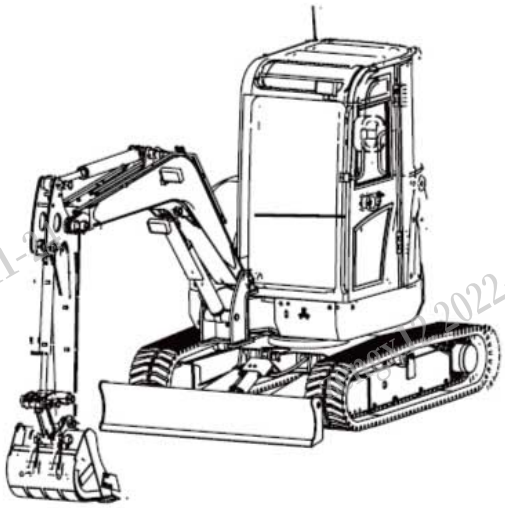
Quality Changes the World

Crawler Hydraulic Excavator

SY35U

SY55U



Operation and Maintenance Manual

SY35U/SY55U Hydraulic Excavator

Operation and Maintenance Manual

⚠ WARNING

Please read and follow the safety precautions and instructions in this manual and on the machine nameplate. Otherwise, severe injuries, deaths or property loss may occur. Please keep this manual together with the machine for future reference.

Sany Group

Sany Heavy Industry Co, Ltd

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Responsibility Division

Important statements

The crawler hydraulic excavator is a multipurpose machine for earthwork construction, intended for earth excavation and loading, land leveling, slope finishing, hoisting, crushing, demolition, ditching, and widely applied in highway and railway construction, bridge construction, urban construction, and construction of airports, ports and water conservancy. The machine has the features of bulldozers, loaders and cranes, and can replace them during operation. The machine is not intended for other purposes than those designated. We do not accept any responsibility for any consequence of use for purposes other than those designated.

We do not accept any responsibility for the following:

- Consequences of failure to correctly use the machine according to the instructions in the manual.
- Consequences of unauthorized retrofitting or modification of the machine.
- Equipment damage or accidents caused by failure to use genuine accessories or use of untested or unauthorized accessories or tools.
- Machine faults or damage because of nature disasters (earthquakes, typhoons, etc.), wars and other force majeure.

We cannot foresee all risks that may occur at the working site; therefore, the machine operators and customers shall pay high attention to safety issues.

The regions where the machine is used and their local governments may have more strict operating provisions which shall be observed if they conflict with these rules for safe operation.

Responsibilities of our manufacturer

- Ensure that the machine quality is acceptable and accompanying documents are accurate.
- Fulfill the after-sales service commitment, and document all the maintenance and repair work performed by after-sales service personnel.
- Provide trainings to the equipment operators and maintenance staff as required.

Responsibilities of customers or other authorized personnel concerned

- Personnel concerned shall be welled trained and fully acquainted with the Parts Catalogue and the Operation and Maintenance Manual before operating and maintaining the machine.
- Make sure that personnel operating and maintaining the machine are competent and aware of their respective responsibilities.
- Regularly inspect the safety awareness of personnel concerned in working.
- Immediately stop the machine in the event of any fault influencing safety.

- Our service personnel have the right to carry out the relevant safety check on the machine when necessary.
- Besides checks specified by Sany, carry out the relevant inspection according to the related regulations by the country or region where the machine is used.
- Make sure that the machine is timely maintained and repaired.
- Make a use planning carefully and consciously.

Responsibilities of all the operation personnel

- In the event of any abnormalities that may cause abnormal operation of the machine or pose a potential risk, timely report to the supervisor, and rectify in time if possible.
- All staff working around the machine must obey all the warning signals and caution for safety of themselves and others.
- All the operation personnel shall be acquainted with the content and procedures of work activities.
- Observe whether there are dangerous situations such as high voltage wires, irrelevant personnel, poor ground condition, and timely warn the operators and signalmen of them.

Responsibilities of management

Make sure that only operators that are well trained, fully understand the content of this manual, enjoy good health and possess the operation certificate can operate the machine.

- Make sure that only operators with good judgment, cooperation consciousness and psychological quality can operate or maintain the machine.
- Make sure that signalmen have good visual and audible judgment, know well standard commanding signals and send clear and accurate signals, and possess rich experience in hazard identification and instruct operators to avoid in time.
- Make sure that assistants can correctly determine the machine model and working condition, and choose an appropriate machine.
- Assign the corresponding safety responsibility to each operation personnel and ask them to timely report unsafe factors to the supervisor.

Table of Contents

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Foreword

⚠ WARNING

Read and understand all safety precautions and instructions in this manual before reading any other manuals provided with this machine and before operation or maintaining it. Failure to do this could result in death or serious injury.

1.Foreword

1.1 Overview

This Operation and Maintenance Manual is a guide for using the excavator properly, and mainly provides the technical and safety information for operation. Make sure to read every part of this Manual.

This Manual is helpful to use the machine safely and efficiently. When operating, please always follow the precautions herein. The accident is avoidable by learning about the basic safety rules concerning the machine operation. You should be responsible for operating and maintaining the machine properly; otherwise, it would lead to personal injuries or machine damages.

Only the operating personnel who hold the license from competent local authority (according to the local law), is qualified and experienced are allowed to operate this machine.

Operate the machine always in accordance with relevant laws and regulations of the state, province, autonomous region and municipality. The operation safety information and description herein should be taken only as recommendations and warnings.

SANY Heavy Machinery Co., Ltd. is unable to foresee all kinds of potential hazardous situation in the operation and maintenance; thus, the safety information in this Manual and on the machine will not include all the possible safety measures. You are responsible to take all necessary measures to ensure the safety when using the methods or actions which are not recommended or allowed particularly in this manual.

All the data, graphic charts and specifications herein are the latest product information available when it is published. SANY Heavy Machinery Co., Ltd. reserves the right to change it from time to time without advance notice. Please contact with SANY Heavy Machinery Co., Ltd. or its authorized agents for the latest information about the machine or the problems concerning data in this manual.

Application scope of SY35U machine: altitude below 1,200m and atmospheric temperature at -15℃ to +40℃.

Application scope of SY55U machine: altitude below 1,500m and atmospheric temperature at -20℃ to +40℃.

⚠ CAUTION

Before operation and maintenance, the operators and maintenance personnel must do the following:

- Read and understand this Manual.
- Read the safety notices in this Manual and the safety nameplate on the machine, and fully understand them.
- Not use or operate the machine for the purposes prohibited herein in any cases.
- If the fuel oil volume, particle or latitude exceeds the maximum value specified for this model and application, it might lead to injuries, and such circumstance will not be covered by the quality warranty.
- The operating personnel shall always keep in mind that the rated load of machine is based on the level and firm ground; if the machine is used on the uneven or soft ground, or on the slope, please pay attention to the load deviation.
- Always keep this Manual in the cab for the convenience of reference.
- Please contact with the authorized agents of SANY Heavy Machinery Co., Ltd. for substitution if this manual is lost or illegible due to damages or dirt.
- This Manual shall be regarded as a permanent integral part of this machine. This Manual shall be handed over to the new user together with the machine if the machine is to be sold.
- The machine provided by SANY Heavy Machinery Co., Ltd. to the purchasing country complies with all the applicable specifications and standards. If the machine is purchased from another country or from the person of another country, some safety devices and technical requirements may not be available for your country. Please contact with the authorized agent of SANY Heavy Machinery Co., Ltd. before use if you have any doubt about whether the machine meets the local use standards and specifications.

1.2 Safety information

For helping you use this machine safely, this Manual provides the safety precautions and nameplates fixed on the machine and gives instructions for the purpose of describing the potential hazardous situation and giving methods for avoiding such hazardous situation.

The user and after-sales personnel must be familiar with all kinds of warning signs and warning symbols on the machine before operating and maintaining the machine, strictly follow the safety criterion and suggestions herein and take positive safety preventive measures and countermeasures for the purpose of minimizing the risks of personal injuries, the machine damages due to improper repair or the risks arisen from unsafe factors.

1. Safety warning

The safety warning is composed of safety warning symbols and mark words. It is used to remind you the potential hazardous situation which might lead to personal injuries or damages. The safety warning may be classified with the mark words according to the severity corresponding to the hazardous situation.

3 kinds of mark words are used in this Manual: Danger, Warning and Attention, which means:

⚠ DANGER	It would lead to major injuries and even death if such hazard was not avoided.
⚠ WARNING	It could lead to major injuries and even death if such potential hazard was not avoided.
⚠ CAUTION	It could lead to medium or minor injuries if such potential hazard was not avoided. "Attention" also could be used to remind the occasions of unsafe operations which might lead to personal injuries, machine and environmental damages.

Examples of safety warnings

⚠ WARNING

- Be sure to engage the locking lever on the locked position when standing up from the driver's seat.
- It would lead to major injuries or death if it was touched accidentally when the control lever is not locked.

2. Safety decals

The safety nameplate is fixed on the excavator to remind the operator or maintenance personnel on site the potential hazards when operating or maintaining the excavator.

"Safety nameplate in text" and "safety nameplate in graph" are used on this machine to indicate the safety measures.

Examples of safety nameplate in text

Fig.1-1

Example of safety nameplate in graph

The safety graph indicates the degree of hazardous situation equivalent to the signal words with images. For the convenient of operating personnel or maintenance personnel to learn about the type and degree of hazardous situation from time to time, such safety graphs adopt images.

As shown in the example of warning graph on the right, the upper safety graph displays the type of hazardous situation and the lower safety graph displays the method for avoiding such hazardous situation.

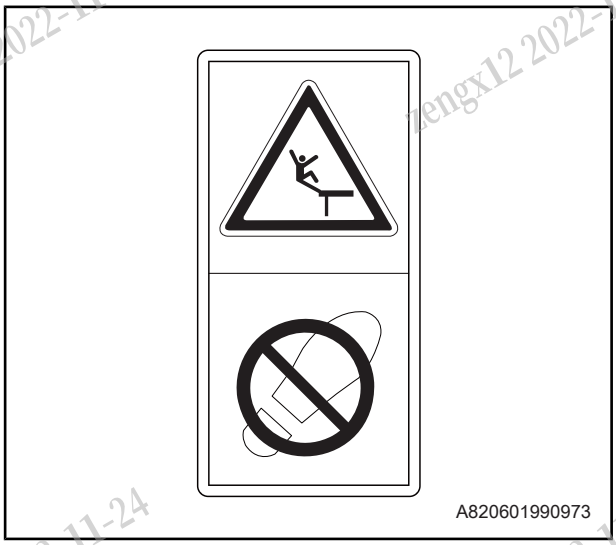

Fig.1-2

1.3 Notes for Page Number

The page number herein is relative page number.

Example: 3-20
- 20: Page 20 in Chapter 3
- 3: Chapter 3

1.4 Introduction

1.4.1 Brief introduction

SANY hydraulic excavator is designed mainly for the following work:

Excavation

Leveling

Ditching

Loading

Dismantling

Refer to relevant part of operation and maintenance manual for details.

The number in the figure is corresponding to the number in the [ ] of the text (for example: 1 → [1]).

In this Manual, the measurement is subject to international system of unit (SI).

1.4.2 Direction of Excavator

For the purpose of this Manual, the front, rear, left and right refer to the running direction viewed from the cab when the cab is facing the front and the driving wheels are in the rear part, as shown in the Figure.

【A】Front

【B】Back

【C】Left

【D】Right

【E】Driver seat

【F】Driving wheel

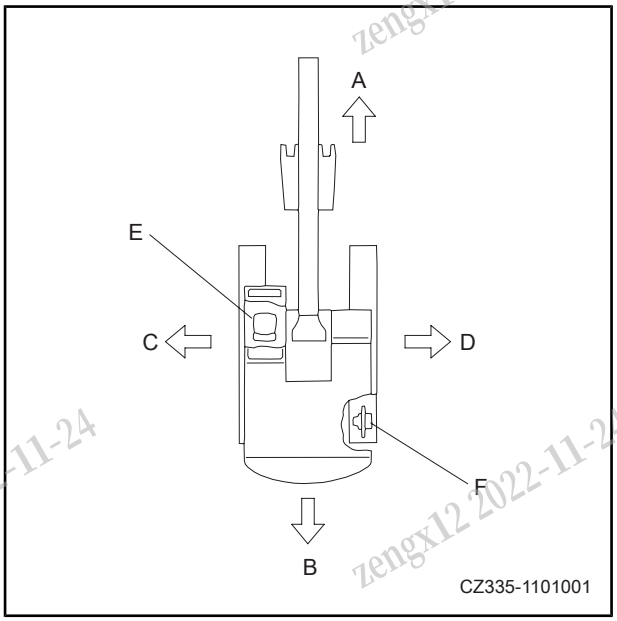

Fig.1-3

1.4.3 Running-in of new machines

The excavator of SANY Heavy Machinery Co., Ltd. has been adjusted and tested before delivery. However, the influence will be influenced seriously and the service life of excavator will be shortened if the excavator is operated under full load before the running-in period.

It is necessary to perform the running-in for the excavator in the first 100 hours (according to the indication of service hours on the displayer).

Be sure to fully understand the contents herein and pay attention to the following points in the running-in process:

1. Idle by 3-5 minutes after starting the engine. During this period of time, do not operate the control lever or fuel control knob, and then adjust the engine speed to 1,500r/m, operate

slowly until the water temperature reaches about 60℃.

2. Avoid operating at high speed under heavy load.

3. Avoid starting engine suddenly, or accelerating suddenly, unnecessary stop or changing directly after starting the engine.

1.5 Product information

1.5.1 General

Please inform the authorized agent of SANY the following information when requiring maintenance or ordering replacement parts.

1.5.2 Machine data plate

The excavator S/N nameplate is located on the front part at the bottom of cab (as shown below).

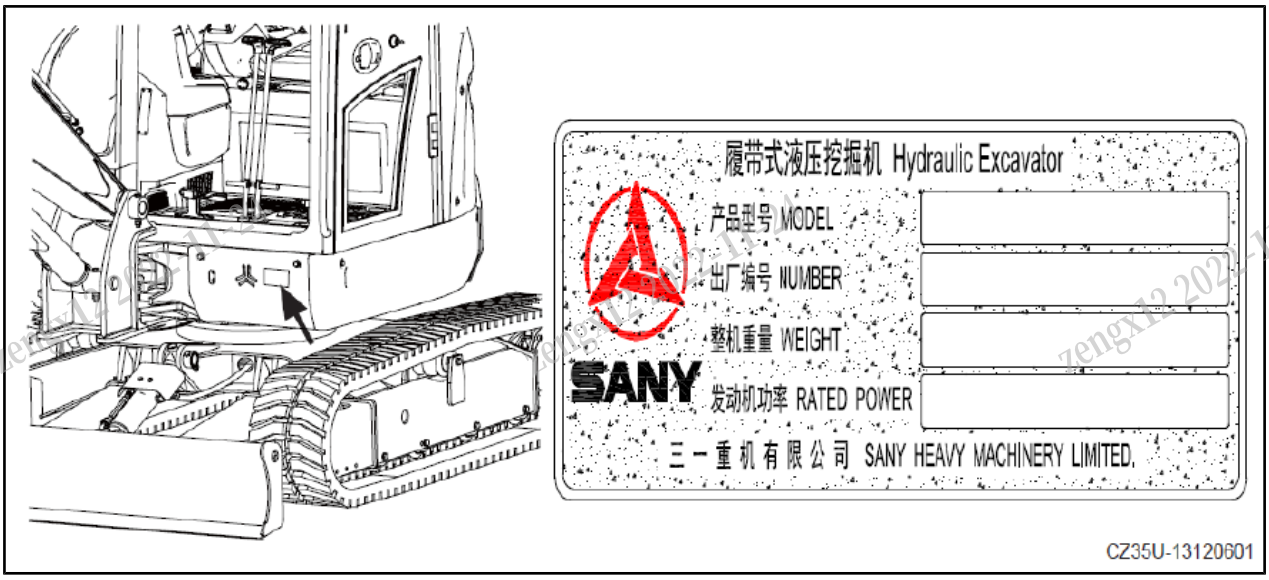

Fig.1-4

1.5.3 Engine data plate

The engine SN nameplate is located on the position shown in Figure 1-5. The positions of nameplate may be different for the different engines.

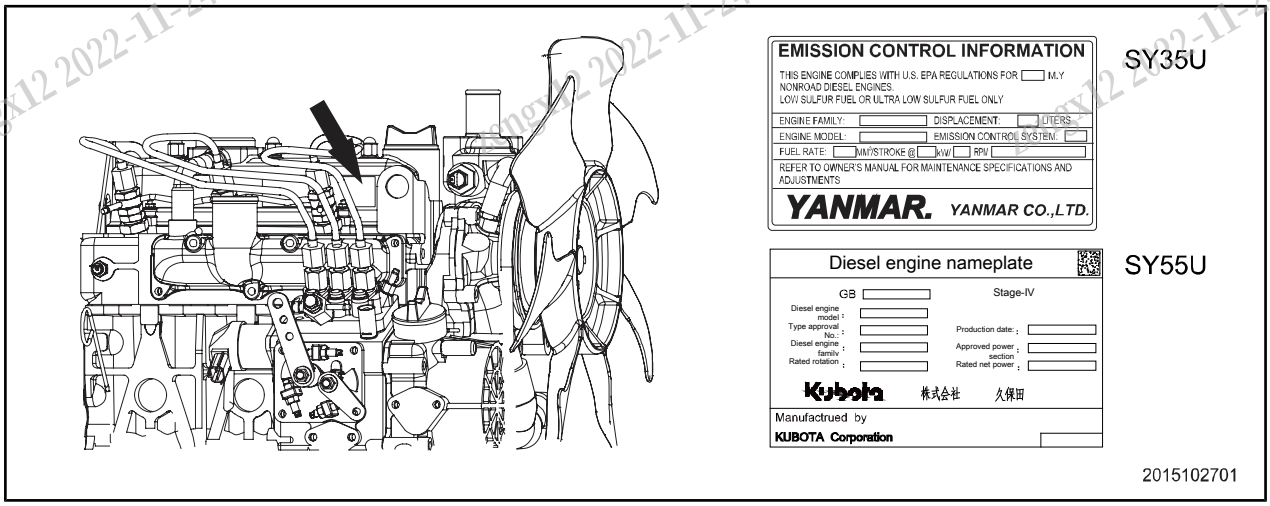

Fig.1-5

1.6 Description of Noise and Vibration Values

	Mode 1	Mode 2
Measure acoustical power at A-weighted sound pressure level (in dB)		
Uncertainty of noise (unit: dB)		
Uncertainty of vibration (unit: m/s2)		
Measure sound pressure level at Aweighted sound pressure level (test point: the position of operator, unit: dB)	(measured value)	(measured value)

Note: Measure the noise values with the measurement method in prEN 474-1 and with reference to the basic standards ISO/DIS 6395, ISO/DIS 6396 and EN ISO 3744.

1.7 CE Certification and Relevant Statements (Unless CE certification is not required)

According to requirements of 2006/42/EC Machinery Director, the excavator shall meet the “basic health and safety demands”. The user shall be responsible for the consequences due to the changes on the excavator.

The statement shall be kept properly as an attached accessory. The user shall be responsible for the consequences due to the operation of excavator, replacement or adding of devices or parts not in accordance with this Manual. The relevant personnel must ensure the safety of the excavator in any time and under any conditions, and shall be responsible for that.

Note: This CE certification and statement only apply to the excavator exported to Europe.

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Safety

⚠ WARNING

Read and understand all safety precautions and instructions in this manual before reading any other manuals provided with this machine and before operation or maintaining it. Failure to do this could result in death or serious injury.

2.Safety

2.1 Safety decals

2.1.1 General

The following warning signs and safety nameplates are used on this excavator.

- Be sure to understand the correct position and contents of the nameplates fully.
- For ensuring the contents of nameplate to be legible, it is necessary to place them on proper positions and always keep them clean. When cleaning the nameplates, do not use organic solvent or gasoline; otherwise, the paint of nameplates will peel off.
- In addition to the warning sign and safety nameplate, there are also other nameplates which shall be treated in the same way.
- If the nameplates are damaged, lost or become illegible, it is necessary to replace them with new parts. Refer to this Manual or the real nameplates for details concerning part No. of nameplate.

2.1.2 Location

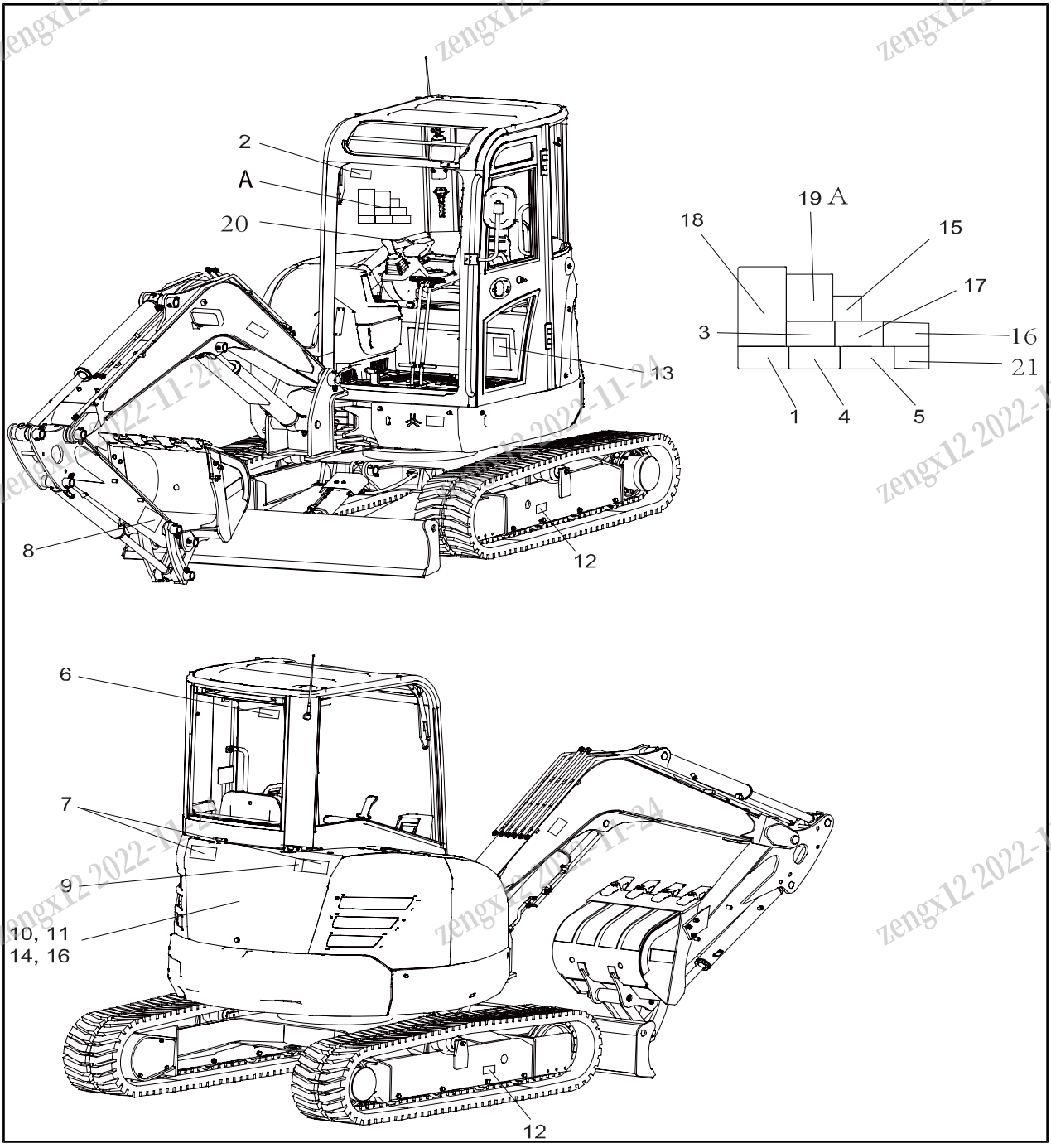


Fig.2-1

S/N	Name of nameplate	S/N	Name of nameplate	S/N	Name of nameplate
1	Safety warning sign for seat	9	Safety warning sign for hot parts	17	Indication sign for control
2	Warning sign for front window locking	10	Warning sign for splashing prevention	18	Lubrication Chart
3	Warning sign for power off with key	11	Warning sign for beating by fan	19	Warning sign for avoiding stress on single side of dozer blade
4	Warning sign for avoiding high voltage	12	Warning sign for tensioning device	20	Warning sign for dozer blade control
5	Warning sign for reading the instructions	13	“Do not climb” warning board	21	Warning sign for avoiding excavator tilting during operation
6	Warning sign for emergency exit	14	Safety warning sign for belt	22	Warning sign for avoiding standing here
7	Warning sign for counterweight	15	Warning sign for preheating		
8	Warning sign for bucket rod	16	Warning sign for air filter		

2.1.3 Safety Nameplate

1. Safety warning sign for seat

- The driver shall fasten his seat belt properly when operating the excavator.

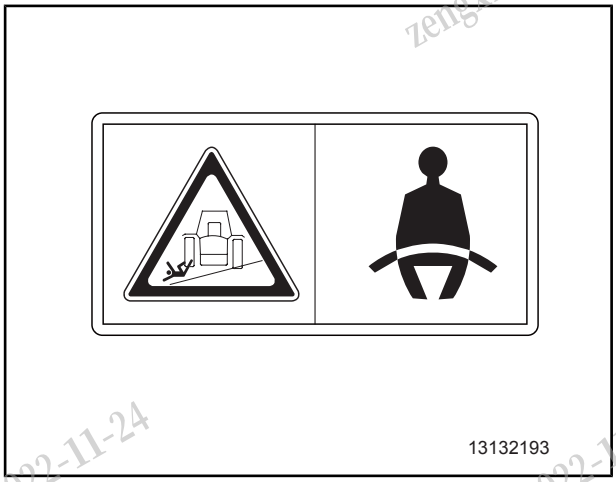


Fig.2-2

2. Front window lockout warning decal

- The nameplates indicates the risk of front window dropping.
- It is necessary to lock the front window with locking pin after rising it up.

Fig.2-3

3. Warning sign for power off with key

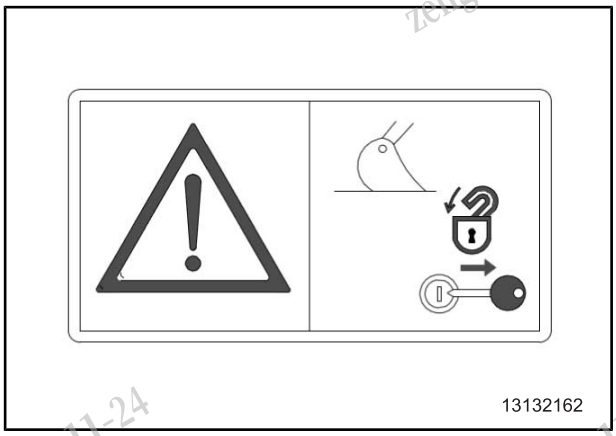


Fig.2-4

4. Warning sign for avoiding high voltage

- The sign indicates that there exists risk of electric shock if the excavator is too close to the power transmission line.
- It is necessary to keep safe distance to the power transmission line.

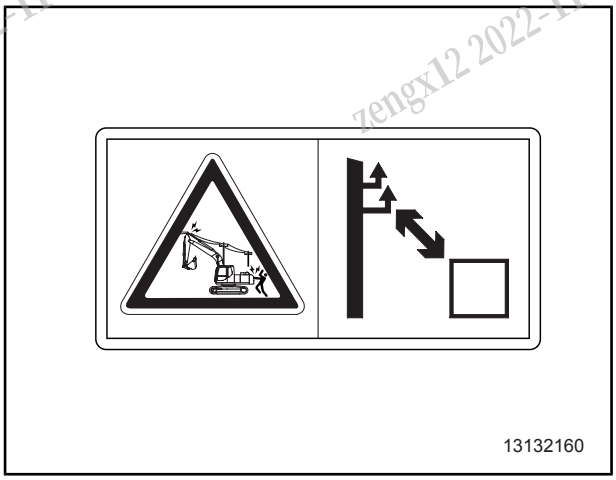


Fig.2-5

5. Warning sign for reading the instructions

- Warning!
- Read this Manual before operating, maintaining, disassembling, assembling and transportation.

Fig.2-6

6. Warning sign for emergency exit

Fig.2-7

7. Warning sign for counterweight

- The nameplate indicates the risk of being collided by the excavator. Do not enter the slewing scope.
- Keep away from the excavator in the work process.

Fig.2-8

8. Warning sign for bucket rod

- The nameplate indicates the risk of being collided by the working device.
- Keep away from the excavator in the operation process.

Fig.2-9

9. Warning nameplate for hot parts

- Do not touch the hot parts for avoiding burns.

Fig.2-10

10.Warning sign for splashing prevention

- Attention: Before opening the oil tank cover or other container cover, it is necessary to release the pressure according to the instructions, and open it slowly for avoiding splashing.

Fig.2-11

11.Warning sign for beating by fan

- Be careful about the injuries due to rotating parts. Keep away.

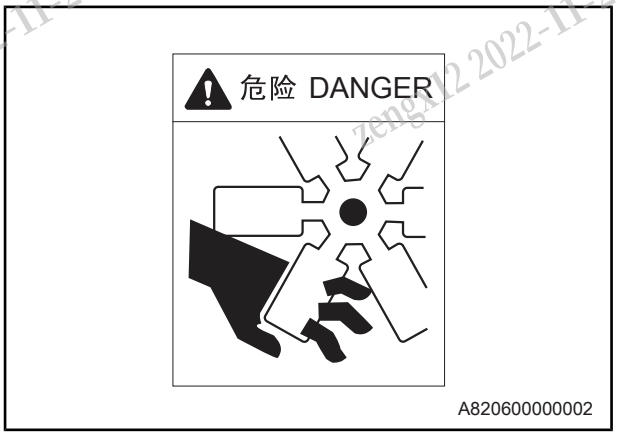


Fig.2-12

12.Warning sign for tensioning device

- Do not loosen the crawler over 1 turn; otherwise, you might get hit by the regulating valve flying out under high pressure!

Fig.2-13

13.“Do not climb” warning board

Fig.2-14

14.Safety warning sign for belt

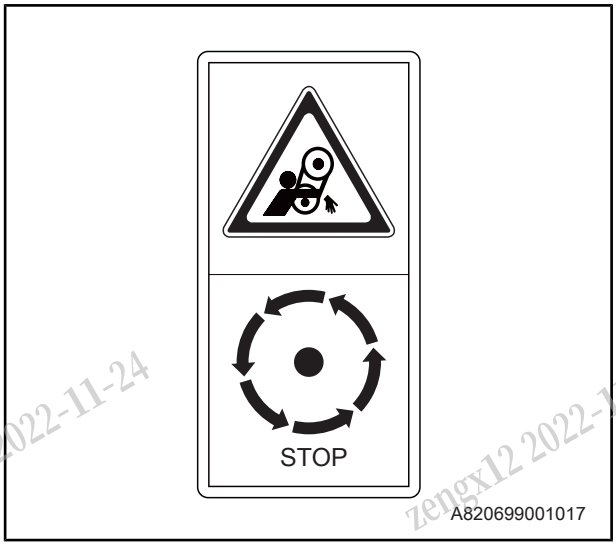


Fig.2-15

15.Warning sign for preheating

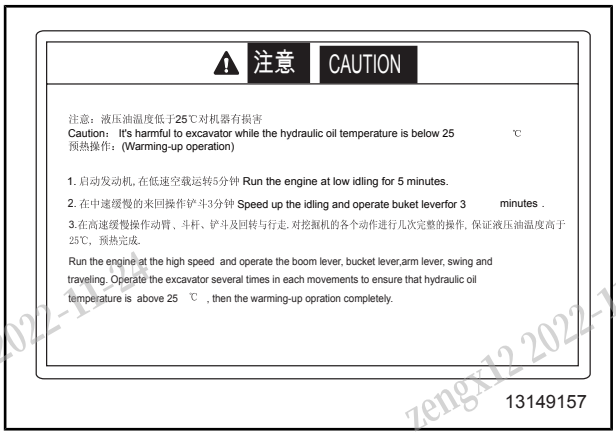


Fig.2-16

16.Indication sign for control

- For preventing personal injuries or fatal accident, please confirm the operating state of the excavator and the operating mode displayed, pay attention to the surround part and operate slowly when operating the excavator.

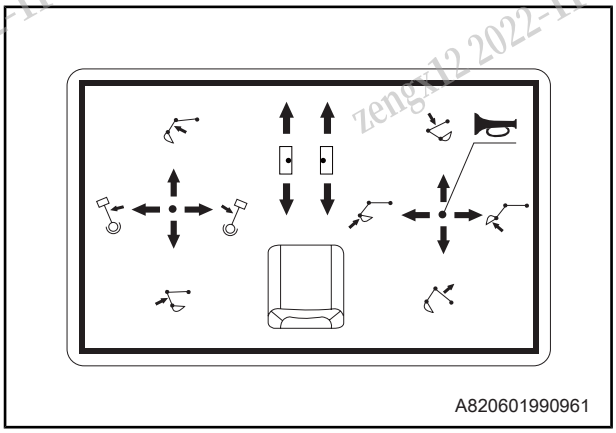
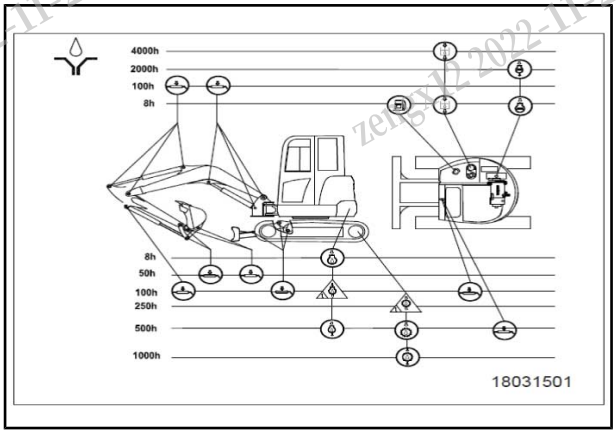


Fig.2-17

17.Lubrication Chart



18.Indication sign for control of dozer blade

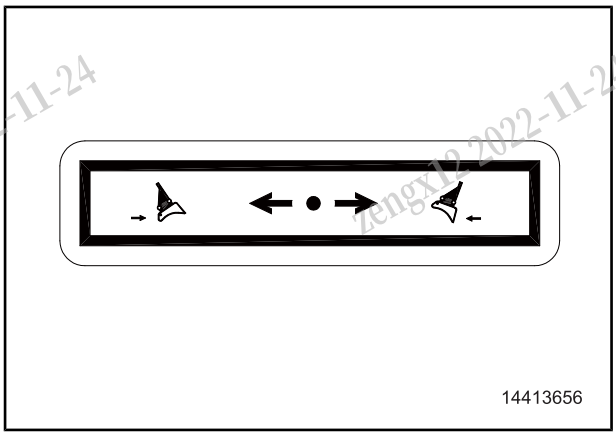


Fig.2-18

19.Warning sign for avoiding standing here

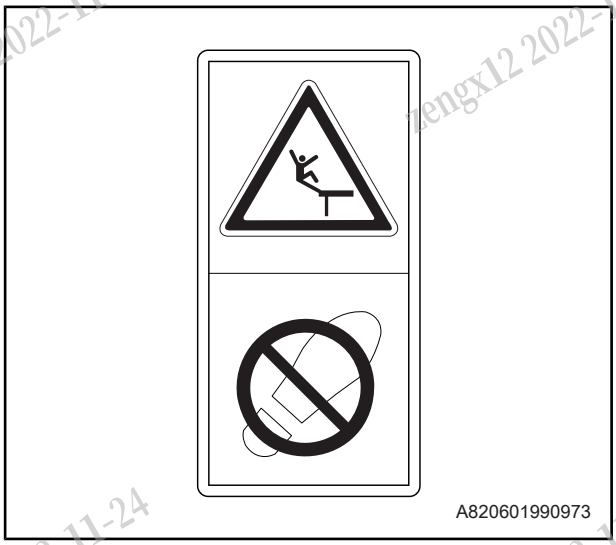


Fig.2-19

2.2 Safety information

2.2.1 Safety Regulations

- Only the trained personnel could operate and maintain the excavator.
- It is necessary to follow all the safety regulations, precautions and instructions when operating or maintaining on the excavator.
- If the operating or maintenance personnel are under the influence of alcohol or drug, their capacity of operating or repairing the excavator safely will reduce/decline serious so that they will get themselves and other personnel on site in danger.
- When working together with another operator or command personnel, it is necessary to ensure that all the people understand all the hand signals.

2.2.2 If Finding Abnormal Situation

If finding any abnormal situation (noise, vibration, odor, incorrect instrument indications, smoke or oil leakage etc., or any abnormal display on the warning device or monitor), it is necessary to report to the competent personnel and take necessary measures. Do not operate the excavator unless the trouble is solved.

2.2.3 Protective Articles for Operating Personnel

Put on tight clothes or other work clothes and protective articles required by the working conditions, including:

- Safety helmet
- Safety shoes
- Safety glasses, protective goggles or protective mask
- Protective gloves
- Earplug
- Reflective protective clothing
- Dust mask

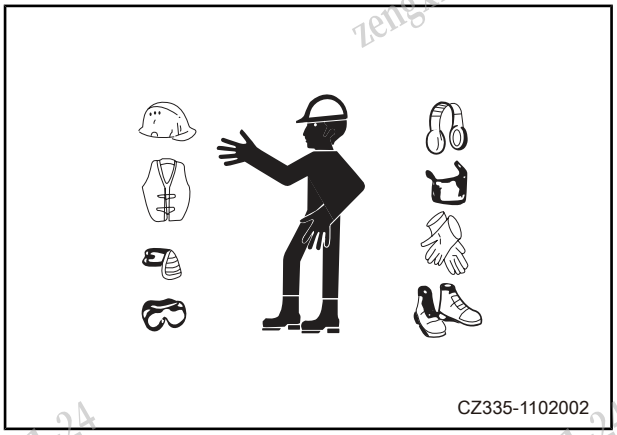


Fig.2-20

Put on necessary protective articles, as well as other equipment required by the owner, administration department for public utility, government and the laws and regulations. Do not trust to chance for avoiding unnecessary hazard.

⚠ CAUTION

- Do not wear loose clothes or ornaments. They might hook on the control lever or other extruding component.
- The hair might be tangled into the excavator if it is too long and extends out of the safety helmet.
- Always wear safety helmet and safety shoes. When operating or maintaining the excavator, it is necessary to wear safety goggles, mask, gloves, earplugs and safety belt if so required for work.
- Before use, it is necessary to inspect whether the functions of all protective devices are normal.

2.2.4 Fire extinguisher and first-aid kit

Be sure to observe the following precautions for avoiding injuries or fire hazard:

- Equip first aid kit and fire extinguisher nearby.
- Read carefully and understand the instructions on the fire extinguisher, and use the fire extinguisher properly.
- Inspect and maintain regularly to ensure the fire extinguisher is readily available.
- Inspect the first aid kit regularly and supplement drug when necessary.
- Prepare emergency measures for fire hazard and accident.

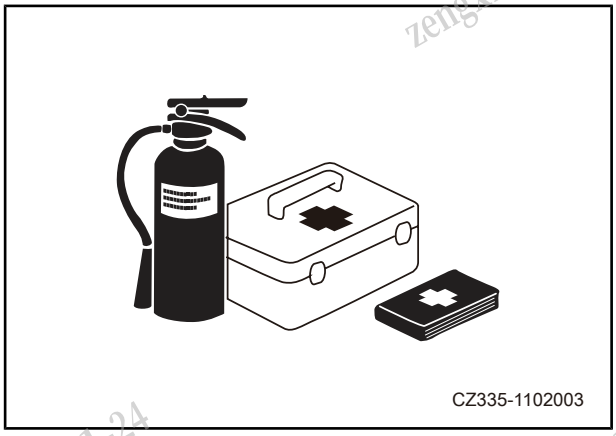


Fig.2-21

2.2.5 Safety equipment

For protecting yourself and the people around, it is necessary to install the following safety equipment on the excavator. It is necessary to fix every equipment on proper position and engage them in working state:

- Guard board
- Light
- Safety sign
- Horn
- Running alarm (optional)
- Mirror
- Fire extinguisher (optional)
- First aid kit (to be supplied by the owner)
- Wiper

Please ensure that all the above devices are available for use. It is prohibited to take down or disconnect any safety devices.

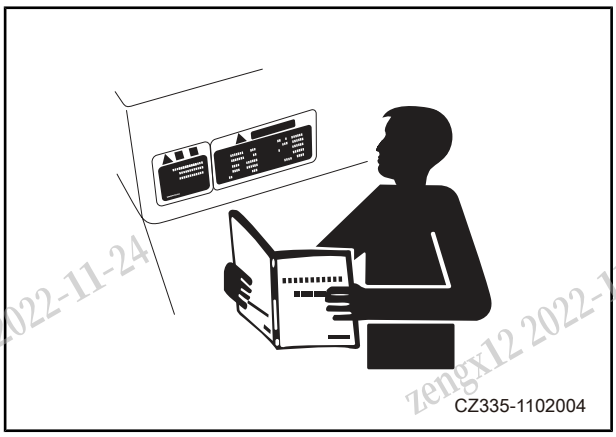


Fig.2-22

⚠ CAUTION

- Ensure that all shields and covers are on their proper positions. If any shield or cover is damaged, it is necessary to repair immediately.
- Understand the use method for safety devices and use them properly.
- Do not take down any guard rails of cab (except for repairing the excavator).

2.2.6 Keeping the machine clean

- Clean the wiper, rear-view mirrors and lights. Clean the grass, snow, ice or mud in the operating area, on the steps and at the handle position timely for avoiding sliding. Remove the mud on the shoes before getting on the excavator.
- The personnel might slip or fall, or the dirt might enter their eyes if inspecting or maintaining the excavator with mud or greasy dirt. Always keep the excavator clean.
- If the water enters the electrical system, do not start the power supply and engine; otherwise, it would cause excavator failure or computer board damages etc. Do not clean the electrical system with water or steam (including sensors and connectors etc.).

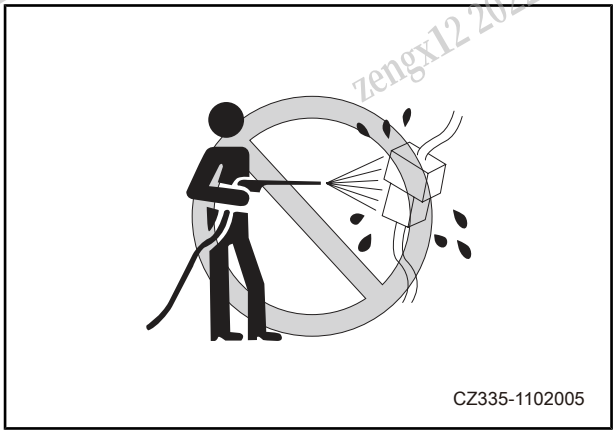


Fig.2-23

2.2.7 Keeping the cab clean

- When entering the cab, it is necessary to clean the mud and oil at the shoe sole; otherwise, it might lead to serious accident due to sliding when operating the peal.
- Put the sundries in the tool kits and do not place them in the cab disorderly.
- Do not use mobile phone when operating or driving the excavator.

- Do not take any hazardous goods like inflammables or explosives in the cab.

2.2.8 Locking of safety lock control lever

- Before standing up from the driver's seat (for example when opening or closing the front window, removing or installing the bottom window or adjusting the seat), it is necessary to lower the working device fully to the ground, move the safety locking lever to the locked position firmly and then turn off the engine. Otherwise, the excavator might move suddenly and it might lead to serious personal injuries or excavator damages if the control lever or pedal which has not been locked is touched by accident.

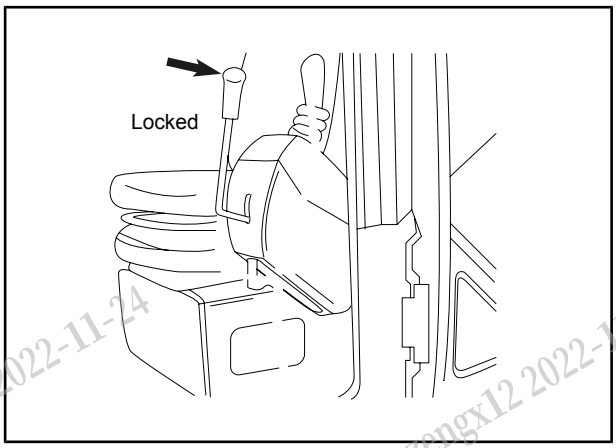


Fig.2-24

- When leaving the excavator, it is necessary to lower the working device full to the ground, move the safety locking lever to the locked position firmly and then turn off the engine. Lock all equipment with the key, take down the key and put it in the specified position.

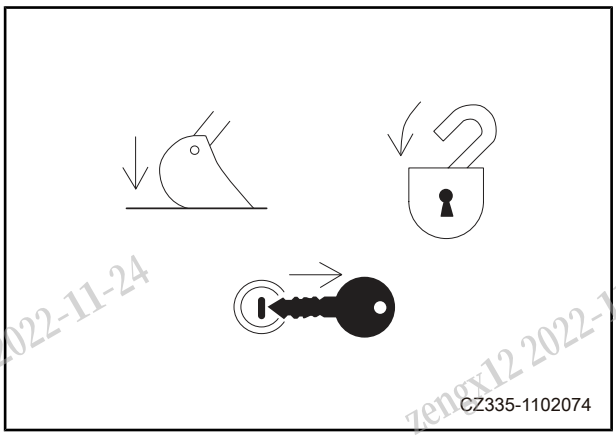


Fig.2-25

2.2.9 Precautions for working at heights

When working at heights, please use stepladder or other brackets to ensure safe operation.

2.2.10 Keeping clear of the accessory

Do not let anybody sit on the working device or other accessories; otherwise, they might drop and suffer serious injury.

2.2.11 Do Not Get Stuck on Hinge Position

The gap around the working device will change along with the movement of connecting rod. If getting stuck, it would lead to serious personal injuries. Do not let anybody approach the rotating or telescoping positions.

2.2.12 Do Not Get Burned

2.2.12.1 Hot coolant

- When inspecting or draining the coolant, be careful not to get burned by the hot coolant or steam; before operating, let the coolant cool down fully.
- Do not open the radiator cap before the engine cools down. Even though the coolant has cooled down, it is necessary to loosen the cap slowly to release the internal pressure of radiator before removing the radiator cap for avoiding serious burn.

Fig.2-26

2.2.12.2 Hot oil

When inspecting or draining the oil, it is necessary to let the oil cool down fully before starting operation for avoiding burns by the sprayed hot oil. Even though the oil has cooled down, it is necessary to loosen the cap or screw plug slowly to release the internal pressure before removing the cover or screw plug.

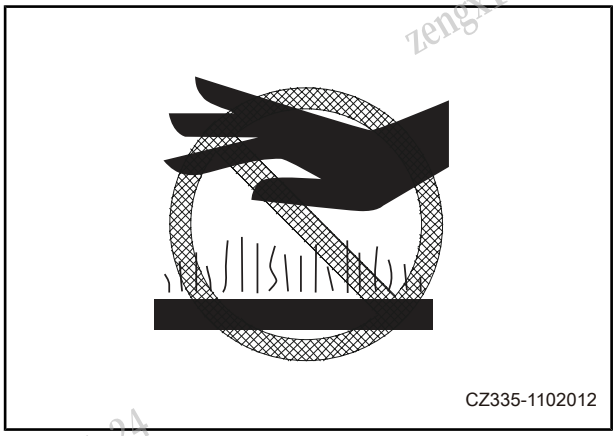


Fig.2-27

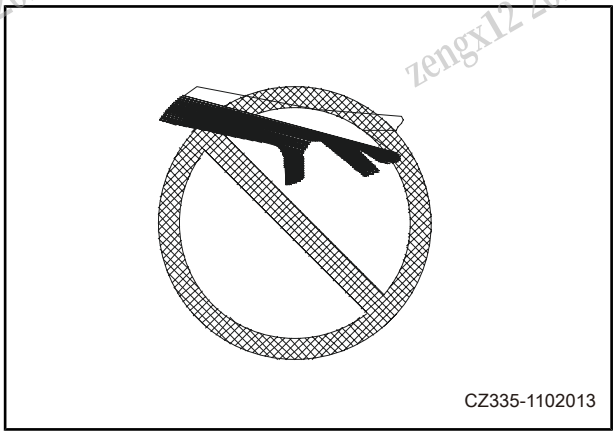


Fig.2-28

2.2.13 Fire and explosion prevention

2.2.13.1 Fire caused by fuel or engine oil

- It is necessary to store the engine oil or fuel oil in the designated places and it is not allowed to get close to it without permission.
- It is strictly prohibited to smoke or use open flame near the fuel oil or engine oil.
- Inspect whether the fixing clamp of pipeline is lost or loose, whether the hose is twisted, whether the hose and the pipeline rub against each other, whether oil cooler is damaged, whether flange bolt of oil cooler is loose for avoiding oil leakage; fasten, repair or replace any lost, loose or damaged fixing clamp, pipeline, hose, oil cooler and its flange bolt.
- It is necessary to fill in or store oil in the well-ventilated places.
- It is necessary to turn off the engine before filling in the oil.
- Do not leave the excavator when filling in the fuel oil and engine oil.
- Do not let the fuel oil overflow onto the hot surfaces or the parts of electrical system.
- It is necessary to wipe off the overflowed fuel oil or engine oil timely after filling in fuel oil or engine oil.
- Put the duster cloth containing oil or other combustible materials into a safe container for keeping the workplace safe.
- Tighten the fuel oil and engine oil tank covers firmly.
- It is necessary to use non-flammable oil when wash the parts with oil. The diesel oil and gasoline are flammable so that they shall not be used.
- When performing grinding or welding operations on the chassis, it is necessary to

Fig.2-29

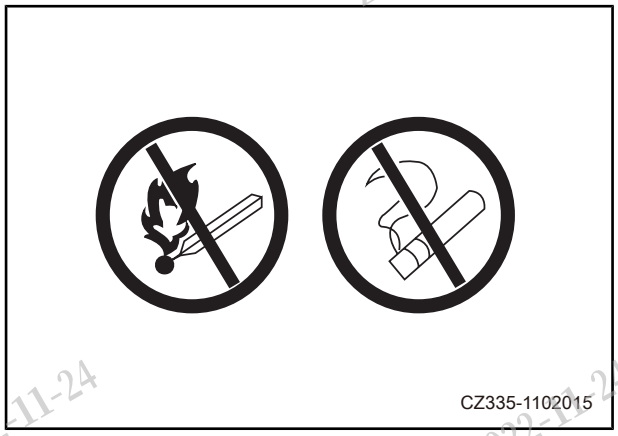


Fig.2-30

move all the flammable materials to a safe place before starting.

- Do not weld or cut the pipeline containing flammable liquid.

2.2.13.2 Fire caused by inflammable materials

- It is necessary to clean the dry leaves, wood chips, scraps of paper, dust and other inflammables stacking or attached on around the engine, exhaust manifold, silencer and storage battery or in the engine hood for avoiding fire hazard.

2.2.13.3 Fire caused by electrical wire

It would cause fire hazard if the electrical system is short-circuited.

- Keep the electric wire connector clean and fix firmly.
- After operating by 8-10 hours every day, it is necessary to inspect whether the cable and electric wires are loose, twisted, hard or ruptured; inspect whether the wiring end caps are lost or damaged.
- If the cables or electric wires are loose or twisted, it is necessary to tighten the loosen connector and electric wire thimble, straighten out the wiring, repair or replace the damaged electric wires.

2.2.13.4 Fire caused by hydraulic circuit

- Inspect whether the thimble, shield and buffer pad of all hoses and pipelines are fixed on proper position.
- If they are loose, they will vibrate and rub against other parts in the operation process, resulting in damages to hose, spraying of high pressure oil and fire hazard or serious personal injuries.

2.2.13.5 Fire caused by lighting equipment

- When inspecting fuel oil, engine oil, battery electrolyte, window cleaning solution or coolant, it is necessary to use explosive-proof lighting equipment. Otherwise, it would lead to explosion and result in serious injuries.
- It is necessary to observe the provisions in this Manual when using the power supply of this excavator for lighting.

2.2.13.6 Fire hazard caused by thermal shroud

- It would cause fire hazards if the thermal shroud is damaged or lost.
- If finding any abnormal situation, it is necessary to repair or equip new thermal shroud before operating the excavator.

2.2.14 Actions in case of a fire

Evacuate from the excavator rapidly according to the following requirements in case of fire hazard.

- Turn the starting switch to Position OFF to switch off the engine.
- Evacuate from the excavator with the armrests and steps.

2.2.15 Windshield cleaning solution

Please use ethanol-based cleaning solution. The methanol-based cleaning solution will irritate the eyes so that it shall not be used.

2.2.16 Preventing flying components

The lubricating grease in the tension regulating device of crawler is under high pressure; it might lead to serious injuries, blindness or fatal accidents if failing to observe the following precautions:

- Do not remove the grease nozzle or valve part; as the parts might fly out so the body and face must be kept away or diverged from the valve body.
- The running reducer contains pressure.
- The gear oil is hot liquid so that it is necessary to loosen the air venting bolt gradually to release the pressure after the gear oil cools down. As the parts might fly out, so the body and face must be kept away or diverged from the air venting bolt for avoiding injuries.

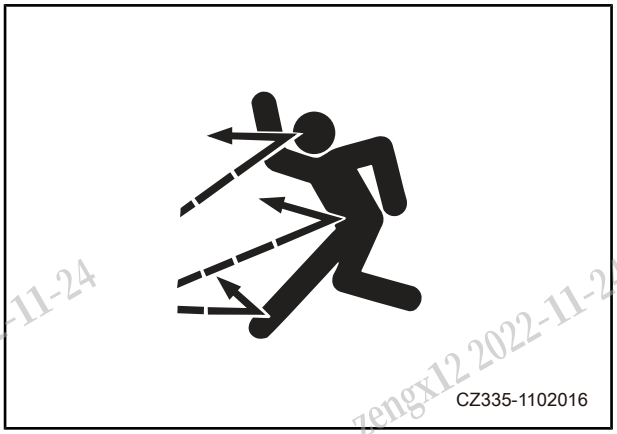


Fig.2-31

2.2.17 Prevent falling, flying and invading objects

In the hazardous workplace in which the falling objects, flying substances and foreign matters might hit or enter the cab, it is necessary to install necessary shields to protect the operating personnel according to the operation situation.

- When performing removal or breaking operations, it is necessary to install front shield and paste transparent glass paper on the front glass.
- When operating in the mine or quarry with falling rock risk, it is necessary to install falling object protective structure (FOPS) and front shield, and paste transparent glass paper on the front glass; the operating personnel shall wear safety helmet and protective goggles.
- When performing the above operations, it is necessary to close the front window, and ensure other personnel are out of the hazardous area with falling object, and keep appropriate safe distance.
- The aforesaid contents are in allusion to the typical working conditions. It might be necessary to install other shields according to the operation situation on site. Please contact with the authorized agent of SANY Heavy Machinery Co., Ltd. in advance.

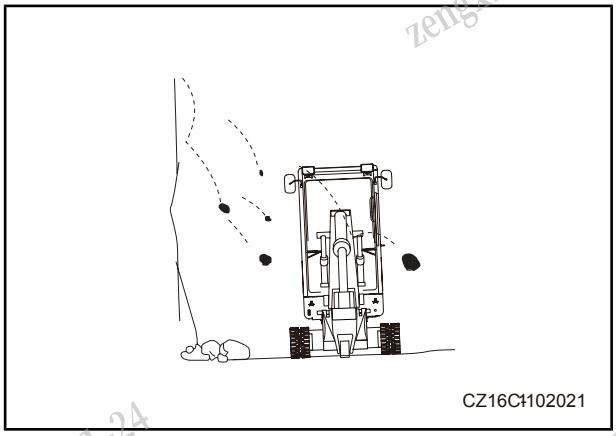


Fig.2-32

2.2.18 Accessory installation

- When installing the optional parts or accessories, please pay attention to the safety or legal restriction issues; thus, it is necessary to contact with the authorized agent of SANY Heavy Machinery Co., Ltd. in advance.
- SANY Heavy Machinery Co., Ltd. will not be responsible for any injuries, accidents or product troubles due to the use of unapproved accessories or parts.
- When installing or using the optional accessories, please read the instruction for relevant accessories and the general description on the accessories in this manual.

2.2.19 Accessory combination

The working device of different types or combinations might collide against the cab or other components of excavator. Before using unfamiliar working device, it is necessary to inspect whether there exists collision risk and operate carefully.

2.2.20 Cab window glass

- The working device might come into contact with the body of the operator if the cab glass close to the working device was damaged or broken. It is necessary to stop operation immediately and replace the glass.
- The glass will lose protection function and shall be replaced with new part immediately if the top window has been damaged.

2.2.21 Unauthorized retrofit

If the excavator was refitted without the approval of SANY Heavy Machinery Co., Ltd., it might lead to safety problems and result in personal casualties. The refitting might influence the excavator strength and sight seriously. Before refitting in any form, please contact with the authorized agents of SANY Heavy Machinery Co., Ltd.. SANY Heavy Machinery Co., Ltd. will not assume any responsibilities to the accidents, troubles or damages due to the refitting without its approval.

2.2.22 Investigate Construction Site in Advance

- It might cause fire hazard when operating near flammable materials such as thatch roof, dry leaves or cured hay; therefore, be careful.
- Inspect the terrain and ground situation of the workplace, and determine the safest operation method. Do not operate in the hazardous areas with risks of collapse or falling rock.
- Reinforce the ground as per needs, keep safe distance between the excavator and ditch edge or road shoulder, and designate a signalman to direct for avoiding personal casualties when operating in the hazardous sections such as ditch edge or road shoulder etc.
- If there are water pipes, gas pipes, cable ducts or high voltage electric wire pipelines buried in the workplace, it is necessary to contact with the competent public utility department in advance and mark their positions; be careful not to break or damage any pipelines when excavating.
- Take necessary measures to prevent any unauthorized personnel entering the working area. When operating on the road, it is necessary to arrange a signal man and install the baffle to ensure the traffic and pedestrian safety.
- Be particularly careful when operating on the frozen ground because the ground might become soft and wet as the ambient temperature rises up.
- It is necessary to inspect the type and situation of bed rock as well as the depth and flow rate of water before operation when driving or operating the excavator in the shallow water or soft ground.

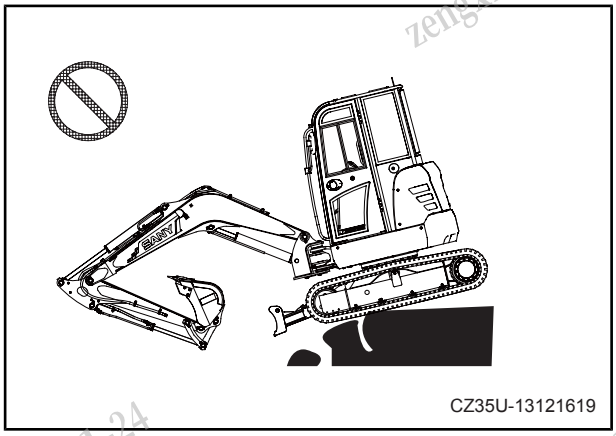


Fig.2-33

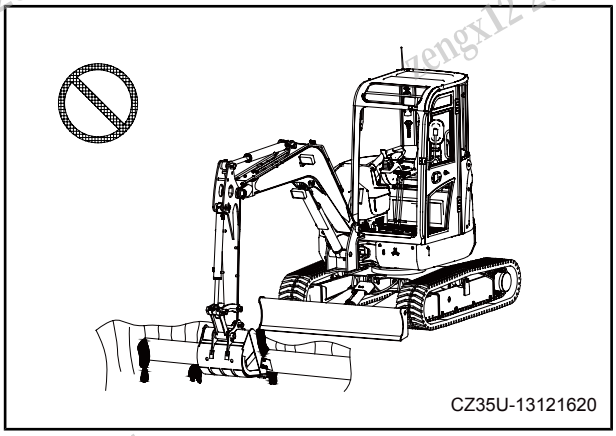


Fig.2-34

2.2.23 Operation on loose ground

- Do not drive or operate the excavator near the cliff edge, road shoulder or deep ditch. In such areas, the excavator might sink or tip over as the ground might be very soft and under the effects of weight and vibration of the excavator. More important, the soil would be softer after heavy rain, explosion or earthquake.
- The soil ground might collapse due to the weight and vibration of excavator when operating on the dike or near the excavated ditches. Before starting operation, it is necessary to take measures to ensure the ground safety and prevent the excavator tipping over or falling.

2.2.24 Don’t approach high voltage cable

Do not drive or operate the excavator near the cables; otherwise, it might suffer electric shock, resulting in equipment damages or personal casualties. In the workplace near the cables, it is necessary to operate in the following steps:

- Before operating in the places having cables, inform the local electric power company the operations to be performed, and request them to take necessary measures.
- It might suffer electric shock if the excavator is too close to the cable, resulting in serious burns and even death. It is necessary to keep safe distance (see the table on the right) between the excavator and the cable. Before operating, it is necessary to communicate with the local electric power company on the measures for work safety.
- It is necessary to designate one signalman to direct if the excavator is too close to the cable.
- Do not let anybody approach the excavator when operating near the high voltage cable.
- If the excavator is too close to or touches the cable, the operator shall not leave the cab before the cable has been cut off for avoiding electric shock. Besides, do not let anybody approach the excavator.
- For avoiding unexpected accidents, it is necessary to wear rubber footwear and rubber gloves. Lay a layer of rubber pad on the seat and do not touch the undercarriage with any exposed body parts.

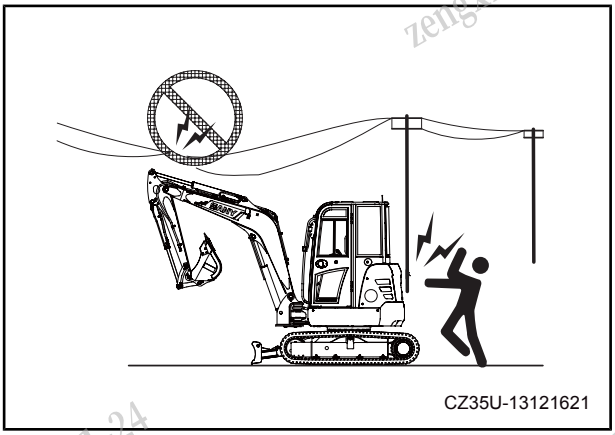


Fig.2-35

Cable Voltage	Safety Distance
100V-200V	More than 2 m (7 ft)
6,600V	More than 2 m (7 ft)
22,000V	More than 3 m (10 ft)
66,000V	More than 4 m (14 ft)
154,000V	More than 5 m (17 ft)
187,000V	More than 6 m (20 ft)
275,000V	More than 7 m (23 ft)
500,000V	More than 12 m (36 ft)

2.2.25 Ensuring good sight

This excavator is equipped with rear-view mirrors to improve the sight; however, some places are still invisible on the seat even though

the rear-view mirror is equipped. Therefore, be careful when operating.

When operating the excavator in the places with bad sight, it might cause excavator damages or personal injuries if the situation of workplaces or the barriers in the area around the excavator could not be confirmed. When operating in the places with bad sight, it is necessary to strictly observe the following matters:

- Before working every day, inspect the rear-view mirror. Clean the dirt and adjust the field of view to ensure good sight.
- When operating in the dark place, it is necessary to turn on the working light and front lights of excavator; when necessary, it is necessary to establish auxiliary lighting in the operating area.
- If the sight could be guaranteed, such as fogy day, snowy day, rainy day or sandstorm day, the operation should be stopped.
- It is necessary to establish marks on the road shoulder or soft ground; if the sight is bad, arrange one signalman when necessary. The operator shall pay special attention to the marks, and follow the instructions of the signalman.
- Before operating, make sure that all the workers understand all signals and gestures.

2.2.26 Ventilation of working environment

- The exhaust gas of engine may be fatal; it is necessary to open the door and window to ensure sufficient ventilation when having to start the engine or treat the fuel oil, cleaning oil or paint in the confined area.
- It is prohibited to operate in the environment containing toxic gas or underground; it is necessary to wear gas mask and ensure good ventilation if having to operate the excavator in such environment.

Fig.2-36

2.2.27 Prevention of asbestos dust

It would cause lung cancer if the air breathed in contains asbestos dust. When removing or treat industrial wastes in the workplace, the personnel would be exposed to the hazard of breathing in asbestos dust. Be sure to observe the following rules:

- Spray water to reduce dust when cleaning, but do not use compressed air.
- Operate the excavator on the windward position and wear dust filtration mask if the air contains asbestos dust.
- Do not let any other persons approach the excavator in the operation process.
- Observe the regulations, provisions and environmental standards for workplace.

⚠ WARNING

- The parts used on this excavator do not contain asbestos. But the fake parts might contain asbestos. It might cause lung injury or death if breathing in too much asbestos. Therefore, be sure to use authentic parts of SANY Heavy Machinery Co., Ltd..

2.2.28 Cab emergency exit

- If the cab door could not be opened for some reasons, it is allowed to break the glass with the emergency hammer and use the opening as an emergency exit.
- When escaping, clean the glass fragments first from the window frame and be careful not to get scratched by the glass. Be careful not to slip and fall due to the glass cullet on the ground.

Fig.2-37

2.3 Safe machine operation

2.3.1 Start

2.3.1.1 Boarding the machine safely

When getting on or off the excavator:

- Always face the excavator and keep three points (one hand and two feet or two hands and one foot) in contact with the excavator.
- Do not jump on or off the excavator; d not climb onto the excavator when it is running.
- Do not use any control lever as armrest.
- Clean the mud, greasy dirt and water on all the pedals, armrests and shoes from time to time.
- Align the cab before getting in or out of the cab.

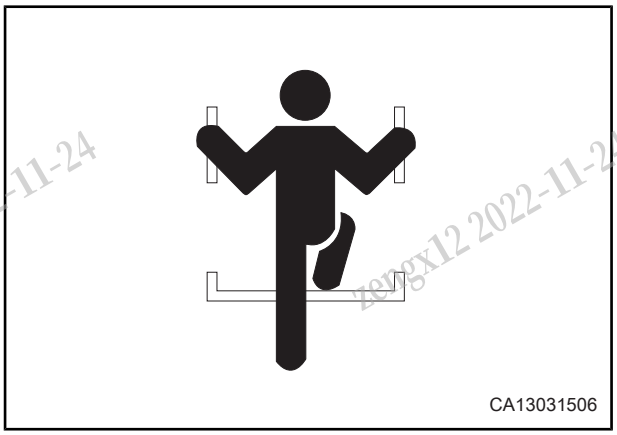


Fig.2-38

2.3.1.2 Adjusting the seat

The operator would get fatigue easily, resulting in misoperation if the seat position is improper. When changing operator for excavator, it is necessary to re-adjust the seat position. When leaning against the seat back, the operator shall be able to push the pedal to the bottom and operate the control lever properly. Otherwise, it is necessary to move the seat forth and back to readjust it.

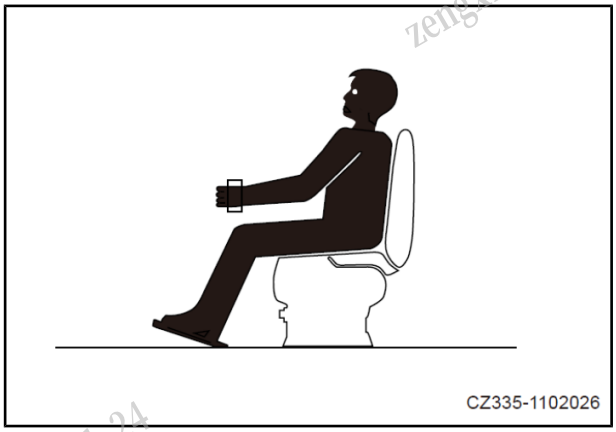


Fig.2-39

2.3.1.3 Fastening safety belt

The operator might be get hurt or thrown out of the cab, or be crushed by the excavator, which would lead to serious casualty accident if the excavator tips over. Before operating the excavator, inspect the seat belt, belt fastener and fixed part carefully; if finding any damages or abrasion, it is necessary to replace the seat belt or other parts before operating the excavator. When driving the excavator, be sure to sit on the operator seat and fasten the seat belt to prevent the unexpected accidents.

Replace the seat belt every three years, regardless of its use situation.

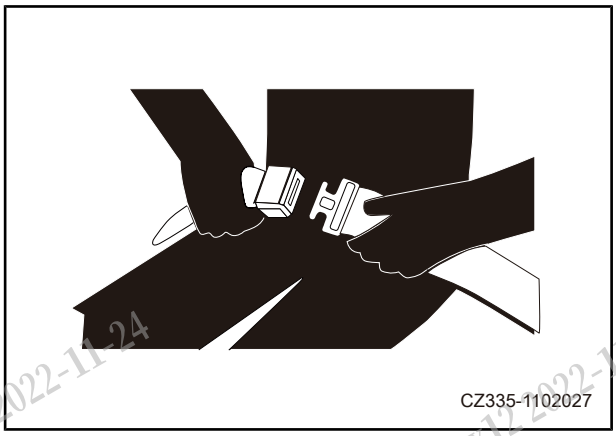


Fig.2-40

2.3.1.4 Check before starting the engine

It is necessary to perform the following inspections before starting the engine during the daily work:

- Wipe off the dust on the surface of window glass to ensure good sight.
- Wipe off the dust on the surface of front light and working light and inspect whether the working light works normally.
- Inspect the engine coolant level, fuel oil level and engine oil level.
- Inspect whether the air filter is plugged.
- Inspect whether the electric wires are broken.
- Adjust the seat to a position convenient for operation, and inspect whether the seat belt and belt fastener are damaged or worn.
- Inspect whether the work of instruments is normal, inspect the angle of working light and inspect whether all the control levers are on the neutral positions.
- Inspect whether the safety locking lever is on the “locked” position.
- Adjust the rear-view mirror for the convenience of viewing the rear part of the excavator clearly from the driver’s seat.

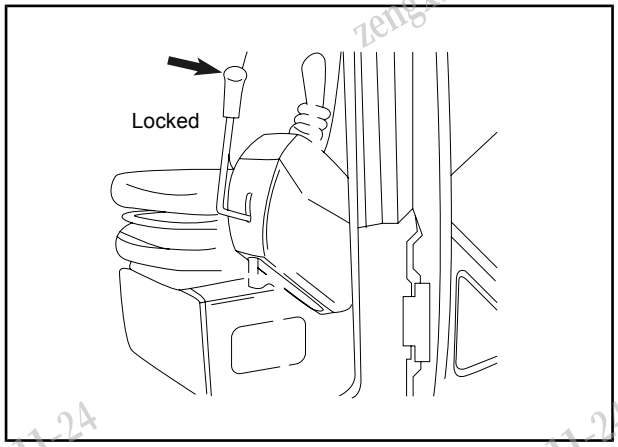


Fig.2-41

2.3.1.5 Starting the machine safely

Understand the correct starting procedures for excavator; see the instructions on excavator start in the operation part.

- Before starting the excavator, ensure that nobody is on, beneath or around the excavator, and ring the horn to sending alarm.
- Sit on the driver's seat and adjust the seat until you feel comfortable to operate all control devices.
- Get familiar with all the warning devices, instruments and operation control devices.
- Engage all the control devices on the neutral position or stop position.
- No one but the operator could stay on the excavator.
- Start the engine strictly in accordance with the instructions in the operation part of this Manual. Do not start the engine with the method which might cause the starting motor to be shortcircuited.

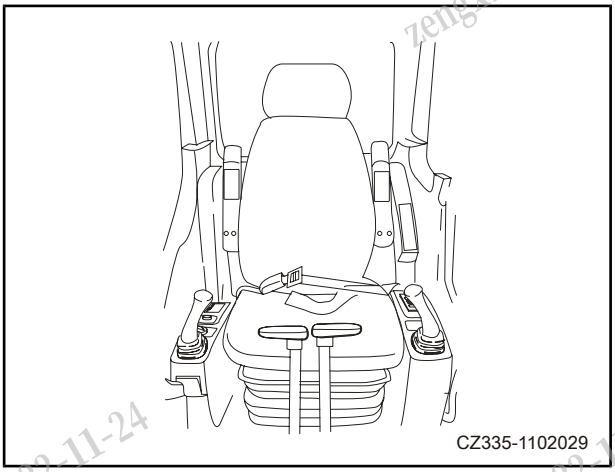


Fig.2-42

⚠ WARNING

- It is necessary to ensure sufficient ventilation if having to start the engine or operate the excavator in the enclosed environment; it might be fatal if breathing in too much tail gas.
- Do not start the excavator if you do not know how to stop it.

2.3.1.6 Engine start in cold weather

- It is necessary to preheat sufficiently. The actions of excavator will be slow, which might cause unexpected accidents if the excavator has not been preheated thoroughly before operating the control lever.
- Before starting, it is necessary to inspect whether the battery electrolyte is frozen or leaks; if the battery electrolyte has been frozen, do not charge the storage battery or start the engine with different power supply but it is necessary to unfreeze the battery electrolyte first; otherwise, the storage battery would catch fire.

2.3.1.7 Required auxiliary equipment for start

Start the engine with the method for connecting the auxiliary cable; be sure to operate according to the instruction in the operation manual; improper operation would cause explosion of storage

battery or the excavator to be out of control, resulting in personal casualties. It is strictly prohibited to start the excavator with auxiliary cable without permission. please contact with the authorized agent of SANY Heavy Machinery Co., Ltd. when necessary.

- Arrange 2 persons to operate (1 person sits in the driver's seat while another person operates the storage battery) when starting the engine with auxiliary cable.
- Be sure to wear protective goggles and rubber gloves before starting the engine with auxiliary cable.
- The voltage of storage battery on normal excavator shall be same to the voltage of storage battery on faulty excavator when the normal excavator is connected to the faulty excavator with auxiliary cable. be careful not to let two excavators contact with each other.
- It is necessary to turn off the key switches of the normal excavator and the faulty excavator when connecting the auxiliary cable. Otherwise, the excavator might move, causing hazard when the power supply is turned on.
- Connect the positive pole (+) first when connecting the auxiliary cable. disconnect the grounding or negative pole (-) cable (on grounding side) first when disconnecting the auxiliary cable.
- Do not let the auxiliary cable clamps touch each other or let the cable clamp touch the excavator when removing the auxiliary cable. The primer fluid containing diethyl ether is highly flammable and explosive substance. Before use, please read the instructions on the diethyl ether container. Diethyl ether shall not be used if the engine is equipped with spark plug type preheater or other preheats.

2.3.1.8 After starting the engine

After starting the engine, idle by 3-5 minutes, observe the parameters of instrument display system and confirm that they are running properly and the readings are within the normal working scope.

2.3.2 Operation

2.3.2.1 Check before operation

- Move the excavator to a wide place without any barrier and operate slowly when inspecting; do not let anybody approach the excavator.
- Be sure to fasten the seat belt.
- Inspect whether the operations of instruments and equipment are normal, and inspect whether the operations of bucket, bucket rod, boom, running system, slewing system and steering system are normal.
- Inspect whether the sound, vibration, heating, odor or instrument of the excavator is normal, and inspect whether the engine oil or the fuel oil leaks.
- When the running control lever is engaged on neutral position, test the engine speed control device; operate the control lever of every equipment to determine whether all functions are normal and understand the control modes of the working device.
- Do not use the excavator anymore and repair immediately if finding any abnormal situation.

⚠ CAUTION

- Observe and listen carefully whether there is abnormal sound in the excavator; stop the excavator immediately in case of any trouble or abnormal situation. Please solve the trouble and report to the superior management before operating further.

2.3.2.2 Precautions before operation

Pay attention to the following precautions before operating the excavator for preventing serious injury or fatal accidents:

- The periphery area within radius of 12m to the slewing center is the working area (dangerous area) of the excavator. Ring the horn before operating to remind the personnel in this area.
- There shall be no person on or near the excavator, or in the slewing area.
- For ensuring good view on the running direction, it is allowed to turn the cab if necessary.
- Please arrange a signalman in the place with bad view.

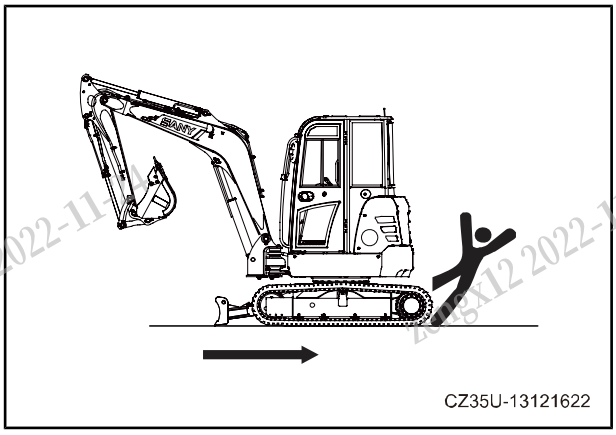


Fig.2-43

2.3.2.3 Verifying the travel direction

- Confirm the position of the undercarriage and the relationship between it and the position of operator before driving the excavator.
- If the traveling motor in located in the front lower part of the cab, the excavator will move backwards of the control lever/pedal is pushed forwards.
- If the guide wheels are on the rear lower part of the cab, the excavator will move forwards if the control lever/pedal is pushed forwards.

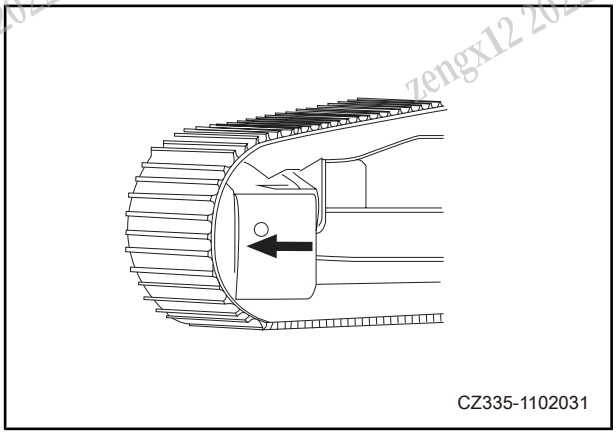


Fig.2-44

- The traveling direction indicative board is on the inner side of the excavator undercarriage; when the control lever/pedal is pushed forwards by the operator, the arrow of indicative board will point to the actual traveling direction of the excavator.

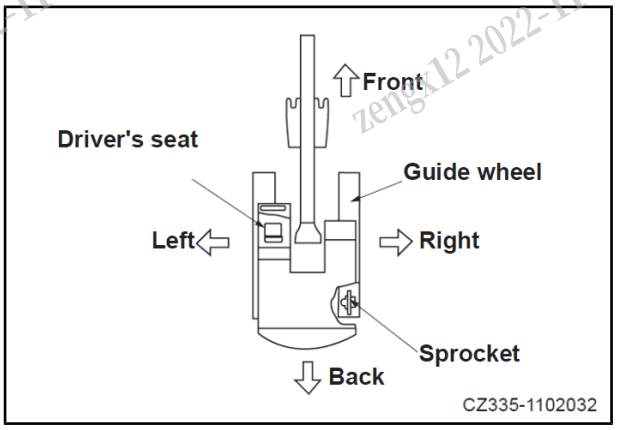


Fig.2-45

NOTE :

For the purpose of this Manual, the front, rear, left and right refer to the traveling direction viewed from the cab when the cab is facing the front and the driving wheels are in the rear part of the excavator.

⚠ CAUTION

- Wrong operation of traveling control lever/pedal might lead to serious casualty accident.

2.3.2.4 Safety rules for changing the machine direction

- It is allowed to operate the excavator only on the seat.
- Only the operator could stay on the excavator.
- Inspect whether the work of traveling warning device is normal (optional).
- It is necessary to lock the cab door or window on the open or closed position. When operating in the workplaces in which the flying object might enter the cab, it is necessary to inspect whether the door and window of excavator are closed tightly.

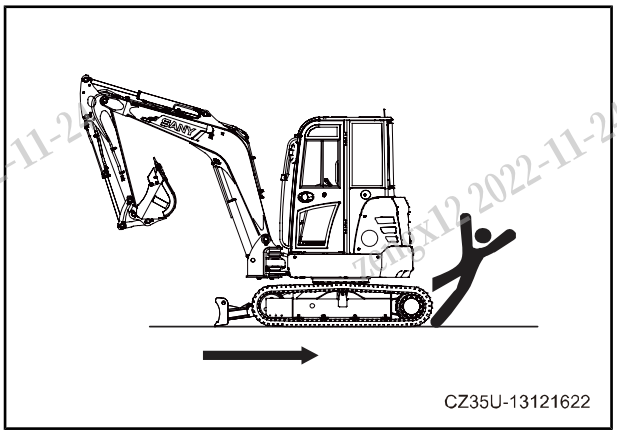


Fig.2-46

- Before traveling backwards or slewing, confirm that there is no person or barrier in the working area of the excavator, and ring the horn for warning.
- Always keep in mind whether any other persons enter the working area of the excavator. When the excavator makes turns or slews , be careful not to collide other excavator or personnel.

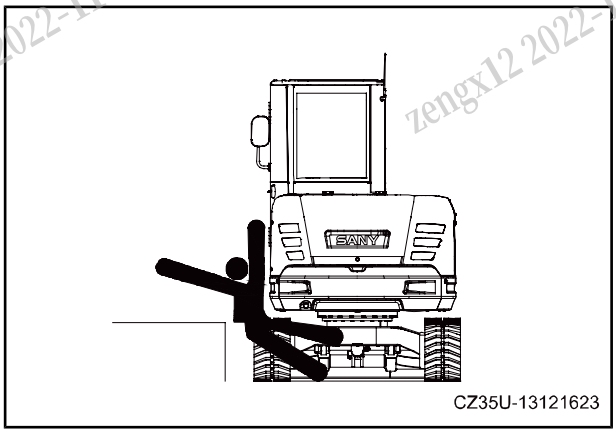


Fig.2-47

- Before driving, it is necessary to adjust the excavator to make the driving wheels ① behind the driver's seat. If the driving wheels are in front of the cab, the excavator will move on the opposite direction to the operation of control lever (the forward and backward running are opposite; the left and right steering are opposite). Be particularly careful when operating the excavator in such case.

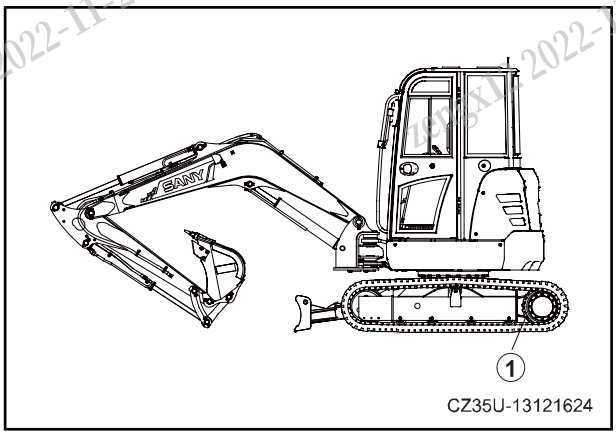


Fig.2-48

- It is necessary to arrange a signalman for directing and keep the signalman always in the field of view if the operator's sight is obstructed when traveling backwards;
- Use the hand signals meeting the local provisions when the working condition requires signalman;
- It is allowed to move the excavator unless both the signalman and the operator are clear about the signals;
- Understand the meanings of all flags, signals and marks used in work, and confirm who is responsible for sending the signal;
- Keep the window, rearview mirror and working light clean and intact;

Fig.2-49

- Dust, heavy rain and fog etc. will reduce the visibility. When the visibility reduces, slow down and use appropriate lighting.

⚠ CAUTION

- If any persons are near the excavator when moving backwards or slewing the superstructure, they might get hit or crushed by the excavator, resulting in serious casualty accident.

2.3.2.5 Travel safety rules

- It is not allowed to exceed the maximum allowable load or performance parameters of the excavator when using it for protecting it from stalling due to overload or the working device being damaged.
- When driving or operating the excavator, it is necessary to keep safe distance to the people, building or other excavator for avoiding collision.
- When driving on the road, it is necessary to contact with relevant department and follow their instructions.
- When driving on the flat ground, it is necessary to retract the working device and keep 20-30cm (8-12in) height off the ground.
- When driving on the rough ground, it is necessary to drive at low speed and not to make turns suddenly; otherwise, the excavator would tip over' if the working device collides against the excavator, the excavator would lose balance or get damaged.

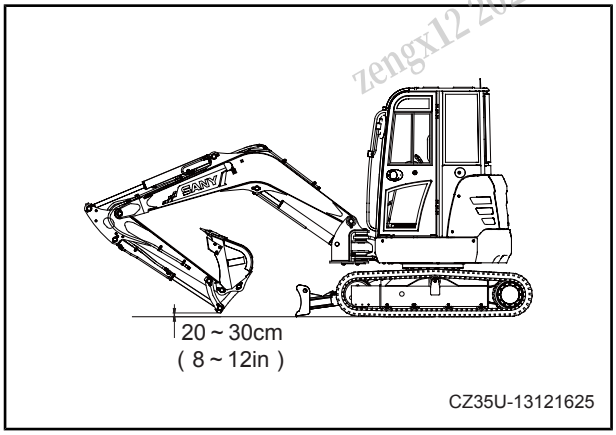


Fig.2-50

- When driving on the rough ground or the abrupt slope, it is necessary to turn off (cancel) the automatic idle switch if the excavator has automatic idle function; if the automatic idle switch was turned on, the engine speed would reduce and the traveling speed will slow down suddenly.
- Try to avoid traveling on the barriers. If having to traveling on the barriers, it is necessary to keep the working device close to the ground and run at low speed.
- When traveling through the bridge or the building, it is necessary to inspect whether the strength of structure is enough to support the excavator first.
- When operating in the tunnel, beneath the bridge or electric wire or in other places with height limit, it is necessary to operate slowly, and be careful not to let the working device touch any object.

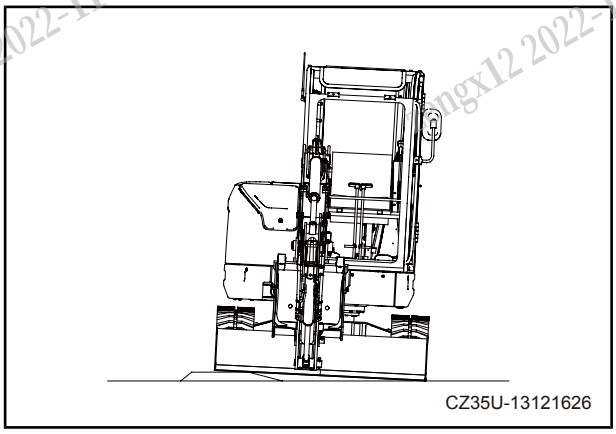


Fig.2-51

2.3.2.6 Driving the machine safely

- Before moving the excavator, confirm that the guide wheels are in front of the cab and be clear about how to move the control lever or pedal.
- Push down the front part of the running pedal or push the running control lever forward so as to make the excavator move toward the direction of guide wheel.
- When running on the slope, it is necessary to keep the working device 20-30cm (8-12in) off the ground so that the working device could be lowered to the ground rapdily for helping park the excavator.

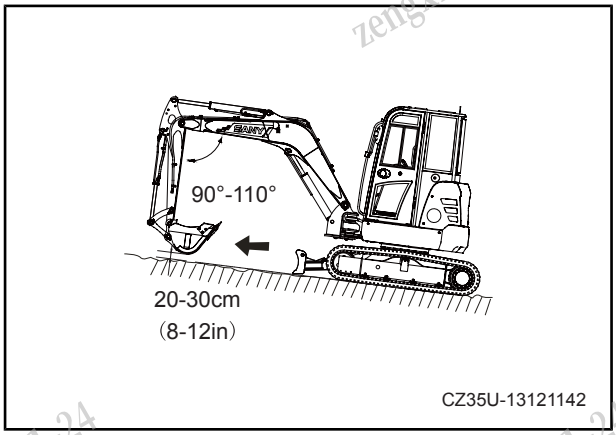


Fig.2-52

⚠ WARNING

- The excavator might slip or tip over, resulting in serious casualty accident when it is running on the slope.

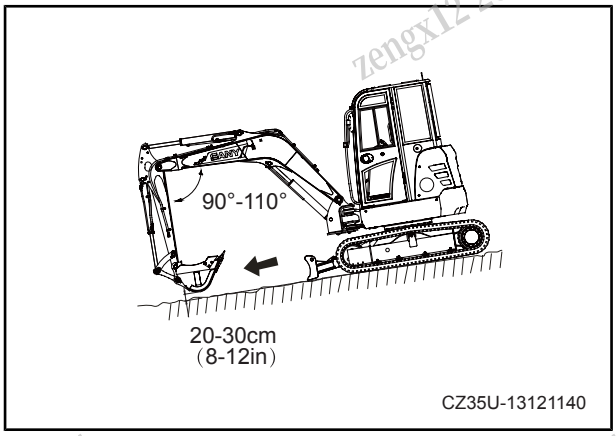


Fig.2-53

- Before running upslope, it is necessary to adjust the cab toward the upslope direction; when running downslope, it is necessary to adjust the cab toward the downslope direction.
- Before running, it is necessary to inspect the hardness of the ground in front of the excavator.

- When driving on the abrupt slope, it is necessary to extend the working device to the front for enhancing the balance, meanwhile lift up the working device off the ground by 20- 30cm (8-12in) and drive at low speed.
- When running downslope, it is necessary to reduce the engine speed, keep the running control lever on the position close to “neutral position” and run at low speed.

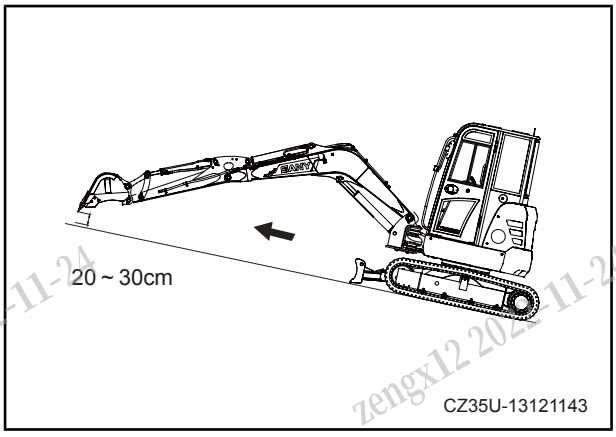


Fig.2-54

- When running on the slope, it is necessary to keep the running direction parallel to the pavement as it is very dangerous to make turns or run transversely on the slope.

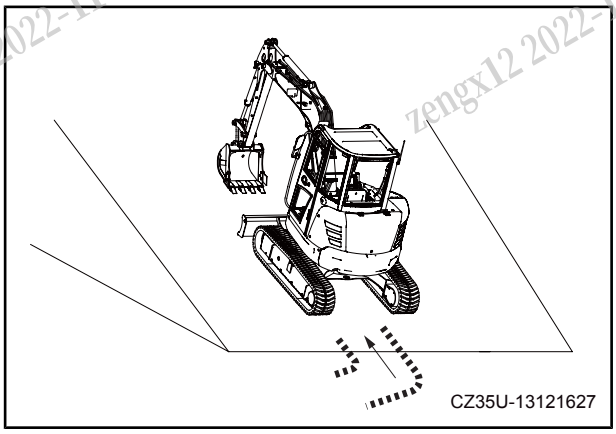


Fig.2-55

- Do not make turns on the slope or run across the slope; it is necessary to drive to a level ground to change the position of the excavator, and then climb on the slope.
- It is necessary to run slowly on the ground covered with grass or fallen leaves or on the wet steel plate. The excavator might slip even if the slope gradient is very small.
- If the engine misses when the excavator is running on the slope, it is necessary to move the control lever to the “neutral position” and restart the engine.

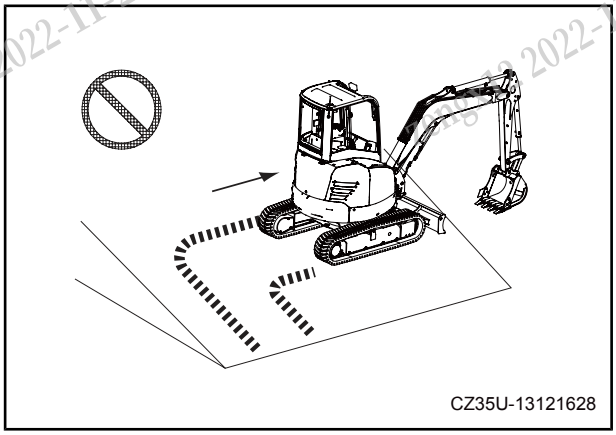


Fig.2-56

2.3.2.7 Operation on slope

When operating on the slope, the excavator might loses balance and tip over if operating the slewing gear or working device, which would cause serious injuries or equipment damages. Therefore, it is necessary to provide a flat working platform for such operations and operate carefully.

- Do not slew the working device form the upslope side to the downslope side when the bucket is fully loaded. Such operation is very dangerous, and would cause the excavator to tip over.
- It is necessary to pile up a working platform to keep the excavator level when having to use the excavator on the slope.

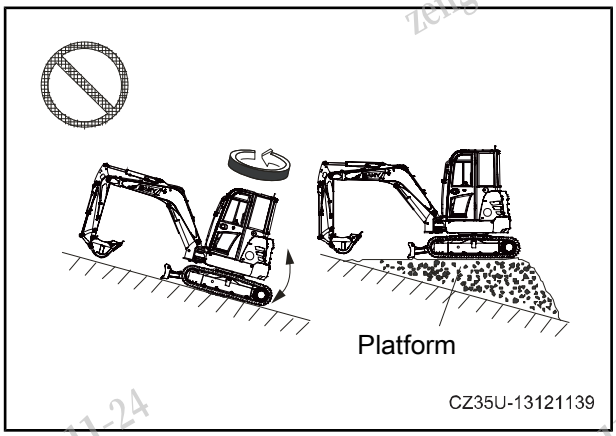


Fig.2-57

2.3.2.8 Operation in snowy weather

- The road covered with snow and ice will be very slippery; when driving or operating the excavator, do not operate the control lever suddenly; when operating on the slope, be particularly careful because the excavator might slide even if the slope gradient is very small.
- The excavator might tip over on the frozen ground as the air temperature rises up and the ground becomes soft.
- The excavator might tip over and get buried in the snow if it is driven into deep snow. Be careful not to leave the road shoulder or get sunk in the snow.
- It would be very difficult to see the road shoulder and the objects near the road buried in the snow when cleaning the snow. The excavator might tip over and collide against the buried object. Thus, it is necessary to operate carefully.

2.3.2.9 Forbidden operation

- Do not excavate the working face below the overhanging portion; otherwise, the rock might drop, and even the overhanging portion might collapse, resulting in serious accidents.

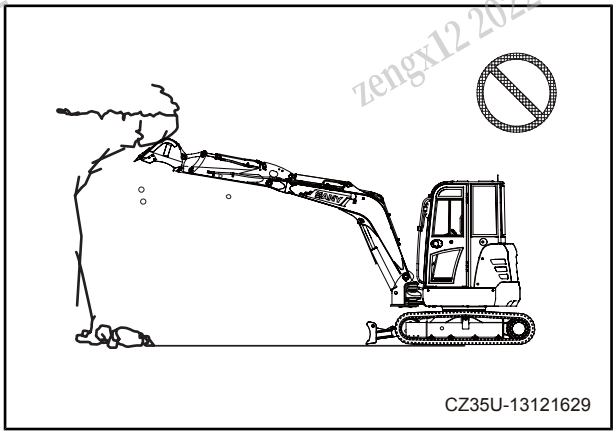


Fig.2-58

- Don’t excavate the front area under the machine too deep. Otherwise, after the underneath part is hollowed out, the ground will collapse and lead to accident.

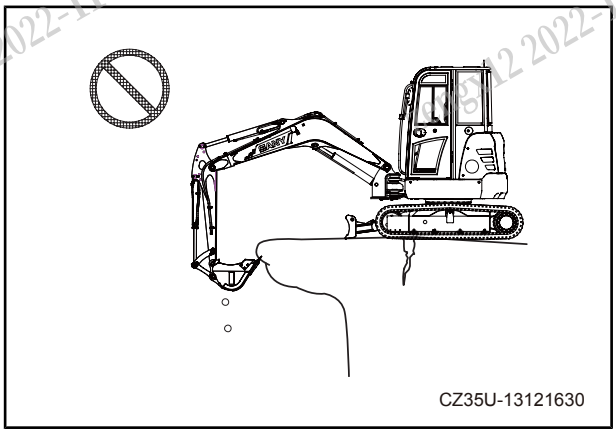


Fig.2-59

- When excavating, it is necessary to adjust the tracks until they are perpendicular to the road shoulder or cliff and the driving wheels are behind the cab for the convenience of evacuating the excavator easily when any abnormal situation occurs.

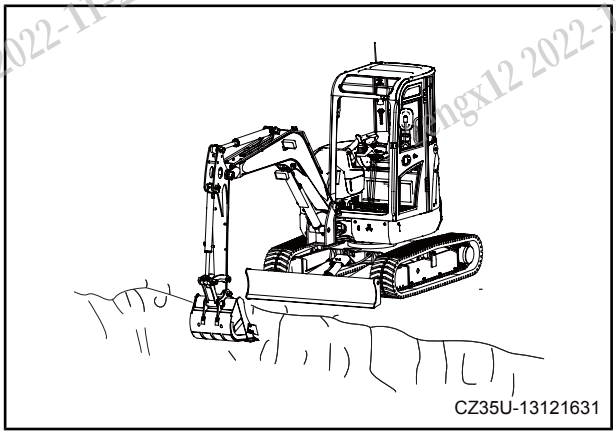


Fig.2-60

- Do not perform removal operations beneath the excavator; otherwise, the excavator will be instable and might tip over.
- When operating on the buildings or other structure, it is necessary to inspect the strength of the structures before operating for preventing the buildings collapsing.

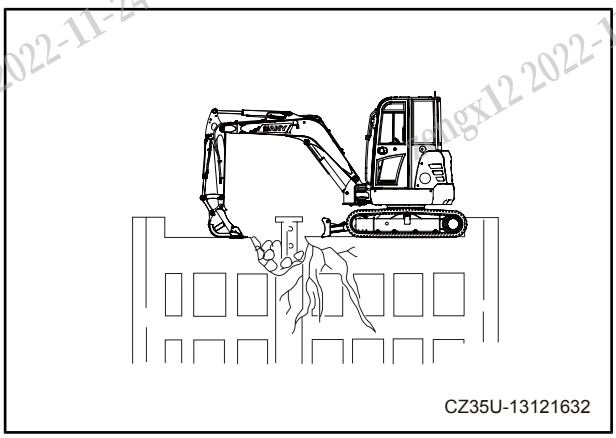


Fig.2-61

- Do not remove any structure above the excavator when removing. The broken objects and collapsed building would damage the excavator and result in personal casualties.

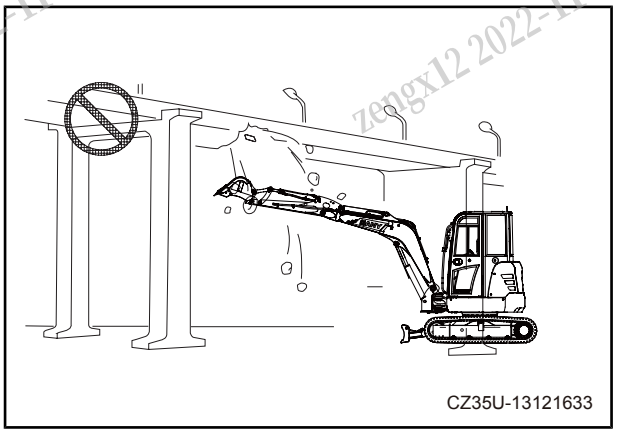


Fig.2-62

- Do not use the impact force of working device for breaking operation because the splashed materials would hurt the people, the working device would get damaged easily and the reaction of impact force also would cause the excavator to tip over.
- Generally speaking, it would be easier to tip over when the working device is in flank than when it is in front of or behind the cab.

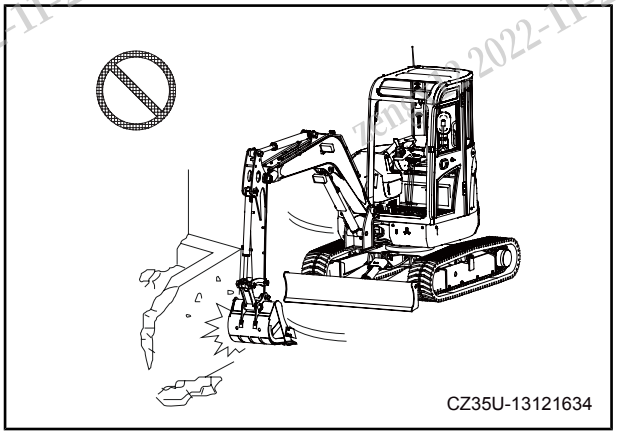


Fig.2-63

- Do not pass above any person or truck cab when lifting the bucket, moving or slewing; it might lead to personal injuries and excavator damages if the materials in the bucket drop out or collide against the bucket.
- The excavator might lose balance and tip over when the crusher or other heavy-duty working device is used.
  Do not drop, slew or stop the working device suddenly.
  Do not extend or retract the boom cylinder suddenly; otherwise, the excavator might tip over due to the impact force.

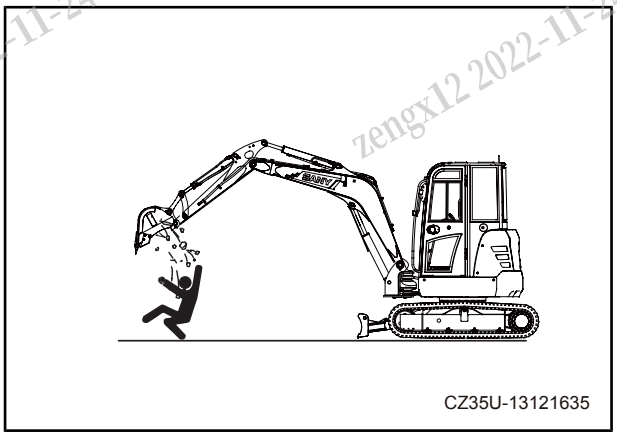


Fig.2-64

2.3.3 Parking

2.3.3.1 Choosing parking lot

- Park the excavator on the firm and horizontal ground.
- Select the areas without the risks of falling rocks and collapse etc. to park the excavator. It is necessary to park the excavator in a place without the risk of being immersed when the area in which the excavator is parked is relatively low.

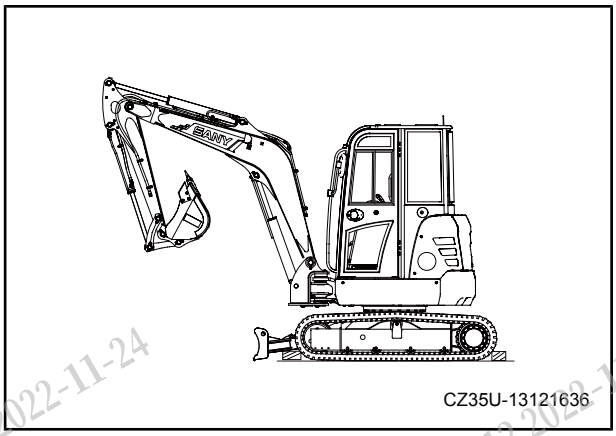


Fig.2-65

- Try to park the excavator on a level ground. If having to park the excavator on the slope, it is necessary to observe the following provisions:
  - Adjust the bucket to the downslope direction and insert the bucket teeth into the ground.
  - Put cushion block below the tracks to prevent the excavator moving.
- Do not park the excavator on the construction road; if having to park in such place, it is necessary to remind other personnel or vehicles with flags in the daytime and the signal lights in the nighttime according to the local regulations.

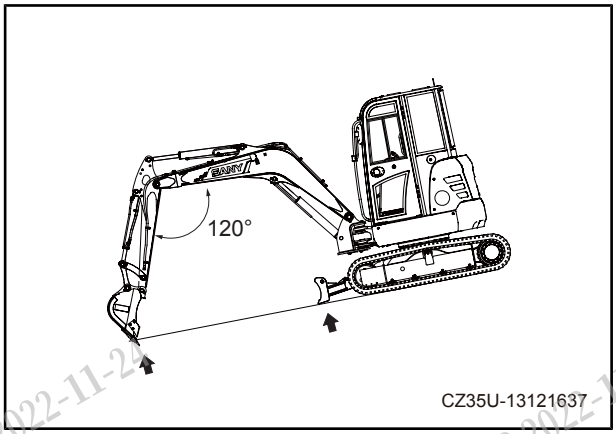


Fig.2-66

2.3.3.2 Machine shutdown

Refer to the operation section of this Manual for detailed steps of turning off the excavator. The general procedures for turning off the excavator are as follows:

- Stop the running excavator.
- Correct the excavator body.
- Lower the working device to the ground or put it on a fixed position.
- Reduce the engine speed and idle the engine at low speed by 5 minutes
- Turn the key switch to the Position OFF to stop the engine.
- Pull the safe control lever to the locked position.
- Take down the starting key for engine.
- Close the window, sunroof and cab door.
- Lock all overhaul doors and compartments.

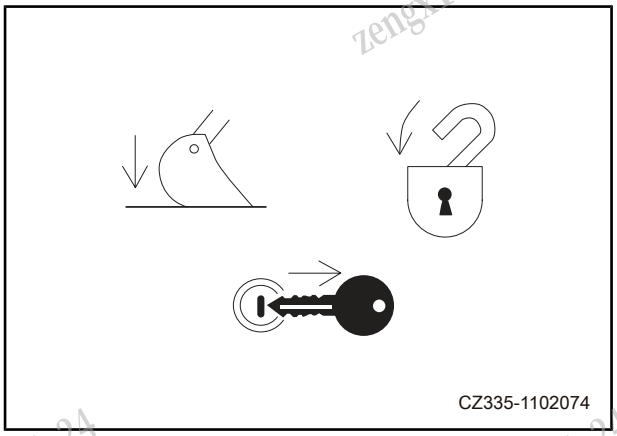


Fig.2-67

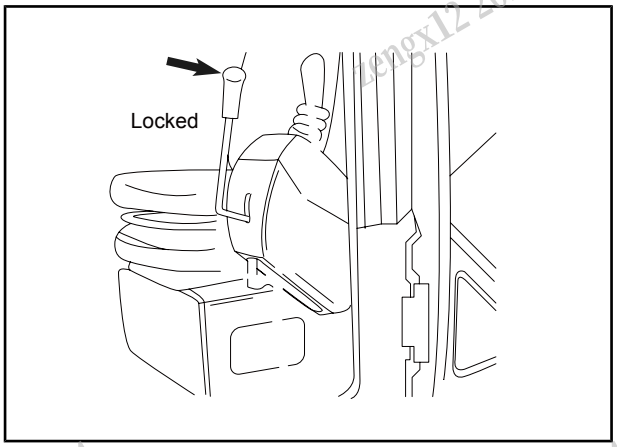


Fig.2-68

NOTE :

- When getting off the excavator, keep three points contacting with the excavator and face it. Do not jump off the excavator.
- Be careful about the smooth tracks, steps and armrests when leaving the excavator.

2.3.4 Transportation

2.3.4.1 Transportation

Pay attention to the following matters when transporting the excavator:

- Learn about the overall length, width and height of the transport vehicle and the excavator for preventing the high position and the barriers in the narrow passage being collided.

- When passing through the bridges, it is necessary to inspect whether the bridges could sustain the weight; when traveling on the road, it is necessary to observe the traffic laws and obey the instructions for traffic.

2.3.4.2 Loading and unloading

When the excavator is loaded and unloaded, the improper operation would cause the excavator to tip over and fall off; thus, it is necessary to pay attention to the following matters:

- It is only allowed to load or unload the excavator on firm and level ground; it is necessary to keep safe distance to the edges of road or cliff.
- It is necessary to use strong enough sloping plate and ensure that the width, length and thickness of the sloping plate are sufficient to provide a safe loading/unloading slope (≤15°).
- Ensure the surface of sloping plate to be clean and free from any lubricating grease, oil, water or loose materials, and it is necessary to clean the dirt on the tracks. Pay attention to the wet surface of sloping plate when loading/unloading in the sleety weather.
- Do not load or unload the excavator with working device; otherwise, the excavator might fall or tip over.
- Cancel the automatic idling function, operate the engine at low speed and run slowly.
- Do not operate any control levers except for running control lever when the excavator is on the sloping plate.
- Do not correct the direction on the sloping plate. If having to change the direction, drive the excavator away from the sloping plate, correct the direction and then drive onto the plate.

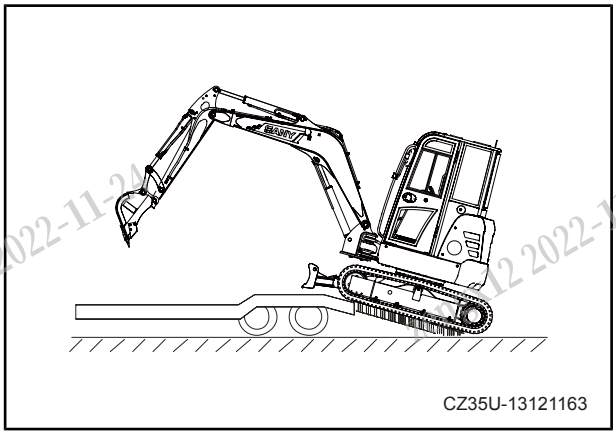


Fig.2-69

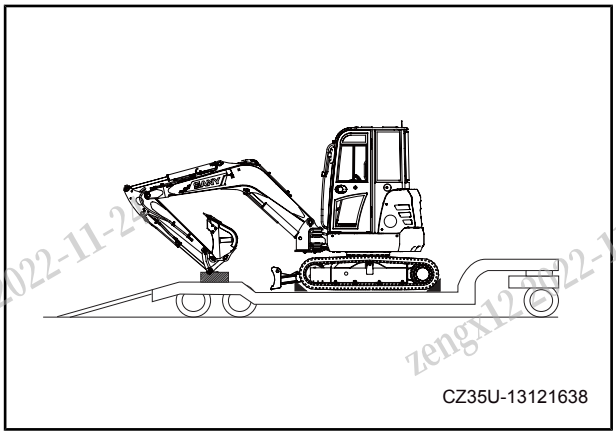


Fig.2-70

- The gravity center of excavator will change suddenly on the connection position between the sloping plate and the trailer, and it will be easy for the excavator to lose balance. It is necessary to drive slowly when passing through this position.
- When loading or unloading the excavator on the embankment or the platform, it is necessary to ensure that it has enough width, strength and gradient.
- When slewing the upper slewing body on the trailer, the trailer will be instable; thus, it is necessary to retract the working device and slew slowly.
- After loading the excavator on the trailer, it is necessary to lock the cab door. Otherwise, the door might be opened suddenly in the transportation process.
- Fix the excavator with chains and cushion blocks. Fix all working devices, lower the bucket and big/small arms and place them on the transportation position.

2.3.5 Storage battery

Prevent Hazards Caused by Storage Battery

The storage battery electrolyte contains acid, and will produce flammable and explosive hydrogen. Wrong operation will cause personal injuries or fire hazards. Therefore, it is necessary to observe the following precautions:

Fig.2-71

- It is prohibited to smoke or use open flame near the storage battery.
- Turn the key switch to the Position OFF when inspecting or treating the storage battery.
- Wear the protective goggles and rubber gloves when operating the storage battery.
- The electrolyte of storage battery is highly corrosive. If the electrolyte is splashed on

the clothes or the skin, it is necessary to wash immediately with a lot of water; if the electrolyte is splashed into the eyes, it might cause blindness and it is necessary to wash immediately with a lot of water and go to a doctor.

For avoiding explosion of storage battery, it is necessary to observe the following precautions when operating:

- Do not let the tools or other metal objects touch the terminals of storage battery; do not put the tools or other metal objects near the storage battery.
- When disconnecting the storage battery, it is necessary to disconnect the negative (-) terminal first after turning off the engine by about 1 minute, and then disconnect the positive (+) terminal; when connecting, it is necessary to connect the positive (+) terminal first, and then connect the negative (-) terminal. Ensure that both terminals are connected firmly.
- In the charging process, it is necessary to stop charging when the storage battery temperature is higher than 45℃ until the its temperature reduces to room temperature; reduce the charging current by half and continue charging.
- When charging the storage battery, the flammable hydrogen will be produced; therefore, it is necessary to remove the storage battery from the superstructure before charging and put it in a well-ventilated place and remove the battery cover.
- If the acid is sprayed from the venting holes of storage battery in the charging process, it is necessary to stop charging immediately.
- It is strictly prohibited to smoke for avoiding any kindling material when charging the battery.

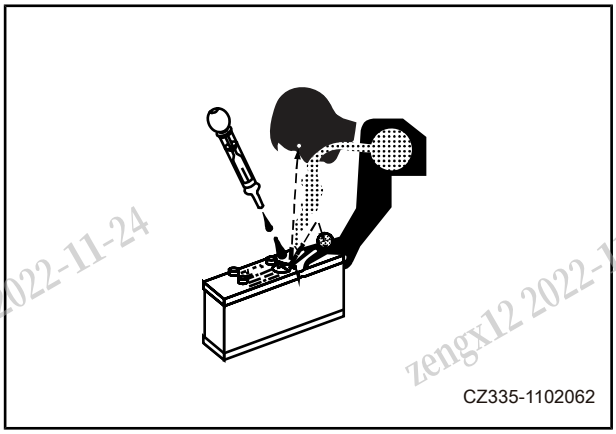


Fig.2-72

- It indicates that the storage battery has been fully charged and it is necessary to stop charging if the electric eye of storage battery turns green.
- It is necessary to tighten the storage battery cover firmly after charging.
- Install the storage battery to the determined position firmly.

2.3.6 Towing

It would lead to serious accidents if the operation method is improper or the unqualified steel wire rope is selected when the damaged excavator is towed:

- Do not tow the excavator on the slope.
- Be sure to wear protective gloves and safety helmets when using the steel wire rope.
- Inspect the strength of steel wire rope and ensure the steel wire rope could sustain the weight of the excavator to be towed.
- Do not use the steel wire rope with broken strand [A], reduced diameter [B] or which is twisted [C]; such steel wire ropes might be broken in the towing process.
- Do not stand between the towing excavator and the towed excavator in the towing process.
- Operate the excavator slowly, and do not apply load on the steel wire rope suddenly.

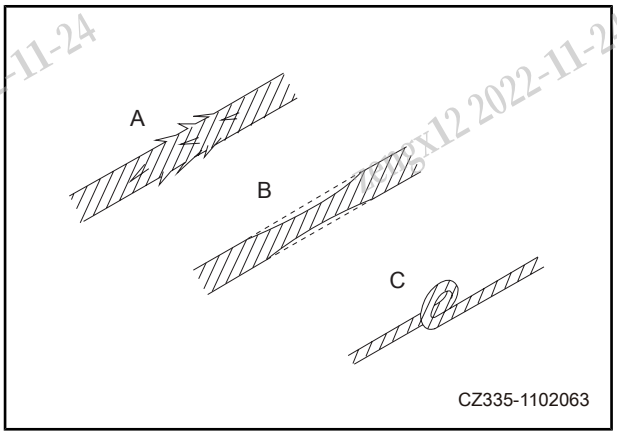


Fig.2-73

2.3.7 Lifting by excavator

- Do not allow anybody enter the working area.
- Before operation, determine all signals which might be used and arrange one signalman.
- Operate the excavator on the level ground for preventing it tipping over or falling.
- Learn about the lifting capacity of the excavator before lifting and do not exceed the specified lifting load.
- Do not use damaged chain, cable, lifting eye and lifting strap.
- Hang the spreader on the lifting point designated by the manufacturer. Absolutely avoid hanging the lifting eye or rope on the bucket tooth. Otherwise, the weight lifted would drop if the bucket tooth falls off.
- Do not leave the driver's seat when lifting the weight.
- Inspect carefully whether the surrounding area is safe before slewing or operating the working device for preventing the lifted weight colliding against the people or the buildings.
- Do not slew or operate the working device suddenly; otherwise, the lifted weight will swing consequently, and even the excavator might tip over; enhance the control with one towing rope when necessary.
- Do not pull the load toward any direction with the working device or by slewing. Once the hook is ruptured or the load is separated, the working device might move suddenly, resulting in personal injuries.

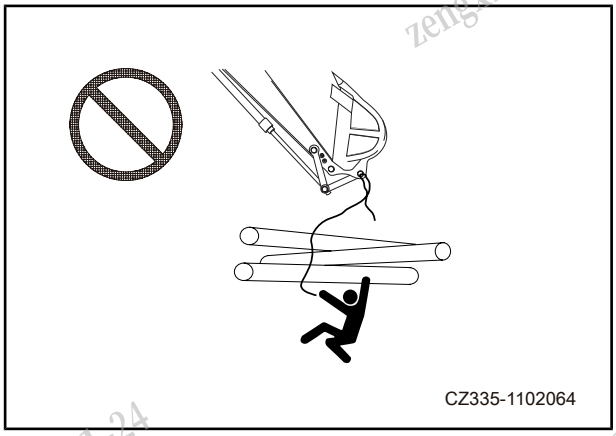


Fig.2-74

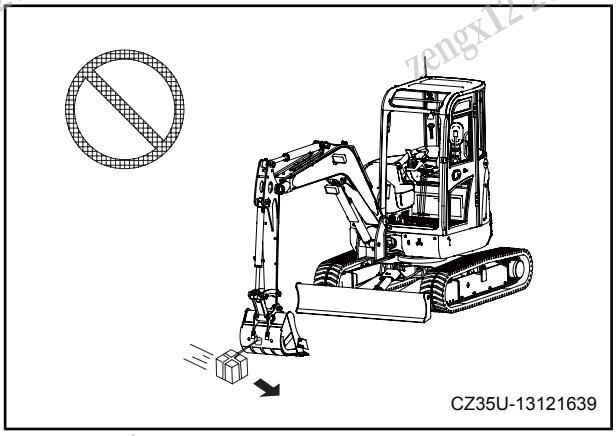


Fig.2-75

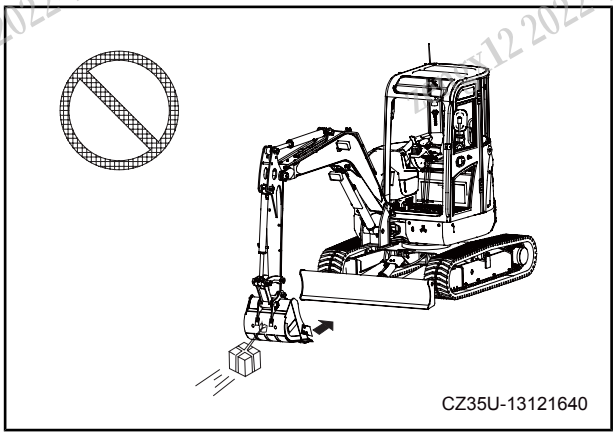


Fig.2-76

2.4 Safe maintenance instruction

2.4.1 Precautions before maintenance

For preventing accidents:

- Learn about the maintenance specification before operation.
- Keep the working area clean and dry.
- Do not spray water or steam in the cab.
- Do not lubricate or perform other maintenance work when the excavator is moving.
- Prevent the hands, feet and clothes contacting with the rotating parts.

2.4.2 Self-preparation

Only the approved personnel are allowed to maintain or repair the excavator; one observer may be arranged if necessary.

- Wear protective clothing for work and safety shoes.
- Wear protective masks when removing the springs or other elastic parts, or supplementing acid to the storage battery. Wear safety helmets and protective goggles when performing welding or cutting operations.
- The flying particles might cause personal injuries when cleaning with compressed air. Thus, it is necessary to wear protective goggles, dust mask, gloves and other protective articles.
- The parts and metal fragments might fly out and cause personal injuries when knocking hard metal parts with the hammer such as pin, bucket tooth, blade edge or bearing; thus, it is necessary to wear protective goggles and gloves, and ensure that there is no person in the surrounding area.
- Do not perform grinding, flame cutting or welding operations without breather and ventilation equipment. Please refer to

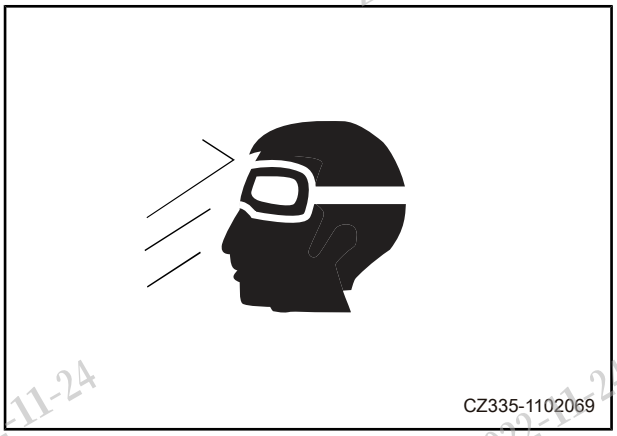


Fig.2-77

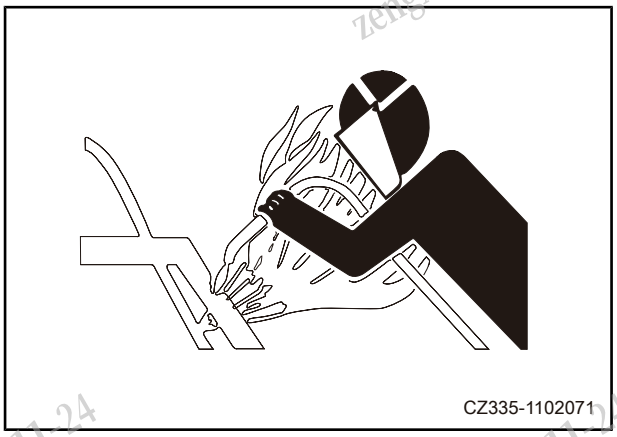


Fig.2-78

relevant manual for proper operation procedures if having to weld on the excavator.

- It would cause temporary or permanent hearing problem if the noise from the excavator is too high. It is necessary to wear earmuffs or earplugs when operating in the noise for long time when maintaining the engine.
- Please wear rubber apron and rubber gloves when contacting with corrosive materials. Wear safety gloves when handling wood material, steel wire rope or sharp metal.

2.4.3 Preparation of working area

- Select a clean and flat area with enough space, sufficient light and good ventilation for repair and maintenance.
- Clean the ground, remove the fuel oil, lubricating oil and water and lay sand or other adsorbing material on the slippery ground.
- Do not leave the hammer or other tools in the working area.
- The personnel might stumble, slip or fall, and consequently suffer personal injuries if the working area could not be kept clean and neat.

2.4.4 Steps of engine shutdown before maintenance

Before maintaining the excavator:

- Park the excavator on the firm, level and horizontal ground.
- Lower the bucket to the ground.
- Put the cushion blocks below the tracks for preventing the excavator moving.
- Turn the throttle control knob to gear 1, and idle the engine with no load at low speed by 5 minutes.
- Turn the key switch to the position OFF to stop the engine.
- Turn the key switch to the position ON, operate the control lever to the front, rear, left or right by 2-3 times for releasing the pressure in the hydraulic system.
- Take down the key from the key switch.
- Pull the safety locking control lever to the locked position.

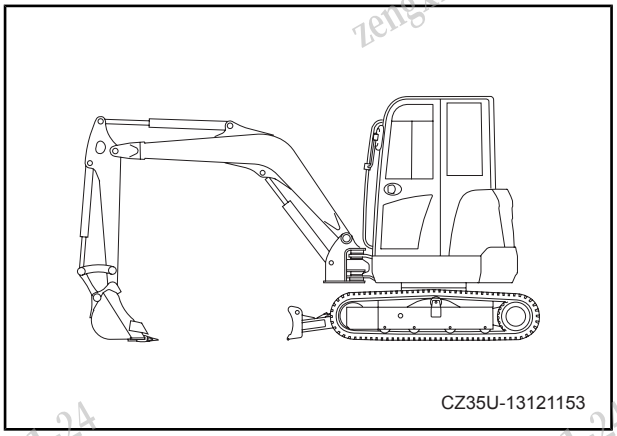


Fig.2-79

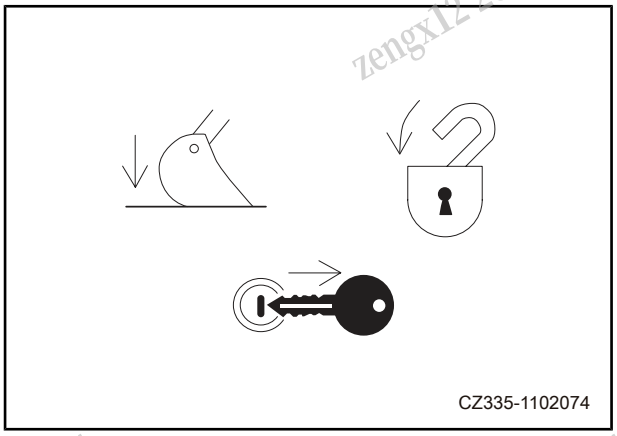


Fig.2-80

2.4.5 Warning decal

- Before maintaining the machine, it is necessary to hang the warning board “Do not Operate” or similar warning sign on the starting switch or direction controller to warn that other people are maintaining the excavator. Establish additional warning signs around the excavator if necessary.
- It would cause serious accidents if the engine was started, or the control lever or step is touched or operated by someone when the excavator is under maintenance.

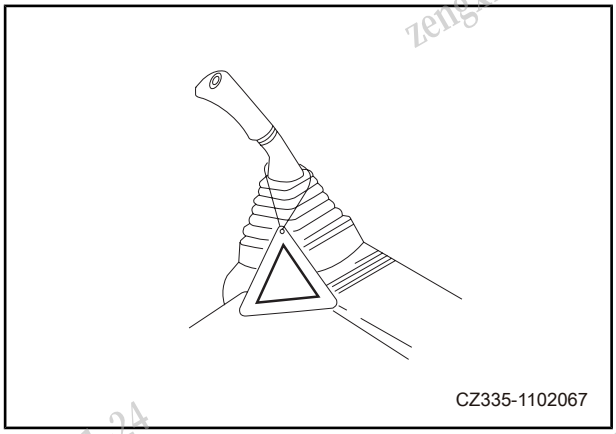


Fig.2-81

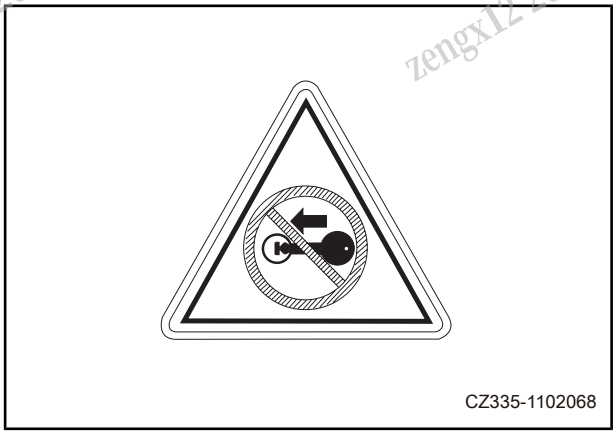


Fig.2-82

2.4.6 Proper tools

- It is only allowed to use appropriate tools and use them properly; it would result in serious accidents if damaged, inferior, defective or temporary tools were used or the tools were used improperly.

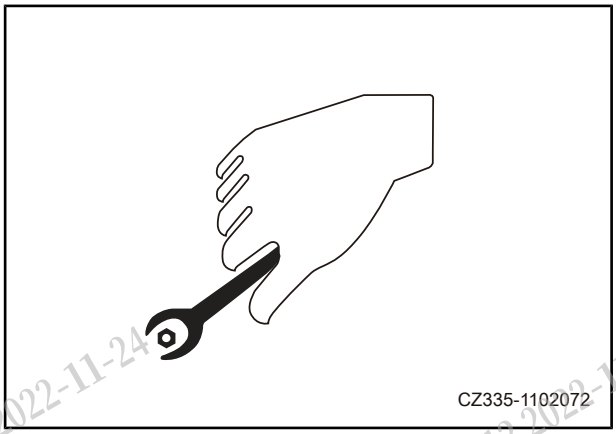


Fig.2-83

2.4.7 Maintenance during engine running

Do not maintain the engine when it is running for avoiding injuries; if having to maintain when it is running, it is necessary to arrange at least two persons to operate and perform according to the following provisions:

- One person must always sit on the operator seat and be always read to switch off the engine. All personnel must keep in contact with each other.
- Move the safety locking lever to the locked position for preventing the working device moving accidentally.

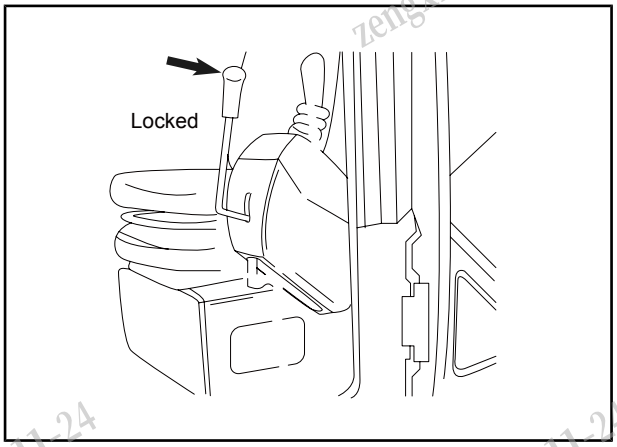


Fig.2-84

- The body part might get tangled into the excavator when operating near the fan, fan belt or other rotating parts; thus, be particularly careful.
- Do not drop insert the tools or other objects into the fan or fan belt; otherwise, the parts would be ruptured or fly out.
- Do not touch any control lever; it is necessary to give signals to other persons to warn them to evacuate to the safe area rapidly if having to operate some control lever.

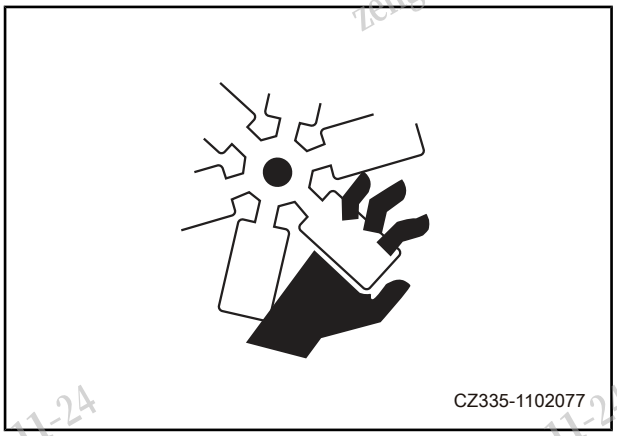


Fig.2-85

2.4.8 Operation under the machine

- Do not perform any repair or maintenance of the excavator unless it has been supported properly.
- Lower the working device to the ground before repairing or maintaining the excavator.
- It is necessary to support the excavator or working device reliably with the cushion block or support which is strong enough to sustain the weight of working device and excavator when having to lift up the excavator or working device for repair or maintenance; neither support the excavator with

Fig.2-86

slag brick, pneumatic tires or brackets; nor support it with single lifting jack.

- It would be very dangerous when working beneath the excavator if it is supported only with the working device when the track shoes are off the ground. The working device or excavator would drop suddenly, and it would result in casualty accident if the hydraulic pipeline is damaged or the control lever is touched accidentally. Do not work beneath the excavator unless it has been supported firmly with cushion block or support.

2.4.9 Track maintenance

- The temperature will be very high if the axis pin rubs against pin bush without grease. For avoiding burns, it is necessary to wear the safety gloves.
- Keep appropriate track tension. When operating on the ground covered with mud and snow, the mud and snow will be attached on the parts of tracks, which will increase the track tension. Adjust the tension of tracks with reference to the product operation manual.
- Inspect whether the track shoes are loose or ruptured, inspect whether the axis pin and pin bush are worn or damaged, and inspect the supporting wheel and carrying wheel.

⚠ CAUTION

- Do not knock the tightening springs of tracks. Those springs might sustain huge pressure, and be ruptured, resulting in personal injuries if they are knocked. Do not remove the springs when they are in compressed state. The tightening springs shall be in uncompressed state.
- Perform in accordance with the instructions of manufacturer on tracks repair.

2.4.10 Safety precautions for track tension adjustment

- The lubricating grease is injected into the track tension adjusting system in high pressure state.
- When loosening the bleeding plug of lubricating grease to release the track tension, it is not allowed to loosen the plug by more than one turn, and it is necessary to loosen the plug slowly.

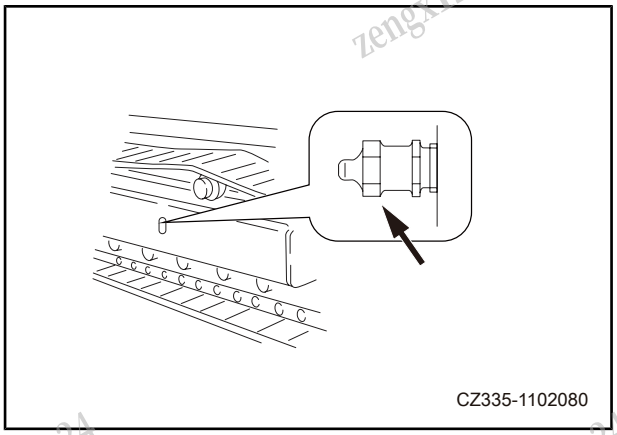


Fig.2-87

⚠ WARNING

- The bleeding plug of lubricating grease might fly out, resulting in serious injuries or damages if failing to operate in accordance with the specified maintenance procedures when adjusting.
- Do not let the face, hands, feet or any other body parts get close to the bleeding opening of bleeding plug.

2.4.11 Don’t remove the buffer spring

The buffer spring assembly is used to buffer the impact force of guide wheel. It contains one high pressure spring. The spring would fly out, resulting in serious casualty accident if it was removed improperly. Please contact with the authorized agent of SANY Heavy Machinery Co., Ltd. for this work, if having to remove it.

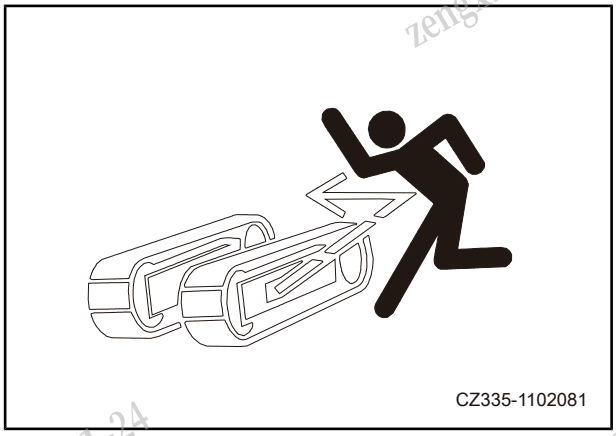


Fig.2-88

2.4.12 Be careful of hot cooling system

When the engine temperature increases, the pressure of cooling system will increase. Before taking down the radiator cover, it is necessary to stop the engine, cool down the system and then take down the radiator cap after the coolant temperature reduces.

WARNING

- It would cause serious injuries when contacting with the hot high pressure coolant.

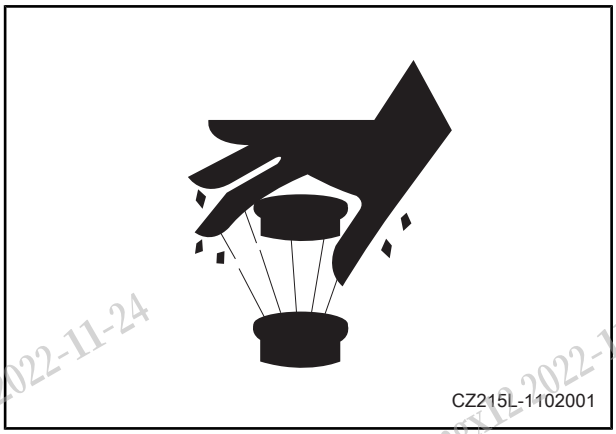


Fig.2-89

2.4.13 Safe operation of high pressure hose

If the high pressure hose leaks oil, it would cause operation trouble, and even fire hazard. If finding that the bolt on the hose becomes loose, it is necessary to stop the operation and tighten the bolt to the specified torque. If finding that the hose is damaged, it is necessary to stop operation immediately and contact with the authorized agent of SANY Heavy Machinery Co., Ltd..

When finding the following problems, it is necessary to replace the hose immediately:

- The hydraulic pipe connector is damaged or leaks.
- The cladding layer is worn out or broken, or the steel wires of reinforcement are exposed.
- Some positions of cladding layer are swelled.
- The cladding layer contains impurities.
- The movable part is twisted or crushed.

2.4.14 Be careful of high pressure liquid

The hydraulic system always contains pressure. When inspecting or replacing the pipeline, it is necessary to inspect whether the pressure in the hydraulic pipeline has been released. If there is still pressure in the oil way, it would lead to serious accident. Thus, it is necessary to operate according to the following provisions:

- Before maintaining the hydraulic system, it is necessary to release the system pressure:

  1. Screw off the butterfly nut of breather valve, press the venting button to release the pressure in the hydraulic oil tank.

  2. Release the pressure in leading pipeline. Within 15s after stop, turn the key switch to the position ON, move the safety locking lever to the unlocked position and operate the running control lever and left/right operating handles sufficiently on various directions to release the pressure in the accumulator.

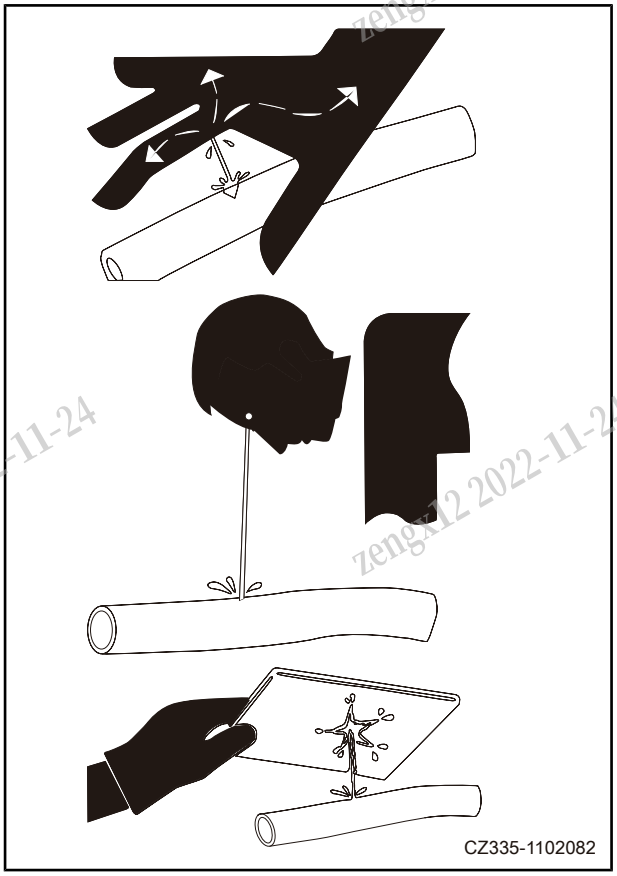


Fig.2-90

- Do not use open flame around the hydraulic system. It is necessary to clean the splashed hydraulic oil immediately.
- The diesel oil or pressurized hydraulic oil could penetrate the skin or the eyes, resulting in serious injuries, blindness or death. It is very difficult to judge by naked eyes whether the hydraulic oil leaks; it is necessary to seek the leakage with a piece of paperboard or wood chip but it is not allowed to touch the leaking liquid directly; it is necessary to wear masks or protective goggles to protect the eyes. If the liquid penetrates the skin, it is necessary to wash with clean water and go to a doctor as early as possible.
- The fuel pipeline will contain high pressure when the engine is running. When inspecting or maintaining the fuel pipeline system, it is necessary to turn off the engine by at least 30s to let the internal pressure reduce before operating.

2.4.15 Welding operation

There exists risks of fire hazard or electric shock in the welding process; thus, only the competent welder are allowed to perform welding operations, and appropriate equipment shall be equipped; the incompetent personnel shall not weld.

2.4.16 Maintain Air Conditioning System Safely

⚠ WARNING

- R134a refrigerant is nontoxic gas under normal temperature but would become highly toxic gas after encountering the fire.

- Keep away from fire when repairing and maintaining the air conditioning system.
- When maintaining the air conditioning system, it is necessary to use the refrigerant properly according to the instructions on the refrigerant container. The refrigerant is R134a. Other refrigerant shall not be used; otherwise, the air conditioning system will be damaged.
- It would cause blindness if the refrigerant enters the eyes; it would cause cold injury if it is splashed on the skin.
- It is strictly prohibited to discharge the refrigerant directly into the atmosphere when using the recovery and circulation system.

Fig.2-91

2.4.17 Precautions related to high voltage

- When the engine is running or is just switched off, high voltage will be produced in on the oil injection terminal and in the engine controller; thus, there exists the risk of electric shock; do not contact with the fuel injector or the inside of engine controller.
- Please contact with the authorized agent of SANY Heavy Machinery Co., Ltd. if having to contact with the terminal of fuel injector or the inside of engine controller.

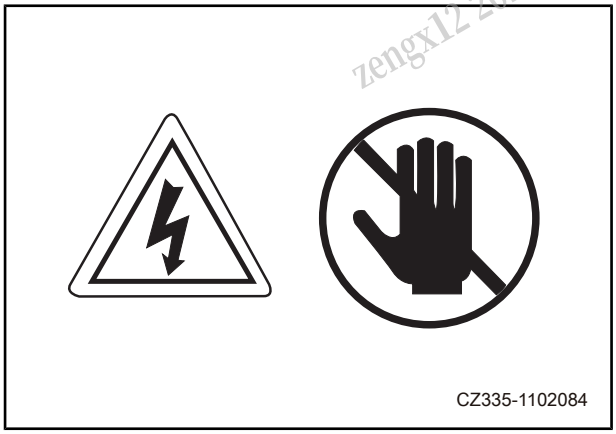


Fig.2-92

2.4.18 Accumulator

The accumulator is charged with high pressure nitrogen. Improper operation of accumulator would cause explosion, resulting in serious accident. Therefore, it is necessary to observe the following precautions:

- Do not disassemble the accumulator.
- Keep the accumulator away from the fire and do not expose it in the flame.
- Do not drill holes, weld or apply cutting etc. on the accumulator.
- Do not collide or roll the accumulator, or subject the accumulator to any impact.
- When disposing the accumulator, it is necessary to bleed the air; please contact with the authorized agent of SANY Heavy Machinery Co., Ltd. for this operation.

Fig.2-93

2.4.19 Preventing the danger of fire and explosion

⚠ WARNING

- Don’**t smoke when handling fuel or maintaining the fuel system, as fuel vapor in the empty fuel tank is highly liable to explode. Don't conduct cutting and welding operation on the fuel pipe, fuel tank or other fuel containers. Otherwise fire and explosion may occur, leading to casualties.**

- Please shut down the engine and turn off the electrical equipment when refueling the tank. Be extremely cautious when refueling the hot engine. Avoid any spark around the grounding fuel nozzle.
- Please handle all solvents and dry chemicals according to the steps marked on the containers in a well-ventilated place.
- Clean away dust and residues on the machine, and don’t place greasy cleaning cloth or other inflammable materials on it.
- Please clean parts with non-inflammable solvent rather than gasoline, diesel or other inflammable liquid.
- Store inflammable liquid and materials in proper containers according to safety regulations.
- Check if fire extinguisher, fire extinguishing system and fire detectors (if equipped) are ready for use.

2.4.20 Regular replacement of safety related parts

- For operating the excavator safely for long term, it is necessary to replace the hoses, seat belts and other parts related to the safety regularly.
- The parts might be aged after exceeding the specified time. Excessive use will cause abrasion and damages which might cause excavator troubles and personal injuries. Meanwhile, it would be very difficult to judge how long the parts could be used merely by external inspection or touch; thus, it is necessary to replace regularly.
- If finding any defects on the safety-related parts, it is necessary to replace or repair even if not reaching the specified time.

2.4.21 Execute Maintenance

- In the repair process, inspect all parts, and replace the worn, ruptured or damaged parts. The excessive worn and damaged parts will fail, resulting in casualties when the excavator is used.
- Tighten all the fasteners and connectors as per the specified torque.
- After repair or maintenance, install all guard boards, cover plates and shield plates. Replace or repair the damaged guard boards. It is only allowed to use the hydraulic oil supplementing system approved or recommended by SANY Heavy Machinery Co., Ltd..
- Start the engine and inspect the leakage (inspect the hydraulic system), operate all the control devices to confirm that the functions are normal. Perform road test when necessary. After test, switch off the excavator and inspect all the work done (whether any splint pin, washer and nut etc. are lost), inspect all the hydraulic oil levels again before operating the excavator.

2.4.22 Proper waste treatment

It would cause harm to the environment and ecology if the wastes have not been treated properly. Consult with the local recycling center or the authorized agent of SANY Heavy Machinery Co., Ltd. for the recycling or treatment methods for wastes.

- The potential hazardous wastes existing in the equipment of SANY Heavy Machinery Co., Ltd. include hydraulic oil, fuel oil, coolant, refrigerant, filter and storage battery etc.
- When draining the liquid, it is necessary to use leak-proof container but it is not allowed to use containers for food or drinks; otherwise, it may be taken in by mistake.
- Do not pour the waste liquid on the ground, in the sewer or into any water sources directly.
- The A/C refrigerant would damage the atmosphere if it leaks. It is necessary to recycle or regenerate the refrigerant according to the relevant regulations.

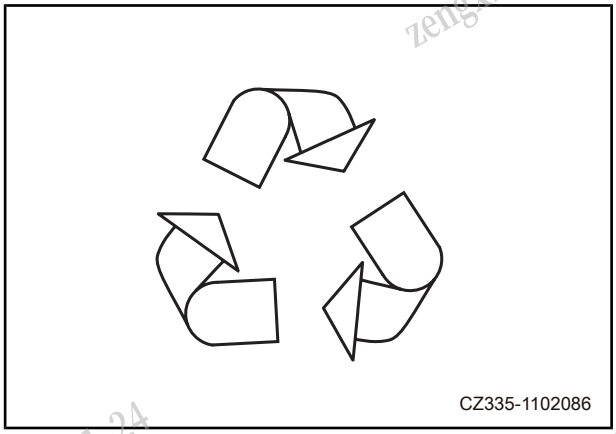


Fig.2-94

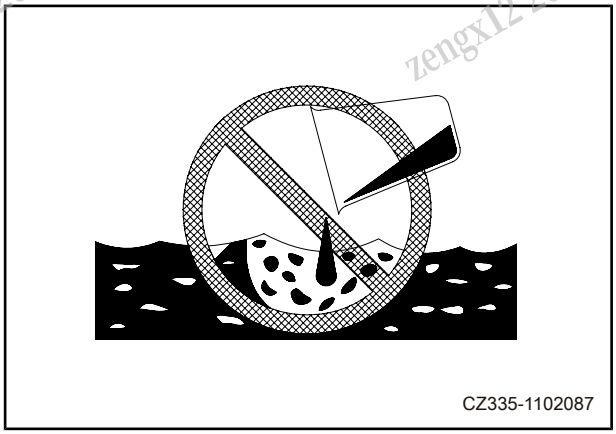


Fig.2-95

Technical Specifications

⚠ WARNING

Read and understand all safety precautions and instructions in this manual before reading any other manuals provided with this machine and before operation or maintaining it. Failure to do this could result in death or serious injury.

3.Technical Specifications

3.1 General Drawing of Excavator

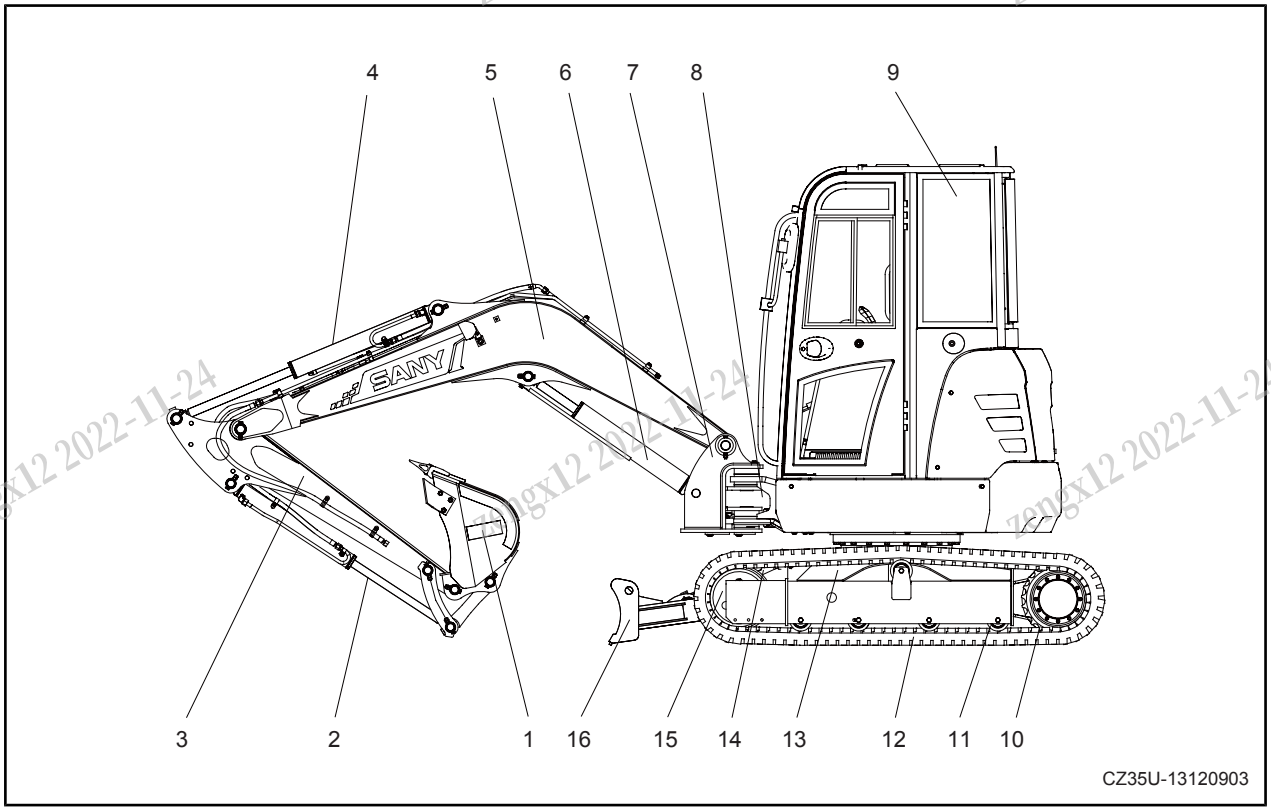


Fig.3-1

[1] Bucket

[2] Bucket cylinder

[3] Bucket rod

[4] Bucket rod cylinder

[5] Boom

[6] Boom cylinder

[7] Deflection head (not equipped for fixed working device)

[8] Deflection cylinder (not equipped for fixed working device)

[9] Cab

[10] Driving wheel

[11] Supporting wheel

[12] Track

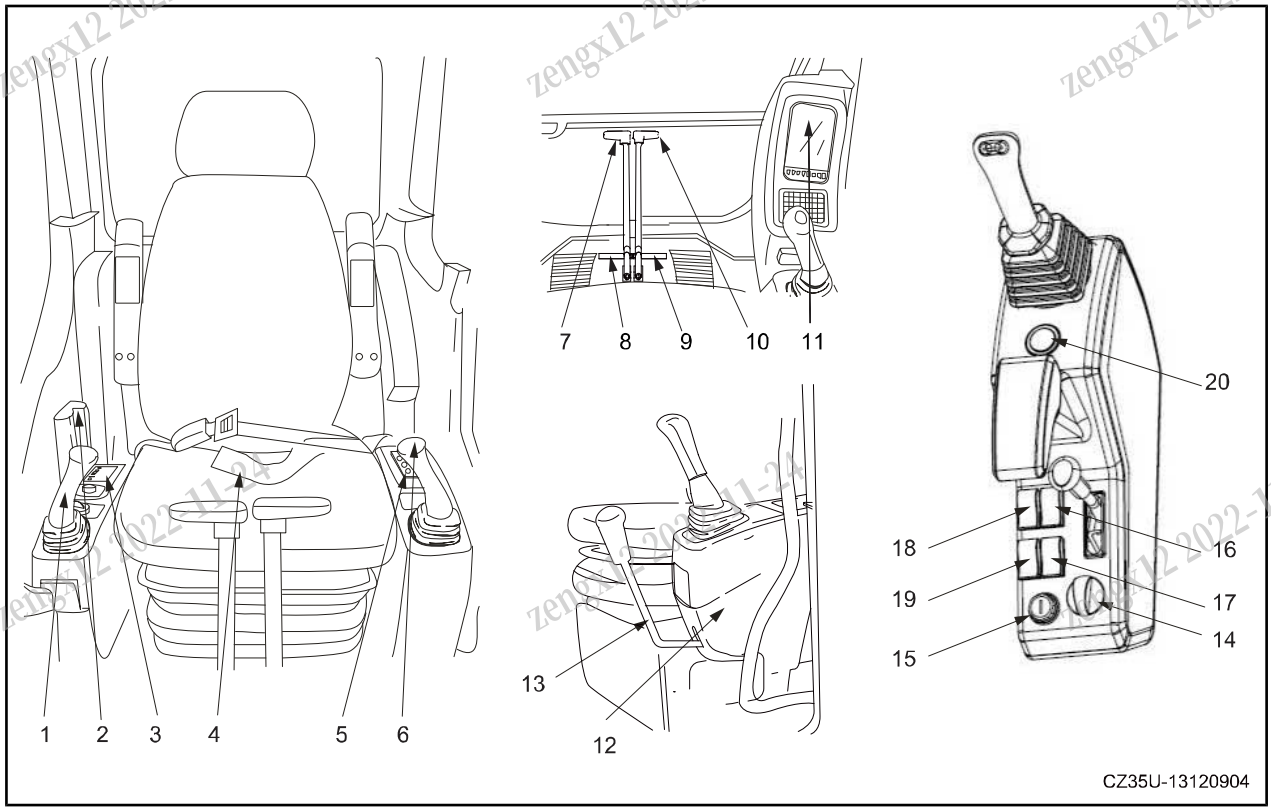
[13] Track frame

[14] Dozer blade cylinder

[15] Guide wheel

[16] Dozer blade

3.2 Control Devices and Instruments



[1] Right control lever/horn (on the top of control lever)

[2] Bulldozer operating handle

[3] Right control switch button

[4] Seat

[5] Radio instrument panel

[6] Left control lever

[7] Left running control lever

[8] Left running pedal

[9] Right running pedal

[10] Right running control lever

[11] Display screen

[12] Operation box

[13] Safety Locking Lever

[14] Throttle Control Knob

[15] Starting switch

[16] Working light switch

[17] Running alarm switch

[18] Wiper switch

[19] Washer Switch

[20] Button start switch (optional)

3.3 Technical Specification

3.3.1 Overall dimensions

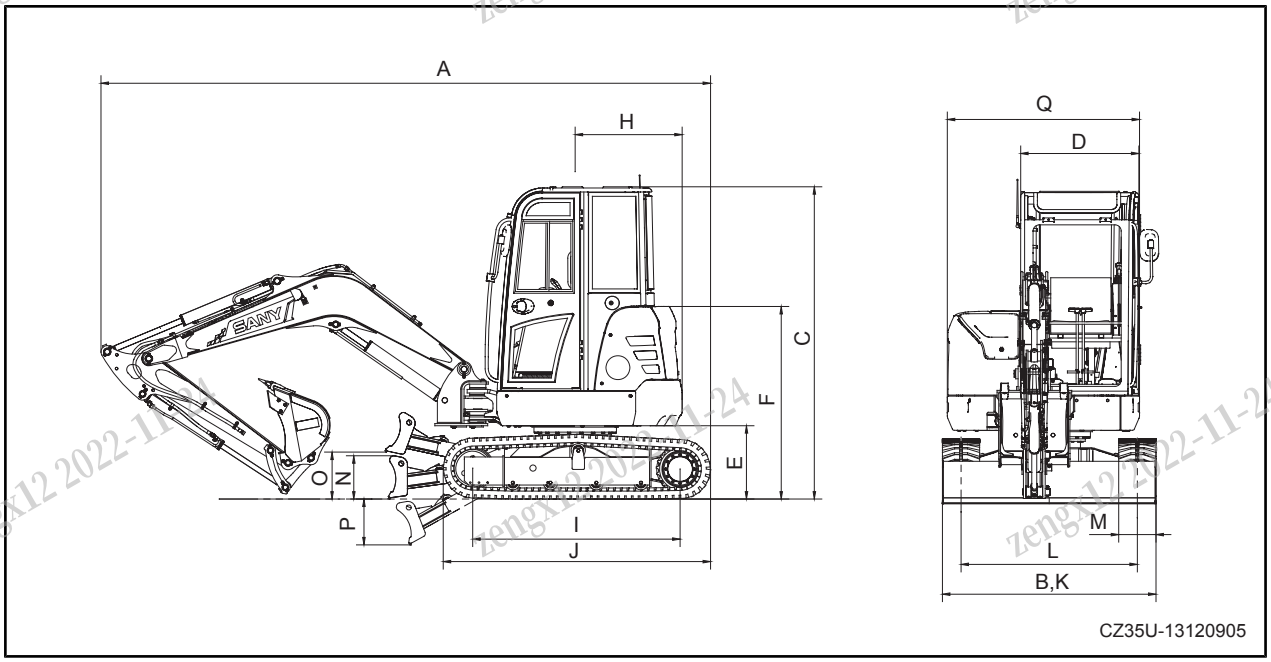


Fig.3-2

Item		Unit	SY35U	SY55U
A	Overall length (when transporting)	mm	4915	5375
B	Overall width	mm	1720	1960
C	Overall height	mm	2515	2620
D	Cab width	mm	955	955
E	Ground clearance of platform	mm	590	655
F	Engine hood height	mm	1550	1650
G	Minimum ground clearance	mm	295	315
H	Tail swing radius	mm	860	980
I	Length to centers of rollers	mm	1670	1990
J	Track length	mm	2155	2510
K	Chassis width	mm	1720	1960
L	Track gauge	mm	1420	1560
M	Track width	mm	300	400
N	Dozer blade height	mm	350	340
O	Maximum ground clearance of dozer blade	mm	375	420
P	Maximum digging depth of dozer blade	mm	370	405
Q	Superstructure width	mm	1550	1760

3.3.2 Working range

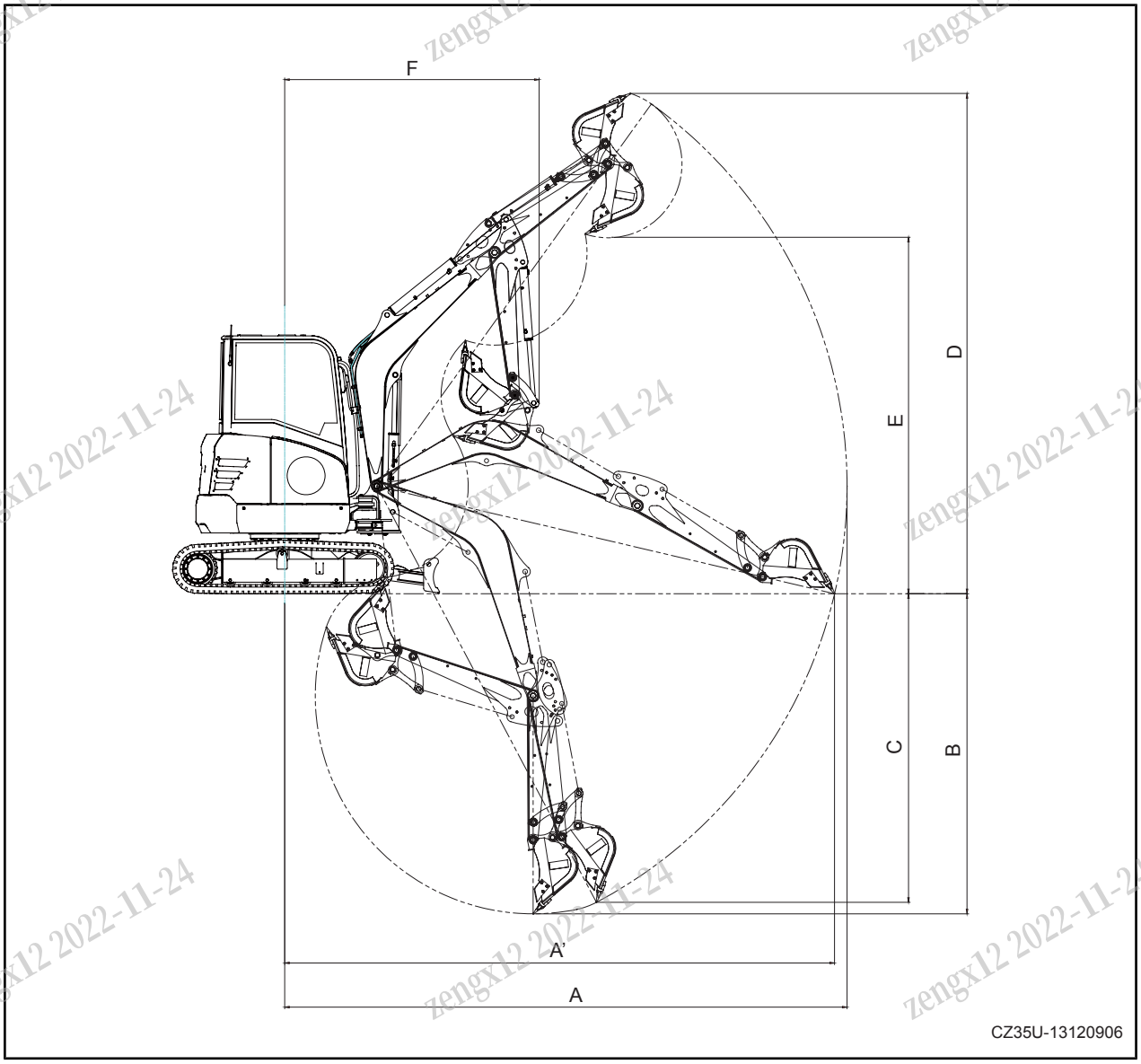


Fig.3-3

Name		Unit	SY35U	SY55U
A	Max. digging radius	mm	5465	5870
A'	Maximum ground digging reach	mm	5345	5725
B	Max. digging depth	mm	3105	3430
C	Max. vertical wall digging depth	mm	2700	2460
D	Max. digging height	mm	4855	5425
E	Max. loading height	mm	3460	3780
F	Min. swing radius	mm	2475	2515

3.3.3 Technical parameters

Item	Unit	SY35U	SY55U
Overall weight	kg	3780	5200
Bucket capacity	m^3	0.12	0.18
Engine power	kW/rpm	20.4/2200	30.7/2200
Traveling speed (low/high)	km/h	2.4/4.4	2.4/4.0
Swing speed	rpm	9	10

System Functions

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⚠ WARNING

Read and understand all safety precautions and instructions in this manual before reading any other manuals provided with this machine and before operation or maintaining it. Failure to do this could result in death or serious injury.

4.System Functions

4.1 Display screen

4.1.1 Main Operation Page

The displayer panel has monitoring display and parameter configuration function etc. It contains the following pages. The description of buttons and pages is as follows:

It is the operating interface when the excavator operates normally, displays operating mode, current date, gear position, water temperature, oil level, manual idle tip, working hours, alarm tip, maintenance tip and real-time time etc., may set working state of excavator and enter the information interface.

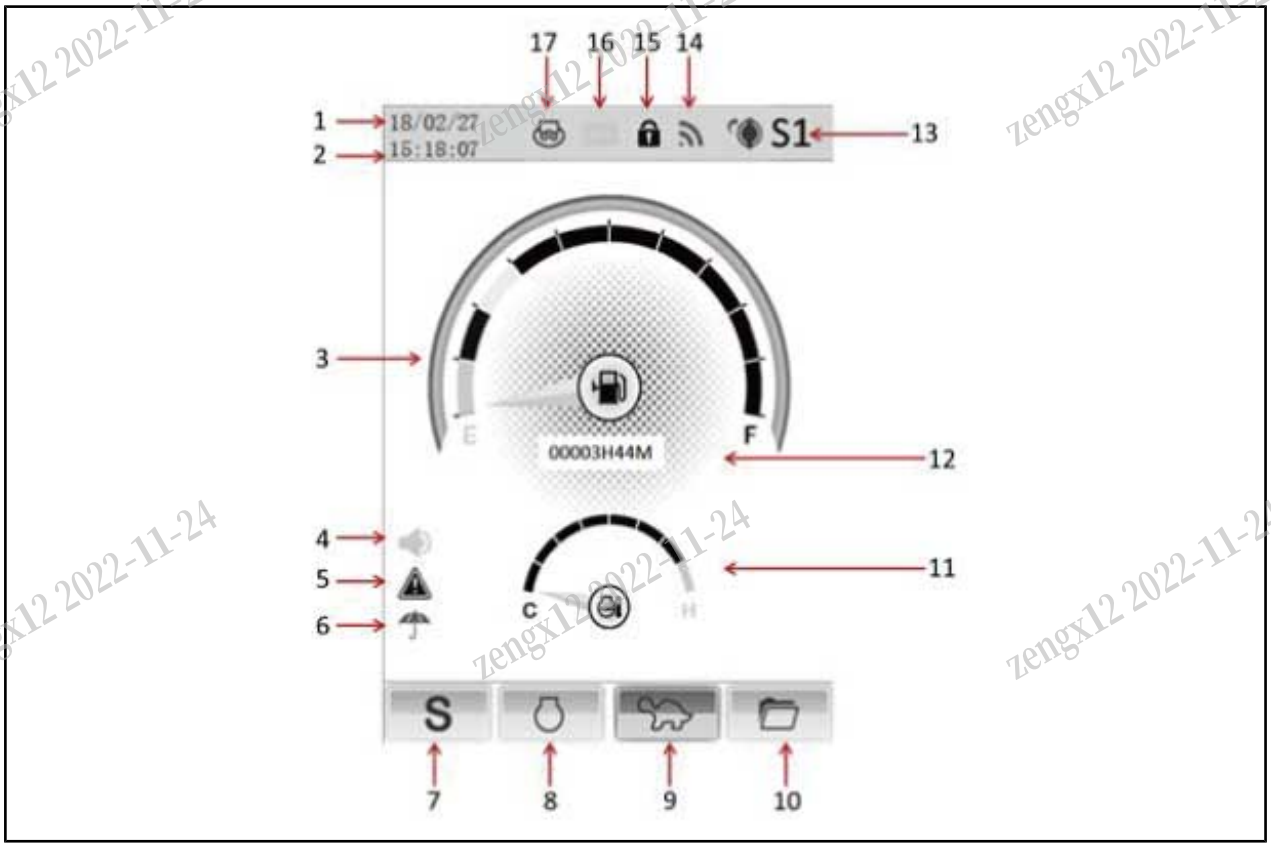

Fig.4-1

[1] System date
[2] System time
[3] Oil level indication
[4] Buzzer indication
[5] Trouble information tips
[6] Maintenance tips
[7] Operating mode change-over
[8] Full-speed idle change-over
[9] High/low speed change-over
[10] Enter the information page
[11] Water temperature tip
[12] Working hours
[13] Gear information
[14] GPS signal indication
[15] Locking indication
[16] Battery discharging indication
[17] Preheating indication

Icon display	Functions	Description
1. System date	Display the current system date	Press the button F2 to enter the time calibration interface
2. System time	Display the current system time	Press the button F2 to enter the time calibration interface
3. Oil level indication	Display the fuel oil level	0-100%; when lower than 15%, the system will activate the fuel oil level too low alarm.
4. Tip from Buzzer	The tip includes audible and visual alarm	
5. Trouble information tips	Indicate the currently existing trouble of system.	Proceed to the trouble page for querying the specific trouble code contents
6. Maintenance tips	This icon will appear if the equipment needs to be maintained.	Press the button F1 for long time for entering the maintenance information query page; this page will disappear after inputting the password at the end of maintenance.
7. Operating mode change-over	Indicate that it will be switched over to mode S, mode B or mode G when the button is pressed .	
8. Full-speed idle change-over	Indicate that the system will select full speed or idle speed when this button is pressed.	
9. High/low speed change-over	Indicate that the system will select high speed or low	

Icon display	Functions	Description
	speed when this button is pressed.	
10. Enter information page	Indicate that the system will enter information tip page if this button is pressed.	
11. Water temperature tip	Display coolant temperature	49-110℃, if the temperature exceeds 110℃, the system will trigger the coolant temperature too high alarm
12. Working hours	Equipment working hour display	Record the total working hours of engine (hour H minute M)
13. Gear information	Display the current throttle position.	0-100
14. GPS signal indication	Indicate the GPS signal intensity	Display when GPRS signal is normal Display when GPRS signal is abnormal
15. Locking indication	Indicate that the equipment is currently in locked state	When the locked state counts down , and after is started, will appear and flash. Press the button F3 for long time to enter the system unlocking interface.
16. Battery discharging indication	Indicate that the battery is currently in discharging state	
17. Preheating indication	Indicate that the engine is currently in preheating state.	

4.1.2 Page Introduction and Ooperation

4.1.2.1 Information List Page

On the homepage, press  to enter the information list page; this page will list the operation information, excavator configuration, trouble information, GPS monitoring and system language etc.

Operations

- Press  to move the position of cursor and select the monitoring items.
- Press  to enter system setting page.
- Press  to enter warning information page.
- Press  to return to homepage.

It is necessary to confirm the password for entering this page.

Fig.4-2

4.1.2.2 Operation Information Page and Switching Quantity Query Page

This page applies to throttle system signal, system pressure, engine signal acquired in the controller, input in display controller and output switching quantity signal.

Operations

- Press  to switch over between operation information page and switching quantity signal query page.
- Press  to return to the information list page.

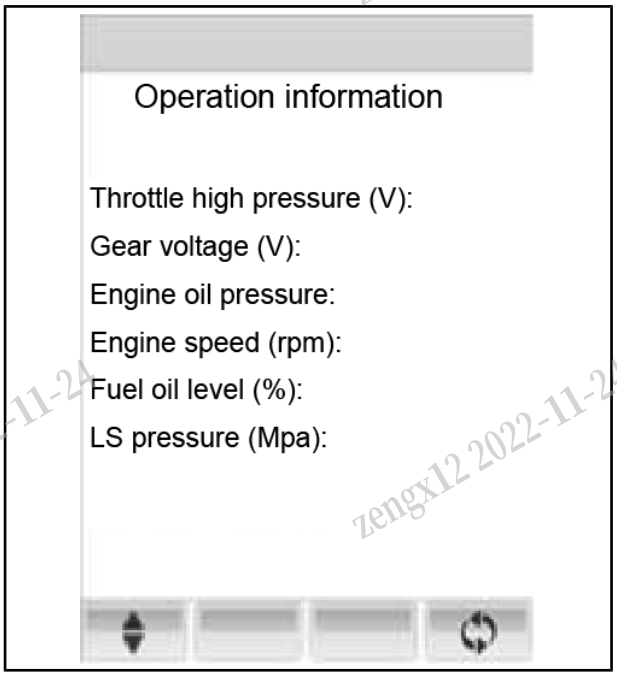

Fig.4-3

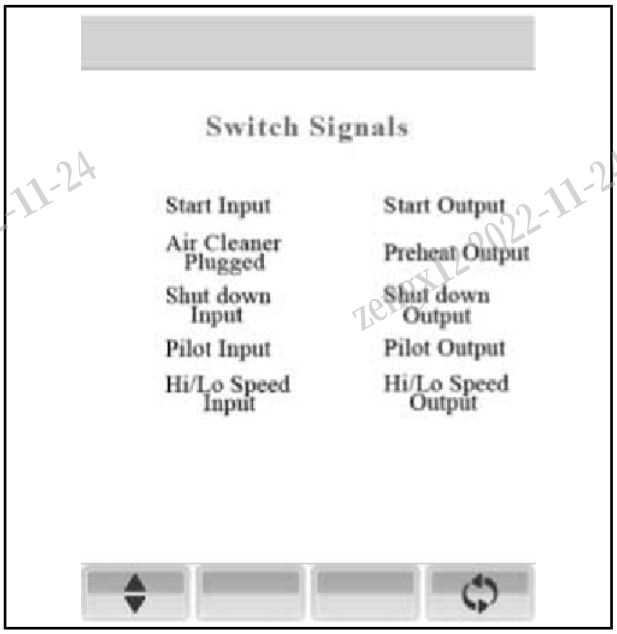

Fig.4-4

4.1.2.3 Excavator Configuration Page

This page displays the controller model and software version of the excavator system.

Operations

- Press  to return to the information list page.

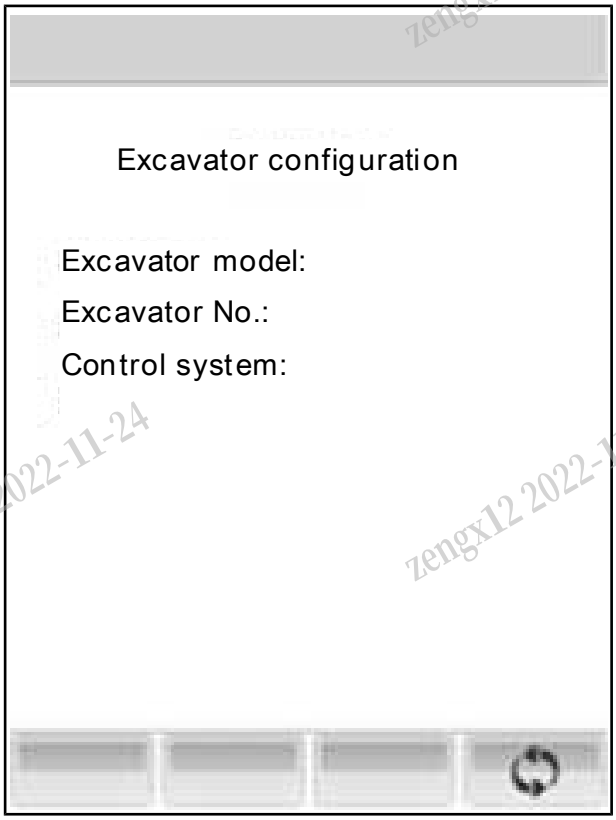

Fig.4-5

4.1.2.4 Trouble Information Page

This page displays the code and total quantity of troubles occurring currently on the system; refer to the list for the specific meaning of the trouble code.

Operations

- Press  to return to the information list page.

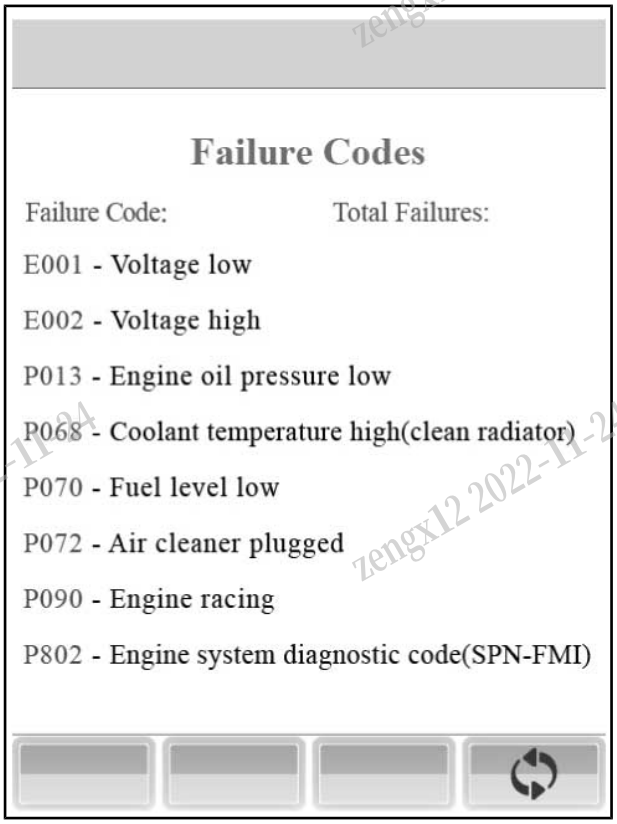

Fig.4-6

4.1.2.5 GPS Monitoring Page

Display the monitoring information related to GPS.

Operations

- Press  to return to the information list page.

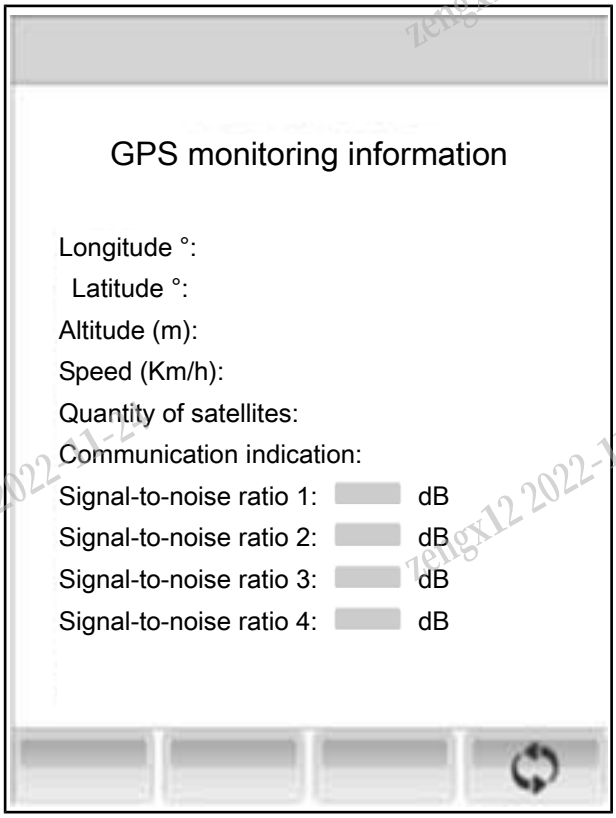

Fig.4-7

4.1.2.6 System Language Selection Page

On this page, the system language may be selected, but the language is default to be Chinese.

Operations

- Press  to select language.
- Press  to confirm the selected language.
- Press  to return to the information list page.

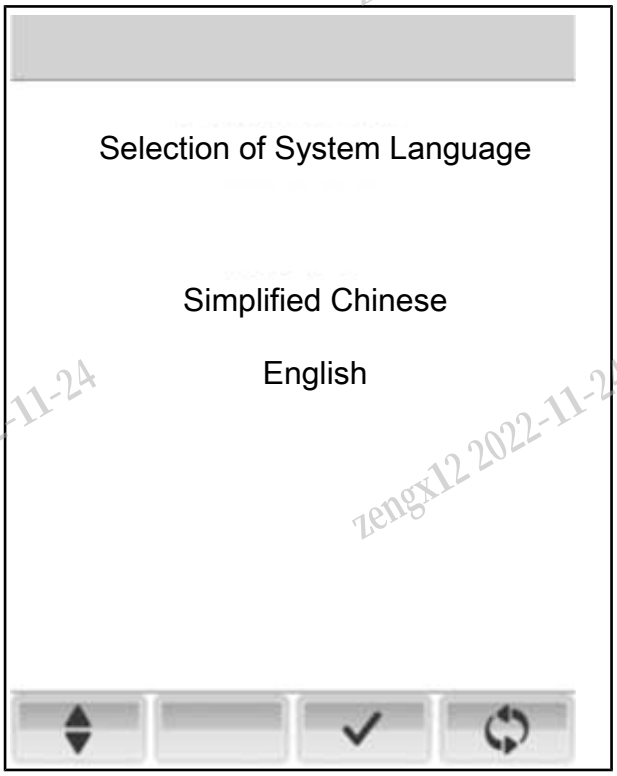

Fig.4-8

4.1.2.7 Maintenance Information Query Page

Operations

- Press  to start or stop the rolling tips of “maintenance cycle” and “maintenance content”.
- Press  to input the password and confirm the completion of maintenance.
- Press  to return to the information list page.

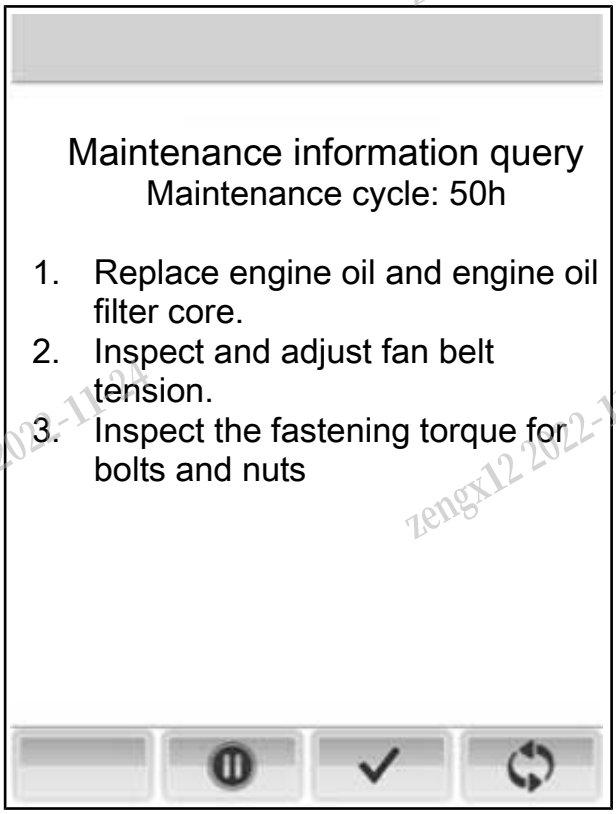

Fig.4-9

4.1.2.8 Time Calibration Page

This page is used for system date/time calibration.

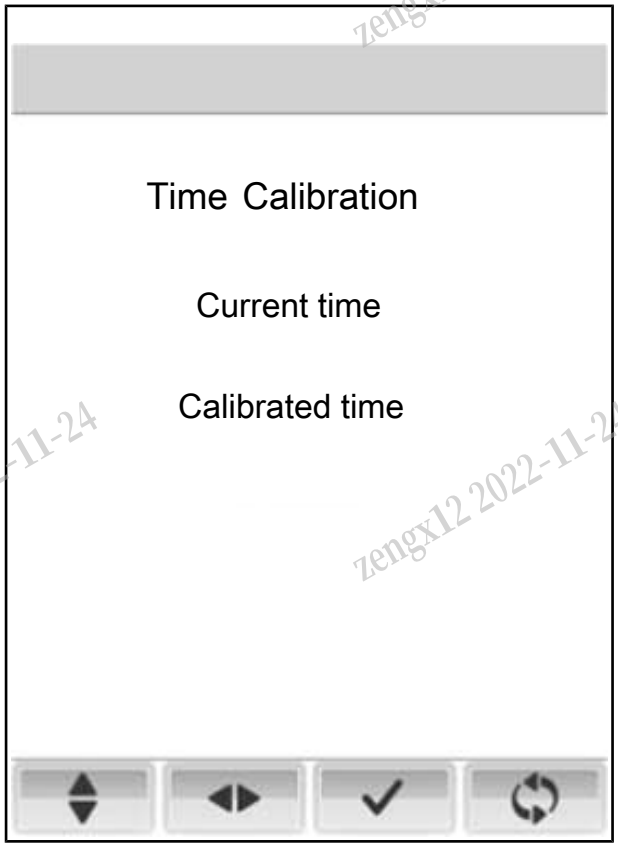

Fig.4-10

Operations

- Press  to increase progressively the digit on the date/time position on which the cursor is located.
- Press  to move the cursor on the date/time position rightward.
- Press  to confirm the inputted time.
- Press  to return to home page.

4.1.2.9 System Setting Page

This page may be used to re-calibrate some parameters of the system such as throttle motor, rotating speed, excavator No. and working hours etc. or query the specific temperature of coolant.

Operations

- Press  to move the cursor to select the operating items.
- Press  to confirm the selected operating item.
- Press  to return to the information list page. Note: It is necessary to confirm the password for entering this page.

Fig.4-11

4.1.2.10 Initialization of Throttle Motor

1. **Operations**

- The prompt message “Do you confirm to reset the throttle motor to the initial position?” will appear if is pressed.
- Press NO to cancel the operation of resetting the throttle motor to the initial position.
- Press to confirm to reset the throttle motor to the initial position 2.5V.
- Press to return to the information list page.

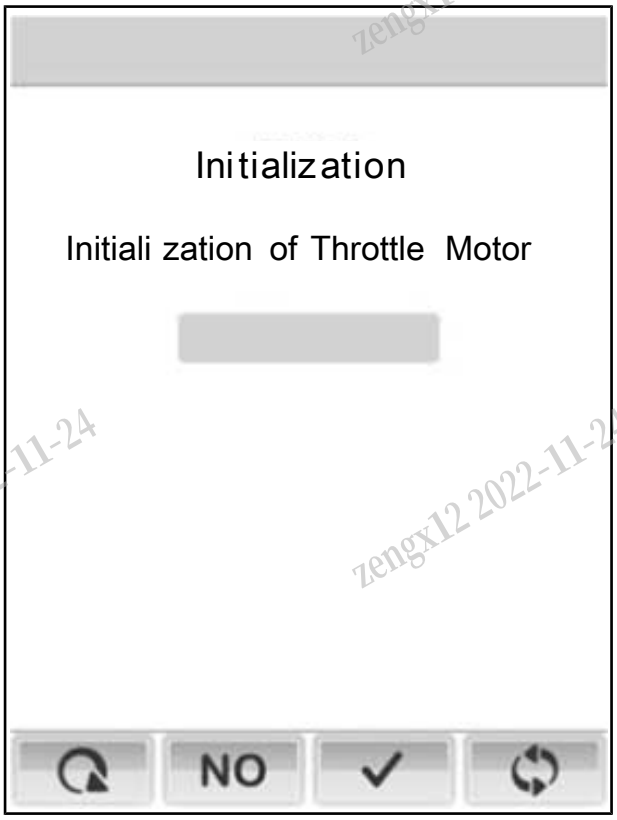

Fig.4-12

4.1.2.11 Gear Speed Calibration Page

Operations

- Press RPM to start the calibration of rotating speed.
- Press to return to the information list page.

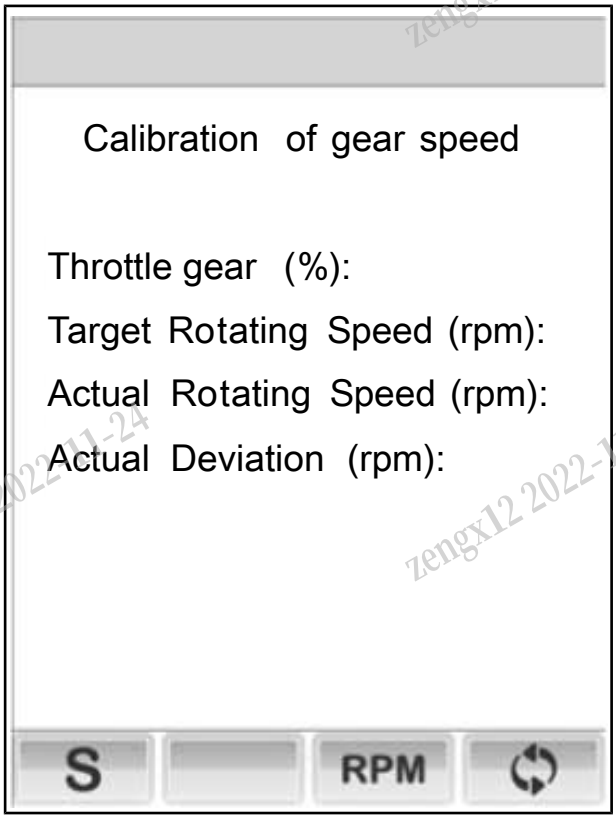

Fig.4-13

4.1.2.12 Working Hours Calibration Page

1. **Operations**

- Press  to increase progressively the digit on the time position on which the cursor is located.
- Press  to decrease progressively the digit on the time position on which the cursor is located.
- Press  to move the cursor on the time position rightward.
- Press  to confirm the working hours calibrated currently.

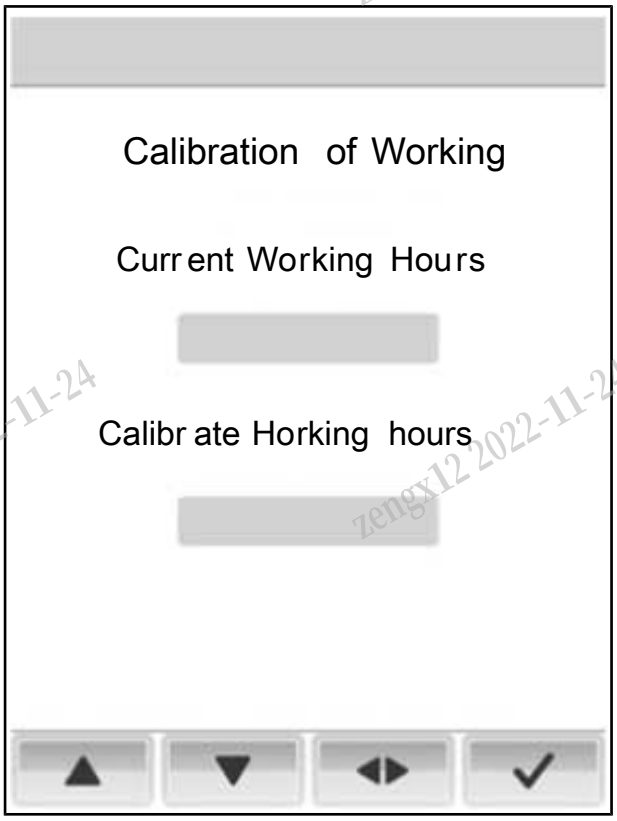

Fig.4-14

4.1.2.13 Coolant Temperature Page

This page displays the specific coolant temperature.

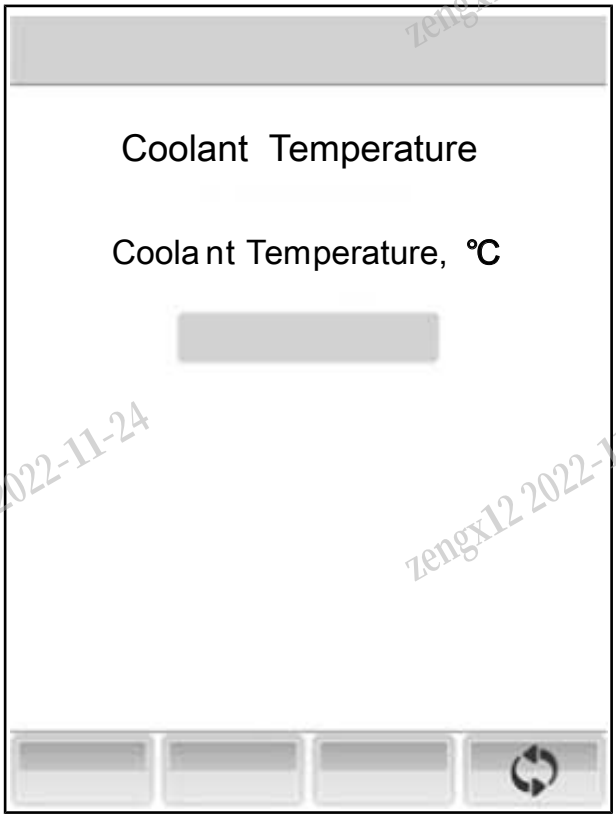

Fig.4-15

4.1.2.14 Locking Information Page

After the system is locked, the locking information page will appear; the locking consists of level-I locking and level-II locking.

Operations

- Press  to enter the system locking page.

Fig.4-16

4.1.2.15 System unlocking page

This page requires the unlocking password obtained from the authorized agent. It is necessary to input the unlocking password to release the lock; it will proceed to [Homepage].

Operations

- Press  to increase progressively the digit of the password position on which the cursor is located.
- Press  to move the cursor on the password position rightward
- Press  to verify whether the password is correct.
- Press  to return to the previous page.

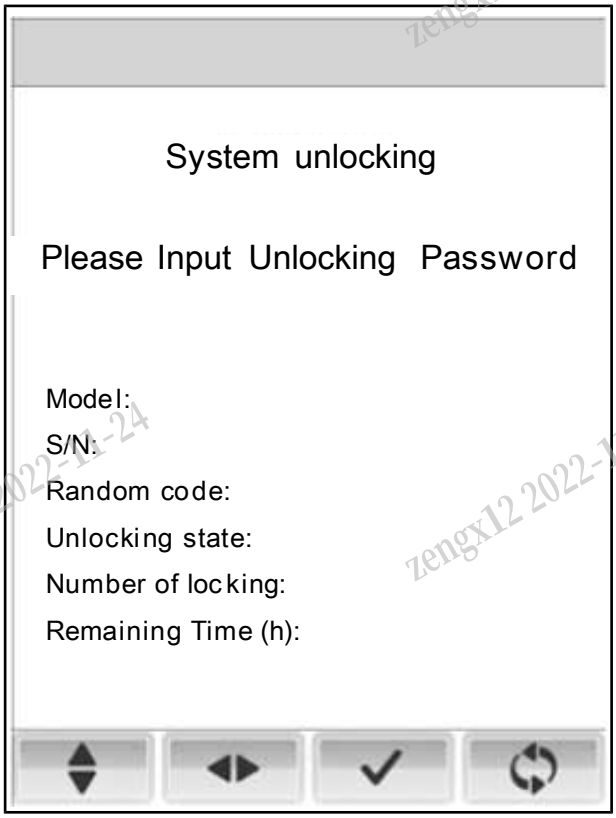

Fig.4-17

4.2 Switch

4.2.1 Switch

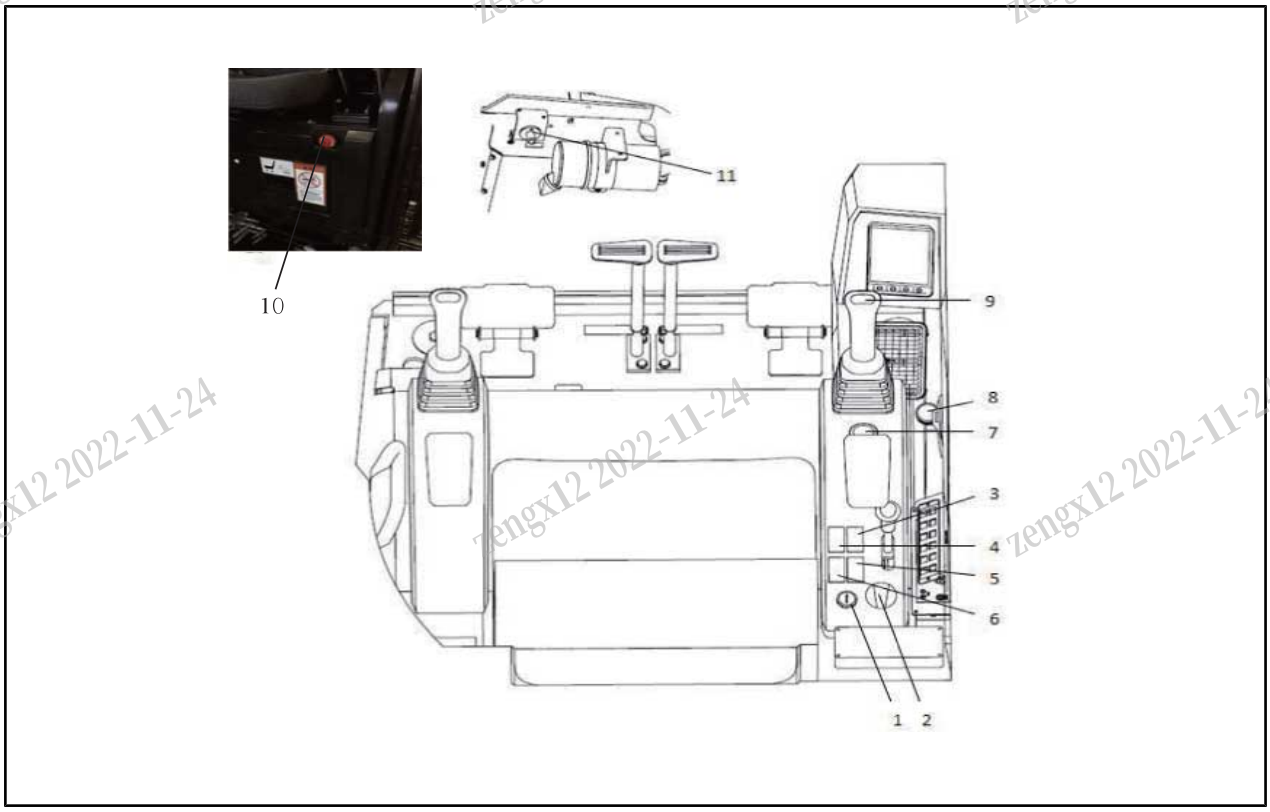

Fig.4-18

[1] Starting switch

[2] Throttle Control Knob

[3] Working light switch

[4] Wiper switch

[5] Running switch alarm (optional)

[6] Washer Switch

[7] Start Button (Optional)

[8] Cigar lighter

[9] Horn switch

[10] Emergency stop switch (optional)

[11] General switch of power supply (optional)

4.2.2 Starting switch

The starting switch is used to start or stop the engine.

Position OFF:

The key may be inserted or pulled out. All electrical system switches (except for outside light) will be turned off and the engine will be switched off.

Position ON:

The current will flow through the charging and light circuits. When the engine is running, the starting switch key shall be kept on the position ON.

Position START:

Engine start position. When starting, hold the key to this position. After starting, release the key immediately. It will return to the B position ON.

HEAT Position:

Reserved for heating gear of engine.

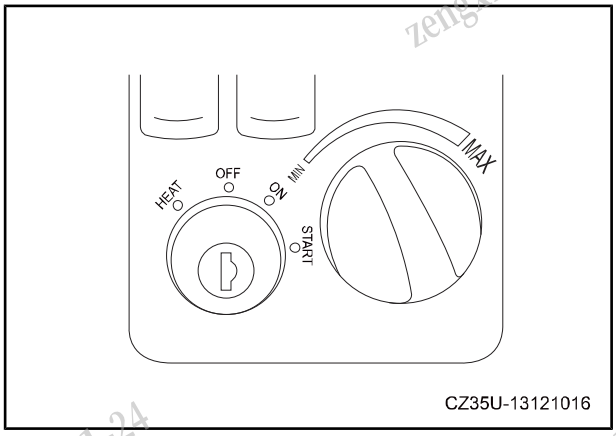

Fig.4-19

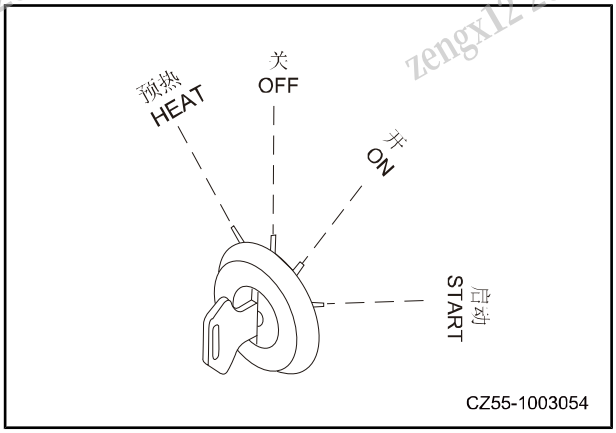

Fig.4-20

4.2.3 Throttle Control Knob

The throttle control knob may be used to adjust the engine speed. The engine speed will increase if it is turned clockwise and will reduce if it is turned counterclockwise.

Low idle speed (MIN): Turn to the left fully

Full speed (MAX): Turn to the right fully

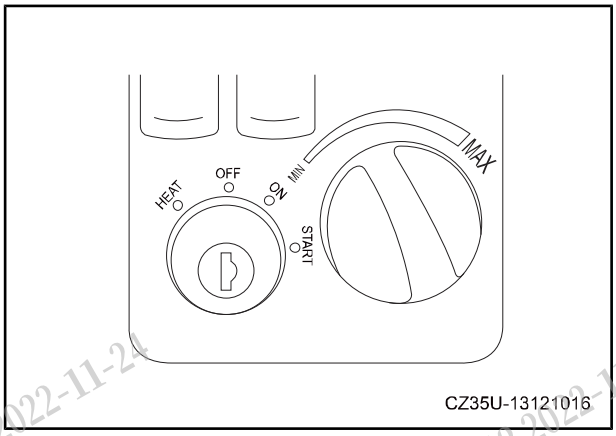

Fig.4-21

4.2.4 Working light switch

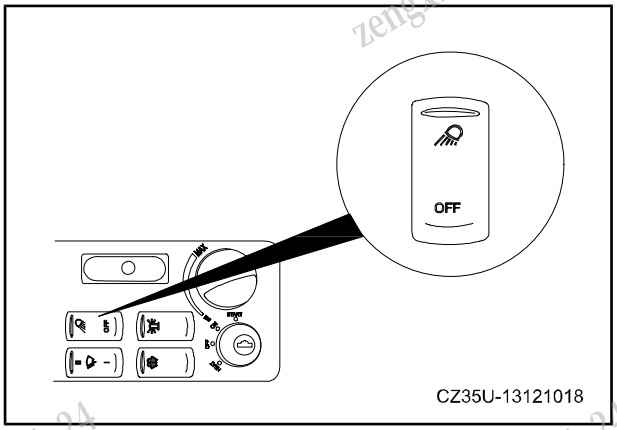

Fig.4-22

Working light position

(a) Boom working light - 1

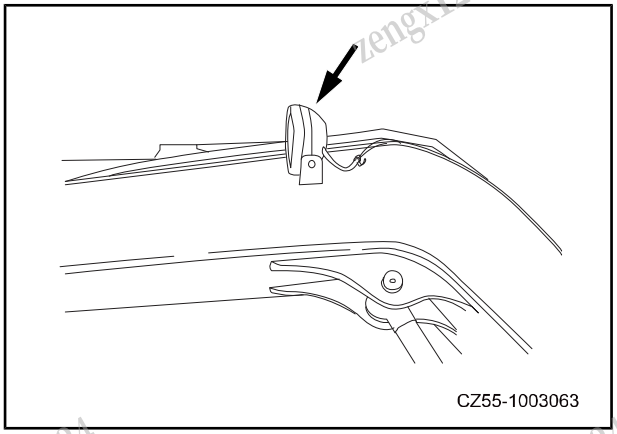

Fig.4-23

(b) Front working light of cab - 2 piece

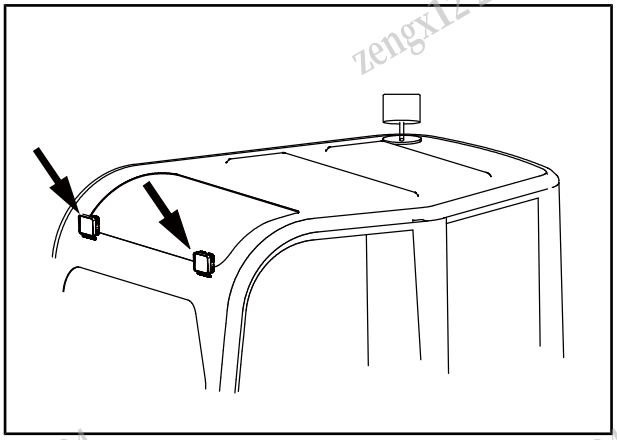

Fig.4-24

4.2.5 Reading Light Switch

The working light could be turned on or off with this switch.

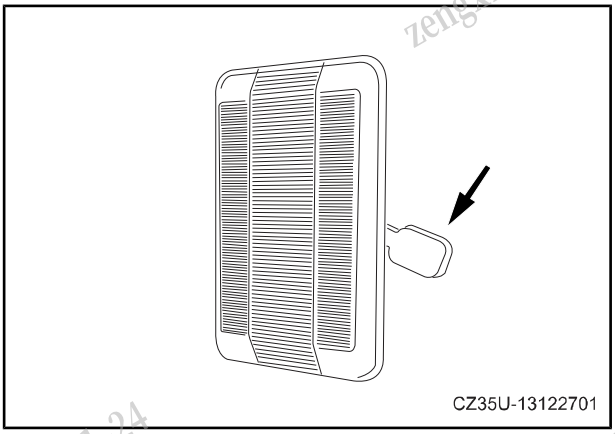

Fig.4-25

4.2.6 Wiper Switch

When it rains or the windshield is dirty, and it requires to turn on the wiper, press the wiper switch- the wiper will start working.

⚠ CAUTION

When using the wiper, press the washer switch to spray some cleaning solution for preventing the wiper being damaged by friction.

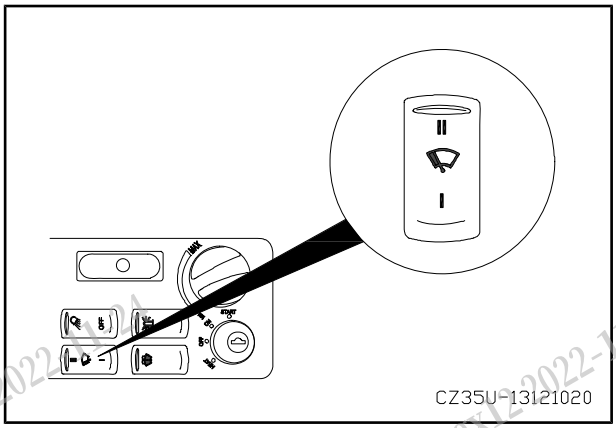

Fig.4-26

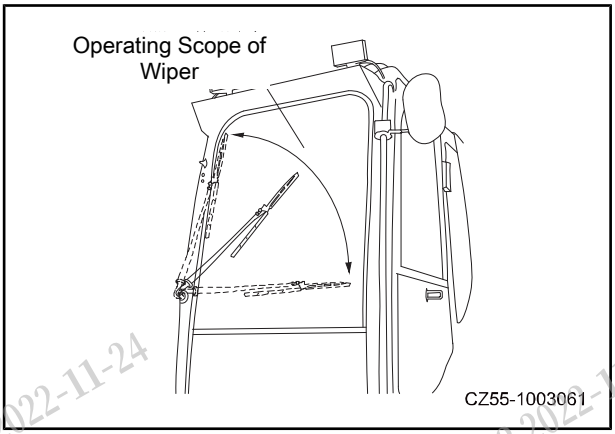

Fig.4-27

4.2.7 Running Alarm Switch (Optional)

When needing give alarm while the excavator is running, press the running alarm switch to realize the running alarm function.

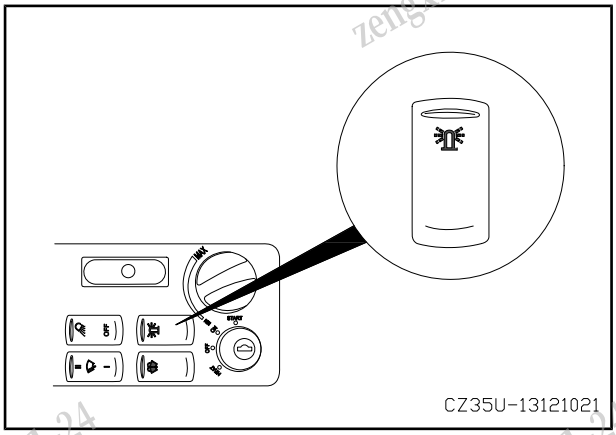

Fig.4-28

4.2.8 Washer Switch

⚠ CAUTION

Before pressing the switch, it is necessary to confirm that the cab windshield is closed.

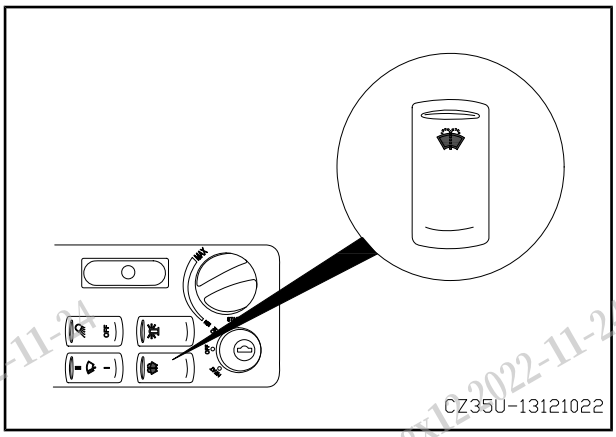

Fig.4-29

4.2.9 Start Button (Optional)

The complete excavator will be powered on if the start button is pressed for short time (less than 3s);

The completed excavator will be powered off if the start button is pressed again for short time (less than 3s) in the power-on state.

The engine will be started if the start button is pressed for long time (more than 3s) in the power-off state.

The engine will be switched off and the complete excavator will be powered off if the start button is pressed for long time (more than 3s) in the engine starting state.

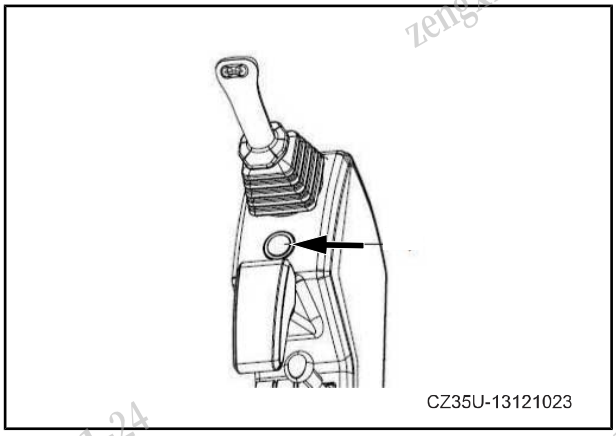

Fig.4-30

4.2.10 Horn switch

The horn switch is installed on the top of the right control lever. The horn will keep ringing as long as the switch is pressed.

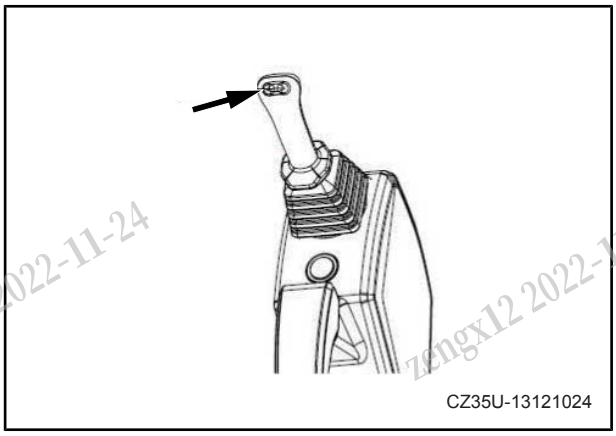

Fig.4-31

4.2.11 Cigar lighter

Use this switch when lighting up a cigarette.

It will return to the original position after several seconds when the cigar lighter is pushed in; it may be used after being pulled out.

If the cigar lighter has been removed, its socket may be used as the power supply with capacity not more than 96W(12V×8A).

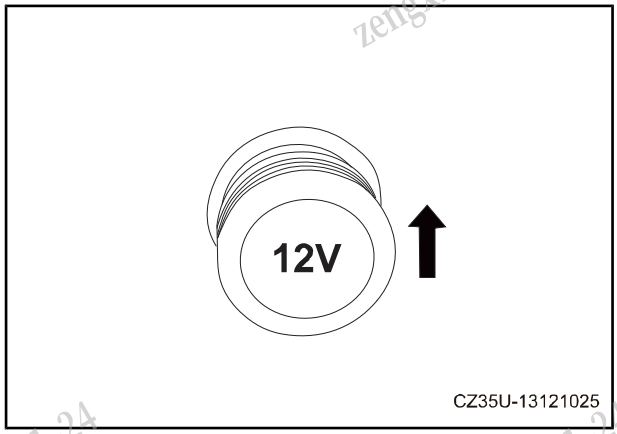

Fig.4-32

4.2.12 General switch of power supply (optional)

⚠ CAUTION

It is not allowed to place the general switch of power supply on the power-off position when the engine is running; otherwise, the electrical system will be damaged.

Power-off Position [O]:

Turn off the electrical circuit; when parking the excavator for long time or maintaining the electrical system, it is necessary to place the general switch of power supply to the power-off position [O].

Power-on Position [L]:

Turn of the electrical circuit; it is necessary to place the general switch of power supply to the power-on position [L]

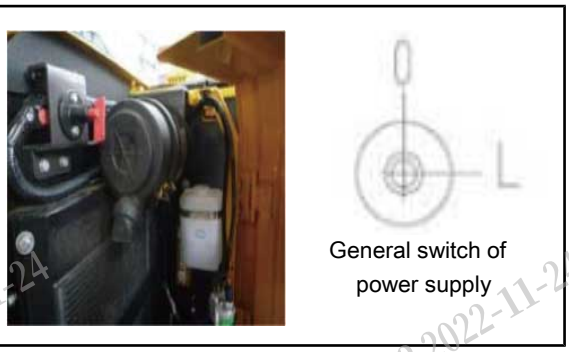

Fig.4-33

General switch of power supply on SY50U (besides tool kit)

Fig.4-34

4.2.13 Emergency Stop Button (Optional)

Please push the emergency stop button to stop the engine when the engine could not be stopped normally or under emergency; it could reset automatically when turning along the direction indicated on the switch. In normal case, do not use this function frequently for avoiding adverse influence on the excavator.

Note: the specific position of this switch on different models may vary.

Fig.4-35

4.3 Control Mechanism

4.3.1 General

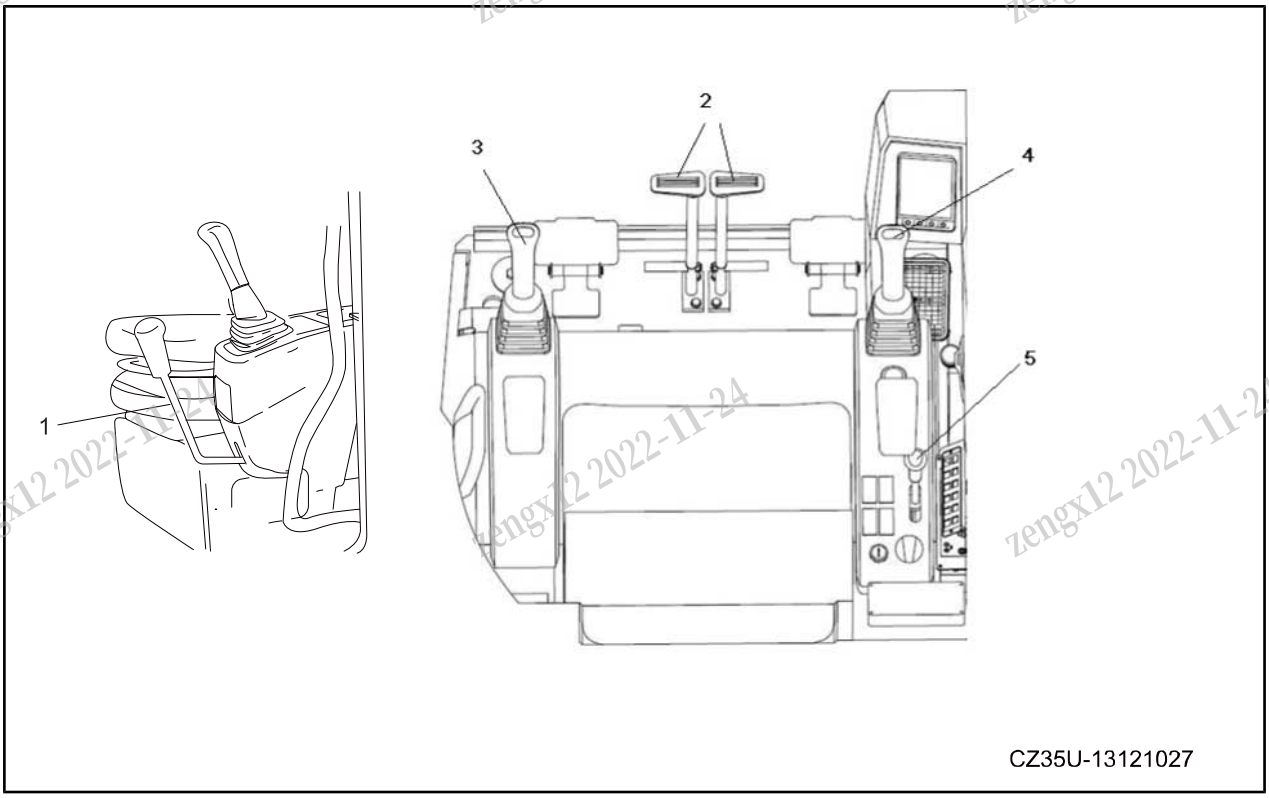

Fig.4-36

[1] Safety Locking Lever

[2] Running Control Lever

[3] Left operating handle

[4] Right operating handle

[5] Bulldozer operating handle

4.3.2 Safety lock control lever

⚠ WARNING

- When leaving the cab, it is necessary to engage the safety locking lever on the locked position reliably. It would cause serious personal injuries when the operating handle was touched by mistake if the safety locking lever is not on the locked position.
- The operating handle might move, which would cause serious accidents or injuries if the safety locking lever was not placed on the locked position reliably.
- Be careful not to touch the operating handle when pulling (up) or pushing (down) the safety locking lever.

The safety control lever is a device for locking the operating handles of working device, sewing, running and accessory (if equipped).

The control lever will be locked if it is pulled up. The excavator may be operated if the control lever is pushed down to the free position.

Remarks:

When the running control lever and operating handle are on the neutral position, place the safety locking lever on the free position; if any part of the excavator acts, it indicates that the excavator has trouble. It is necessary to place the safety control lever on the locked position and stop the engine immediately. Then, contact with the authorized agent of SANY Heavy Machinery Co., Ltd..

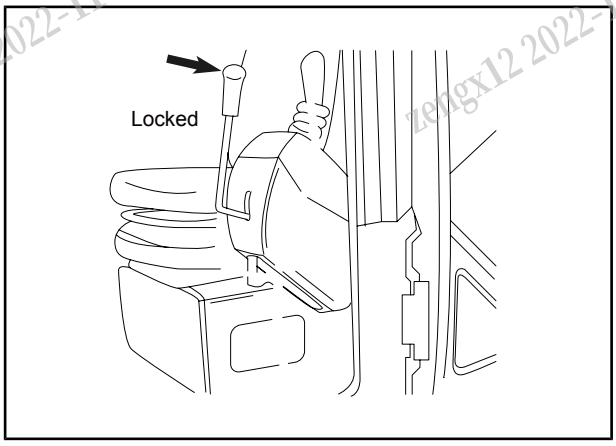

Fig.4-37

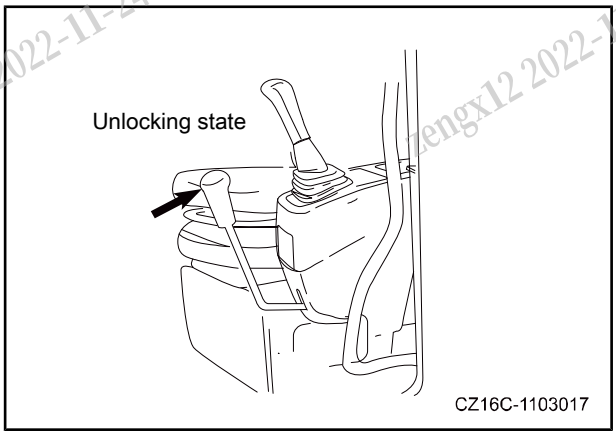

Fig.4-38

4.3.3 Running Control Lever

WARNING

- Do not step the foot on the pedal unless for driving the excavator; if putting the foot on the pedal, and pushing it down by mistake, the excavator would move suddenly and result in serious accident.
- Be particularly careful when using the pedal for operation and running. Do not put the foot on the pedal when not using it.

The control lever is used to change the running direction of the excavator.

[a] Forward:

Push the travel lever forwards (or step down front part of pedal)

[b] Reverse:

Pull the travel lever backwards (or step down rear part of pedal)

[N] Stop the machine (return the travel lever and pedal to the neutral position)

Remarks:

- When the track frames are toward the rear part, the excavator will move forwards on the reverse direction and move backwards on the forward direction.
- When using the running control lever, it is necessary to inspect whether the track frame is forward or backward (if the sprocket wheel is on the rear part, the track frame is forward).
- The running control lever may change the engine speed in the following steps with the automatic speed reduction function.
- When the running control lever and operating handle are on the neutral positions, the engine speed will reduce to the medium speed even though the fuel oil control knob is on the position higher than the medium speed. If any operating handle is operated, the engine speed will rise up to the speed set by the fuel oil control knob.
- If all the operating handles are on the neutral positions, the engine speed will reduce by about 100rpm, and then reduce to the automatic set speed after about 4s.

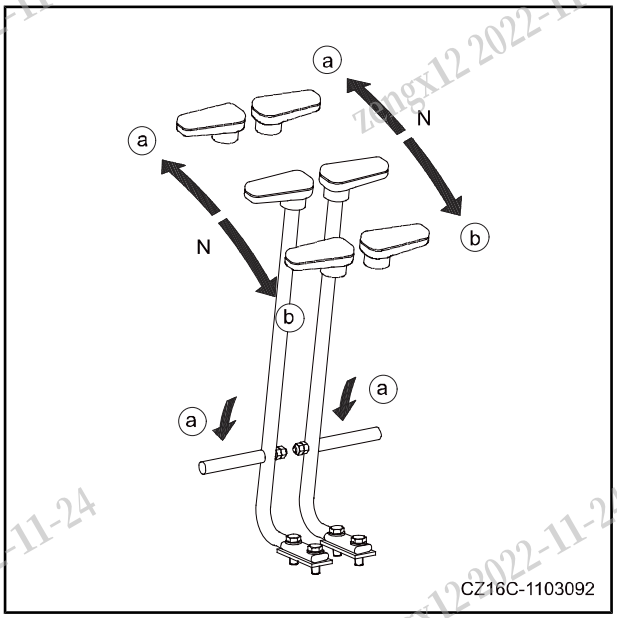

Fig.4-39

4.3.4 Operating Handle

⚠ WARNING

- Do not extend any part of body out of the window. You might get hurt by the boom if colliding against by mistake or touching the operating handle for boom by other reasons. It is necessary to repair or replace if the window is lost or damaged.
- Before operation, it is necessary to be familiar with the positions and functions of each operating handle. Prevent any injuries due to the unexpected movement of excavator.

The left operating handle is used to operate the bucket rod and superstructure.

Bucket rod operation/slewing operation

Action of the left control lever		
a	Front	Bucket rod unloading
b	Back	Bucket rod excavation
c	Left	Left slewing
d	Right	Right slewing

- N (neutral): The superstructure and bucket rod will stay on the original positions.

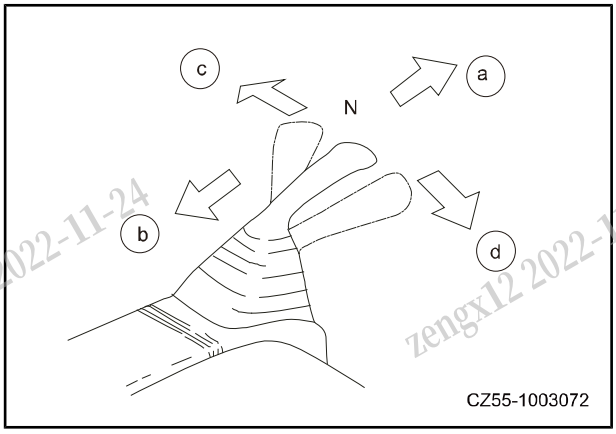

Fig.4-40

Left operating handle is used to operate the boom and bucket.

Boom operation/bucket operation

Action of the right control lever		
f	Front	Boom down
e	Back	Boom up
g	Left	Bucket excavation
h	Right	Bucket unloading

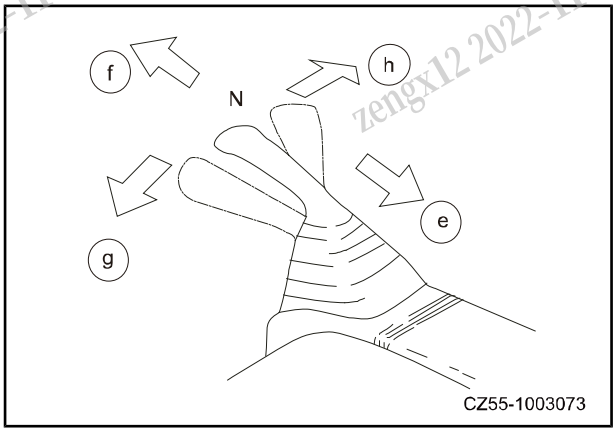

Fig.4-41

- N (neutral): The boom and bucket will stay on the original positions.

NOTE :

- When excavating longitudinally, it is necessary to place the running motor on the rear part to maximize the stability and lifting capacity of the excavator.
- After releasing the control lever and operating handle, they will return to the neutral positions automatically, and the excavator function will stop.

4.3.5 Bulldozer operating handle

The dozer blade operating handle is on the right of the cab seat; the dozer blade will drop if the operating handle is pushed forwards, and the dozer blade will lift if the operating handle is pulled backwards.

[a] : Forward (dozer blade drops)

[b] : Backward (dozer blade lifts)

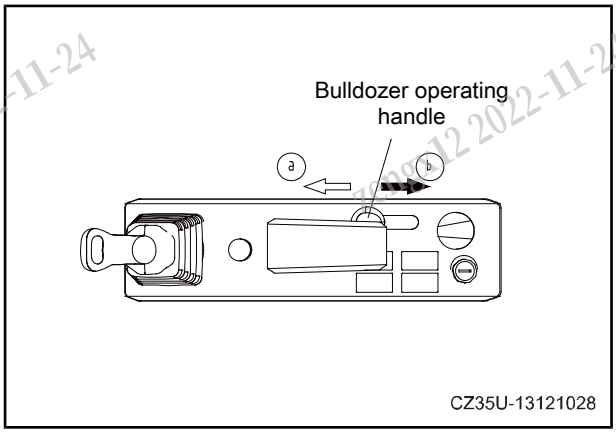

Fig.4-42

4.4 Windshield

4.4.1 General

Before opening or closing the front window, it is necessary to park the excavator on the level ground, lower the working device to the ground, turn off the engine and then operate.

When opening the front window, hold the handle [D] with both hands and lift up; do not loosen before it is locked with automatic spring bolt.

When closing the front window, the window will move rapidly under its dead weight. When closing, hold the handle with both hands. Warning.

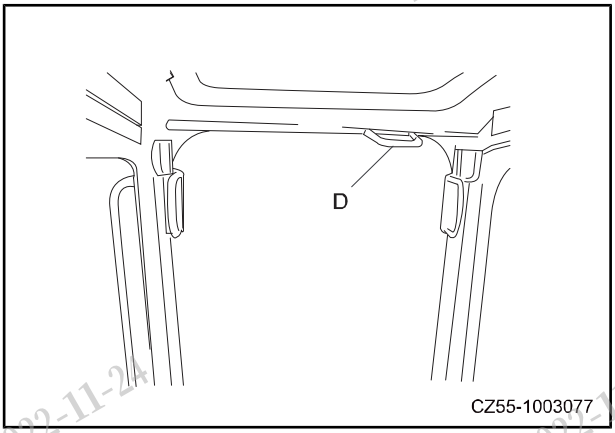

Fig.4-43

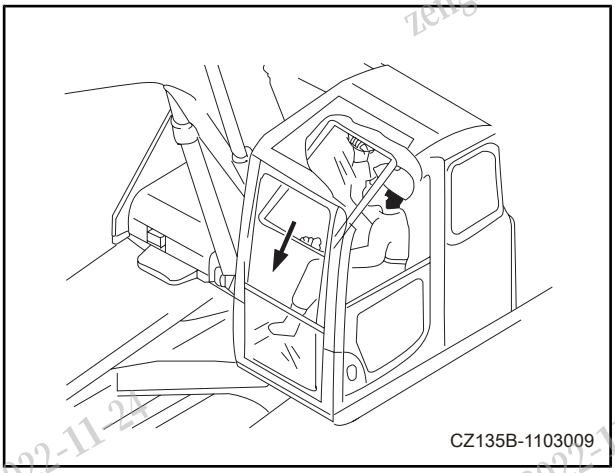

Fig.4-44

⚠ WARNING

- When opening or closing the front window, bottom window or door, it is necessary to place the safety locking lever on the “locked” position.
- It would cause serious accident if the locking lever is on the released position or the operating handle or control pedal is touched by mistake.

The front window may be retracted (lifted up) to the top of the cab.

4.4.2 Open

⚠ CAUTION

People might get hurt if the front window slides. Thus, it is necessary to lock the front window on the top of the cab fully.
Do not operate the wiper when and after opening the front window.

1. Park the excavator on the level ground, lower the working device to the ground fully and then switch off the engine.

2. Put the safety locking lever [1] on the locked position firmly.

3. Inspect to confirm that the wiper blade has been retracted to the support.

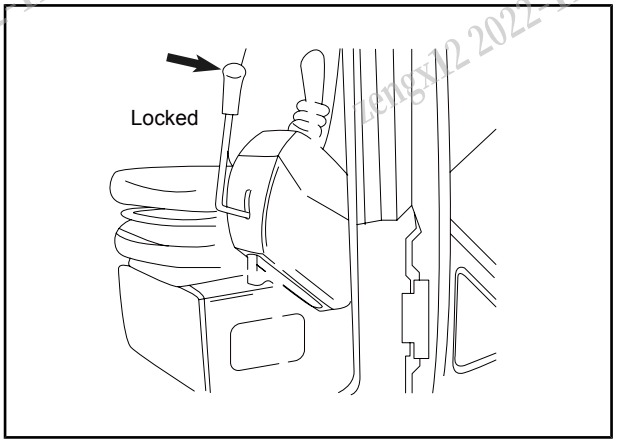

Fig.4-45

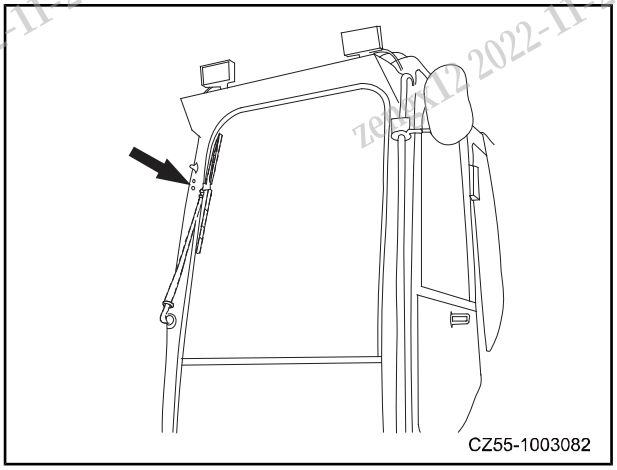

Fig.4-46

4. In the cab, hold the handle [D] with both hands, press on the switch [C] with the thumb, lift up the front window, release the switch [C] and push up the front window to the top of the cab to lock it up.

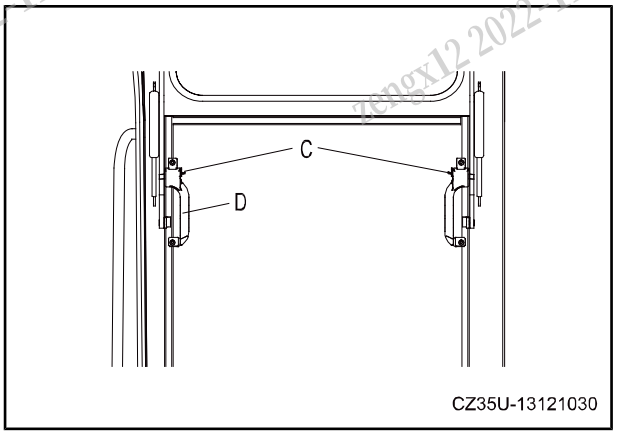

Fig.4-47

4.4.3 Close

⚠ CAUTION

When closing the front window, it is necessary to put it down slowly and be careful not to get the hand stuck.

1. Park the excavator on the level ground, lower the working device to the ground fully and then switch off the engine.

2. Put the safety locking lever [1] on the locked position firmly.

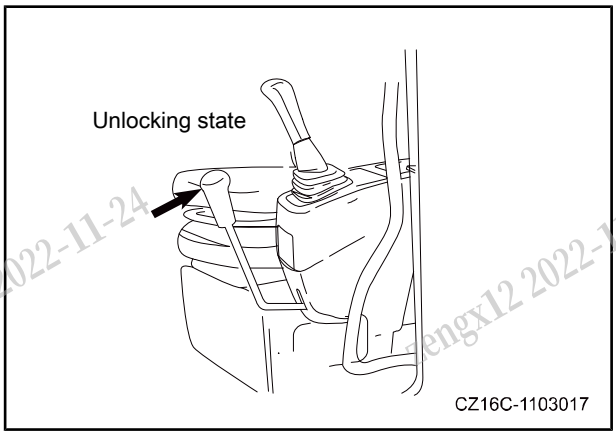

Fig.4-48

3. Hold the front window handle [D] with both hands, press on the switch [C] with the thumb, push down and forwards the front window and release the switch [C].

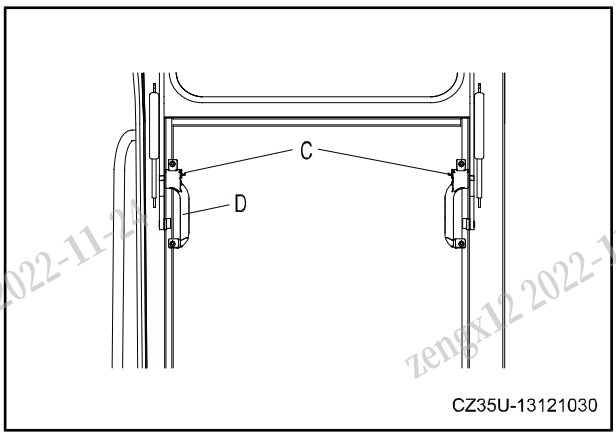

Fig.4-49

4. When the bottom of front window reaches the top of the front lower window, push forward the front window to the lock tongue [G] for locking it up.

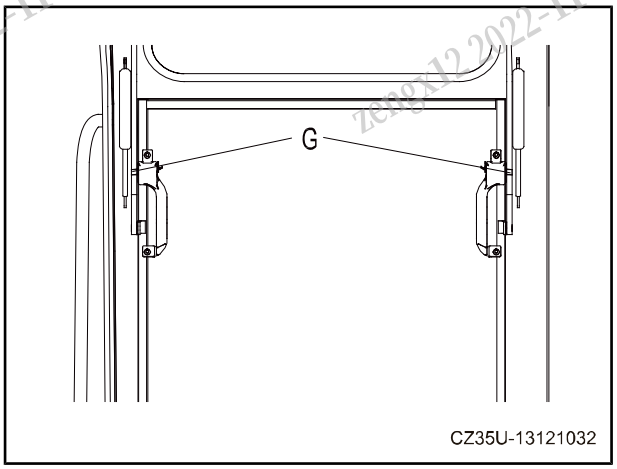

Fig.4-50

4.5 Emergency Hammer

If the cab door or window could not be opened under emergency, the rear window may be broken with the emergency hammer, as escape exit.

Remarks:

The emergency hammer can be used to break the rear window as escape exit only under emergency, but should not be used in any other time.

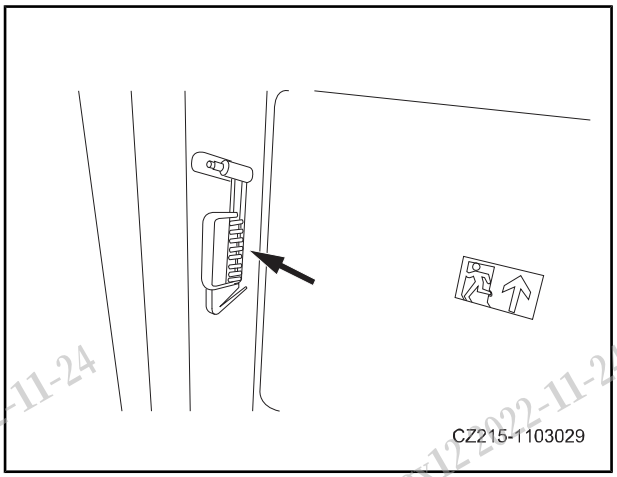

Fig.4-51

4.6 Door lock

⚠ CAUTION

- Before releasing the door lock, it is necessary to park the excavator on the level ground.
- Be sure not to release the door lock on the slope. The door might be closed suddenly, resulting in injuries.
- Before releasing the door lock, do not extend the body or hand out of the excavator. Do not put the hand on the door frame; otherwise, it would cause injuries as the door might be closed suddenly.

Fix the door on that position with the door lock after opening it.

1. Push the door to the locking tongue [1] to fix the door.

2. When closing the door, press the handle [2] on the left side of the cab seat to release the locking tongue [1].

3. When opening the door, it is necessary to lock the door on the locking tongue [1] firmly.

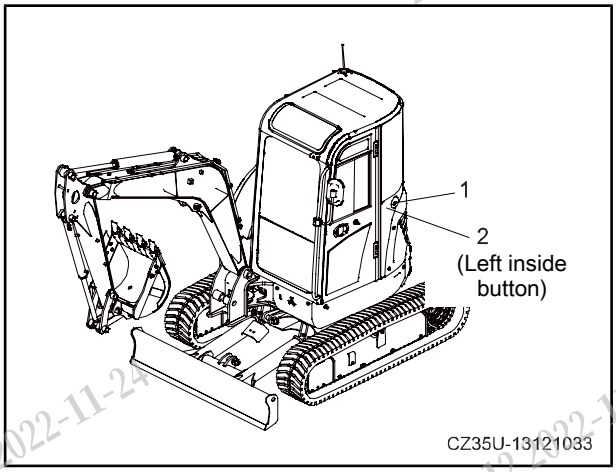

Fig.4-52

4.7 Lockable Cover or Cap

4.7.1 General

Fuel tank filler, cab, engine hood and right shield of excavator are equipped with locks. Unlock/lock the cover and hood with the key.

Insert the key, and insert the key to the position [A].

The key might be ruptured if it is turned before being inserted thoroughly.

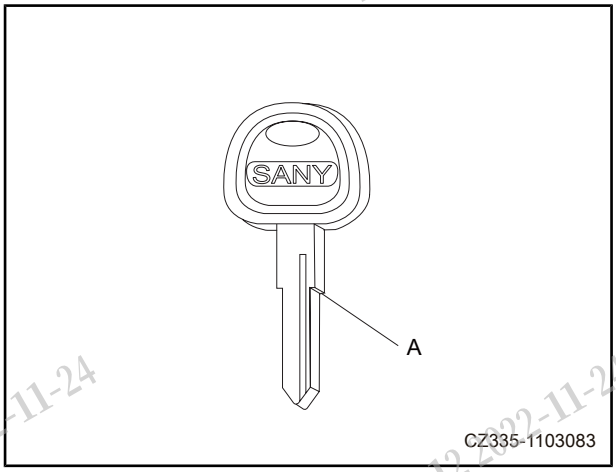

Fig.4-53

4.7.2 Open and close the lock cap

⚠ CAUTION

- After pulling out the key, it is necessary to turn the cover [1] to cover the key hole. Otherwise, the cover lock could not be locked/unlocked flexibly and even might fail as the foreign matter enters the hole.
- The tightening stroke of lock cover is relatively big; it is necessary to turn the lock cover to the proper position and then turn the key to lock the lock cover; the locking tongue might damage the lock cylinder easily when it reaches the inner wall of oil filler if the key is turned before the cover is turned to proper position.
- It is necessary to keep the sealing ring in lock cover clean; if the sealing ring is attached with sundries like scrap iron and pebble etc., the sealing ring might get damaged easily in the tightening process, and the lock cover could be sealed tightly.

Open the cap

1. Open the key hole cover [1].

2. Insert the key into the key slot.

3. Turn the key clockwise to align the key slot to the mark [A] on the cover, and then open the cover [2].

Position [A]: Open

Position [B]: Locked

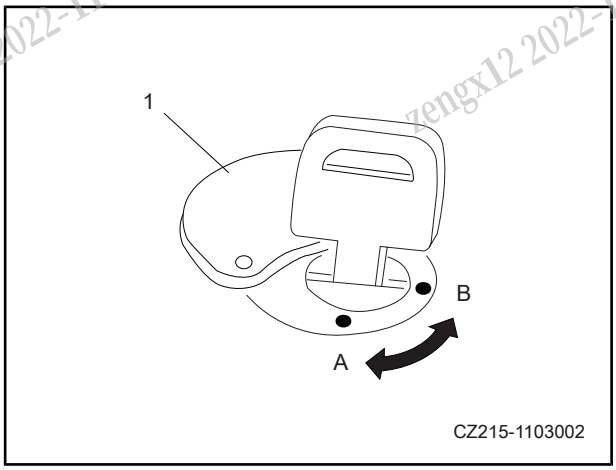

Fig.4-54

Lock the cap

1. Tighten the cover [2] and then insert the key into the key slot.

2. Turn the starting switch key to the “locking” position [B], and then pull out the key.

3. Turn the cover [1] to cover the key hole.

4.7.3 Open and close the lock cover

Open the cover (locked cover)

1. Insert the key into the key slot.

2. Rotate the key counterclockwise and open the cover through its handle.

Position [A]: Open

Position [B]: Locked

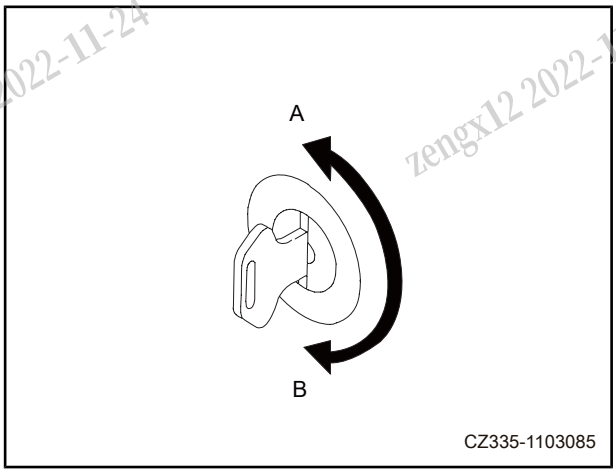

Fig.4-55

Lock the cover

1. Close the cover properly, and insert the key into the key slot.

2. Turn the key counterclockwise and pull out the key.

4.8 Engine hood

1. Turn the key to unlock the engine hood, move the engine hood handle [1] to open the engine hood [2].

2. When closing the engine hood [2], turn the key to lock the engine hood.

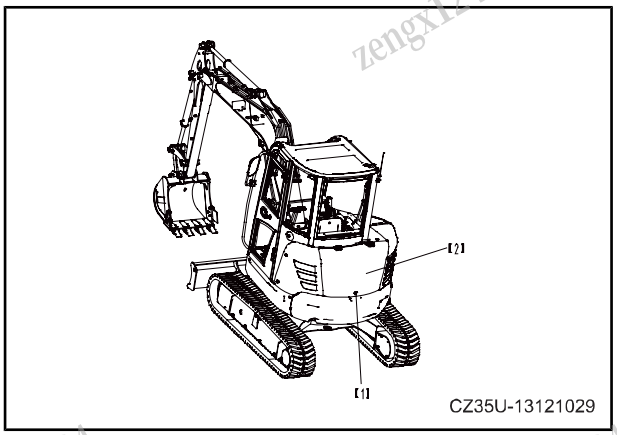

Fig.4-56

4.9 Ashtray

Before putting the burning cigarette in the ashtray, be sure to put out the cigarette. After putting in, close the cover.

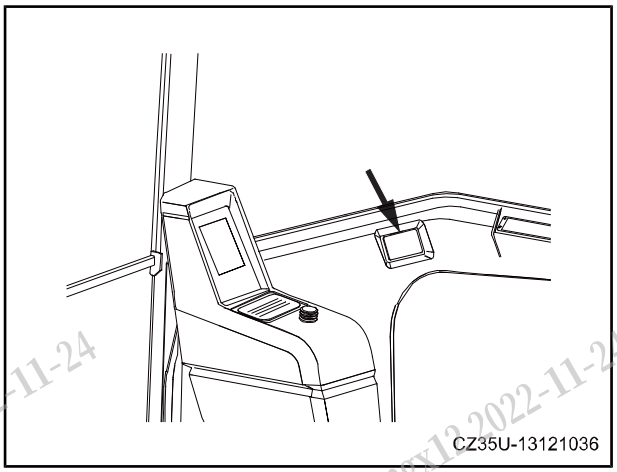

Fig.4-57

4.10 Cup holder

For the convenience of the driver to put the water cup (bottle), one foldable cup holder is designed on the left side of the cab.

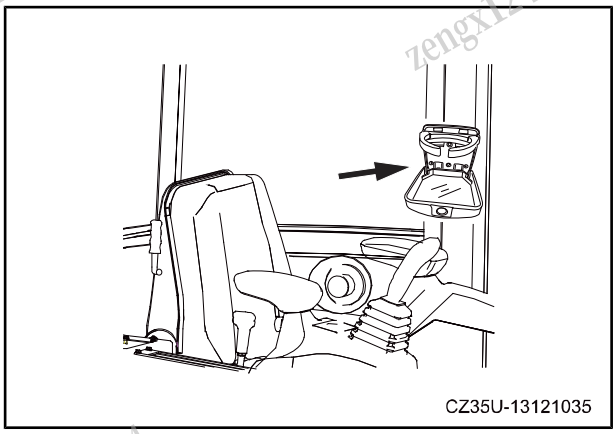

Fig.4-58

4.11 Air conditioning system

Control Panel

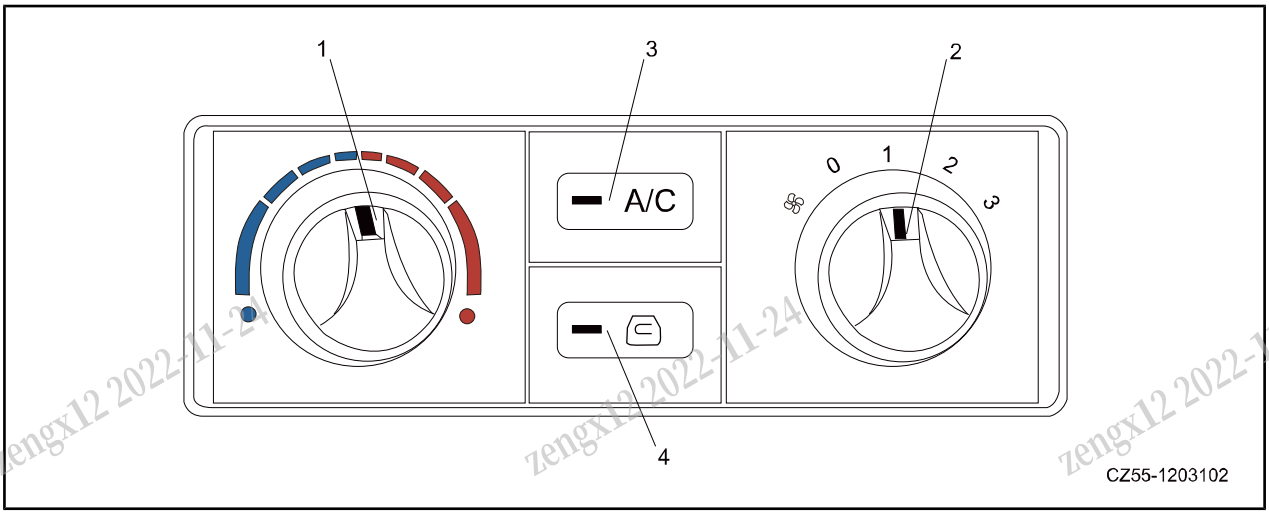

Fig.4-59

[1] Temperature regulation switch

[2] Air Regulation Switch

[3] Compressor power supply switch

[4] Internal/external circulation selector switch (standby)

1. Temperature Regulation Switch

Preset the required inside temperature:

The system will heat if the switch is turned to the right; at maximum slewing position =30℃;

Middle position=22-24℃;

The system will refrigerant if the switch is turned to the left; at maximum slewing position =15℃;

2. Air Regulation Switch

It is used to regulate the air volume of fan (the air volume increases progressively at gears 1, 2 & 3) in refrigeration or heating mode. Gear 0 is the button OFF of air conditioner.

3. Compressor power supply switch

Turn on or off the switch of compressor clutch power supply.

Turn on: Indicator light will be lit up

Turn off: Indicator light will go out

4. Internal/external circulation selector switch (standby)

The switch for selecting internal or external air circulation. At present, this function has not been developed and is only standby.

Internal air: Indicator light will be lit up

External air: Indicator light will go out

Operation Method

⚠ CAUTION

- The air conditioning system could be used only after the engine has been started. After the engine stops, the power supply switch shall be turned off.
- The refrigeration function of air conditioner will not be used in the spring, autumn or winter, but it is necessary to start the refrigeration function to operate by about 5 minutes every two weeks for preventing the moving parts in the system being corroded after they are out of service for long time.
- The heating system is connected to the water tank. Thus, when the ambient temperature is lower than -35℃ and the excavator is to be out of service for long time, the water in the water tank must be drained to prevent frost cracking of the heater pipeline.

1. Start Engine.

2. After the air regulation switch is turned rightwards to gears 1, 2 or 3, the air conditioner will start working and supply air into the cab.

3. When the refrigeration operates, turn on the compressor power supply switch (the indicator light will be lit), and turn the temperature adjusting switch leftwards to proper position (the temperature will be about 15℃ when it is turned to the left limit position); when the heating operates, turn off the compressor power supply switch (the indicator light will go out), and turn the temperature adjusting switch rightwards to proper position (the temperature will be about 30℃ when it is turned to the right limit position);

4. Turn the air regulation switch to gear 0 directly if needing to turn off the air conditioner.

In refrigeration state, the power supply for compressor clutch will be turned on and off (but the indicator light will be normally on) automatically to maintain the inside temperature when the inside temperature reaches the preset temperature.

Position of Air Outlets

[A] : Defrosting air outlet (1)

[B] : Air outlet toward face (1)

[C] : Air outlet (1) toward back

⚠ CAUTION

- When operating the air conditioner, it is necessary to start when the engine is running at low speed. Do not start the air conditioner when the engine is running at high speed; otherwise, it would cause air conditioner troubles.
- If the water enters the control panel, it would lead to unexpected troubles. Be careful not to splash the water on the parts. Keep the parts away from open flame.

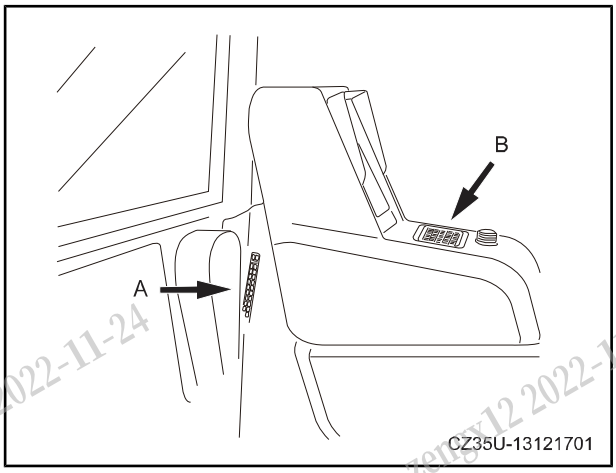

Fig.4-60

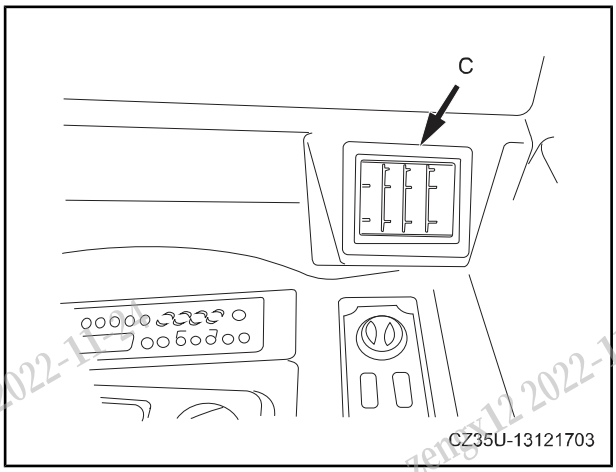

Fig.4-61

Ventilation

- When the air conditioner is operating for long time, it is necessary to adjust the “internal/external air mode” to “external air import” for ventilation for every 1 hour.
- If smoking when the air conditioner is on, the smoke will hurt the eyes. Thus, it is necessary to adjust the “internal/external air mode” to “external air import” for the convenience of discharging the smoke when refrigerating continuously.

Temperature Control

When the refrigerator works, set the temperature to the temperature at which you feel cool slightly when entering the cab (5℃ or 6℃ (9℉ or 10.8℉) lower than the outer temperature). This temperature difference is deemed as the most suitable value for health. Thus, it is necessary to adjust the temperature properly.

Inspection and Maintenance of Excavator Equipped with Air Conditioner

- When inspecting and maintaining on the excavator equipped with air conditioner, it is necessary to perform according to the graphic chart.
- When the air conditioner is out of service for long time, it is necessary to operate the engine at low speed and execute the functions of refrigeration, dehumidification and heating for several minutes to prevent the oil film on the parts being consumed.
- If the inside temperature of the cab is lower than the outside temperature, the air conditioner would not work. At this moment, circulate the fresh air to increase the inside temperature and then turn on the air conditioner switch- the air conditioner will start working.

4.12 Radio

4.12.1 Control panel

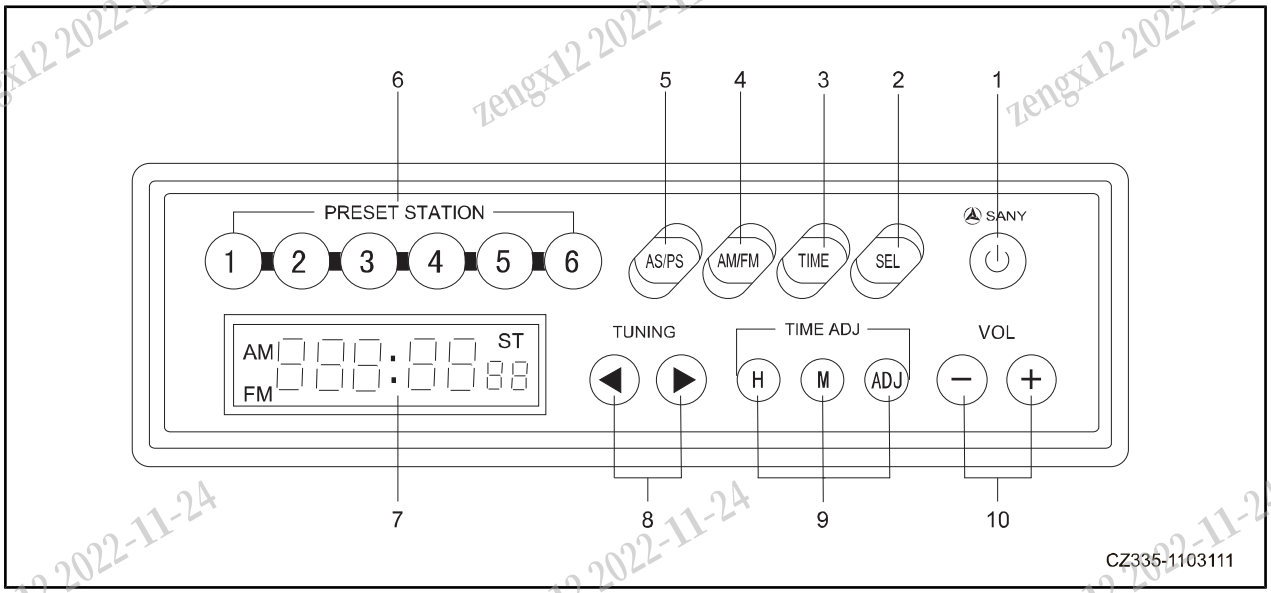

Fig.4-62

[1] Power Supply Switch
[2] Sound Effect Selection Button
[3] Time Display Button
[4] FM/AM selection button
[5] AS/PS button
[6] Radio Preset Station Button (1~6)
[7] LCD Display Screen
[8] Tuning Button
[9] Time adjustment button
[10] Volume Regulation Button

4.12.2 Control Button and Liquid Crystal Display

[1] Power switch key

The power supply for radio will be turned on if the power supply switch ⏻ is pressed. The frequency will be displayed on the display screen [7]. The power supply will be turned off if this switch is pressed again.

[2] Sound Effect Selection Button

The sound effect will change successively to 

: VOL (volume)→BAS (bass) →TRE (treble) →BAL (balance).

The host will return to the frequency display interface if without any operations in 5s. The sound effect will be displayed on the display screen [7].

[3] Time Display Button

When the frequency is displayed, the display screen will display the current time by 5s if the time display button 

is pressed. After 5s, the display screen will resume to the frequency display automatically.

Press on the button [3] by over 5s - the display screen will display country and region: ASA:EU (Asia: Europe).

[4] FM/AM selection button

Push down FM/AM selection button 

to select the desired wave band. The wave band will change among FM→AM→FM each time after this button is pressed.

[5] AS/PS (Automatic Search/Preset Station) Button

Function of AS/PS button: Search stored station automatically for the radio and browse & play the preset station. Automatic search of stored station in the radio:

In the radio state, each preset station may be scanned successively if the AS/PS button 

is pressed; each preset station will play10s and meanwhile the character of preset station position

scanned will flash on the display screen. If needing to listening certain station, press the button AS/PS - the system may stay on the position of this station.

Browse & play the preset station:

In the radio state, press on the AS/PS button AS/PS and wait for over 2s - the system will search the station at current wave band automatically, store 6 stations with strongest signal to the memories 1-6 in sequence and finally lock to the station and start playing.

[6] Radio Preset Station Button (PRESET STATION)

If the buttons (1-6) have been preset to a specific station, the expected station may be selected by pressing the preset button.

[7] LCD Display Screen

On the display screen, receiving wave range, frequency, preset No. and time will be displayed.

[8] Tuning Button (TUNING)

Change the frequency with the tuning buttons ◄ and ►.

◄Button: decrease the frequency

►Button: increase the frequency

[9] Time adjustment key (TIMEADJ)

Use time adjustment buttons H, M and ADJ when adjusting the time.

[10] Volume Regulation Button (VOL)

The volume will increase progressively up to 40 if the button ⊕ is pressed.

The volume will decrease progressively up to 0 if the button ⊖ is pressed.

It will return to frequency display interface if without any operations within 5s.

4.12.3 Radio operation

Setting Method with Preset Button

1. Press the power supply switch [1]. At this moment, the display screen [7] will display the frequency.

2. Adjust to the desired frequency by forward/ backward searching button [8]. There are two tuning methods: automatic tuning and manual tuning.

3. When the desired frequency appears on the display screen [7], press on the desired preset No. by at least 1.5s - the sound received will disappear. However, when the presetting operation (storing into the memory) is completed, the sound will re-appear, and the display screen will display the preset No. and frequency to indicate that the presetting operation has been completed. After completing the presetting operation, press the button [6] “Preset Station” and release it within 1.5s; the radio will receive the channel preset to this button.

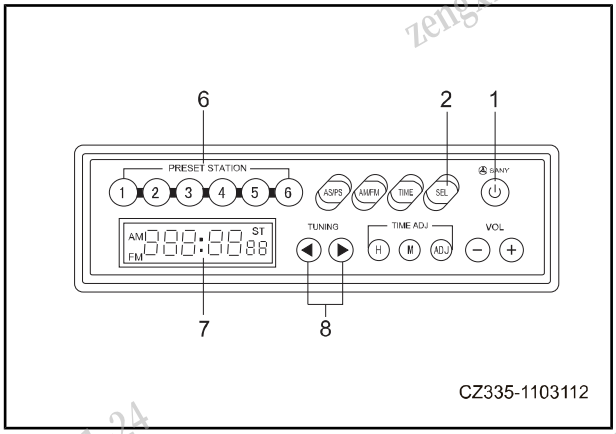

Fig.4-63

NOTE：

Automatic storage button may be used to store to the preset button.

Searching Method for Broadcasting Station

1. Press the power supply switch [1]. At this moment, the display screen [7] will display the frequency.

2. Adjust to the required frequency with the tuning button [8]. There are two tuning methods: automatic tuning and manual tuning.

- Manual tuning
  Press the tuning button [8] until the display screen [7] displays the frequency.
  When the frequency reaches the top or bottom value, it will continue automatically in the sequence of top →bottom or bottom → top.
- Automatic tuning
  Press the tuning button [8] for long time; the system will search backwards or forwards. When receiving a broadcasting station, the tuning will stop automatically. For searching the next broadcasting station, press the tuning button [8] again for long time.
  If this button is pressed in the automatic tuning process, the automatic tuning will be canceled, and the setting will return to the frequency used before this button is pressed.

Adjustment of Sound Effect

- VOL adjustment (VOL): Press down the ⊕ key to increase the volume in turn to 40; press down the ⊖key to reduce the volume in turn to 0;
- BAS adjustment (BAS): Firstly press down the SEL key to switch the audio to the BAS mode, and then press down the⊕ or ⊖key within 5 s to change the BAS loudness within the range of +7~-7.
- TRE adjustment (TRE): Firstly press down the SEL key to switch the audio to the TRE mode, and then press down the⊕ or ⊖key within 5 s to change the TRE loudness within the range of +7~-7.
- BAL adjustment (BAL): Firstly press down the SEL key to switch the audio to the BAL mode, and then press down the⊕ or ⊖key

within 5 s to change balance of the left and right sound tracks within the range of L9-R9. BAL.0 represents balance between left and right sound tracks.

NOTE：

As for any modes, the LED display screen will return to the original setting automatically if without any operations within 5s.

Time Setting

Press the time display button [3] to display the time. After 5s, it will return to frequency display, and the time could not be corrected. In this case, press the time display button [3].

Press the time adjustment button [9] to select hour and minute.

Button Ⓗ: adjust the hour (the time will increase by 1 hour each time when this button is pressed).

Button Ⓜ: adjust the minute (the time will increase by 1 minute each time when this button is pressed).

The time will increase continuously if the button Ⓗ or Ⓜ is pressed until it has been released.

Button ADJ: the time will be set as follows if the button ADJ is pressed.

- When displaying 00-05 minutes, the time will return to 00 minute, 00 second (hour remains unchanged).
- When displaying 55-59 minutes, the time will proceed to 00 minute, 00 second (hour proceeds).
- When displaying 06-54 minutes, the time could not be reset (the time remains same).

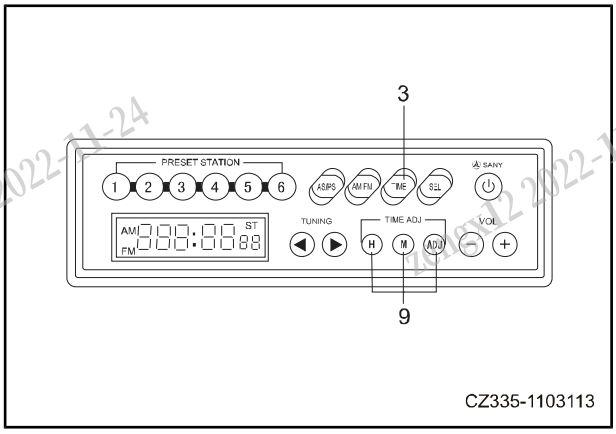

Fig.4-64

⚠ CAUTION

- For avoiding traffic accident, please adjust the volume to the appropriate position.
- In hot or cold weather, please keep this device in the excavator. Ideal temperature is helpful to protect good performance of this device.
- This device would get damaged easily after being sprayed with water; when washing the excavator, be careful not to spray the water on this device. The temperature of its shell might increase to about 70℃, when this device works for long time in big-power output state. Although it is not a defect, but it is not a good idea to touch the shell.
- Non-artificial damages of excavator will be covered by the warranty provided by this company; only the professional maintenance personnel from this company are allowed to adjust and repair this excavator; otherwise, this company will not provide the warranty.

⚠ WARNING

- When installing or removing the audio equipment, it is necessary to turn off the power supply on the excavator.
- When overhauling, it is necessary to switch off the power supply for avoiding unnecessary losses.
- When the power supply is on, it is not allowed to open the shell of complete vehicle without permission; high voltage exists in the shell; otherwise, the complete excavator might get damaged.
- For your safety, please adjust the volume to the extent that you could hear the traffic signal (horn or police whistle).
- Prevent the excavator body being affected by water or corrosion; wipe the excavator with dry cloth.

4.12.4 Antenna

If the signal received is relatively low or contains noise, extend the antenna. If the signal is too strong, retract the antenna to adjust the sensitivity.

Remarks:

When the excavator is transported or the excavator is parked in the garage, the antenna should be retracted to protect it being broken.

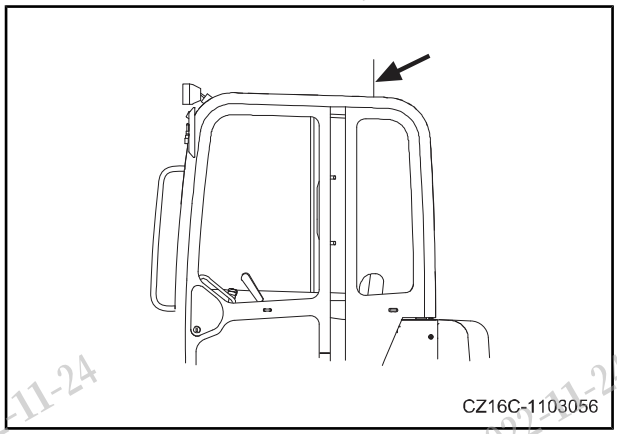

Fig.4-65

4.13 Fuse

If the electrical equipment does not work, it is necessary to inspect the fuse. Fuse position and specification table is pasted on the box cover.

Note: Before replacing the fuse, it is necessary to turn off the starting switch.

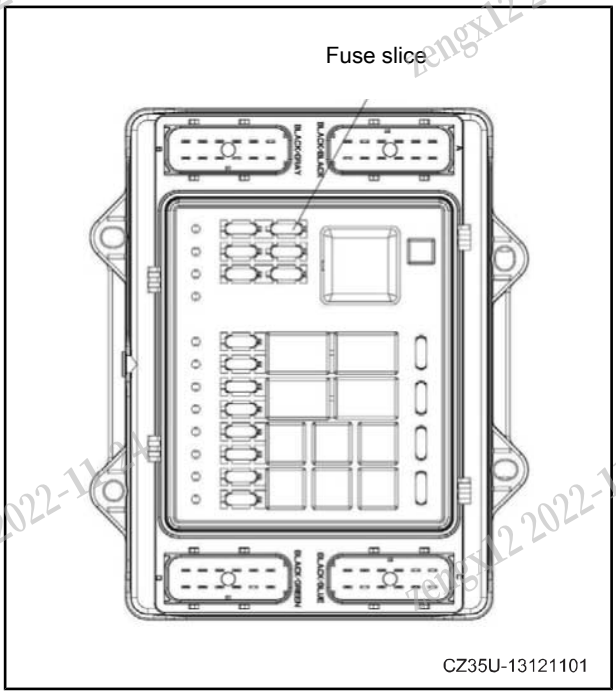

Fig.4-66

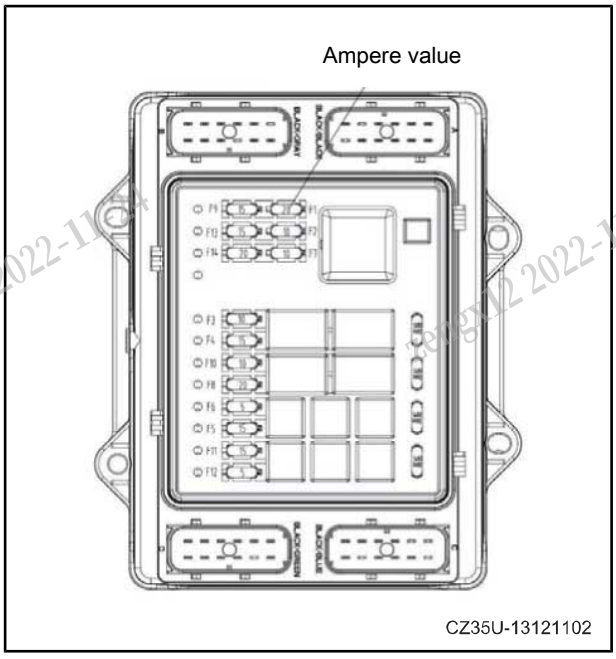

Fig.4-67

S/N	Fuse capacity	Circuit name
F1	20A	Starting
F2	10A	Working light switch
F3	10A	Cab lamp, horn and
F4	15A	Working
F5	15A	Washer, wiper and audio
F6	5A	A/C control panel
F7	10A	GPS
F8	20A	A/C fan
F9	15A	Cigar
F10	10A	A/C compressor
F11	15A	Display screen
F12	5A	Electronic fuel

4.14 Fire Extinguisher

⚠ WARNING

- Be sure to equip fire extinguisher and read the label to know how to use it under emergency.
- It is necessary to inspect regularly to ensure the fire extinguisher is within the warranty period.
- If the warranty period of fire extinguisher expires, it is necessary to replace it timely.

The fire extinguisher is placed on the rear part in the cab.

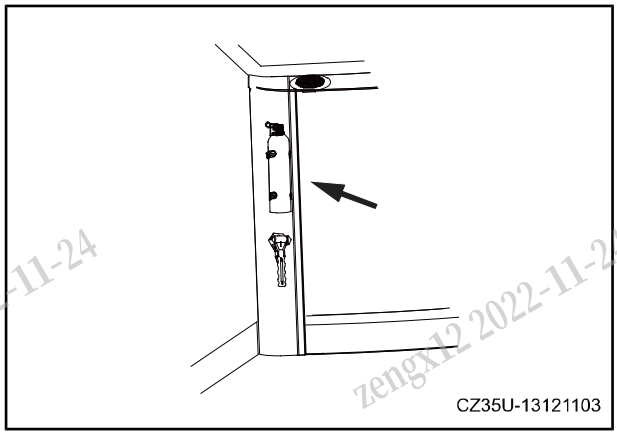

Fig.4-68

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Operation

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⚠ WARNING

Read and understand all safety precautions and instructions in this manual before reading any other manuals provided with this machine and before operation or maintaining it. Failure to do this could result in death or serious injury.

5.Operation

5.1 Before engine start

5.1.1 Walkaround Inspection

Before starting the engine, it is necessary to perform walkaround inspection on the excavator and beneath the excavator. Check whether any bolts or nuts are loose, whether engine oil, fuel oil or coolant leaks and check the situation of working device and hydraulic system. It is also necessary to inspect whether the wire near the high temperature area is loose, or whether there is clearance or dust accumulation.

Before starting the engine every day, it is necessary to perform the following inspections and cleaning operations:

1. Inspect whether the working device, cylinder or hose etc. is cracked, excessively worn or loose, inspect whether the O-rings at the connections of bucket and bucket rod are damaged; it is necessary to repair or replace if finding any problems.

2. Clean the dirt and fragment around the engine, storage battery and radiator, Inspect whether there is dirt around the engine and radiator. It is also necessary to inspect whether there are flammables (dry leaves and fine twigs etc.) around storage battery, engine silencer or other high temperature parts. If finding any dirt or flammables, clean them.

3. Inspect whether the coolant and oil leak from the positions around the engine, inspect whether the engine leaks oil or whether the cooling system leaks coolant. Repair if finding any problems.

4. Inspect whether hydraulic device, hydraulic oil tank, hose and connector leak oil. Inspect whether there is any oil leakage. Repair the oil leaking positions if finding problems.

5. Inspect whether the undercarriage (tracks, driving wheels, supporting wheels or carrying wheel etc.) is damaged or worn, whether the bolts are loose or whether the contact roller leaks oil. Repair if finding any problems.

6. Inspect whether there are any problems on the instrument and monitor. Inspect whether there are any problems on the instrument and monitor in the cab. Replace the parts if finding any problems. Clean the dirt on the surface.

7. Clean and inspect the rear-view mirror. Inspect whether the rear-view mirror is damaged. Repair it if damaged. Clean the mirror surface and adjust the angle so that the driver could see the rear area on his seat.

8. Seat belt and belt fastener. Inspect whether the seat belt and belt fastener are damaged or worn; replace the damaged seat belt immediately after finding.

9. Inspect whether the bucket (if equipped) with hook is damaged. Inspect whether lifting hook, guide plate and hook seat are damaged. Please contact with the authorized agent of SANY Heavy Machinery Co., Ltd. for repair if finding any problems.

5.1.2 Inspections before Starting Engine

5.1.2.1 Coolant Level of Cooling System - Inspection/Filling in water

⚠ WARNING

The coolant will be very hot and the internal pressure of the radiator will be relatively high immediately after the engine stops. In such case, it would lead to burns if the radiator cover removed to drain the coolant. Therefore, it is necessary to let the temperature drop and turn the radiator cover slowly to release the pressure before removing the cover.

1. Open the engine hood and inspect the whether the coolant in the liquid storage tank (as shown in the figure on the right) is between the marks FULL and LOW. If the coolant level is low, it is necessary to fill in the coolant through filler of liquid storage tank until the coolant reaches the FULL level.

2. After filling in coolant, it is necessary to tighten the cover reliably.

3. If the auxiliary water tank is empty, there might be someplace leaking. Repair immediately after inspection. Inspect the water level in the radiator if there is not any abnormal situation. Fill water into the radiator and fill water in the liquid storage tank if the water level is low.

Note: The positions of liquid storage tank on different models may be different.

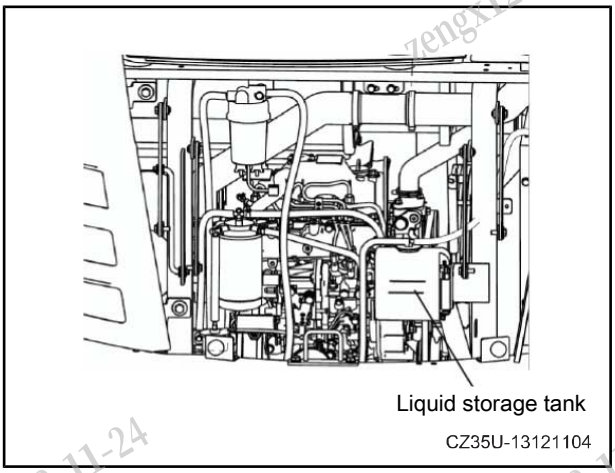


Fig.5-1

5.1.2.2 Engine Oil Level - Inspection/Filling

⚠ WARNING

The parts and oil will be still in hot state immediately after the engine stops, and might cause burns. Before operation, wait until the oil temperature drops.

1. Open the engine hood.

Pull out the oil gauge [A] and wipe off the oil with clean cloth.

2. Insert the oil gauge [A] into the oil filler pipe fully, and then pull it out.

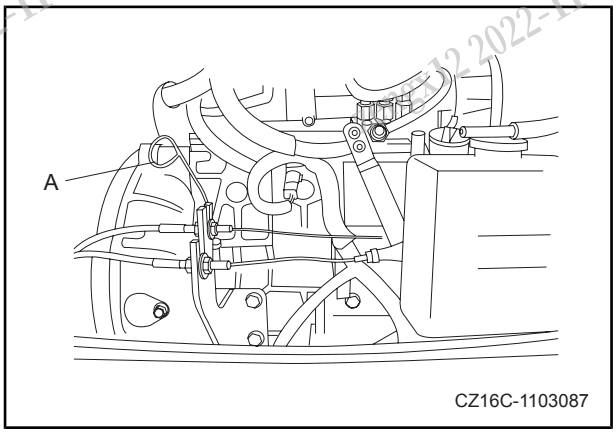


Fig.5-2

3. The oil level shall be between the marks [a] and [b].

It is necessary to fill in oil if the oil level is lower than the mark [b].

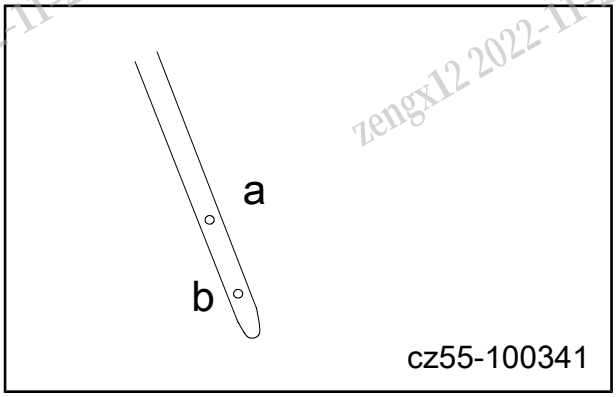


Fig.5-3

4. It is allowed to fill oil through the oil filler [B] if necessary. It is only allowed to use the recommended oil.

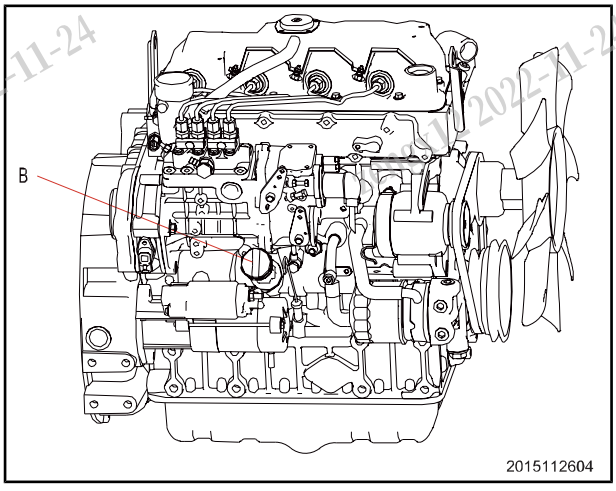


Fig.5-4

5. It is necessary to drain the surplus engine oil from the drainage plug or oil drain valve (SY55U) if the oil level is higher than the mark [a].

6. Tighten the oil filler cover firmly and close the engine hood if the oil level is appropriate.

Remarks:

- It is necessary to switch off the engine and wait at least 15 minutes before inspecting the oil level after the engine is running.
- It is necessary to keep the excavator level before inspection if the excavator is tilting.
- The positions of engine oil gauge, oil filler and drainage plug of different models may be different.

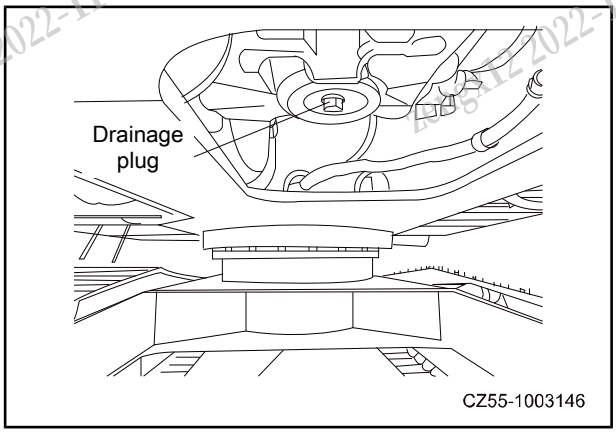


Fig.5-5

5.1.2.3 Fuel Oil Level - Inspection/ Filling

1. Press the start button- the excavator will be powered on and the display screen will be lit up; observe the oil level gauge on the display screen; please fill in fuel oil if the oil level is too low.

2. Do not splash the fuel oil on the excavator and do not exceed the specified volume when filling in oil into the oil supply tank.

Please stop filling in oil if the fuel volume exceeds the fuel tank filter.

Fix the fuel oil gun nozzle firmly and prevent the fuel oil gun nozzle damaging the fuel tank filter.

3. Tighten the cover reliably after filling in oil.

Fig.5-6

5.1.2.4 Hydraulic Oil Level - Inspection/ Filling

1. Adjust the working device to the posture shown in the figure on the right.

2. If the working device is not on the posture shown in the figure, it is necessary to start the engine and operate it at low speed, retract the bucket rod and bucket cylinders, lower the boom, adjust the bucket teeth to contact with the ground and switch of the engine.

3. Within 15s after turning off the engine, turn the starting switch to the position [ON] and operate the control levers (working device and running) in full stroke on each direction to release the internal pressure.

4. Inspect the oil level meter on the hydraulic oil tank. The oil level must be between the marks of oil level meter. Otherwise, it is necessary to fill in hydraulic oil.

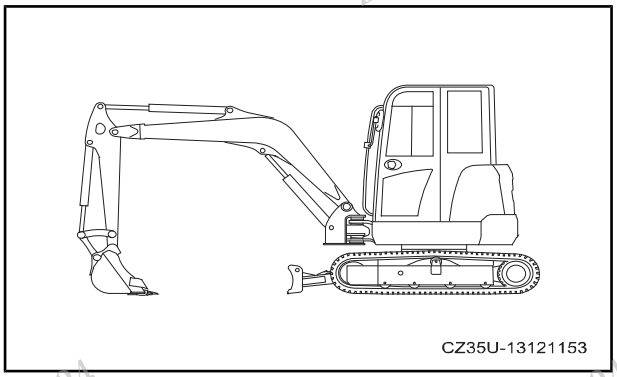


Fig.5-7

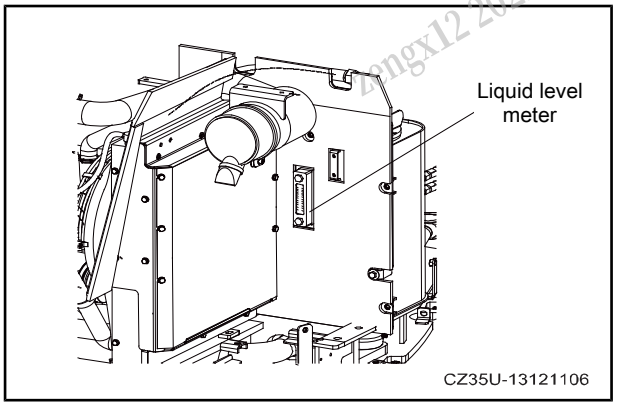


Fig.5-8

The position of oil level meter on hydraulic oil tank of different models might be different. Oil filling steps are as follows:

1. Open the covering part on the top of hydraulic oil tank, screw off the bolt on oil return barrel cover and open the oil return barrel cover.

2. Fill the hydraulic oil into the oil return barrel slowly, and inspect the liquid level meter again.

3. Re-install the oil return cover until the liquid level reaches the middle position of liquid level meter. Re-install the cover part to the original position.

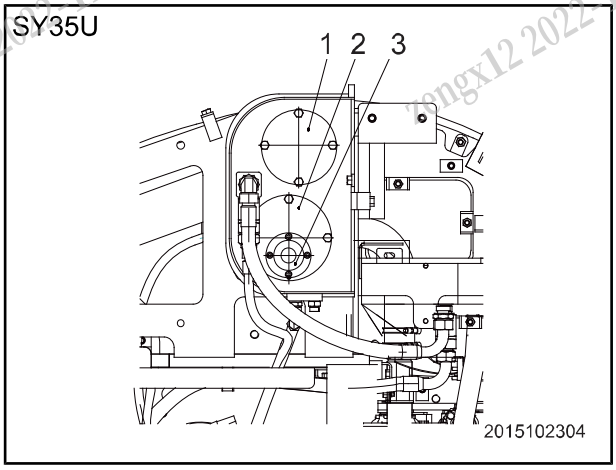
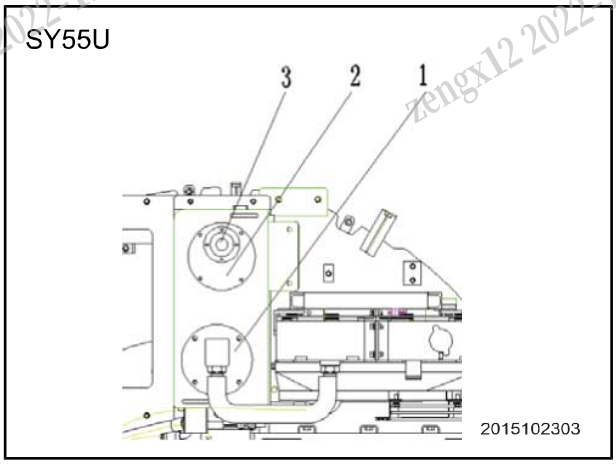


Fig.5-9



(1) Oil return cover (2) Oil suction cover
(3) Breather valve

Fig.5-10

5.1.2.5 Inspect the electric circuit

⚠ CAUTION

It is necessary to find out the reasons and repair immediately or contact with the authorized agent of SANY Heavy Machinery Co., Ltd. for repair if the fuse is blown frequently or there is any sign of short circuit.
It is necessary to keep the upper surface of storage battery clean, and inspect the vent hole on the storage battery cover; if the vent hole is blocked with the dirt or dust, it is necessary to wash the storage battery cover and clean the vent hole thoroughly.

Inspect whether the fuse is damaged or the capacity does not meet the specification, inspect whether the circuit is open-circuited or short-circuited, inspect whether the terminals are loose and tighten any loose parts.

Inspect particularly the circuits of “storage battery”, “starting motor” and “alternator”.

When performing walkaround inspection or inspection before starting, it is necessary to inspect whether there is flammable accumulating around the storage battery, and clean the flammables. Please contact with the authorized agent of SANY Heavy Machinery Co., Ltd. for the investigation of reasons and correction.

Inspection of Horn Functions

1. Turn the starting switch to the position [ON].

2. The horn will ring immediately if the horn button is pressed. If the horn could not ring, please contact with the authorized agent of SANY Heavy Machinery Co., Ltd..

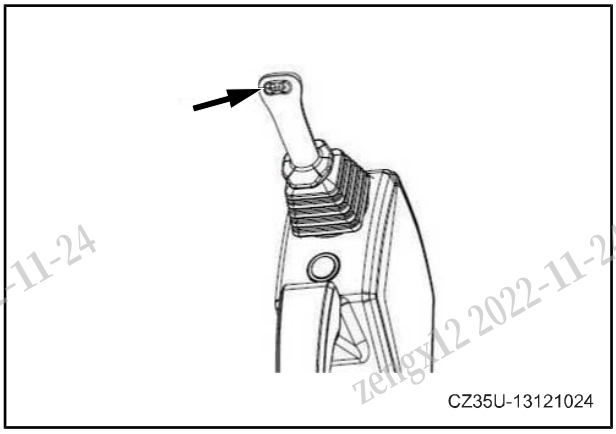


Fig.5-11

5.1.2.6 Inspect the water and sediment in the oil-water separator, and drain water

⚠ CAUTION

- The drainage knob is designed to left-hand thread; please operate according to the mark direction; please operate with hand and do not use vises and wrench for preventing the water drainage screw being damaged.
- After draining the water, it is necessary to bleed off the air in the fuel system for preventing the normal start of engine being influenced.

The oil-water separator may be used to separate the water and sediment mixed in the fuel oil. There is a float which will float up when it is filled up with water in the oil-water separator. Please drain the oil-water separator as per the following steps when there is water and sediment in the water collecting cup of oil-water separator.

- Loosen the bottom drainage knob at the bottom of oil-water separator with hand to drain the water.
- After draining the water, tighten the drainage knob with hand and ensure it not to leak oil and air.

SY35U

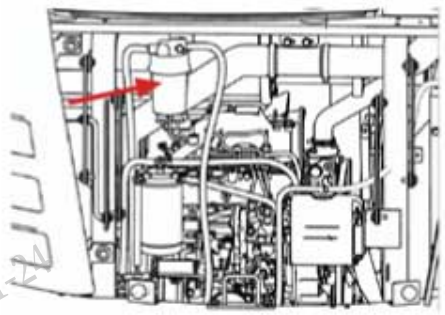


Fig.5-12

SY55U

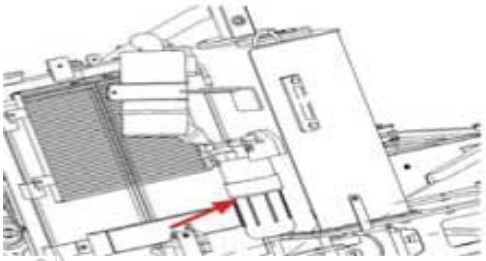


Fig.5-13

5.1.3 Adjustment before Operation

5.1.3.1 Seat Adjustment

The excavator is equipped with all-dimensional adjustable seat. The longitudinal and vertical positions of seat as well as the forward/backward tipping angle could be adjusted to ensure the operation comfort.

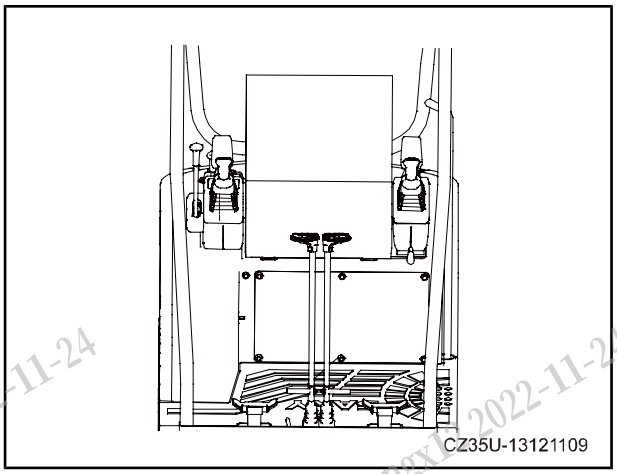


Fig.5-14

1. **Longitudinal Adjustment of Seat**

The adjustment of longitudinal position of seat is controlled with double-layer sliding rails and the longitudinal stroke reaches 100mm. The operator may adjust the seat according to his body shape to the exent that he could operate the excavator to complete all kinds of actions comfortably.

Sit on the seat, pull up the adjusting rod in front of the seat, push the seat forwards or backwards, adjust to an appropriate position and loosen the adjusting rod to fix the seat.

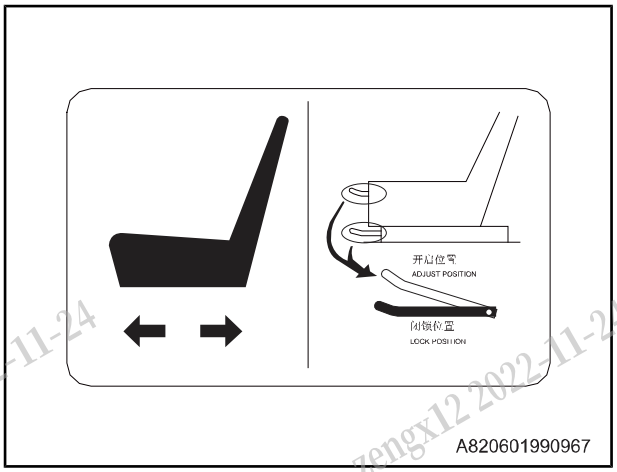


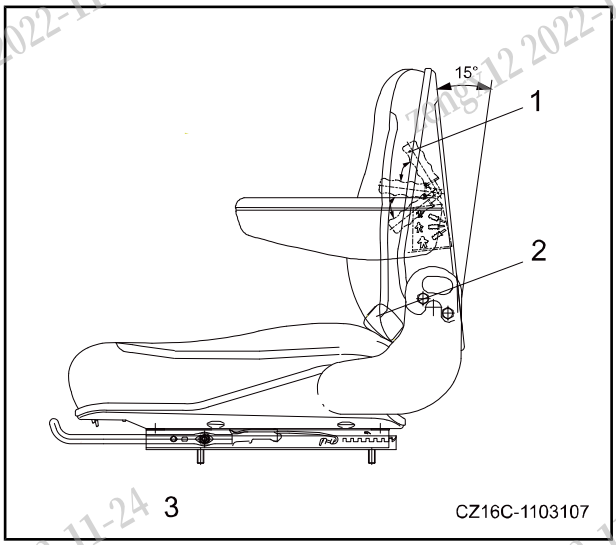
Fig.5-15

2. **Adjustment of Backrest**

Pull up the adjusting rod on the left lower part of the backrest, adjust the backrest forwards or backwards to an appropriate angle directly, loosen the adjusting rod- the backrest will be fixed automatically for obtaining appropriate seat backrest angle.

Weight Bearing Adjustment

Adjust the weight bearing handle, without weight bearing adjustment plate. The weight bearing handle may be adjusted to the scale corresponding to the body weight of different operating personnel.



(1) Weight bearing adjustment handle

(2) Rear backrest adjusting rod

(3) Longitudinal adjustment pull rod for seat

Fig.5-16

5.1.3.2 Adjustment of rearview mirror

Loosen the nut [1] and bolt [2] fixing the mirror, and adjust the position of the mirror to provide the best view from the operator seat in the blind area to the left and right sides behind the excavator.

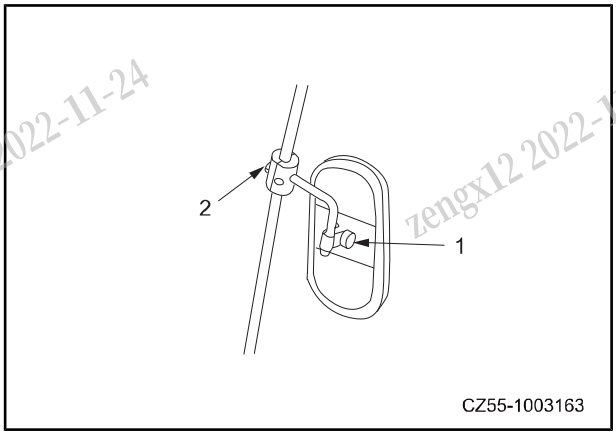


Fig.5-17

5.1.3.3 Seat Belt

⚠ CAUTION

- Before inspecting the seat belt, it is necessary to inspect whether there are any problems on the seat belt and its mounting seat; replace if it is worn or damaged.
- It is necessary to replace the seat belt every 3 years if having not found any problems. The production date of seat belt is marked on the back of the seat belt.
- Be sure to fasten the seat belt when operating. Do not twist the seat belt when fastening it.

The seat belt is equipped with retractor; thus, it is unnecessary to adjust the length.

1. Fasten the seat belt.
Hold the seat belt clamp [2] and pull out the seat belt from the retractor [1]. Confirm that the seat belt has not been twisted, and then insert the locking tongue [3] into the locker [4]. Pull the seat belt gently to confirm whether it is locked firmly.

2. Loosen the seat belt
Press the red part on the locker [4] the locking tongue [3] will pop out automatically from the locker [4].

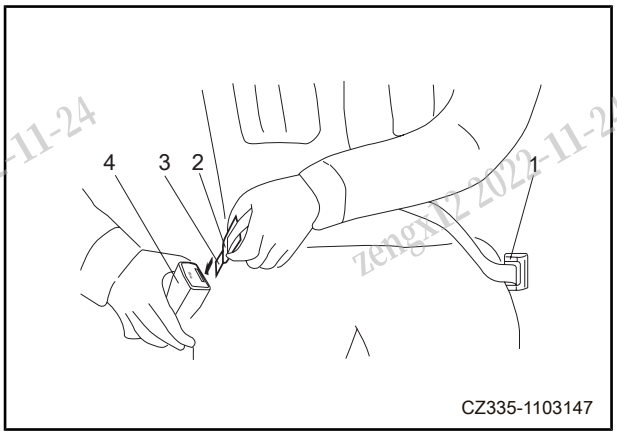


Fig.5-18

5.1.4 Operation before engine start

⚠ WARNING

- Inspect whether the safety locking lever is fixed on the locking position when starting the engine.
- The working device would move suddenly and result in serious accidents when the control lever is touched accidentally if the control lever has not been locked and the engine is started.
- It is necessary to place the safety locking lever on the locked position no matter whether the engine is running when the operator stands up from his seat.

1. Inspect whether the safety locking lever is on the “locked” position.

2. Inspect whether the control levers and foot bars are on the “neutral” positions. They shall be on the “neutral” positions when the control levers or foot bars are not contacted.

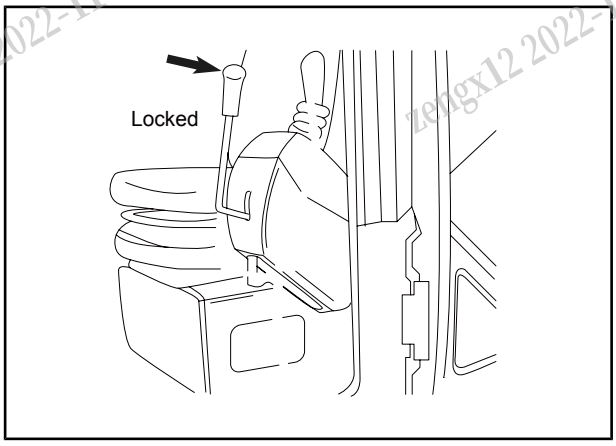


Fig.5-19

3. Insert the key into the starting switch, turn the key to the position ON and then perform the following inspections:

- Engine coolant thermometer
- Fuel oil level meter
- Trouble code

The home screen will be displayed in normal state about 2s after the starting key is turned to the position ON.

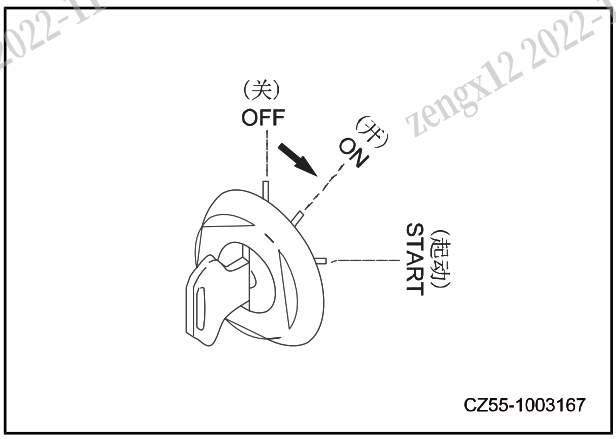


Fig.5-20

5.2 Start Engine

5.2.1 Normal Starting

⚠ WARNING

- It is allowed to start the engine only when the driver sits on his seat.
- Do not start the engine by short-circuiting the starting circuit of engine. Otherwise, it would lead to serious personal injuries or fire hazard.
- Confirm that there is no person or barrier in the surrounding area, then ring the horn and start the engine.
- Do not use start assistant liquid as it would explode.
- The exhaust gas is toxic. It is necessary to keep good ventilation when starting the engine in the confined space.

- Before starting the engine, inspect whether the throttle control knob is on the low idle (MIN) position. If the throttle control knob is on the full speed (MAX) position, the engine will accelerate suddenly and the engine parts will get damaged when it is started.
  Do not hold the starting switch key on the starting position by more than 10s. It is necessary to wait at least 30s before re-starting if failing to start successfully; it is necessary to wait at least 3 minutes before re-starting if failing to start the engine successively in three times according to the previous operations.
- After starting the engine, it is necessary to operate until the engine oil pressure value is within the normal scope. Do not operate the control lever or foot bar when the engine oil pressure is abnormal.

1. Inspect whether the locking lever is on the “locked” position. If the locking lever is on the “released” position, the engine will be unable to be started.

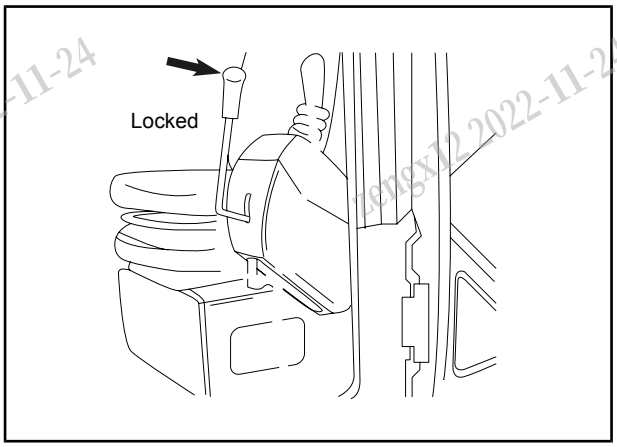


Fig.5-21

2. Turn the starting key to the position ON and ring the horn to inspect whether it is powered on and to warn the people around.

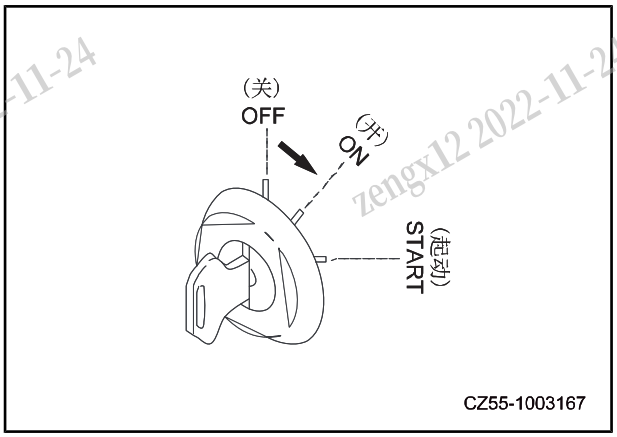


Fig.5-22

3. Turn the control knob to the low-speed no-load position.

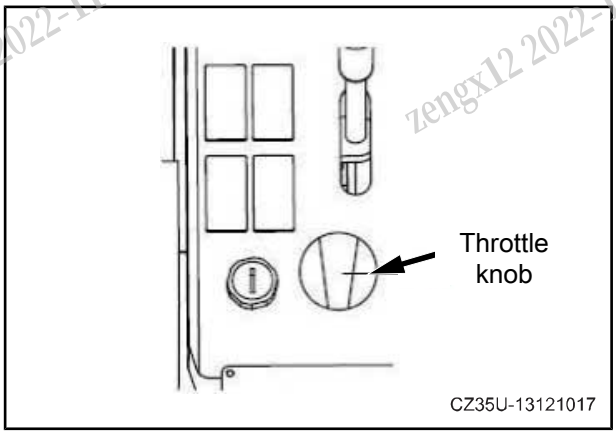


Fig.5-23

4. Turn the starting switch to the position START to start the engine. release the key-the switch will return to the position ON.

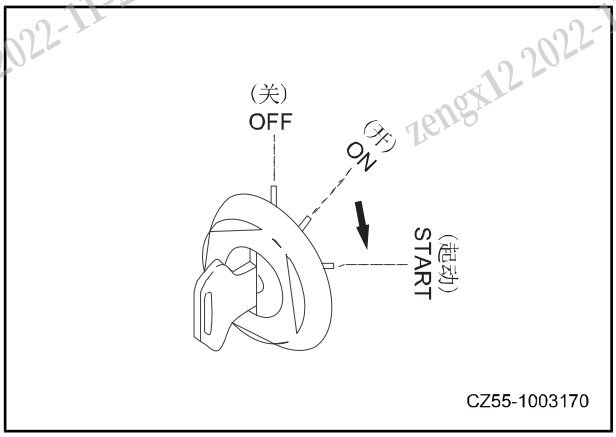


Fig.5-24

⚠ CAUTION

- Prevent the starter being damaged!
- Do not operate the starting motor by over 10s each time for preventing the starter being damaged. If the engine could not be started, turn the key switch to the position OFF, wait 30s and then re-try. The starter will be damaged, if the key switch is turned before the engine stops after failing in the start.
- It is normal phenomenon if the idle speed of engine is too high in hot weather, and it is unnecessary to repair.

5.2.2 Start Engine in Cold Weather

⚠ WARNING

- Confirm that there is no person or barrier in the surrounding area, then ring the horn and start the engine.
- Do not use start assistant liquid as it would explode.

The engine will preheat the air intake system automatically in cold weather. Operate as per the following steps:

1. Turn the starting switch to the position ON.

2. It indicates that the preheating has been completed and it is allowed to start the engine after the preheating indicator light on the display screen goes out.

3. Inspect whether the instruments and indicator lights are normal after starting the engine.

- When the temperature is lower than 0℃, it is necessary to idle the engine at least by 5 minutes at low speed to preheat the engine.
- When the temperature is lower than -18℃ or the hydraulic functions are sluggish; it may require longer preheating time.

5.2.3 After Starting Engine

⚠ WARNING

- It is necessary to turn the starting switch key to the position OFF if there are any abnormal situation or troubles.
- If the working device is operated before the excavator has been fully preheated, the response of working device to the control lever will be slow, and the working device could not move according to the demand of the operator. Therefore, it is necessary to preheat the excavator. Particularly in cold region, be sure to implement preheating operation fully.

5.2.4 Running-in of New Excavator

⚠ CAUTION

- Before delivery, the excavator has been adjusted and tested thoroughly by SANY. However, the performance of excavator will be adversely influenced and the service life of the excavator will be shortened if the excavator is operated under severe conditions at the beginning.
- In the first 100 hours (as per the indication of the hour meter), it is necessary to perform running-in operation. During the running-in, it is necessary to observe the precautions required in this Manual.

During excavator running-in, pay attention to the following points:

1. Keep idle running by 15s after starting the engine. During this period of time, do not operate the control levers or throttle control knob.

2. Keep idle running by 5 minutes after starting the engine.

3. Avoid operating with heavy load or at high speed.

4. Avoid starting, accelerating, turning or stopping suddenly except for emergency.

5. Observe the operation of engine carefully; limit the engine power within 80% of the full load in economic mode when operating the excavator.

6. Be particularly careful at the first 50 hours until you could feel and are fully familiar with the sound of the excavator.

7. Prevent the engine running with no load for long time.

5.2.5 Preheating Operation

⚠ WARNING

- Turn the starting switch key to the position OFF to turn off the engine under emergency, or the engine operations is abnormal or there are other troubles.
- Do not operate the control lever or pedal suddenly when the hydraulic oil is at low temperature. Be sure to perform the preheating operations until the hydraulic oil temperature rises up to an appropriate temperature.
- The excavator might not respond or might act rapidly suddenly when the control lever is operated if it has not been preheated fully, which would lead to serious accident. Particularly in the cold region, it is necessary to preheat the excavator thoroughly.
- Before the preheating operation is completed, neither increase the engine speed suddenly nor operate the engine continuously at low speed or high speed by over 20 minutes; otherwise, the oil will leak from the oil supply pipe of turbocharger, and even it might cause fire hazard. It is necessary to apply load from time to time or operate the engine at medium speed if having to idle the engine.

Do not start operating immediately after starting the engine, but it is necessary to perform the following operations and inspections:

1. After starting the engine, cancel the automatic idle mode and adjust the control knob to let the engine without load operate at low speed (SY35U:1,300-1,400r/m; SY55U:1,200r/m) by about 5 minutes.

2. Adjust the control knob to let the engine operate at medium speed (SY35U:1,500r/m; SY55U:1,600r/m), and then operate the bucket slowly by 5 minutes.

3. Adjust the control knob to let the engine operate at high speed, and operate the boom, bucket rod and bucket by 5-10 minutes.

4. Perform several complete operations for the actions of crawler hydraulic excavator to finish the preheating of excavator. At the end of preheating, inspect whether the indications of instruments are normal.

5. Inspect whether the exhaust gas color, noise or vibration is abnormal; repair timely if finding any abnormal situation.

6. Select appropriate operating mode according to the working condition.

5.3 Turn off Engine

1. Park the excavator on the level ground.

2. Lower the bucket to the ground.

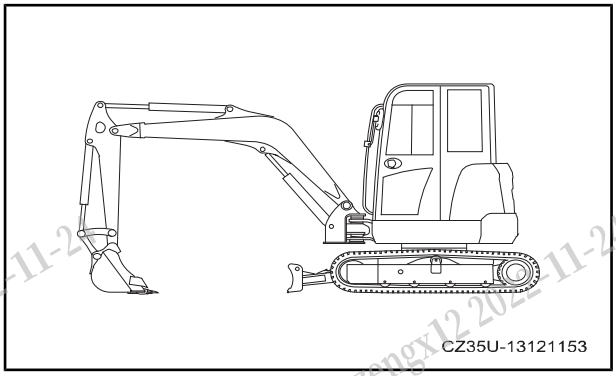


Fig.5-25

3. Turn the throttle control knob to the low-speed no-load position, and operate the engine by 5 minutes to cool down the engine.

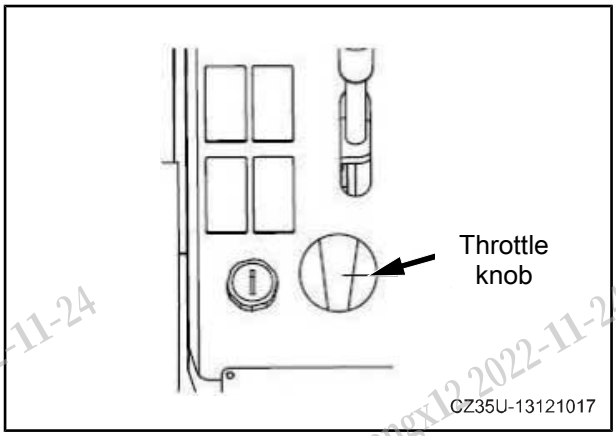


Fig.5-26

4. Turn the key to the position OFF, and take down the key from the switch. Pull the safety locking lever to the locked position.

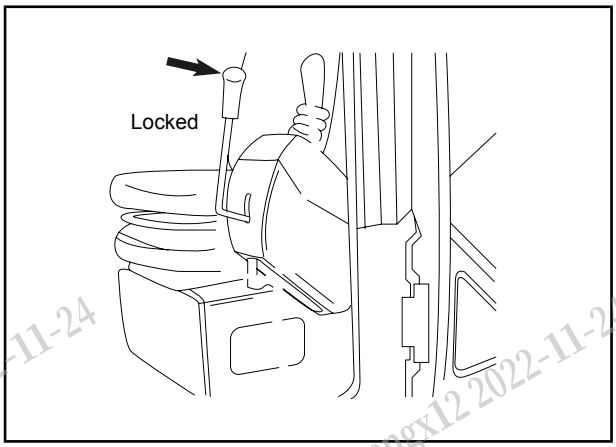


Fig.5-27

⚠ CAUTION

- The service life of engine will be shortened greatly if the engine is turned off suddenly before it cools down. Do not turn off the engine suddenly except for emergency.
- Do not turn it off suddenly particularly when it is overheated; it is necessary to idle the engine at low speed until it cools down, and then turn off the engine.

Inspections after Turning off Engine

1. Perform walkaround inspection for the excavator, inspect the working device, excavator appearance and undercarriage, and inspect whether there is any oil leakage or water leakage. Repair if finding any abnormal situation.

2. Fill fuel oil in the fuel oil tank.

3. Inspect whether there are scraps of paper or chippings in the engine compartment; it is necessary to clean the scraps of paper or chippings for avoiding fire hazard.

4. Clean the mud attached on the undercarriage.

5.4 Movement of Excavator

5.4.1 Precautions when Moving Excavator

Turn the throttle control knob clockwise to the high-speed position to increase the engine speed.

Inspect the direction of track frames before operating the steering control lever.

The operation of running control lever will be opposite if the driving wheels are ahead.

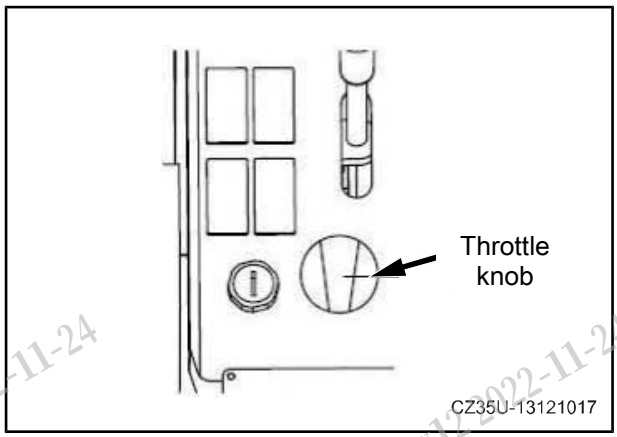


Fig.5-28

⚠ WARNING

- When moving the excavator, ensure that the area around is safe and ring the horn before moving.
- Do not let any person enter the area around the excavator.
- Clean all the barriers on the running route of the excavator.
- The area behind the excavator is a blind area. Therefore, be particularly careful when running backwards.
- With regard to the excavator equipped with running warning device (optional), it is necessary to inspect whether the warning device is normal.

⚠ CAUTION

- Standard running position: The guide wheels are in the front of the excavator and the running motor is in the rear. If the running motor is in the front, the control direction for running foot bar will be opposite to the running direction of excavator.
- It is necessary to verify the position of running motor before running.
- When traveling for long distance, it is necessary to rest by 5 minutes every 20 minutes for protecting the traveling motor being damaged; for operating stability, the damper is installed on the. In the cold weather, the operating force of traveling lever will increase; at that moment, it is necessary to operate the traveling control lever by several times when the safety locked traveling lever is on the locked position.

5.4.2 Drive Excavator with pedal

1. Running forwards

Push down the part A of two foot bars.

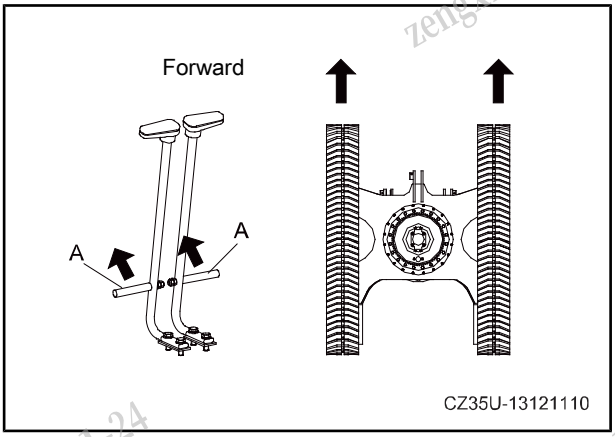


Fig.5-29

2. Turn right

Push down the part A of left foot bar.

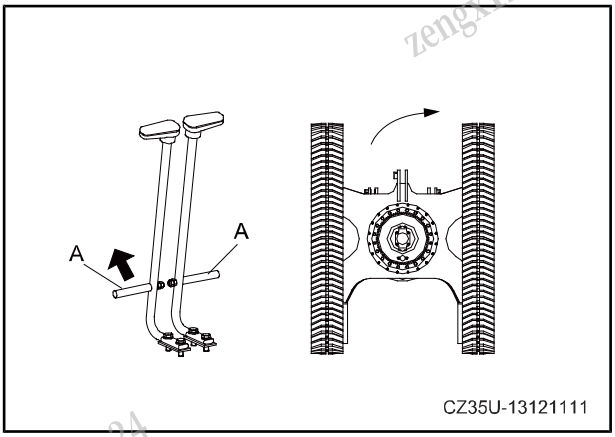


Fig.5-30

3. Turn left

Push down the part A of right foot bar.

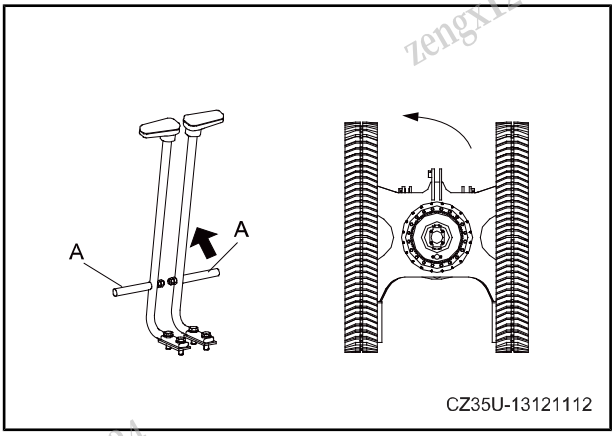


Fig.5-31

5.4.3 Drive Excavator with Control lever

1. Running forwards

Push both running control levers forwards.

2. Running backwards

Pull both running control levers backwards.

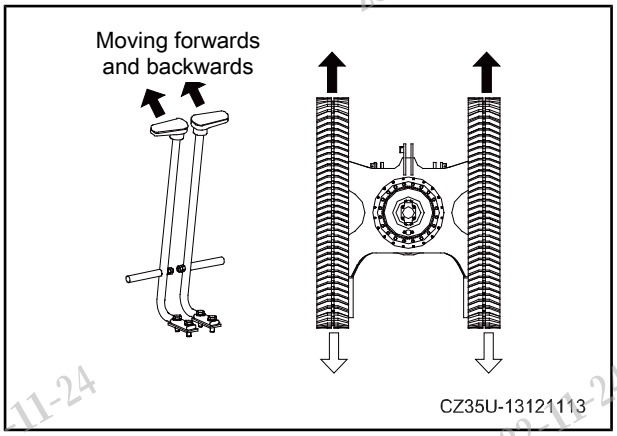


Fig.5-32

3. Turn right

Push the left running control lever forwards.

4. Turn left

Push the right running control lever forwards.

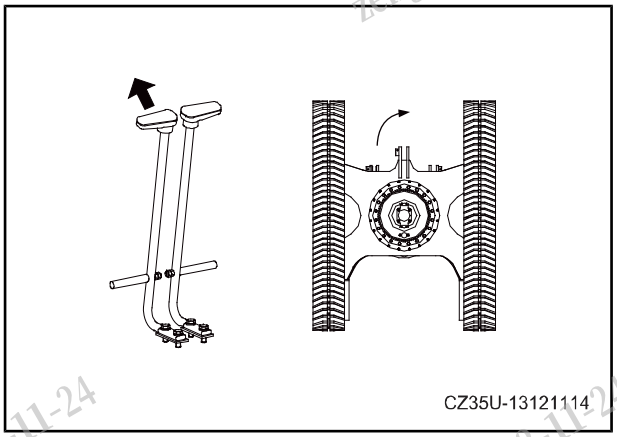


Fig.5-33

5. Spot turn (self rotation)

Push one running control lever to the front part while pull another control lever to the rear part.

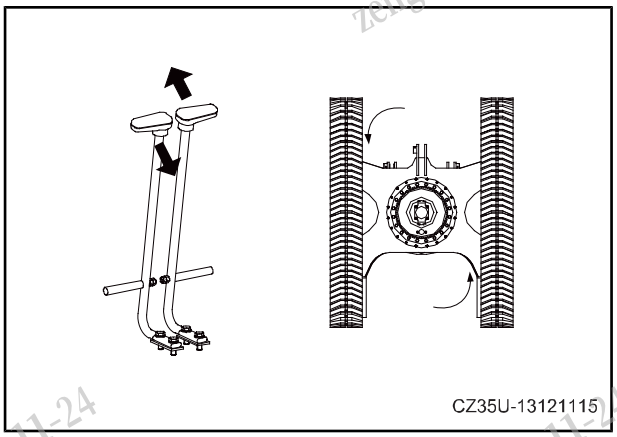


Fig.5-34

5.4.4 Stop Excavator

Place the left and right traveling control levers on the neutral positions; the traveling brake will be in the brake state automatically and the excavator will be stopped.

Avoid stopping the excavator suddenly.

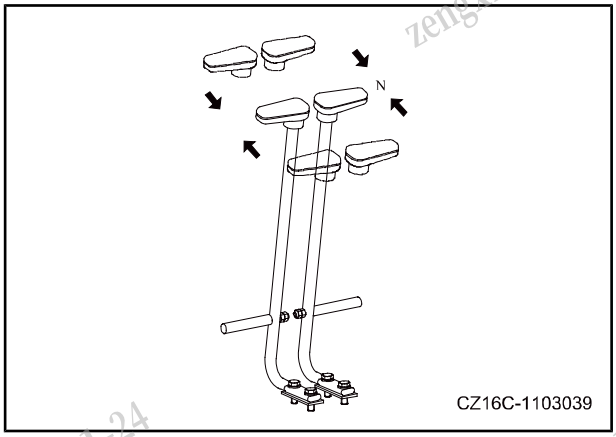


Fig.5-35

5.5 Control and Operation of Working device

5.5.1 Overview

Operate the working device with control lever.

The control lever will return to the neutral position and the working device will stay on that position when the control lever is released.

1. Bucket rod control

Move the left control lever for working device forwards or backwards to operate the bucket rod.

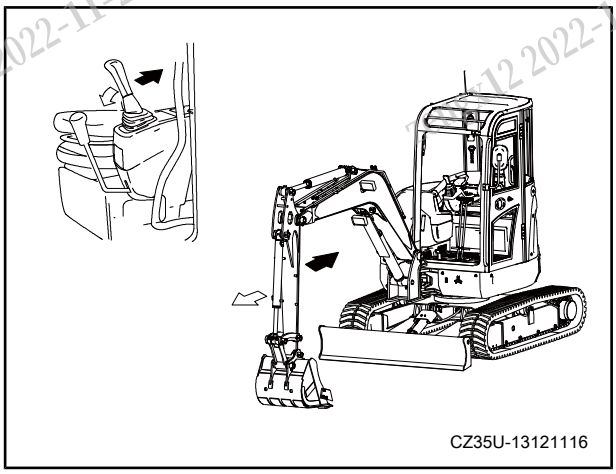


Fig.5-36

2. Slewing control

Move the left control lever for working device leftwards or rightwards to slew the superstructure.

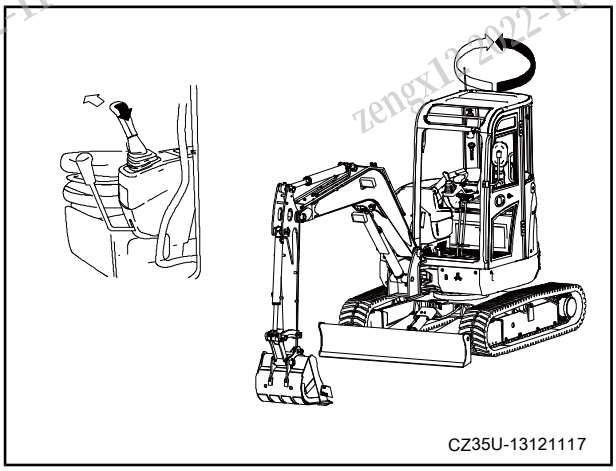


Fig.5-37

3. Boom control

Move the right control lever for working device forwards or backwards to operate the boom.

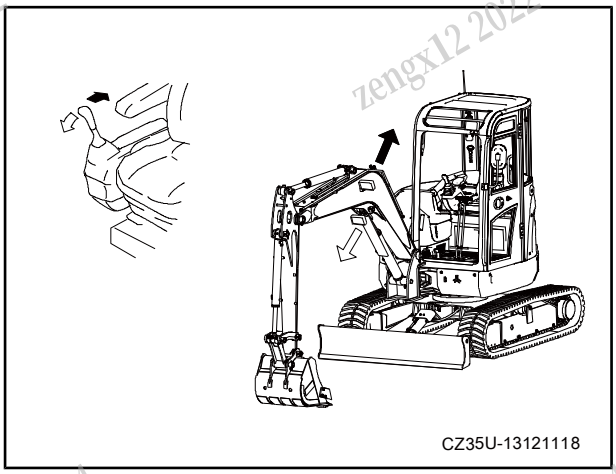


Fig.5-38

4. Boom deflection control (except for fixed boom)

Push down the boom deflection pedal leftwards or rightwards.

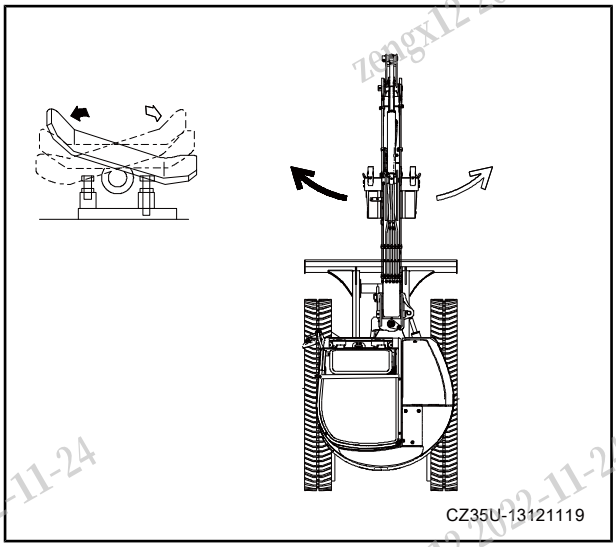


Fig.5-39

5. Bucket control

Move the right control lever for working device leftwards or rightwards to operate the bucket.

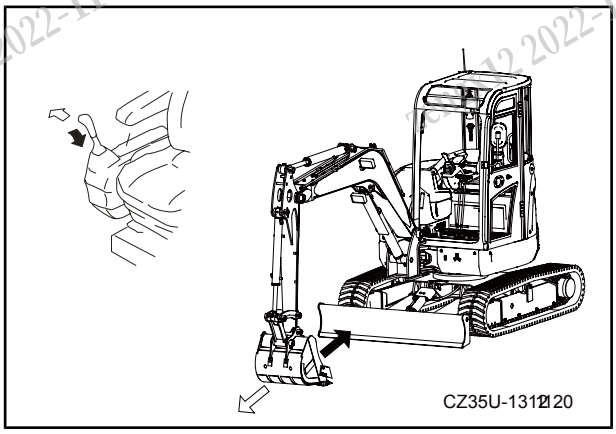


Fig.5-40

6. Dozer blade control

Push forwards or pull backwards the dozer blade control lever to operate the dozer blade.

⚠ CAUTION

- Be particularly careful when operating if having to operate the control lever for working device when the excavator is running.
- The engine speed will increase suddenly if any control lever is operated when the excavator is at automatic idle speed; be carefully when operating.
- Lift the bucket by 20-30cm (8-12in) off the ground when running.
- Do not run backwards downslope.

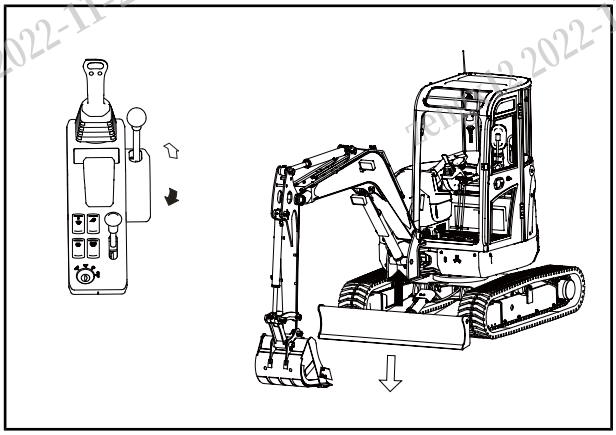


Fig.5-41

5.5.2 Prohibited Operations

1. Prohibit to operate with the slewing force

Do not compact the ground or break the object with slewing force. It will be not only very dangerous but will shorten the service life of the excavator obviously.

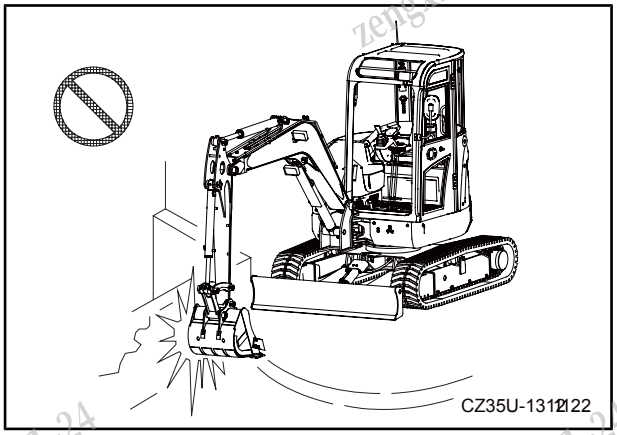


Fig.5-42

2. Prohibit to operate with the running force

Do not insert the bucket into the ground and excavate with the traveling force. Otherwise, the excavator and working device will be damaged.

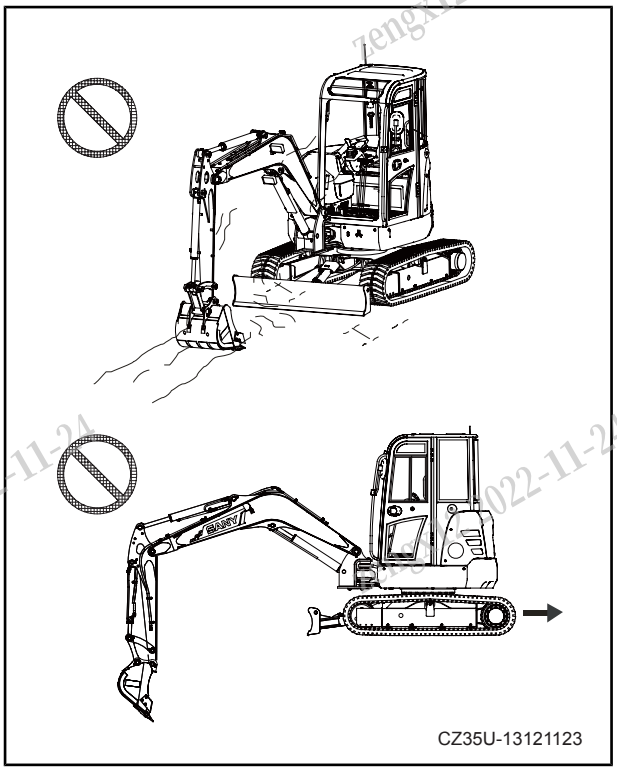


Fig.5-43

3. Prohibit to operate with the end of hydraulic cylinder stroke

The external force will impact the working device and damage the hydraulic cylinder if the cylinder is used when the cylinder piston rod has been extended to the end of the stroke in the operating process.

Avoid such operation when the hydraulic cylinder is retracted fully or extended fully.

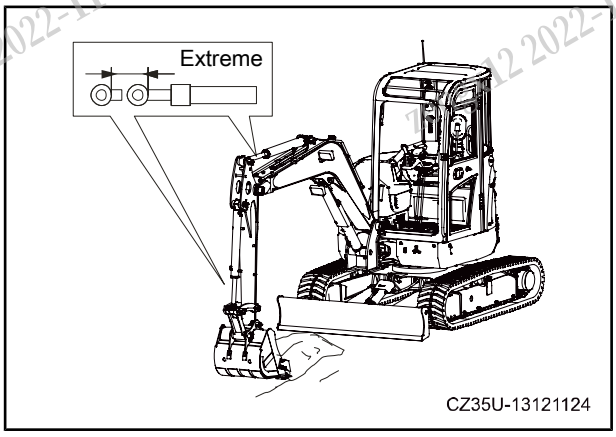


Fig.5-44

4. Prohibit to operate with the descending force of bucket

Do not use the descending force of excavator for digging or use the descending force of bucket for picking, breaking or piling. Otherwise, it will shorten the service life of excavator obviously.

For preventing the hydraulic cylinder being broken, it is not allowed to knock the ground or tamp with the bucket when the bucket cylinder is fully extended (the bucket is fully retracted).

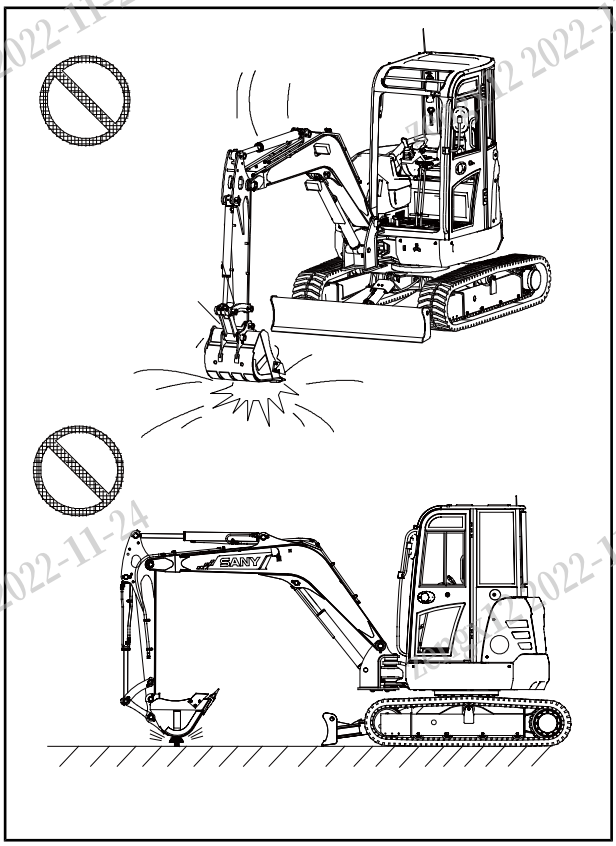


Fig.5-45

5. Prohibit to operate in virtue of the descending force of excavator

It is not allowed to lift up the rear part of the excavator and use the descending force of excavator as additional digging force; otherwise, it would lead to serious damages to the excavator.

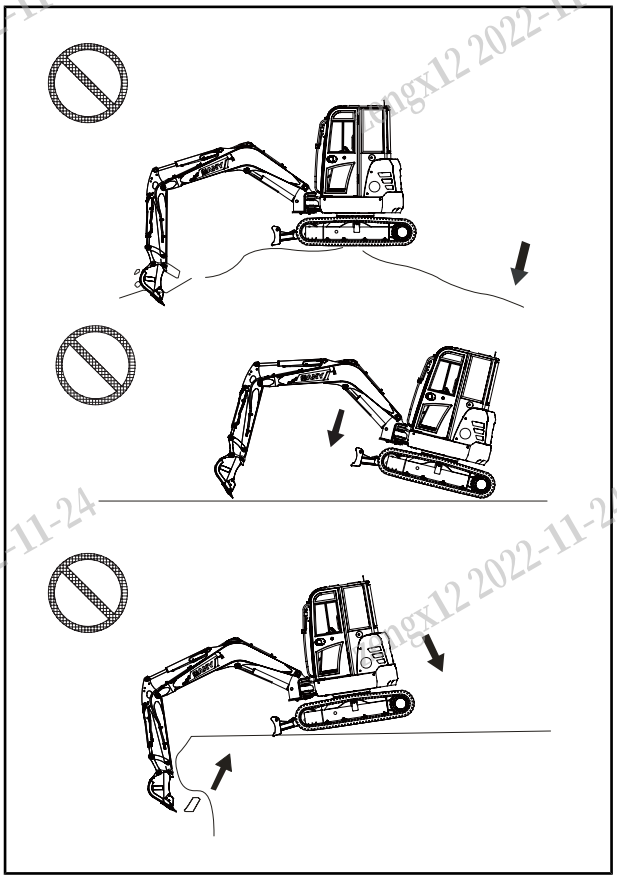


Fig.5-46

6. Excavate Hard Rocky Ground

It is preferable to break with other methods, and then excavate. In this way, it will reduce the damage to the excavator, and be more economic.

Do Not Change to High Speed Mode Suddenly

1) Do not change over the control lever because it would be started suddenly.

2) Avoid changing the control lever from forward gear to reverse gear (or change from reverse gear to forward gear).

3) Avoiding changing the control lever suddenly such as stopping suddenly at high speed (release the control lever).

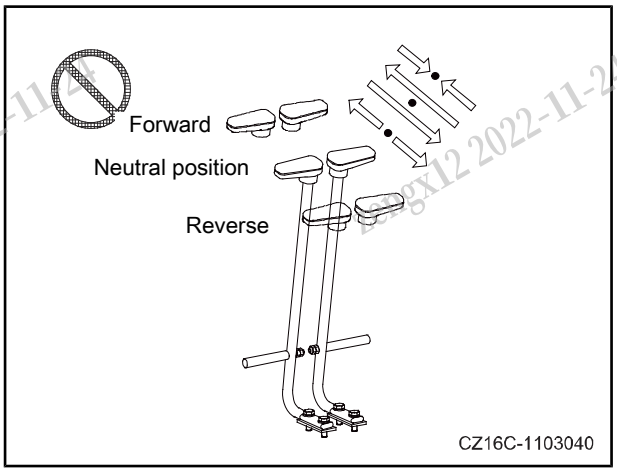


Fig.5-47

7. Prevent Collision of Dozer Blade

Prevent the dozer blade colliding against the stones or road shoulders. Otherwise, it would lead to early damages to the dozer blade or cylinders.

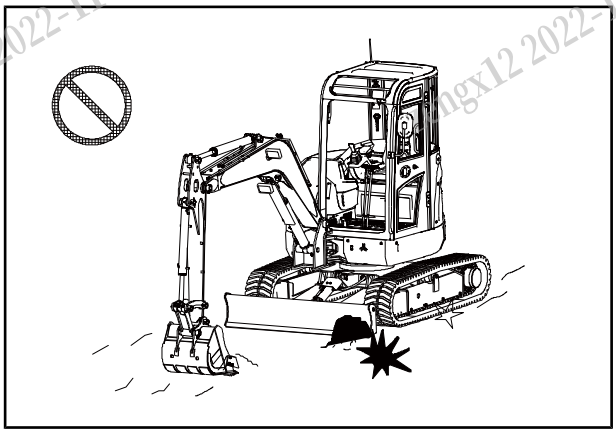


Fig.5-48

8. Support Dozer Blade on Both Sides

Do not support the excavator on one end of the dozer blade when using the dozer blade is used as the outrigger.

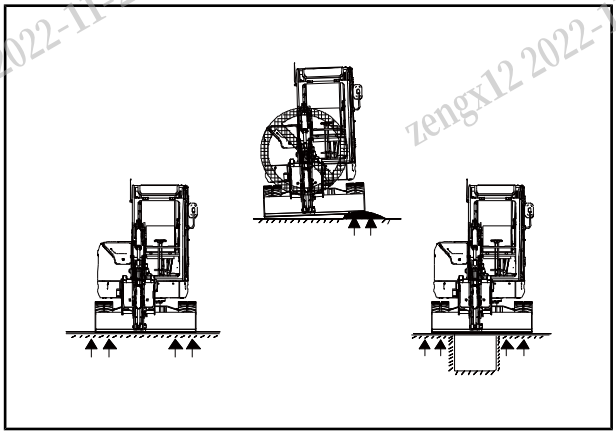


Fig.5-49

5.5.3 General Operation Instructions

5.5.3.1 Traveling

⚠ CAUTION

When driving, slewing or operating the excavator in the confined space, it is necessary to arrange a signalman. Before starting the excavator, it is necessary to unify the signals.

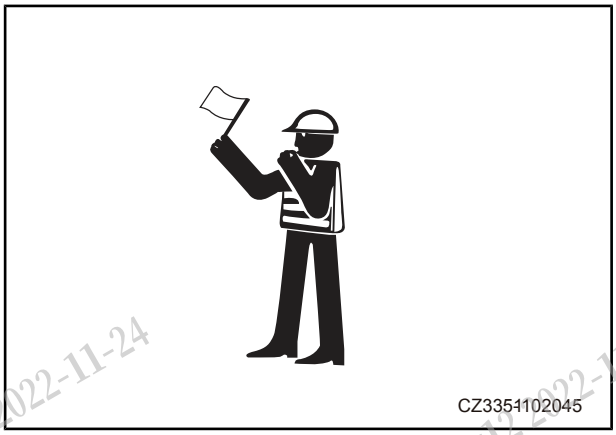


Fig.5-50

1. Before driving the excavator, it is necessary to confirm whether the driving direction is consistent with the traveling control pedal/lever. When the traveling motor is on the rear part, depress the traveling pedal or push the traveling control lever forwards to drive the excavator forwards.

2. Try to select level ground. Try to drive the excavator in straight line or change the direction slightly and gradually.

3. Prevent the excavator contacting with the electric wires and the edge of bridge.

4. When passing through the river, measure the depth of river water with the bucket and cross the river slowly. Do not cross the river if the water level is higher than the center of carrying wheel.

5. Reduce the engine speed when traveling on the uneven ground. select low traveling speed. Relatively low speed will reduce the possibility of excavator damage.

6. Avoid any operations which might damage the tracks and the components of tracks on undercarriage.

7. If the excavator is equipped with rubber tracks, it is prohibited to drive or slew the excavator on the pavement which is covered densely with detritus, is rugged and rough or is covered with rebar ends and broken iron sheet for preventing the tracks being scratched or damaged.

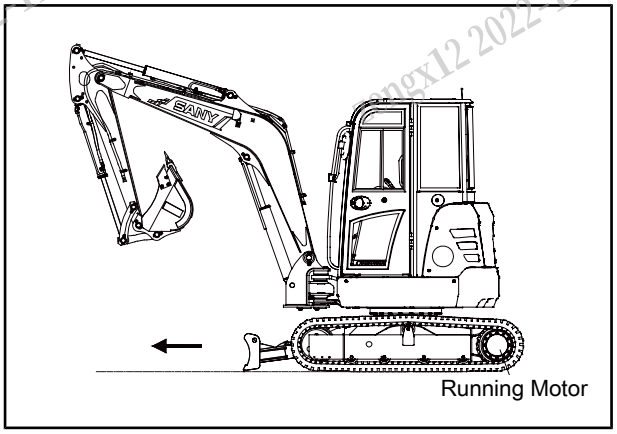


Fig.5-51

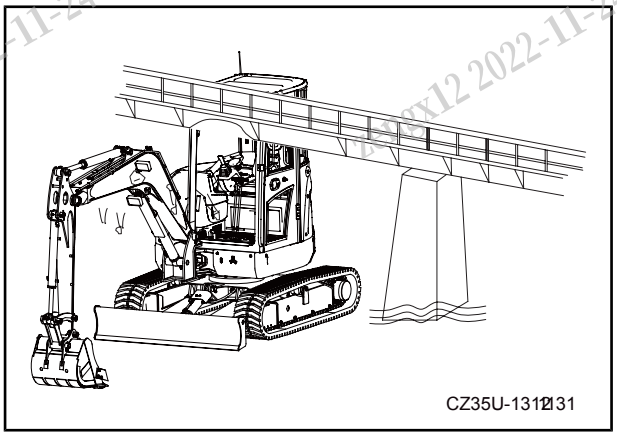


Fig.5-52

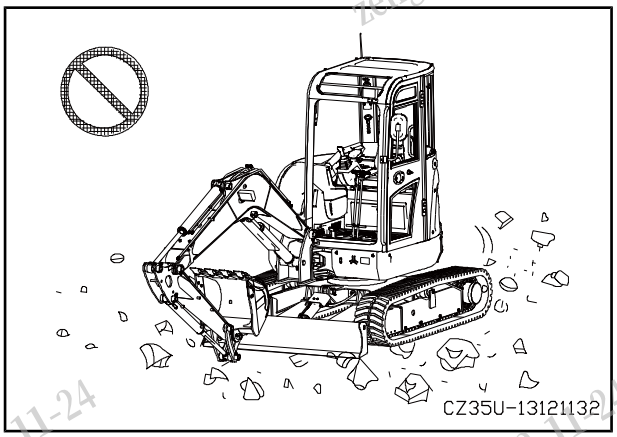


Fig.5-53

8. If the excavator is equipped with rubber track, it is prohibited to drive the excavator on the river bed or the ground covered with soft stones for preventing the tracks slipping or being damaged by the stones stuck.

9. It is prohibited to use the excavator by the sea. The salt in the seawater will corrode the tracks.

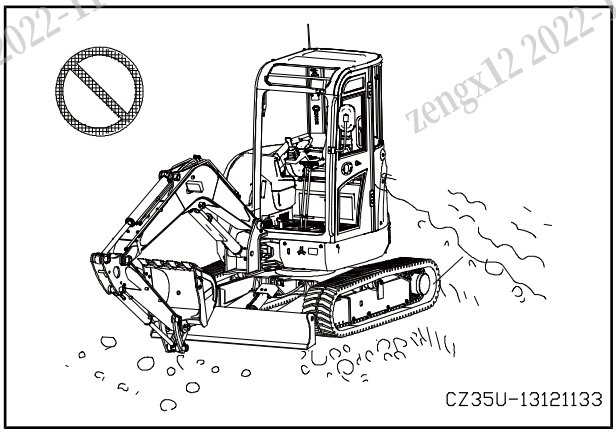


Fig.5-54

10.If the excavator is equipped with rubber tracks, it is necessary to prevent the fuel oil, engine oil, salt and chemical solvent contacting with the track shoes. Those substances will corrode the metal core and rubber surface of the tracks so that the tracks will be rusted and peeled off. It is necessary to wash immediately with water once contacting with such substances.

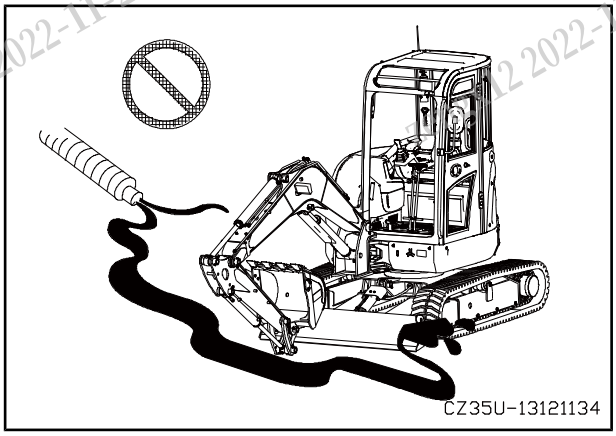


Fig.5-55

11.It is prohibited to drive the excavator on the pavement which is just covered with the asphalt, the pavement on which there is open flame or the burning hot steel plate under sunlight for preventing abnormal wearing or damages the tracks.

12.It is prohibited to perform earthwork in the places where the rubber tracks would slip easily. Otherwise, it would accelerate the track wearing.

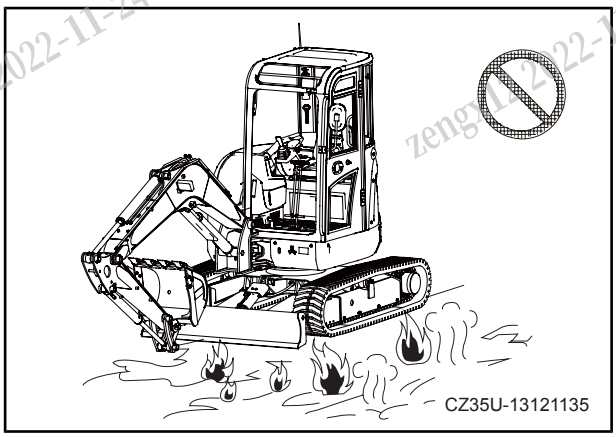


Fig.5-56

5.5.3.2 High-speed Traveling

It is necessary to run at low speed on the uneven roadbed such as stone roadbed or uneven road on which big stones are scattered.

It is necessary to set the guide wheel to forward direction when traveling at high speed.

5.5.3.3 Allowable Water Depth

⚠ CAUTION

If the tilting angle of excavator exceeds 15° when the excavator is driven out of the water, the rear part of the superstructure will be immersed in the water, and the water will be splashed by the radiator fan so that the radiator fan will be damaged. Be particularly careful when driving the excavator out of the water.

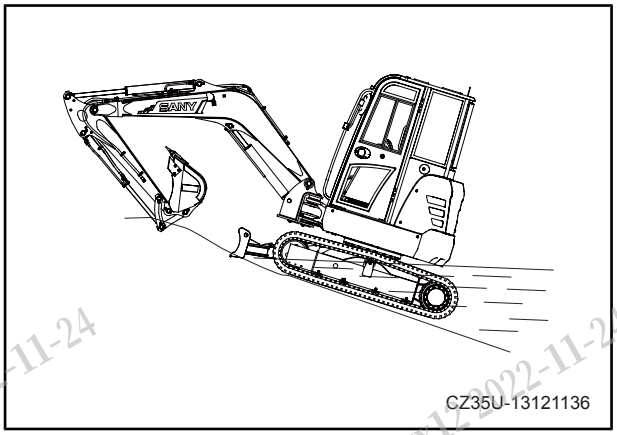


Fig.5-57

1. Do not drive the excavator in the water with the center [1] of carrying wheel immersed in the water.

2. Apply grease on the parts immersed in the water for long time until the used grease has been squeezed out fully (particularly the area around the bucket pin).

3. Confirm that the foundation of the working area is strong enough and prevent the excavator sinking, resulting in the water level higher than the centerline of carrying wheel.

4. It is necessary to inspect the position of the excavator when operating in such environment. Update and adjust the position of the excavator if necessary.

5. Prevent the slewing bearing, slewing gear and central slewing connector being immersed.

6. If the slewing bearing, slewing gear and central slewing connector are immersed, it is necessary to remove the drain plug to drain the mud and water, sweep the slewing area and install the plug. Lubricate the inside engaged gear and slewing bearing.

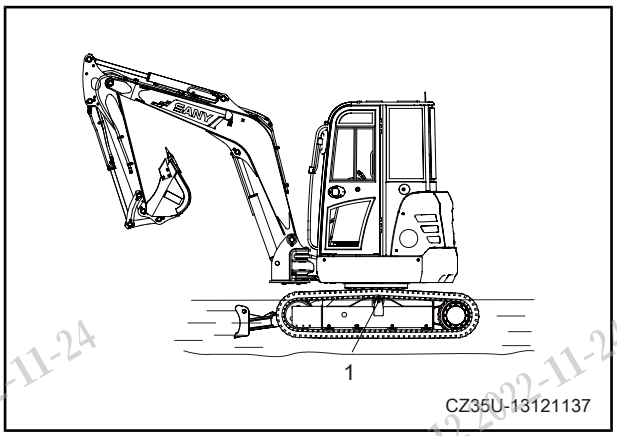


Fig.5-58

5.5.4 Traveling on Slope

5.5.4.1 Overview

Be sure to operate or drive the excavator with the following proper method. In this way, the excavator could be parked safely even when the excavator slips or becomes instable.

⚠ WARNING

- When operating on the slope, the excavator might lose balance and tip over if making turns or operating the working device; thus, it is necessary to avoid such operations.
- It would be very dangerous if slewing toward the downslope direction when the bucket is loaded. It is necessary to stack a platform with soil on the slope if having to perform such operation so that the excavator could keep level when operating.
- Do not drive the excavator on the abrupt slope. Otherwise, it might tip over.
- Do not run backward down the slope.
- Do not make turns on the slope or run across the slope; it is necessary to drive to a level ground before performing such operations. Although the distance might be longer, but it could be safer.
- When the track shoes slide or the excavator could not climb the slope with the force of the tracks when traveling on the upslope, it is not allowed to climb the slope with the help of the pull of the bucket. Otherwise, the excavator may be damaged.

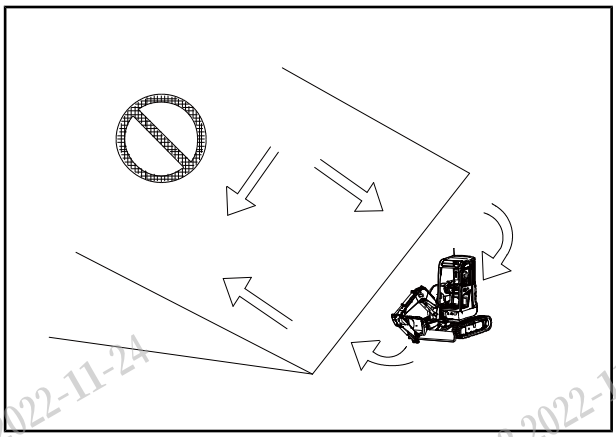


Fig.5-59

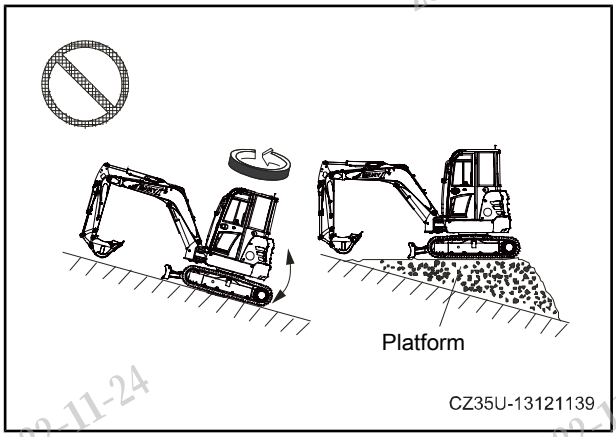


Fig.5-60

1. When driving down abrupt slope, keep low speed traveling with the traveling control lever and low throttle gear. When driving up or down on the abrupt slope with gradient more than 15°, it is necessary to adjust the working device to the state shown in the figure on the right and lower the engine speed.

Remarks:

The side with sprocket wheel shall be on the lower position when traveling downslope. Otherwise, the tracks will become loose, and jump off the teeth.

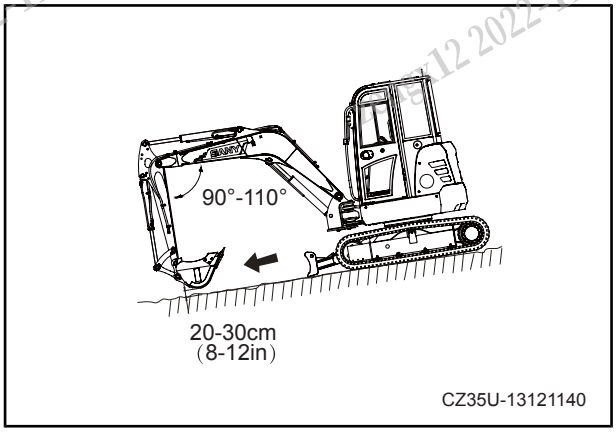


Fig.5-61

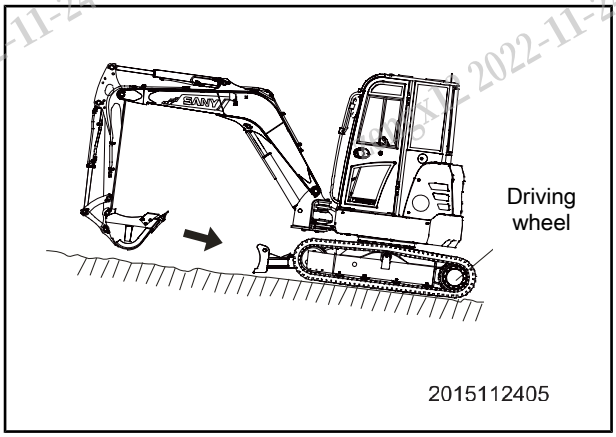


Fig.5-62

2. Adjust the working device to the state shown in the figure when climbing the abrupt slope with gradient over 15°.

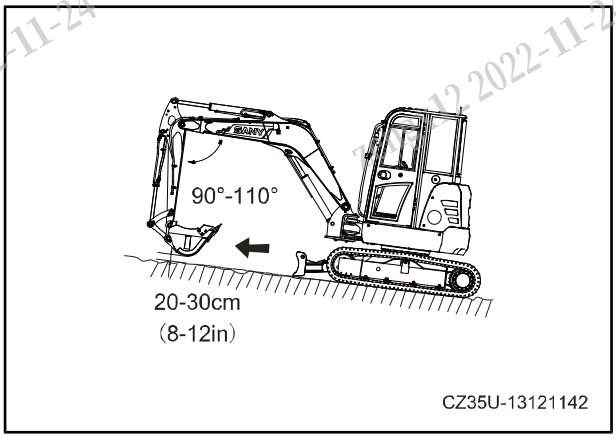


Fig.5-63

3. When driving on the abrupt slope, it is necessary to extend the working device forward, lift the working device off the ground by 20-30cm (8-12 in) and drive at low speed for keeping balance.

When driving downslope, it is necessary to engage the traveling control lever on the neutral position to brake the excavator. In this way, the brake will be applied automatically.

If the track shoes slide when traveling upslope, or the excavator could not climb on the slope with merely with the force of tracks, it is allowed to climb with the help of the pull of the bucket rod.

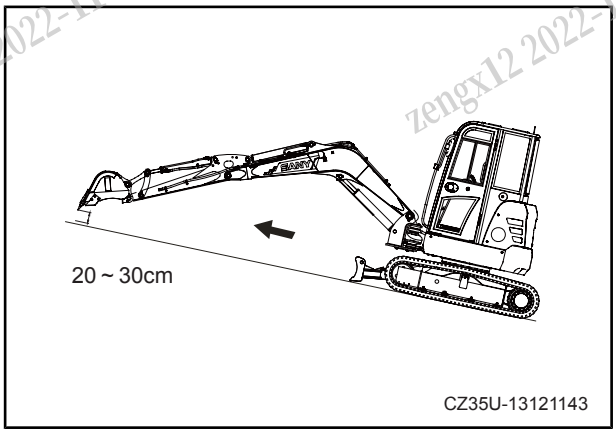


Fig.5-64

5.5.4.2 Precautions for Slope

The excavator might tip over on the uneven ground or the slope. For preventing the excavator tipping over, when operating on the uneven ground or the slope, it is necessary to:

- Reduce the engine speed.
- Select low speed traveling mode.
- Operate the excavator slowly, and pay attention to the movement of excavator.
- Do not try to take any materials in the bucket or lift any object when driving on the slope.
- The engine lubrication will be insufficient when the slope angle exceeds 30°.

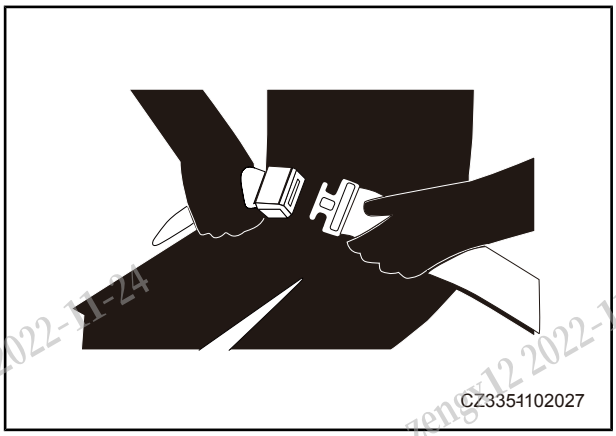


Fig.5-65

1. Do not try to drive the excavator upslope or downslope when the slope gradient is more than 30°. Do not try to run across the longitdinal slope with the gradient more than 15°.

2. Be sure to fasten the seat belt.

3. Do not try to make turns on the slope because the excavator might slide or tip over. It is allowed to make turns only on the very gentle and firm slope.

4. Try not to run across the slope; otherwise, the excavator might slide or tip over.

5. Avoid slewing the superstructure on the slope; do not try to slew the superstructure toward the downslope direction. Otherwise, the excavator might tip over. If having to slew to the downslope direction, it is necessary to operate the superstructure and boom carefully at low speed.

6. If the engine stops on the slope, it is necessary to lower the bucket to the ground immediately, place all control levers on the neutral positions and then re-start the engine.

7. Before climbing the slope, be sure to preheat the excavator fully. If the hydraulic oil has not been preheated fully, the function of the excavator may not be given into the best play.

8. Avoid crossing the slope. When driving on the slope, it is necessary to keep the tracks toward the upslope direction. When driving upslope or downslope, keep the bucket toward the traveling direction, and about 20-30cm (as shown by A) off the ground. If the excavator starts slipping or losing balance, lower the bucket immediately.

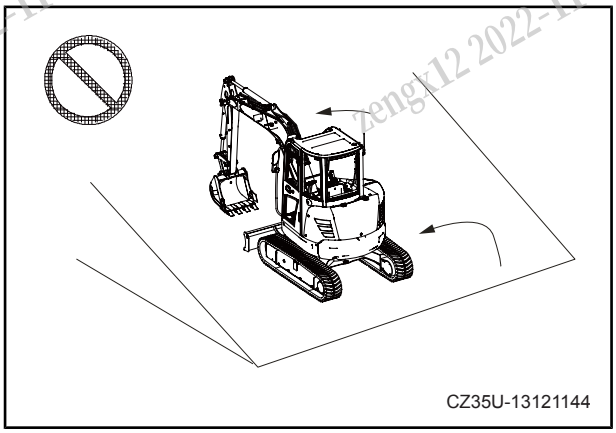


Fig.5-66

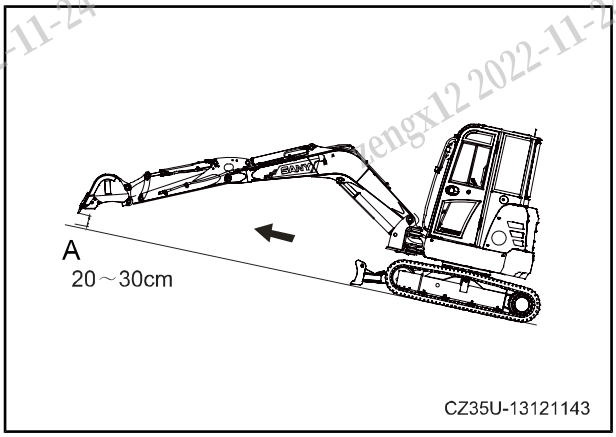


Fig.5-67

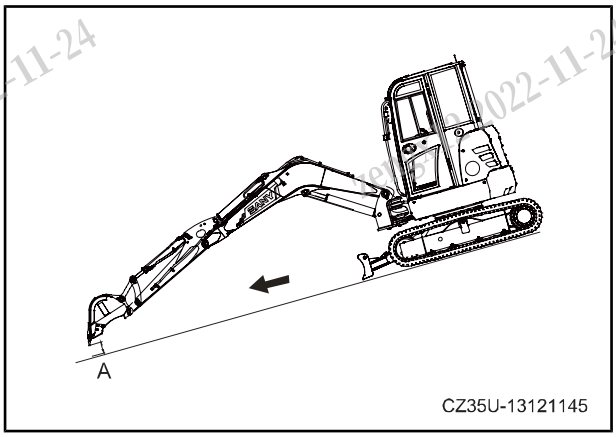


Fig.5-68

5.5.4.3 Engine Stops on Slope

- If the engine stops when climbing on the slope, it is necessary to move all the control levers to the neutral positions, and then start the engine.
- If the engine stops when the excavator is on the slope, it is not allowed to perform slewing operation with the left control lever of working device. The superstructure will slew in virtue of its dead weight.

5.5.5 Operations on Soft Ground

⚠ CAUTION

- The tracks will be bent and (or) loose, and other track parts on undercarriage might be damaged if the wide track shoes are used on the rough ground.
- The wide track shoes shall not be used on the rough ground which is covered with stones, sand heaps or gravel. The wide track shoes are designated for the soft ground.
- It is necessary to inspect the tightness of the track shoe bolts regularly.

Avoid performing such operation on the very soft ground which could not sustain the weight of excavator.

When operating the excavator on the soft ground, it is necessary to select appropriate track shoes. The soft ground might collapse, resulting in the excavator to tip over. When having to operating on the soft ground, be sure to enhance the ground with big steel plate to support the excavator.

If the excavator works on the very soft ground or get sunk, it might need to clean the track frames.

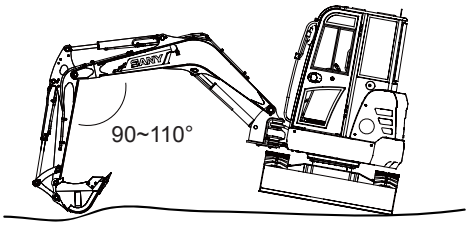


Fig.5-69

1. Lift the track on one side off the ground by slewing the superstructure and lowering the bucket. Keep the angle between the boom and the bucket rod between 90°-110°, and lower the ac part of bucket on the ground.

2. Remove the earth on the tracks by rotating the lifted track. After putting the track on the ground, reduce the traveling speed, and move the excavator to the firm ground carefully.

3. Tow the excavator to the firm ground with boom and bucket rod.

4. It is allowed to tow the excavator if it gets sunk but the engine is still working. Be sure to install the towing rope properly.

5.5.6 Lift Track on One Side with Boom and Bucket Rod

1. Keep the angle between boom and bucket rod at 90°-110° and put the arc part of the bucket on the ground.

2. Lift the track off the ground by slewing the superstructure by 90° and lowering the bucket. When using back-hoe bucket, it is not allowed to dig the bucket teeth into the ground.

3. Put cushion blocks beneath the track frame to support the excavator.

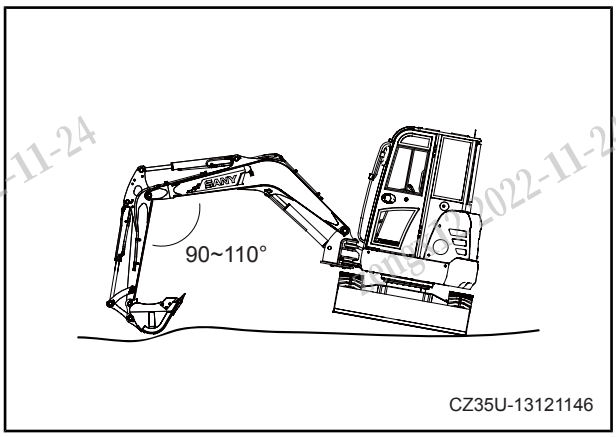


Fig.5-70

5.5.7 Driving Out of Mud

Always operate the excavator carefully to prevent it getting sunk in the mud. If the excavator gets sunk in the mud, it is necessary to move it out in the following steps:

1. **Track on One Side Gets Sunk**

1) When lifting the excavator with boom or bucket rod, it is necessary to make the bottom of bucket contact with the ground. it is not allowed to push with bucket teeth and it is necessary to keep the angle between boom and bucket rod at 90°-110°; when using back-hoe bucket, it also aplies

2) When the track only on one side gets sunk in the mud, it is allowed to lift the track with the bucket, put wood boards or round log beneath the track and drive out the excavator; put wood boards under the bucket if necessary.

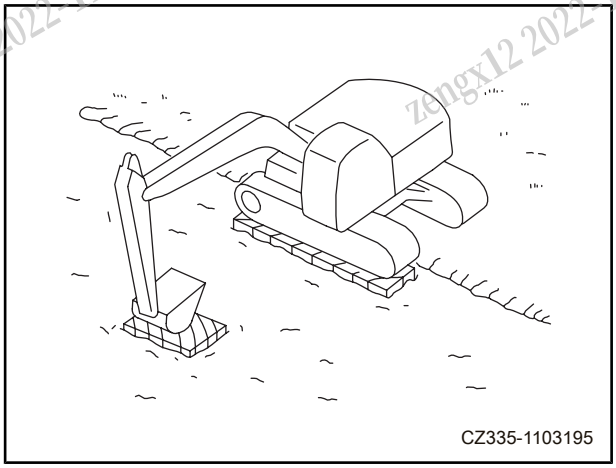


Fig.5-71

2. **Tracks on Both Sides Get Sunk**

If the tracks on both sides get sunk in the mud, and the excavator could not move, lay the wood plates on the ground with the aforesaid method, extend the bucket into the ground in front of the excavator, pull the bucket rod with the same method to excavation operation and place the traveling control lever to the forward position to pull out the excavator.

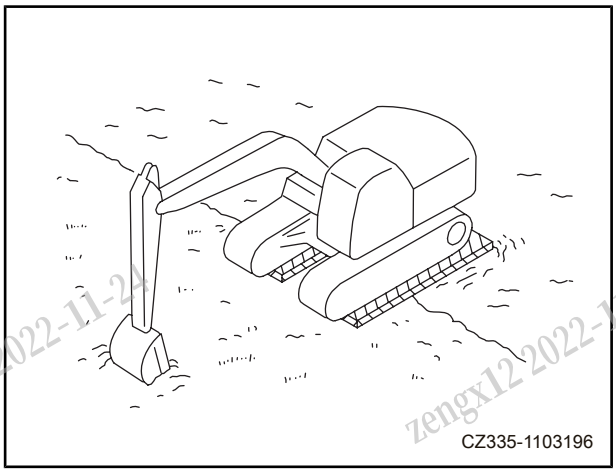


Fig.5-72

5.5.8 Recommended Operations

In addition to the following situation, the use scope may be increased further with all kinds of accessories.

⚠ CAUTION

- When lowering the boom, it is necessary to avoid stopping suddenly. Otherwise, the impact load produced might damage the excavator.
- When operating the bucket rod, it is necessary to avoid extending the hydraulic cylinder fully for preventing the hydraulic cylinder being damaged.
- When excavating at an angle, it is necessary to prevent the bucket teeth colliding against the tracks.
- When excavating deep ditch, it is necessary to prevent the boom or bucket cylinder hoses colliding against the ground.

Ditching

- Install the bucket matching with the width of the ditch and adjust the tracks to the position parallel to the ditch to be excavated for the excavation operation.
- When excavating wide ditch, it is necessary to excavate both sides first, and then dig the center part.

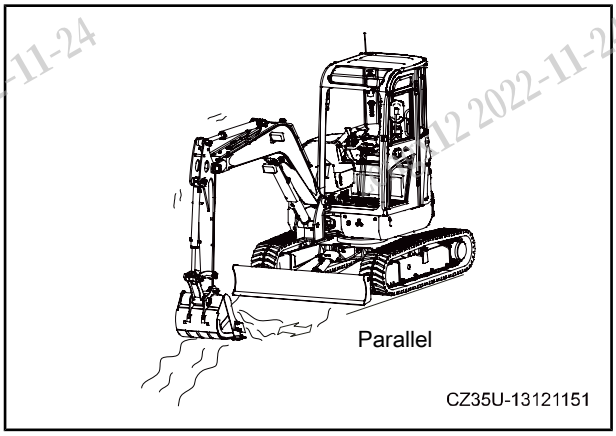


Fig.5-73

- The excavator may be used to evacuate the side ditch with the deflection function of boom.

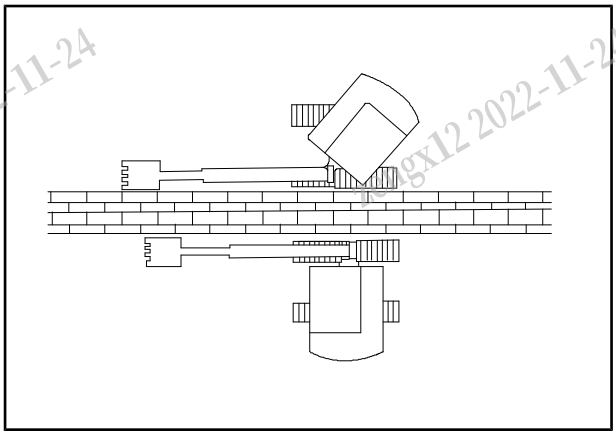


Fig.5-74

Loading

- When the slewing angle is relatively small, it is necessary to ask the dump truck to stop in the place visible to the operator for the convenience of more effective operation.
- It is more convenient to load from the rear of the dump trunk than loading from the side, and the loading capacity is bigger.

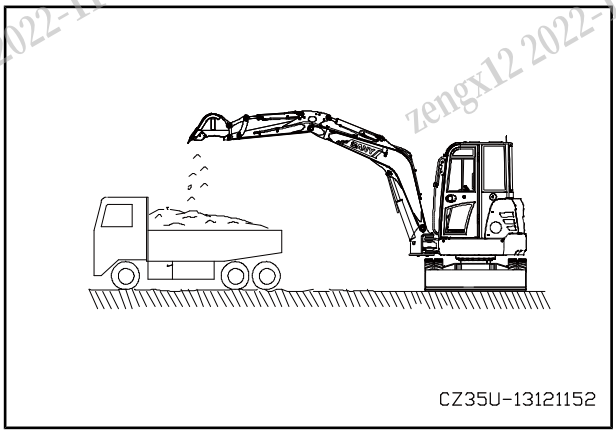


Fig.5-75

Leveling

- When requiring leveling, it is necessary to select low-speed gear. As shown in the figure, slew the bucket and place it on the position slightly in front of the bucket rod.
- Lift the boom slowly while retract it. Once the bucket rod moves beyond its vertical position, lower the boom slowly and make the bucket level to the ground.

Note: Do not pull or push mud with bucket when traveling.

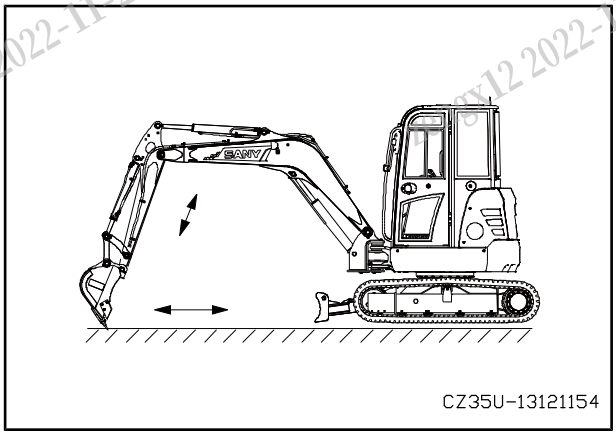


Fig.5-76

5.5.9 Operation Precautions

1. When operating the excavator, it is necessary to appropriate tight clothes and safety helmets suitable for the job.

2. Evacuate all the personnel within the operation and moving scope of the excavator, and clean all the barriers. In the operation process, always pay attention to the ambient conditions. When operating in the narrow scope with barriers around, be careful not to let the upper structure collide against the barrier.

3. When loading the truck head, it is necessary to lift the bucket above the truck head

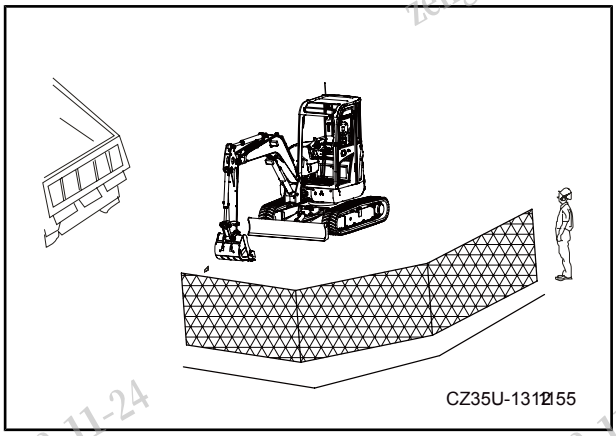


Fig.5-77

from the rear side of the truck. Do not pass the bucket above the cab or the head of anybody.

4. Ensure the operating area to be strong enough to support the excavator firmly. When operating in the cave or on the road shoulder, operate the excavator with the tracks vertical to the wall surface and the traveling motor on the rear part; in this way, the excavator could evacuate easily even if the wall surface collapses.

5. If having to work beneath the precipice or tall bank, it is necessary to confirm that the precipice or bank would not collapse.

6. Prevent the bucket colliding against the tracks when excavating.

7. Do not try to move the stones or break the wall by slewing.

8. Adjust the digging length and depth each time to fully load the bucket when digging each time.

9. The yield when the bucket is fully loaded per digging will be bigger than the rapid circulation of partially loaded bucket.

10. For increasing the productivity, it is necessary to realize full load as the first target, and then the speed.

11. Once the ditch is excavated, it is allowed to insert the bucket below the soil layer to dig the stones; dig the top soil layer by lifting and digging one or two layers.

12. Prevent the bucket sustaining the lateral load. For example, it is not allowed to level the materials by slewing the bucket or collide

against the object from the side with the bucket.

5.5.10 Replacement and Adjustment of Bucket

⚠ CAUTION

- When knocking the axis pin with a hammer, the metal filing might fly into the eyes, resulting in serious injuries. When performing similar operations, always wear protective goggles, safety helmets, gloves and other protective articles.
- The axis pin might fly out and hurt the personnel in the surrounding area when it is hit with great force. Therefore, it is necessary to ensure that the surrounding area is safe before hitting the axis pin.
- When removing the axis pin, be careful not to stand below the bucket or put the feet or other body parts below the bucket.
- Be careful not to get the hands hurt when removing or installing the pin shaft.
- Do not put the finger into the pin shaft when aligning the hole.
- Put the bucket stably after removing it.

Park the excavator on the solid and level ground. It is necessary to unify the signals and work carefully for safety concern when connecting.

1. Park the excavator on the flat ground; lower the bucket on the ground, and fix its flat surface on the ground. Ensure that the bucket will not roll after removing the axis pin.

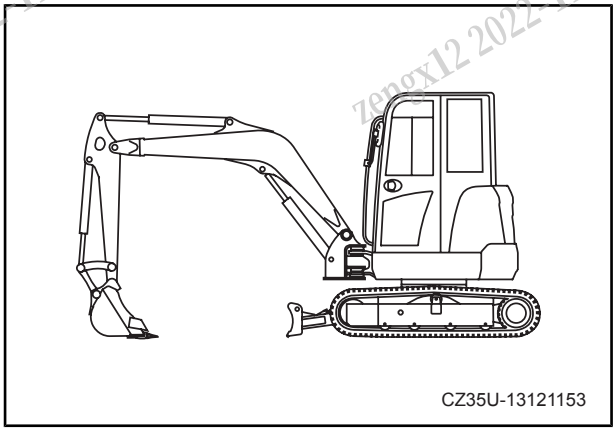


Fig.5-78

2. Slide out the O-ring as shown in the figure.

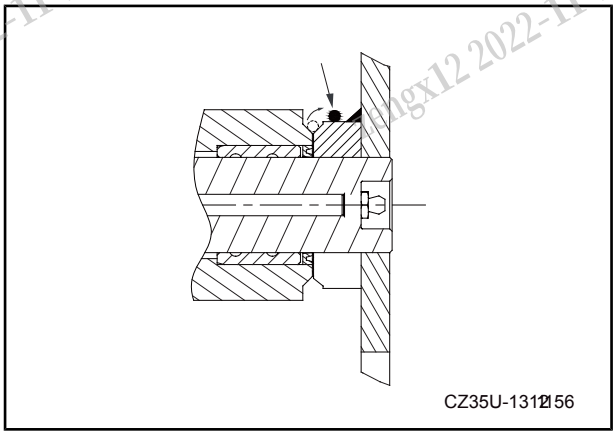


Fig.5-79

3. Remove the fixed bolt and retainer pin, dismantle the bucket pins A and B, and separate the bucket rod from the bucket. Clean the pins and pin holes, and apply sufficient lubricating oil on the pins and pin holes.

4. Align the bucket to the new bucket. Ensure the bucket not to roll.

5. Install the bucket pins A and B.

6. Install the fixed bolt or retainer pin on the pin A and pin B.

7. Apply lubricating grease on pin connections A and B.

8. Start the engine and operate at low speed. Operate the bucket, and rotate the bucket slowly from two directions to inspect whether any interference occurs when the bucket is

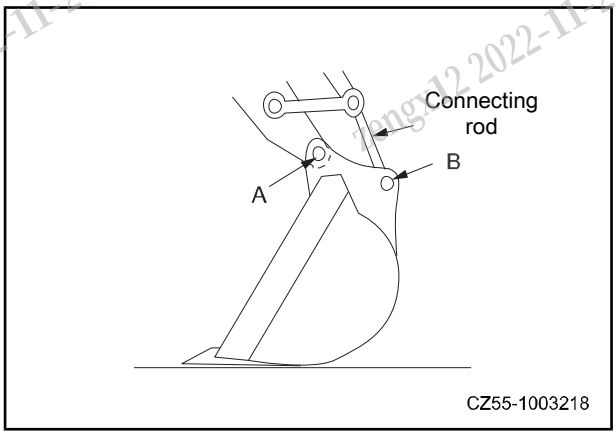


Fig.5-80

moving. Do not use the excavator with any interference.

It is necessary to treat timely if finding interference.

5.5.11 Parking of Excavator

⚠ CAUTION

It is necessary to protect the electrical parts in the cab on rainy days; when parking the excavator, it is necessary to close the window, sunroof and cab door properly.

1. **Normal parking**

1) Drive the excavator to the places without rock fall or flood and park it on the solid and level ground.

2) Lower the bucket to the ground.

3) Turn the throttle control knob counterclockwise to the extreme positions (low-speed no-load position). Operate the engine by about 5 minutes to let it cool down.

4) Pull the safety locking control lever to the locked position.

5) Turn the key switch to the position OFF, and take down the key from the key switch.

6) Close the window and cab door.

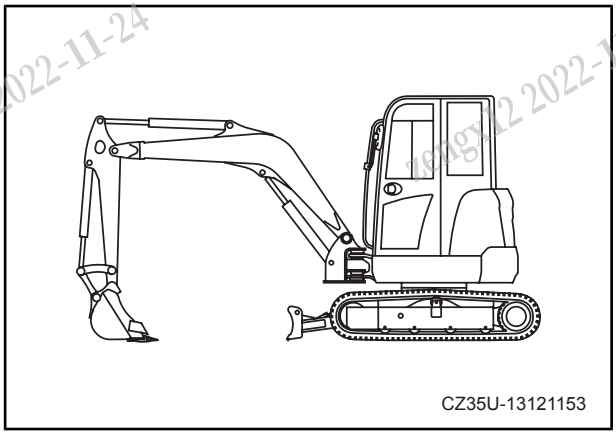


Fig.5-81

2. **Park the excavator on the slope**

Insert the bucket teeth into the ground.

Return the operating handles to the neutral positions, and pull the leading control switch to the locked position.

Hold the tracks on both sides with block stops.

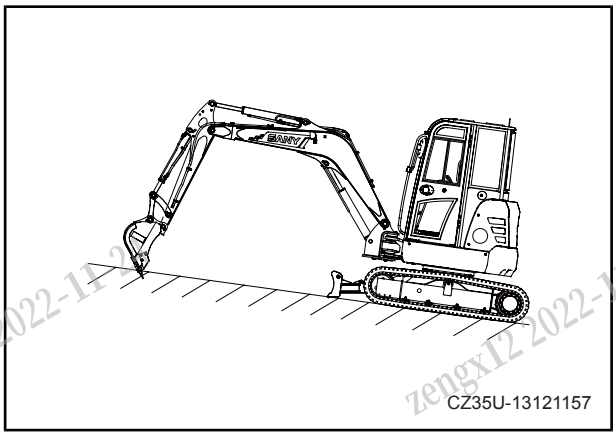


Fig.5-82

⚠ WARNING

Try not to park the excavator on the slope as the excavator might tip over and result in personal injuries!

5.5.12 Inspection after Operation

⚠ CAUTION

When the ambient temperature is lower than - 35℃, be sure to drain the coolant in the radiator and engine jacket (the ice point of anti-freezing solution used by SANY is -35℃). After draining the coolant, it is necessary to mark clearly that “there is no coolant in the radiator”.

Inspect the engine coolant temperature, engine oil pressure and fuel oil level.

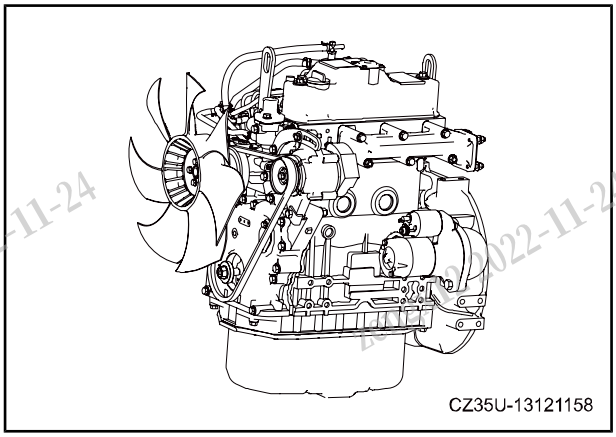


Fig.5-83

5.5.13 Locking

It is necessary to lock the following positions:

1. Cab door.

2. Rear engine hood door of excavator.

3. Right front engine hood door of excavator

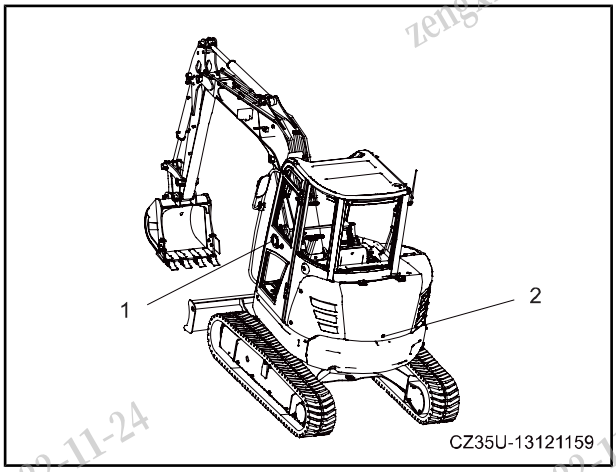


Fig.5-84

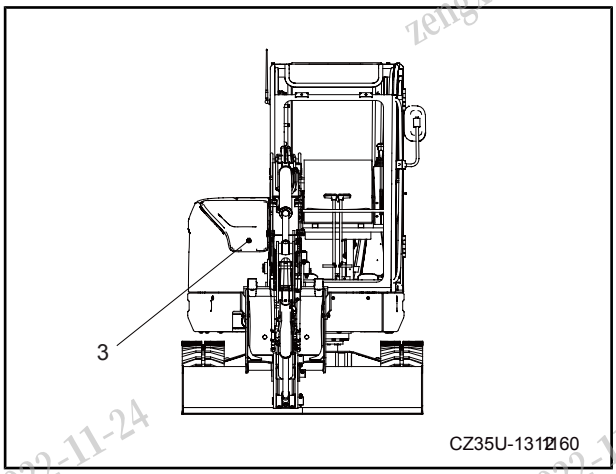


Fig.5-85

5.6 Operations in Cold Weather

5.6.1 Inspection in Cold Weather

1. In the cold region, for the stopped equipment:

1) Keep the complete excavator clean.

2) Engine: Inspect the anti-freezing solution level; inspect whether the engine oil quality is normal, or whether there is any liquid or oil leakage. Upon delivery, the proportion of anti-freezing solution is 50%, and it applies

to the minimum temperature of -30℃ (subject to local air temperature and attached table); replace the fuel oil, engine oil and gear oil with oil suitable local temperature .

3) Hydraulic system: Inspect whether motors, cylinders, main pump, pipelines and connectors leak, inspect whether the cylinder rods are scratched or corroded and apply grease on the exposed part of cylinder rods for protection.

4) Electrical system: Remove the storage battery, and store it indoors after fully recharging.

5) Operate the excavator very month for rust prevention, operate the air conditioning system once to prevent the refrigerant oil settling, keep lubrication of compressor and keep oil film of certain thickness at the sealing ring of air conditioning system for preventing the refrigerant leaking into the atmosphere.

2. Conventional inspections:

Clean the oxide on the storage battery terminals with boiled water, and apply a layer of grease after cleaning to protect the terminals; with regard to the wet-type storage battery, it is necessary to inspect the specific gravity of the electrolyte and supplement distilled water or electrolyte as appropriate.

3. Starting inspection:

1) Before starting each time, it is necessary to inspect the oil levels of the excavator and the liquid levels; it is necessary to drain the water and dirt for the fuel tank at lease every week.

2) When the ambient temperature is lower than 3℃, it is necessary to turn on the pre-heating switch before starting to preheat the air intake.

3) Start the excavator; after idling the engine by 5-10 minutes, operate the cylidners without load to rise up the hydraulic oil temperature to 40℃ before construction.

4) When there are mud on the frame on the freezing days, before traveling, it is necessary to turn the upper frame to 90° position, jack up the track, spin by several turns to throw away the mud and other impurities around the carrying wheel guide wheel and supporting wheel (for the excavator operating in the mud ground, it is recommended for the operator to clean the mud near the carrying wheel and guide wheel carefully with shovel for avoiding freezing after getting off work every day).

5) It is recommended for the operator to drain the water from the oil-water separator after work every day.

5.6.2 Common Operation Knowledge in Cold Weather

Under cold weather conditions, it would become difficult to start the engine, the fuel oil might be frozen and the viscosity of hydraulic oil would increase. Select the fuel oil according to the air temperature. Carry out as per the following steps:

Fuel oil and lubricating oil

Replace fuel oil and lubricating oil of low viscosity for all parts.

Coolant of cooling system

- The anti-freezing solution is toxic; be careful not to splash the anti-freezing solution in the eyes or on the skin. If splashed in the eyes or on the skin, it is necessary to wash with a lot of clean water and go to a doctor immediately.

- The anti-freezing solution is toxic; be particularly careful when treating it. When replacing the coolant containing anti-freezing solution, or treating the coolant in the process of radiator repair, please contact with the authorized agent of SANY Heavy Machinery Co., Ltd. or the local dealers of antifreezing solution. Prevent the fluid flowing into the sewer or spilling on the ground.
- The anti-freezing solution is flammable; thus, keep it away from any combustion source; when treating the anti-freezing solution, do not smoke.

⚠ CAUTION

- Do not use methyl alcohol, ethyl alcohol or propyl alcohol based anti-freezing solution.
- Absolutely avoid using any leak preventive; use separately or together with the anti-freezing solution.
- Do not mix the anti-freezing solution of different brands.

Remarks:

In the regions with permanent anti-freezing solution unavailable, only the ethylene glycol based antifreezing solution without preservative can be used in the cold season. In such case, it is necessary to clean the cooling system twice every year (in spring and autumn). When filling the anti-freezing solution in the cooling system, it is necessary to operate in the autumn rather than the spring.

⚠ WARNING

- The storage battery produces flammable gas. Thus, keep the storage battery away from the fire or sparks.
- The storage battery electrolyte is dangerous. Wash with a lot of clean water and go to a doctor immediately if the electrolyte is splashed into the eyes or the skin.
- The paint is dissoluble in the storage battery electrolyte. If the electrolyte is splashed on the excavator body, it is necessary to clean with water immediately.
- If the storage battery electrolyte is frozen, do not charge the storage battery or start the engine with other power supply; otherwise, the storage battery might explode.
- The capacity of storage battery will decline obviously under low temperature so that the battery shall be wrapped or removed from the excavator, stored in a warm place and re-installed on the excavator in the morning of the next day.

Storage battery

When the ambient temperature reduces, the capacity of storage battery also will decline. If the charging ratio of storage battery is low, the storage battery electrolyte will be frozen. Try to keep the charging of storage battery close to 100% and isolate the storage battery from the low temperature for the convenience of starting the excavator easily in the morning of the next day.

5.6.3 After Daily Operation

⚠ WARNING

- Idle traveling of tracks is dangerous so that it is necessary to keep away from the tracks.
- At the end of operation, it is necessary to fill up the fuel tank for preventing the moisture condensing into water in the empty tank when the temperature reduces.

For preventing the mud and water being frozen on the undercarriage, and preparing the excavator to operate in the next day, it is necessary to observe the following precautions:

- It is necessary to clean the mud and water on the excavator body thoroughly for the purpose of preventing the mud, dirt or water entering and damaging the seals.
- It is necessary to park the excavator on the hard and dry ground.
- Park the excavator on the wood boards if possible. The wood boards may prevent the tracks being frozen in the soil so that the excavator can be started in the morning of the next day.
- Open the draining valve to drain the water in the fuel system for preventing it being frozen.
- After operating in the water or mud, it is necessary to drain the water in the undercarriage with the following methods to extend the service life of the undercarriage.

1. Operate the engine at low speed, and slew by 90° to turn the working device to the side of track.

2. Jack up the excavator to lift up the tracks off the ground slightly. Make the tracks idle traveling. Repeat this operation for the tracks on the left and the right.

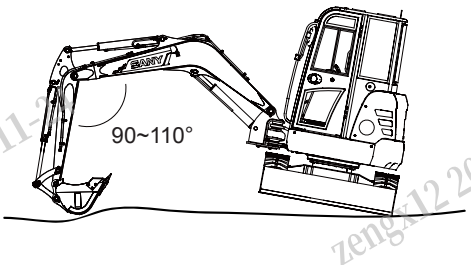


Fig.5-86

5.6.4 After Cold Season

It is necessary to perform as per the following steps when the season changes and the air temperature rises up:

- Replace the fuel oil and engine oil of all parts with the oil of specified viscosity.
- It is necessary to drain the cooling system thoroughly, then clean the inside of the cooling system completely and fill in fresh soft

water when the permanent anti-freezing solution is unavailable for some reasons but ethylene glycol based anti-freezing solution (only for winter) is used, or if there is no anti-freezing solution.

5.7 Long-term Storage

5.7.1 Before Storage

⚠ CAUTION

It is necessary to adjust the excavator to the posture shown in the figure on the right to protect the cylinder piston rod when storing the excavator (prevent rusting of cylinder piston rod).

When storing the excavator for long term, it is necessary to perform as per the following steps:

1. It is necessary to clean and flush all parts, and then store the excavator indoors. If having to store the excavator outdoors, it is necessary to select level ground and cover the excavator with covering cloth.

2. Before storing, it is necessary to fill up the fuel oil tank, lubricate the excavator and replace the engine oil.

3. Apply a thin layer of lubricating grease on the metal surface of piston rod.

4. Disconnect the negative terminal of storage battery, cover the storage battery properly or remove the storage battery from the excavator and store separately.

5. Lock the foot bar with foot bar locking device.

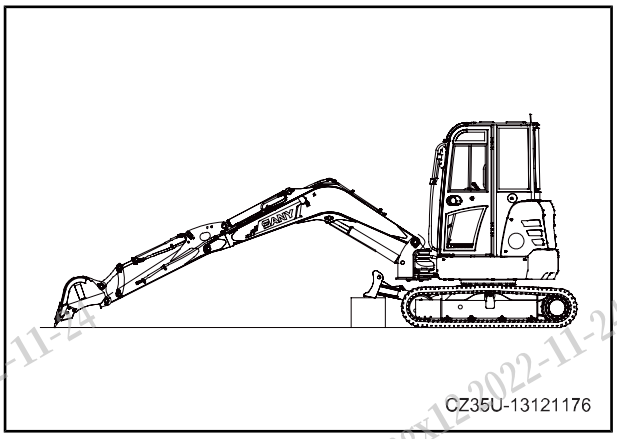


Fig.5-87

5.7.2 During Storage

⚠ WARNING

If having to perform antirust operation when the excavator is indoor, it is necessary to open the door and window for better air circulation and preventing gas poisoning.

During the storage, it is necessary to operate the machine every month so as to apply a layer of new oil film on the surface of the moving parts, and meanwhile charger the storage battery.

5.7.3 After Storage

⚠ WARNING

If needing to use the excavator before performing antirust operation every month, please contact with the authorized agent of SANY Heavy Machinery Co., Ltd..

When using the excavator stored for long term, it is necessary to operate as per the following steps before use:

Remove the lubricating grease on the surface of cylinder piston rod.

Fill in engine oil and lubricating grease for all positions.

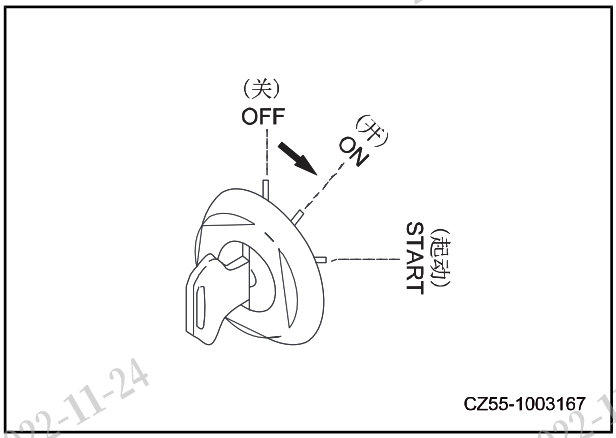


Fig.5-88

5.7.4 Start Engine after Storing for Long Term

1. When starting the excavator which has been stored for long term, it is necessary to cancel the automatic heating operation as per the following steps:

Turn the starting switch to the position ON or press the start button (optional); the display screen will be lit up and the excavator will be in power-on state.

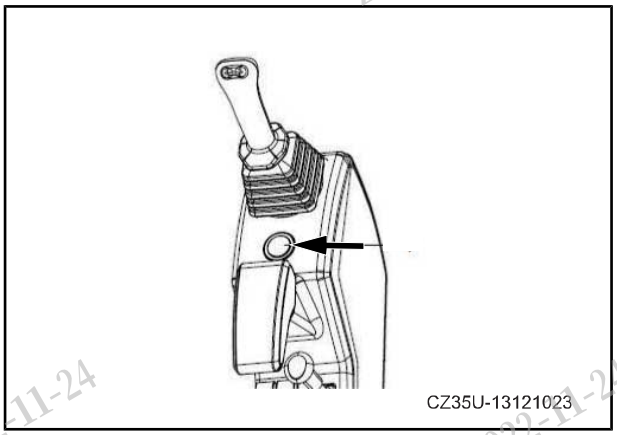


Fig.5-89

2. Turn the fuel oil control knob to the high-speed (MAX) position, and hold on this position by at least 3s. Then, turn it to the low speed position and start the engine.

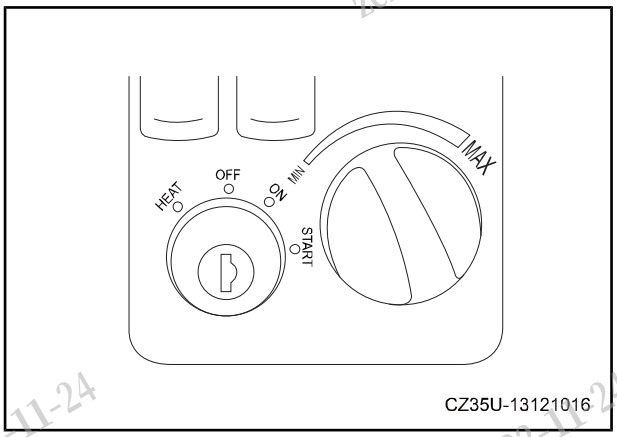


Fig.5-90

5.8 Transportation

5.8.1 Transportation Method

When transporting the excavator, it is necessary to understand and observe all the local regulations.

1. When transporting by trailer, it is necessary to check the length, width, height and weight of the trailer for carrying the excavator.

2. Investigate the situation of the transportation route in advance, such as the limitation on dimensions and weight, as well as the traffic provisions.

3. Sometimes it might be required to disassemble the excavator to meet the local dimension or weight limits.

Note: The transportation weight and dimensions may vary as different varieties of tracks and working devices are installing.

5.8.2 Loading and Unloading

5.8.2.1 Overview

- When loading or unloading the excavator, it is necessary to turn off the automatic idle switch for preventing the excavator speed increasing suddenly as a control lever is operated by mistake.
- Adjust the throttle control knob to the position MIN for avoiding the hazard due to high speed traveling of excavator.
- When loading or unloading the excavator, it is necessary to select firm and level ground. Keep safe distance to the road edge.
- It is necessary to use a slope with sufficient width, length, thickness and strength; its mounting slope should be 15° maximum. When using stacked earth slope, it is necessary to compact the earth completely and take measures to prevent the slope surface collapsing.
- Do not make a turn when driving on or off the slope; if having to make a turn, it is necessary to return to the ground or the trailer flat bed first, then correct the traveling direction and pass the slope.
- Drive the excavator carefully through the protuberance formed at the junction between top end of slope and trailer flat bed.
- Prevent the excavator tipping over and personal when slewing the superstructure. Retract and lower the bucket rod and slew the superstructure slowly to obtain the optimal stability.
- Do not operate any other control lever than the running control lever when driving the excavator on the slope.

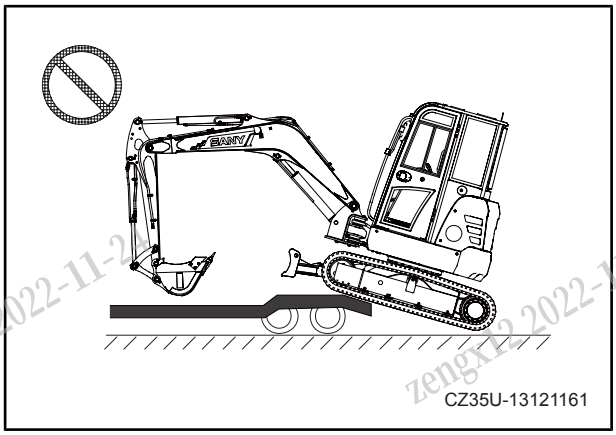


Fig.5-91

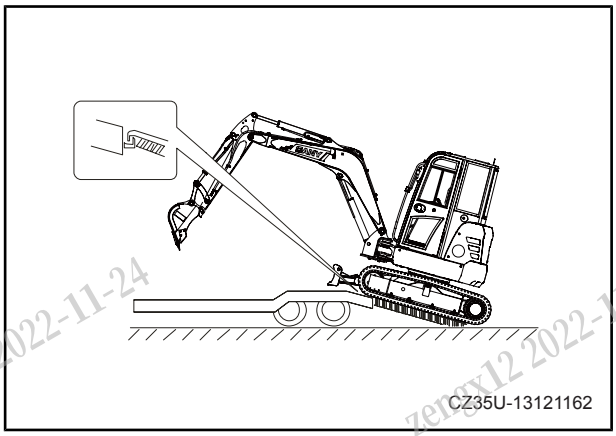


Fig.5-92

- Clean the slope or platform and flat bed before unloading. The excavator might slide if there is greasy dirt, mud or ice on the slope, platform or trailer flat bed.

5.8.2.2 Loading

When loading/unloading the excavator, it is necessary to use slope or platform, and operate as per the following steps:

⚠ WARNING

- It is necessary to load/unload the excavator on firm and level ground, and keep certain safe distance to the road edge.
- It is necessary to put the block stops beneath the wheels when using the slope or platform.
- The slope must be wide enough. Make the gradient of the slope smaller than 15°.
- The platform must wide and strong enough to support the excavator, and have the gradient of smaller than 15°.
- It is necessary to preheat the excavator before loading and unloading in the cold weather.

It is necessary to load the excavator on the trailer in accordance with the following rules:

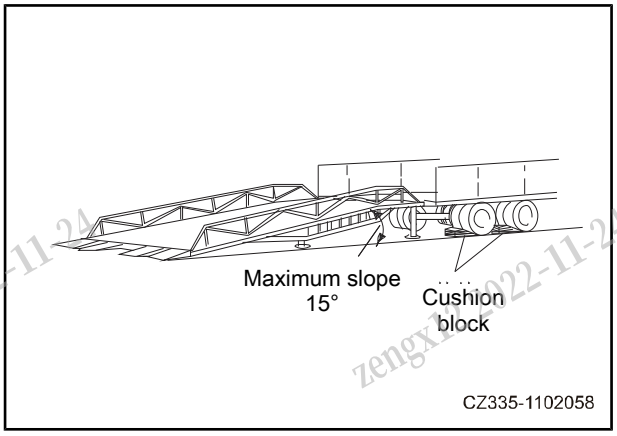


Fig.5-93

1. The direction of excavator is as follows: With working device: place the working device to the front part and run forwards.

Drive the excavator without working device backwards, as shown in the figure.

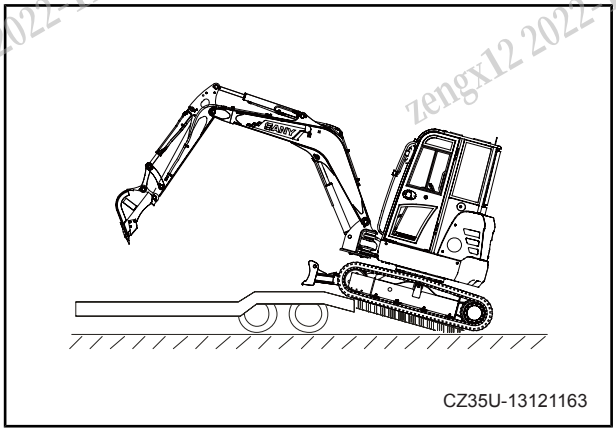


Fig.5-94

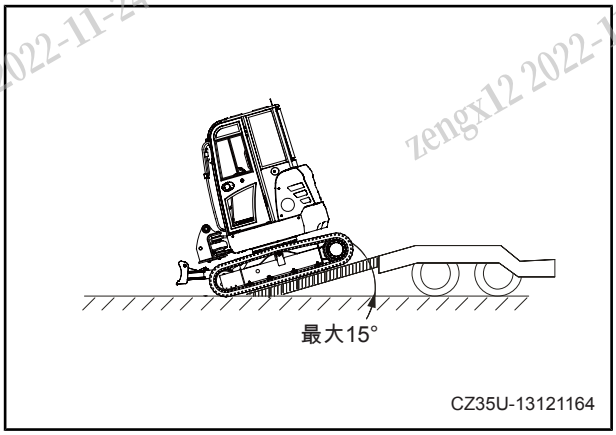


Fig.5-95

2. The centerline of excavator shall be aligned to the centerline of trailer.

3. Drive the excavator slowly onto the slope.

4. When the excavator starts tilting toward the direction of trailer flat bed, support the bucket on the trailer, drive forwards slowly until the tracks are on the trailer fully and contact with the flat bed stably.

5. Lift up the bucket slightly, retract the bucket rod and keep it in lower position, and then slew the superstructure slowly by 180°. Put down the dozer blade.

6. Extend the bucket and bucket rod cylinder fully, and lower the boom slowly.

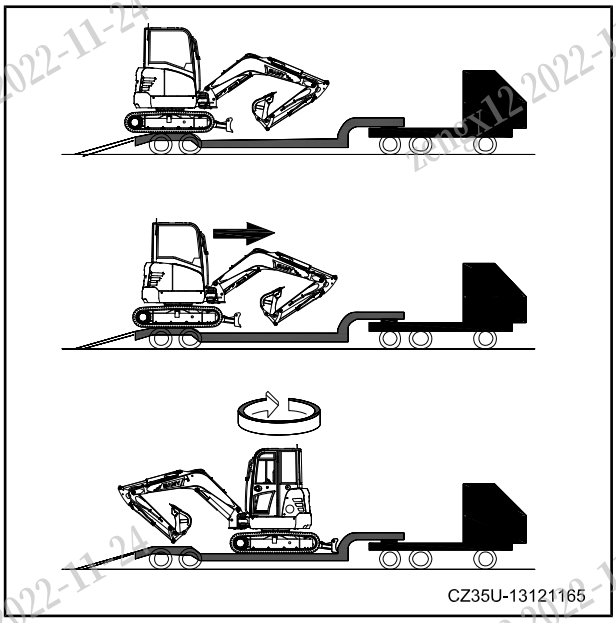


Fig.5-96

7. For preventing the bucket cylinder being damaged in the transportation process, it is necessary to put wood cushion block on one end of the bucket cylinder to prevent it touching the bottom plate.

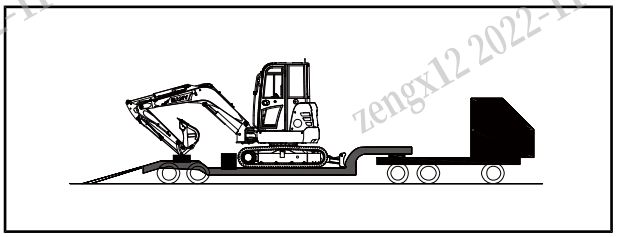


Fig.5-97

8. Stop the excavator and take down the key from the switch.

9. Operate the control lever by several times until the pressure in the hydraulic cylinder has been released fully.

10. Pull the safety locking control lever to the locked position.

11. Close the window and door of the cab, and cover the venting opening to prevent the wind and rain entering.

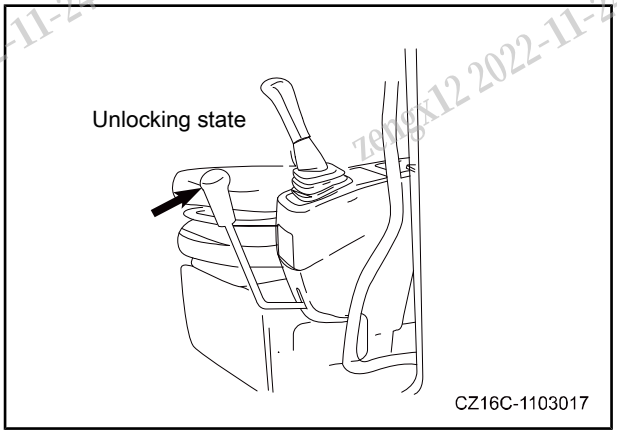


Fig.5-98

5.8.2.3 Fixing the Excavator

⚠ CAUTION

- Retract the radio antenna. Remove the rearview mirror.
- Fasten the removed parts on the trailer firmly.
- For preventing the bucket cylinder being damaged in the transportation process, it is necessary to place wood cushion block on one end of the bucket cylinder to prevent it touching the bottom plate.

After loading the excavator on the trailer, it is necessary to fix the excavator as per the following steps:

1. Extend the bucket and bucket rod cylinders fully, and then lower the boom slowly.

2. Switch off the engine, and take down the key from the starting switch.

3. Engage the safety locking control lever [1] on the locked position.

4. Lock the cab, side door, storage battery box and engine hood.

5. Put cushion blocks beneath two ends of the tracks to prevent the excavator moving in the transportation, and fasten the excavator firmly with iron chain or steel wire rope.

Fix the excavator reliably for preventing it sliding to one side.

⚠ CAUTION

Tie the chain and rope on the frame of excavator, but do not stride over or press the chain or rope on the hydraulic pipeline or hose.

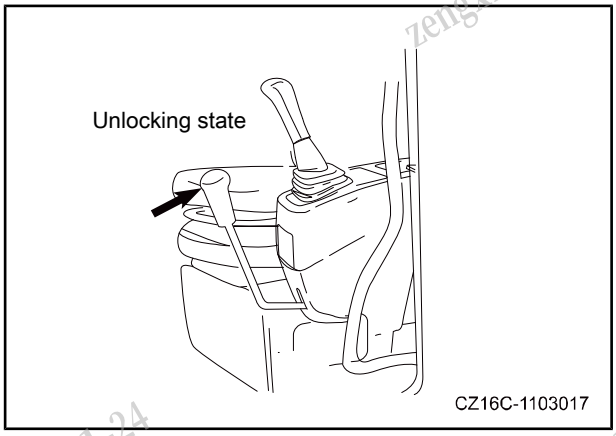


Fig.5-99

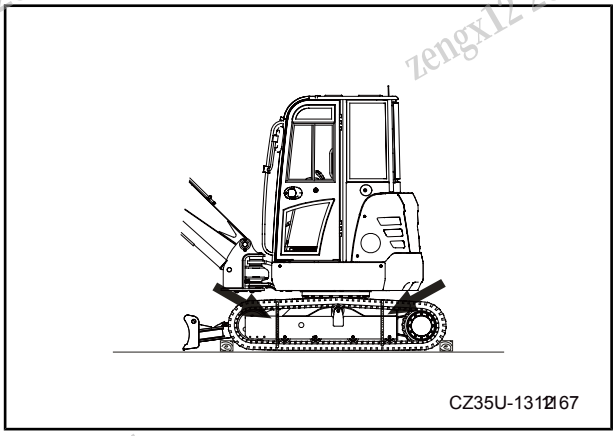


Fig.5-100

5.8.2.4 Unloading

1. It is allowed to load or unload the excavator only on the firm and level ground, and it is necessary to keep safe distance to the edge of the road.

2. Apply braking to the trailer appropriately, and put cushion blocks below the tires to preventing the tires moving. Then, install the slopes between the trailer and the excavator. It is necessary to ensure the slopes on both sides on the same horizontal plane. The maximum gradient of the slopes should not exceed 15°. Adjust the space between two plates to the center between tracks.

3. Remove the iron chains or steel wire rope fixing the excavator.

4. Start Engine.

5. Adjust the safety locking control lever to the free position.

6. Lift the working device, retract the bucket rod below the boom and then move the excavator slowly.

7. Stop moving the excavator when moving toward the slopes when the excavator is above the rear tires of trailer.

8. Adjust the intersection angle between bucket rod and boom to 90-110°, support the flat surface of bucket on the ground and then move the excavator onto the slopes slowly.

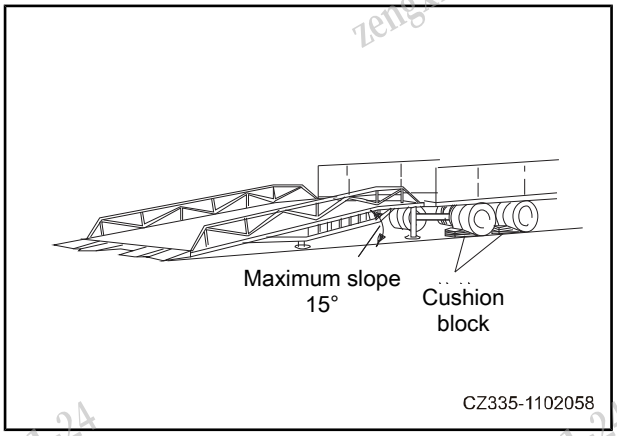


Fig.5-101

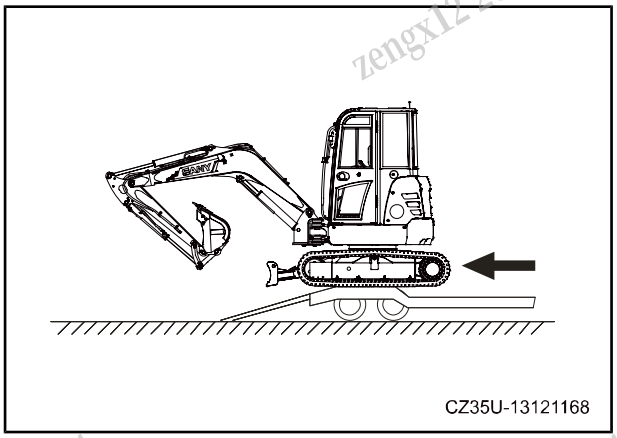


Fig.5-102

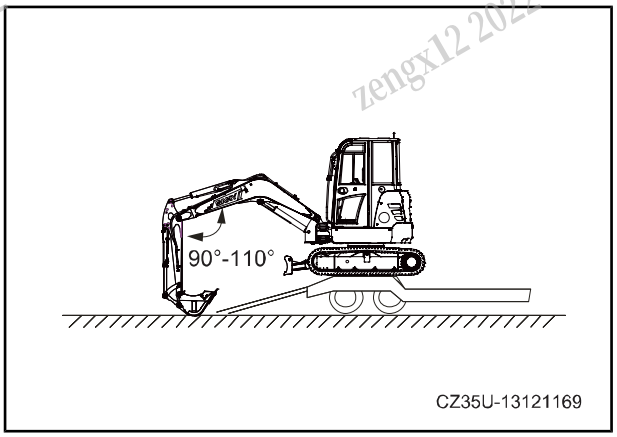


Fig.5-103

9. When moving the excavator to the slopes, operate the boom and bucket rod slowly and lower the excavator carefully until it leaves the slopes safely.

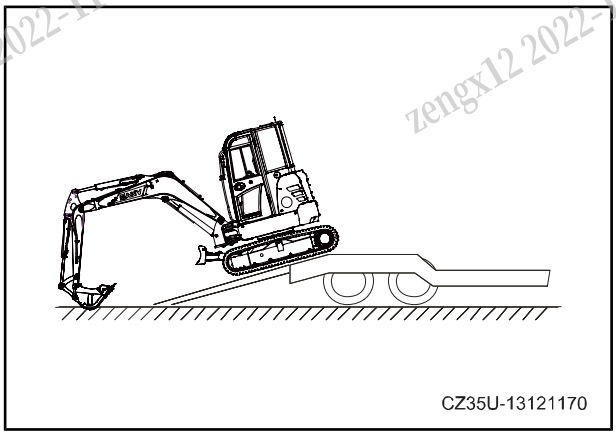


Fig.5-104

⚠ CAUTION

- Drive the excavator carefully through the protuberance formed at the junction between rear end and slope of trailer flat bed.
- Protect the working device from being damaged. When unloading, always keep the intersection angle between bucket rod and boom at 90°.
- Prevent the possible damages to hydraulic cylinder. Prevent the bucket of excavator colliding against the ground fiercely.

5.8.3 Lifting of Excavator

⚠ WARNING

- Only the operating personnel who hold the license from competent local authority (according to the local law), is qualified and experienced are allowed to operate this excavator.
- Do not lift the excavator when there is any person on it.
- Do not allow anybody enter the area beneath or around the lifted excavator.
- Ensure that the steel wire rope for lifting is strong enough to sustain the weight of the excavator. Do not use the damaged or aged lifting rope or lifting tools.
- Do not lift the excavator when the superstructure slews to the side of the excavator. Before lifting, make the longitudinal centerlines of undercarriage and superstructure parallel.
- Before lifting, place the safety locking lever to the locked position to prevent the excavator moving accidentally.
- When lifting, keep the excavator horizontal.
- Do not lift the excavator rapidly. Otherwise, the steel wire rope or the lifting tool would be overloaded, and might break.
- Except for the postures provided in the following steps, do not lift the excavator with any other postures or use any lifting equipment other than those described in the following steps. Otherwise, the excavator would lose balance.

Selection of Steel Wire Rope

- The lifting steps apply to the excavator of standard technical specification. See the section “Technical Specification” of this Manual for the details of excavator weight.
- Select the steel wire rope of appropriate specification according to the weight of the excavator. See the following table.

Steel rope (“Z” or “S”-twisted steel rope, ungalvanized)		
Diameter of Wire Rope	Allowable load	
mm	kN	Ton
10	9.8	1.0
11.5	13.7	1.4
12.5	15.7	1.6
14	21.6	2.2
16	27.5	2.8
18	35.5	3.6
20	43.1	4.4
22.4	54.9	5.6
30	98.1	10.0
40	176.5	18.0
50	274.6	28.0
60	392.2	40.0
Note: The allowable load value shall be estimated as per 1/6 or 1/7 of breaking strength of steel rope.		

When lifting the excavator, it is necessary to operate on the level ground according to the following steps:

1. Start the engine, lift up the dozer blade.

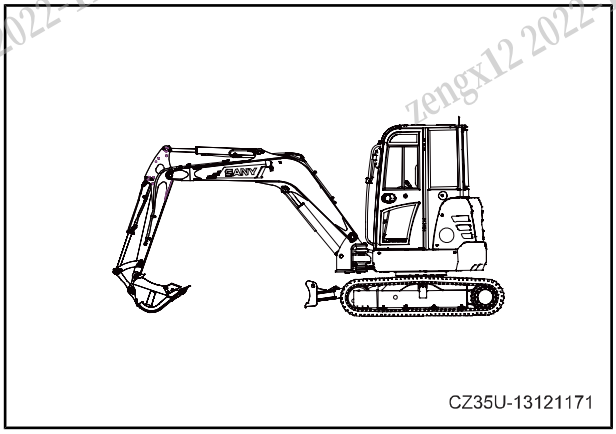


Fig.5-105

2. Extend the bucket rod and bucket cylinders fully to lift up the boom until it reaches an appropriate position.

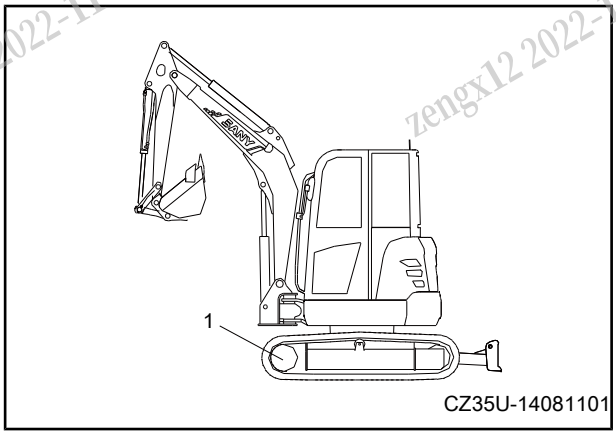


Fig.5-106

3. Pull the safety locking control lever [1] to the locked position.

4. Switch off the engine, and take down the key from the key switch.

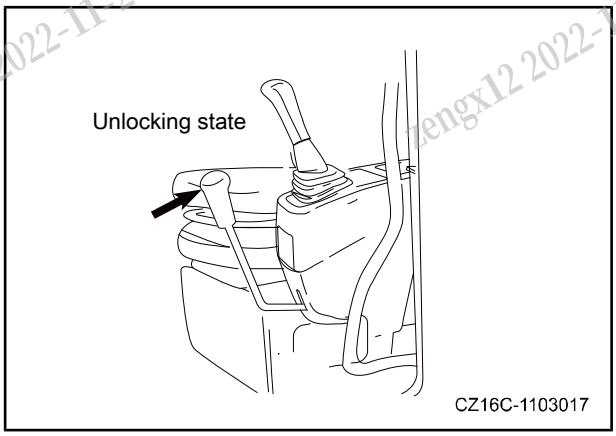


Fig.5-107

5. Use long enough steel rope and supporting rod and prevent them colliding against the excavator when they are lifted. Twine some protective materials around the steel rope and supporting rod for preventing the excavator being damaged.

6. Drive the crane to an appropriate lifting position.

7. When lifting the entire excavator, perform according to the state shown in the figure on the right. After lifting the excavator off the ground, it is necessary to inspect carefully whether the excavator is balanced; if not, adjust the positions of boom and dozer blade appropriately, and then lift the excavator slowly.

8. Lift with at least 6T lifting equipment and corresponding steel rope.

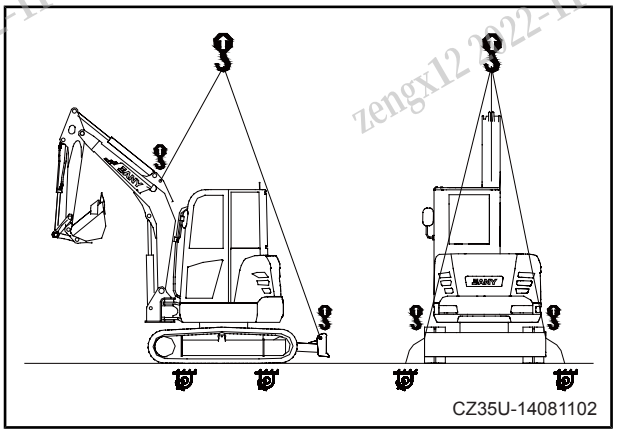


Fig.5-108

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SANY

Trouble Diagnosis

⚠ WARNING

Read and understand all safety precautions and instructions in this manual before reading any other manuals provided with this machine and before operation or maintaining it. Failure to do this could result in death or serious injury.

6.Trouble Diagnosis

6.1 Preparation before Trouble Diagnosis

6.1.1 Inspection before Trouble Diagnosis

Inspection Item		Criteria	Measures
Lubricating oil, coolant	1. Confirm the level and variety of fuel oil	—	Fill in oil
	2. Inspect whether there are foreign matters in the fuel oil	—	Clean and drain
	3. Inspect the hydraulic oil level	—	Fill in oil
	4. Inspect the filter screen of hydraulic oil	—	Clean and drain
	5. Inspect the oil level of slewing mechanism	—	Fill in oil
	6. Inspect the engine oil level (oil level of oil pan)	—	Fill in oil
	7. Inspect the coolant level	—	Add coolant
	8. Inspect the blocking situation of dust indicator	—	Sweep or replace
	9. Inspect the hydraulic oil filter core	—	Replacement
	10. Inspect the oil level in final drive box	—	Fill in oil
Electric equipment	1. Inspect whether the terminals and wires of storage battery are loose or corroded	—	Tighten or replace
	2. Inspect whether the terminals and wires of alternator are loose or corroded	—	Tighten or replace
	3. Inspect whether the terminals and wires starting motor are loose or corroded	—	Tighten or replace
Hydraulic devices	1. Inspect the abnormal noise and odor	—	Repair it
	2. Inspect oil leakage	—	Repair it
	3. Bleed off the air	—	Exhaust
Electricity and electric equipment	1. Inspect the storage battery voltage (engine extinction)	8-11.5V	Charge the battery
	2. Inspect whether the electric wires are discolored, scorched or peeled off	—	Replacement
	3. Inspect whether the wire clips drop or whether the electric wires are suspended	—	Repair
	4. Inspect whether the electric wires get wet (inspect carefully the connectors or terminals)	—	Remove the connector and dry it

	Inspection Item	Criteria	Measures
	5. Inspect whether the fuses are blown or rusted	—	Replacement
	6. Inspect the alternator voltage (the engine is running at semi-throttle opening)	After running by several minutes: lower than 12.5V	Inspect the power generation circuit

6.1.2 Precautions during Trouble Diagnosis

⚠ CAUTION

- Park the excavator on the level ground and confirm the functions of safety pins, cushion blocks and parking brake.
- When operating collaboratively, it is necessary to use uniform signals and keep any irrelevant personnel away.
- The hot water would be sprayed and cause scald if the radiator cover was removed when the engine is still hot. Thus, it is necessary to start the overhaul after the engine cools down.
- Do not touch any hot parts or hold any rotating parts.
- Be sure to remove the negative (-) terminal of storage battery when removing the electric wires.
- It is necessary to release the internal pressure when removing the plug or cap of the compartments containing oil pressure, water pressure or air pressure etc.; it is necessary to connect properly when installing the measuring equipment.

- The trouble diagnosis is performed for the purpose of determining the primary cause of the trouble, repairing rapidly and preventing the recurrence.
- It is necessary to learn about the structure and function when performing trouble diagnosis.
- However, it would be a shortcut if learning about the possible causes for the trouble preliminarily from the operating personnel for effective trouble diagnosis.

1. Do not rush to disassemble the parts when performing trouble diagnosis. If the part was disassembled, the consequent might be:

- The disassembled part is irrelevant to the trouble, or unnecessary part is disassembled.
- The trouble causes could not be found. This would waste labor, part, oil or grease, and meanwhile make the user or operating personnel lose confidence to the product. Therefore, it is necessary to inspect first when performing trouble diagnosis, and carry out according to the specified procedures.

2. Questions for the user or operating personnel:

- Were there any problems that had not been reported?
- Was there any abnormal phenomenon on the excavator before the trouble occurs?
- Did the trouble occur suddenly or was there any problem on the excavator before?
- Under what conditions the trouble occurred?

- Had the excavator been repaired before the trouble occurred?
- When was the excavator repaired?
- Did the same trouble occur before?

3. Inspect other inspection items.
- Inspect engine oil level.
- Inspect whether the oil leaks from the pipeline or hydraulic equipment.
- Inspect the stroke of control lever.
- Inspect the stroke of control valve core.
- Other daily maintenance items may be inspected from the appearance so that it is only allowed to inspect the items deemed necessary.

4. Confirm the trouble
- Confirm the trouble by yourself, and judge whether it is a real trouble or a problem on use or operation
- Do not perform any inspection or measurement which makes the problem worse when operating the excavator or the trouble phenomenon re-occurs.

5. Trouble Diagnosis
- Inspect or test as per items 2-4, narrow the scope of trouble causes, and then determine the trouble position according to the trouble diagnosis flow chart.
- Basic procedures for trouble diagnosis are as follows:

  1) Start from the simple items

  2) Start from the places with high potential

  3) Inspect other relevant contents.

6. Method for solving the primary trouble causes.
- If the root cause has not been removed, the same trouble still will happen again even though the trouble was solved.

Therefore, it is necessary to ascertain the trouble causes and solve the root cause of troubles.

6.1.3 Precautions when Diagnosing Troubles in Electrical Circuits

1. Turn off the power supply before disconnecting or connecting the connector.

2. Inspect whether all the relevant connectors have been inserted properly before performing trouble diagnosis.
- Disconnect and connect the relevant connectors by several times for inspection.

3. Connect all the disconnected connectors before proceeding to the operations in the next step.
- It would produce unnecessary abnormal display if turning on the power supply without disconnecting the connector.

4. It is necessary to move the relevant wires and connectors by several times and inspect whether the readings of the instrument change when performing trouble diagnosis for the electrical circuit (measure voltage, resistance, connectivity or current).

- The contact trouble might exist in the electrical circuit if the readings change.

6.1.4 Precautions when Treating Hydraulic Parts

The most common trouble cause is the greasy filth (foreign matter) in the hydraulic oil way as the pressure and the accuracy of hydraulic part increase. When filling in hydraulic oil, or disassembling or assembling the hydraulic parts, be particularly careful.

1. Pay attention to the operating environment. Avoid filling hydraulic oil, replace the filter or repair the excavator in the rain or wind or in the environment with heavy dust.

2. On-site disassembling and maintenance work.

The dust might enter the parts if the hydraulic parts are disassembled and maintain on site. It would be very difficult to inspect the performance after repair. Thus, it would be the best to replace with assembly unit. The hydraulic parts shall be disassembled and maintained in the particularly prepared dustproof workshop, and the performance shall be inspected with dedicated test equipment.

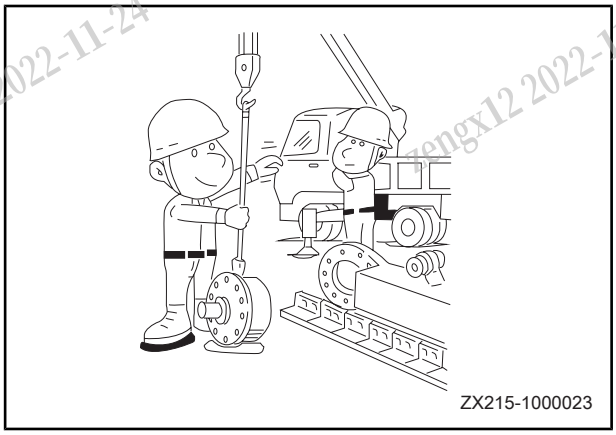


Fig.6-1

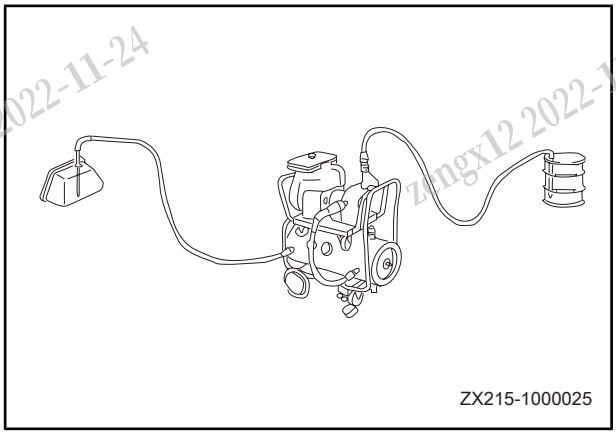


Fig.6-2

3. Fill in hydraulic oil.

When filling in hydraulic oil, be careful to prevent any greasy filthy or dust entering. Be sure to keep the filter core and the surrounding area clean, and it is necessary to use clean pump and oil storage container. The greasy filthy accumulated in the storage process may be filtered out if the oil cleaning equipment is used, which is a more effective method.

4. Replace the hydraulic oil at high temperature

It flows easily when hydraulic oil or other oil temperature is high. Besides, it would be easier for the sediments to be discharged along with the oil from the oil way. Therefore, it would be the best to replace the oil when it is still warm. When replacing the oil, try to drain the used hydraulic oil thoroughly (drain oil from hydraulic oil tank; drain oil from drain plug in the filter and oil way). If there is any used oil, the impurities and sediments would mix with the new oil, and shorten the service life of hydraulic oil.

5. Flushing operation

When disassembling and assembling the equipment or replacing the oil, it is necessary to remove the impurities, sediments and the used oil in the hydraulic oil way with flushing oil. Usually it is necessary to flush twice: flush mainly with flushing oil, and use specified hydraulic oil for auxiliary flushing.

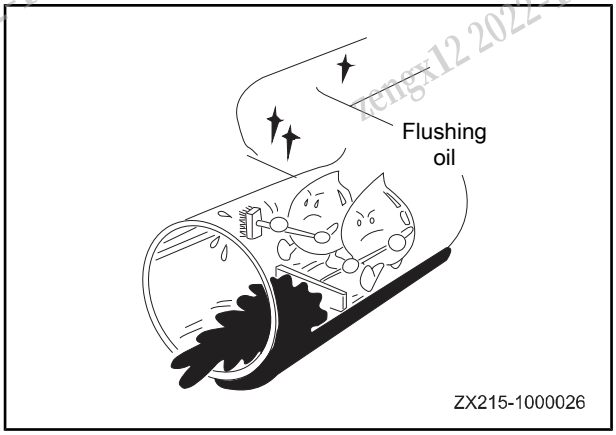


Fig.6-3

6. Cleaning operation

After repairing the hydraulic parts (pump, control valve etc.) or when the excavator is running, it is necessary to clean the sediments or impurities in the hydraulic oil way. Oil cleaning equipment could remove the fine (about 3μ) particles. The oil way could be cleaned effectively with oil cleaning equipment, which would be helpful to avoid removing the filter in the hydraulic part.

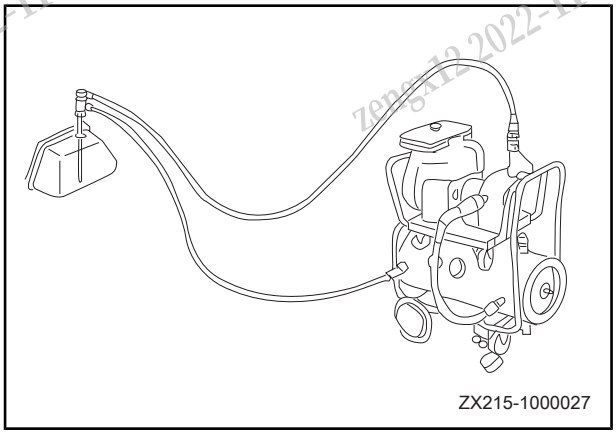


Fig.6-4

6.2 Non-trouble Phenomenon

The following phenomenon is not trouble:

- The moving speed will reduce instantaneously when the bucket rod is higher than or lower than the vertical direction when the working device with no load drops from height if the bucket rod control lever is placed on the position IN (excavation).

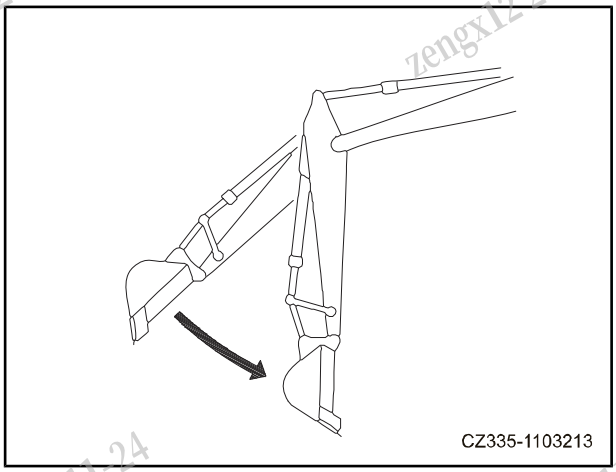


Fig.6-5

- The moving speed of bucket will reduce instantaneously when the bucket tooth is higher than or lower than the horizontal direction when the working device with no load drops from height if the bucket control lever is placed on the position CURL (excavation).
- The brake valve will emit noise when starting or stopping slewing.
- The running motor will emit noise when running downslope at low speed.
- The bucket or bucket rod will vibrate when operating the excavator under heavy load.

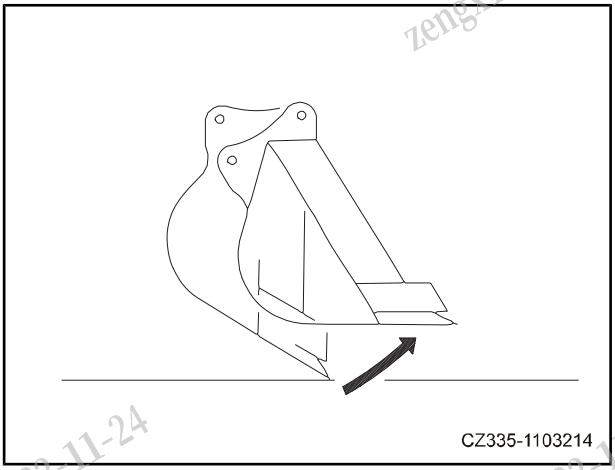


Fig.6-6

6.3 Tow Excavator

⚠ CAUTION

- It is necessary to use a steel wire rope strong enough to sustain the weight of the excavator to be towed when towing the excavator.
- For avoiding serious casualty accidents, it is not allowed to use damaged chains, worn cables, hooks, strap or rope to tow the excavator.
- Do not apply sudden load to the steel wire rope.

It is necessary to use the steel wire rope as shown in the figure on the right when the excavator get trapped in the mud and could not move out by its own power.

Put wood blocks between steel wire rope and excavator body to prevent the steel wire rope and excavator body being damaged.

Do not use light-duty towing pad at this moment.

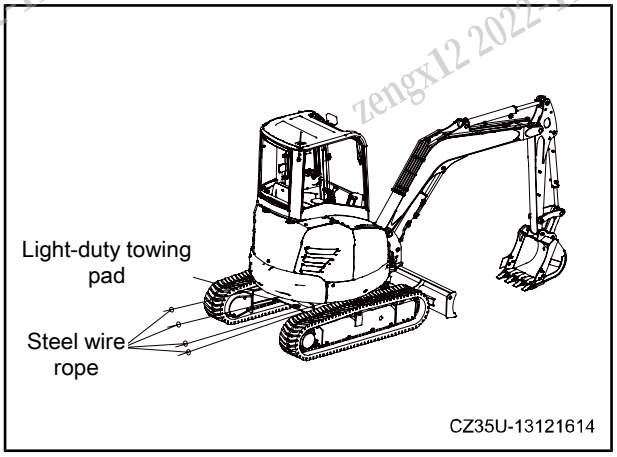


Fig.6-7

6.4 Light-duty towing pad

⚠ CAUTION

- It is necessary to use shackles.
- Keep the steel wire rope horizontal, and parallel to the tracks.
- Select low speed traveling mode and move the excavator slowly.

There is a towing pad on the track frame for steel wire rope.

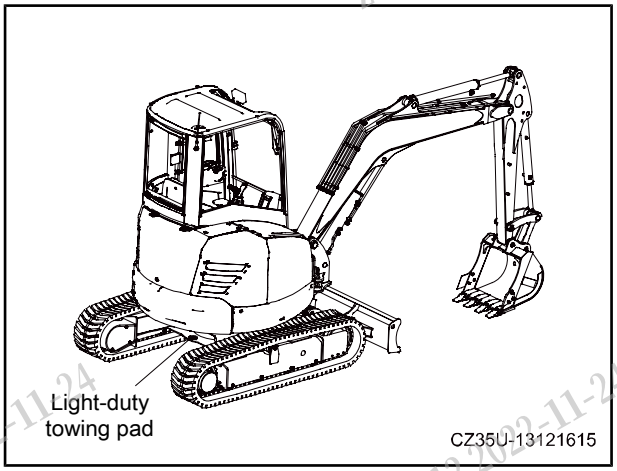


Fig.6-8

6.5 Engine Trouble

6.5.1 Engine Troubleshooting Table

When any trouble occurs, please inspect as per the following table and contact with the authorized agent of SANY for repair.

Fault content		Fault Analysis	Measures
When the engine could not be started	The starter could not ignite or it feels hard to rotate	● The storage battery is used up	● Recharge or replace the storage battery
		● The cable of storage battery drops, is loose or is corroded	● Clean the corroded position
		● The fuse is short-circuited	● Replace the fuse

Fault content		Fault Analysis	Measures
		● Trouble of starting switch or starting relay	● Replace the starting switch or relay
		● Trouble of starting motor	● Repair or replace the starting motor
		● The viscosity of engine oil is too high	● Replace the engine oil of appropriate viscosity
	The starter works normally	● The fuel oil is used up	● Supplement fuel oil and bleed off the air
		● Injection pressure of fuel injector is too low	● Adjust or replace the fuel injector
		● The oil outlet valve of fuel injection pump has trouble	● Replace the oil outlet valve
		● The control rack of fuel injection pump has trouble	● Repair or replace the control rack
		● The plunger of fuel injection pump is worn or bonded	● Replace the plunger assembly
		● The starting operation is improper	● Operate as per the correct starting steps
		● The air enters the fuel system	● Bleed off the air in the fuel system
		● The fuel oil filter is plugged	● Replace the fuel oil filter core or filter cartridge
		● The air filter is plugged	● Clean or replace the air filter core
		● The clutch sideslips	● Repair or replace the clutch
The engine stops immediately after being started		● Idle speed is too low	● The storage battery is used up
		● The fuel oil filter is plugged	●Replace the fuel oil filter core or filter cartridge
		● The air filter is plugged	●Clean or replace the air filter core
Low idle speed is not stable		● Low idle speed control device has trouble	● Repair or replace the low idle speed control system
		● Fuel system leaks or is plugged	● Overhaul the fuel system
		● The air is trapped in the fuel system	● Bleed off the air in the fuel system
		● There is water in the fuel system	● Replace the fuel oil

Fault content	Fault Analysis	Measures
	● Fuel oil filter core is plugged	● Replace the fuel oil filter core or filter cartridge
	● Fuel injection pump has trouble	● Adjust or replace the relevant parts of fuel injection pump
	● Valve clearance adjustment is improper	● Adjust the valve clearance
	● Cylinder head gasket leaks, cylinder sleeve is worn, piston ring is bonded or ruptured or installation of valve and valve seat is improper	● Replace the relevant parts
The power is insufficient	● The fuel oil filter is plugged	● Replace the fuel oil filter core or filter cartridge
	● There is water in the fuel oil	● Replace the fuel oil
	● The air filter is plugged	● Clean or replace the air filter core
	● The fuel delivery pump has troubles	● Repair or replace the fuel delivery pump
	● The injection pressure of fuel injector is too low, or the injection condition is bad	● Adjust or replace the fuel injector
	● Fuel injection pump has trouble	● Adjust or replace the relevant parts of fuel injection pump
	● The exhaust gas leaks from the exhaust system or the air leaks from the intake system	● Adjust or replace the relevant parts
	● The exhaust pipe is plugged	● Clean the exhaust pipe
	● Valve clearance adjustment is improper	● Adjust the valve clearance
	● The valve spring is too soft or is ruptured	●Replace the valve spring
	● Cylinder head gasket leaks, cylinder sleeve is worn, piston ring is bonded or ruptured or installation of valve and valve seat is improper	● Replace the relevant parts
Engine overheating	● The coolant is insufficient	● Supplement the coolant
	● The fan belt is loose or ruptured, and slips consequently	● Replace the fan belt

Fault content	Fault Analysis	Measures
	● The radiator cover is damaged or the radiator core is plugged	● Replace the radiator cover or clean the radiator core
	● The water pump is damaged	● Repair or replace the water pump
	● The cylinder cover or cylinder block seal cover is damaged, resulting in coolant leakage	● Replace the seal cover
	● The thermostat is damaged	● Replace the thermostat
	● The cooling system is plugged by foreign matters	● Clean the foreign maters in the cooling system
	● The adjustment of fuel injection timing is improper	● Adjust the fuel injection timing
The white smoke is emitted from the exhaust pipe	● There is water in the fuel oil	● Replace the fuel oil
	● The fuel injection timing is lagged behind	● Adjust the fuel injection timing
	● Cylinder head gasket leaks, cylinder sleeve is worn, piston ring is bonded or ruptured or installation of valve and valve seat is improper	● Replace the relevant parts
	● The valve oil seal fails, or the valve rod and valve guide pipe are worn	● Replace the valve oil seal, valve and valve guide pipe
	● The piston ring is worn, ruptured or improperly set	● Replace the piston or re-set properly
	● The cylinder sleeve is scratched or worn	● Replace the cylinder sleeve
The black smoke is emitted from the exhaust pipe	● The air filter is plugged	● Clean or replace the air filter core
	● The injection pressure of fuel injector is too low, or the injection condition is bad	● Adjust or replace the fuel injector
	● The adjustment of fuel injection timing is improper	● Adjust the fuel injection timing
	● The oil outlet valve of fuel injection pump is damaged, resulting in fuel oil dripping after injection	● Replace the oil outlet valve

Fault content	Fault Analysis	Measures
	● The fuel injection amount of fuel injection pump is excessive	● Adjust the fuel injection amount
The fuel oil consumption is excessive	● The fuel oil leaks	● Repair or replace relevant parts of fuel system
	● The air filter is plugged	● Clean or replace the air filter core
	● The adjustment of low idle speed is improper	● Adjust the low idle speed
	● The injection pressure of fuel injector is too low, or the injection condition is bad	● Adjust or replace the fuel injector
	● The adjustment of fuel injection timing is improper	● Adjust the fuel injection timing
	● The oil outlet valve of fuel injection pump is damaged, resulting in fuel oil dripping after injection	● Replace the oil outlet valve
	● Valve clearance adjustment is improper	● Adjust the valve clearance
	● The valve spring is too soft or is ruptured	● Replace the valve spring
	● Cylinder head gasket leaks, cylinder sleeve is worn, piston ring is bonded or ruptured or installation of valve and valve seat is improper	● Replace the relevant parts
Engine oil consumption is too big	● The engine oil used is improper	● Replace with appropriate engine oil
	● Engine oil volume is excessive	● Adjust the engine oil volume
	● Engine oil leaks from oil seal and (or) packing	● Replace the oil seal and (or) packing
	● Preheating operation has not been performed	● Operate as per the correct steps
	● Valve oil seal fails, or the valve rod and valve guide pipe are worn	● Replace the relevant parts
	● The piston ring is worn, ruptured or improperly set	● Replace the piston ring or re-set properly
	● The cylinder sleeve is scratched or worn	● Replace the cylinder sleeve

Fault content		Fault Analysis	Measures
Engine oil pressure is too low		● Engine oil volume is insufficient	● Supplement engine oil
		● Engine oil viscosity is inappropriate	● Use lubricating oil of appropriate viscosity
		● Engine oil leaks from oil seal and (or) packing	● Replace the oil seal and (or) packing
		● Engine oil filter core is plugged	● Replace engine oil filter core or filter cartridge
The engine noise is abnormal	Noise of gas leakage	● Exhaust pipe connector is loose or the exhaust pipe is ruptured	● Tighten the exhaust pipe connector or replace the exhaust pipe
		● Fuel injector is loose	● Tighten the fuel injector or replace the packing
		● Exhaust manifold connector is loose	● Tighten the exhaust manifold connector
		● Cylinder head gasket is damaged	● Replace the cylinder head gasket
	Continuous noise	● Fan belt is loose	● Adjust the belt tensity
		● Cooling fan is loose	● Tighten the cooling fan
		● Water pump bearing is worn or damaged	● Replace the water pump bearing
		● Valve clearance adjustment is improper	● Adjust the valve clearance

6.5.2 Coolant Temperature Is Too High

⚠ WARNING

Do not open the radiator cover when the coolant temperature is hot; it would cause burns when the hot water or steam is sprayed out if opening by force. Please cover the filler with thick cloth and open slowly after the coolant temperature reduces.

⚠ CAUTION

- Do not turn off the engine immediately; otherwise, the engine components might get burned due to abrupt rise of coolant temperature.
- It is necessary to fill in water slowly in several times for preventing the engine cracking due to rapid filling of cool water.

When the coolant thermometer pointer exceeds 100℃, and meanwhile the high coolant temperature alarm light is lit up, it indicates that the radiator coolant temperature exceeds the limit. Please

stop the operation of equipment, keep the engine running at a speed slightly higher than idle speed to cool it down. When the coolant thermometer pointer reduces to the central position, and the high temperature alarm light goes out, stop the engine and perform the following treatment.

1. Inspect whether the radiator hose leaks coolant by spot check.

2. Inspect whether the V-belt is ruptured or whether the belt tension is normal by spot check.

3. Inspect the coolant volume by spot check. Supplement the coolant when it is insufficient.
- Open the radiator cover [1], and supplement coolant to the oil filler. After supplementing, please tighten the radiator cover.
- Open the cover of liquid storage tank [2] and supplement the coolant to the mark “FULL”. After supplementing, please tighten the cover of liquid storage tank with force.

4. Inspect whether there are sundries on the front part of the radiator by spot check.

5. It indicates that the cooling system has trouble if the coolant leaks or the radiator coolant temperature often exceeds the limit.

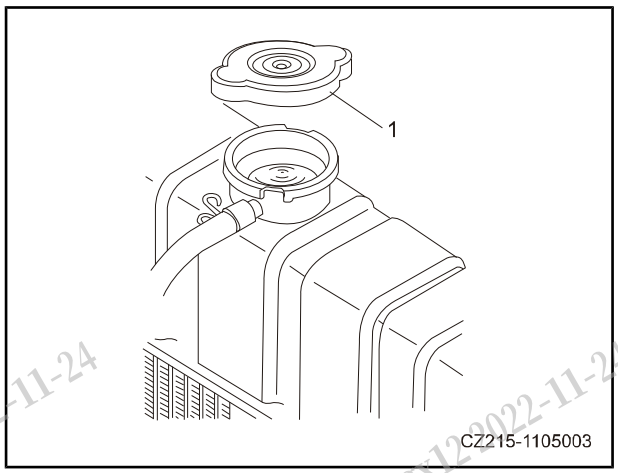


Fig.6-9

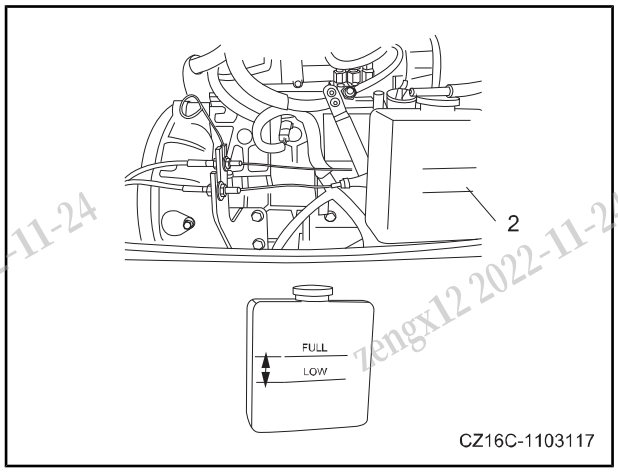


Fig.6-10

6.5.3 When Engine Oil Pressure (Low Pressure) is Abnormal

The oil pressure gauge indicates high pressure state as the engine has not been preheated when the engine is just started. Please confirm the oil pressure again after fully preheating the engine.

When the engine oil pressure has not reached the following value, the display screen will display the engine oil pressure low alarm code P101, indicating abnormal engine oil pressure.

Stop the equipment operation, turn off the engine immediately and perform the following treatment.

	SY35U	SY55U
Idle running	60 kPa {0.6 kgf/cm^2}	50±10kPa {0.5±0.1kgf/cm^2}
Rated operation	400 kPa {4kgf/cm^2}	147KPa {1.50kgf/cm^2}

⚠ CAUTION

Please turn off the engine immediately. The engine might get damaged if it continues operation.

1. Verify whether the engine oil leaks by spot check.

2. Verify the engine oil volume by spot check, and supplement when it is insufficient.

- Take out the engine oil gauge [1] and wipe off the engine oil attached on the gauge.
- Insert the oil gauge into the engine oil fully, and then take it out slowly.
- The position of engine oil attached on the oil gauge is between the marks H and L, which indicates that the oil volume is normal.
- Supplement timely when the engine oil volume is insufficient. Please replace timely when obviously feeling that the engine oil is not clean.

Oil volume (dm^3{L})	
Oil pan	Filter
About 5 {5}/ about 10.2{10.2}	About 1.1 {1.1/} about 10.2{10.2}

- At the end of spot check, insert the oil gauge into the engine oil gauge slot completely.

3. The engine oil volume is normal. When the engine oil pressure is abnormal, the display screen will display engine oil pressure low alarm code P101. Please contact with the authorized agent of SANY Heavy Machinery Co., Ltd. for repair .

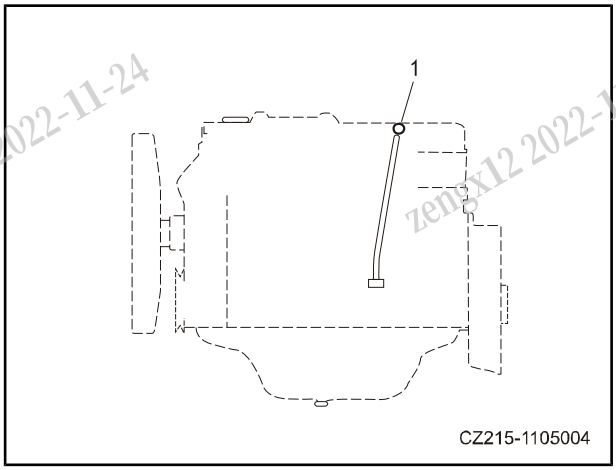


Fig.6-11

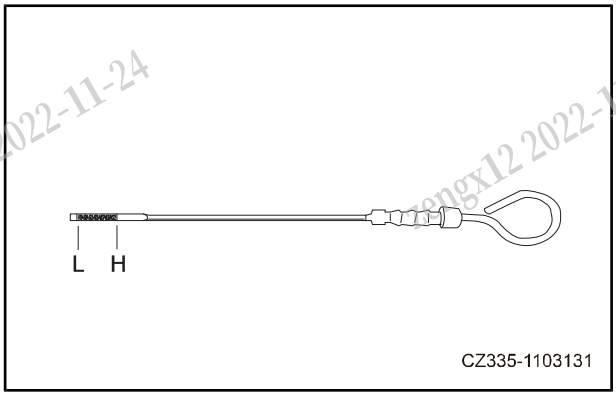


Fig.6-12

6.5.4 When Fuel Oil is Used Up

After the fuel oil is used up, it is necessary to fill in fuel oil before starting the engine again, and bleed off the air in the fuel system.

⚠ WARNING

- It is prohibited to use lighter or smoke etc. in the process of bleeding off the air. Otherwise, it might cause fire hazard, and result in serious accidents.
- The splashed engine oil or fuel oil might cause fire hazard when it is heated or slip accident. Please clean the engine oil or fuel oil at the exhaust pipe etc. thoroughly.
- Be careful not to get scratched by the edge of surrounding part when bleeding off the air as the operating space is very narrow.

Before starting the excavator, turn the starting key to the position ON, keep powering on by 2-3 minutes, operate the electronic fuel delivery pump and bleed off the air in the oil way.

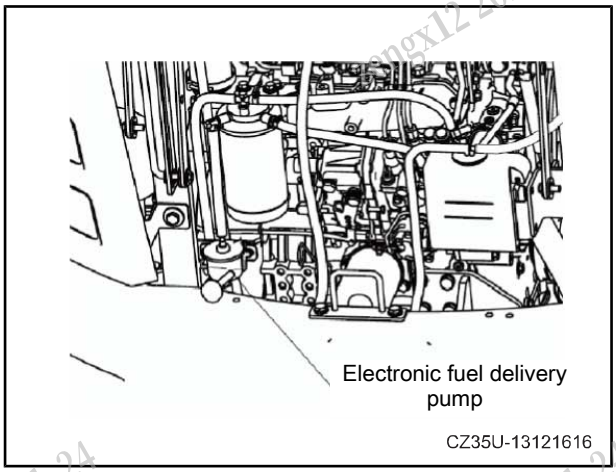


Fig.6-13

6.5.5 When Engine Rotates Counterclockwise

⚠ WARNING

Please start the stop device immediately to turn off the engine. If the engine could not be stopped immediately, it would be burned in several minutes or cause major injury. The tail gas exhausted from the air filter might cause fire hazard.

The following phenomenon will occur when the engine rotates counterclockwise.

- High-pitch knocking noise will be emitted at the beginning of operation.
- Black smoke is emitted from the air filter.
- The tachometer or the oil pressure gauge does not react.
- The low oil voltage warning lamp is lit up.

After stopping, inspect and sweep the air filter and rubber hose of air suction system; replace with new part if finding abnormal situation.

6.6 Trouble of Electrical System

6.6.1 Troubleshooting Table of Electrical System

When any trouble occurs, please inspect as per the following table and contact with the authorized agent of SANY for repair.

Trouble contents	Trouble Analysis	Measures
The engine could not be started	● The storage battery energy is insufficient	● Charge or replace the storage battery
	● Internal trouble of starting switch for engine	● Replacement
	● Trouble of leading switch	● Repair or replace
	● Trouble of starting motor	● Repair or replace
	● The wire harness is open-circuited	● Inspect and repair
	● Trouble of fuse F1	● Replacement
	● The wire is short-circuited (ground trouble)	● Inspect and repair
	● Internal trouble of alternator	● Repair or replace
	● Trouble of starting relay	● Replacement
	● Trouble of stopping device	● Repair or replace
The engine speed fluctuates irregularly	● The wire harness is disconnected	● Inspect and repair
	● Internal trouble of sensor	● Replacement
	● The wire is short-circuited (ground trouble)	● Inspect and repair
	● Internal trouble of controller	● Replacement
The power supply for complete excavator could not be switched off	● Trouble of storage battery relay	● Replacement
	● The surge diode is broken down	● Replacement
The automatic idling does not work	● LS sensor Trouble	● Inspect and repair
	● Accessory signal trouble	● Inspect and repair
	● Controller trouble	● Replacement
The preheating function does not work	● Trouble of preheating fuse	● Replacement
	● Trouble of preheating relay	● Replacement
	● The wire is short-circuited (ground trouble)	● Inspect and repair

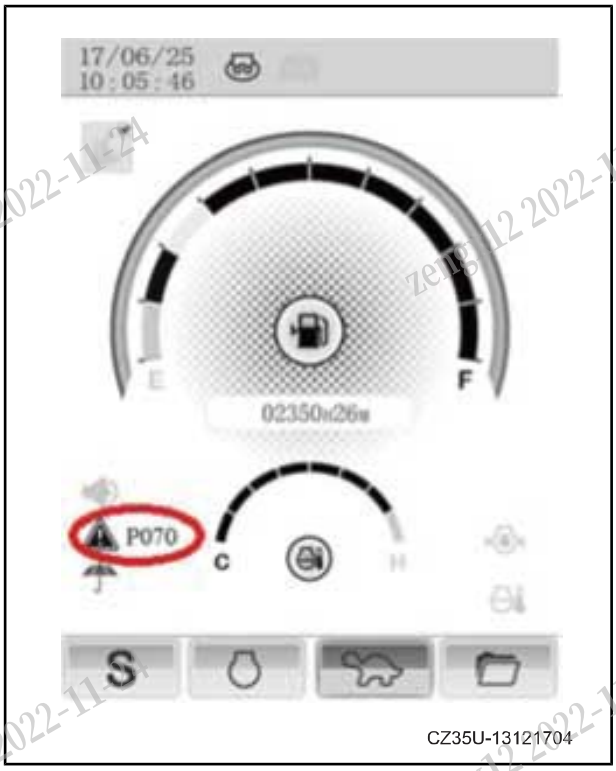
Trouble contents	Trouble Analysis	Measures
	● Trouble of preheating controller	● Replacement
All devices could not work	● Trouble of safety locking switch	● Repair or replace
	● Short-circuit trouble of wire (ground trouble)	● Inspect and repair
The display screen goes black	● Fuse trouble	● Replacement
	● The wire is disconnected	● Inspect and repair
	● The wire is short-circuited (ground trouble)	● Inspect and repair
	● Trouble of display screen	● Replacement
The display screen could not display	● Resistor trouble	● Replacement
	● The wire is disconnected	● Inspect and repair
	● The wire is short-circuited (ground trouble)	● Inspect and repair
	● Trouble of display screen or controller	● Replacement
The dual running speed function does not work	● Trouble of dual running speed solenoid valve	● Replacement
	● The wire is disconnected	● Inspect and repair
	● The wire is short-circuited (ground trouble)	● Inspect and repair
The indication of engine coolant temperature is inaccurate	● Trouble of coolant temperature sensor	● Replacement
	● The wire is disconnected	● Inspect and repair
	● The wire is short-circuited (ground trouble)	● Inspect and repair
	● The wire is short-circuited to 12V	● Inspect and repair
The indication of fuel oil level is inaccurate	● Trouble of oil level sensor	● Replacement
	● The wire is disconnected	● Inspect and repair
	● The wire is short-circuited (ground trouble)	● Inspect and repair
	● The wire is short-circuited to 12V	● Inspect and repair
The wiper does not work	● Internal trouble of wiper motor	● Repair or replace

Trouble contents	Trouble Analysis	Measures
	● The wire is disconnected	● Inspect and repair
	● The wire is short-circuited (ground trouble)	● Inspect and repair

6.6.2 Displayer Monitoring

Perform trouble judgment and analysis according to the trouble information text prompt displayed on the displayer.

Fig.6-14



6.7 Storage battery

6.7.1 Storage battery

⚠ WARNING

- When the storage battery is installed on the excavator, it will be dangerous if charging the storage battery. Before charging, it is necessary to remove the storage battery.
- It is necessary to turn off the engine and turn the starting switch key to the position OFF when inspecting or treating the storage battery
- When treating the storage battery, it is necessary to wear protective goggles and rubber gloves.
- When removing the storage battery, it is necessary to disconnect ground cable (negative [-] terminal) first. When installing, it is necessary to install the positive [+] terminal. If the tool contacts between the positive terminal and the chassis, it will produce the spark; thus, be particularly careful.
- If the terminal is loose, it would cause poor contact and produce spark, which might result in explosion.
- When removing or installing the terminal, it is necessary to inspect which one is positive [+] terminal and which one is negative [-] terminal.

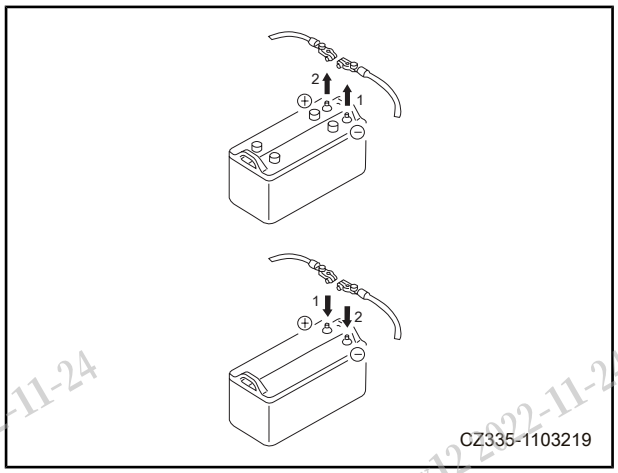


Fig.6-15

6.7.2 Removal and Installation of Storage Battery

1. Before removing the storage battery, it is necessary to remove the ground cable (usually connect to the negative [-] terminal).

2. It would produce electric spark if the tool contacts between the positive terminal and chassis.

3. When replacing the storage battery, it is necessary to fix the storage battery with clamping plate for storage battery.

4. Connection sequence of storage battery wires: Connect the positive wire of storage battery first, and then connect the negative wire.

5. Disconnection sequence of storage battery wires: Disconnect the negative wire of storage battery first, and then disconnect the positive wire.

6.7.3 Charging of Storage Battery

1. The storage battery might explode if it is not treated properly when the battery is charged. Be sure to observe the instructions for storage battery and battery charger, and operate in accordance with the following contents:

- Adjust the voltage of battery charger to match with the voltage of storage battery to be charged. The battery charger will be overheated and explode if failing to select correct voltage.
- Connect the positive [+] cord clamp of battery charger to the positive [+] terminal of storage battery. Then, connect the negative [-]cord clamp of battery charger to the negative [-] terminal of storage battery. It is necessary to connect the cord clamp reliably.
- Adjust the charging current to 1/10 of rated capacity of storage battery; when charging rapidly, adjust the charging current to the value lower than the rated capacity of storage battery. If the charging current is too big, the electroltye will leak or evaporate

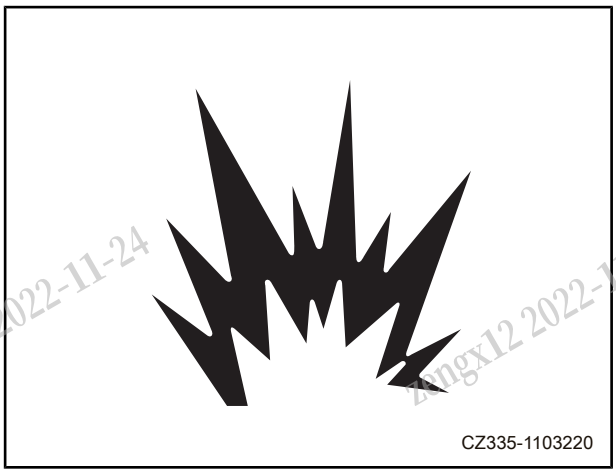


Fig.6-16

completely, which would cause fire hazard or explosion of storage battery.

- If the storage battery electrolyte has been frozen, it is not allowed to charge the battery or start the engine with different power supply. Otherwise, it will get the storage battery electrolyte ignited and the battery to explode.

6.7.4 Start Engine with Auxiliary Cable

6.7.4.1 Overview

Connect and disconnect the auxiliary cable

⚠ WARNING

- When connecting the cable, prevent the positive terminal [+] contacting with the negative terminal [-].
- Prevent the normal excavator contacting with the faulty excavator for preventing electric spark generated near the storage battery igniting the hydrogen released from storage battery.
- When connecting the auxiliary cable, be careful not to make mistake. When connecting finally (to the superstructure frame), it would produce spark; therefore, it is necessary to connect the cable to the position far away from the storage battery (however, it is necessary to keep away from the working device which is not a good conductor).
- When removing the auxiliary cable, be particularly careful to prevent the cable clamps contacting with each other or with the chassis.

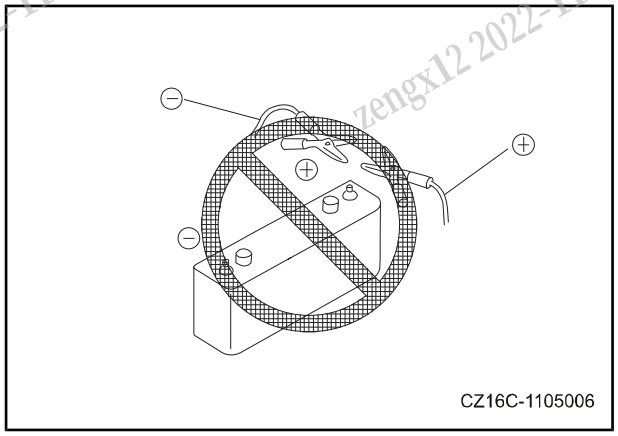


Fig.6-17

Note:

The voltage of starting system for this excavator is 12V. When the excavator is used

normally, one 12V storage battery will be used for supplying power.

The specifications of auxiliary cable and clamp shall be corresponding to the specification of storage battery.

The capacity of storage battery on the normal excavator must be same to the capacity of engine to be started.

Inspect whether the cable and clamp are damaged or corroded.

Ensure the cable and clamp are connected firmly.

Inspect whether the locking lever and parking brake bar of both excavator are on the “locked” positions.

Inspect whether the control levers are on the neutral positions.

6.7.4.2 Connection of Auxiliary Cable

Keep the starting switches of the normal excavator and the faulty excavator on the position OFF.

Connect the following auxiliary cables in the sequence of number marked in the figure.

1. Connect the clamp of auxiliary cable [A] to the positive [+] terminal of storage battery on the faulty excavator.

2. Connect the clamp on the other end of auxiliary cable [B] to the slewing frame of the faulty excavator.

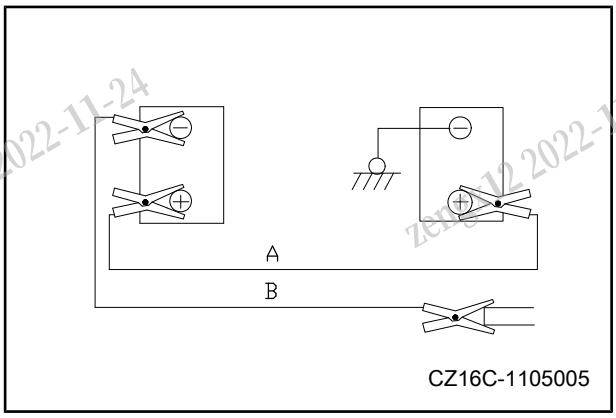


Fig.6-18

6.7.4.3 Start Engine

⚠ CAUTION

No matter whether the excavator is working normally or has trouble, inspect the excavator, and confirm that the safety locking lever is on the “locked” position and inspect whether all the control levers are on “holding” or neutral positions.

1. Ensure the clamp is connected to the terminal of storage battery reliably.

2. Start the engine of normal excavator and idle at high speed.

3. Turn the starting switch of faulty excavator to the “Start” position and start the engine.

If failing to start the engine in the first time, try again after 2 minutes.

6.7.4.4 Disconnection of Auxiliary Cable

After starting the engine, disconnect the auxiliary cable in the opposite sequence to the connection.

1. Remove one clamp of auxiliary cable [B] from the slewing frame of faulty excavator.

2. Remove the clamp of auxiliary cable [B] from the negative [-] terminal of storage battery on the normal excavator.

3. Remove the clamp of auxiliary cable [A] from the positive [+] terminal of storage battery on the faulty excavator.

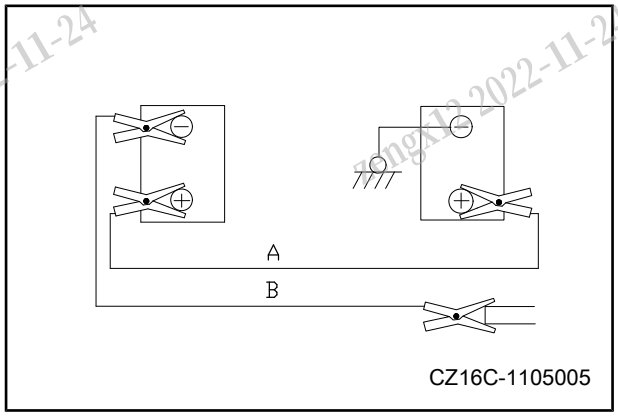


Fig.6-19

6.8 Troubles of Hydraulic System

- When any trouble occurs, please inspect as per the following table and contact with the authorized agent of SANY for repair.
- Set the operating mode to maximum rotating speed for trouble diagnosis.

Trouble contents	Trouble Analysis	Measures
The working device acts slowly, or the running and slewing speed is low	● The main overflow valve is not adjusted properly or fails	● Replacement
	● The leading overflow valve has trouble	● Replacement
	● The regulator has trouble	● Repair or replace
	● The plunger pump has trouble	● Inspect and repair
The working device, running or slewing gear could not work	● The leading safety valve has trouble	● Repair or replace
	● The leading pump overflow valve has trouble	● Replacement
	● The hydraulic pump has trouble	● Inspect and repair
	● The coupling has trouble	● Inspect and repair
The hydraulic pump has abnormal noise	● The hydraulic oil level reduces	● Supplement hydraulic oil
	● The hydraulic oil quality is poor	● Replace with appropriate hydraulic oil
	● The air breather on the top of hydraulic oil tank is plugged	● Clean or replace
	● The hydraulic oil tank filter screen is plugged	● Clean or replace
	● The plunger pump has trouble	● Inspect and repair
The automatic idling could not work	● The sensor has trouble	● Replacement
	● The leading valve has trouble	● Replacement
	● Controller trouble	● Repair or replace
The boom action is slow	● The right leading valve (boom oil way) has trouble	● Inspect and repair
	● The pressure sensor has trouble	● Replacement
	● The boom control valve (valve core) has trouble	● Repair or replace
	● The boom control valve (holding valve) has trouble	● Repair or replace
	● The boom control valve (safety valve and oil filling valve) fails or the sealer has trouble	● Repair or replace
	● The boom cylinder has trouble	● Inspect and repair

Trouble contents	Trouble Analysis	Measures
The bucket rod action is slow	● The left leading valve (bucket rod oil way) has trouble	● Inspect and repair
	● The pressure sensor has trouble	● Replacement
	● The bucket rod control valve (valve core) has trouble	● Repair or replace
	● The bucket rod control valve (regeneration valve) has trouble	● Repair or replace
	● The boom control valve (safety valve and oil filling valve) fails or the sealer has trouble	● Repair or replace
	● The bucket rod cylinder has trouble	● Inspect and repair
The bucket action is slow	● The right leading valve (bucket oil way) has trouble	● Inspect and repair
	● The pressure sensor has trouble	● Replacement
	● The bucket control valve (valve core) has trouble	● Repair or replace
	● The bucket control valve (holding valve) has trouble	● Repair or replace
	● The bucket control valve (safety valve and oil filling valve) fails or the sealer has trouble	● Repair or replace
	● The bucket cylinder has trouble	● Inspect and repair
Single cylinder of working device could not act	● The leading valve fails	● Inspect and repair
	● The pressure sensor has trouble	● Replacement
	● The working device control valve (valve core) has trouble	● Repair or replace
The settling volume of working device cylinder is too big	● The working device cylinder has trouble	● Repair or replace
	● The holding valves (boom and bucket rod) have trouble	● Repair or replace
	● The sealer of working device control valve (safety valve and oil filling valve) fails	● Repair or replace

Trouble contents	Trouble Analysis	Measures
	● The working device valve core has trouble	● Repair or replace
The action of working device is lagged	● The regeneration valve of bucket rod fails	● Repair or replace
	● The control valve (safety valve and oil filling valve) fails	● Repair or replace
Other working devices move when single oil way is overflowing	● The sealer of control valve fails	● Replacement
The excavator deviates when running	● The running overflow valve has trouble	● Repair or replace
	● The leading overflow valve fails	● Replacement
	● The regulator has trouble	● Repair or replace
	● The proportional solenoid valve gets clamped	● Repair or replace
	● The running valve core gets clamped	● Repair or replace
	● The central slewing connector gets clamped	● Repair or replace
	● The running motor fails	● Repair or replace
	● The running leading pressure sensor has trouble	● Replacement
The excavator runs slowly	● The running overflow valve has trouble	● Repair or replace
	● The leading overflow valve fails	● Repair or replace
	● The sensor has trouble	● Repair or replace
	● The running control valve (valve core) fails	● Repair or replace
	● The running control valve (oil filling valve) fails	● Repair or replace
	● The running motor has trouble	● Inspect and repair
It is not easy for the excavator to make a turn or the power is insufficient	● The running leading valve fails	● Repair or replace
	● The running leading pressure sensor fails	● Replacement

Trouble contents		Trouble Analysis	Measures
		● The running control valve (valve core) fails	● Repair or replace
		● The running control valve (oil filling valve) fails	● Repair or replace
		● The running motor (safety valve) fails	● Repair or replace
		● The running motor (one-way valve) fails	● Repair or replace
The running speed could not be changed		● The high/low speed change-over solenoid valve fails	● Replacement
		● The running motor has trouble	● Inspect and repair
The excavator could not run (only on one side)		● The running control valve (oil filling valve) seat has trouble	● Repair or replace
		● The running motor (safety valve) seat has trouble	● Repair or replace
		● The running motor (oil filling valve) seat has trouble	● Repair or replace
		● The running motor has trouble	● Inspect and repair
		● The leading pressure sensor has trouble	● Replacement
The excavator could not slew	The excavator could not slew to the left or right	● The slewing motor (parking brake) fails	● Inspect and repair
		● The slewing motor (safety valve) is not adjusted properly or fails	● Adjust or replace
		● The slewing motor has trouble	● Inspect and repair
		● The slewing gear has trouble	● Inspect and repair
	The excavator could not slew to one direction	● The leading valve fails	● Repair or replace
		● The slewing control valve (valve core) fails	● Repair or replace
		● The sealer of slewing motor (oil filling valve) fails	● Replacement
The slewing speed is slow	The acceleration performance is poor or the slewing speed is low	● The slewing motor (parking brake) fails	● Inspect and repair
		● The slewing motor (safety valve) is not adjusted properly or fails	● Adjust or replace

Trouble contents		Trouble Analysis	Measures
		● The slewing motor has trouble	● Inspect and repair
		● The brake control pipeline is plugged	● Dredge or replace the pipeline
	The unilateral acceleration performance is poor or the slewing speed is low	● The leading valve fails	● Repair or replace
		● The slewing motor (pressure-compensated valve) fails	● Repair or replace
		● The sealer of slewing motor (oil filling valve) fails	● Replacement
		● The shuttle valve of slewing leading pressure sensor leaks from one side	● Repair or replace
The overrunning is too big when the slewing stops.	The over-slewing amount is relatively big on two directions	● The slewing motor (safety valve) is not adjusted properly or fails	● Adjust or replace
		● The slewing motor has trouble	● Inspect and repair
	The over-slewing amount is relatively big only on one direction	● The leading valve fails	● Repair or replace
		● The slewing control valve (valve core) fails	● Repair or replace
		● The sealer of slewing motor (oil filling valve) fails	● Replacement
The impact is too big when the slewing stops		● The slewing leading valve fails	● Repair or replace
		● The slewing anti-swing valve fails	● Repair or replace
		● The slewing overflow valve fails	● Repair or replace
The abnormal noise is too high when the slewing stops		● The counterbalance valve fails	● Repair or replace
		● The slewing motor (safety valve) fails	● Repair or replace
		● The slewing motor (oil filling valve) fails	● Repair or replace
		● The slewing mechanical device fails	● Inspect and repair
The drifting of slewing hydraulic	When slewing parking brake is applied	● The slewing brake control pipeline has trouble	● Inspect and repair
		● The slewing motor (parking brake) has trouble	● Repair or replace

Trouble contents		Trouble Analysis	Measures
pres-sure is too big	When the slew-ing parking brake is released	● The slewing control valve (valve core) fails	● Repair or replace
		● The slewing motor (overflow valve) has trouble	● Repair or replace
		● The slewing motor (oil filling valve) has trouble	● Repair or replace

6.9 Other common troubles

Trouble contents	Trouble Analysis	Measures
The noise of structural member is too high	● The fasteners are loose and produce abnormal noise	● Inspect and re-tighten
	● The abrasion of clearance between bucket and bucket rod end increases	● Adjust the clearance to be smaller than 1mm
The bucket tooth drops during work	● The bucket tooth pin is used by several times so that the spring deformation elasticity is insufficient	● Replace the bucket tooth pin
	● The bucket tooth pin does not match with the tooth seat	
The tracks are knotted under the excavator	● The tracks are loose	● Tighten the tracks
	● The excavator runs rapidly on the rugged road with the driving wheel in the front	● The excavator runs slowly on the rugged road with the guide wheel in the front
The fan does not rotate	● Poor electrical contact or poor contact of plug connector	● Repair or replace
	● The volume switch, relay or temperature control switch is damaged	
	● The fuse is blown or the battery voltage is too low	
The fan operates normally but the air volume is too small	● There are barriers on the air suction side	● Clean
	● The evaporator or condenser fins are plugged, obstructing the heat transfer	● Clean
	● One fan propeller gets stuck or damaged	● Replacement
The compressor does not work or it is difficult for the compressor to operate	● The compressor clutch could not get engaged due to open circuit or poor contact of circuit.	● Repair
	● The tension of compressor belt is insufficient, and the belt is too loose	● Adjust the tensity of compressor belt
	● The coil of compressor clutch is broken or fails	● Replace the clutch coil

Trouble contents		Trouble Analysis	Measures
		● The refrigerant volume is too small or too big	● Adjust the filling volume of refrigerant
The refrigerant is insufficient		● The refrigerant leaks	● Solve the leaking point
		● The filling volume of refrigerant is too small	● Fill in refrigerant of appropriate volume
Readings of high/low pressure gauges under normal working conditions		When the ambient temperaure is: 30-50℃ Reading of high pressure gauge: 1.47-1.67MPa (15-17kgf/cm^2) Reading of low pressure gauge: 0.13-0.20MPa (1.4-2.11kgf/cm^2)	
The low-pressure pressure is too high	The frost is attached in the surface of lowpressure pipe	● The opening of expansion valve is too big	● Replace the expansion valve
		● The contact of temperature wrap of expansion valve is poor	● Install the temperature wrap properly
		● The refrigerant volume in the system is excessive	● Drain some to the specified volume
The low-pressure pressure is too low	The readings of high/low pressure gauge are lower than normal value	● The refrigerant is insufficient	● Supplement the refrigerant to the specified volume
	The pressure reading of low pressure gauge is negative pressure	● The low pressure hose is plugged, or the expansion valve is plugged by ice or dirt	● Repair the system; replace the liquid storage tank if it is plugged by ice
	The evaporator is frozen	● The thermostat fails	● Replace the thermostat

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Maintenance

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⚠ WARNING

Read and understand all safety precautions and instructions in this manual before reading any other manuals provided with this machine and before operation or maintaining it. Failure to do this could result in death or serious injury.

7.Maintenance

7.1 Maintenance Information

Do not perform any inspection and maintenance not described in this Manual.

Inspect the reading of hour meter every day to check whether it reaches the necessary maintenance time. When the maintenance time for the excavator is reached, the form will appear, indicating that it is necessary to maintain.

Inspect the reading of hour meter every day to check whether it reaches the necessary maintenance time. When the maintenance time for the excavator is reached, the form will appear, indicating that it is necessary to maintain.

It is necessary to use authentic SANY engine oil and lubricating grease. Select engine oil and lubricating grease of appropriate viscosity according to the ambient temperature.

Use windshield wiper fluid and prevent the dirt entering.

Use clean engine oil and lubricating grease. Keep the engine oil or lubricating grease clean and prevent the impurities entering the oil and lubricating grease.

After replacing the oil or filter core, inspect whether there are metal filing or impurities in the used oil and filter core. If finding a lot of metal filing or impurities, it is necessary to report to the competent personnel and take appropriate measures.

If the excavator is equipped with fuel filter screen, it is not allowed to remove the filter screen when filing in fuel oil.

- Turn off the engine starting switch.
- Disconnect the negative pole of storage battery.
- Do not use voltage higher than 200V continuously.
- Connect the grounding cable within 1m scope to the welding position. The instrument might break down if the grounding cable is close to the instrument or connector etc.
- Avoid sealer or bearing between welding position and grounding point.
- Do not use the area around axis pin or hydraulic cylinder of working device as grounding point.
- Be careful not to drop the nut, bolt or tool into the excavator when opening the inspection window or oil filler. It will damage the excavator and result in troubles which would lead to accidents if it drops into the excavator. Therefore, it is necessary to take it out if anything drops in the excavator.
- Do not contain any unnecessary things in the pocket; it is only allowed to take some necessary things for inspection.

Working Place with Heavy Dust

When operating in the working place with heavy dust, it is necessary to perform in the following steps:

- Clean the filter core timely when the air filter blocking alarm on the air filter gives alarm.
- Clean the radiator core frequently to avoid blocking. (c) Clean and replace the fuel filter core frequently.
- Clean the electrical components, particularly the starting motor and alternator to avoid dust accumulation.
- Move the excavator to a place without dust to prevent the dust entering the oil when inspecting or replacing the oil.

Avoid Mixing Different Lubricating Oil

Do not mix the lubricating oils of different designations. If needing to fill in oil of different designations, it is necessary to drain the used oil thoroughly and replace with the new oil.

Lock Inspection Cover

When opening the inspection cover for maintenance, it is necessary to lock the inspection cover firmly with locking lever. The inspection cover might be closed by the wind, and cause personal injuries if the inspection cover is opened but has not been locked when inspecting or maintaining.

Hydraulic System - Bleeding off Air

When the hydraulic device has been repaired or replaced, or the hydraulic pipeline has been removed and installed, it is necessary to bleed the air in the oil way. See “Bleed off the air in the hydraulic system” for details.

Installation of Hydraulic Hoses

- When removing the parts on the positions with O-ring or packing seal, it is necessary to clean the mounting surface and replace with parts. Do not forget to install the O-ring and packing.
- When installing the hoses, do not twist or bend the hoses into the circle of small diameter. Otherwise, it will damage the hoses and shorten the service life of the hoses obviously.

Inspection after Inspection and Maintenance

If failing to inspect after inspection and maintenance, the unexpected trouble might occur, and it might lead to serious injuries or damages. It is necessary to perform as per the following steps:

Inspections after operation (when the engine is turned off)

- Inspect whether any inspection and maintenance positions have been forgotten.
- Inspect whether all inspection and maintenance items have been performed properly.
- It will be very dangerous if the parts drop into the excavator and get stuck into the connecting-rod gear. Inspect whether any tools or parts drop into the excavator.
- Inspect whether there is any water leakage or oil leakage, and whether all bolts have been tightened.

Inspections when operating the engine

- Refer to “Inspections before starting the engine” for details of inspections when operating the engine, and be careful.
- Whether the inspection and maintenance items are performed normally.
- Inspect whether there is oil leakage when the engine speed rises up and the load is applied to the oil.

7.2 Lubricating Oil, Coolant and Filter Core

Lubricating Oil

- The oil is used in the engine and working device operating under severe working conditions (high temperature and high pressure), and will be deteriorated during use.
- It is necessary to use the oil of the grade and temperature specified in the “Operation and Maintenance Manual”.
- It is necessary to replace as per the specified maintenance cycle even if the oil is not dirty.
- The oil is as important for the excavator as the blood for human. Therefore, be careful when treating to prevent any impurities (water, metal particles and dust etc.) entering.
- Most troubles of the excavator are caused by the impurities.
- When storing or filling in fuel oil, be particularly careful not to let the impurities enter
- Do not mix the oil of different grades and designations.
- Fill in oil as per the specified oil volume.
- It would cause trouble if the oil volume is too big or too small.
- It is recommended to analyze the oil quality regularly to inspect the situation of the excavator. With regard to the users requiring such service, please contact with the authorized agent of SANY Heavy Machinery Co., Ltd..

Fuel Oil

- The fuel pump is a kind of precise part. The fuel pump would be unable to work normally if the fuel oil contains moisture or dirt.
- When storing or filling in fuel oil, be particularly careful not to let the impurities enter.
- It is necessary to use the fuel oil specified in “Operation and Maintenance Manual”.
- The fuel oil will be settled if the temperature is too low (particularly when the temperature is lower than -15℃ (5° F)); thus, it is necessary to replace with the fuel oil matching with the temperature.
- For preventing the moisture in the air condensing into water in the fuel tank, it is necessary to fill up the fuel tank at the end of work every day.
- It is necessary to drain the sediment and water in the fuel tank before starting the engine or 10 minutes after filling in fuel oil.
- It is necessary to bleed off the air in the oil way if the fuel oil has been used up or the fuel oil filter core has been replaced.

Coolant of cooling system

- The river water contains a lot of calcium and other impurities. The water scale will attach on the engine and radiator, resulting in heat transfer trouble and overheating if the river water is used.
- Do not use water not suitable for drinking.
- When using the anti-freezing solution, observe the precautions in the “Operation and Maintenance Manual”.
- The coolant contains authentic SANY anti-freezing solution when the excavator is delivered.
- SANY anti-freezing solution may prevent the cooling system being corroded effectively.
- SANY anti-freezing solution may be used continuously for two years or 4,000 hours. Thus, such antifreezing solution still can be used even in hot region.
- The anti-freezing solution is flammable; thus, keep the anti-freezing solution from the open flame.
- The mixing ratio of water and anti-freezing solution will vary under different ambient temperature.
- It is necessary to wait until the engine cools down before filling in the coolant if the engine is overheated.
- If the coolant is insufficient, the engine will be overheated, and the air entering will cause corrosion to the cooling system.

Lubricating grease

- The lubricating grease is used to prevent the twisting and noise at the connections.
- The nozzle not included in the section “Maintenance” is the nozzle used during overhaul. Thus, it is unnecessary to fill in the lubricating grease.
- It is necessary to apply lubricating grease if any parts become inflexible or produce noise after being used for long time.
- After filling in the lubricating grease, wipe the used lubricating grease squeezed out
- Wipe off the used lubricating grease carefully on various positions; the rotating parts will be worn if the sand or dust is attached on the lubricating grease.

Storage of Lubricating Oil and Fuel Oil

- It is necessary to store indoors for preventing the water, dust or other sundries entering.
- When storing the oil barrels for long time, it is necessary to place the barrels sideways to make the oil filler of oil barrel on the side surface (to prevent the oil sucking moisture).
- If having to store the barrels outdoors, it is necessary to cover the barrels with waterproof cloth or take other protective measures.
- For preventing the oil being deteriorated when storing for long time, it is necessary to use in the first-in first-out sequence (use the lubricating oil or fuel oil which has been stored for the longest time).

Filter core

- The filter core is a very important safety part. It may prevent the impurities in the oil way and gas circuit entering important devices and resulting in troubles.

- It is necessary to replace all the filter cores regularly. See “Operation and Maintenance Manual” for details.
- However, it is necessary to replace the filter core within the shorter cycle according to the lubricating oil and fuel oil (sulfur content) used when operating under the severe conditions.
- When replacing the engine oil filter core, it is necessary to inspect whether there are any metal particles attached on the filter core. If finding metal particles, please contact with the authorized agent of SANY Heavy Machinery Co., Ltd..
- Before using, do not open the package of standby filter core.
- It is necessary to use the authentic SANY filter core.

Maintenance of Electrical System

- It will be very dangerous if the electrical equipment has been affected by damp or the insulation layer of wires is broken. It will result in electric leakage and excavator troubles. Do not wash the inside of the cab with water.
- Be careful not let the water enter the electrical parts when washing the excavator.
- Inspect whether the harnesses are broken, whether the bellows are intact, whether the plug connectors are loose and whether the fixed points of harnesses are reliable.
- Do not install any other electronic parts than those specified by SANY Heavy Machinery Co., Ltd..
- The external electromagnetic interference will result in trouble of control system controllers. When installing the radio receiver or other radio equipment, it is necessary to contact with the authorized agent of SANY Heavy Machinery Co., Ltd..
- When operating on the beach, it is necessary to clean the electrical system carefully for preventing corrosion.
- When installing the cab air cooler or other electrical equipment, it is necessary to connect it to the special connector of power supply. The optional power supply shall not be connected to the fuse, starting switch or storage battery relay.

7.3 Quick-wear Parts

The quick-wear parts such as filter core and bucket tooth etc. shall be replaced during regular maintenance or after reaching the wear limit. For using the excavator economically, it is necessary to replace the quickwear parts properly. It is necessary to select authentic SANY parts as replacement. When ordering parts, please refer to the query code in the relevant sections of spare parts drawing volume.

Table of Quick-wear Parts

The parts in the brackets shall be replaced at the same time

Items	Part name	Quantity	Replacement cycle
Engine oil filter	Filter core	1	Every 250 hours (50 hours for new excavator)
Fine fuel filter core	Filter core	1	Every 500 hours
Coarse diesel filter	Filter core	1	Every 500 hours
Air breather of hydraulic oil tank	Filter core	1	Every 1000 hours
Hydraulic oil filter	Oil suction filter core	1	Every 2000 hours
	Oil return filter core	1	Every 1,000 hours
	(O-ring)	(2)	
Air filter core	Outer filter core	1	Sweep when the air filter indicator alarms or every 250 hours; sweep 6 times or 1 year, whichever comes earlier.
	Inner filter core	1	Replace 1 time after replacing the main filter core 3 times; or every 1750 hours or 1 year, whichever comes earlier.
Bucket	Bucket tooth	4	
	Bucket tooth seat	4	
	Tooth pin	4	
	Side edge (left)	1	
	Side edge (right)	1	
	(Bolt)	(6)	
	(Nut)	(6)	

7.4 Select Appropriate Lubricating Oil, Fuel Oil and Coolant According to Environment

Correct selection

Container	Liquid variety	Environmental temperature								
		-22 -30	-4 -20	-14 -10	32 0	50 10	68 20	86 30	104 40	12-2℉ 5-0℃
Engine oil pan	Engine oil			SAE 10W	SAE 30					
				SAE 10W-30						
				SAE 15W-40						
Guide wheel	Gear oil			SAE 30						
Supporting wheel										
Running Motor										
Sprocket wheel										
Hydraulic system	Hydraulic oil			SAE 10W						
				SAE 10W-30						
				SAE 15W-40						
			ISO VG32							
				ISO VG46						
						ISO VG68				
Fuel tank	Diesel oil			ASTM D 975 No.2						
				GB252 premium grade - #20 diesel oil						

Container	Liquid variety	Environmental temperature								
		-22 -30	-4 -20	-14 -10	32 0	50 10	68 20	86 30	104 40	12-2℉ 5-0℃
		GB252 premium grade - #35 diesel oil								
Grease nozzle	Lubri-cating grease	NLGI No.2								
Cooling system	Anti-freeze coolant	Fill in anti-freezing solution								

Capacity Table

Model	Volume (L)				
	Fuel tank	Hydraulic oil tank	Engine lubri-cating oil	Cooling system	Lubricating oil for run-ning reducer
SY35U	40	40	6	5.5	0.7
SY55U	78	52	9	5.7	0.9

Remarks

- When starting the engine when the ambient temperature is lower than 0°C, it is necessary to use SAE 10W, SAE 10W-30 or SAE 15W-40 engine oil even if the air temperature in the daytime rises up to about 10°C.
- It is allowed to mix the single-stage oil with the multi-stage oil (SAE 10W-30 and 15W-40); however, it is necessary to fill in single-stage oil matching with the temperature in the table.
- The sulfur component in the fuel oil will be converted into sulfur oxide when burning, and will change to dilute sulfuric acid after reacting with the water, which will cause engine damages. For avoid such trouble, be sure to use the fuel oil with sulfur content less than 0.2%.
- The fuel oil quality varies in different places so that the replacement time for fuel oil is the theoretical reference value. The fuel oil shall be replaced by the commercial division of the agents according to the local conditions.
- The replacement cycle for engine oil and engine oil filter is recommended to be 250 hours when using in the environment with heavy dust.

7.5 Technical Specification of Tightening Torque

Table of Tightening Torque

⚠ CAUTION

- The parts will be loose or damaged if the nuts, bolts or other parts have not been tightened to the specified torque, resulting in excavator troubles or operation problems.
- Be particularly careful when tightening the parts.

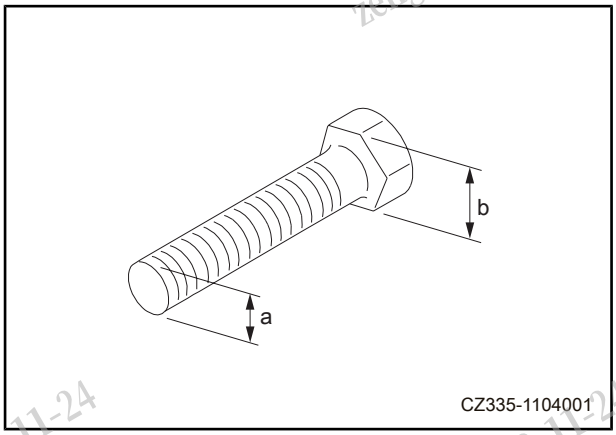

Fig.7-1

Unless otherwise specified, the metric nuts and bolt shall be tightened to the torque shown in the following table.

The tightening torque shall be determined according to the width across flats of nuts and bolts. It is necessary to replace with authentic SANY parts of same dimensions when needing to replace the bolts or nuts.

Thread Diamete a (mm)	Width across the flats b (mm)	Tightening Torque			
		Target Value		Service Limit	
		N·m	kgf·m	N·m	kgf·m
6	10	13.2	1.35	11.8 ~ 14.7	1.2 ~ 1.5
8	13	31	3.2	27 ~ 34	2.8 ~ 3.5
10	17	66	6.7	59 ~ 74	6.0 ~ 7.5
12	19	113	11.5	98 ~ 123	10.0 ~ 12.5
14	22	206	21	187 ~ 225	19.0 ~ 23.0
16	24	279	28.5	245 ~ 309	25.0 ~ 31.5
18	27	382	39	343 ~ 425	35.0 ~ 43.5
20	30	549	56	490 ~ 608	50.0 ~ 62.0
22	32	745	76	662 ~ 829	67.5 ~ 84.5
24	36	927	94.5	824 ~ 1030	84.0 ~ 105.0
27	41	1320	135	1180 ~ 1470	120.0 ~ 150.0
30	46	1720	175	1520 ~ 1910	155.0 ~ 195.0
33	50	2210	225	1960 ~ 2450	200.0 ~ 250.0
36	55	2750	280	2450 ~ 3040	250.0 ~ 310.0
39	60	3280	335	2890 ~ 3630	295.0 ~ 370.0

- Refer to the following table for the use of hydraulic hoses

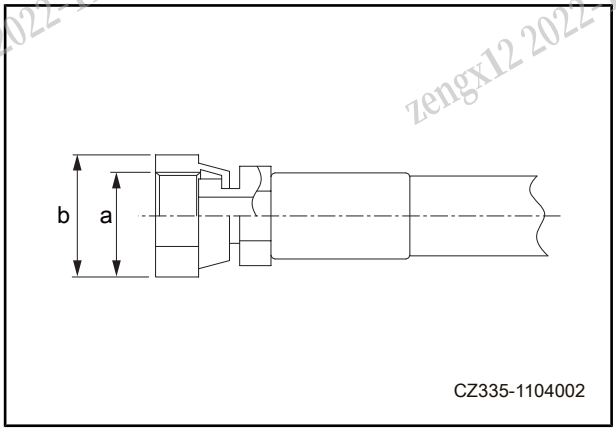

Fig.7-2

Nominal designation of thread（a）	Width across the flats(b) (mm)	Service Limit	
		N·m	kgf·m
M12	14	17.5 ~ 22.5	1.75 ~ 2.25
M14	17	19.5 ~ 29.5	2.0 ~ 3.0
M16	19	24.5 ~ 34.5	2.5 ~ 3.5
M18	22	43 ~ 59	4.4 ~ 6.0
M22	27	60 ~ 88	6.1 ~ 8.9
M30	36	115 ~ 155	11.8 ~ 15.8
M36	41	140 ~ 192	14.2 ~ 19.6

7.6 Regular Replacement of Key Parts Related to Safety

When operating or driving the excavator, the user must maintain the excavator regularly for ensuring safety. Besides, the user also shall replace the parts listed in the table regularly for improving the safety further. Such parts are closely related to the safety and fire protection.

Along with the time, the materials of such parts will change, and they are prone to be worn or deteriorated. It will be very difficult to judge the situation of the parts through the regular maintenance. Therefore, the parts must be replaced in any cases once the specified maintenance cycle expires. This is important for always maintaining the functions of the parts fully.

However, it is necessary to repair or replace immediately if the parts are abnormal before the replacement cycle expires. if the hose clamp is deteriorated, such as deformation or cracks, it is necessary to replace the hose clamp together with the hose. When replacing the hose, it is necessary to replace the O-ring, packing and other similar parts at the same time. Ask the authorized agent of SANY Heavy Machinery Co., Ltd. to replace the key parts related to safety.

Key Parts Related to Safety

S/N	Regular replacement of key parts related to safety	Quantity	Replacement cycle
1	Fuel hose (fuel tank- oil-water separator)	1	Every 2 years or every 4000 hours, whichever comes earlier.
2	Fuel hose (fuel pump- fuel filter)	1	
3	Fuel hose (fuel filter- fuel injection pump)	1	
4	Fuel return hose (pump- control valve)	1	
5	Pump outlet hose (pump- control valve)	1	
6	Working device hose (oil inlet of boom cylinder)	2	
7	Working device hose (bucket cylinder pipelineboom root)	2	
8	Working device hose (oil inlet of bucket cylinder)	2	
9	Working device hose (bucket rod cylinder pipelineboom root)	2	
10	Working device hose (oil inlet of bucket rod cylinder)	2	
11	Accessory pipeline hose (boom root)	2	
12	Accessory pipeline hose (boom end)	2	
13	Accessory pipeline hose (oil inlet of slewing motor)	2	
14	Running pipeline hose (control valve-slewing connector)	4	
15	Running pipeline hose (slewing connector- running motor)	4	
16	Seat belt	1	Every 3 years

7.7 Lubrication Chart

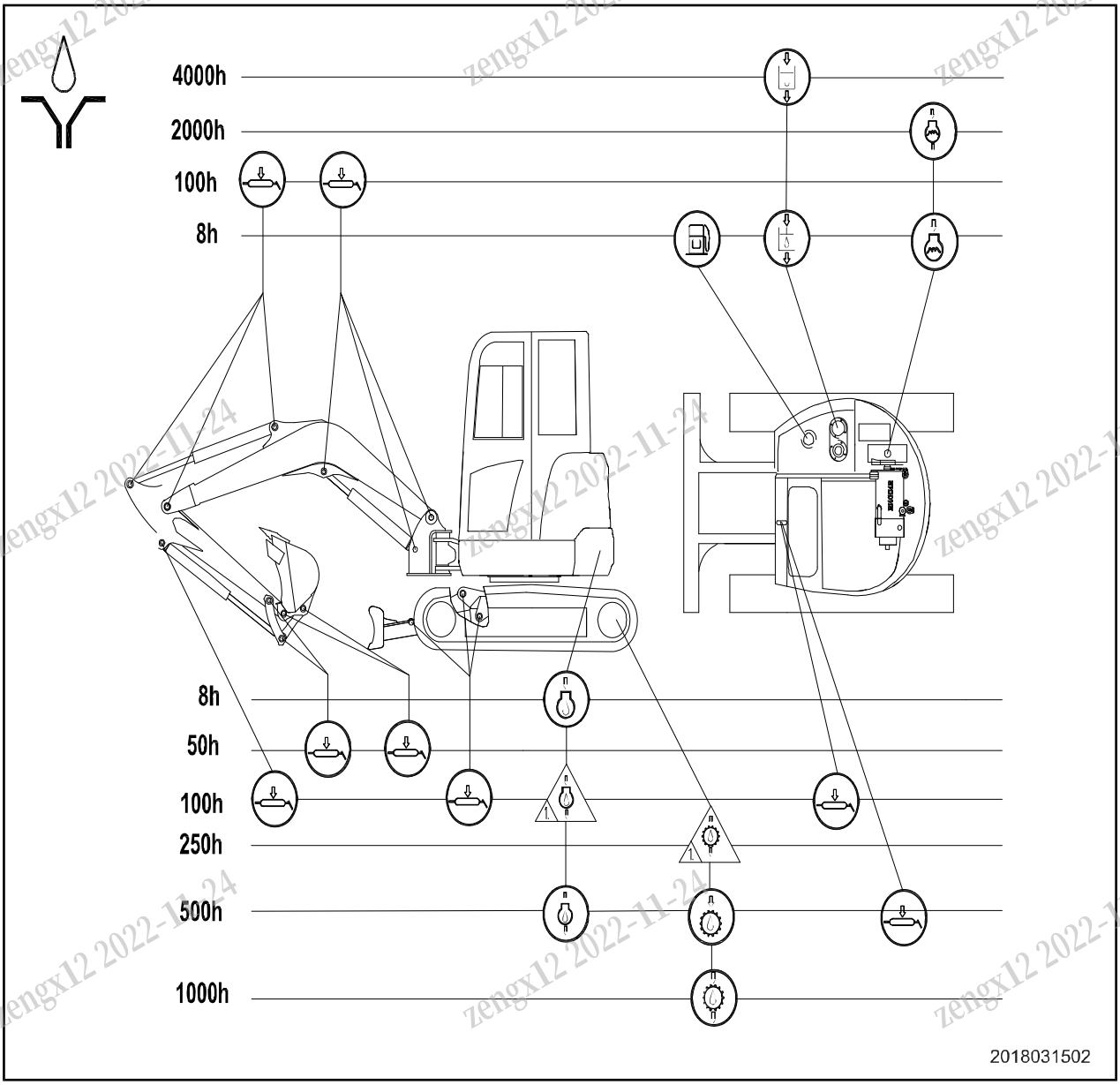

Fig.7-3

7.8 Maintenance Schedule

7.8.1 Maintenance Plan

If the machine is equipped with hydraulic hammer, the maintenance schedule for some parts might be different. Determine the proper maintenance schedule with reference to “Maintenance Cycle when Using Hydraulic Hammer” for details.

Maintenance in the first 50 hours

“Maintenance in the first 50 hours (to be performed only after the first 50 hours)” on page 7-19

When required

Inspection before Starting

Maintenance Every 50 Hours

Maintenance Every 100 Hours

Maintenance every 250 hours

Maintenance every 500 hours

Maintenance every 1000 hours

“Overview” on page 7-46

“Hydraulic Oil Return Filter Core - Replacement” on page 7-46

“Inspect Fan Belt Tension and Replace Fan Belt” on page 7-48

Maintenance every 2000 hours

“Overview” on page 7-49

“Oil in running reducer-replacement” on page 7-49

“Oil Suction Filter Core of Hydraulic Oil Tank - Cleaning/Replacement” on page 7-51

“Alternator and Starting Motor - Inspection” on page 7-52

“Engine valve clearance-inspection/ adjustment” on page 7-53

Maintenance every 4000 hours

“Overview” on page 7-53

“Water Pump - Inspection” on page 7-53

“Oil in Hydraulic Oil Tank- Replacement” on page 7-54

7.8.2 Maintenance Cycle when Using Hydraulic Hammer

The operation of hydraulic hammer will accelerate the pollution of hydraulic system and the deterioration of hydraulic oil. Therefore, as compared with the excavator equipped with bucket, it is necessary to replace hydraulic oil and hydraulic oil tank filter core more frequently. The recommended replacement interval is as follows (refer to “Maintenance Plan” for replacement methods for filter and oil) Replacement interval (in hours)

	Excavator equipped with hydraulic hammer	Excavator equipped with general bucket
Hydraulic oil	1000	4000
Filter core	100	1000

- The data in the above table applies to the situation when the service time fraction of hydraulic hammer is 100%. When the service time fraction of hydraulic hammer reduces, the replacement interval may be extended as shown in the following figure.
- Be sure to replace the filter core after using the hydraulic hammer continuously by 100 hours.

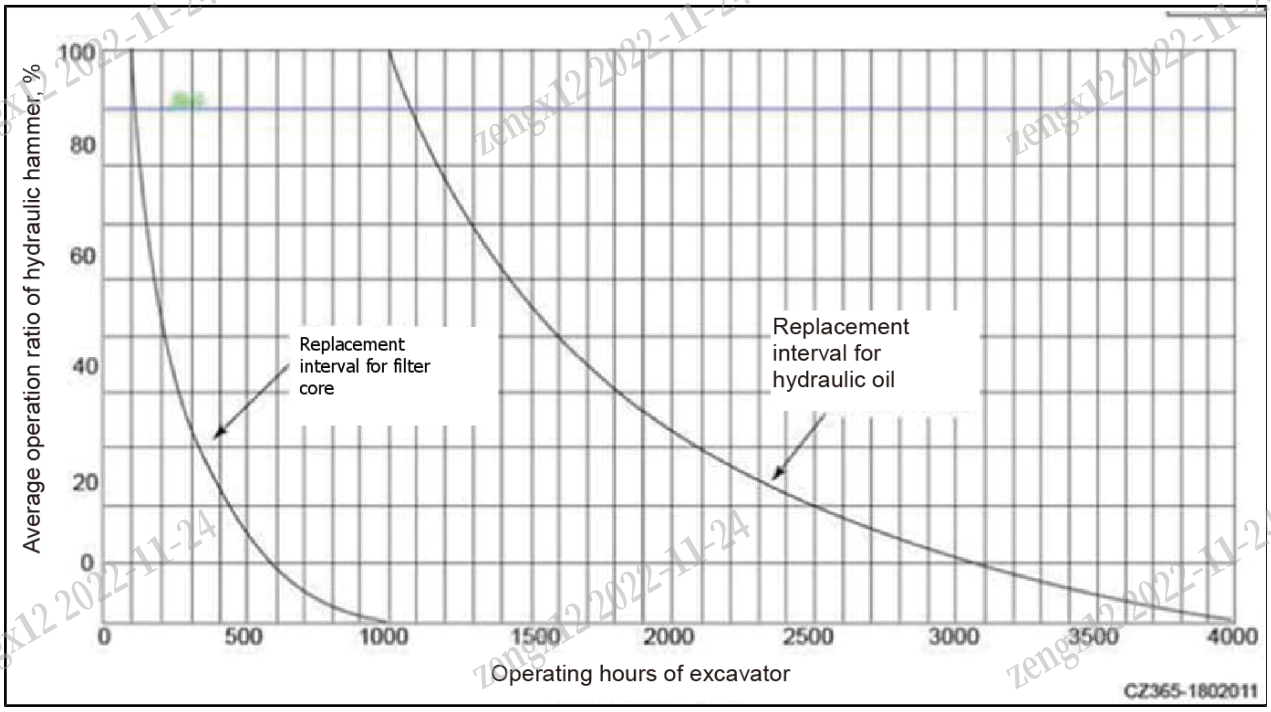

Fig.7-4

7.9 Maintenance Procedures

7.9.1 Maintenance in the first 50 hours (to be performed only after the first 50 hours)

1. Perform the following maintenance only after the first 50 hours of new excavator.

Fill the oil into the engine oil pan, and replace the engine oil filter.

Note: When inspecting, maintaining and needing special tools, please contact with the authorized agent of SANY Heavy Machinery Co., Ltd..

See the section “Maintenance every 500 hours and 2,000 hours” for details of replacement or maintenance methods.

7.9.2 When required

7.9.2.1 Air Filter Core - Inspection/ Cleaning/Replacement

⚠ WARNING

- If inspecting, cleaning or replacing when the engine is running, the dust will enter the engine and damage it. Before performing such operations, it is necessary to turn off the engine.
- When using the compressed air, the dirt might splash and result in personal injuries. Be sure to wear protective goggles, dust mask or other protective devices.

Excavator Equipped with Dual Filter Cores

Inspection

It is necessary to clean the air filter core when the excavator alarm indicates that the resistance reaches 6.25Kpa.

Notes:

- It is necessary to replace the outer filter core [4] and the inner filter core [5] if the filter has been used by over one year or has been cleaned by more than 6 times.
- It is necessary to replace the vacuum valve [3] if the rubber has been damaged or deformed obviously.

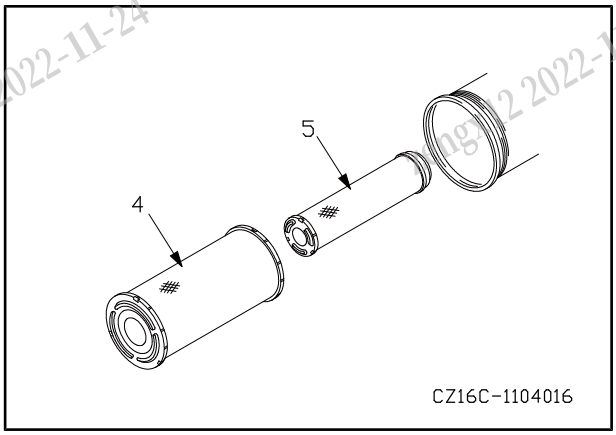

Fig.7-5

Clean/replace the filter core

1. Open the right rear engine hood door of the excavator, open the elastic clip [1] and remove the air filter rear cover [2].

2. Remove the outer filter core [4], pat the outer filter core gently with hand, but do not knock on the hard object.

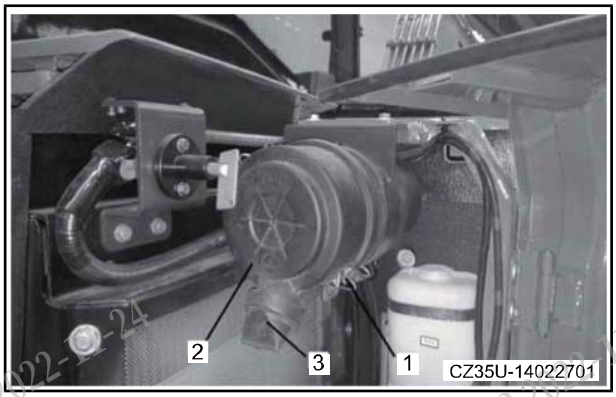

Fig.7-6

3. Blow from inside to outside with dry compressed air (lower than 0.69MPa (7kgf/ cm2)) along the folds of the filter core, and then blow along the folds of filter core and blow from inside to outside again.

1) Before purging the outer filter core, clean the inside of the air filter body with clean duster cloth.

2) If the air filter alarm tip occurs on the display screen continuously or very fast after being installed, it is necessary to replace the inner and outer filter cores even though the filter core has not been cleaned 6 times.

4. When replacing the air filter core, it is necessary to replace the outer filter core [4] and the inner filter core [5] together. Before removing the outer filter core [4], clean the inside of the filter. Remove the inner filter core [5] to replace. When installing, install the inner filter core [5] first and then install the outer filter core [4].

5. After cleaning the filter core, inspect by light; replace if finding any small holes or relatively thin part on the filter core.

⚠ CAUTION

- When cleaning, do not knock or pat the filter core with anything.
- Do not use folded filter core or the element with damaged packing or seal.

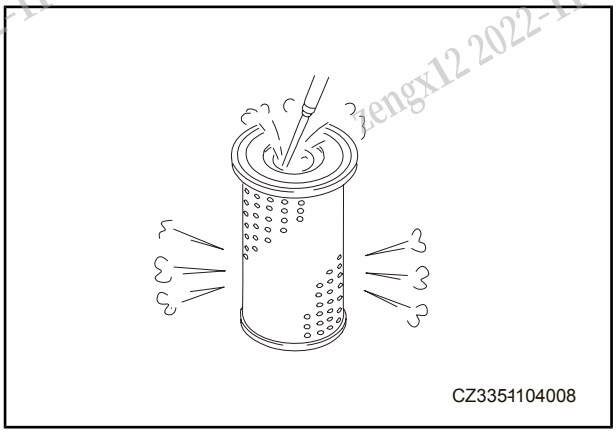

Fig.7-7

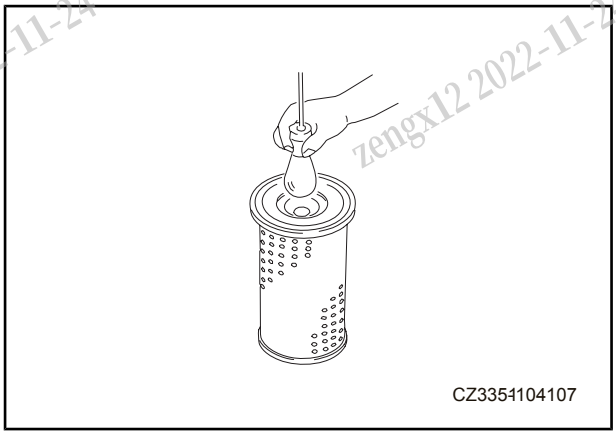

Fig.7-8

7.9.2.2 Cooling System Coolant - Replacement

⚠ CAUTION

- After turning off the engine, the coolant is still very hot and the radiator still contains relatively high internal pressure.
- Before removing the radiator cover, wait until the temperature reduces, and then turn the cover slowly to release the pressure.

Prepare water filling hose and a container with minimum capacity of at least 7L to contain the coolant.

1. Turn off the engine; turn the radiator cover [1] slowly and remove it.

2. Remove the bottom cover, and then put the coolant container below the drain valve. Open the drain screw plug [2] on the radiator to drain the coolant.

3. After draining the coolant, close the drain screw plugs [2], and fill in tap water. After fill up the radiator, start the engine and operate at low speed so as to increase the temperature to at least 90°C, and then keep operating by about 10 minutes.

4. Turn off the engine and drain the drainage screw plug [2] to drain water.

5. After draining the water, clean the radiator with degreaser. Refer to the instructions for degreaser for relevant cleaning method.

6. Fill water into the water filler with the water injector.

7. Operate the engine at low speed by about 5 minutes, and then operate at high speed by 5 minutes to bleed off the air mixed in the coolant (the radiator cover has been removed at this moment).

8. After draining the coolant in the storage tank [3], clean the inside of the tank, and then fill in coolant to the position between high and low liquid levels.

9. Turn off the engine, wait about 3 minutes, fill the water into the filler and then tighten the radiator cover.

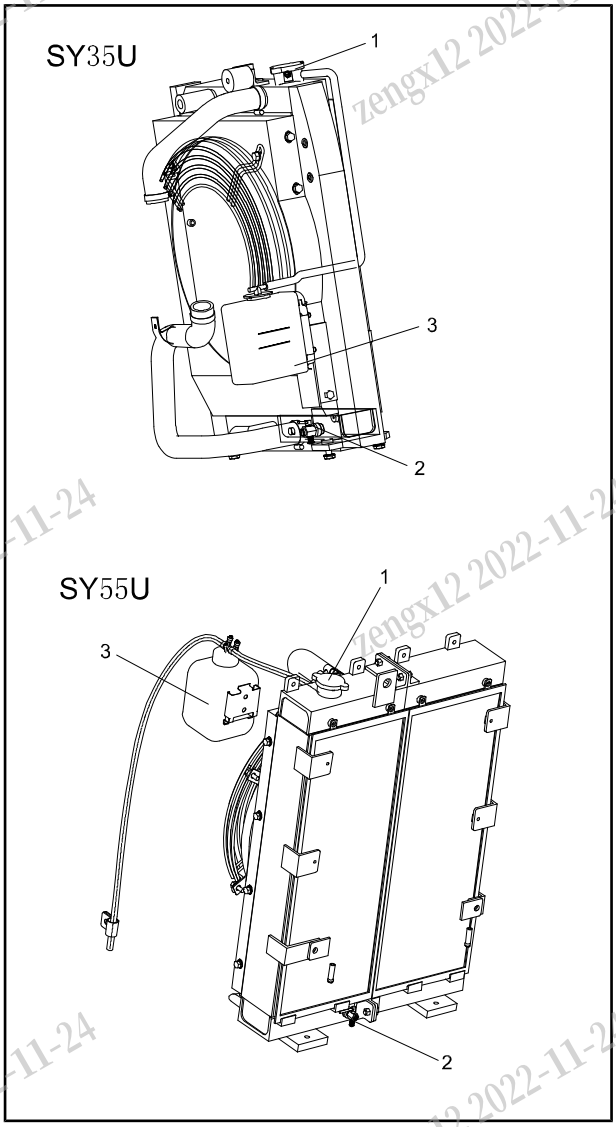

Fig.7-9

7.9.2.3 Track tension-inspection/ adjustment

1. **Inspection**

1) Drive the excavator forwards on the level hard ground by at least 3m.

2) Support the bucket against the ground laterally to suspend one track.

3) Measure the sinking amount between supporting wheel tread and track rail chain link surface with ruler.
   - It indicates that the track tensity is normal if the sinking amount (H) is within the following scope.

4) As shown in the figure, it indicates that the tension meets the standard when H=10-20mm if the excavator is equipped with rubber tracks. When H>25, it is necessary to adjust the tracks. It indicates that the tension meets the standard when H=20-30mm if the excavator is equipped with steel tracks; when H>35, it is necessary to adjust the tracks.

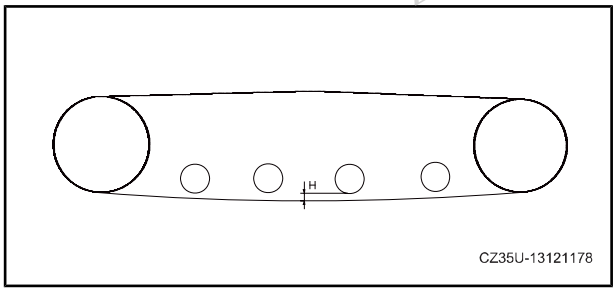

Fig.7-10

2. **Adjustment**

⚠ WARNING

- Do not loosen the screw plug [1] by over one turn to prevent it flying out under high pressure and resulting in hazard.
- Do not loosen any parts than the screw plug [1]. Do not face the mounting direction of the screw plug [1].
- Do not try to remove the track shoes or track regulator because the high pressure grease in the track regulator will cause hazard.

3. **Tighten Tracks**

Prepare a grease gun

1) Fill in lubricating grease through nozzle [2] with grease gun.

2) When inspecting the track tension, it is necessary to drive the excavator forwards slowly by 7-8m (23ft -26ft 3 in).

3) Inspect the track tension again; re-adjust if the tension is not proper.

4. **Loosen Tracks**

- Loosen the valve [1] slowly; otherwise, the grease in the track tension cylinder will be sprayed out. When loosing the valve [1], keep the body and face from facing the valve [1].
- It is prohibited to loosen the grease nozzle [2].
- Before loosening the tracks, clean the foreign matters like macadam or mud etc. between sprocket wheel and track chain.

1) When loosening the tracks, turn the valve [1] counterclockwise at low speed with 24" socket spanner. At this moment, the grease will be drained from the grease outlet.

2) Loosen the valve [1] by 0.5-1 turn to loosen the tracks.
Note: If the grease could not be drained smoothly, it is allowed to lift up the tracks off the ground, and rotate the tracks slowly.

3) After obtaining appropriate sinking amount, tighten the valve [1] clockwise to 60-80N·m (6- 8kgf·m).

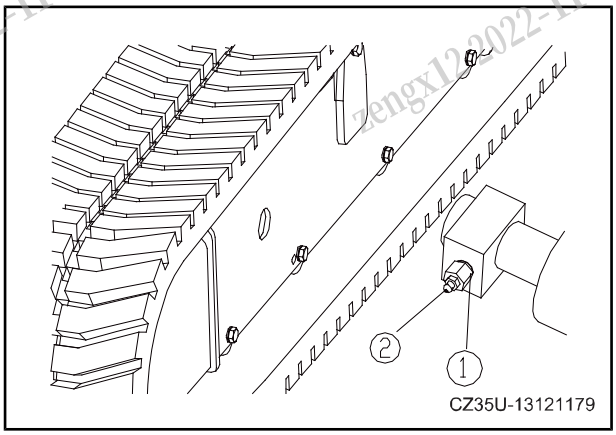

Fig.7-11

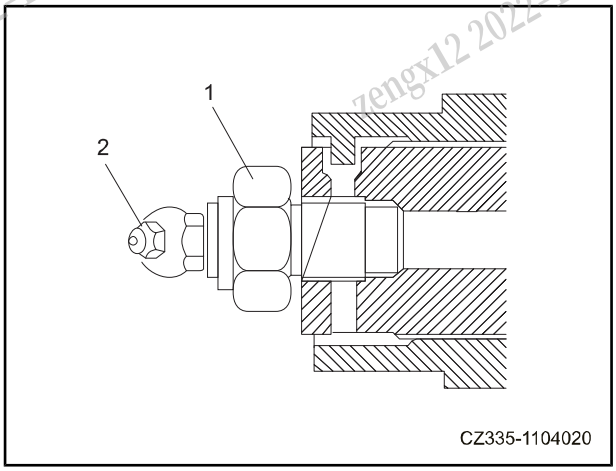

Fig.7-12

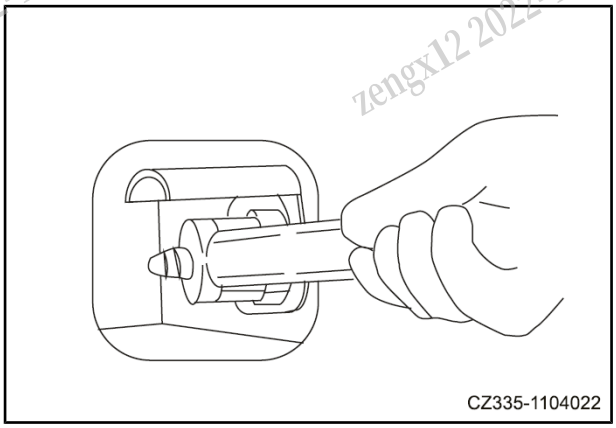

Fig.7-13

7.9.2.4 Bucket Teeth-Replacement

⚠ WARNING

- When replacing the bucket teeth, it is necessary to engage the working device in stable state, then turn off the engine and lock all the control levers and operating handles firmly, otherwise, it would cause danger due to misoperation.
- The lock pin might fly out if it is hit with too much force. Inspect to confirm that there is not person in the surrounding area.
- When replacing, usually there will be flying blocks; therefore, it is necessary to wear protective goggles, gloves and other protective articles.

Replace the bucket tooth before the bucket tooth seat is worn.

It is necessary to replace the bucket tooth [1] if the wear mode of bucket tooth exceeds the design use limit [A] shown below.

Dimension of A in (mm)	
New	Use limit
133	60

Replace the bucket teeth and inspect that the working device is in stable state; then place the safety locking control lever on the locked position. Put the bottom of bucket horizontally.

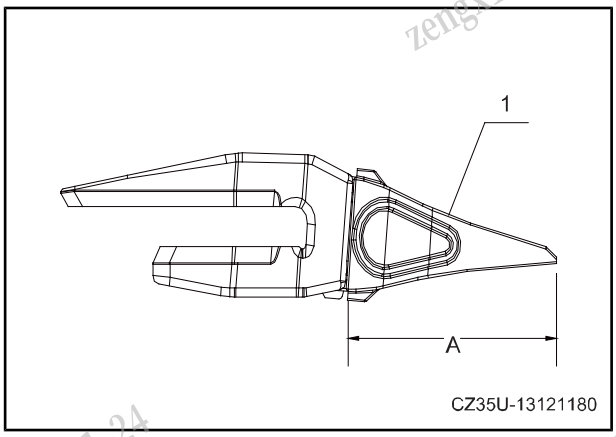

Fig.7-14

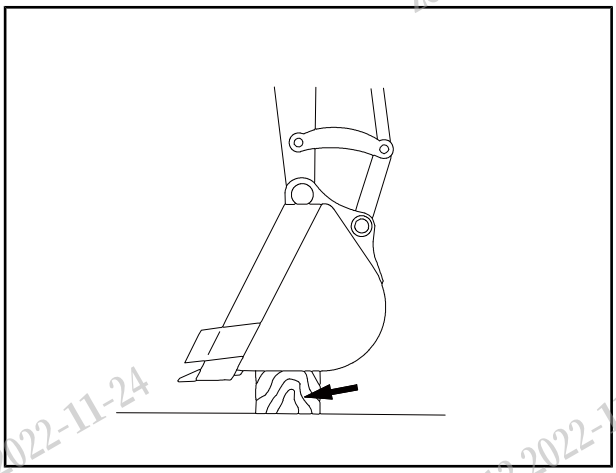

Fig.7-15

7.9.2.5 Windshield cleaning solution level- inspection/filling in liquid

Each time when performing routine maintenance for complete excavator, it is necessary to check and supplement the cleaning solution, and turn on the washer switch to check its working conditions.

When the cleaning solution is insufficient, the solution sprayed will contain air bubbles. In such case, it is necessary to inspect the liquid level of liquid storage tank (in the left overhaul door of excavator). Supplement cleaning solution if necessary.

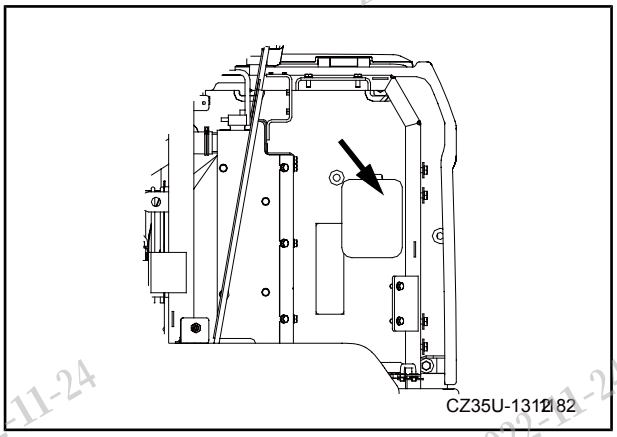

Fig.7-16

1. Open the overhaul door of excavator- the liquid storage tank could be see;

2. Open the cover of liquid storage tank, fill in cleaning solution and close the cover tightly.

3. Turn on the washer switch and check whether it sprays water normally.
Note: Be careful to prevent the dust entering when filling in cleaning solution.

Mixing Ratio of Pure Cleaning Solution and Water

Select the mixing ratio according to the ambient temperature. Before filling in, it is necessary to dilute the cleaning solution with water as per the ratio in the following table.

Operating area	Mixing ratio of cleaning solution and water	Anti-freezing temperature
General	1:2	- 10℃(14 °F)
Winter in cold region	1:1	- 20℃(- 4 °F)
Winter in freezing cold region	Pure cleaning solution	- 30℃(- 22 °F)

Note: There are two types of cleaning solution: for - 10℃ (14°F) (general) and for -30℃ (-22°F) (cold region). Select according to the operating area and season.

7.9.2.6 Coolant Level - Inspection

⚠ WARNING

- It would cause blindness or cold injury if the refrigerant is splashed into the eyes or on the hands. Therefore, do not touch the refrigerant. Do not loosen any parts of refrigerant pipe.
- Keep the position leaking refrigerant gas away from any open flame.

The cooling performance will be very bad if the refrigerant (R134a) is insufficient.

When the engine is idling at high speed and the air conditioner is in maximum refrigeration state, there shall be no air bubbles in the observation window (inspection window) of liquid storage tank of condenser.

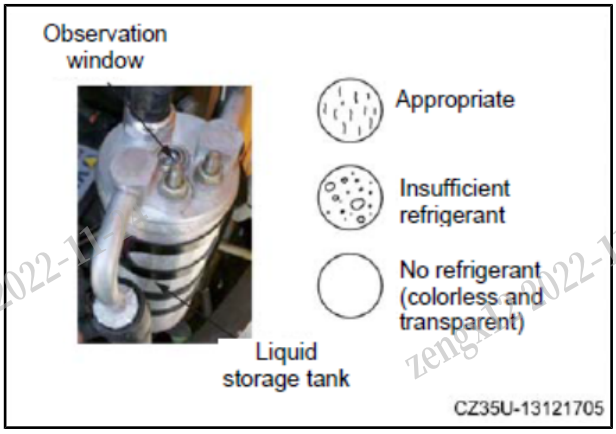

Fig.7-17

- The refrigerant flows and there is no air bubble: appropriate
- The refrigerant flows but there are air bubbles (the air bubbles pass through continuously): the refrigerant is insufficient
- Colorless and transparent: there is no refrigerant

  Note: when the refrigerant is insufficient, please contact with the authorized agent of SANY Heavy Machinery Co., Ltd. for filling in the refrigerant.

Inspection when Excavator Is Not Used

It is necessary to operate the air conditioning unit by 3-5 minutes every month to lubricate the compressor parts when the excavator is not used for long time.

Table of Inspection and Maintenance Items of Air Conditioning Unit

Inspection and Maintenance Items	Inspection and Maintenance Items	Maintenance Cycle
Refrigerant (gas)	Filling volume	Twice every year- in spring and autumn
	Leakage at the pipeline connections or internal leakage of parts	Daily
Condenser	Radiator fins are blocked	Every 500 hours
Compressor	Functions	Every 4000 hours
V-belt	Loose or bent	Every 250 hours
	Deterioration, abrasion, bruise or crack	Every 250 hours
	Noise, odor or abnormal heat	When required
Fan motor and fan	Functions (inspect whether there is abnormal noise)	When required
A/C air volume switch	Air volume switch control and switching function	Daily
Control mechanism	Functions (whether the functions are normal)	When required
Connecting bolts	The connection parts are loose, or the nuts and bolts are loose or drop	Half a year
Connecting pipeline	Installation situation; whether the connection parts are loose, leak gas or are damaged	When required
Temperature difference of liquid storage dryer	It indicates that the dryer is plugged if there is temperature difference	One year

7.9.3 Inspection before Starting

Refer to “Inspection before Starting” in the operation section for the details of the following items.

- Inspect the coolant level and fill in water
- Inspect the oil level in engine oil pan, and fill in oil
- Inspect the fuel oil level，fill in oil
- Inspect the water and sediment in the oil-water separator, and drain water

- Inspect the oil level in hydraulic oil tank, and fill in oil
- Inspect the electric wires
- Inspection of Horn Functions

7.9.4 Maintenance Every 50 Hours

7.9.4.1 Fuel Tank - Drainage

When flushing the inside of oil tank, it is not allowed to use trichloro ethylene but it is only allowed to use diesel oil.

It is necessary to perform this step before operating the excavator as daily maintenance.

It is necessary to perform this step before operating the excavator.

- Prepare a container to contain the drained fuel oil.
- Open the valve at the bottom of oil tank to drain the sediment and water accumulated at the bottom of oil tank together with the fuel oil. At this moment, do not splash the fuel oil on the body.
- Close the drain valve when clean fuel oil flows out.

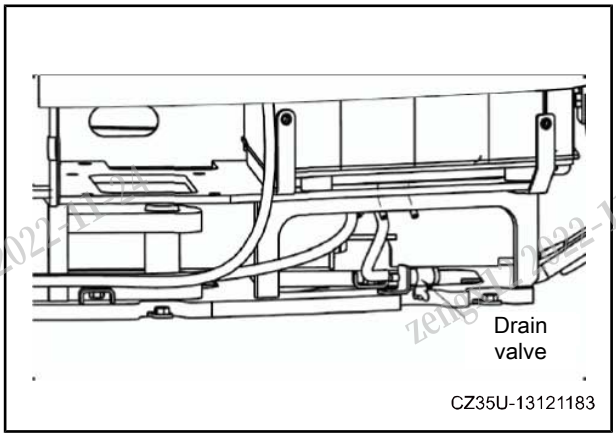

Fig.7-18

7.9.4.2 Lubrication (position of connecting pin A between bucket rod and bucket)

1. Lower the working device on the ground, put it in the lubrication state shown in the figure on the right and turn off the engine.

2. Fill the lubricating grease into the grease nozzle shown with the arrow with grease gun.

3. Wipe off the overflowing grease after lubricating.

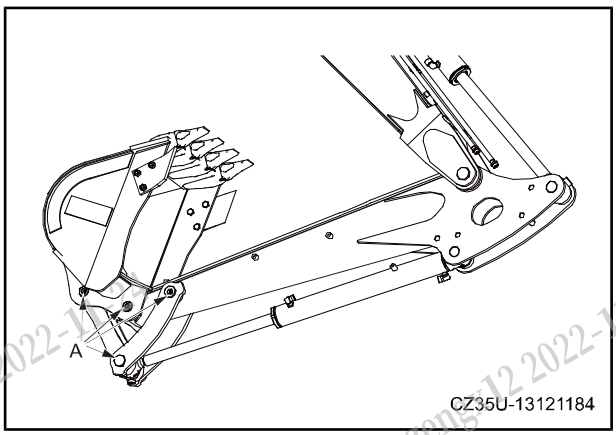

Fig.7-19

7.9.5 Maintenance Every 100 Hours

7.9.5.1 Overview

Perform the maintenance every 50 hours at the same time.

7.9.5.2 Lubrication

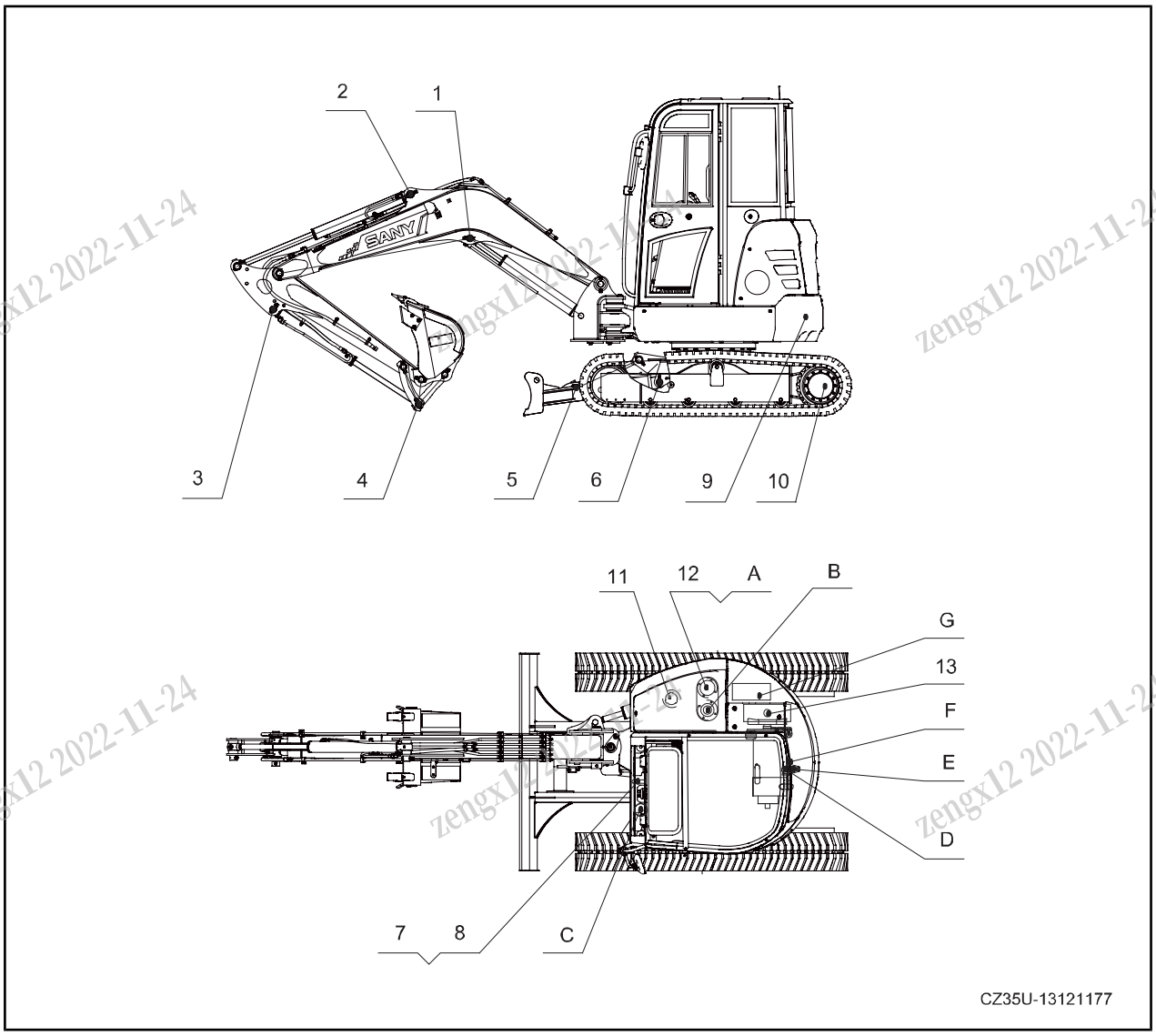

Fig.7-20

1. Lower the working device and dozer blade to the ground, put them in the lubrication state shown in Figure 7-3 and turn off the engine.

2. Fill lubricating grease into the grease nozzles at the positions 1, 2, 3, 5, 6 and 7 shown in the figure with the grease gun.

3. Wipe off the overflowing grease after lubricating.

7.9.5.3 Oil Level in Oil Pan-Inspection/ Filling

1. Take out the oil gauge, wipe the greasy dirt on the oil gauge with clean cloth and re-insert the oil gauge [A].

⚠ WARNING

The parts and oil are very hot immediately and might cause burns after the engine stops. Before starting operation, wait until the temperature drops.

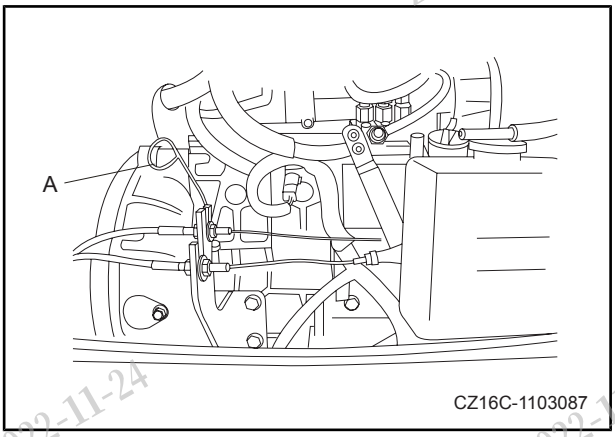

Fig.7-21

2. Take out the oil gauge again; the oil level must be between the marks of small holes.

3. Fill in oil through the oil filler if necessary. Only use the recommended oil.

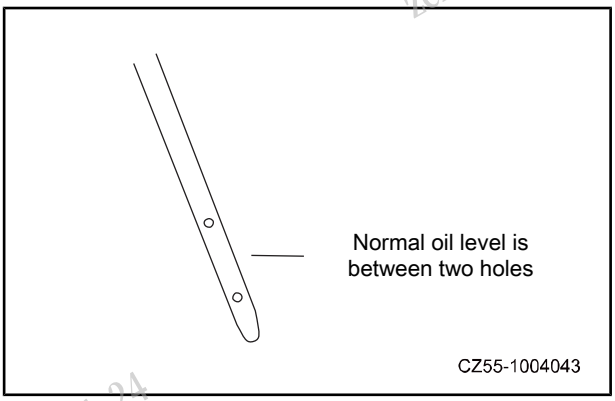

Fig.7-22

4. Loosen the oil drain screw plug to drain the surplus oil if the oil level exceeds the mark on the oil gauge.

5. Inspect oil level or fill in oil, then insert the oil gauge into the hole and install the oil filler cap.

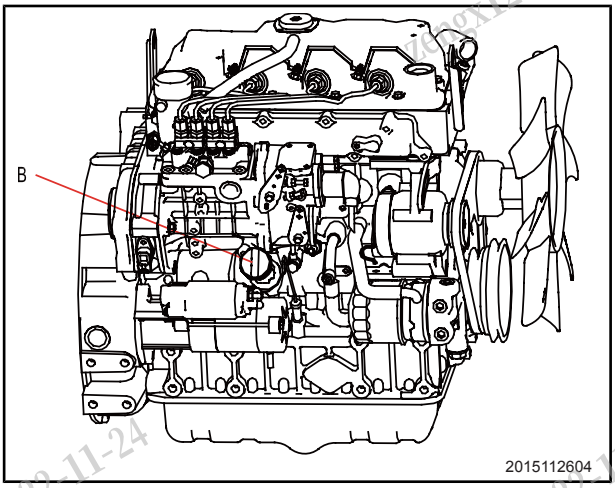

Fig.7-23

7.9.6 Maintenance every 250 hours

7.9.6.1 Tension of A/C compressor belt-inspection/adjustment

1. **Inspection**

Manual inspection: Press the middle between driving belt pulley and compressor pulley with a finger and apply a force of about 6Kg (58.5N); the normal belt deformation should be about 5-8mm.

Inspection with tension meter: Inspect the tension of compressor belt with tension meter. The tension is 637±108N for new belt and is 441±88.2N for used belt.

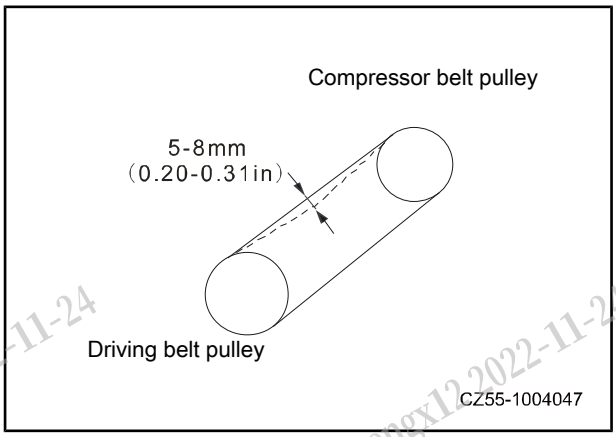

Fig.7-24

2. **Adjustment**

Tighten the adjusting screw with the wrench to fasten the A/C compressor belt to the specified tension.

Tighten the screw.

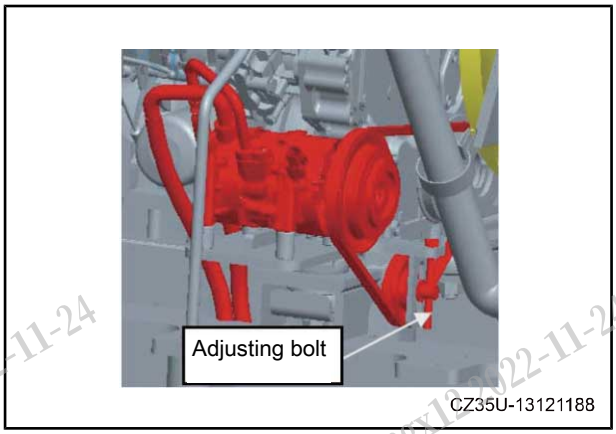

Fig.7-25

⚠ CAUTION

- Inspect whether the belt pulleys are damaged, whether the V-grooves are worn and whether the V-belts are worn. Inspect particularly and prevent the V-belts from contact with the bottom of belt grooves.
- If the belt has been stretched, and there is not allowance for adjustment, or there are cuts or cracks on the belt, please contact with the authorized agent of SANY Heavy Machinery Co., Ltd. for replacement.
- When adjusting the new belt, it is necessary to re-adjust the belt after operating by one hour.

7.9.7 Maintenance every 500 hours

7.9.7.1 Overview

It is necessary to perform the maintenance items every 100 hours and every 250 hours.

7.9.7.2 Lubrication of Slewing Pinion and Slewing Bearing

1. It is necessary to designate one person to lubricate the slewing bearing, gear and slewing superstructure. Before lubricating the slewing bearing, it is necessary to evacuate all the personnel around from the site.

Operate in the following steps:

1) Park the excavator on the level ground.

2) Lower the bucket to the ground.

3) Turn the throttle control knob to the position MIN.

4) Idle the engine with no load by 5 minutes at low speed.

5) Turn off the starting switch and take down the key.

2. Fill lubricating grease in two grease nozzles when the superstructure is stationary.

3. Start the engine, lift up the bucket off the ground by 20-30mm and slew the superstructure by 45° (1/8 turn)

4. Lower the bucket to the ground.

5. Repeat the aforesaid steps by 3 times from the step 3.

6. Fill lubricating grease in the slewing bearing until the grease overflows from the seal of slewing bearing.

Do not fill in too much lubricating grease.

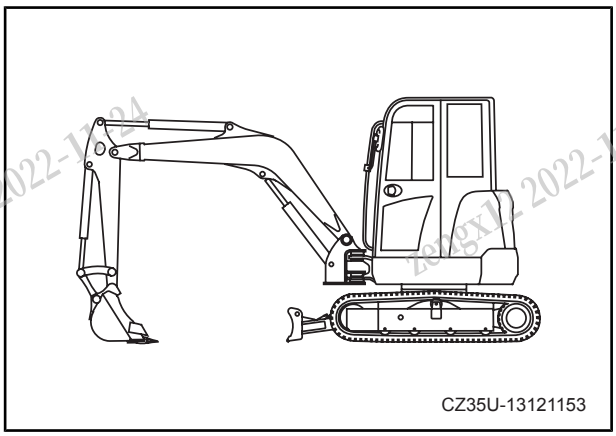

Fig.7-26

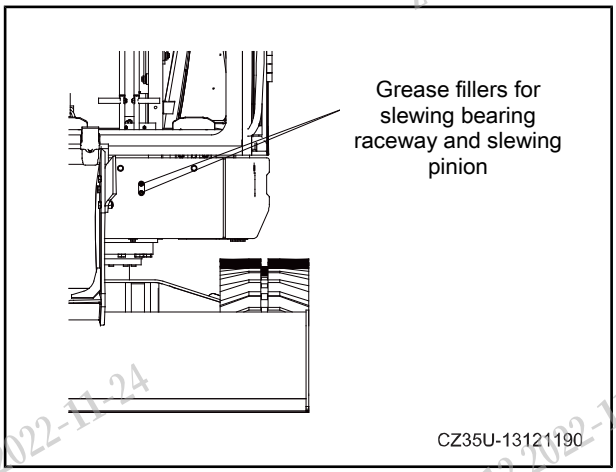

Fig.7-27

Lubricating grease

- If the lubricating grease has been polluted, it is necessary to replace with clean lubricating grease.
- The lubricating grease is used to prevent twisting and noise at the connections. If the parts are not flexible or produce noise, it is necessary to fill in lubricating grease prior to the maintenance period.
- Wipe off the used lubricating grease squeezed when filling in lubricating grease. The rotating parts will be abraded if the sand or dust is attached to the lubricating grease.

7.9.7.3 Fill oil in the engine oil pan, and replace the engine oil filter core

1. Remove the cover at the bottom of excavator, then put a container blow the oil drain valve and drain the oil into the 7L container along the clean cloth.

2. For preventing the oil being splashed on the body, it is necessary to push down the handle of drain valve to drain the oil and then lift up the handle to close the drain valve.

3. Open the cover on the right rear side, and remove the engine oil filter barrel by turning counterclockwise with the filter wrench.

4. Clean the filter core seat, and apply a layer of clean engine oil (or a thin layer of lubricating grease) on the seal surface and threads of filter core.

5. Install the new filter, turn the filter barrel clockwise with hand until the gasket contacts with the contact face. Prevent the gasket being damaged when installing the filter.

6. When installing, it is necessary to make the seal surface contact with the seal surface of filter core seat, and then tighten by 3/4-1 turn further. Inspect carefully to confirm that no used seal is attached on the filter core seat. If there is used seal, it will cause leakage.

7. After replacing the filter core, open the engine hood, fill engine oil to the marks between round marks on oil gauge through the oil filler.

8. Install the oil filler cap.

9. Start the engine and operate the engine with no load at low speed by 5 minutes.

10. Inspect whether the engine oil pressure indicator lamp on the monitor panel goes out immediately. If not, turn off the engine immediately and find out the reasons.

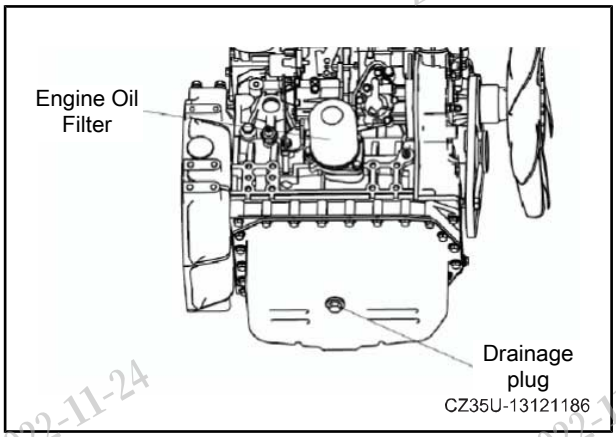

Fig.7-28

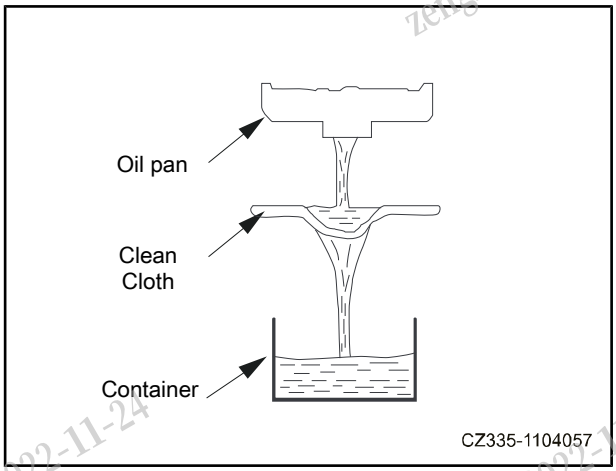

Fig.7-29

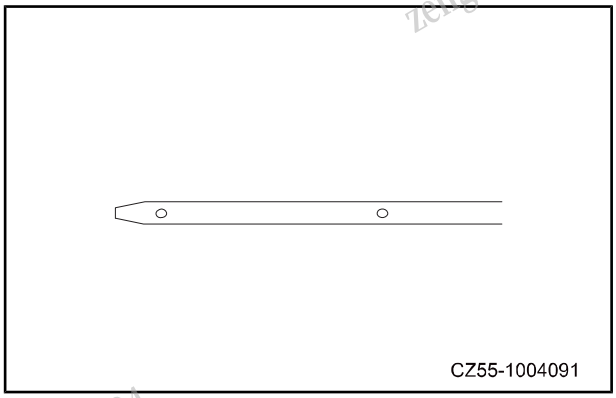

Fig.7-30

11.Turn off the engine, and take out the key from the starting switch.

12.Inspect whether the drainage plug leaks and the oil level on oil gauge, and install the bottom cover.

Note: Please purchase authentic SANY engine oil from the authorized agent of SANY Heavy Machinery Co., Ltd. to ensure the oil quality. Replace the oil every 500 hours.

7.9.7.4 Fuel oil filter core- replacement

⚠ WARNING

- The parts are in high temperature state after the engine is running. Before replacing the filter core, let the parts cool down.
- Keep the fuel oil away from the open flame.
- It is prohibited to suck oil by stepping on the manual pump.
- After sucking oil, tighten the round handle properly to prevent the impurities enter the manual pump.

Note: It will be difficult to start the engine or the engine may operate abnormally if there is air in the fuel system. After draining the water and sediment in the oil-water separate, replacing the fuel filter, cleaning the fuel transfer pump filter or drying the fuel tank, it is also necessary to bleed off the air in the fuel oil system.

Prepare a filter core wrench and a container to collect the fuel oil.

- Put the container below the filter core.
- Turn the filter core counterclockwise with the filter core wrench to remove it.
- Clean the filter core seat, fill clean fuel oil into the new filter core, apply engine oil on the seal surface and then install the filter core on the filter core seat.
- After the seal surface contacts with the seal surface of filter core seat, tighten further by 1/2 turn. The seal will be damaged, which will lead to fuel leakage if the filter core is tightened too much. If the filter core is too loose, the fuel oil will leak from the sealing position. Therefore, it is necessary to tighten to appropriate position.
- After replacing the fuel filter core, it is necessary to bleed off the air in the system.

Fill oil in the fuel tank (until the float reaches the highest position).

If the fuel oil has been used up or the fuel filter core has been replaced, it is necessary to keep powering on by 2-3 minutes when re-starting so as to make the fuel delivery pup work and bleed off the air in the oil way.

Remarks:

- It is necessary to use the authentic SANY filter core.
- After replacing the filter core, start the engine and inspect whether the seal surface of filter core leaks oil.

7.9.7.5 Working Device - Lubrication

- If the abnormal noise occurs on the lubricating position, it is necessary to lubricate in addition to the maintenance cycle.
- It is necessary to lubricate every 10 hours when operating the excavator in the first 50 hours.
- It is necessary to lubricate the axis pin immersed in the water when excavating in the water.
- It is necessary to lubricate every 100 hours when operating under heavy load such as operating the hydraulic hammer.

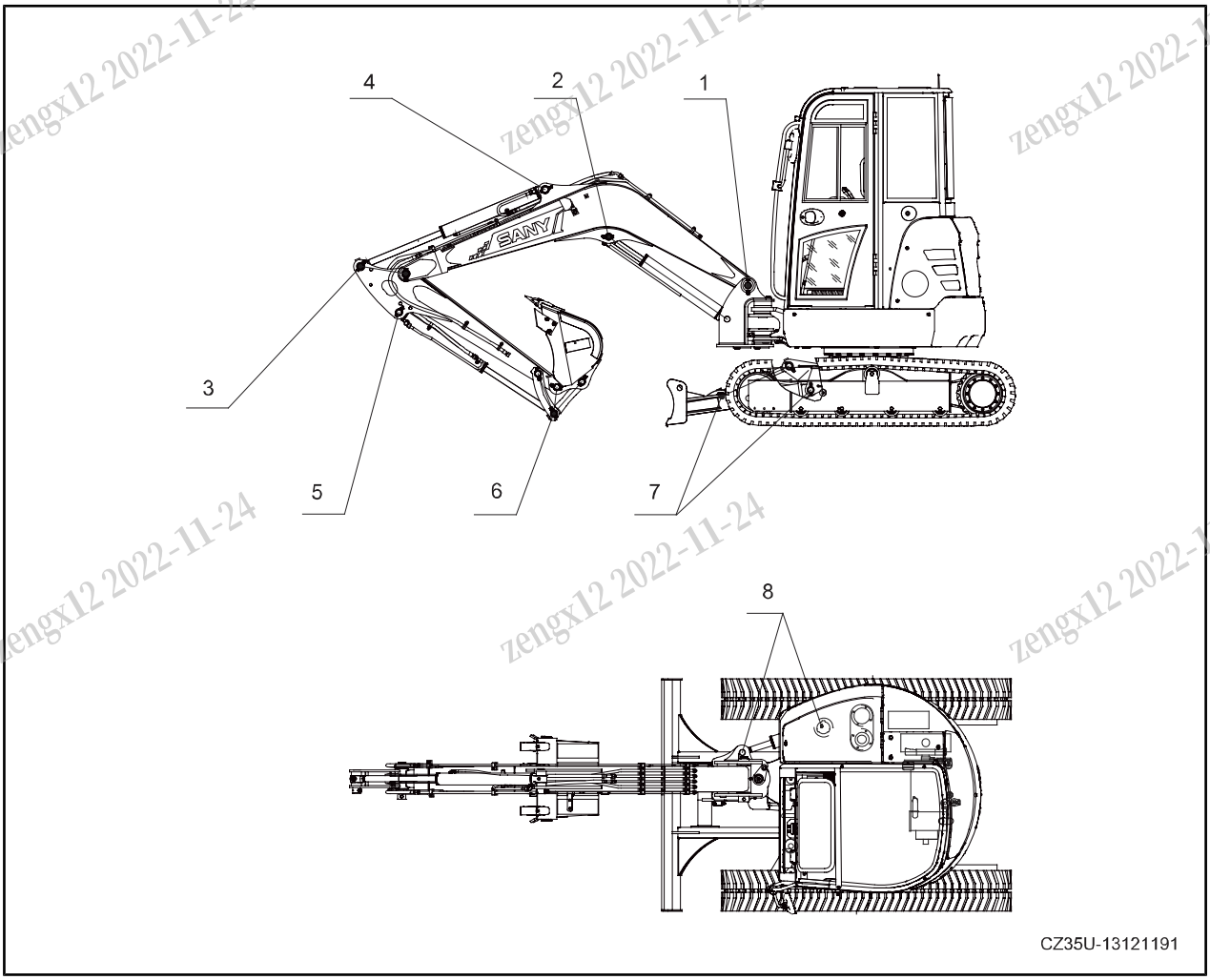

Fig.7-31

1. Put the working device in the lubrication state shown in the figure below, then lower it on the ground, and turn off the engine.
2. Inject the lubricating grease into the grease nozzle as shown by the arrow.

3. After filling in the lubricating grease, wipe the used lubricating grease squeezed out.

1. Boom root (1)

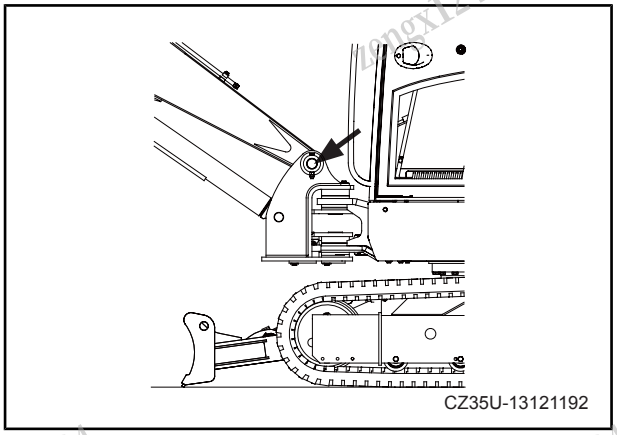

Fig.7-32

2. Connecting pin of boom cylinder (2)

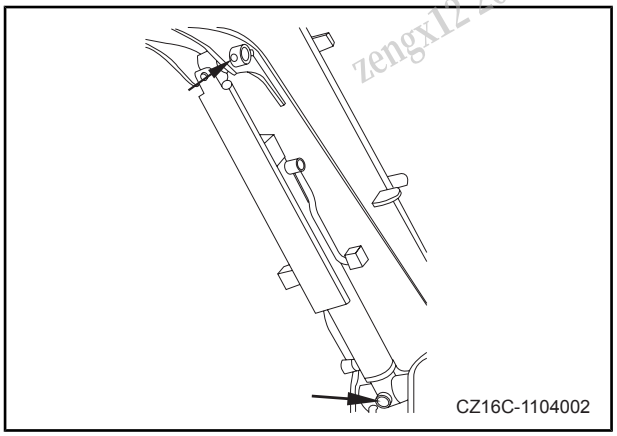

Fig.7-33

3. Connecting pin (2) between boom and bucket rod

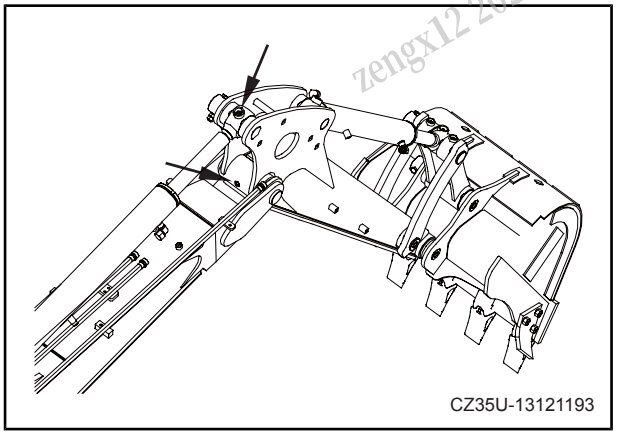

Fig.7-34

4. Connecting pin of bucket rod cylinder piston (1)

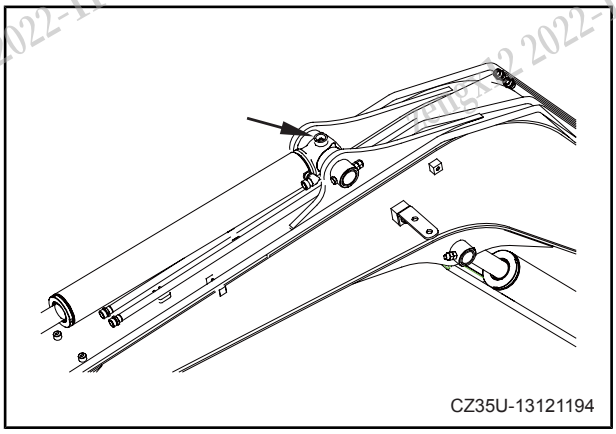

Fig.7-35

5. Bottom pin of bucket cylinder (1)

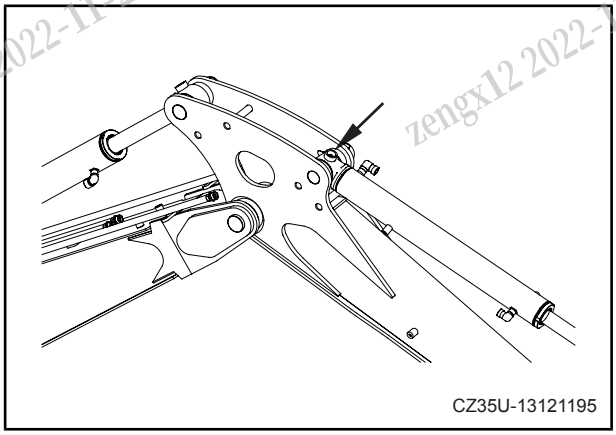

Fig.7-36

6. Connecting pin between bucket and connecting rod (6)

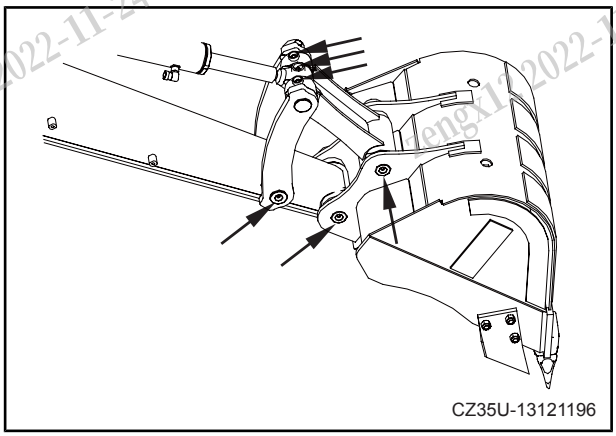

Fig.7-37

7. Maintenance of connecting pin of dozer blade (4)

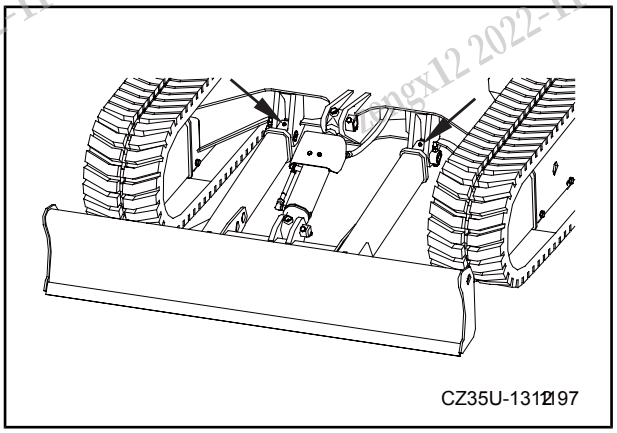

Fig.7-38

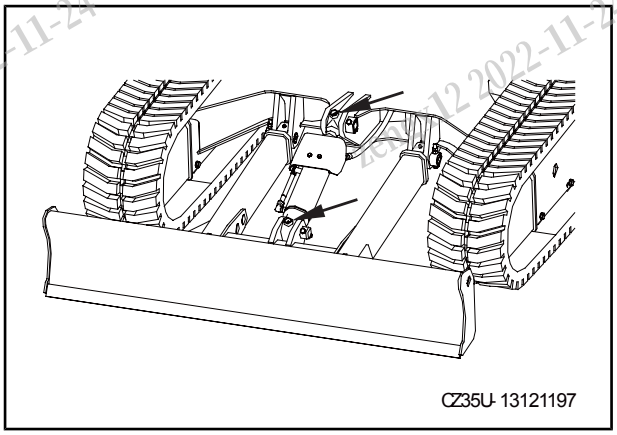

Fig.7-39

8. Connecting pin of deflection cylinder (2, without stationary type)

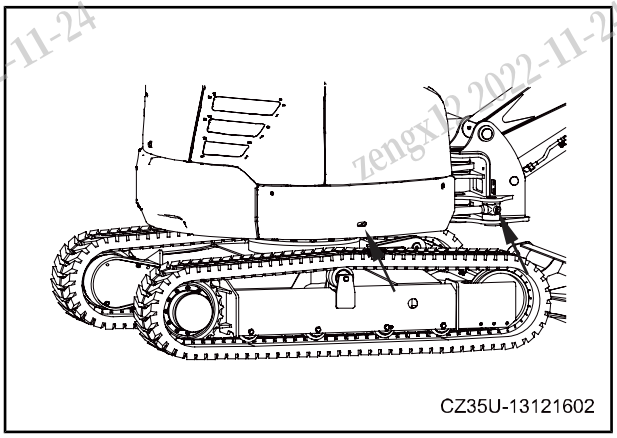

Fig.7-40

7.9.7.6 Clean and Inspect Radiator Fins and Condenser Fins

⚠ CAUTION

Please wear protective goggles, dust mask or other protective articles when using compressed air, high pressure water or high pressure steam.

- The radiator fins will get damaged if the distance from the nozzle to the radiator fin is too small when the compressed air is used; if the radiator fins are damaged, it will lead to water leakage and overheating. When cleaning, it is necessary to keep appropriate distance to prevent the radiator fins being damaged. Do not spray the radiator core directly.
- Such inspection shall be performed every day and will not be limited by the maintenance cycle when operating in the work place with heavy dust.

1. Open the engine hood and radiator overhaul door.

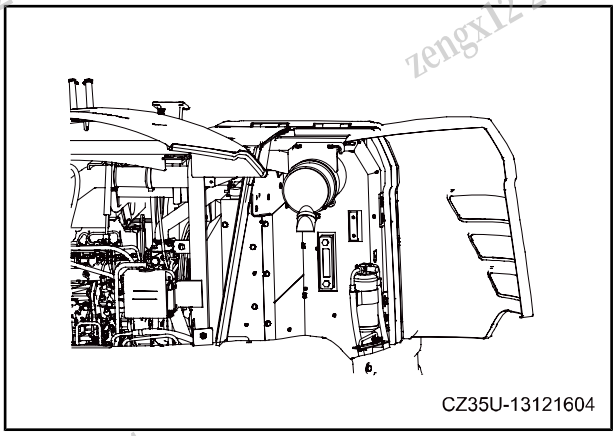

Fig.7-41

2. Inspect the radiator fins and condenser fins. If there are mud, dust or leaves etc. on them, it is necessary to clean with compressed air or high pressure water along the opposite direction of air flow.

Note: When flushing with high pressure water, it is necessary to reduce the water spraying pressure of water gun, and nebulize the water; when operating, it is necessary to keep about 30cm to the radiator fins. If the distance is too small, the radiator fins might be deformed, resulting in blockage or rupture.

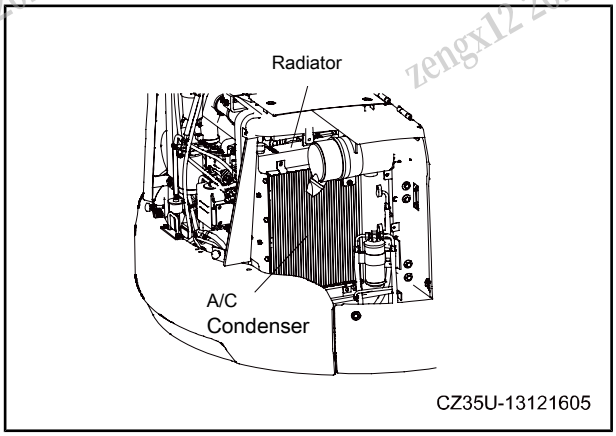

Fig.7-42

⚠ CAUTION

When cleaning, do not pick the dirt with the hard object for preventing the radiator fins being damaged.

3. After cleaning, inspect whether the radiator fins are deformed or have holes and cracks; please adjust and replace timely if any; inspect whether the rubber hoses are cracked or aged; please replace with new hoses if so; inspect whether the hose clamps are loose and tighten if so.

4. Remove the bottom cover plate, and clean the dust, dirt and dry leaves on the surface.

7.9.7.7 Inner and Outer Air Filter of Air Conditioning System - Cleaning

⚠ WARNING

Please wear protective goggles, dust mask or other protective articles when using compressed air, high pressure water or high pressure steam.

⚠ CAUTION

- The normal interval for cleaning the filter is 500 hours. However, if the excavator is used in the work place with heavy dust, the maintenance interval should be shortened and the filter should be cleaned more frequently.
- If the filter has been filtered, the air volume will reduce, and the suppression noise of air conditioner could be heard.

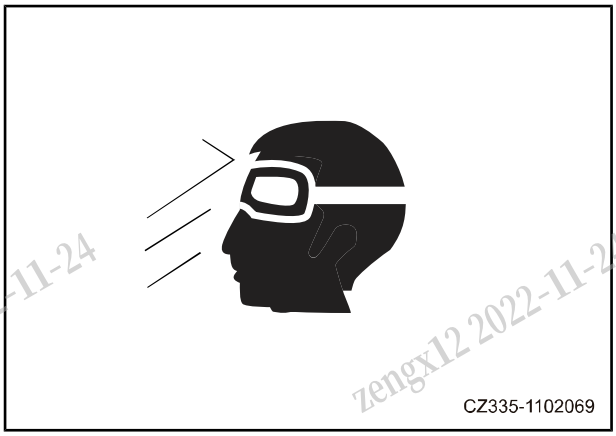

Fig.7-43

Sweep and Replace Air Conditioner Filter

Sweep the filter.

Circulation air filter- every 500 hours

Replace the filter

Circulation air filter- after sweeping 6 times

⚠ CAUTION

Sweep with low-pressure (lower than 0.2MPa) compressed air. Prevent the debris hurting other people and keep operating area safe.

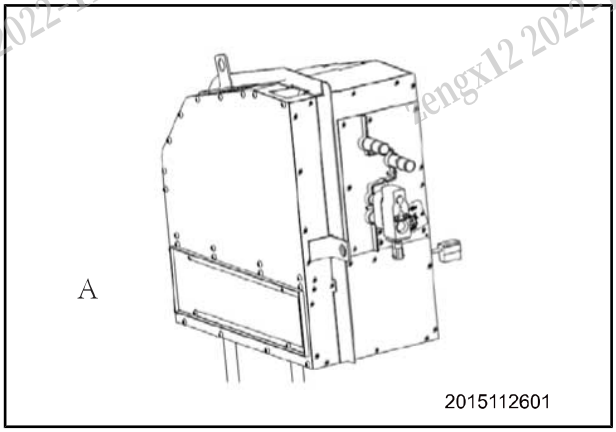

Fig.7-44

1. Remove the right trim part in the cab, and dismantle the air filter.

2. Sweep the filter.

3. Re-install the oil return filter or install a new filter.

7.9.7.8 Oil Level in Running Reducer - Inspection/Filling in oil

⚠ WARNING

- The part and oil are still in hot state and might cause burns after the engine stops. Wait until the temperature reduces before starting operation.
- The oil or screw plug might fly out if the tank contains residual pressure. Loosen the screw plug slowly to release the pressure.

⚠ CAUTION

The turbocharger might be damaged if the steps for turning off the engine are incorrect.

1. Park the excavator on the level ground.

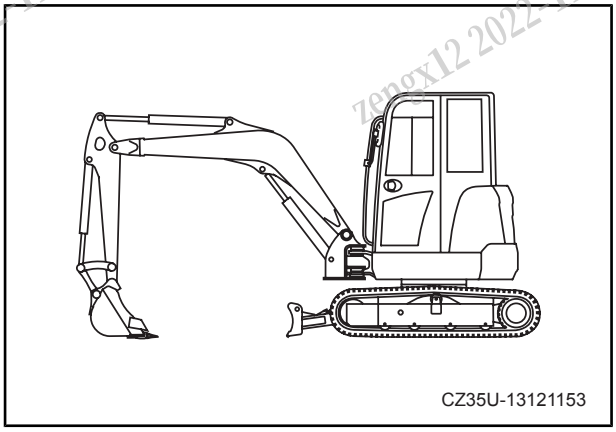

Fig.7-45

2. Rotate the running motor until the oil drain screw plug [1] is on the lowest position

3. Lower the bucket to the ground.

4. Turn the throttle control knob to the position MIN.

5. Idle the engine with no load by 5 minutes at low speed.

6. Turn off the engine, and take out the key from the starting switch.

7. Pull the safety locking control lever to the locked position, rest by 10 minutes and then inspect the oil level.

8. After the gear oil cools down, loosen the screw plug [2] at the oil filler (FILL/ LEVLL) slowly to release the pressure.

9. Inspect the oil level through the oil filler. The oil must reach the hole bottom.

10. Fill in the oil until the oil overflows from the inspection screw plug hole if necessary.

11. Wrap the threads of screw plug with seal strap, install the screw plug [2] and tighten the screw plug [2] to 49N·m.

12. Inspect the gear oil level of another running reducer.

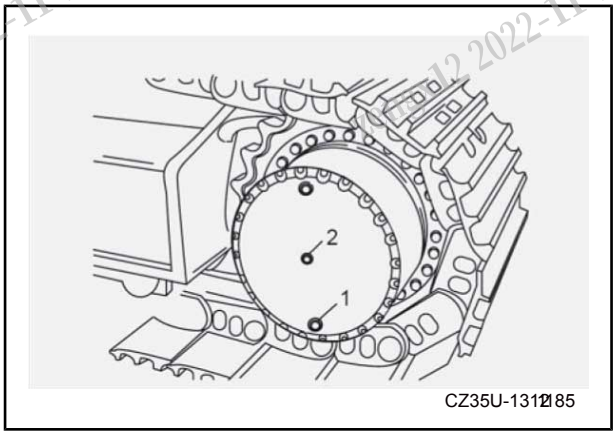

Fig.7-46

7.9.8 Maintenance every 1000 hours

7.9.8.1 Overview

It is necessary to perform the maintenance items every 250 hours and every 500 hours.

7.9.8.2 Hydraulic Oil Return Filter Core - Replacement

⚠ WARNING

- The part and oil are still in hot state and might cause burns after the engine stops. Wait until the temperature reduces before cleaning the hydraulic oil tank filter screen.
- The oil will be sprayed out if the oil filler cover is removed. Therefore, it is necessary to turn the cover slowly to release the internal pressure, and then remove it carefully.

Note: If the excavator is equipped with hydraulic hammer, the hydraulic oil would be deteriorated more easily than the normal operation of bucket. When maintaining, refer to “Maintenance Cycle when Using Hydraulic Hammer” for details. he positions of oil level meter of different models may be different.

1. Put the working device on the solid level ground in the maintenance posture shown in the figure, and then lower the working device to the ground and turn off the engine.

Name of parts of hydraulic oil tank

S/N	Name
A	Oil tank body
B	Liquid level meter
C	Oil suction filter core
D	Oil return filter core
E	Oil return cover
F	Oil suction cover

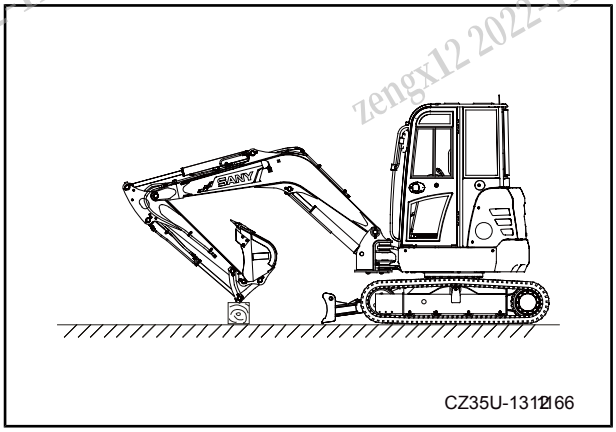

Fig.7-47

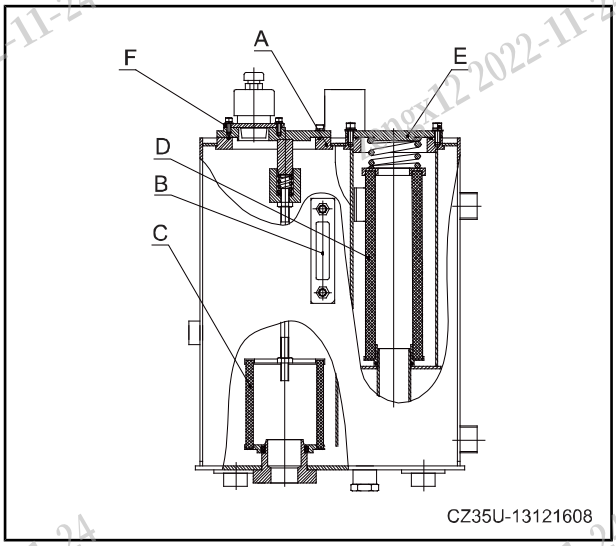

Fig.7-48

2. Open the oil return filter core cover; when removing the last two bolts [1], overcome the light spring duty and press on the filter cover [2]. Open the filter cover [3].

3. Remove the spring [4] and the filter core [6]. Take out the oil return filter.

4. Abandon the used oil return filter, and install new oil return filter and spring [4].

5. Install the O-ring and oil return filter cover, and tighten the bolt [1] to 113N·m (11.5kgf·m).

6. For bleeding off the air, start the engine as per the section “Start the Engine” and idle the engine at low speed by 10 minutes.

7. Turn off the engine.

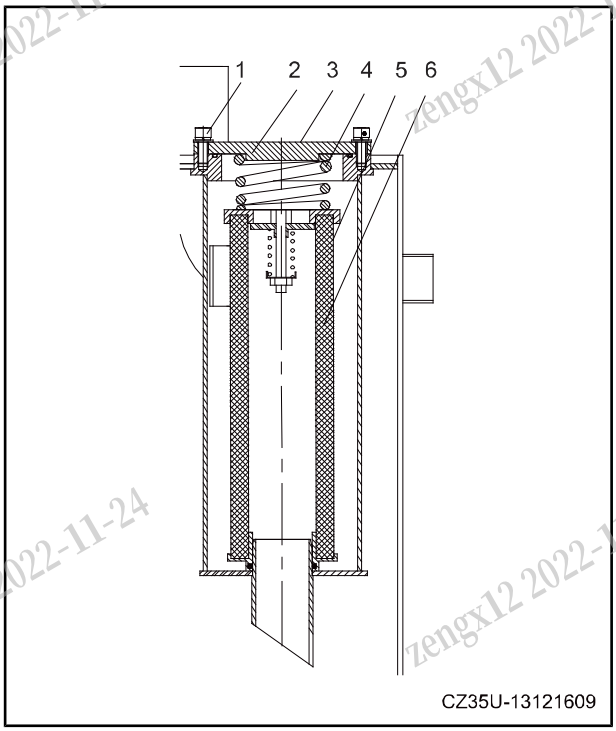

Fig.7-49

⚠ CAUTION

Take down the filter core, and inspect whether there are metal particles or filing at the bottom of filter tank. If there are many bronze and metal particles, it indicates that the hydraulic pump, motor or valve has been damaged or will be damaged. If there are rubber chippings, it indicates that the hydraulic cylinder seal has been damaged.

7.9.8.3 Inspect Fan Belt Tension and Replace Fan Belt

Note: The replacement of fan belt needs special tools. Please contact with the authorized agent of SANY Heavy Machinery Co., Ltd. for replacement.

⚠ CAUTION

The charging of storage battery might be insufficient, the engine might be overheated and the belt might suffer rapid and abnormal abrasion if the fan belt is too loose. However, the bearing and belt might be damaged if the belt is too tight.

1. Inspect the wear mode of belt visually. Replace it if necessary. Press the middle of belt between fan belt pulley ① and alternator belt pulley ② with the thumb to inspect the tension of fan belt. The deflection must be within the scope of A when the pressing pressure is about 98N (10kgf). A: 10-12mm.

2. If the tension is not within the specified scope, loosen the adjusting disc and bracket bolt. Adjust the tensioning bolt to make the belt deflection within the scope of A. Tighten the adjusting disc and bracket bolt.

3. Install the new belt, operate the engine with no load at low speed by 3-5 minutes and then readjust the tension to ensure that the new belt is placed properly.

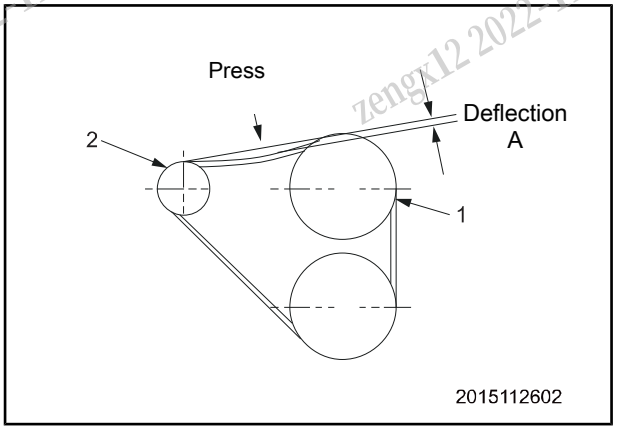

Fig.7-50

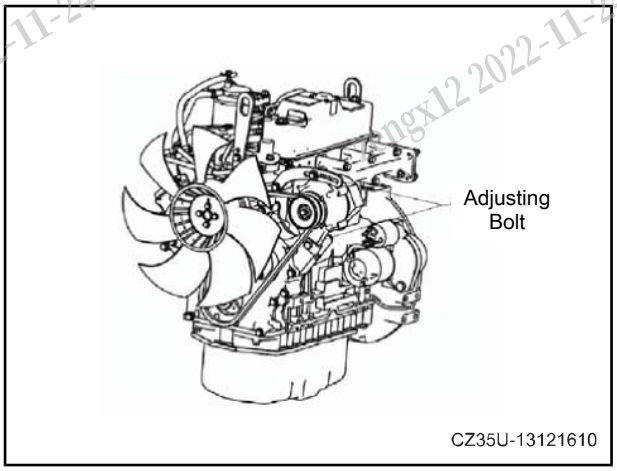

Fig.7-51

7.9.9 Maintenance every 2000 hours

7.9.9.1 Overview

It is necessary to perform the maintenance items every 250 ,500 and 1000 hours.

7.9.9.2 Oil in running reducer-replacement

The oil is still in hot state and might cause burns after the engine stops. Wait until the temperature reduces before starting operation.

⚠ WARNING

- The oil is still in hot state and might cause burns after the engine stops. Wait until the temperature reduces before starting operation.
- The oil or screw plug might fly out if the tank contains residual pressure. Keep the body an face away and off the air bleeding screw plug. Loosen the screw plug slowly to release the pressure.

Park the excavator on the level ground.

1. Rotate the running motor until the oil drain screw plug [1] is on the lowest position

2. Lower the bucket to the ground.

3. Turn the throttle control knob to the position MIN.

4. Idle the engine with no load by 5 minutes at low speed.

5. Switch off the engine, and take down the key from the starting switch.

6. Pull the safety locking control lever to the locked position.

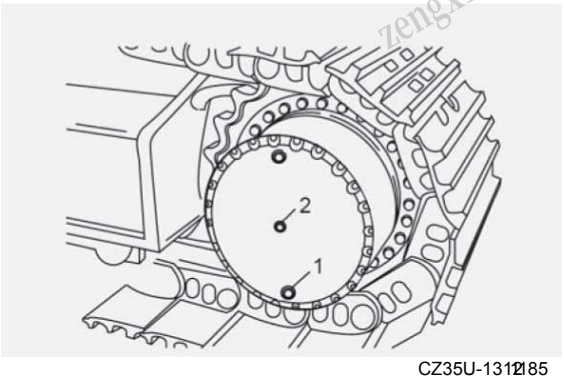

Fig.7-52

⚠ CAUTION

The turbocharger might be damaged if the steps for turning off the engine are incorrect.

7. After the gear oil cools down, loosen the screw plug [2] at the oil filler (FILL/ LEVLL) slowly to release the pressure.

8. Inspect the oil level through the oil filler. The oil must reach the hole bottom.

9. Fill in the oil until the oil overflows from the inspection screw plug hole if necessary.

10.Wrap the threads of screw plug with seal strap, install the screw plug [2] and tighten the screw plug [2] to 49N·m.

11.Inspect the gear oil level of another running reducer.

7.9.9.3 Oil Suction Filter Core of Hydraulic Oil Tank - Cleaning/ Replacement

⚠ WARNING

- The part and oil are still in hot state and might cause burns after the engine stops.
- Let the temperature reduce before cleaning the hydraulic oil tank filter core.

1. Park the excavator on the level ground, and lower then working device to the ground.

2. Turn off the engine, and put the safety locking lever on the locked position.

3. Loosen 4 bolts, and then remove the cover [1]. At this moment, the cover will pop out under the effect of spring [2] force; therefore, press on the cover when removing the bolt.

4. Hold the top of rod [3] and lift up to remove the spring [2] and filter core [4].

5. Clean all the dirt on the filter core [4], and then clean in the clean diesel oil or cleaning oil. Replace with new part if the filter core has been damaged.

6. When installing, fix the filter core [4] on the bulge [5] of oil tank and then assemble.

7. When assembling, fix the spring [1] with the budge at the bottom of cover [2], and then tighten with the bolt.

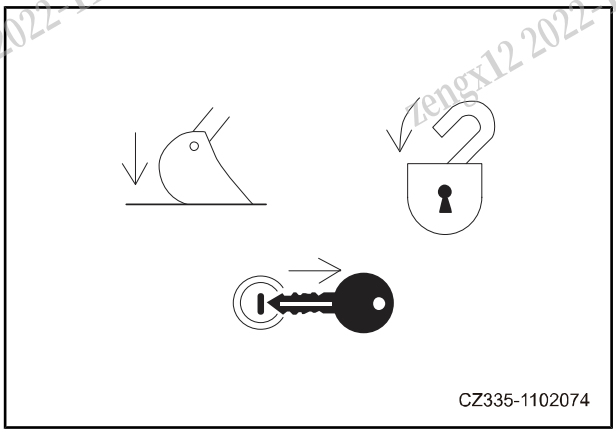

Fig.7-53

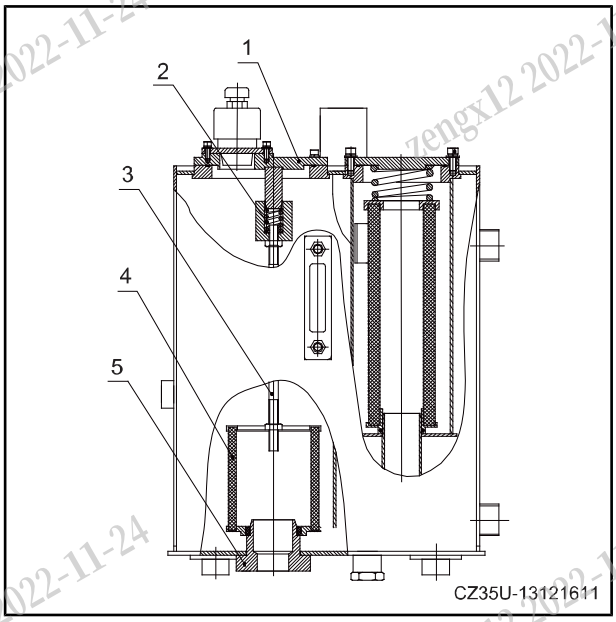

Fig.7-54

7.9.9.4 Alternator and Starting Motor - Inspection

Please contact with the authorized agent of SANY Heavy Machinery Co., Ltd. for inspection or repair if the electric brush has been worn or the lubricating grease in bearing has been used up.

It is necessary to inspect every 1,000 hours if the engine is started frequently.

7.9.9.5 Engine valve clearance-inspection/ adjustment

The removal and adjustment of parts require special tools. Thus, please contact with the authorized agent of SANY Heavy Machinery Co., Ltd. for maintenance.

7.9.10 Maintenance every 4000 hours

7.9.10.1 Overview

It is necessary to perform the maintenance items every 250 hours, 500 hours, 1,000 hours and 2,000 hours at the same time.

7.9.10.2 Water Pump - Inspection

The belt pulley may have clearance, or leak oil or water and the drain outlet might be blocked. Thus, please contact with the authorized agent of SANY Heavy Machinery Co., Ltd. for inspection, overhaul or replacement.

7.9.10.3 Oil in Hydraulic Oil Tank-Replacement

1. Inspection of Liquid Level

- Before starting the engine, it is necessary to inspect the oil volume of hydraulic oil tank. The oil level of hydraulic oil tank may be inspected with the liquid level meter on the hydraulic oil tank.
- When placing the excavator horizontally, it indicates that the oil level is correct if the hydraulic oil reaches the oil level mark of liquid level meter.

⚠ WARNING

After turning off the engine, the parts and oil are still in hot state and might cause burns. Before cleaning the air breather part of hydraulic oil tank, let it cool down.

2. Replacement of hydraulic oil

- If finding hydraulic oil is abnormal during the inspection, it is necessary to replace the oil no matter how long the excavator has been used; if the hydraulic oil has been polluted or the deterioration time is too short, it is necessary to identify the reasons, and then replace the oil.
- When finding the hydraulic oil volume is insufficient during the maintenance and repair, it is necessary to supplement oil; the oil to be supplemented must be same to the designation of oil used in the oil tank. Supplement oil to the volume specified by the oil gauge.
- Pay attention to the environmental protection when handling the hydraulic oil.

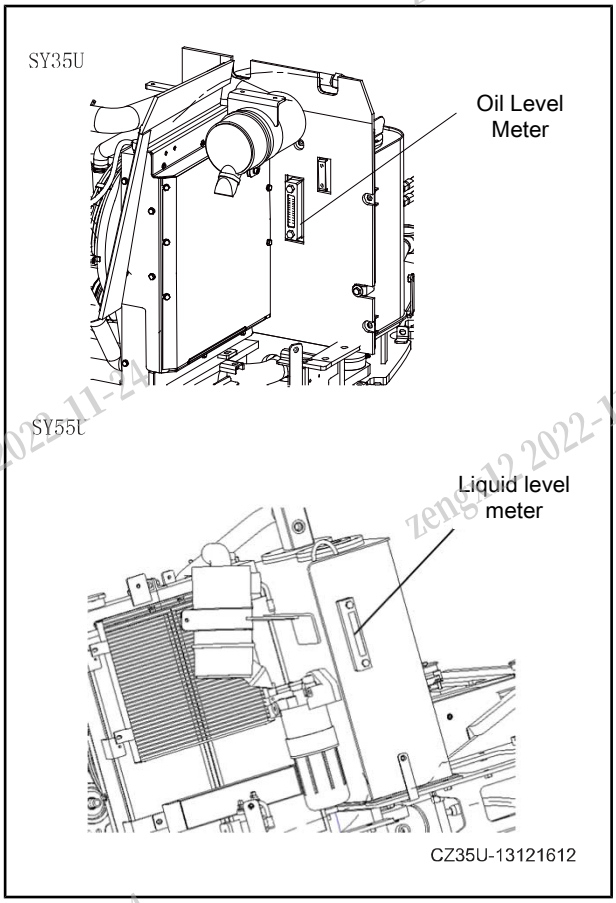

Fig.7-55

3. It is necessary to park the excavator on level ground when replacing the hydraulic oil.

1) Drain the hydraulic oil into an appropriate container through the oil outlet at the bottom of oil tank.

2) Clean the hydraulic oil tank and seal the oil outlet properly.

3) Remove the screw, dismantle the oil suction port cover and fill in new hydraulic oil to the mark of liquid level meter.

Note: If the excavator is equipped with hydraulic hammer, the hydraulic oil would be deteriorated more easily than the normal operation of bucket. When maintaining, refer to “Maintenance Cycle when Using Hydraulic Hammer” for details. The positions of oil level meter of different models may be different.

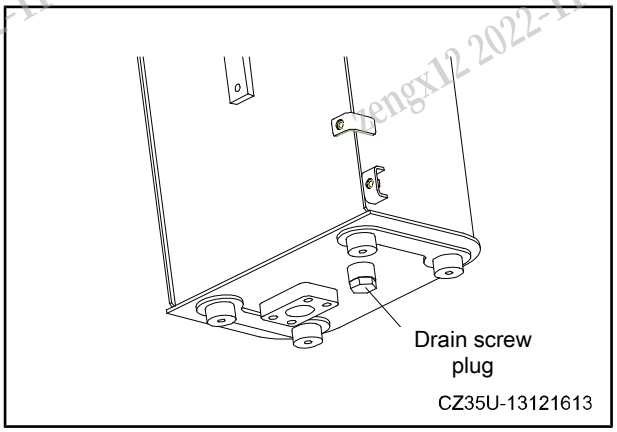

Fig.7-56

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Accessories and Optional Parts

⚠ WARNING

Read and understand all safety precautions and instructions in this manual before reading any other manuals provided with this machine and before operation or maintaining it. Failure to do this could result in death or serious injury.

8.Accessories and Optional Parts

8.1 Safety precautions

Pay attention to safety while installing accessories or options on board. Please comply with the following precautions for selection, installation and use of accessories or options:

Precautions for selection

- Before installing accessories or options on board, please consult the agents authorized by Sany Heavy Machinery Co., Ltd. Depending on the type of accessory or option, front guard, overhead guard or other safety structures may be required to be installed on board additionally.
- Only accessories or options approved by Sany Heavy Machinery Co., Ltd. shall be installed. Sany Heavy Machinery Co., Ltd. will take no responsibility for the accident, damage or malfunction caused by unapproved accessories or options.

Please read the Operation Manual carefully

- Before installing and using any accessories or options, be sure to read carefully and understand the contents of the corresponding Operation Manual.
- If the Operation Manual was lost or damaged, you should ask the manufacturer of accessories or the agents authorized by Sany Heavy Machinery Co., Ltd. for a new one.

Precautions for removal and installation

Ensure safety while removing and installing accessories or options. Please comply with the following precautions:

- Remove and install the accessories or options in a flat and solid place.
- When the cooperative work between two or more persons is required, one should be the commander and others follow his/her commands.
- Use the lift to carry the object over 25 kg. (The lift must be operated by qualified and experienced staff with official license.) It is forbidden to stay under the lifted object.
- During removal and installation process, please don’t use the machine while any object is being lifted. Please use a holder to avoid the object falling if necessary.
- Before removing some heavy parts, consider the effect of the removal on the balance of the machine. To prevent rollover, the machine may be supported before removal of some heavy parts, if necessary.
- Ensure the accessories or options to be installed or removed ones are stable and would not turn over.
- As for more details about removal or installation, please consult the agents authorized by Sany Heavy Machinery Co., Ltd.

Precautions for use

Please keep in mind the following precautions while installing large or heavy accessories or options.

- Before operation, please move the machine to a safe place for trial operation and make sure that you have clearly known the movement, center of gravity and working range of the machine.
- Do not swing the machine if it is inclined; otherwise, the machine would be in the risk of turning over.
- In the process of operation, make sure to keep a safe distance from the machine to the surrounding obstacles. Please pay attention to the followings while installing heavy accessories or options:
- The turning circle of heavy accessories or options may be large. Incorrectly calculating their turning circle could cause a risk of hitting other objects. Please reserve a large space for rotational motion.
- When the lifting process stops, the heavier the accessories or options are, the longer distance they will move downwards under their dead weight. Therefore do not stop them at the lifting position, but lower them down to the ground.
- Never swing, lower or stop the accessories or options abruptly to prevent the machine from turning over.
- Never extend or retract the boom cylinder abruptly to avoid machine rollover due to impact.

8.2 Operations of Recommended Accessories

8.2.1 Overview

Note:

- Select the accessories most suitable for the main excavator.
- The excavator models suitable for installing the accessories are different. Please contact with the authorized agent of SANY Heavy Machinery Co., Ltd. for the selection of accessories and excavator models.

8.2.2 Hydraulic Hammer

Main purposes:

To break the stones

To remove the buildings

To build the road

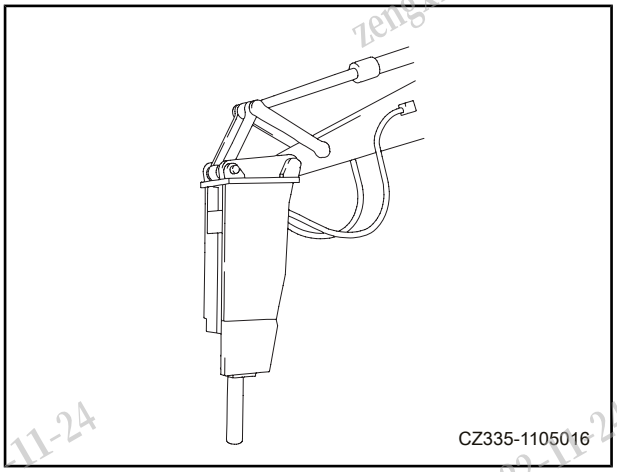

Fig.8-1

8.2.3 Operations of Hydraulic Hammer

1. Press the drill rod on the surface of object to be broken vertically, as shown in the figure:

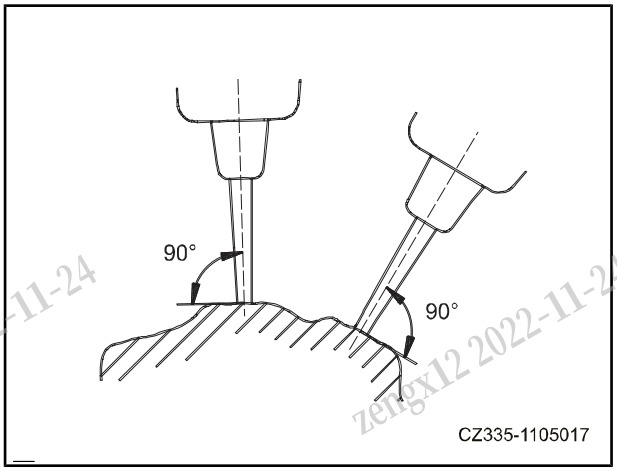

Fig.8-2

2. When impacting, press the drill rod tightly and lift up the crawler hydraulic excavator.

Note: Do not lift up the excavator too much.

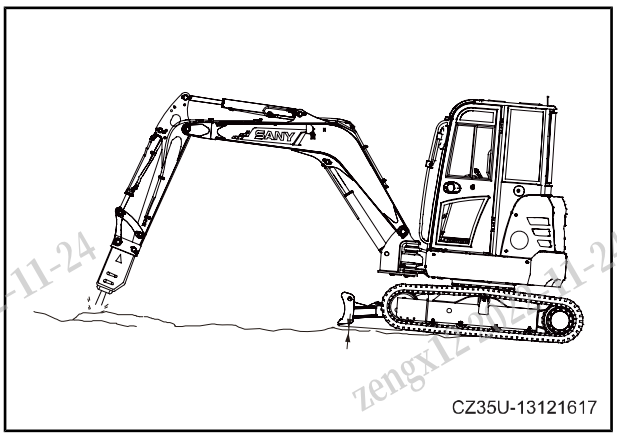

Fig.8-3

3. Push down the pedal control valve to hit the object repeatedly with the drill rod.

⚠ CAUTION

It is necessary to move the hammer and restart breaking from the end if failing to break the object within 1 minute.

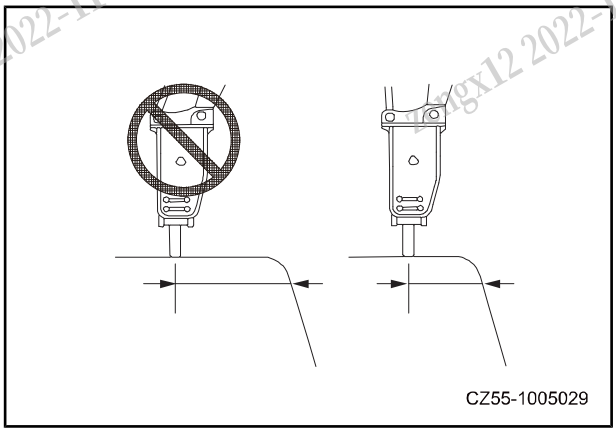

Fig.8-4

8.3 Prohibited Operations

1. Do not extend the piston rod to the end of stroke when operating the cylinder.

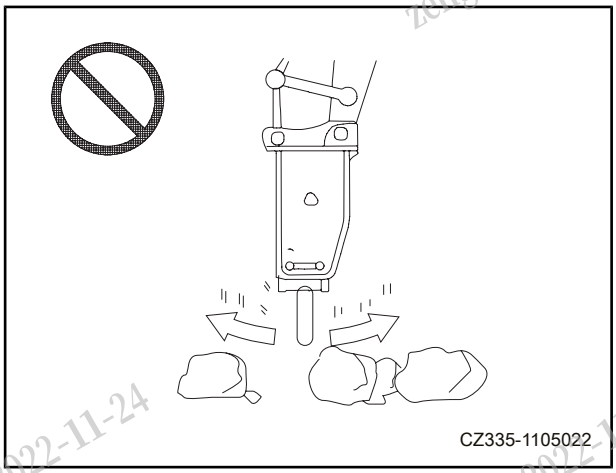

Fig.8-5

2. Do not swing the hammer against the rocks, buildings or concrete etc.

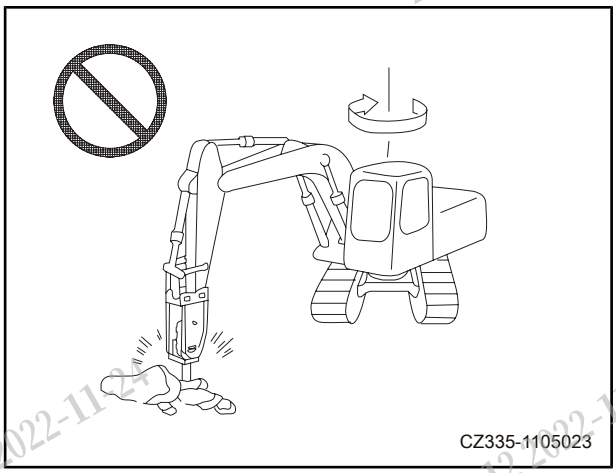

Fig.8-6

3. Do not move the drill rod when hitting.

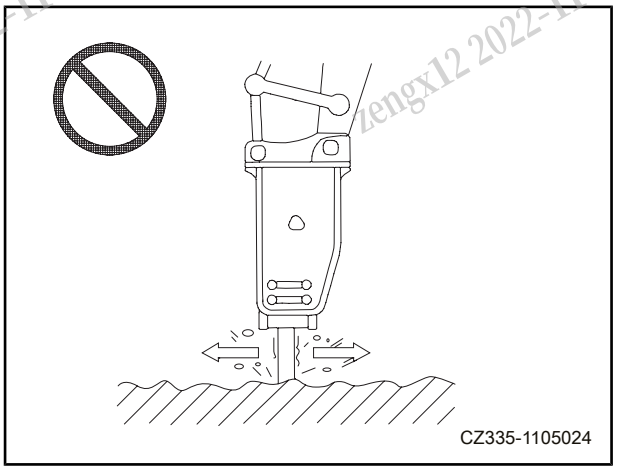

Fig.8-7

4. Do not twist the drill rod when drilling holes on the ground.

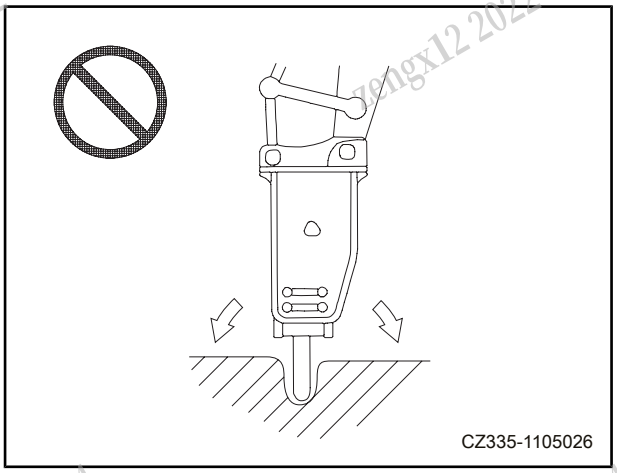

Fig.8-8

5. Do not extend the bucket cylinder to the maximum position when lifting up the excavator.

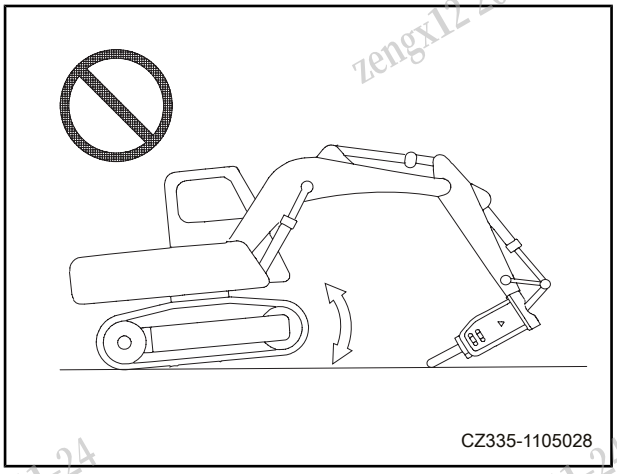

Fig.8-9

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