modes.
- It is equipped with luxury seats and air conditioning (cooling and heating), thus providing a comfortable driving and riding environment.
- It adopts streamlined appearance design, and its line is concise, fluent and beautiful. It has open engine hood to be convenient for maintenance.
- It's equipped with dozer blade



#### **6** Technical performance parameters

ltem	Unit	Value
Total weight	kg	3800
Standard bucket capacity	m <sup>3</sup>	0.12 (0.08~0.16)
Travel speed (low/high)	km/h	2.4/4.4
Max. slewing speed	r/min	9.0
Engine model		3TNV88-ZCSC
Rated engine power (kW)	kW	20.4
Rated engine speed	r/min	2200
Hydraulic system working pressure	MPa	24
Boom length	mm	2450
Arm length	mm	1400

#### **6.1 Overall performance**

#### 6.2 Product standard

Q/371300 003 Hydraulic Excavator

#### 7 Pasting position and content of safety

#### sign

The pasting positions of safety signs for ER636H are shown in the table below. Carefully read and follow instructions on all safety signs on the machine. Properly keep the safety signs. In case of loss, damage or illegible letters on the safety signs, please supplement or do repairing in time. To replace the parts with safety signs, please paste corresponding safety signs on the new parts for replacement. If relevant signs are changed, the actual position shall be followed.

To wipe and clean the safety signs, use cloth, soap water, etc. rather than detergent, gasoline, etc.





1. Sign for prohibiting entering the rotary region



- 2. Schematic diagram of lifting
- 3. Sign of warning



4. Lifting sign



5. Sign of paying attention to working device





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- 6. Sign of Door opening
- 7. Sign of lubricating oil filling

- 8. Sign of fuse box position
  - 9. Sign of emergency exit



10. Sign of installation position of fire extinguisher





11. Sign of paying attention to hand clamping



	HYDRAULIC O EXCAVATOR
Operating Mass	kg
Rated Bucket Capacity	m <sup>3</sup>
Engine Power	kW
Dimension	mm
Manufacturing Year	
Product Identification	
Number	
SHANDONG LI	NGONG CONSTRUCTION
MACHIN	IERY CO.,LTD.
LINGONG INDUSTRY F	

ANTI-	FREEZE FILLING
<ul> <li>The cool</li> </ul>	ant is glycol engine antifreeze.
<ul> <li>Add as p</li> </ul>	er environment condition and
operation	instruction of antifreeze,
or it will i	mpair antifreeze effect.
Choose a	antifreeze is advised as below
-25#	temperature ≥ -15°C
-35#	temperature ≥ -25°C
-45#	temperature ≥ -35°C

12. General nameplate for hydraulic excavator

13. Sign of anti-freezing solution filling

14. Sign of high temperature liquid warning



- 15. Sign of operate engine throttle
- 16. Sign of hydraulic oil type





17. Sign of avoiding high temperature burn



18. Sign of avoiding fan injury



19. Sign of lifting lug





- 20. Sign of no reversely screwing the kick spring
- 21. Sign of battery disconnection



22. Sign of driving direction





- 23. Sign of paying attention to cab door
- 24. Sign of open side mantle

25. Warning sign of touching the machine



26. Sign of explosion warning



27. Sign of paying attention to safety lock





28 Sign of leaving the machine safety lock lever to prohibit open



30. Sign for safety distance with power line



31. Sign of paying attention when leaving the machine





32. Sign of reading the Manual



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33 Shut down the engine before maintenance or repair

34. Sign of paying attention to operating mode



35. Sign of no trampling or walking







LUBRICATION POINTS INDICATION

**\*** 🛛

- 36 Fuel tank is prohibited from open flame sign
- 37. Sign of fuel tank

38. Schematic diagram for lubrication

39. Sign of paying attention to window closing



0

$\land$	WARNING
It is forbidden	to install or modify electrical systems
<ul> <li>Before starting clear combust</li> </ul>	e without permission! g and after stopping the machine, ible material in high-temperature
<ul> <li>Before starting clear combust areas.</li> </ul>	e without permission! g and after stopping the machine, ible material in high-temperature

40. Fire prevention warning signs





41. Notes on the use of electronic controlled engines



# **Chapter II Monitor and Controller**

## **Warning**

Do not operate the machine before understanding positions, function and usage of instrument and steering controller.

Check the instrument and the controller at any time, pay attention to abnormal readings timely, and adopt necessary measures to prevent the machine from getting seriously damaged.

#### **1** Monitor



• Engine coolant temperature gauge Indication range of pointer:  $60^{\circ}$ C-120°C.

When the indication range of pointer is at  $60^{\circ}$ C-110°C, the engine coolant temperature is normal.

When the indication range of pointer is at  $110^{\circ}C \sim 120^{\circ}C$  (red area), the engine coolant temperature is too high, then the warning light flickers red, and the buzzer honks and warns.

Operation shall be stopped immediately when the pointer enters the red area. The engine shall be run at a low idle speed for cooling, until the pointer goes back to the range of  $60^{\circ}C \sim 110^{\circ}C$ .







#### • Fuel level gauge

This gauge displays liquid level in the fuel tank. If the pointer declines to the red area, the machine shall be refueled.

• Operation hour indicator

This indicator displays total number of operation hours of the engine on LCD in 6 figures. Minimum timing unit is 0.1h, and maximum is 99,999.9h.

The instrument starts timing when any of the following conditions is met:

Engine oil pressure switch is disconnected; revolving speed is  $\geq$ 700rpm.

• Engine speed indicator

This indicator displays current revolving speed of the engine on LCD. Its maximum timing revolving speed is 3,000 revolutions, and minimum timing revolving speed is 600 revolutions. If the engine speed exceeds this range, it will cause inaccuracy of value.

• Warning light

The warning light will flicker red at the time of warning.

The warning light starts to warn at a frequency of 0.5Hz when any of the following conditions is met:

- ➤ The engine speed is ≥700rpm, and meanwhile the engine oil pressure switch is grounded, which continues for 3 seconds;
- > The engine speed is  $\geq$ 700rpm, and meanwhile the system voltage is  $\leq$ 11V, which continues for 3 seconds;
- ➤ The engine speed is ≥700rpm, and meanwhile the system voltage is ≥15V, which continues for 3 seconds;
- ▶ Water temperature of the engine is  $\geq 110^{\circ}$ C.
- Engine oil pressure warning indicator lamp

When the engine oil pressure switch is grounded, the engine oil pressure warning indicator lamp is on, and the color is red.

• Charging indicator

If this indicator is off when the engine runs, it means that the storage battery is being charged. If this indicator lamp is on when the engine runs, it means that the charging system is faulty. When the start key is twisted to "**T**" position before starting of the engine, this indicator lamp is on. When any of







the following conditions is met, this charging indicator starts to warn, and at this time this indicator lamp is on, and the color is red.

- $\succ$  The engine speed is <700rpm;
- ➤ The engine speed is ≥700rpm, and meanwhile the system voltage is ≤11V, which continues for 3 seconds;
- ➤ The engine speed is  $\geq$ 700rpm, and meanwhile the system voltage is  $\geq$ 15V, which continues for 3 seconds;
- Air filter blocking warning indicator lamp

When the air filter is blocked in the running process of the engine, this indicator lamp is on and warns, and the color is red. At this time, the air filter must be replaced or washed. When the start key is twisted to "I" position before starting

When the start key is twisted to "I" position before starting of the engine, this indicator lamp is on.

• High-speed traveling indicator lamp

When the machine travels at a high speed, this indicator lamp is on, and the color is green.

• Preheating indicator lamp

When the start switch is in "" position for preheating in cold weather, this indicator lamp is on, and the color is yellow; this indicator lamp is off when preheating is completed.

• Buzzer warning

When any of the following conditions is met, the buzzer in the instrument combination panel starts to warn at a frequency of 0.5Hz:

- ➤ The engine speed is ≥700rpm, and meanwhile the engine oil pressure switch is grounded, which continues for 3 seconds;
- ➤ The engine speed is  $\geq$ 700rpm, and meanwhile the system voltage is  $\leq$ 11V, which continues for 3 seconds;
- ➤ The engine speed is ≥700rpm, and meanwhile the system voltage is ≥15V, which continues for 3 seconds;
- ▶ Water temperature of the engine is  $\geq 110^{\circ}$ C.

If none of the above conditions are met, the buzzer will not warn.

## 2 Switch

• Start switch

**4** 

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This switch is in the rear of right control box, and is used to open or close electrical system of the vehicle and start the engine.

**O** position

Key can be inserted into or removed from this position. If the key is rotated to this position, the starting circuit will be closed.

I position

This position is used to open electrical system of the vehicle. When the engine runs, please keep the key in this position.  $\Box$ 

 $\Theta$  position

This position is the position for starting engine. Keep the key in this position during the starting period. After the engine has been started, immediately loosen the key, and then it will automatically return to **I** position.

• Rocker switch

The rocker switch is at the right of driver's seat.

Sprinkling switch

Position 1Sprinkler sprinklesPosition 2Sprinkler stops sprinkling

Window wiper switch

Position 1 The window wiper operates continuously

Position 0 The window wiper operates intermittently

Position 2 The window wiper stops operating

Attention: The window wiper switch is in the top left corner of front windshield.

Hazard Warning Flasher Switch

Position 0Hazard warning flasher OFFPosition 1Hazard warning flasher ON







2 0 1



Quick-change power switch

Position 1 The quick-change power supply is switched on, and the quick-change power switch is working.

Position 2 The quick-change power supply is switched off, and the quick-change power switch is not working.

Quick-change selector switch

Position 1 Install the implement. Position 0 OFF. Position 2 Remove the implement.

Breaker/hydraulic shear selector switch

Position 1 Hydraulic shear operation function is enabled. Position 0 OFF. Position 2 Breaker operation function is enabled.

Master power switch Position "I": the master power switch is on.

Position "O": the master power switch is off.

Important! The engine can be started only when the master power switch is in Position "I" (ON). When inspecting electrical system or parking, please confirm that the master power switch is in Position "O" (OFF), to prevent electric leakage of the storage battery. Never place the master power switch in Position "O" when the machine runs.

CAUTION! It is forbidden to turn off the main power switch within 2min after the engine is shut down. Otherwise, the engine might be damaged.





#### **3** Other controls

#### **3.1 Working device control handles**

• Working device control handle (left)

This handle is used to slew and control arm.

- 1 The arm extends (unloading)
- 2 The arm retracts (excavation)
- 3 Slewing left
- 4 Slewing right
- Working device control handle (right)

This handle is used to control boom and bucket.

- 1 The bucket retracts (excavation)
- 2 The bucket extends (unloading)
- 3 The boom lowers
- 4 The boom lifts

- 1 0 B 2
- Control lever with one buttons
  - A Left control lever
  - B Right control lever

1 Operation of the swing cylinder of the working device - press and hold the button, and the swing cylinder can be extended and retracted by operating the left lever control to both sides

2 Horn



#### Hydraulic excavator operation & maintenance manual



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- Control lever with three buttons
  - A Left control lever
  - B Right control lever
  - 1 Hydraulic shear rotates counterclockwise
  - 2 Hydraulic shear rotates clockwise

3 Operation of the swing cylinder of the working device - press and hold the button, and the swing cylinder can be extended and retracted by operating the left lever control to both sides.

- 4 Hydraulic shear clamping / breaker vibration
- 5 Hydraulic shear extends
- 6 Horn
- Control lever with two buttons
  - A Left control lever
  - B Right control lever
  - 1 Reserved
  - 2 Reserved
  - 3 Horn.
  - 4 Reserved
  - 5 Reserved

6 If the roller is rolled to the left, the working device will swing counterclockwise; if the roller is rolled to the right, the working device will swing clockwise.

**3.2 Traveling control lever and traveling** 

#### pedal

Important! Do not step on the traveling pedal at the time of work.

Important! Inspect direction of the crawlers before operating the traveling control lever (or pedal). Traveling operation order is reverse when the travel motor is in front.








This control lever (or pedal) is used to move and stop the machine.

Position N: neutral position (to stop the machine)

Position 1: to move forward

When the travel motor is in the rear, push the control lever forward (or step on the pedal forward), and then the machine moves forward.

Position 2: to move backward

When the travel motor is in the rear, pull the control lever backward (or step on the pedal backward), and then the machine moves backward.

#### **Optional pedal**

1

Position 1 Operating hydraulic cutter or breaking hammer. During operation of the hydraulic breaker, depressing the front end of this pedal may cause the breaker to vibrate. During operation of the hydraulic shear, depressing the front end of this pedal may open the hydraulic shear; depressing the rear end of this pedal may close the hydraulic shear.

Position 2 Locking pedal

Attention! When the machine is not operated by the optional pedal, be sure to keep the pedal in the locking position, to avoid the unexpected operation.



# 3.3 Dozer blade control handle

The dozer blade control handle is on the right control box. Position 1: to lift the dozer blade Position 2: to lower the dozer blade Position N: neutral position (neutral gear)

# **3.4 Engine throttle control handle**

This knob is located on the right control box, and rotating the knob controls the throttle size.

# **3.5 Safety lock control lever**



If the safety lock control lever is not firmly placed in the locked position, the control lever may move, thus causing serious accident or injury.

The engine can be started when the safety lock control lever is in the "locked" position. After the engine is started, working device, slewing and traveling can be controlled when it is in the "unlocked" position.

Important! The personnel shall firmly pull the safety lock control lever to the locked position and lock this system when leaving the cab. If the safety lock control lever is not in the locked position, and the working device control handle is wrongly touched, it will cause serious personnel injury.

Attention! Do not touch the working device control handle when pulling upward or pushing downward the safety lock control lever.

Clockwise turn the safety lock control lever to position "A"; the system is at "unlock" position.

Anti-clockwise turn the safety lock control lever to position "B", the system is at "lock" position.









# 3.6 Seat adjustment



Park the vehicle in a safe place and shut off the engine when adjusting the seat.

Before changing driver or starting operating the machine, adjust the driver's seat to obtain the most comfortable seating position.

Do not adjust the seat when operating the machine.

Forward and backward adjustment

Adjust Handle 1 from side to side to realize forward and backward movement of the seat, adjust the seat to the position suitable for operation, and then loosen Handle 1. For example, when carrying out deep excavation operation, move the seat forward to improve the inferior sight in front of the machine.

• Backrest adjustment

The operator shall sit on the driver's seat, pull Handle 2 backward, adjust the backrest to the proper position, and then loosen Handle 2.

• Armrest adjustment

Left and right armrests can be manually pulled to the vertical positions. Move the armrests upward or downward according to needs, to be convenient for operating and getting on or off the machine.









# 3.7 Safety belt

Important! The safety belt must be replaced immediately in case of wear or damage.

It is not allowed to privately refit the safety belt or its installation parts.

A seat belt shall be used by one adult only.

The safety belt must be replaced once every three years.

# 3.8 Car door lock system

This system is used to fix the door in place with door lock after opening the door, to keep safety of the cab in the open position.

After opening the cab door, push it back.

Firmly fix the door on the lock pin.

Press the handle in the cab, to release door lock.

#### **3.9 Cab windows**

# **∆** Warning

Place the safety lock control lever in the locked position when opening or closing front upper window, front lower window or car door (refer to "3.5 Safety lock control lever in Chapter II"). If the control lever is not locked and is accidentally touched, it will cause serious accident.

• Front upper window

You can place (push upward) the front upper window on the top of the cab.

#### **Open the windows**

Park the machine on flat ground, make the working device fully fall on the ground, and then shut off the engine.

Firmly place the safety lock control lever in the locked position; refer to "3.5 Safety lock control lever in Chapter II".

Hold the handles on the left and right sides of the front window with both hands and press the unlock button, strongly push upward the window and open it until the front upper window is pushed into the lock pin in the rear of the top of the cab, and then confirm that it is locked.







#### Attention! When the front upper window is opened, do not operate the window wiper, to prevent it from being damaged.

#### Close the windows

Park the machine on flat ground, make the working device fully fall on the ground, and then shut down the engine.

Firmly place the safety lock control lever in the locked position; refer to "3.5 Safety lock control lever in Chapter II".

Both hands grasp left and right handles of front window, press unlock button, pull it down to unlock it. And then apply force forward to slowly drag the handle to lower the front window till the front window is pushed to the window lock in the front of cab top and locked.

• Dismantle the front lower window

Open the front upper window.

Hold the upper part with both hands, pull it up, and then dismantle it.

Store the dismantled window behind the driver's seat in the cab.

• Roof window

Important! Do not clean the roof window with diluents, or the surface of the car window will be damaged.

# 3.10 Fire extinguisher

The fire extinguisher meeting local and national laws and requirements shall be assembled.

Install the fire extinguisher according to the following method:

Disassemble two bolts at the back of the cab and assemble the fire extinguisher. The use method and attentions for fire extinguisher shall be subject to text on the fire extinguisher.

# 3.11 Cab light

This light is on the top of the cab. Turn on/off this light through toggle switch.

#### 3.12 Emergency exits



There are two emergency exits in the cab: door and rear window. No matter the rear window is fixed type or sliding type, in emergent condition, use the safety hammer in the cab to break the glass and escape from the cab. **Attention: it's only used in emergent condition.** 

3.13 Covers/hoods with locks

Attention! Insert the key to the end, and then turn the key. If the key is turned before it is fully inserted to the end, the key may be broken.

# 3.14 Protective structure for falling object

# or splash (optional)

Necessary protective equipment shall be installed according to operating conditions when falling object or splash enters the cab and causes danger of injury.

The users shall install protecting wire net in front of the cab according to needs when carrying out operation with a breaking hammer, so as to prevent the splash from entering the cab and causing personnel injury.

The users shall install FOPS (falling object protective structure) on the top of the cab according to needs when carrying out operation in pits.

Important! Do not make the vehicle travel when the front window is open.

Protecting wire net device of excavators of Shandong Lingong is placed outside the frame structure of the cab. This kind of device is installed to prevent heavy object on the top from falling when the machine is working and protect the working personnel once the machine rolls over. It can not only support the load when the machine is rolling over, but also absorb impact energy.

#### Attentions will be paid when using:

- If the machine is damaged or deformed due to object falling or rolling over, its strength will be reduced, which will not comply with its normal protection functions. You shall contact Shandong Lingong Construction Machinery Co., Ltd. or its designated distributor to consult with it for repair method, and shall not repair on your own.
- Design of the cab complies with protection requirement for falling object. The weight of the falling object is consistent with the testing method of "FOPS".





- It is strictly prohibited to arbitrarily drill and electrically weld inside and outside of ROPS to avoid damaging or reducing strength of ROPS.
- The cab can protect operators of the machine. It complies with requirements of "ROPS" rolling over protection structure as per testing standard. Therefore, if the machine encounters rolling over accident, please firmly hold the seat armrests, and do not jump off the vehicle.

# 3.15 Storage of Operation and Maintenance

# Manual

There is a ditty bag behind the driver's seat. Please the Operation and Maintenance Manual in the bag for reference at any time.



# Chapter III Operation instructions

# **1** Introduction

This chapter includes provisions on operation and safety. To guarantee correct and safe running/operation of the machine, you must abide by these provisions, and meanwhile you shall abide by laws of the state, the province and the city on transportation safety, traffic safety, industry safety and labor welfare as well as responsibility and obligations stipulated thereof.

# 2 Breaking-in of new vehicle

#### Important! Oil level shall be inspected frequently.

The machine has been thoroughly adjusted and tested before delivery. But at the time of use of new machine, if the machine is operated under harsh conditions, it will have an adverse effect on performance of the machine and shorten service life of the machine. The machine must be broken in within the first 100 hours (according to indication of the hour meter), so as to improve hardness and smoothness of surface of all bearings, thus greatly improving service life. The following provisions shall be abided by during the breaking-in operation:

- The engine shall run at idle speed for 5 minutes after starting.
- Heavy loading or high-speed running shall be avoided.
- Sudden starting, sudden speed-up, sudden steering and sudden stop shall be avoided except for emergency situation.

# **3** Safety rules during the operation

# 3.1 Obligations of the operators

- The operators must abide by rules and suggestions in the *Operation & Maintenance Manual*, and pay attention to special requirements and dangerous matters of laws, regulations or operation sites.
- The operators must have a full rest, and keep their mind and body in good condition, and shall never operate the machine after drinking or under the circumstance of taking drugs and other narcotic drugs.



- The operators must fully grasp situation of operation site of the machine, and forbid anyone to pass or stand under the lifting excavating device, which is essential to avoid serious personnel and property loss and possible fatal accidents.
- They shall prevent anyone from entering or staying in the dangerous area which is within 7m away from the machine. If there is a person in this area, the operators must be particularly careful, and can operation the machine only after being able to see the person or know where he or she is.
- In case of finding any abnormity (noise, vibration, smell, incorrect instrument display, smoke, oil leakage, etc., or any abnormal display on the alarm devices or the monitor) in the process of operation or maintenance, they shall report to the supervisor and adopt necessary measures. They shall not operate the machine before the fault is corrected.

# 3.2 Safety provisions

- Default or defect influencing safety must be eliminated before starting.
- The personnel shall wear clothes suitable for safe operation, and wear hard hats, so as to strengthen head protection.
- When the machine travels, communication equipment shall not be used, because its signal may interfere with important electronic devices of electrical system in the machine.
- The personnel must always sit on the seats when starting the engine.
- Avoid crushing hands or fingers, and keep hands away from the areas with danger of crushing hands (covers, doors, windows, etc.).
- Sit on the seat, and tie safety belt.
- Face the machine and use ladder and grip when getting in and out of the machine. Do not grasp any control handle (or control lever). Keep three-point contact at least, that is, two hands and one foot or one hand and two feet. Do not jump.
- The cab door must be firmly closed during the operation.
- The vibration (wobble) occurring during the operation may be harmful to the operators.

The methods for reducing vibration are as follows:



- ➢ Adjust the seat and tie the safety belt.
- Select the smoothest operation surface (level this surface where necessary).
- Adjust machine speed.
- The machine's angle of tilting to one side shall not exceed 10° when it travels on uneven ground.
- There are two escape routes in the cab: door and rear window. In case of dangerous situation, break the glass with an emergency hammer to escape; refer to "3.13 Emergency exits in Chapter II".
- Use the inspection channel installed with non-slip mat only when climbing up the top of the machine. Do not climb up the engine hood or cover not installed with non-slip mat.
- Inspect grip and ladder (including crawler pad) before getting on or off the machine. If there is oil, lubricating grease or mud on grip and ladder (including crawler pad), wipe it away immediately. Keep these areas clean. In case of damage, carry our repair, and tighten the loose bolts.

# 4 Work in dangerous areas

Attention: the machine is not applicable to environment which is harmful to human body, such as poison gas, dust, etc.

# 4.1 Operation close to aerial high-tension

#### cable

- The personnel may get shocked if the machine is close to high-tension cable. There is not necessarily direct contact, but the current can be conducted from the wires.
- If the machine works near the high-tension cable, everyone shall be forbidden to get close to the machine.
- The personnel must contact the electric power company to confirm voltage of the cable before getting close to the overhead wires for work.
- For safety's sake, minimum distance which the machine must keep from the high-tension cable is as follows:





Voltage	Minimum safe distance from wires
0~1 kV	2m (7 feet)
1~55 kV	4m (13 feet)
55~500 kV	6m (20 feet)

• If the working device touches the wires, the operators must stay in the cab; if the machine still works, the operators shall try to move the working device, to keep it away from the high-tension cable, thus breaking the circuit.

# 4.2 Operation in the places mounted with

# cables used for electric trains in the sky

- Contact competent department of railway to obtain permission before loading or unloading of the machine.
- Be sure to contact competent department of railway again when continuing the operation after operation interruption.

# 4.3 Operation in the areas with cables and

# pipelines buried underground

- Before operating the machine, the personnel must contact the departments in charge of underground cables and pipeline, and follow their instructions.
- When positions of such cables or pipelines are complex to dispose, or the operators cannot see the actual operation points in the operation area, they shall appoint a signalman; refer to "8 Hand signals in Chapter IV" for hand signals.

# 4.4 Operation in the places with limited

#### space

- Inspect whether the space is enough or not before operation.
- Move slowly at the time of operation.

# 4.5 Operation under the circumstance of

# insufficient lighting conditions



- Turn on frame lamp and boom light when operating in buildings and tunnels.
- Please do not operate the machine when the visibility is poor, such as dense fog, snow or rain.

#### **4.6 Operation in other dangerous areas**

- When the machine constitutes obstacle and danger to traffic, or when width of connecting device of the machine exceeds its own width, warning light on the top of the cab shall be turned on (its wiring has been reserved, and it can be optionally installed by the users according to needs).
- Pay special attention to moving the machine at the time of suspended load, and arrange a signalman if necessary; refer to "8 Hand signals in Chapter IV" for hand signals.
- Use road markings when carrying out operation on the road or beside it.
- Be particularly careful when operating the machine in the places marked as dangerous areas.
- Do not carry out operation in the places which are close to edge of facilities such as wharf and skew bridge.

# 5 Start the machine

#### 5.1 Inspection before starting the engine

Important! The personnel shall always walk around the machine before starting, so as to confirm that there is no person in the places which are the closest to the machine.

- Place the machine in repair position; refer to "1 Repair position in Chapter V".
- Carry out daily maintenance; refer to "15 Regular maintenance in Chapter VI".
- Adjust the seat, so as to control controller and pedal comfortably and safely; refer to "3.6 Seat adjustment in Chapter II".
- Inspect the monitor and turn the start switch to "I" position, and then all the lights will be on immediately. If any of the lights is out, it shows that this light or the electrical system is faulty. After the engine runs, all the lights are off.
- Inspect whether frame lamp, boom light, window wiper, rearview mirror, etc. are in a usable state or not.



- Inspect and confirm that there is no leakage.
- Inspect and confirm that there are no defective or loose spare parts, or such spare parts will cause damage.
- Inspect and confirm that there is fuel in the fuel tank. If the fuel in the fuel tank runs out or the air enters the system for some reason, the air must be discharged before starting of the engine; refer to "5.4 Deflate the fuel system in Chapter VI"
- Inspect and confirm that the engine hood and the guard board have been closed.

#### 5.2 Operation before starting the engine

- Clean or defrost windows.
- Always sit on operator's seat when starting the engine; refer to "5.3 Start the engine in this Chapter".
- Fasten seat belt before carrying out all operations.
- Inspect and confirm that the monitor and all controllers and switches can work normally.
- Inspect and confirm that there is no one nearby the machine before starting the machine.
- Honk the horn.
- Put the safety lock control lever down (refer to "3.5 Safety lock control lever in Chapter II"), and start the machine.

#### **5.3 Start the engine**



Important! Do not keep the key in  $\bigodot$  (starting) position for more than 20 seconds, or it may seriously damage the starting system. Try to start the engine again after 2 minutes.

Important! In case of abnormal sound, excessive vibration or abnormal operation, please immediately place the start switch in "O" position, and shut off the engine.

Attention! Ensure that the safety lock control lever at the lock state; otherwise, it's unable to start the engine.



Please refer to 3.5 of Chapter II "Safety lock control lever".

- Turn the engine throttle control handle to small throttle position. Refer to 3.4 of Chapter II "Engine throttle control knob".
- If the temperature is more than 0°C (+32°F), directly turn the key to "☉" starting position; if the temperature is less than 0°C (+32°F), place the start switch in "☉", preheating position, and turn the key to

"<sup>6</sup>" starting position after preheating indicator lamp on the monitor goes out.

- Loosen the key immediately after starting the engine.
- If the engine fails to be started, after the engine stops completely, turn the key back to "O" stop position, and then try to start it again.

Attention! When it is very cold (less than -15°C = +5 °F), the engine cannot be put into high strength work immediately after start. Let the engine idle for 10~15 minutes.

# 5.4 Operation and inspection after starting

#### the engine

Important! In case of abnormal sound, excessive vibration or abnormal circumstance, please immediately turn the key to "O" (stopping) position, and shut off the engine.

- Do not operate the working device immediately after starting the engine. Confirm that all systems have reached sufficient operating temperature first.
- Place the engine throttle control handle in the neutral position, and let the engine run at idle speed for 5 minutes.

Important! Do not run the engine at high speed or low idle speed for more than 20 minutes.

# **Important!** Please run the engine at intermediate speed if the idling time is long.

• Pull the safety lock control lever to "unlocked" position (refer to "3.5 Safety lock control lever in Chapter II"), and lift the bucket from the ground.



• Operate the control lever slowly, move bucket cylinder and arm cylinder to the end of their strokes respectively for 30 seconds and 5 minutes in turn, and raise hydraulic oil temperature.

Important! Do not carry out operation if the hydraulic oil temperature is low; run the engine at low speed and light load, until the oil in the engine and the hydraulic system gets hot and is easier to flow.

- After warming the engine up, inspect whether the monitor is in the following states or not.
- > Engine coolant thermometer is at the range of  $30^{\circ}$ C ~110°C
- ➢ Fuel level gauge comes close to H
- Central warning light (red) goes out
- Charging indicator lamp (red) goes out
- Air filter blocking warning indicator lamp (red) goes out
- Engine water temperature warning indicator lamp (red) goes out
- Hydraulic oil temperature warning indicator lamp (red) goes out
- Hydraulic oil filter blocking warning indicator lamp (red) goes out
- Preheating indicator lamp (yellow) goes out
- Inspect whether there is abnormal exhaust color, noise or vibration or not. Repair it in case of finding abnormity.
- Place the safety lock control lever in the locked position, and confirm that slewing and working device cannot be operated by the left and right working device control handles.

# 6 Operate the machine

# 6.1 Operate the working device

#### Left working device control handle

This handle controls slewing and arm.

N - neutral position (the upper frame and the arm are kept in a stationary position)





- 1 The arm extends
- 2 The arm extends and slews right
- 3 It slews right
- 4 The arm retracts and slews right
- 5 The arm retracts
- 6 The arm retracts and slews left
- 7 It slews left
- 8 The arm extends and slews left

#### Right working device control handle

This handle controls boom and bucket.

N - neutral position (the boom and the bucket are kept in a stationary position)

- 1 The boom declines
- 2 The boom declines and the bucket extend
- 3 The bucket extends
- 4 The boom rises and the bucket extends
- 5 The boom rises
- 6 The boom rises and the bucket retracts
- 7 The bucket retracts
- 8 The boom declines and the bucket retract



#### Moldboard control handle

This handle controls moldboard

N - neutral position (the moldboard is kept in a stationary position)

- 1 The moldboard rises
- 2 The moldboard declines



# 6.2 Control the traveling direction

Important! Inspect direction of the crawlers before operating the traveling control lever or the traveling pedal. If the travel motor is in front of the machine, the traveling control lever or the traveling pedal must be operated in the opposite direction.

Important! Be sure to operate the traveling control lever steadily, and avoid sudden start and stop. Do not change the traveling direction rapidly.

In case of letting the machine continue to travel, please comply with the following operation conditions:

Ground	Onemation	
condition	Operation	
	Do not let it continue to travel for more	
	than 2 hours. If it is to travel for more	
	than 2 hours at high speed, the machine	
Even, normal or	shall be shut off for at least 20 minutes,	
soft soil	and the machine must travel forward.	
	Otherwise, idler wheel or guide wheel	
	of the crawlers may be overheated, thus	
	causing oil leakage.	
	The machine traveling at low speed	
Uneven or	shall not continue to travel for more	
coarse soil	than 1 hour. If it is to travel at high	
(mixed with	speed for more than 1 hour, the machine	
grit, gravel and	shall be shut off for at least 20 minutes,	
boulder or	and the machine must travel forward.	
located on an	Otherwise, idler wheel or guide wheel	
incline)	of the crawlers may be overheated, thus	
	causing oil leakage.	

• Forward traveling

- Place the engine throttle control handle in the large throttle position, so as to raise the engine speed.
- When the travel motor is in the rear of the machine, slowly push the traveling control lever forward, or slowly step on the front of the pedal;
- When the travel motor is in front of the machine, slowly pull the traveling control lever backward, or slowly step on the rear of the pedal.
- Backward traveling
- Place the engine throttle control handle in the large throttle position, so as to raise the engine speed.



- When the travel motor is in the rear of the machine, slowly pull the traveling control lever backward, or slowly step on the rear of the pedal;
- When the travel motor is in front of the machine, slowly push the traveling control lever forward, or slowly step on the front of the pedal.
- Left steering
- When the travel motor is in the rear of the machine: push the right traveling control lever forward, to realize forward left steering; pull the left traveling control lever backward, to realize backward left steering.
- When the travel motor is in front of the machine: operate the traveling lever in the direction which is opposite to the above direction.
- Right steering
- When the travel motor is in the rear of the machine: push the left traveling control lever forward, to realize forward right steering; pull the right traveling control lever backward, to realize backward right steering.
- When the travel motor is in front of the machine: operate the traveling lever in the direction which is opposite to the above direction.
- Direction switch and rotation in reverse
- ➤ When the travel motor is in the rear of the machine: pull the left traveling control lever backward, and meanwhile push the right traveling control lever forward, to make the machine switch the direction to the left quickly; pull the right traveling control lever backward, and meanwhile push the left traveling control lever forward, to make the machine switch the direction to the right quickly;
- When the travel motor is in front of the machine: operate the traveling lever in the direction which is opposite to the above direction.



# 7 After operation

# **Warning**

When entering or leaving the cab, the personnel shall always face the machine, and use foot pedal or grip to avoid slipping. When getting on or off the machine, the personnel shall always adopt three-point contact, that is, two hands and one foot or two feet and one hand. Do not jump off the machine.

# 7.1 Machine parking steps

Important! Select even ground to park the machine, and avoid dangerous places. If the machine must be parked on a slope, heel block shall be put under the crawler pad. The bucket shall be inserted into the ground as an additional safety measure.

- Place the left and right traveling control levers in the neutral positions.
- Place the engine throttle control handle in the small throttle position.
- Lower the bucket and the dozer blade to the ground, and make the bottom of the bucket stay parallel to the ground.
- Place the safety lock control lever in the locked position; refer to "3.5 Safety lock control lever in Chapter II".
- Run the engine at low speed for about 5 minutes, to cool it gradually.
- Turn the key switch to OFF position, and shut off the engine.
- Take down the key to the start switch.

Important! Avoid stopping the machine suddenly. If the machine needs to stop for a period of time (no matter how long it is), the master power switch shall be placed in "0" position (OFF position).

# 7.2 Operation and inspection after shutting off

# the engine

- Patrol and inspect working device, machine outside and chassis, and inspect whether there is water leakage or oil leakage or not. Repair it in case of finding abnormity.
- Fill up the fuel tank with fuel.







- Remove crawler pad as well as sludge, rock fragments and rubble attached to the chassis.
- Park the machine on board after cleaning the crawlers under the freezing weather condition.

# 8 Park the machine

Important! Select level ground to park the machine, and horizontally place the bucket and the dozer blade on the ground. If the machine must be parked on a slope, heel block shall be put under the crawlers to prevent the machine from moving, and meanwhile the bucket shall be adjusted to the downhill side, and the bucket teeth shall be inserted into the ground.

- Select a place without danger of rock fall, collapse and flood to park the machine.
- Pay attention to the weather situation, and adopt proper measures, so as not to let the machine get frozen on the ground, cave in, or suffer any other bad consequences.
- When the vehicle breaks down and stops, place fence, signal, flag or warning light, and place other necessary signals, so as to guarantee that this machine can be clearly seen by the passing vehicles. In addition, do not make the machine, the fence and the flag hinder the traffic.
- Pull the safety lock control lever to the locked position when shutting off the engine and leaving the machine; refer to "3.5 Safety lock control lever in Chapter II".
- Close the windows, lock the cab and all covers, and then take down the key, carry it properly, and put it in the stipulated place.
- Shut off the master power switch.

Important! If the engine is stopped without cooling, its service life may be shortened. Do not shut off the engine immediately except for emergency situation. When the engine is overheated, cool it down at low speed, and then shut off the engine.

If the machine is to be parked for a long time, the following points must be accomplished:

• Inspect whether there is oil leakage or water leakage in the machine or not, and whether fault occurs to working device and crawlers or not.







- Remove soil and debris attached to the crawlers and the idler wheels.
- Carry out rust-proof treatment towards the exposed parts, and completely lubricate the machine.
- Fill the fuel tank and the hydraulic oil tank to the mark of maximum capacity.

When long-term storage of the excavator ends, the following operations shall be carried out:

- Wipe off the lubricating grease on hydraulic oil cylinder piston rod.
- Apply lubricating grease on all the parts needing to be lubricated.

# 9 Transport the machine

<b>Warning</b>	
$\succ$	Abide by regulations relating to weight, height,
	length and load safety when transporting the machine.
	Pay special attention to loading and unloading of the machine.
	Run the engine at low speed, and set the traveling speed of the vehicle at low speed.
	Select sturdy and even ground, and make it keep sufficient distance from the road shoulder.
	Ensure that sturdiness, width, length, and thickness of the board for loading and unloading the machine conform to the safety standards. If the board is too
	bent, it shall be supported with wood pad. Remove grease, engine oil, soil, ice, etc. on the board and underbody of the truck, to avoid sideslip of the vehicle.
$\blacktriangleright$	Do not change the travel route on the board. If it is necessary to change, lay the vehicle down from the board firstly, and then shange the direction
	The operation shall be carried out slowly at the time of slewing on the truck due to unstable chassis.
$\triangleright$	After loading, block various crawlers, and fix them

- with ropes which have sufficient strength, so as to enable the machine to be unable to move.
- Lock the cab door.





- Properly apply brake to the trailer, and put heel block A under the tire, so as to ensure that the trailer will not move.
- Install loading platform B between the trailer and the machine, and fix it firmly:
- Ensure that sturdiness, width, length, and thickness of the loading platform are safe for loading.
- > Ensure that angle of the loading platform is  $15^{\circ}$  or less.
- Ensure that the distance between the loading platforms matches the center of the crawlers.
- Respectively inspect whether the left and right loading platforms have the same height or not.
- Set the traveling speed at low speed.
- Operate the engine at low speed.
- Determine the direction, and slowly drive the machine to the loading platforms.
- Do not make piston rod of the bucket touch the trailer when loading the machine.
- Do not operate any control lever (or control handle) other than traveling control lever (or traveling pedal) when the machine is on the loading platforms.
- Load the machine on the trailer correctly, and ensure that the machine is firmly fixed.

# 9.2 Fix the machine

- Decline the bucket.
- Fully extend the bucket cylinder and the arm cylinder, and then slowly decline the boom.
- Lay the safety lock control lever down, so as to firmly lock this system. Refer to "3.5 Safety lock control lever in Chapter II".
- Shut off the engine, and take down the key from the start switch.
- Shut off the master power switch (place it in "0" position); refer to the part of master power switch in "2 Switch in Chapter II".
- Lock the cab door and all covers and hoods with locks; refer to "3.15 Covers/hoods with locks in Chapter II".
- Cover the exhaust pipe, to prevent the turbocharger from being damaged.











• Put heel block under both sides of the crawlers, and fix the machine with tether which has appropriate load capacity, to enable it to be unable to move.

Attention! When loading the machine along with the working device, even if the boom is shut, the pressure on hydraulic cylinder of the boom from dead weight of the machine is still very large; therefore, please insert a support between the arm and the boom at the time of loading.

# 9.3 Unload the vehicle

- Properly apply brake to the trailer, and put heel block A under the tire, so as to ensure that the trailer will not move.
- Install loading platform B between the trailer and the machine, and fix it firmly:
- Ensure that strength, width, length, and thickness of loading platform B are safe for loading.
- > Ensure that angle of loading platform B is  $15^{\circ}$  or less.
- Ensure that the distance between loading platforms B matches the center of the crawlers.
- Respectively inspect whether the left and right loading platforms have the same height or not.
- Dismantle iron chain or wire rope for fixing the machine.
- Start the engine for preheating.
- Place the safety lock control lever in the "unlocked" position; refer to "3.5 Safety lock control lever in Chapter II".
- Place the engine throttle control handle in the low speed position.
- Raise the working device, slowly move the machine, and stop moving when the machine is leveled with the top edge of rear wheel of the trailer.
- Adjust the angle between the arm and the boom to 90°~110°, lower the bucket to the ground, and slowly move the machine to the unloading platform from the back of the trailer.
- When moving the machine from the unloading platform, slowly operate the boom and the arm, and carefully lower the machine until the machine completely leaves the platform.





A tension! Keep the working device as low as possible uunder the circumstance of not touching the ground oand her objects. Do not operate other control lever (or ccontrol handle) other than the traveling control lever tone ramp.

# 9.4 Lift the machine



Do not lift the machine when someone is in the cab or on the machine.

Use qualified steel rope, chain and lift hook with sufficient loading capacity.

Always lift the machine as shown in the following figure. Incorrect lifting will deflect the load, thus causing personnel injury or damage to the machine.

Please do not let the pedestrians or the vehicles enter the underneath of the lifted machine at the time of lifting.

- Lift the machine on even, sturdy and level ground.
- Start the engine, and install the working device in the way shown in the figure.
- Lower the safety lock control lever to lock the system. Refer to 3.5 of Chapter II "Safety lock control lever".
- Shut off the engine, inspect safety of the whole machine, and then firmly close and lock operator's cab door, front window and engine hood.
- Correctly connect lifting ropes or lifting chains whose strength is sufficient for weight of the machine in the lifting positions (respectively in the middle of track rollers of the first crawler and the second crawler in front and at the back) as shown in the figure.
- After installing all lifting equipment, adjust lifting angle of the lifting ropes to 30°~40°, slightly lift the machine to inspect balance, and lift the machine slowly and evenly only if there is no problem.

#### Attention:

The lifting steps are applicable to machines with standard technical specifications.

The lifting methods will be different according to the actually installed accessories and optional parts. In this case, please contact and consult distributors of our company.







# 10 Tow the machine

# **10.1 Precautions**

- Use ropes with sufficient strength to tow the machine, and do not use tow ropes with broken strands, decrease of diameter or kink.
- It is forbidden to tow the machine on a slope.
- Anybody is forbidden to stand nearby the tow ropes in the process of towing. Do not cross or approach the tow ropes.
- Do not let anybody enter the middle place between the towing tractor and the towed vehicle when connecting the towed machine.
- Do not pull the ropes suddenly, but pull them slowly. The loose ropes pulled suddenly are easy to break.
- Keep the ropes level, straight and parallel to the crawlers.
- Select low-speed traveling mode. The machine can be slowly started at the time of towing.

# 10.2 Heavy-load towing

- Wire ropes shall be used in the way shown in the figure when the machine gets stuck in the mud and cannot get out depending on its own power, or when the machine is used to tow a weight.
- Blocks can be put between the towing ropes and the machine, to protect the machine and prevent the ropes from being damaged.

# 10.3 Light-load towing

• The shackle on the lower frame can be used to tow relatively light objects.







# Chapter IV Operation Techniques

This chapter makes instructions and suggestions on the way to operate the machine, including the way to use the most common working device, so as to enable the operator to use the machine safely and effectively.

# **1 Excavation rules**

# **1.1 Precautions**

**Warning** 

The operator must sit on the driver's seat when carrying out excavation operation. In the process of operation of the machine, there shall be nobody outside the upper structure, on the crawlers or at the entrance of car door.

Read **"3 Safety rules during the operation in Chapter III**" firstly.

- Before operation, carefully research drawings of the operation site and local rules, be familiar with state of the ground and situation of dangerous areas on the site, shut off gas pipelines, power supply and water resource in necessary, and mark the positions of underground cables and pipelines.
- If there is danger that the outsiders are too close to the machine, fence shall be set up and the mark of "No Admittance" shall be pasted in the area around the machine. Special attention shall be paid to slewing machine.
- Do not let the bucket pass over heads of other workers or over seat of operators of self-discharging truck and other transportation equipment, because the stuff loaded thereof may fall, and the bucket may touch the self-discharging truck, thus causing serious injury or damage.
- Never use the bucket to do the action of hewing.
- It is strictly forbidden to use dozer blade as supporting equipment.
- It is strictly forbidden to use this machine as crane for lifting.



- If the machine has any uncontrolled action, the pedal and the control lever shall be released firstly, and then the engine shall be shut off.
- If red warning light is on and the buzzer honks, the personnel shall immediately shut off the engine, and find out the reason.
- The machine should not be equipped with bucket or other working device which has the greater size that the allowed one.
- In case of the fire, the master power switch shall be shut off if possible (placed in "0" position).
- Do not excavate working surface under the suspended part, or it will be in danger of making rock fall or collapse from the suspended part fall on the machine.
- Do not excavate the underneath in front of the machine too deep. Otherwise, the ground under the machine may collapse, thus making the machine fall.
- When carrying out excavation operation, adjust the crawler to be at a right angle to road shoulder or cliff and make the travel motor stay in the rear, so that the machine is easy to escape in case of any situation.
- Do not carry out demolition operation under the machine, or it will make the machine become unstable and be in danger of tipping.
- When operating on the upper part of building or other structure, inspect strength of the structure before starting operation. It will be in danger of making the building collapse and causing serious injury or damage.
- Do not carry out overhead demolition when carrying out demolition operation. It will be in danger of making the broken part fall or making the building collapse and causing serious injury or damage.
- Do not carry out breaking operation with impact force of the working device. It will be in danger of causing personnel injury or damaging the working device due to flyweight of the broken materials.
- In general, the working device is more likely to tip over when it lies on the side than lying in front or in the rear.



 Be extremely careful and do not bang up the working device when constructing in places with height restriction, such as in tunnels, under bridges, under cables or in garages.

- When the working device and the dozer blade are on the same side, and the working device carries out close range operation, the operation shall be carried out carefully, to avoid contact of the bucket and the dozer blade when; when the working device carries out deep excavation operation, the dozer blade shall be placed on the ground, and cannot be lifted, to avoid contact with the boom cylinder.
- Stability of the machine must be ensured at the time of excavation operation. The dozer blade must be placed on the ground at the time of operation on level ground; the dozer blade must be adjusted to the lower side of the slope and placed on the ground at the time of operation on a slope.

# 1.2 Precautions at the time of loading

# materials

# **Warning**

Confirm that other people do not stand nearby when loading materials on the vehicle. Stones may fall out at the time of loading.

- If possible, position of the excavator shall be higher than position of the transport vehicle.
- The transport vehicle shall be placed properly, to avoid unnecessary slewing or lifting of the excavator.
- Confirm that driver of the transport vehicle is outside the working area of the machine. Never slew the bucket above the cab of the loading vehicle.
- Load the vehicle stably, and do not load it too high, to avoid unnecessary scattering.











#### 1.3 Precautions at the time of slewing or

#### reversing

- Appoint a signalman in places with danger or low visibility; refer to "8 Hand signals in this Chapter" for hand signals.
- Confirm that no outsiders go into the slewing radius or operation range.
- Honk the horn or send signal before the machine starts, to warn all personnel to leave the machine.
- There is a blind angle in the rear of the machine. Confirm nobody is in the blind angle before reversing the vehicle.

# **1.4 Forbidden operations**

• Operations by the use of shaking force Do not rake the soil on the ground, demolish buildings, or push the bucket teeth into the ground by the use of shaking force. These operations may damage the machine and the working device.

• Operations by the use of traveling force

Do not carry out excavation or push the bucket teeth into the ground by the use of traveling force. These operations may cause overload of rear of the machine, and damage the travel driving mechanism.

• Operation of extending the hydraulic cylinder to the end of its stroke

Do not extend the cylinder to the end of its stroke, or it may cause overload of brake in the cylinder, and shorten service life of the machine. Interval 1 shown in the figure on the right shall be as large as possible at the time of operation.





• Operations by the use of falling force of the bucket Do not use falling force of the machine for excavation or use falling force of the bucket for pick, breaking hammer or pile driver. Impact excavation or consecutive impact will cause overload of rear of the machine or damage the working device. That will obviously shorten service life of the machine.

#### • Operation of lifting

This machine is forbidden to be used as crane in principle. But if it is permissible, correct rated push-type hook and certified lifting appliance/shackle clip are needed.

• Operations by the use of falling pressure of the machine

Do not carry out operation by the use of falling pressure of the body. When excavating hard rock ground, the personnel had better break it in other ways, and then excavate it, which reduces the damage to the machine and is more economical.

• Operation of excavating rock

Excavation operation shall be carried out after the rock is broken with a heavy hammer, to avoid damage to the machine and improve operation efficiency.

# 2 Machine vibration

Machine vibration on construction machinery is influenced by many factors, such as operating mode, state of ground, speed, etc. The operators can influence the actual vibration level to a large extent.

# 2.1 Guiding principles for reducing

# vibration level of the machine

- Use a machine with proper type and size according to the purpose, and have proper optional equipment and working device.
- Keep the site and the transportation road in good condition.



- Remove all big stones or obstacles.
- ➢ Fill all ditches and holes well.
- Provide equipment and set the time to keep the site conditions
- Adjust speed and traveling path of the machine, to minimize the vibration level.
- Bypass obstacles and rugged platforms.
- Reduce the speed when driving through the rugged terrain.
- Maintain the machine according to the manufacturer's recommendation.
- Brake and steering systems.
- > Controller, hydraulic system and connection.
- Frequently maintain and adjust seats.
- Adjust seats and suspension according to weight and figure of the operators.
- Inspect and maintain seat suspension and adjust devices of the machine.
- ➢ Use seat belt and adjust it correctly.
- Carry out steering, brake, acceleration and gear shift, and move the working device stably.
- Minimize long work cycle or vibration of long-distance traveling.
- > Use suspension system if possible.
- Reduce the speed to prevent vibration if there is no available suspension system.
- Transport the machine when the construction site is far apart from it.

# 2.2 Guiding principles for effectively

#### minimizing back pain

- Adjust the seat and the controller to obtain the best operation posture.
- > Have a rest, and reduce long-term sitting posture.
- > Avoid jumping off the cab or the proximity system
- Reduce repeated processing and lifting of heavy objects.
- Maintain proper weight and good physical condition.

# **3** Operation under special operating

#### modes







- 3.1 Traveling
  - If the machine travels on even ground, the working device must be retracted and lifted, and kept 40cm~50cm above the ground.
- If the machine travels on rugged ground, its inclination angle shall not exceed 10° at the time of operation.
- The machine shall travel at low speed on uneven roadbed, such as stone roadbed or uneven road with big stones. The drive wheel shall be set in the direction of forward motion when the machine travels at high speed.

# 3.2 Traveling on a slope

- When the machine travels on a slope, the angle between the boom and the arm shall be kept at 90°~110°, and the bucket shall be lifted by 20cm~30cm away from the ground.
- Be careful when opening or closing the car door on a slope. Pulling-pushing force of the car door may change quickly, so be sure to keep the car door in the closed state and firmly lock it.
- The machine shall not travel on a slope with an angle of 30° or above, or it will be in danger of tip-over.
- When the machine travels on a slope with an angle or 15° or above, posture of the machine shall be as shown in the figure. When the machine travels upward on a slope, the personnel can insert the bucket into the ground and pull the arm if the crawler pad slips, so as to make the machine move upward with the help of the power of the working device.









When the machine travels downward on a slope with an angle or  $15^{\circ}$  or above, posture of the machine shall be as shown in the figure, and the machine shall travel at low speed.

- The machine shall not travel downward in reverse on a slope, and shall not shift direction or travel transversely. The machine shall shift direction on even ground or travel downward to even ground and make a detour.
- If the machine slips, the bucket shall be immediately laid down to the ground, and the machine shall be stopped.
- Slewing action or operation of working device shall not be carried out on a slope, or the machine will lose balance and tip over. Slewing action shall not be carried out especially when the bucket is loaded with goods.
- Under an inevitable circumstance, the slope shall be filled up with soil, to make the machine remain horizontal and stable as far as possible, and the operation shall be carried out carefully.
- When the machine travels on a slope, if the engine shut off, please place the traveling control lever in the "neutral position", lay down the bucket to the ground, and then restart the engine.
- If the start switch is placed in the "**I**" running position and the control handle is operated after the engine is shut off on a slope, the upper structure of the machine may slew under the action of gravity. Therefore, please do not operate the slewing function.





Be very careful when working on the muddy ground.



Use bottom of the bucket (do not use the bucket teeth) when propping up the machine with the boom or the arm.

Set the angle between the boom and the arm at the range of  $90^{\circ}$ ~110°.

Supplement and add lubricating grease to pin of the working device after carrying out underwater operation or existing from the muddy ground. Inspect lubricating oil in driving wheel, idler wheel and crawler driving box, and replace the lubricating oil if the lubricating oil has been polluted.

• The crawler on one side is stuck in the mire If the crawler on one side is stuck in the mire, the crawler stuck in the mire shall be propped up with the bucket, and a board shall be put under the crawler. A board shall also be put under the bucket if necessary.

• The crawlers on both sides are stuck in the mire If the crawlers on both sides are stuck in the mire, boards shall be put under the crawlers on both sides. Push the bucket teeth into the ground, pull the arm like the excavation work, and push the traveling control lever to the forward position, so as to enable the machine to get out of the mire.

# 3.4 Traveling in water

Important! When the machine is driven out of the water, if angle of the machine exceeds 15°, rear of the upper frame will enter the water, and the water will be splashed by radiator fan, which will cause damage to the radiator fan. Be particularly careful about it.

• The allowable operating water depth is center of the upper track roller. Do not completely submerge the upper track roller.





Upper track roller
Water surface





- When leaving the water, ensure that lubricating grease of all parts exposed to water is supplemented, such as pin of the bucket, etc.
- Old lubricating grease shall be completely removed no matter whether it is in the maintenance cycle or not.
- Inspect whether the engine oil in the traveling driving mechanism is polluted or not. The engine oil shall be replaced if necessary.



# 3.5 Operation under the condition of cold

#### climates

WarningPrevent the unprotected skin from directly touching<br/>very cold metal parts, or the skin will be frozen on<br/>the metal.Reaction of hydraulic system of the machine will be<br/>very slow at very low temperature. Therefore, be

**very careful to avoid accidents before this system reaches the normal operating temperature.** Read suggestions on starting; refer to "5 Start the machine

in Chapter III".

- Ice and snow on the car windows must be removed before the machine carries out operation.
- The surface covered with snow or frozen is very slippery. Be very careful when making the machine travel or operate, and do not suddenly operate the control handle. The machine will slip even on a small slope. Therefore, special attention shall be paid at the time of operation on a slope.
- The frozen ground will soften when the temperature rises, which will cause tip-over of the machine.
- If the machine enters into deep snow, it will be in danger of tipping over or being buried in the snow. Be careful not to leave the road shoulder or falling into snow.

#### **3.6 Operation at a site with impurities**

When the machine operates at a site whose environment is polluted or a site which is harmful to health, the machine must be equipped with outfit suitable for this kind of site. Moreover, for the machine working on this kind of site, its maintenance cycle shall be shortened.


## **3.7 Operation under the condition of low**

#### visibility

## 

When the visibility reduces, inspect whether the machine can safely complete the operation or not. If the visibility exceeds the safety limit, the operation shall be immediately stopped, and the machine shall be parked at a safe site after the visibility improves.

If carrying out operation at night or at dark:

- Confirm that the excavator has been equipped with sufficient work lights and reflective pieces.
- It is harder to judge distance and height in the dark. Therefore, be particularly careful when carrying out excavation at night.
- It is necessary to set up road warning signal or turn on roof warning light (optional for the users) when carrying out operation on the road.

## **4 Recommended operations**

Excavator is a multifunctional machine, and it can be fitted with multiple professional working devices to complete multiple types of work. Only simple operations are explained as follows.

Backhoe operation

Backhoe operation is applicable to excavation in a place which is lower than position of the machine.

When the angle between the bucket cylinder and the connecting rod and the angle between the arm cylinder and the arm are respectively set at 90°, the cylinders are the most efficient. In case of carrying out excavation work, this angle shall be used to improve work efficiency. Working range of the arm is  $30^{\circ}$  forward and  $45^{\circ}$  backward based on the arm angle. The difference may be very small in terms of excavation depth. When using the cylinders, do not make them reach the stroke end, and keep them in this range only.







#### • Forward shovel operation

Forward shovel operation is applicable to excavation in a place which is higher than position of the machine. Forward shovel operation can be carried out by the bucket installed in reverse.

#### • Ditching operation

Install a proper bucket, and adjust the crawlers well according to the direction of ditching operation (the crawlers and the ditch are parallel), so that it can work effectively.

When excavating a wide ditch, excavate two sides of the ditch, and then excavate its central area.

• Loading operation

When parking the dump truck, lessen the slewing radius, and make the operator have good visibility, so as to work effectively.

In addition, loading can be carried out in the rear of the dump truck, but not on its sides, which will make the operator work more easily, and improve the efficiency.



## Crawlers

Crawler	Purpose	Applicable safety precautions
pad		
А	Stony	Travel at a slow speed on
	ground	bumpy ground or ground with
	and	many obstacles.
	common	
	soil	
В	Soft	Travel at a high speed only on
	ground	flat ground. Reduce traveling
		speed to about half of low speed
		when crossing an obstacle
		inevitably in the traveling
		process.
		Attention! Do not use the
		machine on uneven ground
		with large obstacles (e.g.
		round stone and fallen tree).
C	Dead-soft	Only used on the ground where
	ground	it is impossible to use type A
	(muddy	and B crawler pads. Travel at a
	ground)	high speed only on flat ground.
		Reduce traveling speed to about
		half of low speed when having
		to cross an obstacle.
		Attention! Do not use the
		machine on uneven ground
		with large obstacles such as
		large round stone and fallen
	D 1	
D	Paved	Only used on paved ground.
	ground	Attention! It cannot be used
		on uneven ground or
1		excessively hard ground.



## 6 Replace the bucket

## 🕂 Warning

When the hammer is used to strike the pin shafts, the metal filing may fly into the eyes, thus causing serious injury.

Always wear goggles, safety helmet, gloves and other protective articles when carrying out such operation. Stably put the bucket away when dismantling the bucket.

If the pin shafts are struck hard, the pin shafts may fly out and hurt the personnel in the surrounding area. Therefore, it is necessary to inspect whether the surrounding area is safe or not.

When dismantling the pin shafts, be particularly careful not to stand under the bucket, and not to put their feet or any part of their body under the bucket. Be careful not to hurt hands when dismantling or installing the pin shafts.

Do not put fingers into the pin holes when aligning holes.

- Slightly put the bucket on even ground.
- Dismantle ring gasket and stop pin, and pull-out pinshafts (A) and (B), and dismantle the bucket.

Attention! Ensure that the pin shafts will not be soiled by mud after the pin shafts are dismantled. Both sides of the shaft sleeve are fitted with dust seals. Be careful not to damage them.











• Align arm and hole (1) as well as connecting rod and hole (2), and then install pin shafts (A) and (B) painted with lubricating grease.

Attention! O-ring damages easily when the bucket is installed. Therefore, it is necessary to put the O-ring on the boss at the end of the arm. Move the O-ring down to the standard groove when striking the pin shafts.

- Install the rings and pins to each pin shaft.
- Add lubricating grease through nozzles (D), (E), (F) and (G) (5 parts in total) on connecting rod of the bucket.

## 7 Hand signals

Hand signals are applicable to ground operation (excavating and leveling site) and machine traveling command when an obstacle influences vision of the operator. If rapid rise, fall or movement is needed, the arm action must be more vivid.

• Raising the boom

As shown in the figure, horizontally stretch out one of the two arms, make a fist and stretch out the thumb, and make the fingertip point up.

#### • Lowering the boom

As shown in the figure, horizontally stretch out one of the two arms, make a fist and stretch out the thumb, and make the fingertip point down.











#### • Extending the bucket

As shown in the figure, stretch out one hand and keep it still, and then clench the other hand into a fist, stretch out the thumb, and make it horizontally point to the still hand and draw a small circle in the vertical plane.

#### • Steering

As shown in the figure, raise one of the two arms and make a fist to point out inward steering, and then clench the other hand into a fist and draw a circle in the vertical plane to point out rotation direction of crawlers or wheels.



## • Pivot steering

As shown in the figure, put one hand on the head to instruct crawlers or wheels on one side and in the rear to rotate, and then clench the other hand into a fist and draw a circle in the vertical plane to instruct crawlers or wheels on the other side to move forward.





#### • Movement

As shown in the figure, clench the two hands into fists and raise them, and draw a circle in the vertical plane according to rotation direction of crawlers or wheels.

• Distance of movement

As shown in the figure, raise the two hands and make the palms point inward, laterally move the two hands to show the distance of movement.

• Slow movement

As shown in the figure, keep one hand still, and put it in front of the hand sending a signal of movement, to show slow action execution.





#### • Stop

As shown in the figure, stretch out one of the two arms and make the palm face down, and then move the arm forward and backward.

#### • Emergency stop



As shown in the figure, stretch out the two arms and make the palms face down, and then move the arms forward and backward.

#### • Shutting off the engine

As shown in the figure, make the thumb or the index finger cross front of the throat.





# Chapter V Safety during the Repair

## **Warning**

If having to carry out repair or maintenance before cooling of the machine, be careful not to get burned by thermal fluid and spare parts.

This section involves general safety provisions which shall be abided by at the time of vehicle inspection and maintenance. This manual also elaborates safety provisions and warning words which shall be noticed at the time of vehicle operation in different sections.

## **1 Repair position**

**Before conduct of any repair work,** the machine shall be parked on even ground and preparatory work before repair shall be conducted:

- Place the machine on even, sturdy and level ground.
- Lean the working device on the ground.
- Lean the dozer blade on the ground.
- Shut off the engine, and take down the start key.
- Place the safety lock control lever in the locked position; refer to "3.5 Safety lock control lever in Chapter II".
- Gradually release the pressure in pipelines and vessels, so as to avoid danger.
- Cool the machine down sufficiently.
- 2 Getting in/out or climbing up the

#### machine





#### Hydraulic excavator operation & maintenance manual



- Inspect grip or ladder before getting on or off the machine. In case of oil stains, lubricant or sludge, wiped it up immediately, to prevent slipping when getting on or off the machine.
- Do not grasp any control lever (or control handle) when getting on or off the machine.
- Do not jump on or off the machine. Do not get on or off the vehicle when it moves.
- When getting on or off the machine, use grip or pedal to support the body, and keep at least three-point contact (two feet and one hand or two hands and one foot), to ensure to keep the body stable.
- Always face the machine.
- Handle A on the cab door is used to close the cab door.
  Do not use this handle as access grip when leaving the cab.

### **3** Safety provisions

#### 3.1 Preventing personnel injury

- It is very dangerous to use incorrect repair methods. Make sure that you have had sufficient knowledge, correct information and proper tools and equipment required for repairing the machine.
- Please read all labels, marks and signs on the machine and this *Operation & Maintenance Manual* before repairing the machine. Important information relating to machine repair and maintenance is included in each description.
- Temporarily paste or place a sign marked "No Operation" or other similar warning signs on start switch and instrument panel before implementing repair work. Prevent others from starting the engine or controlling the handles. Otherwise, it will cause injury or death of the operator.
- Do not wear loose clothes, such as headscarf or ornaments when working on the machine, or they may be clamped, thus causing injury.
- Be sure to wear safety helmet, safety goggles, gloves, protective shoes and other protective articles needed at the time of repair.



- Guarantee there is sufficient ventilation equipment when starting the engine indoors.
- Do not stay in front and the rear of the machine when the engine runs.
- Before opening engine hood, radiator shell, etc., shut off the engine, and ensure that no tools or other articles which may cause damage are left in the machine.
- All pressure vessels must be opened carefully, and any remaining pressure must be released. After the engine shuts off, there is still remaining pressure gathered in the system. If they are opened before the pressure is released, the liquid will spray under high pressure. Likewise, inspection of tightness of leaking connection and joints shall be carried out only after all pressure in the system is completely released.
- The leakage must be found out with paper or wood chip, but not directly by hands.
- Ensure that there are no oil stains, diesel fuel, dust and ice, etc. on the tread surface, grip and non-slip surface. Do not tread machine surface which shall not be trodden.
- It is necessary to shut off the engine when repairing the machine, unless otherwise specified in the labels or this manual.
- Any transformation without consent of ACHILLES may cause danger. Before transforming machine, you can consult ACHILLES AUSTRALIA or its designated distributor. ACHILLES AUSTRALIA will not undertake liability for any damage due to unauthorized transformation.

If one of the following conditions was satisfied, the modification will be formally permitted:

1. Auxiliary devices, accessories, assemblies, accessories or software are produced, distributed or licensed by ACHILLES AUSTRALIA

2. The modification shall be made with the written permission of SDLG's technique department.

#### Repair and maintenance safety when the engine runs

To prevent injury, do not carry out maintenance work when the engine runs. If it is necessary to carry out maintenance when the engine runs, the following precautions must be abided by:



- Arrange for an operator to sit on the seat, guarantee smooth contact between all repair and maintenance personnel and him, and prepare to shut off the engine at any time.
- Do not touch high-temperature components such as tail pipe and muffler, to prevent burns.
- When the operation point is close to rotary parts, it is in danger of being entangled by the rotary parts. The operator shall very careful about it.
- Do not touch any control lever (or control handle). If it is necessary to operate control lever (or control handle), a signal shall be sent to the other personnel, so as to warn them to go to a safe place.
- Never let any tool or any part of the body touch fan blade or fan belt. Otherwise, it may cause severe trauma.
- Do not adjust the unknown parts at random.

## 3.2 Preventing damage to the machine

- It is very dangerous to use incorrect repair methods. Make sure that you have had sufficient knowledge, correct information and proper tools and equipment required for repairing the machine.
- The personnel shall use equipment with sufficient lifting or supporting capacity when lifting or supporting the machine or spare parts of the machine.
- All lifting devices must conform to provisions of the state on lifting devices. If lifting devices, tools or working methods stipulated in this manual fail to be used, ACHILLES SDLG. will undertake no liability.
- The pressure in the hydraulic system must be released before start of the work.
- Special methods shall be adopted for repairing and maintaining vehicles used in a polluted area (polluted environment or unsanitary area). In addition, special safety provisions shall be abided by at the time of maintenance of such vehicles.
- Repair parts designated by ACHILLES SDLG. shall be sued at the time of repair and replacement; engine oil and lubricating grease designated by ACHILLES SDLG., Ltd. shall be sued at the time of maintenance, and engine oil and lubricating grease with proper viscosity shall be selected



according to environment temperature.

- By all means avoid mixing up different brands of oil. If there is only one kind of oil, but it is different from the oil being used, then the oil being used shall be completely replaced.
- Avoid overflow when emptying/discharging oil or fuel. When the liquid cannot be discharged to vessel directly, a pump shall be used or a hose shall be connected so as to discharge the liquid safely. The oil overflowing the ground will pollute the environment, and will lead to fire. The used oil and other liquid shall always be processed by the authorized waste recovery processing company.
- Ensure that all covers on the machine have been covered up before start of the engine.
- Refer to "11.2 Precautions during welding in Chapter VI" for measures relating to electric welding.

### **Fire prevention**

#### 4.1 Fire prevention measures

## **Warning**

If the vehicle is used in the environment easy to have fire disaster, e.g. environment with easy explosion, special equipment shall be supplied.

Be very careful if cleaning with high-pressure nozzle because electrical components and wire might be damaged even under very low hydraulic pressure and temperature. Electrical components and wire shall be protected with appropriate methods. Meanwhile, turn off engine and main power switch.

- It is strictly forbidden to place sundries around the whole machine wires, so as to avoid causing short circuit of the wires due to friction between the sundries and the wires, or it will cause fire in a severe case.
- Be alert to danger of fire. Learn to use fire extinguisher, and be clear about its storage position, so as to immediately find out the fire extinguisher to be used in case of need.
- When the fuel tank is filled with fuel or opened, smoking beside the machine is forbidden, and the personnel shall ensure that there is no open fire around the machine.

4



- Diesel oil is combustible, and cannot be used for cleaning the machine (except for some small parts). Authorized solvents shall be used.
- Some solvents will cause rash. Inhalation of vapor of such solvents shall be reduced as far as possible.
- Most of the solvents are inflammable, and shall be stored properly, so as to avoid constituting a fire hazard.
- The work site for repair shall be kept clean. Cleanliness is crucial to normal operation of various systems in the machine. Oil or water will make ground and steps become slippery, and are very dangerous to relevant electrical system and electric tools. Clothes with oil or cloth steeped with grease are serious hidden trouble of fire.
- Machine and equipment shall be inspected every day, and all kinds of guard boards shall be free of dirt and oil, so that risk of fire can be reduced, and it is easier to find out the faulty or loose spare parts.
- The machine shall be kept clean particularly when it works in a sensitive environment (such as sawmill, garbage accumulation place or similar places). To reduce accumulation of inflammable materials, the machine shall be equipped with proper equipment (such as muffler hood, radiator separation plate, high-powered fan or special filter, etc.) when it operates in such an environment.
- Any fire extinguishing equipment fitted on the machine shall be in a working state. Some auxiliary equipment can also be used for fire prevention, and can be adopted by the operators in case of fire. But such equipment cannot substitute for the fire prevention work which shall be done by the operators themselves.
- Inspect wires, especially the conductors not connected with fuse, and confirm that they will neither be damaged due to friction, nor cause damage due to friction.
- Inspect the conductors not connected with fuse after disconnection, and confirm that their connection and clamping modes will not have friction. The conductors not connected with fuse cannot lean on oil pipes and fuel pipelines.
- Inspect fuel hose, hydraulic system and brake hose, and confirm that they are not damaged due to friction.
- Welding and grinding work can be carried out only in



• Storage battery, plastic items and other materials which may endanger the environment shall not be simply discarded. The personnel shall ensure that their processing mode will not pollute the environment.

#### 4.2 Measures in case of fire

# Measures which shall be adopted in case of the smallest fire sign:

- Drive the machine to a safe place, to prevent the fire from spreading.
- Lower the working device to the ground.
- Place the start switch in "O" position, and leave the cab.
- Shut off the master power switch.
- Try to extinguish the fire. Call fire prevention telephone number for help in case of need.

### 4.3 Measures after fire

The personnel shall adopt the following protective measures when processing the machine damaged by fire or high heat:

- Wear thick protective rubber gloves and goggles.
- Do not touch the spare parts directly by hand, to prevent burns. Thoroughly wash it with whitewash.
- Please refer to "5.3 Heated fluorocarbon rubber in this Chapter" for processing heated fluorocarbon rubber.

## **5** Processing dangerous materials

#### 5.1 Heated paint



If heated, the pain will break down, and form stimulating compounds. It is very harmful to health to work in such an environment for a long time.

The heated paint will liberate toxic gas. Therefore, the paint in the area which is 10cm (4in) around it must be cleaned up before welding, grinding or gas cutting. Otherwise, that will not only endanger health, but also influence welding quality.

#### Methods and precautions for removing paint

- Strong blow. Respiratory protection equipment and goggles shall be worn if this method is adopted.
- Paint remover or other chemicals. Portable air pump, respiratory protection equipment and goggles shall be used if this method is adopted.
- Grinding machine. Portable air pump, respiratory protection equipment, protective gloves and goggles shall be used if this method is adopted for removing paint. They shall not be discarded after use, but shall be delivered to qualified departments for processing.

#### 5.4 Air conditioning refrigerant

Attention! The workshop for processing refrigerant must be identified and permitted, and its principal must have corresponding qualification.



If coming into contact with the refrigerant leaking out, the personnel shall adopt the following measures:

- If suspecting that the refrigerant leaks out, the personnel shall leave the dangerous area and contact qualified repair shop to carry out repair.
- The gases formed by the refrigerant after heating will harm lungs and nervous system. Even under the circumstance that their concentration is very low and nothing can be smelled, the personnel shall immediately leave this area; people will be drugged at a high concentration, so the personnel shall immediately move from the dangerous area to a place with fresh air. If the symptom continues, the personnel are requested to go to the hospital for treatment.
- Liquid refrigerant may cause frostbite. The personnel shall warm up the injured part with warm water or warm clothes. If the symptom does not improve, the



personnel are requested to go to the hospital for treatment.

• If the liquid refrigerant gets into the eyes, the personnel shall go to the hospital for diagnosis and treatment after washing the eyes with running warm water.

#### 5.5 Storage battery

## **Warning**

Storage battery contains sulfuric acid which is very corrosive to the skin.

- The storage battery will release explosive gases. Do not smoke near the storage battery.
- Ensure that metal objects (such as tool, finger ring, watchband, etc.) do not come into contact with battery post, or it may cause injury or fire.
- Ensure that the battery post is always fitted with protective element.
- The storage battery shall not be placed upside down or placed horizontally, and shall not be impacted or heavily pressed by any machinery.
- Do not connect the discharged storage battery and the fully charged storage battery in series, or it will be in danger of explosion.
- Firstly, disconnect ground wire when dismantle the storage battery, and finally connect ground wire when installing it, so as to reduce danger of spark.
- The storage battery contains substances which harm health and pollute the environment. Therefore, the scrapped storage battery must be properly processed in accordance with relevant local/national provisions.
- Refer to "11.1 Charge of storage battery in Chapter VI" for charge of storage battery.

## 6 Prevention of environmental pollution

During maintenance, care should be taken to protect the environment. Draining oil/fluid that is harmful to the environment into the environment will pollute the environment. The degradation of oil in water and sediment is very slow. One liter of oil is enough to pollute millions of liters of drinking water.

## **O**CAUTION

For the following points, all waste must be sent to an



officially approved waste management company for processing.

- 1. The oil must be collected in a suitable container and measures to prevent overflow must be taken during draining.
- 2. Before disposing of the used filter, all the working fluid in it must be drained. If the machine is working in an environment that contains asbestos or other dust that is harmful to health, put the used filter of the machine in the sealed bag that comes with the new filter.
- 3. The battery contains substances harmful to personal health and the environment. The used battery must be disposed of as environmentally hazardous waste.
- 4. Consumables such as used rags, gloves, bottles and cans may also be contaminated by oil/fluid that is harmful to the environment. These consumables must also be treated as environmentally hazardous waste.
- 5. When the product needs to be scrapped, please follow the local laws, regulations and environmental protection policies.



# Chapter VI Repair and Maintenance

## 1 Clean the machine

The machine shall be cleaned regularly.

Important! Avoid using corrosive cleanser or chemicals at the time of cleaning, so as to avoid damage to paint of the machine.

Attention! Clean the parts with accumulation of inflammables such as wood chips, leaves and paper on the machine every day, clean up fuel, lubricating oil, etc. on the machine, and ensure that there are no oilcloths or other inflammables.

Precautions for cleaning the machine:

- Water temperature cannot exceed  $60^{\circ}$ .
- Soft sponge shall be used.
- The machine shall be lubricated again after cleaning.
- Paint shall be made up if necessary.

## 2 Paintwork maintenance

The machine is easier to rust in a humid and corrosive environment. It is suggested that paintwork of the machine should be maintained once every six months.

## 3 Clean the cab

If the machine works in an environment with a lot of dust or with a fire hazard, its cab needs to be cleaned every day. When it operates in other environments, inspection and cleaning shall be carried out at least once a week.

## **Warning**

The engine cannot be run when the cab is cleaned, because damage will be caused by the rotating spare parts.

- It would be best to carry out cleaning after finishing work schedules and before parking the machine.
- Use personnel protection equipment such as goggles, gloves and breathing mask.
- Inspect and repair all leakages after cleaning.
- Close all covers and hoods.





1 Oil filler 2 Oil filter 3 Oil dipstick 4 Fuel fine filter element 5 Air filter

## 4.1 Inspect engine oil level

#### Inspect engine oil level every day.

- Place the machine in repair position; refer to "1 Repair position in Chapter V".
- Open the engine hood.
- Pull out dipstick A, insert it after cleaning, and then pull it out again (at least two times).
- If the oil level is higher than H mark, find out the reason and eliminate it. If there is no abnormality, discharge the redundant engine oil from drain plug at the bottom of the engine, and then inspect the oil level again.
- If the engine oil level is between "H" and "L", it means the oil level is normal. If the oil level is lower than "L" scale mark, the stipulated engine oil shall be added through oil filler of the engine. Refer to "19 Selection of oil in this Chapter" for selection of engine



H Highest oil level L Lowest oil level

oil.

• If the oil level is normal, put the dipstick back, and close the engine hood.

Important! If the oil level is inspected after the engine works, inspection shall be carried out after the engine has been shut off for 10 minutes. If the machine is slanted, the machine shall be placed horizontally before inspection.

## 4.2 Replace engine oil and engine oil filter

### element

**Replace engine oil and engine oil filter element once** every 250 hours (50 hours at the first time). If the machine works in an acid or dusty environment, the replacement cycle shall be shortened. Engine oil filter is a disposable appliance; it cannot be cleaned, and must be replaced.

## **Warning**

Be careful at the time of replacement of oil. The hot engine oil will burn the skin with no adoption of any protective measures.

- Start the engine, make it run at idle speed, and shut it off after the oil temperature reaches 80°C.
- Place the machine in the repair position; refer to "1 Repair position in Chapter V".
- Unscrew the drain plug at the bottom of the engine, and connect a joint and a matching oil discharge hose which are provided as attached maintenance tools, then discharge the oil and collect it with a vessel.

Attention! Pay attention to environmental protection when disposing of waste oil and waste liquor.

Drain plug

<sup>/</sup> 



- Open oil filler cap 2, and speed up oil discharge.
- Exhaust the old oil, dismantle the joint and the discharge hose, and screw the drain plug.
- Rotate engine oil filter 1 anticlockwise with a wrench.
- Clean fitting surface of the engine oil filter.
- Fill the filter element with engine oil, place a new sealing gasket on the new engine oil filter, and meanwhile apply proper amount of engine oil to surface of the sealing gasket. Rotate the engine oil filter to the right to install it on the engine, until surface of the engine oil filter touches the engine. Then tighten it for 3/4 circle with a wrench.

Important! Excessive mechanical tightening may damage the screw thread or damage leak tightness of the engine oil filter element.

Important! After the filter element is replaced, the engine must run at low idle speed for at least 1 minute, so as to ensure that the engine has been lubricated before working.

- Fill it with the stipulated engine oil for about 12L from side or top engine oil filler of the engine, and then tighten the oil filler cap.
- Shut the engine off after running it at idle speed for about 5 minutes, and then inspect whether the engine oil filter and the drain plug are of oil leakage or not.
- After shutting off the engine for about 10 minutes, inspect the oil level again, and add the oil in case of insufficiency.

#### 4.3 Adjust clearance of intake/exhaust valve

# Inspect and adjust valve clearance every 1000 operation hours.

To guarantee accuracy of opening and closing time of valves, their clearance must be correctly adjusted. Otherwise, it will cause too much noise when the engine runs, influence working performance of the engine, and cause damage to the machine. Clearance adjustment shall be operated by after-sales service personnel designated by ACHILLES MACHINERY AUSTRALIA

#### **5** Fuel system

Important! Clean fuel is critical to avoiding operational failure of the engine.

Important! Carefully clean the surrounding area before dismantling the oil filler cap, and avoid spill of



fuel at the time of fuel filling. Keep filling the fuel tank in cold season, to avoid occurrence of condensation water in the fuel tank.

### 5.1 Fuel filling and oil level inspection

The operator can inspect fuel oil level constantly through fuel oil level gauge on the monitor. If the point falls to the red area, the stipulated fuel shall be added. Before fuel filling, the upper frame of the machine can be rotated to an appropriate angle compared with the lower frame, so that the personnel can stand on the crawler to carry out filling after stopping the machine. Refer to "19 Selection of oil in this Chapter" for selection of fuel, similarly hereinafter.

### **5.2 Discharge sediment**

#### Discharge sediment once every 50 hours.

- Place a vessel under the discharge valve
- Open the oil filler cap.
- Connect the discharge hose, open the discharge valve at the bottom of the fuel tank, discharge all of the sediment, and collect it with the vessel.

Important! Waste oil and waste liquor shall be disposed of in an environmental and safe way!

• Dismantle the discharge valve, and close the valve and the oil filler cap.

## 5.3 Replace fuel filter

## **Warning**

The fuel is hot after the machine just finishes operation. It shall be carried out after the fuel is cooled.

Avoid open fire.

Replace the fuel filter in first 250h of use and then replace it once every 250h. If poor quality fuel is used, the replacement cycle will be shortened.

- Place a vessel to collect the fuel in the filter.
- Close fuel cock of oil-water separator (place it in "OFF" position).
- Dismantle the fuel filter with a filter disassembly wrench.

Important! Filter and fuel shall be disposed of in an environmental and safe way!







- Fill the new fuel filter with clean fuel after thoroughly cleaning the filter cover.
- Apply engine oil to the new O-ring, and stick it on the filter cover. At the time of installation, firstly rotate it by 2/3 circle, and then rotate it slowly by hand.

Attention! If screwing of the filter is too tight, the Oring may be damaged, thus causing fuel leakage; if screwing of the filter is too loose, the fuel will leak from the O-ring. So it shall be screwed appropriately.

• After finishing installation, open cock of oil-water separator ("OFF" position), and exhaust air in fuel system. Refer to "5.7 Exhaust air in fuel system in this Chapter".

## **5.4 Drain away water in fuel prefilter**

The personnel shall inspect the fuel prefilter frequently, and drain away water in it regularly.

- Prepare a vessel and put it under the fuel prefilter.
- Unscrew the water discharge valve by 3 circles to drain away the water, and tighten the water discharge valve after fully discharging the standing water in the water accumulation cup.

## 5.5 Replace fuel prefilter

# **Replace it once every 500 hours. The replacement cycle shall be shortened if bad fuel is used.**

- Clamp the fuel oil way.
- Place a fuel collection vessel under the fuel prefilter, to recycle the fuel in the filter.
- Unscrew the fuel prefilter from coarse filter bracket.
- Replace the filter with a new one, use a new O-ring and lubricate it.
- Tighten the water accumulation cup by 1/4 to 1/2 circles.
- Fill the filter with fuel.
- Use a new filter seal ring and lubricate it.

Attention! The seal ring must be fixed and placed well!

• Place the filter on the bracket and screw it by 1/4 circle.

Attention! If screwing of the filter is too tight, the Oring may be damaged, thus causing fuel leakage; if screwing of the filter is too loose, the fuel will leak from the O-ring. So it shall be screwed appropriately.

#### 5.6 Drain away water in oil-water separator





#### Hydraulic excavator operation & maintenance manual



- Prepare a vessel and place it under drain plug E.
- Close fuel cock of oil-water separator (place it in "OFF" position).
- Loosen drain plug E, and discharge water accumulated in it.
- Screw drain plug E.
- Open fuel cock (place it in "ON" position).
- Exhaust air in fuel system. Refer to "5.7 Exhaust air in fuel system in this Chapter".

#### 5.7 Exhaust air in fuel system

Note! Air in the fuel system can cause difficulty starting or abnormal operation of the engine. After draining the water and sediment in the water separator and replacing the fuel filter, it is necessary to ensure that the air in the fuel system is discharged. The engine of this machine is equipped with automatic bleeding function, and thus no manual bleeding is required.

#### 6 Air filter

Air filter can prevent dust and other impurities from entering the engine. Attrition rate of the engine greatly lies in cleanliness of absorbed air. Therefore, the air filter shall be regularly inspected and properly maintained.

Important! Do not start the engine which has not been fitted with filter or whose filter has been damaged in any case.

Regularly inspect whether there is leakage in hose and pipeline connection from the air filter to the air intake duct of the engine or not.

Prepare a spare air filter, and store it a good dustproof place.

#### 6.1 Clean dust discharge valve of air filter

Clean the dust discharge valve every day.

Press dust discharge valve A and discharge the dust, or dismantle this dust discharge valve from the air filter, empty the dust, and carry out cleaning.





#### 6.2 Clean and replace filter element

When air filter blocking warning indicator lamp  $\sum$  on the monitor is on, cleaning or replacement shall be carried out. Even if the warning indicator lamp is off, main filter element shall be replaced at least once every 500 hours, and safety filter element shall be replaced simultaneously when the main filter element is replaced at the third time. If the filter element is damaged, it must be replaced no matter whether it reaches the replacement cycle or not.

Important! Replacement cycle of filter depends on working environment of the machine. The replacement cycle shall be shortened under the circumstance of harsh operating environment.

Attention! Safety filter element does not need to be cleaned, and only needs to be replaced.

#### Clean main filter element

- Loosen clasp.
- Take down air filter cover, slightly rotate main filter element B forward and backward, and then take it out slowly.
- Clean filter element mechanically:

Lean it on soft and clean object surface, and carefully pat end of the outer filter element.

#### Attention! Do not lean it on hard surface to beat it.

• Clean filter element with compressed air:

Clean it with clean and dry compressed air whose maximum pressure is 500 kPa (5 bar) (73 psi). The distance between the nozzle and the filter shall not be less than  $3\sim5$  cm ( $1\sim2$  inches). Blow the filter clean along the internal folding parts.

Attention! Inspect whether the filter element is damaged or not after cleaning. It can be inspected with a lamp in a dark room. Even if it has the smallest hole, scratch, crack or other damage, the filter element must be replaced.

#### **Replace main filter element**

- Take the main filter element out; refer to "Clean main filter element" for the steps.
- Clean internal surface of the shell with a wet rag, and pay special attention to sealing surface of the shell and pipeline at the outlet.

#### Important! Do not clean the shell with compressed air.

• Install the new filter element in the shell after







confirming good elasticity of rubber ring on the new filter element.

#### **Replace safety filter element**

If the main filter element is damaged, the safety filter element plays a role of protective filter. If the main filter element has been replaced or cleaned, once the warning indicator lamp is on, it means the safety filter element is blocked.

Attention! Safety filter element can be replaced only, and cannot be cleaned.

- Refer to the steps in "Clean main filter element", and take the main filter element out.
- Clean the filter shell.
- Carefully take safety filter element C out from the shell.
- Wipe fitting surface of the safety filter element with a clean and wet cloth.
- Install a new filter element, and install a main filter element.
- Install end cover.

Attention! The safety filter element shall be dismantled very carefully and accurately, so that the impurities will not enter into the engine. Carefully inspect whether the new safety filter element is installed correctly or not.

Attention! The safety filter element shall not be dismantled unless when it is to be replaced.

## 7 Cooling system

If the coolant level is normal but the engine temperature become high, the radiator must be cleaned.

Important! Be careful, and do not damage chip of the radiator.

## 7.1 Inspect coolant level

Inspect coolant level every day.

**Warning** 

The coolant will be very hot after the engine just finishes operation. Do not open radiator cap before the coolant is cooled. The radiator cap shall be opened slowly to release the internal pressure.

• Open the engine hood.









- Check the liquid level of auxiliary radiator. When the engine is in cold state, the liquid level of auxiliary radiator is at "MIN" position; when the engine is in hot state, the liquid level of auxiliary radiator is at "MAX" position or close to "MAX" position.
- When the coolant is insufficient, fill coolant to the specified liquid level from the filler cap of auxiliary radiator.

Important! You are recommended to use special coolant of ACHILLES SDLG SERIES You are strictly forbidden to mix up different brands of coolant, to avoid causing blocking of the radiator.

Important! You are forbidden to use water as cooling medium.

• Screw down the filler cap of auxiliary radiator.

Important! Do not add cold coolant into hot engine, or it may cause cracks of cylinder block and cylinder head.

Attention! If the auxiliary water tank becomes empty, inspect whether it is of leakage or not, and inspect coolant level of the radiator. Add the coolant to the stipulated liquid level in case of insufficiency.

## 7.2 Replace the coolant

Replace the coolant once every 2,000h or a year, whichever is earlier.

## <u>/</u>Warning

The anti-freezing solution is flammable, so open fire should be avoided.

Important! Different types of coolant cannot be mixed up, or the engine will be damaged.

Important! Antifreeze is toxic. Be careful not to spill the coolant containing antifreeze on your body, when dismantling drain plug. If it spills into eyes, please wash them with a lot of clean water and go to a doctor immediately.

- Open the engine hood.
- Dismantle the bottom cap.





- Place a vessel to collect the coolant under discharge valve 2 at the bottom of the radiator, slowly loosen filler cap 1 of the radiator, open discharge valve 2 and discharge the coolant.
- Open the drain plug on the engine cylinder block, discharge the coolant and collect it with the vessel.
- After discharging the coolant, close the discharge valve and the drain plug, and refill the radiator with clean soft water.
- Start the engine and run it at low idle speed for about 10 minutes.
- Shut off the engine, open discharge valve 2 and the drain plug, and empty the coolant.
- Clean the radiator with detergent. Please comply with instructions of detergent for relevant cleaning method.
- After finishing cleaning, close discharge valve 2 and the drain plug, open water pipe, and refill the radiator.
- Start the engine, and run it at low idle speed. Open the discharge valve and the drain plug, and wash them with water pipe until the water flowing out becomes clear.

Important! Do not let the discharge exceed the water supply at the time of washing, because the cylinder block must keep the state of being full of water.

- Shut off the engine, close the water pipe, empty the cooling system, close discharge valve 2, wind the drain plugs with sealing tape and tighten it.
- Add the coolant to lower edge of the filler through the filler of the radiator.
- Run the engine at low idle speed for about 5 minutes, and then run it at medium idle speed for 5 minutes, so as to discharge the air mixed in the coolant. (At this time, do not cover filler cap of the radiator.)
- Shut off the engine, wait for about 3 minutes, and then add the coolant to the place nearby filler of the radiator to make liquid level of the auxiliary water tank reach the "LOW" position, and then tighten filler cap of the radiator and cap of the auxiliary water tank.
- Install bottom cap of the radiator, and inspect whether the cooling system is of leakage or not.

# **Important!** Pay attention to environmental protection when discharging the coolant.



### 7.3 Clean chips of radiator, engine oil cooler

#### and condenser

Clean all chips once every 500 operation hours.



- Open engine hood and storage battery cover in the rear of the machine.
- Remove sludge, dust and leaves attached to radiator fins and engine oil cooler fins with compressed air. Meanwhile wash protecting wire net in front of the oil cooler, and then clean fins of air conditioning condenser.
- Inspect the rubber hose. Replace it with a new hose in case of finding that the hose has cracks or has hardened due to aging. In addition, inspect whether the hose clamp loosens or not.

Important! When using compressed air, keep it a certain distance away from the chips, so as to prevent damage. If the chips are damaged, phenomena of leakage and overheating will be caused. In case of operation in a dusty environment, inspection shall be carried out every day no matter whether it reaches the regular maintenance time or not.

#### 8 Hydraulic system

Important! All operations carried out on the hydraulic system must keep high cleanliness. Even if there is a tiny particle, it will cause damage or blocking of the system.

#### 8.1 Inspect hydraulic oil level

#### Inspect hydraulic oil level every day.

- Park the machine on sturdy, even and level ground.
- Respectively operate left and right working device control handles to ends of their respective directions, so as to release internal pressure in the hydraulic circuit.
- Place the safety lock control lever in the "locked" state. Refer to "3.5 Safety lock control system in Chapter II".

• Inspect hydraulic oil level through circular oil pointer. If the oil level is between the upper and lower oil gauges, it indicates that the liquid level is normal. If the oil level is below the lower oil mark, open the oil filler cap on the top of the oil tank and add the specified hydraulic oil. Refer to "19 Selection of oil in this Chapter" for selection of hydraulic oil, similarly hereinafter.

Important! When adding the hydraulic oil, do not make it exceed the normal liquid level. In case of excessive hydraulic oil, it may overflow or cause damage to the hydraulic circuit.

Important! Different brands of hydraulic oil cannot be mixed up.

## 8.2 Replace hydraulic oil

Replace the hydraulic oil once every 3,000 operation hours under the operating mode of excavation; replacement cycle of hydraulic oil shall be shortened under the operating mode of breaking, and replacement shall be carried out according to frequency of usage of hydraulic hammer.

## **Warning**

Be careful when replacing the oil. Hot oil will burn the skin with no adoption of any protective measures.

- Park the machine on sturdy, even and level ground.
- Start the engine, slew the upper frame structure, and locate the drain plug at the bottom of the hydraulic oil tank between the left and right crawlers.
- Completely retract the bucket cylinder and the arm cylinder, and then lower the boom.
- Shut off the engine, and place the safety lock control lever in the locked state; refer to "3.5 Safety lock control lever in Chapter II".
- Release the pressure in the hydraulic oil tank through ventilation filter.
- Dismantle the cover plate below the hydraulic oil tank.
- Place a vessel under the drain plug.





1 Ventilation filter element





• Dismantle the drain plug, install the discharge valve, discharge the hydraulic oil, and collect it with the vessel

- Unscrew the filler cap, and speed up the discharge process. Dismantle O-ring and oil suction filter.
- Empty the hydraulic oil, dismantle the discharge valve, and install the drain plug.
- Carry out reinstallation after thoroughly washing the oil suction filter.
- Fill hydraulic oil of about 150L and screw down the filler cap.
- Start the machine, inspect oil level on the liquid level gauge, and add the oil in case of insufficiency.

#### 1Drain plug



1 Oil suction filter







#### 8.3 Replace hydraulic oil return filter

#### element

Replace the oil return filter element once every 1,000 hours; replacement cycle of hydraulic oil shall be shortened under the operating mode of breaking, and replacement shall be carried out according to frequency of usage of hydraulic hammer.

- Release the pressure in the hydraulic oil tank through air ventilation filter.
- Open fixing cover, dismantle O-ring, spring and gasket, pull out the filter, and dismantle the filter element.
- Wash the dismantled spare parts.
- Install new filter element and all spare parts. When installing the cover, press the cover downward, and simultaneously fasten the bolt.
- Start the engine, and make it run at low speed for 10 minutes, so as to remove the air.
- Shut off the engine.

#### 8.4 Clean hydraulic oil suction filter

#### element

Clean the filter element once every 2,000 operation hours, and replace it if necessary.

- Unscrew the plug screw, dismantle the cover, and pull out the filter element.
- Carry out cleaning, and replace it in case of damage.

#### 8.5 Replace hydraulic pilot filter element

# Replace the pilot filter element once every 1,000 operation hours.

- Place a collection vessel under the filter.
- Dismantle the filter body.
- Replace filter element of the hydraulic pilot filter.



### 8.6 Replace ventilation filter element

# Replace the ventilation filter once every 2,000 hours if necessary.

- The ventilation filter will be blocked after working in a dusty working environment for a period of time.
- Unscrew the bolt on the ventilation filter, and pull on the filter element.
- Replace it with a new ventilation filter element.

#### 8.7 Release pressure in hydraulic oil tank

#### and hydraulic circuit

Important! There is always internal pressure in the hydraulic circuit. Do not carry out oil filling or oil discharge and do not maintain or inspect the machine before releasing the pressure. When unscrewing hydraulic oil tank cover and hose joint, the personnel shall standby them and loosen them slowly.

- Release the pressure in the hydraulic circuit.
- Rotate the start switch to "ON" position, respectively operate the left and right working device control handles and pedals to ends of their respective directions for many times, and eliminate the pressure in the hydraulic circuit.
- Release the pressure in the hydraulic oil tank.
- Press the air exchange filter to release the pressure in the oil tank.





#### 8.8 Processing of energy accumulator

## **∕**!∖ Warning

The energy accumulator is full of high-pressure nitrogen. Be careful at the time of processing, and abide by the following matters:

You cannot strike the energy accumulator, and cannot carry out drilling and welding on the energy accumulator.

The energy accumulator cannot get close to open fire or other high temperature heat source.

You cannot try to install other objects on the energy accumulator.

You should wear safety goggles and protective gloves when processing the energy accumulator. The pressure oil can penetrate skin and cause great damage.

Before the energy accumulator is scrapped and discarded, pressure relief shall be carried out towards the energy accumulator by a repair service station of ACHILLES AUSTRALIA

Release pressure of energy accumulator

- Completely lower the working device to the ground.
- Place the start switch in "I" position after shutting off the engine.
- Control working device control handles and pedals in all directions and in full-stroke, and release the pressure in the control circuit. Refer to "8.7 Release pressure in hydraulic oil tank and hydraulic circuit in this Chapter".
- Rotate the start switch to "O" stop position, and take down the key.
- Place the safety lock control lever in the locked position; refer to "3.5 Safety lock control lever in Chapter II".

#### 9 Slewing driving mechanism

Attention! This machine adopts maintenance-free slewing driving mechanism, and gear oil does not need to be replaced.


## 10 Traveling driving mechanism

## 10.1 Inspect oil level of gear oil of traveling

### driving mechanism

Check oil level every 250 hours at the operating temperature.

Important! Clean up surrounding areas of oil port before inspecting oil level of the traveling driving mechanism. The traveling driving mechanism will be damaged if there are impurities in the oil.

Inspect the oil level under operating temperature, and maintain normal oil level of gear oil.

If the oil is too little, the traveling driving mechanism will fail in correct drive, thus causing damage.

If the oil is too much, it will be foamy, thus causing overheating of the traveling driving mechanism.



The oil will be very hot after the machine just stops working. Operation shall be carried out after cooling.

- Place the machine on even ground.
- Adjust drain plug A to the lowest place, and make it be perpendicular to the ground, as shown in the figure.
- Place the safety lock control lever in the "locked" position; refer to "3.5 Safety lock control lever in Chapter II".
- Remove the oil inspection plug. If the Gear oil almost overflows from the hole, the oil level is normal.
- If the oil level is too low, add the specified gear oil through the oil fill plug/drain plug. Refer to "19 Selection of oil in this Chapter" for selection of gear oil, similarly hereinafter.

## 10.2 Replace gear oil

Replace the gear oil every 2,000 hours.

- Position the travel motor on one side so that the filler plug/drain plug is at the bottom, as shown in the figure on the left.
- Prepare a container to collect the drained gear oil.
- Remove the filler plug/drain plug, and use a container to collect the gear oil.



1 Oil inspection plug

2 Oil fill/drain plug







- Check the O-ring on the plug, and replace it if damaged.
- After draining, install the filler plug/drain plug.
- Rotate the travel motor so that the filler plug/drain plug is on the top, as shown in the figure on the left.
- Remove the filler plug/drain plug.
- Add the specified gear oil through the filler plug/drain plug.
- Install the filler plug/drain plug.
- Check the oil level again, and top up when necessary.
- Repeat the above steps for the travel motor on the other side.

## Traveling driving mechanism- End face

## three-hole type

## **10.3 Inspect oil level of gear oil of traveling**

#### driving mechanism

Check oil level every 250 hours at the operating temperature.

Important! Clean up surrounding areas of oil port before inspecting oil level of the traveling driving mechanism. The traveling driving mechanism will be damaged if there are impurities in the oil.

Inspect the oil level under operating temperature, and maintain normal oil level of gear oil.

If the oil is too little, the traveling driving mechanism will fail in correct drive, thus causing damage.

If the oil is too much, it will be foamy, thus causing overheating of the traveling driving mechanism.



Chapter II".



• Dismantle oil level inspection plug B. If the gear oil almost overflows from the hole, it indicates that the oil level is normal.

• If the oil level is too low, add the stipulated gear oil through oil filler plug C. Refer to "19 Selection of oil in this Chapter" for selection of gear oil, similarly hereinafter.

## 10.4 Replace gear oil

Replace the gear oil once every 2,000 hours.

- Prepare a vessel to collect the gear oil to be discharged.
- Place oil inspection plug B in horizontal position, and put drain plug A at the lowest point.
- Dismantle drain plug A and oil inspection plug B, and collect the gear oil with the vessel.
- Inspect O-seal rings on the plugs, and replace them timely in case of damage.
- Install drain plug A after emptying the oil.
- Add the stipulate gear oil through oil filler plug C.
- Inspect the oil level again, and add the oil in case of insufficiency.
- Install oil inspection plug B and oil filler plug C.

## **11 Electrical system**

## **11.1 Charging of storage battery**

## **Warning**

Dismantle the storage battery cover first when charging the storage battery fast. When the storage battery charges, it may generate explosive hydrogen-oxygen gas mixture, and short circuit and nearby open fire may cause powerful explosion.

An indicator showing state-of-charge of the battery is installed on the storage battery cover. When the indicator shows green, the battery can be used normally. When the indicator shows black, the battery shall be charged timely. When the indicator shows white, the battery shall be replaced immediately.

The storage battery is in danger of explosion if the storage battery is processed incorrectly at the time of charging. Therefore, the personnel shall execute according to processing procedures of storage battery and procedures on charging in the instructions, and abide by the following SDLG

precautions:

- When the storage battery is charged, it will generate hydrogen and oxygen which will cause explosion once encountering open fire or blocking of exhaust port. Therefore, the storage battery shall be far away from open fire, and short circuit shall be avoided.
- All plug screws shall be dismantled at the time of charging, so as to obtain good ventilation. Keep away from fire or spark, so as to avoid explosion.
- When the battery is being charged, positive pole of the battery charger shall be connected to positive pole of the storage battery, and negative pole of the battery charger shall be connected to negative pole of the storage battery. Reverse charging is strictly prohibited.
- The battery will generate gas when charging. Therefore, the battery shall be regularly checked to confirm the exhaust port is not blocked, to prevent battery from explosion.
- In the charging process, when the electrolyte temperature of the battery is over 45°C, charging voltage or charging current shall be reduced based on actual situation to prevent electrolyte from splashing due to high temperature.
- Cables shall be dismantled from negative pole of the battery before charging. Otherwise, it will generate high voltage, and damage AC generator.
- Positive pole of the battery charger shall be connected to positive pole of the storage battery, and negative pole of the battery charger shall be connected to negative pole of the storage battery. Do not charge the battery in series (24V).
- It is suggested that battery charger with constant voltage of 16.0V (whose maximum shall not be more than 16.2V; if it is more than this limit, water will be electrolyzed largely, thus causing drop of the liquid level, white light of the indicator, and scrap of the battery) and limited current of 25 amperes should be used to charge the storage battery, until the charging current is less than 2 amperes and the indicator turns green.
- In the charging process, if acid is sprayed from exhaust port of the storage battery in large quantities, the charging shall be stopped immediately and the reason shall be found out.



- Indicator state shall be inspected once per hour in the process of supplementary charging of the storage battery. If indicator of the storage battery shows green, it indicates that the storage battery has been fully charged, and the charging is stopped.
- Voltage of the battery whose charging is just finished may be more than 13V, but it is floating charge voltage, and the floating charge voltage will disappear after letting it stand for several days or discharging for several times.
- After the battery finishes supplementary charging and passes test, it is suggested that butter shall be spread on the end post, to prevent occurrence of electric erosion phenomenon.
- The battery charger shall be turned off immediately after charging is completed. Overcharging will cause the following circumstances: overheating of storage battery; decrease of electrolyte; damage to plate electrode.

## **11.2 Precautions at the time of welding**

Electric welding operation shall be carried out by welders with corresponding qualifications and skills in a place equipped with proper equipment. Electric welding will produce gases, and it may cause fire and lead to electric shock at the time of operation. Therefore, it should never be operated by personnel with no qualification.

- The master power switch shall be shut off before electric welding operation.
- Terminal of the storage battery shall be disconnected, to prevent explosion of the storage battery.
- The paint (at least 10cm around the welding spot) in the place needing to be welded shall be removed, to prevent production of harmful gases.
- If electric welding is carried out on hydraulic equipment or pipeline, or a place very close to it, flammable vapor and spark will be produced, thus causing danger of fire or explosion. Therefore, it is necessary to avoid carrying out electric welding in such a place.
- Sparks splashing at the time of welding will directly fall on rubber hoses, wires or pressure pipelines, then these pipes may break suddenly, and insulation skin of wires will be damaged. Therefore, they shall be





- Protective clothing shall be worn for carrying out electric welding operation.
- Good ventilation shall be guaranteed at electric welding operation site.
- All inflammable materials shall be cleaned, and the operation site must be equipped with fire extinguisher.
- Transformation affecting performance, safety and strength of vehicle and working device cannot be carried out.

## **11.3 Replacement of fuse**

Important! The personnel shall place the start switch in "O" position, and ensure the fuse is of the same specifications.

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11	12	13	14	15	16	17	18	19	20
10A	10A	20A	15A	20A	10A	10A	15A	10A	5 A
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S/N	Specification	Application circuit				
1	15A	Cab light				
2	10A	Boom light				
3	15A	Wiper/Water Spray				
4	5A	Fuel level power supply				
5	5A	Excitation circuit of high and low speed				
6	10A	IECU power supply				
7	10A	Horn				
8	15A	Safety lock				
9	10A	High and low speed				
10	30A	Common electricity				
11	10A	Boom swing				
12	10A	Radio				
13	20A	Cigarette lighter				
14	15A	Walking buzzer				
15	20A	-				
16	10A	Quick change				
17	10A	Crushing hammer				
18	15A	-				
19	10A	Hydraulic shear				
20	5A	-				



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S/N	Specification	Application circuit					
1	15A	Cab light					
2	10A	Boom light					
3	15A	Wiper/Water Spray					
4	5A	Fuel level power supply					
5	5A	Excitation circuit of high and low speed					
6	10A	IECU power supply					
7	10A	Horn					
8	15A	Safety lock					
9	10A	High and low speed					
10	30A	Common electricity					
11	10A	Boom swing					
12	10A	Radio					
13	20A	Cigarette lighter					
14	15A	-					
15	20A	VECU					
16	10A	-					
17	10A	-					
18	15A	-					
19	10A	Hydraulic shear					
20	5A	-					



## 12 Lubrication system

## 12.1 Fill working device with lubricating

#### grease

For regular bushes, the new machine shall be repaired and maintained once every 10 working hours or every day within 100 working hours since the first use. Connecting rod system of the working device shall be repaired and maintained once every 50 working hours or weekly after 100 working hours since the first use. Under bad working conditions (or after hydraulic hammer is used), sludge, water or abrasive may enter into bearing; therefore, connecting rod system of the working device shall also be repaired and maintained every 10 working hours or every day.

• As shown in the figure, place the working device on the ground, and shut off the engine.



- 1 Boom cylinder mounting pin
- 3 Boom cylinder piston rod end pin shaft
- 5 Boom and arm connecting pin
- 7 Bucket cylinder mounting pin
- 9 Connecting pin shaft of arm and connecting rod
- 11 Bucket cylinder piston rod end pin shaft
- 13 Dozer blade mounting pin
- 15Dozer blade cylinder piston rod end pin
- 17 Boom support mounting pin

- 2 Boom mounting pin
- 4 Arm cylinder mounting pin
- 6 Arm cylinder mounting pin
- 8 Arm and bucket connecting pin

10 Connecting pin shaft of piston rod and connecting rod

- 12 Connecting pin shaft of bucket and piston rod
- 14 Dozer blade cylinder mounting pin

16 Boom swing cylinder mounting pin, swing gear and swing bearing

18 Boom swing cylinder piston rod end pin

- Add lubricating grease through lubricating grease filling nozzle by hand or with electric grease gun.
- Remove the overflowing lubricating grease.

Attention: after work in water, regardless of filling cycle of the lubricating grease, new lubricating grease shall be immediately added to the submerged parts, such as pin shaft of bucket, and the old lubricating grease shall be removed.

## 12.2 Add lubricating grease to slewing bearing

Inspect each lubricating point every day, and add the lubricating grease in case of insufficiency.

- Place the machine on level ground, and lower the bucket to the ground.
- Turn the start key to "O" stop position.
- Move up the safety lock control lever, and lock this system. Refer to "3.5 Safety lock control lever in Chapter II".
- Clean the lubricating grease filling nozzle, and add the lubricating grease by hand or with electric grease gun.
- Place the safety lock control lever in the "unlocked" position, start the engine, lift the bucket to a place which is about 1m above the ground, and then rotate the upper structure by 1/8 circle.
- Lower the bucket to the ground.
- Start from Step 2, and repeat the operation steps for 4 times.
- Add the lubricating grease to the slewing bearing, until overflowing of lubricating grease can be seen from the slewing bearing.
- Do not add too much lubricating grease. The overflowing lubricating grease shall be removed after the lubricating grease is added.



## 13 Replace bucket teeth

## Warning

When replacing the bucket teeth, movement of working device due to mis-operation is very dangerous. Keep the working device stable, turn off the engine and firmly lock all control levers.

To knock out the fixing pin by excessive force, the fixing pin may fly out. Ensure that there is nobody in the surrounding region. In the replacement process, there is always flyweight; therefore, safety goggles, gloves and other protective devices should be put on.

Replace the bucket teeth before the bucket teeth seat wears.

- Place a heel block under the bucket so as to dismantle the pin assembly, then horizontally place the bucket on the heel block, shut off the engine, and place the safety lock control lever in the locked position.
- Place a metal bar (whose diameter shall be less than diameter of pin shaft) on pin head of the fixing pin, and knock the metal bar with a hammer so as to knock out pin shaft B. Be careful not to damage lock washer C, and then dismantle the bucket teeth.
- Clean the fitting surface. Fit new bucket teeth A into the bucket teeth seat, slightly push the pin assembly inward by hand, then knock in the pin assembly with a hammer, and fit the bucket teeth on the bucket.

## 14 Maintenance of air conditioning

Clean the filter once every 500 hours. Replace it once every 1,000 hours.

If the air conditioning filter is blocked, airflow, cooling and heating ability will be reduced. Therefore, it shall be cleaned regularly.

Important! The air conditioning system contains supercharged refrigerant HFC (R134a), and this refrigerant cannot be discharged deliberately.

Important! Only the personnel receiving special





training can repair cooling system and add refrigerant. Never mix up different refrigerants!

Important! Always keep the air conditioning in the available state. No matter what season it is, the air conditioning shall be started at least once a week, to prevent the refrigerant from leaking from sealing element of compressor.

#### 14.1 Inspection before running of the air

#### conditioning

- Parts to be inspected weekly
- Parallelism and degree of tension of V-belt for compressor drive.

Important! If tension of the belt is incorrect, performance of the compressor will decrease, and both the belt and the compressor will be damaged.

Press down the belt center with the force of about 10Kg, and it is appropriate if that can be pressed down by 7-10mm. If tension of the V-belt does not conform to the requirements upon inspection, it can be adjusted in accordance with the following method:

Loosen nut 1 of idle belt pulley, and adjust tension of the belt with adjusting bolt 2.

Inspect whether there is foreign matter on surface of condenser heat exchanger or not.

The personnel are required to clean inside of radiating fins, and ensure that there are no blockages among the fins. Cold water or compressed air shall be used for washing, and use of hot water or hot air is strictly forbidden.

- Parts to be inspected before starting of the air conditioning in summer
- Clean surrounding area of the compressor with compressed air, and particularly prevent foreign matter between clutch sucker and belt pulley.
- Inspect appropriate amount of refrigerant by using the method for inspecting pressure.

Attention! If amount of the refrigerant is insufficient, the cooling performance will be very poor.



- a Start the engine, and gradually increase the engine speed to 1,500rpm.
- b Open the cab door and all windows.
- c Open the temperature control switch and rotate it to the maximum, and rotate the air volume adjustment switch to the maximum.
- d Inspect flow condition of the refrigerant in pipelines through sight glass.

The refrigerant is appropriate: bubbles appear first and gradually become clear; bubbles are hardly seen, and then turn to be slight white.

The refrigerant is excessive: bubbles cannot be seen.

The refrigerant is insufficient: bubbles appear constantly.

- Inspect connection status of nut and screw around the compressor.
- Inspect whether there is a trace of refrigerant leakage in connection part of refrigerant pipe and connection part inside the unit or not.
- Inspect whether there are defects on the pipe surface due to interference or friction between the refrigerant pipe and the bodywork or not.
- Inspect the belt and ensure that it is free of crack, excessive wear, gap and burr.

## 14.2 Parts to be inspected anytime during

## running of the air conditioning

- Inspect whether the compressor has abnormal noise or not.
- Inspect whether cooling and other switches of the control panel are normal or not.
- Inspect whether evaporative generator of evaporator can be started at three gears including high gear, medium gear and low gear or not and whether there are changes in wind speed at different gears or not, and inspect whether the air temperature at air outlet reduces or not.



#### 14.3 Maintenance of air conditioning during

#### the off season

- If the air conditioning is not used for a long time, refrigerant or refrigeration oil in the system is forbidden to be discharged. If the refrigerant or the refrigeration oil is discharged, it will cause internal corrosion of hoses and parts.
- If the air conditioning is not used during the off season or for a long time, the air conditioning shall be started at least once a month (for about 5 minutes), to prevent dryness of pad, O-ring or bearing in the compressor, thus increasing durability of the compressor and the system and minimizing refrigerant leakage.

Attention! When the air conditioning is started in winter, the compressor clutch will not work due to low temperature in the vehicle. Fan heater shall be turned on firstly, and then the air conditioning shall be started after a certain period of time. The switch is started due to low pressure when revolving speed of the compressor is increased, so it shall be run in the idle state (lowvoltage starting is normal, and separate inspection is not necessary).

#### 14.4 Removal of common faults of air

#### conditioning

#### The evaporative generator fails to be started

- a Power supply is of poor connection; inspect connection status of power supply.
- b Power fuse is disconnected; inspect and replace the fuse.
- c Wires are disconnected or short-circuited; inspect whether they are energizing and short-circuited or not.

#### The air volume is insufficient

- a The evaporative generator is of poor starting; inspect and replace it.
- b Foreign matter is attached to surface of the evaporative heat exchanger; clean it with compressed air or water.
- c The evaporative heat exchanger is frozen; inspect temperature sensor for preventing the evaporative heat exchanger from freezing.
- d Air leaks; inspect whether there is air leakage between



the evaporator and the air duct or not.

#### The compressor is of poor starting

- a The fuse in the fuse box is disconnected; inspect and replace the fuse.
- b The pressure switch is poor or the pressure is abnormal; inspect connection of pressure and highpressure switch harness or replace high-pressure switch.
- c The temperature sensor for setting in-car temperature is poor or the temperature settings are abnormal; adjust temperature set point downwards, and inspect or replace the temperature sensor.
- d The clutch burns out or the voltage is too low; inspect voltage of the clutch, and replace the clutch when the clutch burns out.

#### Low pressure is too high

- a Expansion valve is abnormal; replace the expansion valve.
- b Valve body in the compressor is abnormal: high pressure and low pressure are almost the same; inspect valve body of the compressor.

#### Low pressure is too low

- a Dryer or pipeline is blocked; there is temperature difference between inlet and outlet of the dryer; replace the dryer.
- b Expansion valve is frozen or blocked; inspect whether the expansion valve is blocked or not, and confirm whether it is frozen due to internal freeze of water or not.

#### High pressure is too high

- a The condenser is of poor condensation; inspect whether there is foreign matter attached to surface of the condensation heat exchanger or not, and clean it.
- b The refrigerant is overcharged: the low-pressure pipe's temperature is too low or its pressure is too high; inject a moderate amount of refrigerant after discharging the refrigerant or carrying out vacuum-pumping again.

#### High pressure is too low

- a The refrigerant is insufficient; supplement the refrigerant after confirming it with sight glass.
- b Valve body in the compressor is abnormal: high pressure and low pressure are almost the same; inspect or replace valve body of the compressor.
- c the external temperature is too low; it is a normal



phenomenon.

#### There is abnormal noise

- a Evaporation fan is damaged or deformed; inspect and replace it.
- b Connecting nut of the compressor is loose; fasten nut and screw.
- c V-belt is of poor parallelism or tension; adjust theVbelt.

## 15 Tension degree of crawler

## 15.1 Check the tension degree of crawler

Check the crawler tension degree every 50h.



Check the crawler tension degree and be sure to lift up the crawler above the ground.

For measurement, handle with care to avoid crawler falling off or moving.

The abrasion condition of crawler generally varies with the working condition or soil property.

Frequently check the crawler tension degree and maintain specified value.

Thoroughly clean the lower base plate. Clean it once a day or more frequently as per the soil condition at the site.

Measure the crawler tension degree as per clearance L between crawler frame bottom and upper surface of lower crawler pad:

- Slowly operate the handle and use boom and arm to lift up the crawler.
- Check the crawler tension degree as per the soil property.

Working condition	Clearance L (mm)	
General soil	155-165	
Stony ground	145-155	
Medium soil (sand,	165 175	
snowfield, etc.)	105-175	
Rubber crawler	135-145	







## 15.2 Adjust crawler tension

## **Warning**

Valve A may pop out under the effect of highpressure compressed lubricating grease in the cylinder.

When loosening valve, A, do not unscrew it by more than one circle. Do not loosen other parts except for valve A. Keep away from installation position of this valve.

If the crawler tension cannot be adjusted according to the method in this manual, please contact Repair Center of ACHILLES MACHINERY AUSTRALIA

Improve crawler tension:

- Add lubricating grease through lubricating grease filling nozzle with high-pressure lubricating grease filling gun.
- Move the machine forward and backward, and inspect the adjusted crawler tension.
- Make another adjustment if the tension is incorrect.

#### **Reduce crawler tension:**

• Gradually loosen valve A, so as to discharge lubricating grease.

Attention: do not loosen valve A by more than one circle. If discharging of lubricating grease is not smooth, the machine can be moved forward and backward. Do not discharge lubricating grease with lubricating grease filling nozzle.

- Close valve A, but do not screw it too tightly, or the joint will be damaged.
- Inspect the crawler tension again. Make another adjustment if the tension is incorrect.

## **16 Lubrication**

Lubrication is an important part of repair and maintenance. If the machine is lubricated in the right way, service life of gasket, bearing and bearing pin can be greatly extended. Lubrication diagram can make the lubrication work easier, and can reduce the danger of forgetting lubricating points. Lubrication can supply the bearing with lubricating grease, and reduce wear between bearing pin and bearing bush; in addition, it can substitute for old and dirty lubricating



grease.

Important! Before the lubricating grease is added, lubricating grease filling nozzle and lubricating grease gun shall be cleaned, to avoid bringing in sand and dirt at the time of adding.



#### **17 Regular maintenance**

Regular maintenance is divided into maintenance every 10 hours, every 50 hours, every 250 hours, every 500 hours, every 1,000 hours and every 2,000 hours.

#### 17.1 Maintenance every 10 hours

- Inspect engine oil level; refer to "4.1 Inspect engine oil level in this Chapter".
- Inspect coolant level; refer to "7.1 Inspect coolant level in this Chapter".



- Inspect fuel oil level; refer to "5.1 Fuel filling and oil level inspection in this Chapter".
- Inspect oil level of hydraulic oil tank; refer to "8.1 Inspect hydraulic oil level in this Chapter".
- Inspect liquid level of glass cleaner.
- Clean dust discharge valve of air filter; refer to "6.1 Clean dust discharge valve of air filter in this Chapter".
- Inspect all control levers and control switches.
- Inspect lights, horn and monitor.
- Inspect wear of bucket teeth.
- Inspect whether the seat belt is suitable for operation or not.
- Inspect whether the hydraulic system is of leakage or not.
- Clean crawler and drive sprocket (after work every day).

#### **17.2 Maintenance every 50 hours**

## Maintenance every 10 hours shall be carried out simultaneously

- Discharge sediment in the fuel tank; refer to "5.3 Discharge sediment in this Chapter".
- Fill lubricating points of working device with lubricating grease; refer to "12.1 Fill working device with lubricating grease in this Chapter". (Filling shall be carried out every day within the first 100 working hours of a new machine.)
- Inspect whether there is water or sediment in oil-water separator or not, and drain it away; refer to "5.4 Drain away water in oil-water separator in this Chapter".
- Inspect crawler tension; refer to "15.1 Inspect crawler tension in this Chapter".
- Inspect engine air filter and clean it, and replace it if necessary; refer to "6 Air filter in this Chapter".
- Inspect and adjust belt tension of engine and air conditioning compressor.
- Inspect working status of storage battery; refer to "11 Electrical system in this Chapter".
- Inspect running situation of air conditioning, and start and run it for one minute.
- Inspect lubrication situation of each articulated pin shaft and slewing bearing of working device.
- Inspect fixing bolts of fastening counterweight, crawler pad, travel motor, swing motor and slewing bearing.

#### The following maintenance shall be added in the first 50



#### hours:

• Replace engine oil and filter element; refer to "4.2 Replace engine oil and engine oil filter element" in this Chapter.

#### 17.3 Maintenance every 250 hours

## Maintenance every 10 hours and every 50 hours shall be carried out simultaneously.

- Replace engine oil and filter element; refer to "4.2 Replace engine oil and engine oil filter element" in this Chapter.
- Replace the fuel filter element. Refer to 5.3 of this chapter "Replace the fuel filter element".
- Clean air filter element; refer to "6 Air filter" in this Chapter.
- Inspect oil level of gear oil of traveling driving mechanism; refer to "10.1 Inspect oil level of gear oil of traveling driving mechanism in this Chapter".
- Add lubricating grease to slewing gear bearing; refer to "12.2 Add lubricating grease to slewing gear bearing in this Chapter".

#### **17.4 Maintenance every 500 hours**

## Maintenance every 10 hours, every 50 hours and every 250 hours shall be carried out simultaneously.

- Replace fuel prefilter; refer to "5.5 Replace fuel prefilter in this Chapter".
- Replace the air filter element. Refer to 6 of this chapter "Air filter".
- Add lubricating grease to swing motor bearing; refer to "9.3 Add lubricating grease to swing motor bearing in this Chapter".
- Clean chips of water radiator, engine oil cooler and condenser; refer to "7.3 Clean chips of radiator, engine oil cooler and condenser in this Chapter".
- Clean sliding surface of guide buffer.
- Clean storage battery surface and wiring terminal, and apply Vaseline to surface of wiring terminal.
- Clean air conditioning filter.

#### 17.5 Maintenance every 1,000 hours

Maintenance every 10 hours, every 50 hours, every 250 hours and every 500 hours shall be carried out simultaneously.



- Replace hydraulic oil return filter element (replacement cycle shall be shortened if hydraulic hammer is used); refer to "8.3 Replace hydraulic oil return filter element in this Chapter".
- Replace hydraulic pilot filter element; refer to "8.5 Replace hydraulic pilot filter element in this Chapter".
- Replace air conditioning filter element.
- Adjust the engine valve clearance.
- Fasten fixing bolts of the engine.

#### 17.6 Maintenance every 2,000 hours

Maintenance every 10 hours, every 50 hours, every 250 hours, every 500 hours and every 1,000 hours shall be carried out simultaneously.

- Replace ventilation filter element of hydraulic oil tank (or replace it if necessary); refer to "8.6 Replace ventilation filter element in this Chapter".
- Replace the coolant, refer to "7.2 Replace the coolant in this Chapter"
- Wash hydraulic oil suction filter element.
- Replace gear oil of traveling driving mechanism; refer to "10.2 Replace gear oil in this Chapter"

#### 17.7 Maintenance every 3,000 hours

# Maintenance every 10 hours, every 50 hours, every 250 hours, every 500 hours and every 1,000 hours shall be carried out simultaneously.

• Replace hydraulic oil (replacement cycle shall be shortened if hydraulic hammer is used); refer to "8.2 Replace hydraulic oil in this Chapter".

## 18 Regular replacement of main parts

To guarantee safety, the users must regularly inspect and maintain the machine when operating or driving the machine. In addition, to further improve safety, the users shall regularly replace the spare parts in the list of spare parts to be replaced periodically. These spare parts are particularly closely related to safety and fire prevention. Therefore, please contact the dealers for replacement. As time goes on, materials of these spare parts will change, and they are easy to wear or deteriorate. But it is very difficult to fully judge situation of the spare parts through regular maintenance. Therefore, they shall be replaced regardless of the situation when they reach the stipulated replacement time, so as to guarantee good performance of these spare parts.

But if these spare parts are abnormal before the replacement cycle, they must be repaired or replaced right now. If the hose clamp is of deterioration, such as deformation or crack, the hose clamp shall be replaced simultaneously when the hose is replaced.

In addition, hydraulic hoses which have not yet been listed as parts to be replaced regularly shall be inspected, and shall be tightened or replaced in case of abnormity. O-ring, sealing gasket and other similar spare parts shall be replaced simultaneously when the hose is replaced.

S/N	Safety critical parts to be replaced regularly	Qty.	Replacement cycle
1	Fuel hose (fuel tank-fuel injection pump)	2	
2	Fuel hose (fuel filter element - fuel injection pump)	1	
3	Fuel hose (nozzle-fuel tank)	1	
4	Hose (main pump oil outlet)	1	Every 2 years
5	Hose (pump oil return)	1	or every
6	Hose (main pump oil absorption)	1	4,000 hours, whichever is
7	Hose (boom cylinder – control valve)	4	earner
8	Hose (arm cylinder-control valve)	4	
9	Hose (bucket cylinder-control valve)	4	
10	Hose (swing motor-control valve)	2	
11	Safety belt	1	Every 3 years



## **19 Oil Selection**

Oil type	Quality grade	Recommended viscosity for different ambient temperature	ACHILLE oil and its executive standard	Filling Qty.	Oil application part
Engine oil	API CI-4	SAE 5W-30 -30°C~40°C	Mobil Delvac <sup>TM</sup> Super diesel	6.7L	Engine
		SAE 10W-30 $-20$ °C $\sim$ 40 °C	engine oil		
		SAE 15W-40 $-15$ °C $\sim$ 50 °C	CI-4 15W-40		
		SAE 30 0°C∼40°C			
		SAE 40 5°℃~50°℃			
Gear oil	API	SAE 75W-90 -40 $^\circ\mathrm{C}$ $\sim$ 40 $^\circ\mathrm{C}$	Heavy load vehicle gear oil	$2 \times 0.8 L$	Traveling and slewing
	GL4/GL5	SAE 80W-90 -25 $^\circ \mathrm{C}$ $\sim$ 40 $^\circ \mathrm{C}$	SAE#90 GL-5 GB 13895		reducer
		SAE 90 -20°C~30°C			
		SAE 85W-140 -10°C∼50°C			
Hydraulic	Anti-abrasion	ISO VG32 HV $-20^{\circ}\text{C} \sim 15^{\circ}\text{C}$	L-HV46(MV 46)	35L	Hydraulic oil tank and
oil	hydraulic oil	ISO VG46 HV $-10^{\circ}$ C $\sim 30^{\circ}$ C			hydraulic system
	with high	ISO VG68 HV $0^{\circ}$ C $\sim$ 40 $^{\circ}$ C			
	viscosity index				
	of over 160				
Fuel		0# general diesel oil ambient	GB 19147	33L	Fuel tank
		temperature≥4 ℃			
		-10# general diesel oil ambient			
		temperature≥-5°C			
		-20# general diesel oil ambient			
		temperature≥-14°C			
		-35# general diesel oil ambient			
		temperature≥-29℃			



## Hydraulic excavator operation & maintenance manual

Antifreezing		LCS ant freezing solution	8L	Radiator
solution				



Lubricating	#2 or #3 lithium lubricating	Pin shat at the hinged
grease	grease GB/T 7324	points of working
		device and slewing
		mechanism

Note: the filling quantity is only for reference and the oil level shall be followed for actual filling. Please use high quality fuel, as the impurity in the fuel may cause fault of engine in short time and influence the service life. The poor fuel with Sulphur content over 1,000ppm should not be used for Yanmar external EGR engine.