LIFT TRUCK

OPERATION & MAINTENANCE MANUAL

16BE-X
20BE-X

Serial No.

HYUNDAI

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SPECIFICATIONS

APPENDIX

1. DISCLAIMER

⚠ **THIS TRANSLATION IS BASED UPON THE ORIGINAL ENGLISH OPERATION AND MAINTENANCE MANUAL.**
THE ENGLISH VERSION SHALL PREVAIL OVER THE TRANSLATION IN CASE OF ANY LEGAL DISPUTE.

2. A MESSAGE TO HD HYUNDAI LIFT TRUCK OPERATORS

Lift trucks are specialized trucks with unique operating characteristics, designed to perform a specific job. Their function and operation are not like a car or ordinary truck. They require specific instructions and rules for safe operation and maintenance.

Safe operation of lift trucks is of primary importance to HD HYUNDAI.

Our experience with lift truck accidents has shown that when accidents happen and people are killed or injured, the causes are:

- Operator not properly trained
- Operator not experienced with lift truck operation
- Basic safety rules not followed
- Lift truck not maintained in safe operating condition

For these reasons, HD HYUNDAI wants you to know about the safe operation and correct maintenance of your lift truck.

This manual shows and tells you about safety inspections and the important general safety rules and hazards of lift truck operation. It describes the special components and features of the truck and explains their function. The correct operating procedures are shown and explained. Illustrations and important safety messages are included for clear understanding. A section on maintenance and lubrication is included for the lift truck mechanic.

The operator's manual is not a training manual. It is a guide to help trained and authorized safety operate their lift truck by emphasizing and illustrating the correct procedures. However, it cannot cover every possible situation that may result in an accident. You must watch for hazards in your work areas and avoid or correct them. It is important that you know and understand the information in this manual and that you know and follow your company safety rules!

Be sure that your equipment is maintained in a safe condition. Do not operate a damaged or malfunctioning truck. Practice safe operation every time you use your lift truck. Let's join together to set high standards in safety. Remember, before you start operating this lift truck, be sure you understand all driving procedures. It is your responsibility, and it is important to you and your family, to operate your lift truck safely and efficiently.

⚠ **Be aware that the Federal Occupational Safety and Health Act (OSHA) and state laws require aware that the Federal Occupational Safety and Health Act (OSHA) and state laws require that operators be completely trained in the safe operation of lift trucks; It is also an (OSHA) hat operators be completely trained in the safe operation of lift trucks; It is also an (OSHA) requirement that a truck inspection be performed before every shift. If you need training in operating or inspecting your lift truck, ask your supervisor.**

HD HYUNDAI lift trucks are built to take hard work, but not abuse. They are built to be dependable, but they are only as safe and efficient as the operator and the persons responsible for maintaining them. Do not make any repairs to this truck unless you have been trained in safe lift truck repair procedures and are authorized by your employer.

This manual describes procedures for operation, handling, lubrication, maintenance, checking and adjustment. It will help the operator realize peak performance through effective, economical and safe truck operation.

3. INTRODUCTION

HD HYUNDAI welcomes you to the growing group of professionals who own, operate and maintain HD HYUNDAI lift trucks. We take pride in the long tradition of quality products and superior value the HD HYUNDAI name represents. This manual familiarizes you with safety, operating, and maintenance information about your new lift truck. It has been specially prepared to help you use and maintain your HD HYUNDAI lift truck in a safe and correct manner.

Your HD HYUNDAI lift truck has been designed and built to be as safe and efficient as today's technology can make it. As manufactured, for some models, it meets all the applicable mandatory requirements of ANSI B56.1-1988 Safety Standard for Powered Industrial Trucks. Some trucks are also furnished with equipment to help you operate safety; for example, load back rest, parking brake and horn are standard equipment.

Safe, productive operation of a lift truck requires both skill and knowledge on the part of the operator. The operator must know, understand, and practice the safety rules and safe driving and load handling techniques described in this manual. To develop the skill required, the operator must become familiar with the construction and features of the lift truck and how they function, the operator must understand its capabilities and limitations, and see that it is kept in a safe condition

Routine Servicing and Maintenance

Regular maintenance and care of your lift truck is not only important for economy and utilization reasons; it is essential for your safety. A faulty lift truck is a potential source of danger to the operator, and to other personnel working near it. As with all quality equipment, keep your lift truck in good operating condition by using quality standard parts, and following the recommended schedule of maintenance.

Operator Daily Inspection - Safety and Operating Checks

A lift truck should always be examined by the operator, before driving, to be sure it is safe to operate. The importance of this procedure is emphasized in this manual with a brief illustrated review and later with more detailed instructions. HD HYUNDAI dealers can supply copies of a helpful Drivers Daily rivers Daily Checklist. It is an OSHA requirement.

Planned Maintenance

In addition to the daily operator inspection, HD HYUNDAI recommends that a planned maintenance and safety inspection program (PM) be performed by a trained and authorized mechanic on a regular basis. The PM will provide an opportunity to make a thorough inspection of the safety and operating condition of your lift truck. Necessary adjustments and repairs can be done during the PM, which will increase the life of components and reduce unscheduled downtime and increase safety. The PM can be scheduled to meet your particular application and lift truck usage.

The procedures for a periodic planned maintenance program that covers inspections, operational checks, cleaning, lubrication, and minor adjustments are outlined in this manual. Your HD HYUNDAI dealer is prepared to help you with a Planned Maintenance Program by trained service personnel who know your lift truck and can keep it operating safely and efficiently.

Service Manual

In-depth service information for trained service personnel is found in Service Manual.

4. HOW TO USE THIS MANUAL

This manual is a digest of essential information about the safe operation, the features and functions and explains how to maintain your lift truck. This manual is organized into eight major parts:

Section 1. **Section 1, Safety hints**, reviews and illustrates accepted practices for safe operation of a lift truck.
Section 2. **Section 2, Operating hazards**, conditions that could cause damage to the truck or injury to the operator or other personnel.
Section 3. **Section 3, Know your truck**, describes the major operating components, systems, controls, and other features of your truck and tells how they function.
Section 4. **Section 4, Operator maintenance and care**, presents details on how to perform the operator's daily safety inspection and refuel the lift truck.
Section 5. **Section 5, Starting and operating procedures**, discusses specific instructions on the safe, efficient operation of your lift truck.
Section 6. **Section 6, Emergency procedures**, gives instructions for towing your truck in an emergency and for using battery jumper cables to start your truck in an emergency.
Section 7. **Section 7, Planned maintenance and lubrication**, describes the PM (Planed Maintenance) program.
Section 8. **Section 8, Specifications**, provides reference information and data on features, components, and maintenance materials.

※ **The descriptions and specifications included in this manual were in effect at the time of printing. HD HYUNDAI reserves the right to make improvements and changes in specifications or design, without notice and without incurring obligation. Please check with your authorized HD HYUNDAI dealer for information on possible updates or revisions.**

The examples, illustrations, and explanations in this manual should help you improve your skill and knowledge as a professional lift truck operator and take full advantage of the capabilities and safety features of your new lift truck.

The first section of the manual is devoted to a review, with illustrations and brief messages, of general safety rules and the major operating hazards you can encounter while operating a lift truck. Next, you will find descriptions of the components of your specific lift truck model and how the instruments, gauges, and controls operate. Then, you will find a discussion of safe and efficient operating procedures, followed by instructions on how to tow a disabled lift truck. The later sections of the manual are devoted to maintenance and truck specifications.

Take time to carefully read the Know Your Truck section. By acquiring a good basic understanding of your truck's features, and how they function, you are better prepared to operate it both efficiently and safely.

In Planned Maintenance, you will find essential information for correct servicing and periodic maintenance of your truck, including charts with recommended maintenance intervals and component capacities. Carefully follow these instructions and procedures.

Each major section has its own table of contents, so that you can find the various topics more easily.

We urge you to first carefully read the manual from cover to cover. Take time to read and understand the information on general safety rules and operating hazards. Understand how all gauges, indicator lights,

and controls function. Please contact your authorized HD HYUNDAI dealer for the answers to any questions you may have about your lift truck's features, operation, or manuals.

Operate your lift truck safely; careful driving is responsibilities of operator and administrator.
Driving defensively and thinking about the safety of people who are working nearby. Know your truck's capabilities and limitations. Follow all instructions in this manual, including all symbols (⚠ △ ※) and messages to avoid damage to your lift truck or the possibility of any harm to yourself or others.

This manual is intended to be a permanently attached part of your lift truck. Keep it on the truck as a ready reference for anyone who may drive or service it. If the truck you operate is not equipped with a manual, ask your supervisor to obtain one and have it attached to the truck.

And, remember, your HD HYUNDAI dealer is pleased to answer any questions about the operation and maintenance of your lift truck and will provide you with additional information should you require it.

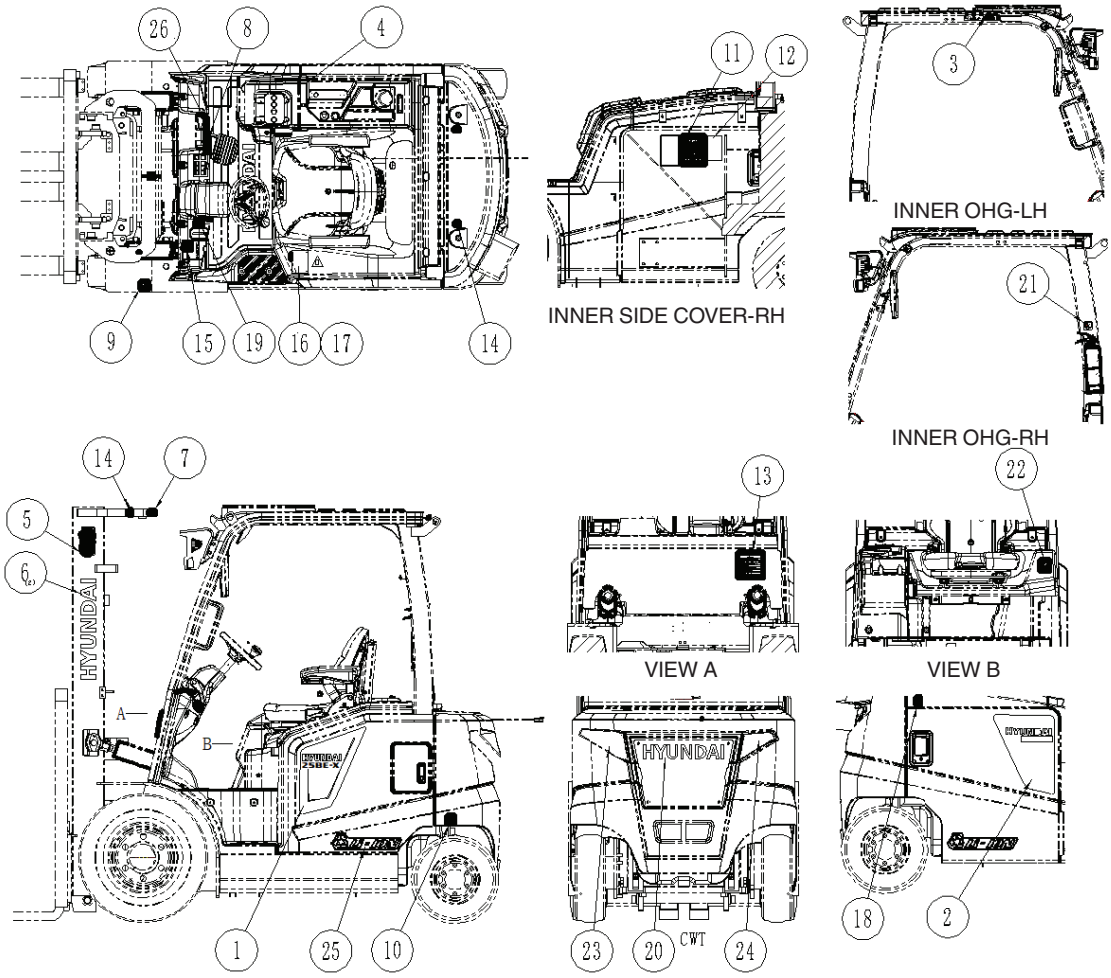
Any modification without permission is forbidden.

⚠ **Truck modification by user, which can introduce hazards or risk not considered by manufacturers, will invalidate the existing truck risk assessments.**
Truck modification outside Europe is subject to regional requirements (see ISO/TS3691-8).

5. SAFETY LABELS

1) Location

Always keep these labels clean. If they are lost or damaged, attach them again or replace them with new labels.



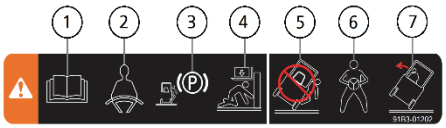
1	MODEL NAME	10	TIRE	19	PARKING BRAKE
2	MODEL NAME	11	MAINTENANCE EXPORT	20	HYUNDAI LOGO
3	WARNING OHG	12	BAT. HANDLING	21	FIRE EXTINGUISHER
4	EMERGENCY BUTTON	13	SAFTEY (DC03)	22	SEAT WARNING
5	MAST WARNING	14	HOOK	23	CWT
6	HYUNDAI LOGO	15	BRAKE DRY	24	CWT RH
7	HAND CAUTION	16	NAMEPLATE	25	LI ION
8	START CAUTION	17	RIVET	26	SOLID TIRE (EXPORT)
9	TIRE	18	HYDRAULIC OIL		

2) DESCRIPTION

There are several specific warning labels on this truck please become familiarized with all warning labels. Replace any safety label that is damaged, or missing.

(1) **SAFETY WARNING** (Item 3)

This warning label is positioned on the inside of the upper left side of overhead guard.



① Refer to operator's manual in detail.

② Always buckle up the seat belt for safety operation.

③ When the operator gets off the truck, always press the parking brake switch so that the truck can keep with stopping condition.

④ The people should not pass through under forks and other attachments which are lifted or being lifted.

⑤ Do not jump down from the truck. It can be caused that the operator has severe injury or death in the event of a tip over.

⑥ Outstretch the legs as widely as possible and grasp firmly the steering handle.

⑦ Lean the body to the opposite direction in order to avoid severe injury or death when the truck is tipped over.

⚠ **Safety and warning decals are placed in conspicuous locations on the truck to remind you of essential procedures or to prevent you from making an error that could damage the truck or possibly cause personal injury, you should know, understand, and follow these instructions. Safety and warning decals should be replaced immediately if missing or defaced (Damaged or illegible). Refer to page 0-6 of this manual for the location of all decals.**

⚠ **The purpose of the decals is to remind the operator that staying in the seat provides the best chance of avoiding injury in the event of a truck-tipping or driving off a dock mishap. Lift trucks can be tipped over if operated improperly. Experience with lift truck accidents has shown that the driver cannot react quickly enough to jump clear of the truck and overhead guard as the truck tips. To protect operators from severe injury or death in the event of a tip over, it is best to be held securely in the seat. So, please, always buckle up when driving your lift truck.**

(2) **EMERGENCY BUTTON** (Item 4)

This warning label is positioned on the right side of the hood.

⚠ **Press the red button (emergency button) in case of emergency.**

※ **Press the red button (emergency button) when the truck is not used for a long time.**

※ **Operate the key after 5 seconds pulling the button.**

(3) **MAST WARNING** (Item 5)

This warning label is positioned on the both side of the mast.

⚠ **Never stand or work under forks at any circumstances without supporting with block.**

⚠ **In case of working under the forks, it is essential to support the carriage with blocks.**

(4) **HAND CAUTION** (Item 7)

This label is positioned on the center side of the mast cross plate.

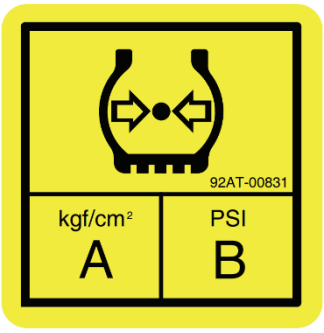
⚠ **It warns of the danger of injury from movement between rails, chains, sheaves, fork carriage, and other parts of the mast assembly. Do not climb on or reach into the mast. Personal injury will result if any part of your body is put between moving parts of the mast.**

(5) **TIRE** (Item 9,10)

These labels are positioned on the front top side of the left and right fender and the both rear side of the main frame.

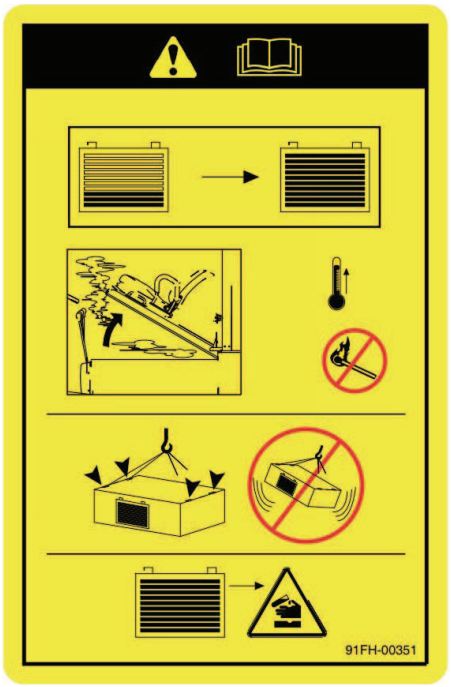
※ **Tire pressure must be checked in accordance with the planned maintenance chart.**

※ **Refer to page 7-10 for the regulated tire air pressure (A and B).**



(6) **BAT. HANDLING** (Item 12)

The decal for the battery handling is positioned on the right side inside of the cover.



⚠ **Please see Page 7-25 of safe battery exchange.**

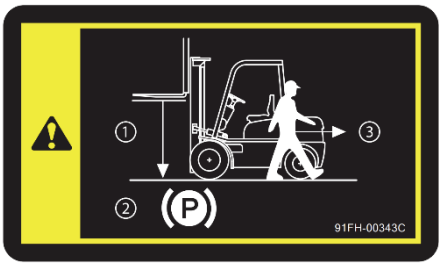
※ **Open the battery cover while charging the battery. Hear and inflammable hydrogen gas are generated during battery charging. Never place fire near the battery.**

※ **When raising the battery, hang ropes in two or four of the hooks, and prevent impact on the battery.**

※ **The battery electrolyte is mild sulfuric acid solution (H_2SO_4). Pay special attention to protect clothes or machine parts from contact with the solution.**

(7) **PARKING WARNING** (Item 19)

This warning and caution plate are located on the right side of the dashboard. Warnings before leaving the operator seat.



① Be sure to lower the attachment to the ground.

② Apply the parking brake.

(8) **SAFETY INSTRUCTION** (Item 13)
This warning label is positioned on the outer right side of the dashboard.

(9) **HOOK** (Item 14)
This warning label is positioned on the both top side of mast and the both side of the counterweight.

⚠ **Please see Page 1-23 of the manual for safe hauling procedures.**

(10) **BRAKE DRY** (Item 15)
This label is positioned on the left side of the dashboard.

⚠ **Use DOT 3 only for brake oil.**

(11) **HYDRUALIC OIL** (Item 18)

This warning label is positioned on the bottom left side of the driver seat.

⚠ **Fill only the hydraulic oil.**

⚠ **Do not fill the diesel oil.**

(12) **PARKING BRAKE** (Item 19)

This warning decal is positioned near the parking brake lever.

※ **When parting, fully pull the lever up.**

(13) **FIRE EXTINGUISHER** (Item 21)

This warning label is positioned on the rear left side of the stay.

※ **Read and understand the instructions adhered decal on the fire extinguisher.**

(14) **SEAT WARNING** (Item 22)
The label is positioned on the left/front of the hood.

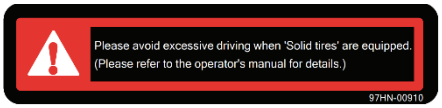
⚠ **Make sure have moved the seat before opening the hood.**

(15) **SOLID TIRE** (Item 26)
This decal is positioned on the right side of the dashboard.

⚠ **Do not travel at excessively high speed with the solid tires are installed.**

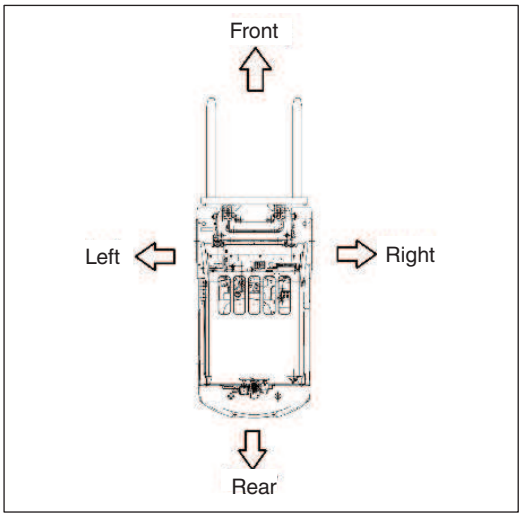
※ **Do not drive on the road for automobiles.**

※ **Please see Page 2-11 for further information.**



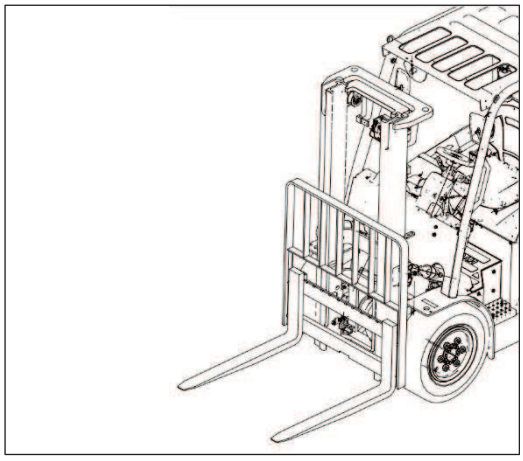
1. DIRECTION

The directions of this truck indicate forward, backward, right and left when truck is in the traveling direction.



2. SERIAL NUMBER

Inform following when you order parts or the truck is out of order.
It's shown on front of the left side of frame.



3. SYMBOLS

⚠ **Important safety hint**

⚠ **It indicates matters which can cause the great loss on the truck or the surroundings.**

※ **It indicates the useful information for operator.**

4. VIBRATION AND NOISE

The vibration level on the whole truck body is measured in accordance with EN13059 standards that contains in-depth testing criteria (e.g., load, speed, and road surface conditions). Vibration level at workplace may vary dependent upon actual work and surface conditions.

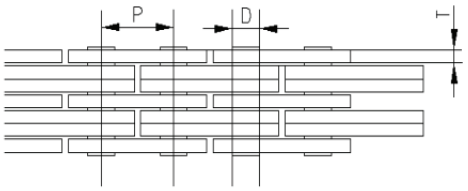
- Vibration on whole body is measured at standard production truck mounted with whole suspension sheets in position of operator.
- The truck body vibration was measured in accordance with EN13059.
  - 16/20 BE-X: <0.62 m/s^2
  - Uncertainty, K=0.2 m/s^2

Noise is measured according to EN 12053:2001+A1:2008.

Model	At the operator' position: measure with sound pressure level dB(A)
16BE-X	64
20BE-X	64

5. STRENGTH OF CHAIN

Static test coefficient for lifting attachment is 1.33.
The chain used in this equipment is type BL-644, and the parameters are as follows.
P: pitch-row (=19.05 mm)
D: diameter (=7.94 mm)
T: chain connecting plate thickness (=3.2 mm)
F: Maximum cracking strength (=13000 kgf)



1) Total load applied to the chain (W)

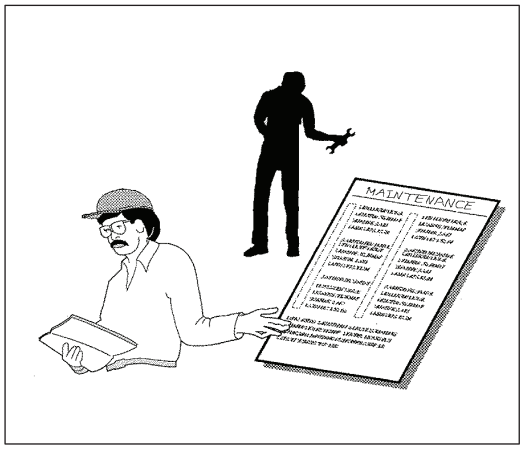
W = (scale load + Weight of case + Weight of fork + Weight of chain)/2
W = (3500 + 135.3 + 97.6 + 12) / 2 = 1872.45kgf

2) Chain breaking safety rate

SF= Maximum cracking strength(F)/ Total load applied to the chain (W)=6.94

1. DAILY INSPECTION

At the beginning of each shift, inspect your truck and fill out a check, maintenance and lubrication table.
Check for damage and maintenance problems.
Have repairs made before you operate the truck.
Do not make repairs yourself. Lift truck mechanics are trained professionals.

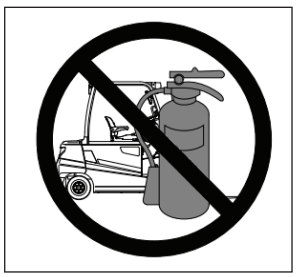


2. DO'S AND DON'TS

Do watch for pedestrians.

Do wear safety equipment when required.

Don't mix drugs or alcohol with your job.



Don't block safety or emergency equipment.

Don't smoke in NO SMOKING areas or when refueling.

Don't operate the truck outdoors in rainy day.

Do not charge battery in indoor environment where ventilation is not performed.

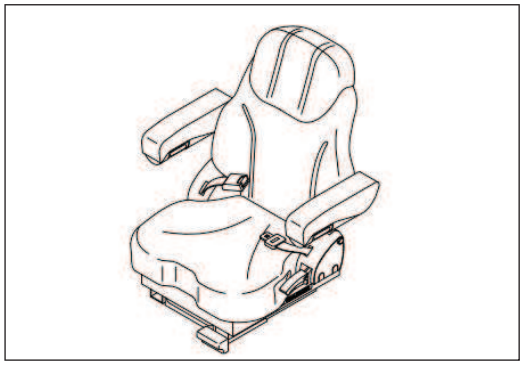
Do not leave the truck outdoor in rainy day.

Protect electronic systems from spray of water during washing the truck with water.

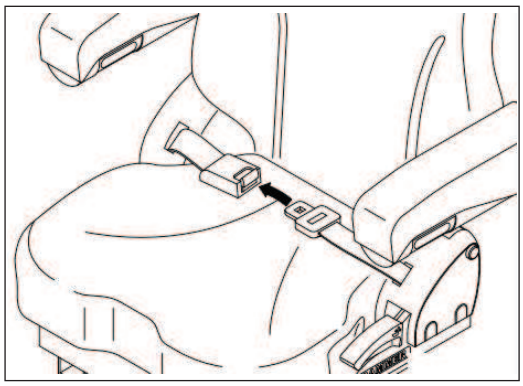
⚠ **Unauthorized modification**
Modifying the truck without authorization of the company may cause safety accident. Contact the dealer of HD Hyundai before attempting modifying the truck.
HD Hyundai should not be responsible any injury or damage caused by unauthorized modification.

3. SEAT BELTS

⚠ **Always buckle up for the truck equipped with safety belt.**



⚠ **Seat belts can reduce injuries.**

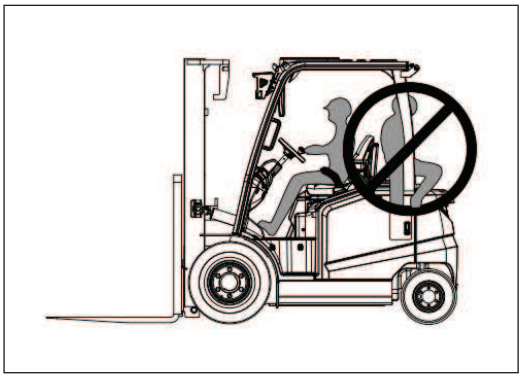


4. NO RIDERS

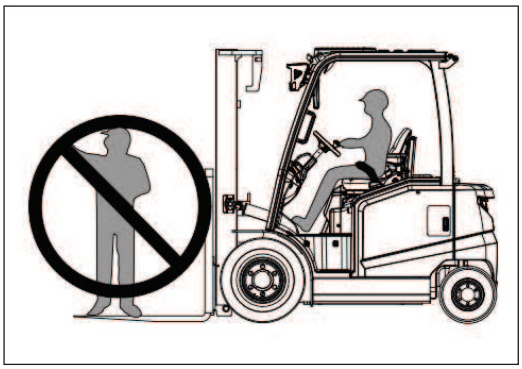
1) **The operator is the only one who should be on a truck.**

   ⚠ **No riders other than operator**

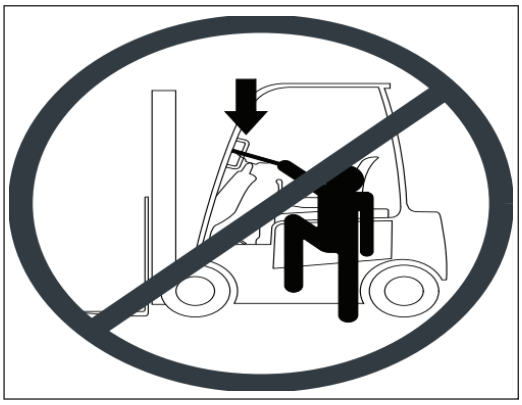
   Any rider other than operator may be struck by object, or fell down off the truck.



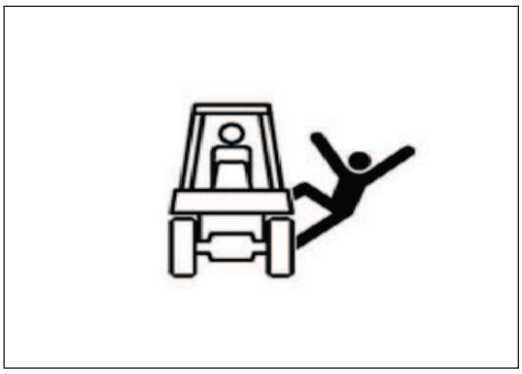
2) **Never let anyone step on the forks.**



3) **Do not hold the steering wheel when you get on or off the truck, but use the handle mounted on the struck only. Excessive loads on the steering wheel may cause structural deformation or safety trouble.**

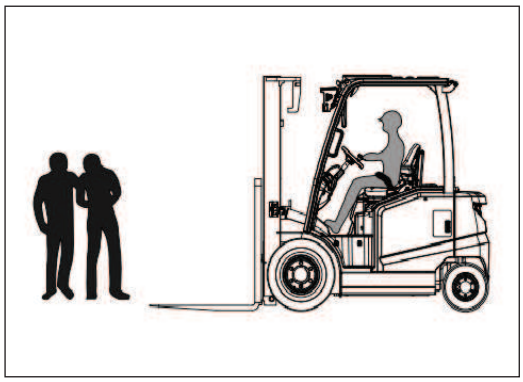


4) **Do not jump on or off the truck. Do not get on or off the truck while the truck operates. Get on or off the truck with the handle or step mounted the truck. Keep the handle or the step free from foreign substances such as mud or oil, and always keep them clean.**
Wear slippery-preventing footwear.

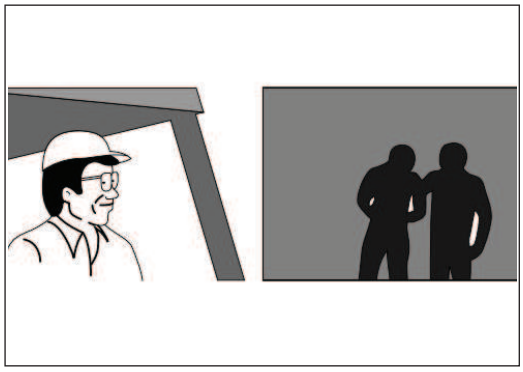


5. PEDESTRIANS

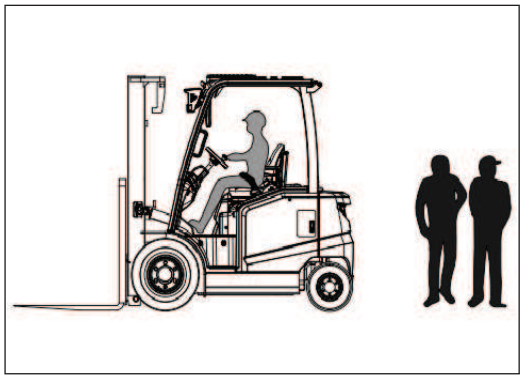
1) **Watch where you are going. Look in the direction of travel. Pedestrians may use the same roadway you do. Sound your horn at all intersections or blind spots.**



2) **Watch for people in your work area even if your truck has warning lights or alarms. People may not watch for you.**



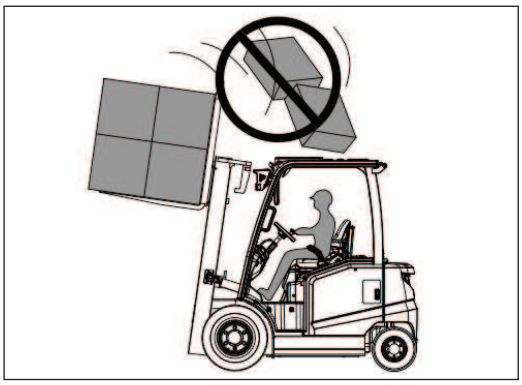
3) **Watch for people standing back, even when you parking.**



6. OPERATOR PROTECTION

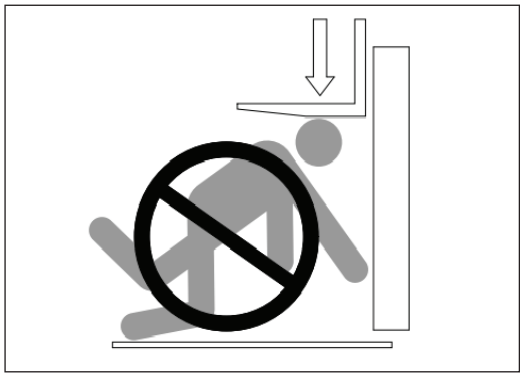
1) **Keep yourself under the overhead guard while operating.**

2) **Always keep your body on the seat within the confines of the truck.**

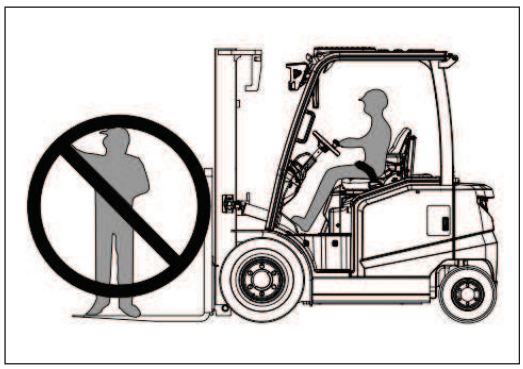


7. FORK SAFETY

Never allow anyone to walk under raised forks.

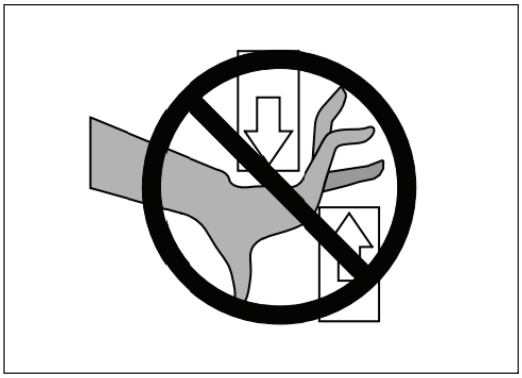


Do not use the folks of the truck as an elevator for work at high place.

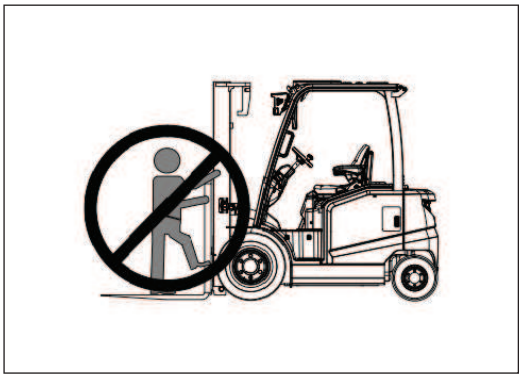


8. PINCH POINTS

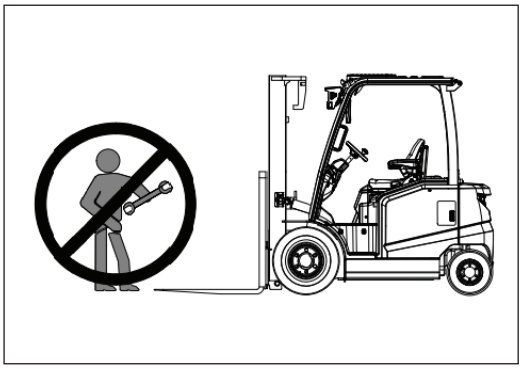
⚠ **Keep hands, feet and legs out of the mast.**



⚠ **Don't use the mast as a ladder.**



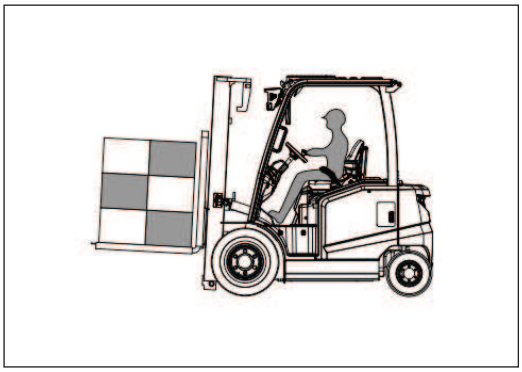
⚠ **Never try to repair the mast, carriage, or attachment by yourself. Always get a trained mechanic.**



9. TRAVEL

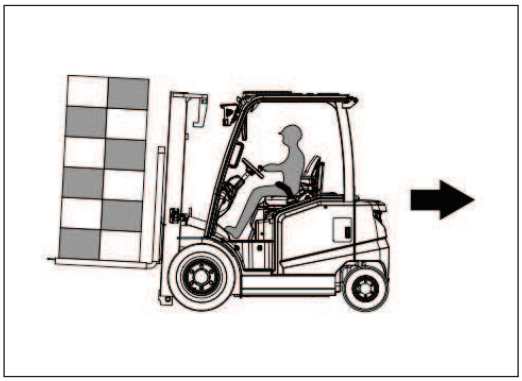
1) **Travel with the load near the floor/ground, with mast tilted back to cradle the load whenever possible.**

   ⚠ **Never lift or lower the load when the truck is in motion.**



2) **When handling bulky loads that restrict your vision operate your truck in reverse to improve visibility.**

   Be sure to pivot in the seat to give maximum visibility.

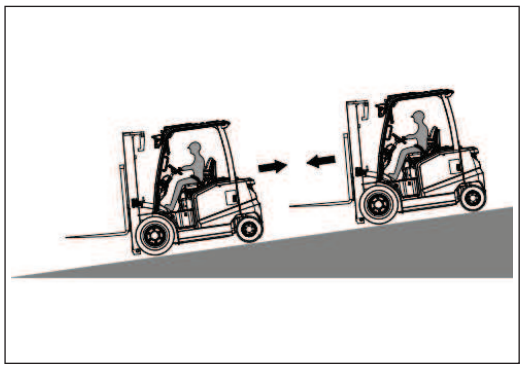


3) **Unstable loads are a hazard to you and to your fellow workers. Always make certain that the load is well stacked and evenly positioned across both forks. Never attempt to lift a load with only one fork.**

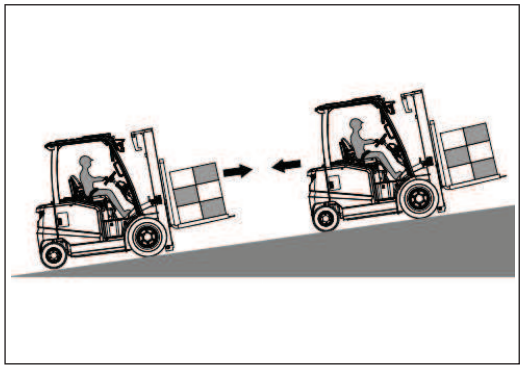
10. GRADES, RAMPS, SLOPES AND INCLINES

⚠ **Never turn on a grade, either loaded or unloaded.**

1) Unloaded
Forks downgrade

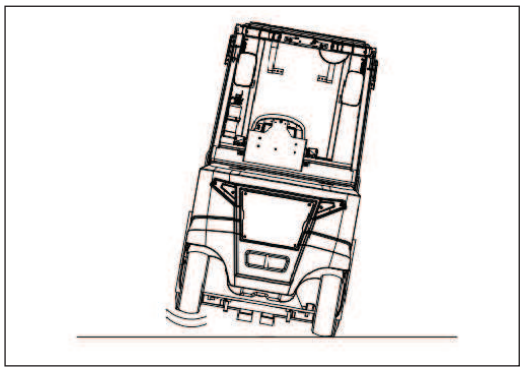


2) Loaded
Forks upgrade



11. TIP OVER

1) LATERAL TIP OVER

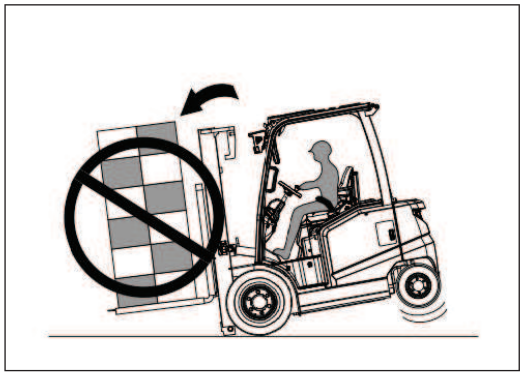


(1) Lateral tip over can occur with a combination of speed and sharpness of turn. This combination will exceed the stability of the truck. This condition is even more likely with an unloaded truck.

(2) With the load or mast raised, lateral tip over can occur while turning and/or braking when traveling in reverse or accelerating and turning while traveling forward.

(3) Lateral tip over can occur loaded or unloaded by turning on an incline or ramp.

2) LONGITUDINAL TIP OVER



(1) Longitudinal tip over can occur with combination of overloading and load elevated also with capacity load and elevated. This combination will exceed the stability of the truck. This condition is even more likely with excessive forward tilt, braking in forward travel or accelerating rearward.

(2) Longitudinal tip over can occur by driving with the load down slope on a steep grade. Lateral and longitudinal tip over can occur if the truck is driven over objects on the floor or ground, off the edge of improved surfaces, or into potholes in the road surface, or by running into overhead objects or collisions.
An off-dock type of tip over can occur if the truck is steered too close to the dock edge, driven off the edge of the dock or ramp, or if the highway truck or trailer rolls away from the dock or is driven away during loading.

⚠ The conditions listed above can be further he conditions listed above can be further aggravated by overloading, excessive tilt, or off-center loads.

⚠ Lift truck tip over can cause serious injury or death if the operator is trapped between the truck and the ground.

3) WHAT TO DO IN CASE OF A TIP OVER

⚠ If your truck starts to tip over, do not if your truck starts to tip over, do not jump off the truck.

⚠ Brace yourself as illustrated right.

(1) Make sure your seat belt is fastened securely, if the truck is equipped with seat belt.

(2) Stay in your seat.

(3) Grip the wheel with the both hands.

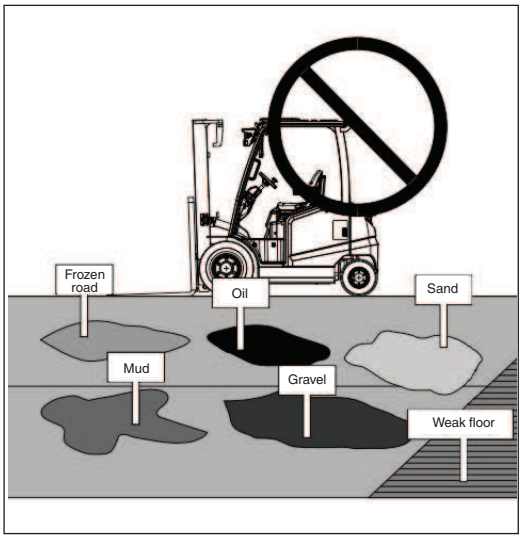
(4) Brace your feet.

⚠ Your chances for survival in a tip-over are better if you stay with the truck, in your seat.

12. SURFACE AND CAPACITY

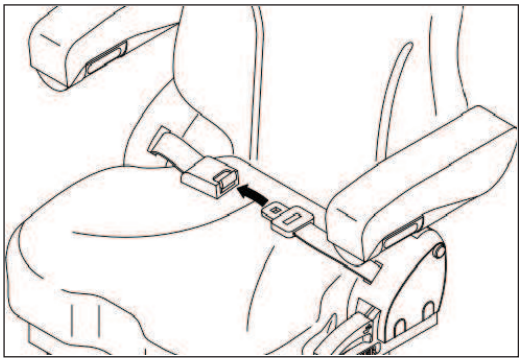
Avoid these conditions. They can cause a truck to tip over or lose traction for braking or driving.

⚠ **Know the weight of your truck and load. Especially when using elevators, know the capacity of the elevator you intend to use. Do not overload.**



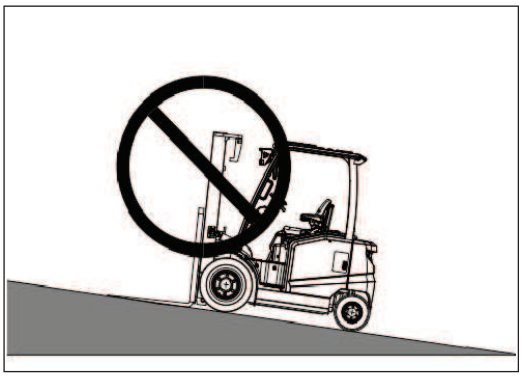
TIPOVER

⚠ **Seat belts can reduce injuries. ALWAYS BUCKLE IT UP.**

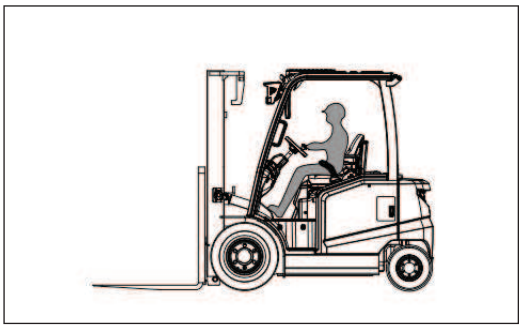


13. PARKING

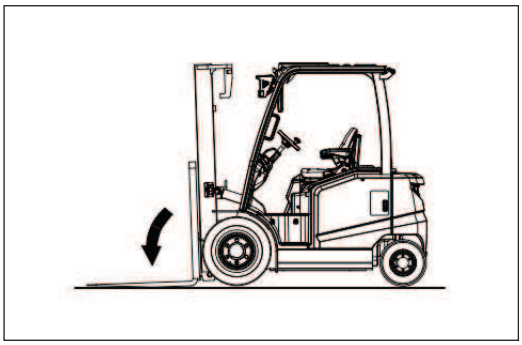
1) **Never park on a grade.**



2) **Always come to a complete stop before leaving the truck. Be sure the travel control is in NEUTRAL.**

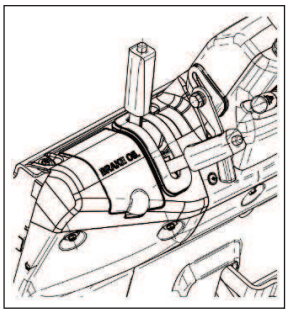


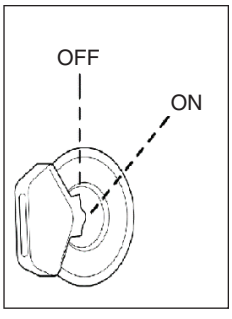
3) **Lower forks fully to the floor and tilt mast forward.**



4) **Put the parking brake switch in LOCK position.**
Position 1: Lock
Position 2: Release

5) **Turn start key to OFF position.**





14. LIFTING, JACK-UP AND BLOCKING

⚠ **Lifting or jack-up of heavy equipment such as lift truck may cause risk. Pay special attention to the work.**

1) Safe parking

Before working on the truck:

(1) Park the truck on flat and hard surface such as concrete floor free from cracks or breaking.

(2) Erect the mast vertical, and fully lower the forks or the attachment.

(3) Put all of controls in NEURAL, and turn the start key to OFF position, and then withdraw the key.

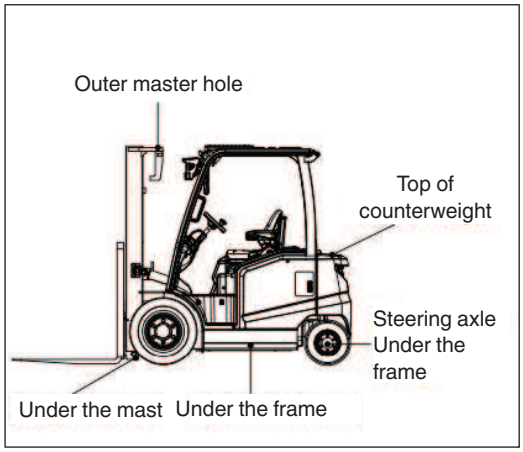
(4) Apply the parking brake, and keep the tires stationary with blocks.

⚠ **Defective truck may cause accident. All of tools and lifting devices should be kept intact, and satisfy loading standard. Affix OSHA decal, if required. Defective tools may cause serious injury to human being.**

2) Positions of lifting, fixing and jack-up

See the figure for fixing sections of the truck during work of lifting, fixing and jack-up. Fully understand lifting, fixing and jack-up procedures of each functional part of the truck, and perform the procedures precisely and safely.

⚠ **Do not use the overhead guard as a fixing section when lifting. Serious accident or damage to truck may be caused.**



3) Lifting driving wheel

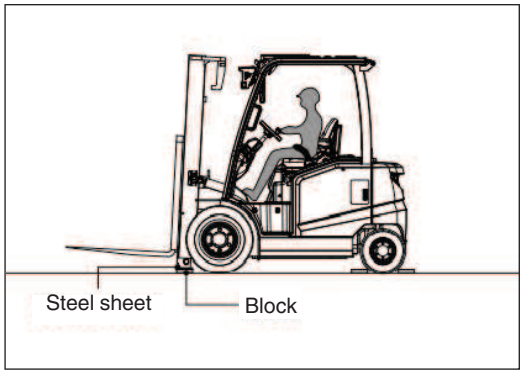
The mast is used as a lever for lifting driving wheel for preventing safety accidents resulted from sudden operation of driving wheel.

(1) As described in Safety Parking, park the truck safely, and install blocks on the rear wheels (steering wheels).

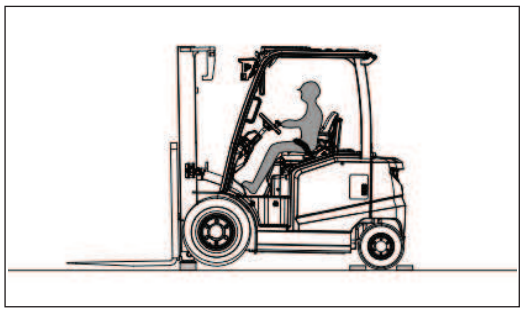
(2) Make sure that the pin bolt for mast mounting is securely fastened.

(3) Turn the key switch to ON position to start the truck. Fully incline the mast rearward, and adjust the mast height to install block on the end of the mast.

(4) Place hard wooden block of thickness of 100 mm the front bottom of each mast rail, and then install steel sheet of thickness of 3-6 mm onto the wooden block.

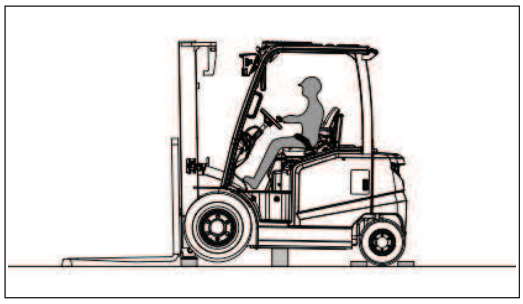


(5) Incline the mast frontward to the largest extent. Then, driving wheel is lifted from the ground. Release the tilt lever, and turn the engine off.



(6) Install block on the slip wheel cradle on the bottom of the frame of the rear driving wheel, or on the bottom of the driving wheel. Check safety distance between the driving wheel, the bottom, and block when block is used.

※ **When the forks are lifted from the ground as shown on the figure, affix a tag alarming tip-over risk on the end of a fork to prevent safety accident.**



(7) Check the truck for stable conditions. Make sure that the blocks are securely fixed below the frame bottom before driving or working on the truck.

(8) Lower the driving wheel on the ground, and remove the blocks in the reverse order of the procedures above.

4) Lifting with crane

If there is proper device available, make use of a crane to lift the front of the truck, and then place the wheel cradle under the wheel, or install block under the frame.

⚠ **Carefully check if the truck is kept balanced when lifting it. The truck may tip over to the left or the right. Support the side of the truck or the overhead guard, or use the guide to prevent tip over.**

(1) As described in Safety Parking, park the truck safely, and install blocks on the rear wheels (steering wheels).

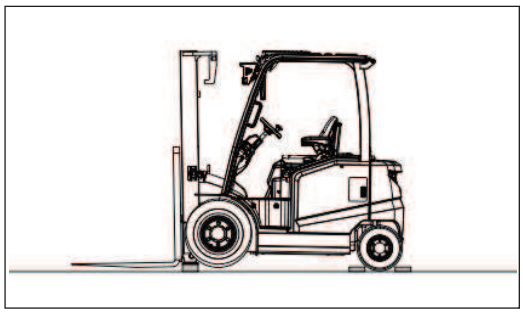
(2) Make sure that the pin bolt for mast mounting is securely fastened.

(3) Tie the outer master rains with two chains respectively to lift the front of the truck by making use of the mast.

⚠ **Make sure that capacity of the chain or the crane is sufficient for lifting the truck before lifting the truck. See the data plate of the truck.**

(4) Slowly lift the truck, and then lower the truck onto blocks under the frame.

(5) Once maintenance is complete, perform the lifting procedures in reverse order to safely lower the truck. Care should be exercised to prevent tools or other devices left under the wheels.



5) Lifting and fastening the mast

These procedures are for safe accessing to functional parts near the driving axle from the front of the truck. The figure illustrates disassembled mast

(1) It is not required to dismantle the forks.

(2) Part the lift truck safely.

(3) Install blocks on the front and the rear of the driving wheel.

(4) Move supporting blocks near the mast rail before lifting the mast.

(5) Use wooden blocks of length of 305 mm (A) and 610 mm (B) on both of the standard masts.

※ **Support the inner mast and the carriage simultaneously on the standard masts.**

※ **Ascending speed of the carriage of the standard mast is faster than the inner mast by 3 times.**

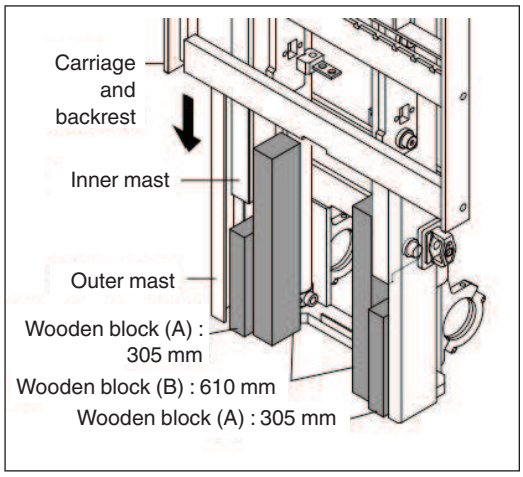
(6) Start the engine, and ascend the mast and the carriage.

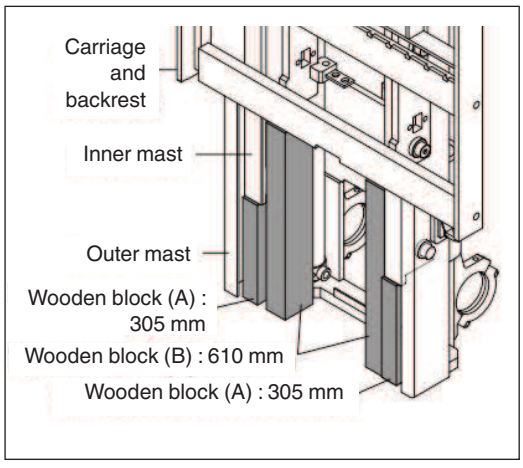
(7) As for the standard mast, support the inner mast with a block (A), and the carriage with a block (B), and then lower the inner mast and the carriage simultaneously until they are safely seated.

(8) Use wooden blocks of length of 915 mm (C) on the both sides of the 3-layer free mast.

※ **Support the carriage only on the 3-layer free mast.**

2-Layer standard mast





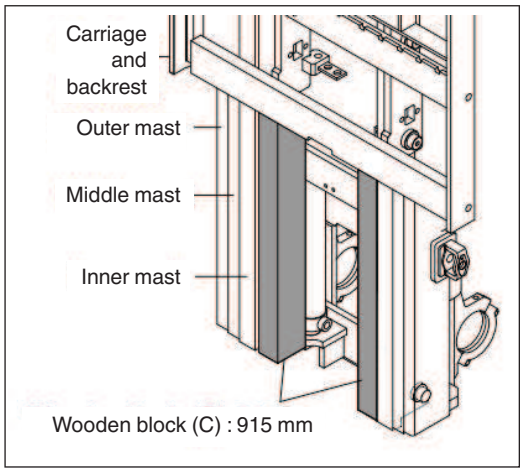
(9) Start the engine, and ascend the carriage.

(10) As for 3-layer free mast, support the mast with block (C) on inside, and then descend the mast until the carriage is safely seated.

⚠ **The middle-mast and the inner mast of the 3-layer free mast do not ascend until the carriage reaches the height of free ascending.**

(11) Perform the aforementioned procedures in reverse order to remove the wooden blocks.

3-Layer free mast



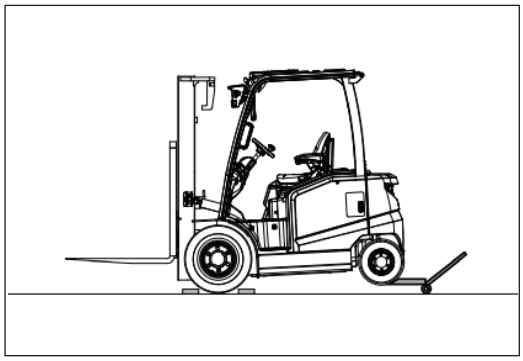
6) Lifting rear of the truck

It is possible to lift the rear of the truck by installing blocks on the center of the front or the rear steering axle, or on the center of the frame of the steering axle mount, or jacking up them.
See the data plate for the weight of the truck.

(1) Safely park the truck, and install blocks on front and rear of the driving wheel.

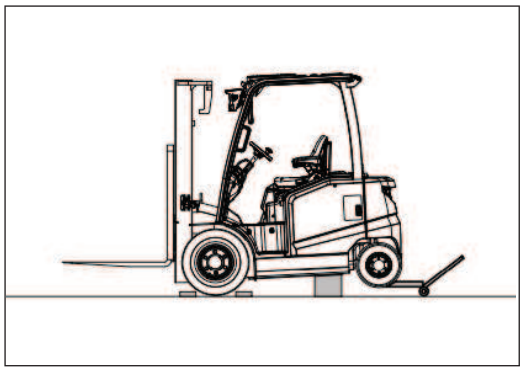
(2) Install floor jack on the center between two wheels of steering axle-mounted frame.

※ **If there is no space sufficient for installing the jack under the frame, move the truck over the seam to secure required space.**



(3) Lift the truck to the least height for allowing maintenance.

(4) Install blocks under the main side structure of the frame on the both sides of the truck. Install block on the front as near the counterweight and the rear wheel as possible to ensure max. stability of the truck.



(5) Install blocks in same number on both sides of the truck to keep the block balanced for operation.
Lower the truck on the blocks, and remove the jack.

⚠ **Make sure that blocks are safely installed before beginning maintenance.**

(6) Once maintenance is complete, perform the aforementioned procedures in reverse order to lower the rear of the truck on the ground. Lower sides of the truck by 50 mm at a time alternately.

- Place jack under the frame bottom to lift the truck.
- Carefully remove blocks, and lower the truck.

- Remove jack and blocks from the driving wheel.

7) Lifting entire truck

See the data plate for the weight of the truck.

(1) Safely park the truck, and fully lower the mast.

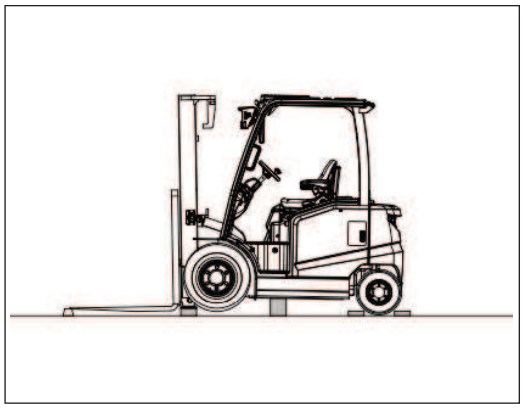
(2) Park the truck on board, if required, to expand gap from the ground.

⚠ Lateral tip over - Make sure that the mast is sufficiently lowered, and keep difference between lifted side and the opposite side within 50 mm when lifting one side of the truck to prevent lateral tip over.

Longitudinal tip over - If the axle and the mast are removed during installing blocks on the truck, the truck may tip over rearward by the weight of the counterweight. It is, therefore, required to remove both of the mast and the counterweight before lifting the truck to remove the axle. The steering axle should be fixed with block to fix the rear of the truck.
It is same to reverse order, also. When removing the counterweight while installing block on the truck, the truck may tip over forward by the weight of the axle.

(3) Install jack on the bottom of the side frame near the center of the truck.

※ Correctly install jack on the bottom of the main side frame. Do not install jack on the bottom of the fuel tank or the hydraulic oil tank.



(4) Lift in one direction at a time alternately in opposite direction up to 150 mm for maintenance work.

(5) Install block on each position with jack installed on the bottom of the side frame. Install blocks near the steering wheel, and driving wheel to keep stable conditions to the largest extent.

(6) When only one jack is used, put the truck on blocks, and then move the jack to the opposite side to work. Repeat individual lifting procedures.

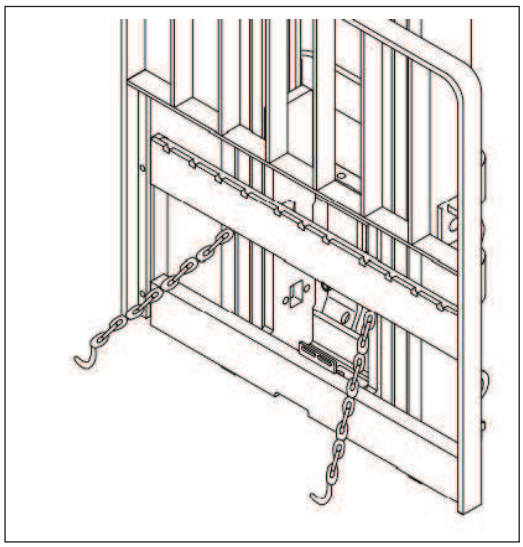
(7) Use blocks of same size to keep level.

⚠ Correctly install jack on the bottom of the main side frame. Do not install jack on the bottom of the fuel tank or the hydraulic oil tank.

(8) Once maintenance is complete, perform the lifting procedures in reverse order to safely lower the truck. Carefully remove blocks one after another alternately between two directions. Care should be exercised to prevent tools or other devices left under the wheels.

※ A number of seams may be required to install under tires dependent upon the height of jack when removing the jack.

8) How to fasten the truck when shipping



(1) Front of truck

① Mast and carriage mounted

- Fully lower the carriage.
- Install tie-down (e.g., chain) between the carriage and the fork bar.

② Mast and carriage not mounted

- a. Install chain over the floor plate of the truck,

※ **Use clad chain, or install protective film on contact point between chain and the truck to protect the truck from damage by chain.**

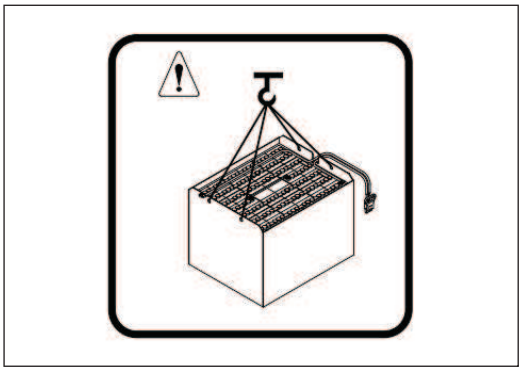
(2) Rear of truck

Install chain through the pocket hole on the bottom of the counterweight.

15. LIFTING OF LIFT TRUCK

1) **Check the weight, the full length, the full width, and the full height before lifting the truck.**

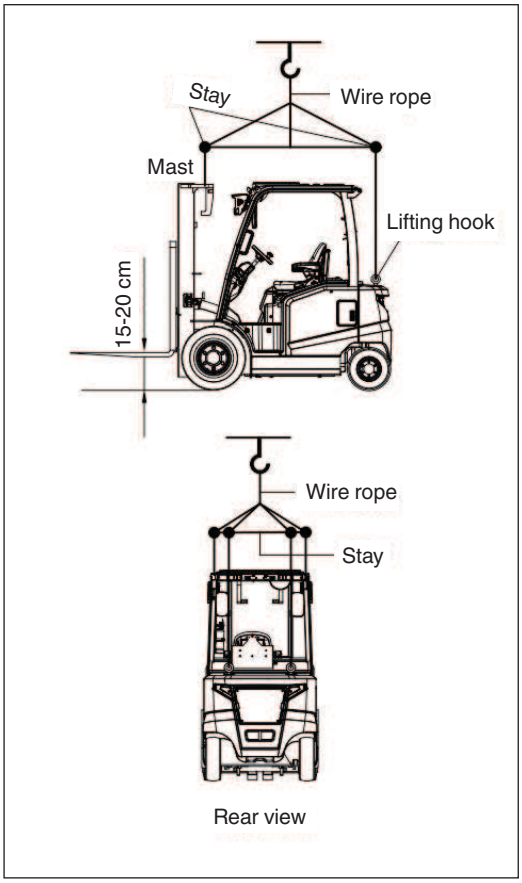
   ⚠ **The battery should be removed before lifting the lift truck. Please see Page 7-25 of safe battery exchange.**



2) **Use wire rope and stay of sufficient length to prevent contact with the lift truck when lifting.**

3) **Protect the truck from damage caused by contact of wire rope with the truck, and insert rubber sheet between rope and the truck, and fabricate additional lifting stay to protect the truck.**

4) **Position a crane at adequate place.**



5) **Install wire rope and stay as shown on the right figure.**

   ⚠ **Use wire rope and other lifting device free from damage or degradation, and with sufficient strength.**

   ⚠ **Wrong method of lifting or role hanging causes movement of the lift truck during lifting to result in personal injury or truck damage.**

   ⚠ **Do not apply rapid loads on lifting wire rope and other devices.**

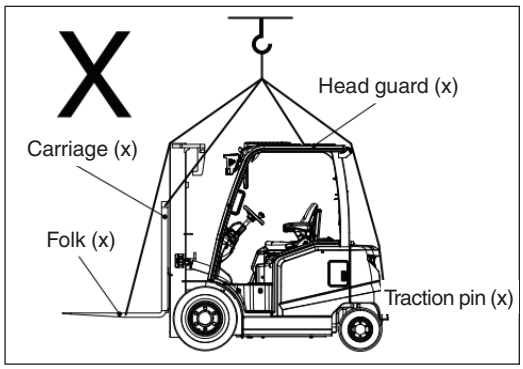
   ⚠ **Prevent access of people under the lift truck during lifting, and to surroundings of the truck.**

⚠ **It is recommended to fabricate adequate for field situations of truck lifting.**

⚠ **Do not install wire rope at unsafe positions such as fork, carriage, head guard, and traction pin. Injury of operator or severe damage to truck may be caused.**

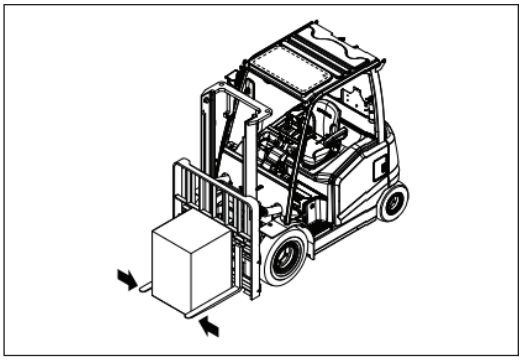
⚠ **If you have any trouble for lifting, please call the service center.**

⚠ **Lifting of the lift truck should safely be done upon instructions of skilled engineer.**



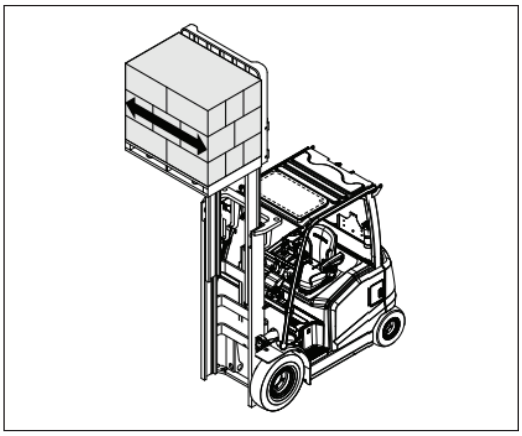
16. SIDE SHIFT AND PORK POSITIONER (OPT)

⚠ Do not handle loads held between forks.



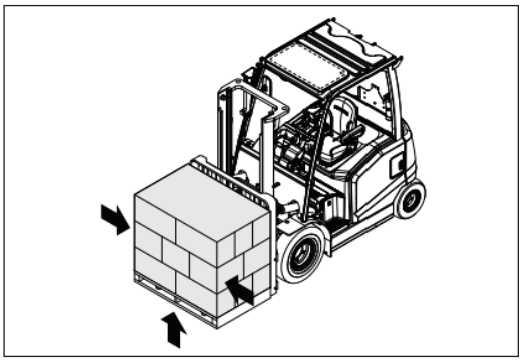
⚠ Do not operate attachment or drive the truck while loads are ascended.

When the side shift suddenly operates in this situation, stability is seriously lost, and the truck may excessively pivot.

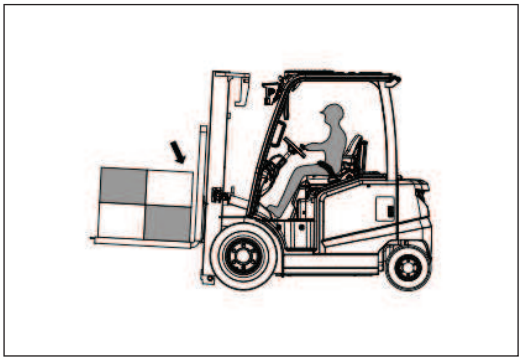


⚠ Avoid overload or unbalanced loading.

When applying the side shift, load cargo on the forks in accordance with the specified loading capacity indicated on the name plate. Unbalanced loading may increase loads to deteriorate stability of the truck.



⚠ Do not load cargo higher than the backrest.

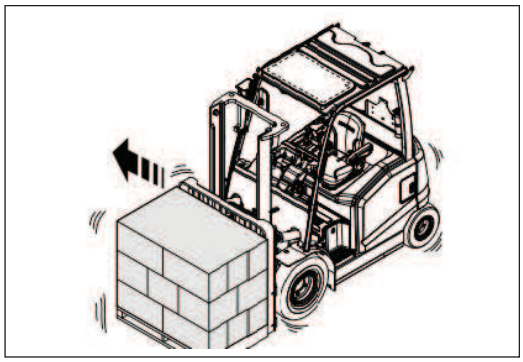


If auxiliary device such as load table is not mounted on the forks, do not operate the side shift.

Do not drive the lift truck while moving with cargo loaded on the side shift.

When moving with cargo loaded on the side shift, weight imbalance may cause fall of cargo, or tip over of the lift truck.

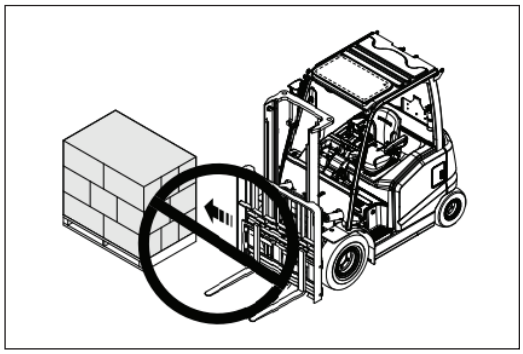
⚠ Unbalanced load may cause tip over of the lift truck.



When cargo is loaded on the side shift before driving, make sure that the side shift is kept at NEUTRAL position.

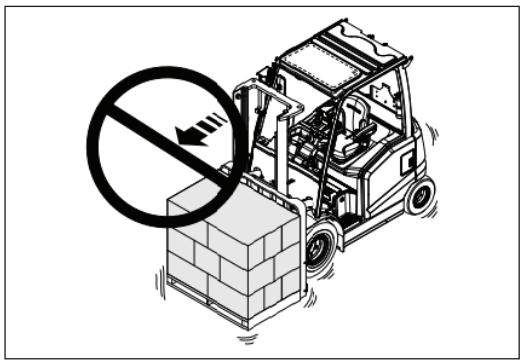
The side shift loaded with cargo should slowly be operated to prevent fall of cargo or tip over of the lift truck.

Do not move cargo by pushing or pulling it with the side shift. Cargo damage or personal injury may occur.



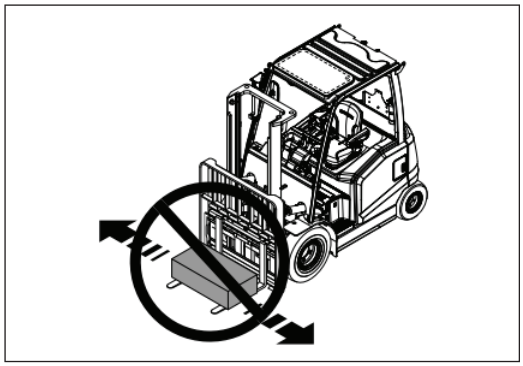
When moving the lift truck with the side shift loaded with cargo, and lifting or lowering cargo with the side shift not on NEUTRAL position, unbalanced weight may cause tip over of the lift truck.

Cargo should be kept on NEUTRAL position when loading cargo on the side shift, or ascending or descending the side shift.



Neither load cargo on the fork positioner, nor operate the folk positioner with the fork arms kept on the ground.

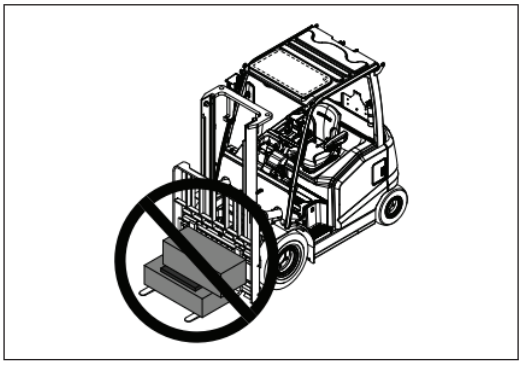
⚠ While operating the fork positioner, do not move the lever suddenly or fast. Cargo may fall.



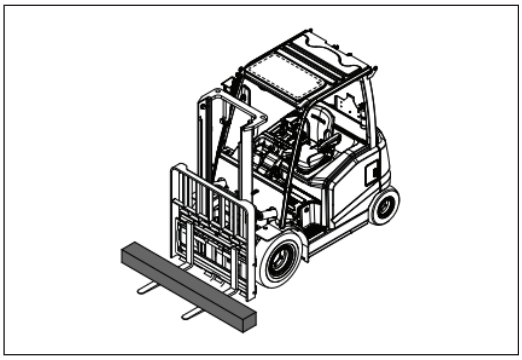
1. LOOSE LOADS

⚠ Loose or unbalanced loads are dangerous. Observe these precautions.

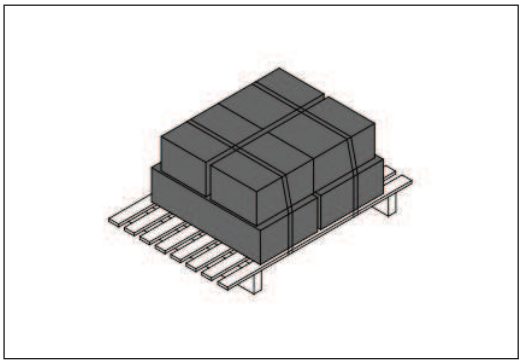
Never carry loose or uneven material.



Center wide loads.



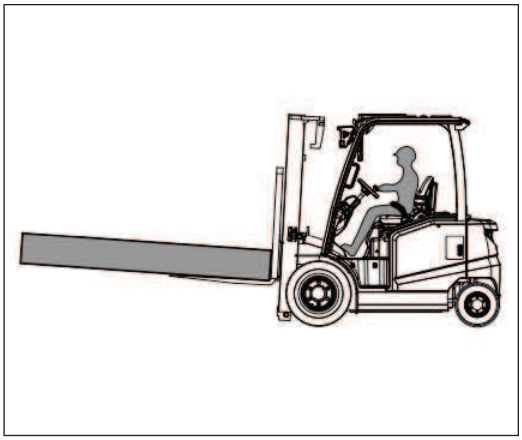
Stack and band loose material.



2. LONG AND WIDE LOADS

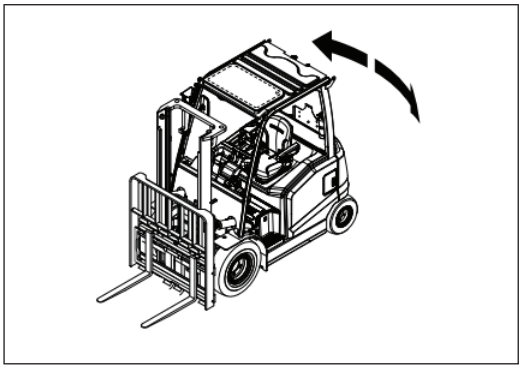
⚠ **With long or wide loads, you need more room. So slow down and watch your clearance.**
When extra-long material makes it necessary to travel with the load elevated, do so with extreme care and be alert to load end-swing when turning.

⚠ **A long load reduces the capacity of the truck. Know and understand your truck load rating.**



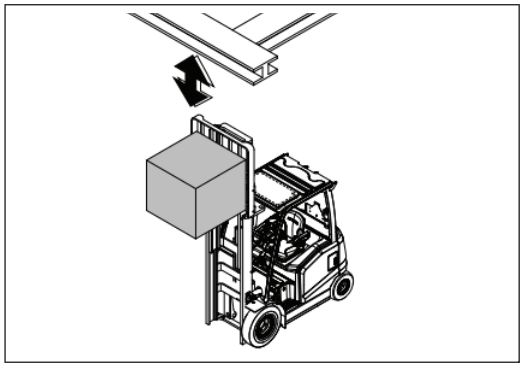
3. REAR SWING

⚠ **When turning, be sure the rear end of the truck does not swing into racks.**
Watch for pedestrians beside the truck.

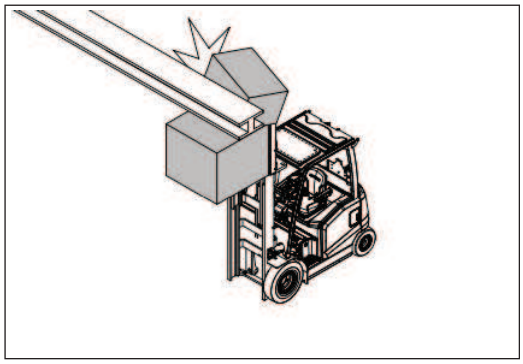


4. LOW OVERHEAD CLEARANCE

⚠ **Know the height of your truck, with and without a load. Check your clearances. Keep the load low and tilted back.**

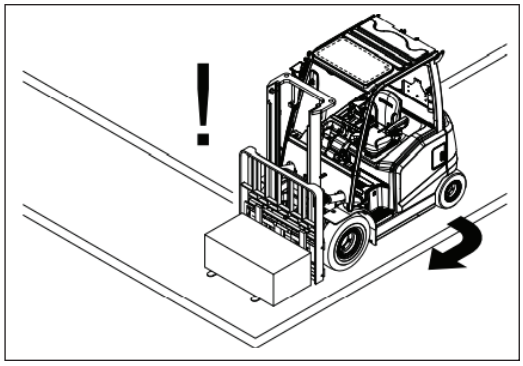


⚠ **Watch overhead clearance:**
Moving into overhead structures can tip a truck over, or spill a load.

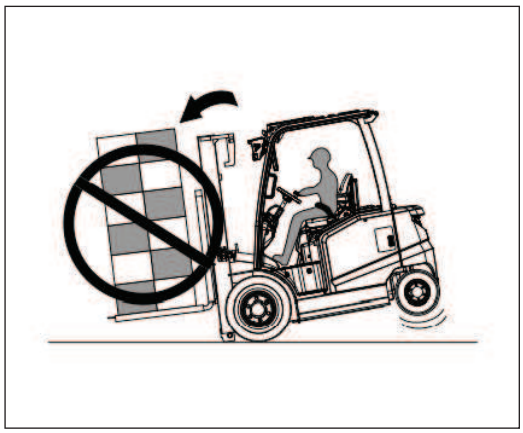


5. FAST TURNS AND HIGH LOADS

⚠ **Slow down before turning.**
The truck can tip over.



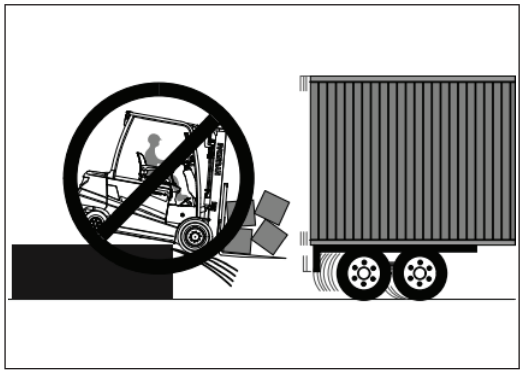
⚠ **Turn too sharp with a raised load and your truck can tip even at slow speeds. Travel with a load raised only when removing or depositing a load.**



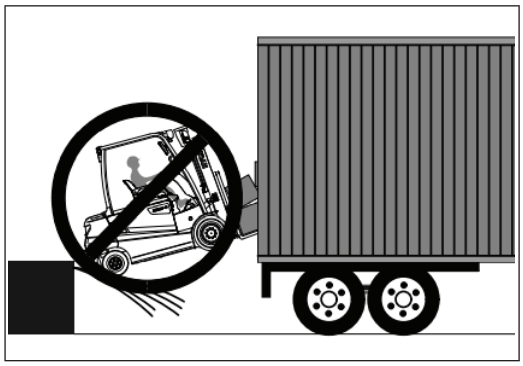
6. DROP-OFFS

⚠ **To avoid these hazards, you must:**

1. **Talk to the truck driver yourself: make sure the driver does not move the trailer until you are done.**
2. **Apply trailer brakes.**
3. **Use wheel chocks.**
4. **Use trailer-to-dock locking system if available.**

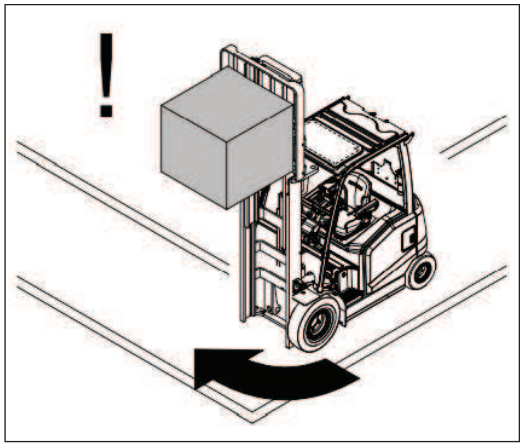


⚠ **The impact of moving in and out of a trailer may cause the trailer to creep or move.**



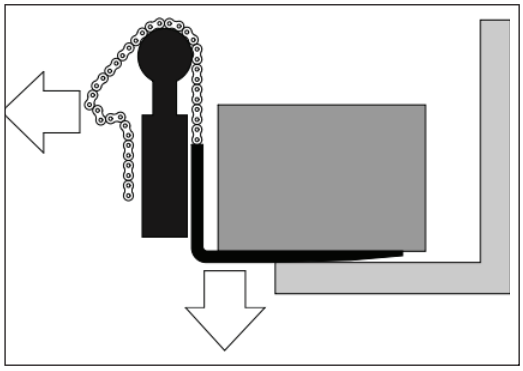
7. RIGHT ANGLE STACKING

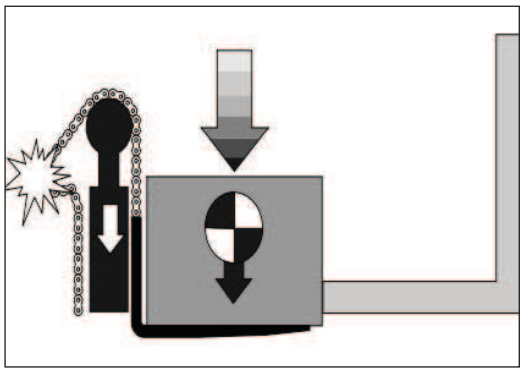
⚠ **When right angle stacking or moving with a raised load to clear low objects, avoid sharp turns and move slowly.**



8. CHAIN SLACK

⚠ **Slack chains mean rail or carriage hang-up. Raise the forks before you move, or chains might brake.**

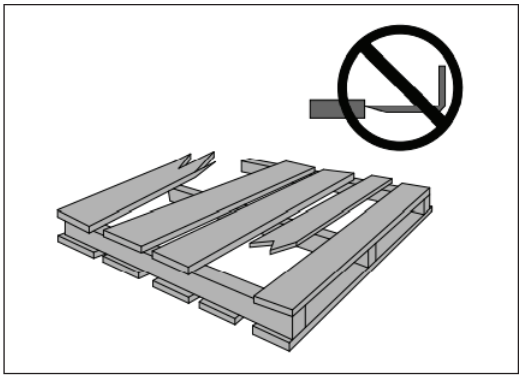




9. PALLETS AND SKIDS

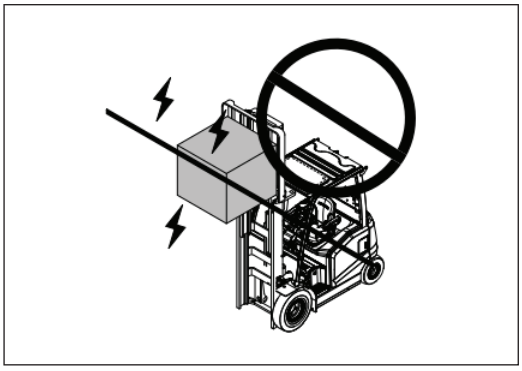
⚠ **Do not move or store materials on damaged pallets or skids. Items can fall through them causing severe injury or death.**

⚠ **Be sure the pallet or skid you are using is in good condition and does not have defective or missing components and fasteners.**



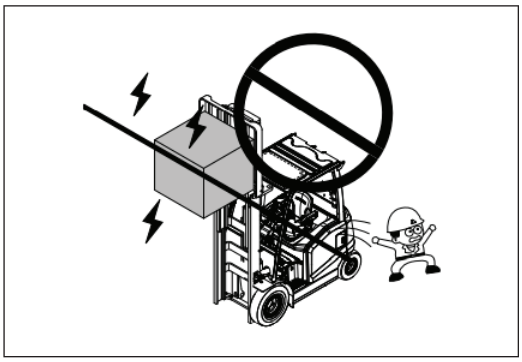
10. CAUTION FOR ELECTRICAL LINES

⚠ **When moving the truck with the mast raised, watch out electrical lines over the truck.**



⚠ **The operating near the electrical lines is very dangerous. Operate within safe working range permitted as below:**

Supply voltage	Min. safe distance
6.6 kV	3 m
33.0 kV	4 m
66.0 kV	5 m
154.0 kV	8 m
275.0 kV	10 m



⚠ **If the truck touches the electric power lines, keep sitting on the operator's seat and make sure the personnel on the ground not to touch the truck until off the electric current. Jump off the truck without contacting the truck when you need to get off.**

11. SOLID TIRE

1) Do not drive over 25 km/h.

2) Do not drive over 8 km per hour.

3) Do not drive on the road for automobile. (Example: Heat emitting for one hour after continuous driving for two hours)

⚠ The durability of the solid tire is not guaranteed with non-compliance.

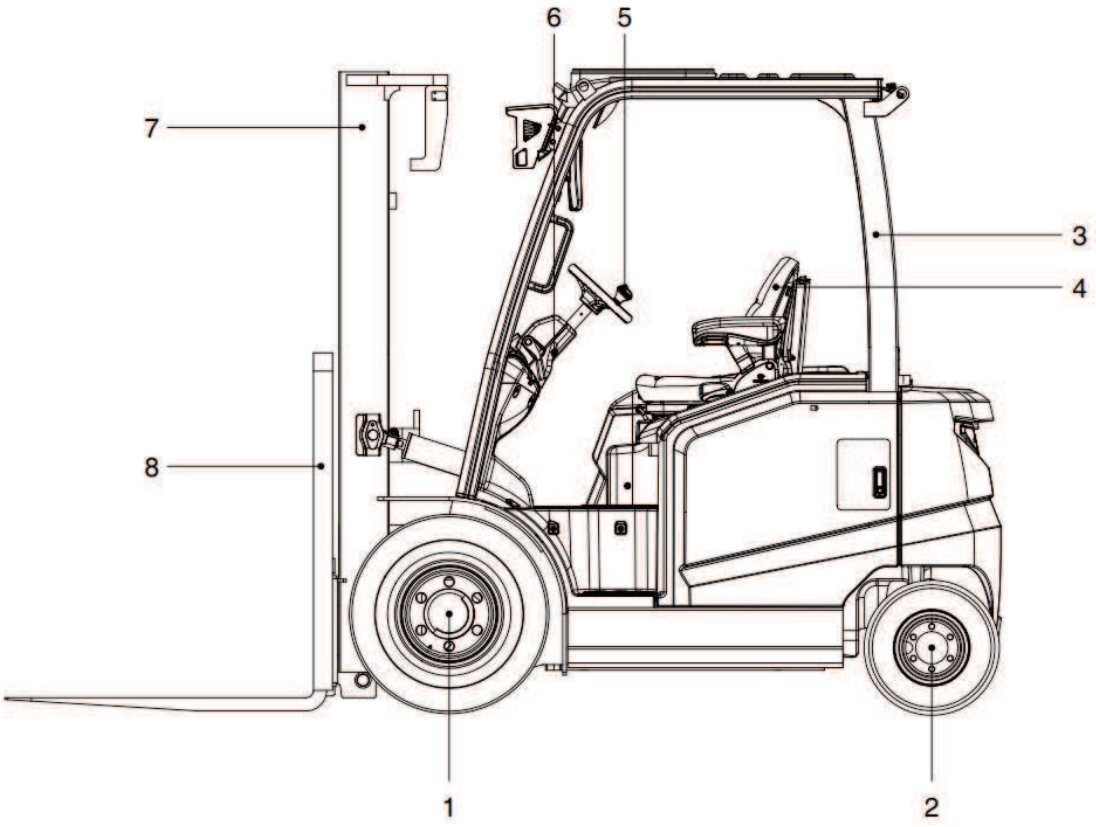
12. WEIGHT INDICATOR (OPTION)

This device prevents safety accident such as overload work or rollover. To measure the load, the drive and material handling is stopped. And mast is to be vertical and fork height is to be 300 ~ 500 mm (12 ~ 20 in).

※ **This function is not available for business dealing and certification.**

※ **This weight indicator measures the lift cylinder and converts it into weight.**

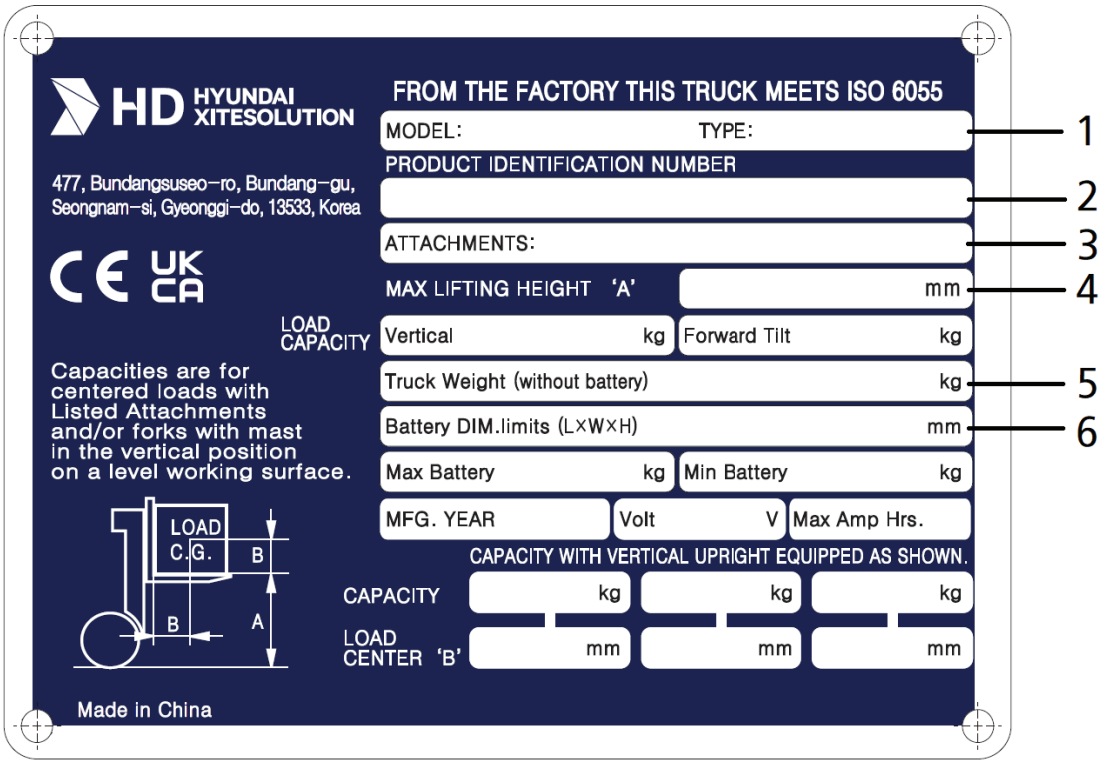
1. GENERAL LOCATIONS



1	Driving axle, tire and wheel	3	Overhead guard	6	Direction lever
2	Steering axle, tire and wheel	4	Operator's seat	7	Mast
		5	Steering wheel	8	Carriage and backrest

2. NAME PLATE

NAME PLATE OF LIFT TRUCK



1) Truck model name or number

2) Truck serial number

An identification number assigned to this particular truck and should be used when requesting information or ordering service parts for this truck from your authorized HD HYUNDAI dealer. The serial number is also stamped on the top of the right fender.

3) Attachment description (If any installed)

The user must see that the truck is marked to identify the attachment (s), including the weight of the truck/attachment combination and truck capacity with the attachment.

4) Capacity rating, load center, and lifting height data

Shows the maximum load capacity of this truck with relation to load centers and fork heights (See diagram on plate). Personal injury and damage to the truck can occur if these capacities are exceeded. Do not exceed the maximum capacity specified.

5) Truck weight

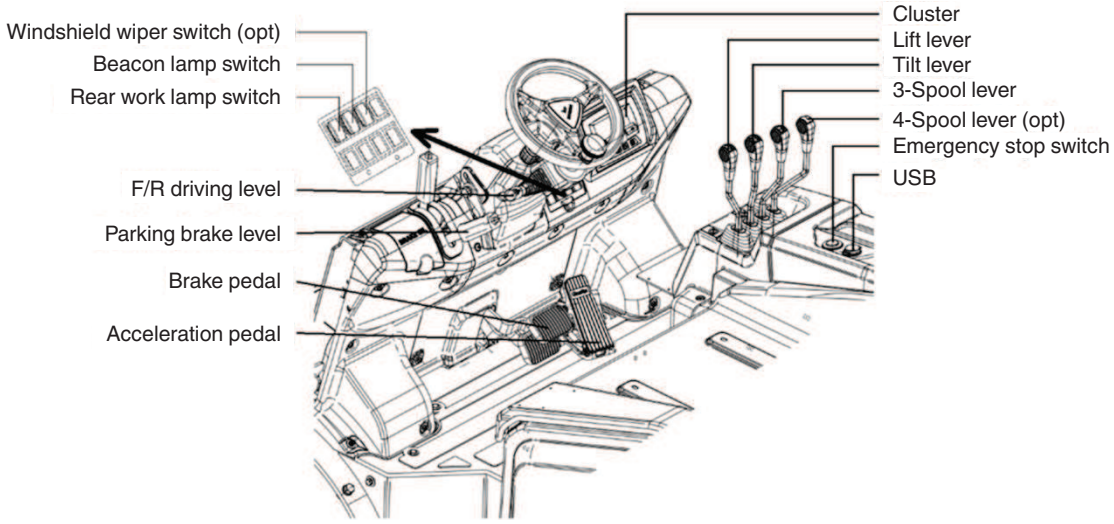
The approximate weight of the truck without a load on the forks and battery. This weight plus the weight of the load must be considered when operating on elevators, elevated floors, etc. to be sure they are safe.

6) Battery weight and system voltage

⚠ Before modifications that affect the stability of safety systems are made only after obtaining written approval from HD HYUNDAI. This is an OSHA requirement. Contact your authorized HD HYUNDAI dealer for a new nameplate showing the revised capacity.

3. CAB DEVICES

LOCATIONS AND NAMES



4. CLUSTER

1) STRUCTURE

There are 15 LED indicators (red, orange and green) on the cluster. LCD will indicate the operation and abnormal status of truck to the driver in order to use and maintenance.

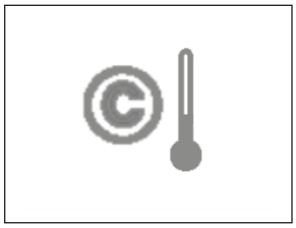
1	Battery Charging warning	9	Parking brake	19	Battery level
2	Brake Oil warning lamp	10	Seat warning lamp	20	Function menu button
3	Seat-Belt warning lamp	11	Brake lamp	21	H N E Mode switch button
4	Time	12	Overload warning	22	Turtle speed mode button
5	H/N/E working mode	13	Weighing	23	Confirm button
6	Controller high-temperature warning lamp	14	Vehicle speed	24	Lithium Battery heating indicator
7	Fault warning	15	F N R Indicate		
8	Motor high-temperature warning lamp	16	Hour-meter		
		17	Fault code		
		18	Turtle speed		

2) WARNING LAMP

(1) **Motor high-temperature warning lamp**

Lights up when temperature of motor is more than the limit.

(2) **Controller high-temperature warning lamp**

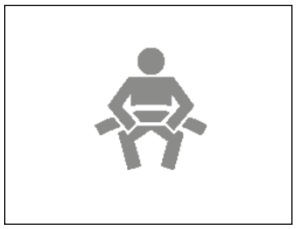


Lights up when temperature of controller is more than the limit.

(3) **Seat warning lamp**

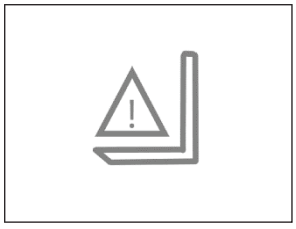
Lights up when operator leaves the seat.
(During driving, the vehicle stops after the operator leaves the seat for 2 seconds)

(4) **Seat belt warning lamp**



Lights up when operator does not wear the seat belt.
(The vehicle can't move)

(5) **Overload warning lamp (OPT)**



Light up when the cargo exceeds 20% of the rated load.

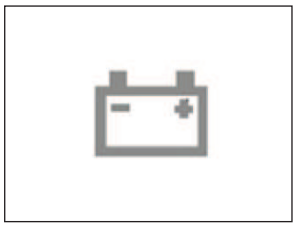
(6) **Alarm warning lamp**

Lights up for error warnings.

(7) **Brake oil warning lamp**

Lights up when brake oil level is low.

(8) **Battery charging warning lamp**



Lights up when battery charging voltage is low.

3) INDICATOR LAMP

(1) **H power mode indicator lamp**

Lights up when Power Mod is High.

(2) **N power mode indicator lamp**

Lights up when Power Mod is Normal.

(3) **E power mode indicator lamp**

Lights up when Power Mod is Eco.

(4) **Forward driving indicator lamp**

Lights up when truck drives forward.

(5) **Parking brake indicator lamp**

Lights up when parking brake is applied.

(6) **Reverse driving indicator lamp**

Lights up when truck drives reverse.

(7) **Brake pedal indicator light**

Light up when the brake pedal is pressed.

4) BUTTONS

(1) **Confirm button**

① On the main work interface, this key is the mute key.

② On the menu interface, this key is the confirmation key.

(2) **Menu button**

① On the main work interface, this key is a menu key

② On the menu interface, this key is the menu return key

(3) **Up/power mode button**

① Press when moving to menus on the left or the top.

② Press when switching between power modes (H/N/E).

(4) **Move down/speed mode button**

① Press when moving to menus on the right or the bottom.

② Press when switching between speed modes (turtle).

5) Matters needing attention in power mode and turtle speed mode

The instrument has three power modes: H/N/E

The instrument has two walking modes: normal speed/turtle speed

Category	Mode			
Driving speed	H	N	E	Turtle
	100%	80%	60%	33%
Lifting speed	H	N	E	
	100%	80%	70%	

Operating instructions:

(1) When it is currently in H mode, press ▲ key that H mode changes to E mode (driving speed and speed all enter E mode); Press ▲ key again to change E mode into N mode (driving speed and speed all enter N mode); Press ▲ key again to change the N mode into H mode (driving speed and speed all enter H mode).

(2) The three power modes of H/N/E can only be switched when the vehicle speed is 0km/h and five seconds after releasing the brake pedal; Press ▲ while the vehicle is running, and the power mode will not be switched, When the vehicle stops at a speed of 0km/h and five seconds after releasing the brake pedal, the power mode will be automatically switched.

(3) (For example: In H mode, when the vehicle presses ▲ key during driving, the vehicle still runs in H mode, When the vehicle stops and travels at a speed of 0km/h and five seconds after releasing the brake pedal, the H mode on the instrument will automatically change to the E mode at this time, the vehicle enters the E mode)

(4) Press ▼ key on the instrument will display the turtle icon at this time the vehicle speed will enter the turtle speed mode; Press ▼ key again and the turtle icon on the instrument disappears. The driving speed of the vehicle will enter the normal mode. Driving speed is based on the H/N/E mode speed displayed by the current instrument. Turtle speed mode can only be switched when the vehicle stops and five seconds after releasing the brake pedal.

6) Instrument startup interface

After the combination instrument of DZB916-XDZG forklift is powered on, the buzzer emits a "drip" self-inspection. The LCD screen displays the boot screen of modern heavy industry LOGO. The combination instrument panel of DZB916-XDZG forklift truck is composed of a 4.3 inches color LCD screen+4 multi-function keys.

The color LCD screen is used to display the fault code and switch status information of the vehicle speed, electric SOC, load weight, gantry tilt angle, rear wheel steering angle, hour meter, RTC clock, traveling motor controller, pump motor controller, BMS, etc. The instrument has three display languages, Chinese, English and Korean, and multi-level menu operation.

7) Main work interface

The power-on interface shown in Figure 1 displays for 3 seconds, and the LCD displays the main working interface.

When the instrument is powered on for the first time to display the main working interface, the alarm indicators on the main working interface, such as brake failure, maintenance indication, high motor temperature, high electric control system temperature, seat indication, seat belt indication, hand brake, low battery power alarm, slow speed indication, current F/N/R gear, H/N/E working mode indication, overload alarm, etc., are all lit for self-inspection.

The self-inspection ends in 2 seconds, and the speedometer, electricity meter, alarm and status indication are displayed according to the real-time status signal.

Speedometer

The speedometer shows the current speed of the forklift in km/h.

The vehicle speed signal is sampled by the controller.

The controller sends it to the instrument for display via CAN bus.

Percentage of electricity (SOC)

The electricity meter (SOC) displays the current percentage of remaining battery power.

The power is sampled by BMS controller.

The controller sends it to the instrument for display via CAN bus.

Wheel steering angle

The rear wheel steering angle signal comes from the controller. The display range is -90 degrees to 0 degrees to 90 degrees. The rear wheel angle function can be turned on or off by entering the [Rear wheel angle function] interface in the [Function setting] menu

8) Instrument menu

(1) System status interface

After enter menu interface, select “system status” and press enter button.

(2) Running parameters interface

After enter menu interface, select “Running parameters” and press enter button.

When using lithium battery, 6, 7, 8, 9 will show data.

(3) Display settings interface

After enter menu interface, select “display settings” and press enter button.

In the display setting interface, the brightness of the LCD screen, time and language can be set. There are three languages, Chinese, English and Korean.

(4) Weight calibration interface

The load weight signal comes from the sensor, and directly connected to cluster. In order to improve the weighing accuracy, the weighing sensor will be calibrated in the process of truck debugging.

Calibration of weight sensor

- Enter fork weight
- Enter load weight
- Confirm parameter

After enter menu interface, select “Weight calibration” and press enter button to start calibrating of weight sensor.

(5) Function settings

After enter menu interface, select “function setting” and press enter button.

OPS setting

After enter function setting interface, select “OPS setting” and press enter button.

This number means duration of alarm.

※ **Alarm when: Parking system is not working and operator is not on the seat whatever power on or off.**

Gantry Tilt Angle

This function is not currently implemented.

Weighing display (OPT)

After enter function setting interface, select “Weighing display” and press enter button.

Wheels Steering Angle

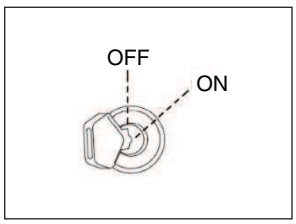
This function is not currently implemented.

Hourly meter management

After enter function setting interface, select “Hourly meter management” and press enter button. It will be used after truck debugging in factory only. Then hourly meter works normally.

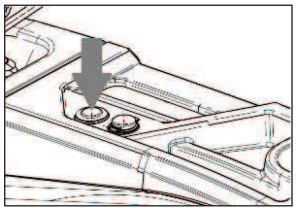
5. SWITCHES AND LEVERS

1) START SWITCH



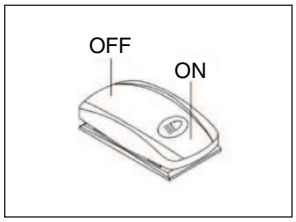
The switch supplies power to control circuit, and operates in sequence of OFF → ON clockwise.
OFF: Power off
ON: Power ON and truck got ready for operation

2) EMERGENCY STOP SWITCH



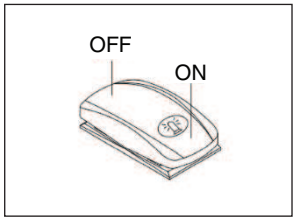
Press down the emergency stop switch which will interrupt electric circuits, and all of functions are disabled. When the truck is not for extended period of time, store the truck with the switch pressed. Press the emergency switch when charging the battery. When operating the truck after charging, release the switch, and then press Start switch 5 seconds later.

3) REAR WORK LAMP SWITCH



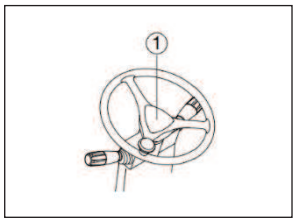
Press the switch to turn the rear work lamp on.

4) BEACON LAMP SWITCH



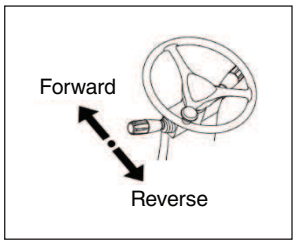
Press the switch to turn the beacon lamp on.

5) HORN SWITCH



The horn sounds when the button (①) is pressed.

6) FORWARD AND REVERSE DRIVING LEVER

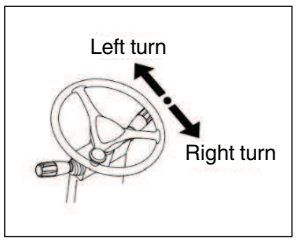


(1) The lever switches driving direction to forward or reverse. Push the lever forward to driving the truck in forward direction.

(2) When the lever is on neutral position, control switch is turned off.

(3) Pull the lever backward to driving the truck in reverse direction.

7) LEFT- AND RIGHT-TURN LEVER

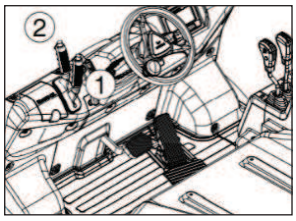


(1) Pressing the switch blinks flash lamp to indicate turning direction; left or right.

(2) Pull the lever backward to turn right.

(3) Push the lever forward to turn left.

8) PARKING BRAKE LEVER

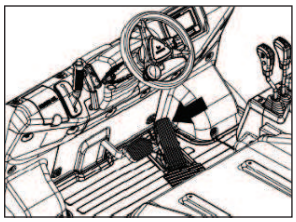


(1) Parking brake applied (front wheel fixed)

(2) Parking brake released

※ **Before moving the truck be sure the parking brake lever is released.**

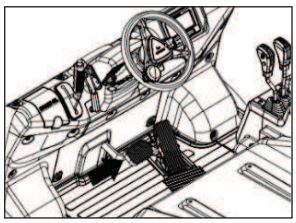
9) ACCELERATION PEDAL



(1) This pedal controls the engine speed.

(2) When turning the lever in the opposite direction while driving, electric brake applies. When pressing further the pedal, the truck stops, and then drives in the opposite direction.

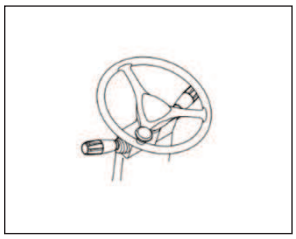
10) BRAKE PEDAL



Pressing the pedal stops the truck, and brake lamp on the rear side lights up.

⚠ **Pay special attention to operating the brake when moving cargo.**

11) STEERING WHEEL



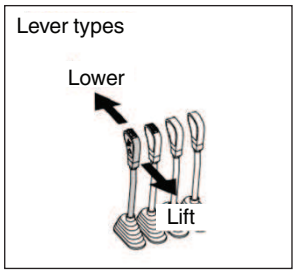
(1) A knob is mounted on the wheel for handling the steering wheel with a hand.

(2) It is allowed to perform unloading work with the right hand, and handle the steering wheel with the left hand.

(3) It is possible to enhance driving convenience by adjust the steering column.

⚠ Rapid handling of the steering wheel may cause risky situation.

12) LIFT LEVER

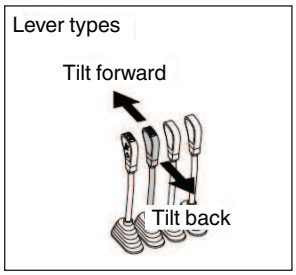


(1) Lift
Pulling the lever backward ascends the folks.

(2) Lower
Pushing the lever forward descends the folks.

(3) Hold
Releasing the lever (fingertip) when forks are lifted (or lowered) to desired position holds the forks at the position.

13) TILT LEVER

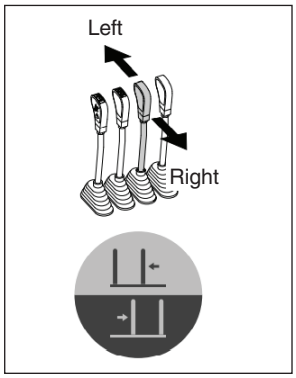


(1) Tilt forward
Pushing the lever (fingertip) forward tilts the mast forward.

(2) Tilt back
Pulling the lever (fingertip) backward tilts the mast backward.

(3) Hold
Releasing the lever (fingertip) stops movement of the mast.

14) LEVER FOR SIDE SHIFT

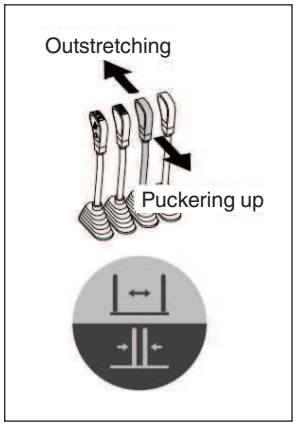


(1) LH movement
Push the lever forward to move the carriage left.

(2) RH movement
Pull the lever backward to move the carriage right.

15) LEVER FOR SIDE SHIFT WITH FORK POSITIONER

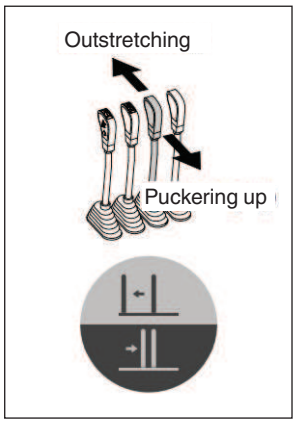
(1) **Fork positioner (synchronizer type)**



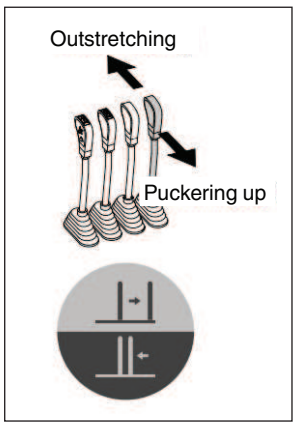
① Outstretching the forks
Push the lever forward to outstretch both forks simultaneously outward.

② Puckering up the forks
Pull the lever backward to pucker up both forks simultaneously inward.

(2) **Fork positioner (independent type)**

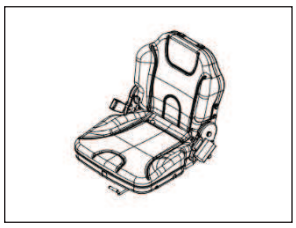


① LH fork movement
Push the lever forward to move the LH fork outward.
Pull the lever backward to move the LH fork inward.



② RH fork movement
Push the lever forward to move the RH fork outward.
Pull the lever backward to move the RH fork inward.

16) SEAT SWITCH



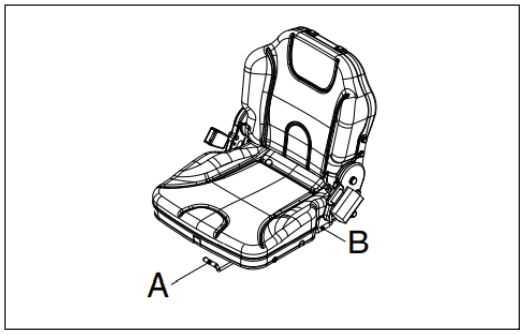
The switch is automatically turned on when operator sits on seat.

⚠ **The truck starts only when the seat switch is turned on.**

6. OPERATOR'S SEAT ADJUSTMENT

It is allowed to adjust operator's seat adequate for body of operator to reduce fatigue during driving, and enhance work efficiency.

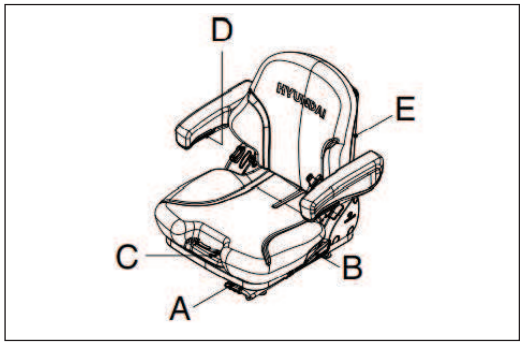
1) OPERATOR'S SEAT



(1) Front/rear adjustment (A)
- Pull Lever A to adjust the seat back and forth.
- It is allowed to adjust forth up to 72 mm, and back up to 84 mm (stroke: 156 mm).

(2) Backrest adjustment (B)
Pull Lever B to adjust the angle of backrest.

2) OPERATOR'S SEAT (GRAMMER, OPT)



(1) Front/rear adjustment (A)
- Pull Lever A to adjust the seat back and forth.
- It is allowed to adjust forth up to 120 mm, and back up to 90 mm (stroke: 210 mm).

(2) Backrest adjustment (B)
Pull Lever B to adjust the angle of backrest.

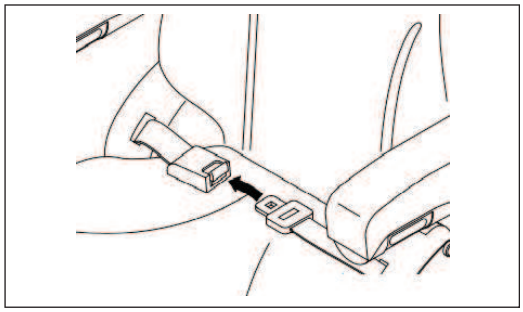
(3) Weight adjustment (C)
Turn Screw C with socket wrenches without sitting on the seat to adjust weight.

(4) Armrest adjustment (D)
Rotate Adjustment Knob D to adjust the angle.

(5) Heater switch (E, opt)
Heater is turned on and off with the switch.

3) SEAT BELT

Never forget wearing the seat belt before starting the truck. Adjust tension of the seat belt before wearing it.



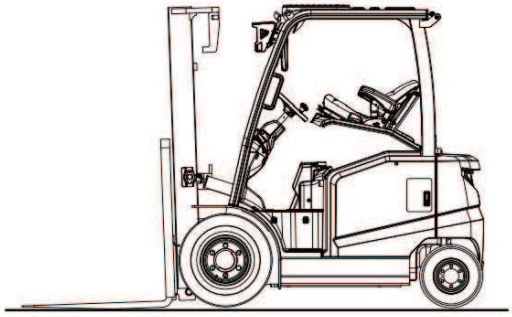
- ⚠ **Always wear the seat belt before driving the truck to prevent safety accident.**
- ⚠ **Failing in wearing the seat belt may cause personal injury in accident.**
- ⚠ **Check the seat belt for any abnormal conditions before starting the truck.**
- ⚠ **Replace the seat belt every three years even if there are no apparent defects on the belt.**

7. BATTERY COVER

Hold the handle on the top of the battery cover to lift the cover for inspecting and servicing the battery.

※ **Fix the steering column forward before opening the battery cover.**

※ **Pull the handle of the latch or press the button on the handle of the battery cover to open the cover. Opening and closing the battery cover is made with gas spring. Lifted cover is kept at the position.**



1. SAFETY INSPECTION

Before using a lift truck, it is **the operator's responsibility** to check its condition and be sure it is safe to operate.
Check for damage and maintenance problems; have repairs made before you operate the truck. Unusual noises or problems must be reported immediately to your supervisor or other designated authority.
Do not make repairs yourself unless you are trained in lift truck repair procedures and authorized by your employer. Have a qualified mechanic make repairs using genuine HD HYUNDAI or HD HYUNDAI- approved parts.

⚠ **Do not operate a truck if it needs to be repaired. If it is in an unsafe condition, remove the key and report the condition to the proper authority If the truck becomes unsafe in any way while you are operating it, stop operating the truck, report the problem immediately, and have it corrected.**
Lift trucks should be inspected every eight hours, or at the start of each shift. In general, the daily inspection should include the visual and functional checks described on the followings.

⚠ **Leaking hydraulic oil may be hot or under pressure. When inspecting a lift truck, wear safety glasses and do not check for leaks with bare hands.**

2. VISUAL CHECKS

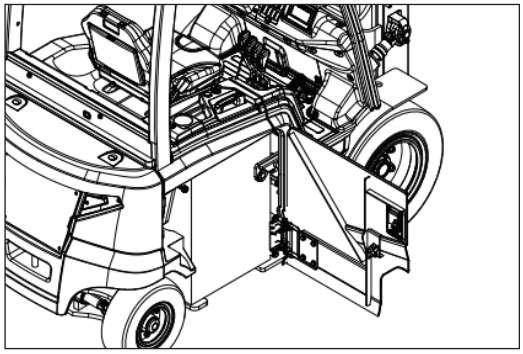
※ **First, perform a visual inspection of the truck and its major components;**

1) **Walk around your lift truck and take note of obvious damage that may have been caused by operation during the last shift.**

2) **Check that all capacity, safety, and warning plates or decals are attached and legible.**

3) **Make sure that battery is safely mounted on correct position. Check battery fastening devices for correct installation for preventing movement or tip over of battery. Check the battery connector for safety.**

   ⚠ **Check surroundings of driving axle for any external oil leak.**



4) **Check for hydraulic oil leaks and loose fittings.**

   ⚠ **Oil may be hot or under pressure. Do not use bare hands to check.**

5) **Be sure that the driver's overhead guard, load back rest and all other safety devices are in place, securely fastened and undamaged.**

6) **Check all of the critical components that handle or carry the load.**

7) **Look the mast and lift chains over.**
   Check for obvious wear and maintenance problems such as damaged or missing parts, leaks, slack or broken chains, rust, corrosion, bent parts, cracks, etc.

8) **Carefully inspect the load forks for cracks, breaks, bending, twists, and wear. Be sure that the forks are correctly installed and locked in their proper position.**

9) **Inspect the wheels and tires for safe mounting, wear condition, and air pressure.**

10) **Check the hydraulic sump oil level, engine oil level, and fuel level.**

3. FUNCTIONAL CHECKS

Check the operation of the truck as follows.

※ **Before performing these checks, familiarize yourself with the starting and operating procedures in Section 5 of this manual.**

1) Test warning devices, horn, light, and other safety equipment and accessories.

2) Check self-diagnosis display, operation time indicator lamp, and remainder battery capacity indicator lamp with the truck started (dependent upon types of lift truck). Self-diagnosis display should indicate remainder capacity of battery, or failure code. If failure code is not an operator's failure code, contact service engineer.

3) Check all of control devices and systems for normal operation, and returning to neutral positions:

(1) Service brake, parking brake

(2) Hydraulic pressure regulator: Lift, tilt and auxiliary system (if mounted)

(3) Acceleration pedal

(4) Forward and reverse driving device

(5) Steering systems

(6) Lift mechanism and any attachments

- **Action after inspection**

  (1) Fully stop the lift truck.

  (2) Return the forward and reverse levers to the neutral position.

  (3) Apply the parking brake.

  (4) Fully lower the attachment.

  (5) Turn the start switch to OFF position.

- **Action on stopped lift truck**

  (1) Remove the key from the starting switch.

  (2) Lift truck may move on slope. Fix the wheels with base blocks.

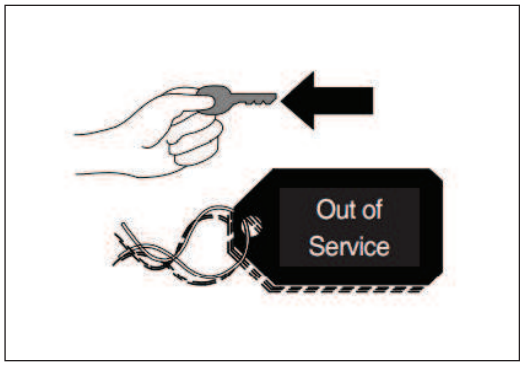
4. CONCLUDING THE INSPECTION

Record all of inspection results or detected troubles, if any, on the operator's daily checklist, and provide the checklist to the maintenance engineers. Any abnormal noise or trouble should immediately be inspected.

Do not operate a lift truck that has a maintenance problem or is not safe to operate.

Instead, remove the key from the starting switch and put an Out of Service tag on the truck.

If all of the daily inspection checks were normal or satisfactory, the truck can be operated.



STARTING AND OPERATING PROCEDURES

1. BEFORE OPERATING THE TRUCK

Be sure that you have read and understand the information in this Operator's Manual and are trained and authorized before operating the lift truck.

⚠ **A lift truck can be dangerous if not used properly. Safe operation is the responsibility of the operator.**

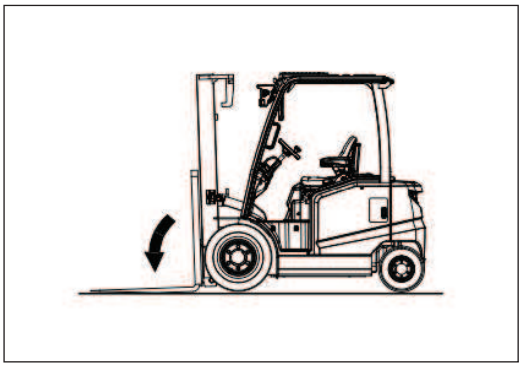
⚠ **Do not start or operate the truck, or any of its functions or attachments, from any place other than the designated operator's position.**

⚠ **Inspect your lift truck before operating at the start of each shift. Before putting your truck to operating, check the operation of the controls and all systems.**

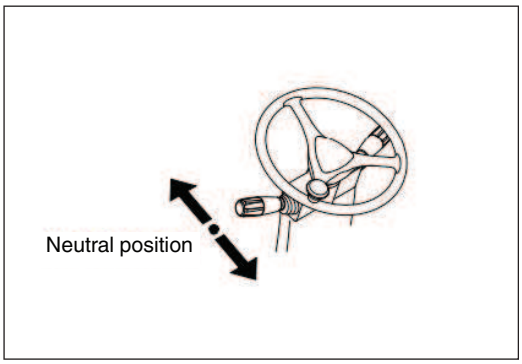
⚠ **Protect yourself. Do not operate truck without a DRIVER'S OVERHEAD GUARD unless conditions prevent its use. Do not remove overhead guard unless specifically authorized. Use special care if operation without this safety device is required.**

2. STARTING FROM A SAFE CONDITION

Always start from a safe condition. Before operating a lift truck, make sure that:



1) **The parking brake is applied.**
2) **The forks are fully lowered to the floor or ground.**
3) **You are familiar with how all the controls function.**



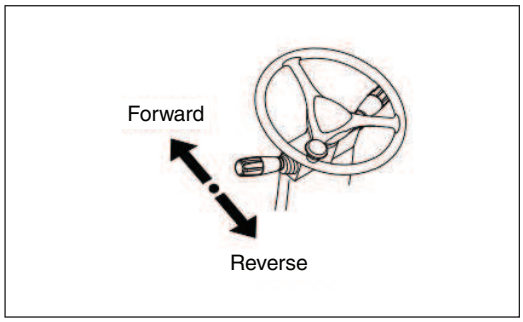
4) **All controls are in neutral or other correct position.**
5) **The truck has received its daily inspection and ready and safe to operate.**
   Put the gear selector lever in the NEUTRAL position, before starting. The truck should start only in the NEUTRAL position.

3. BEFORE OPERATING THE TRUCK

Check the aforementioned requirements, and make sure that the forward and reverse levers are on NEUTRAL position before operating the truck. Operator should sit on the operator's seat before operating the truck. Release the emergency stop switch, and turn the starting switch clockwise 5 seconds later to ON position before starting the lift truck.

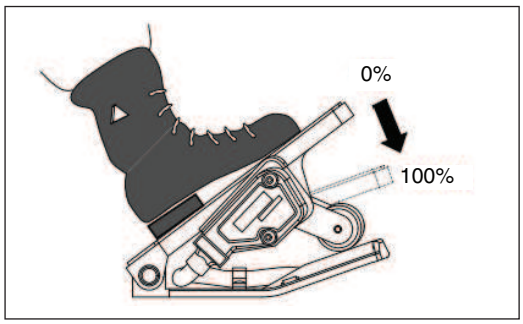
1) TRAVELING

(1) Push (or pull) the forward and the reverse lever, and then gradually press the accelerator pedal.



(2) Press the pedal to start motor. Then the truck moves forward (or backward).

(3) Speed is changed in scope of min. and max. speed dependent upon force pressing the pedal.



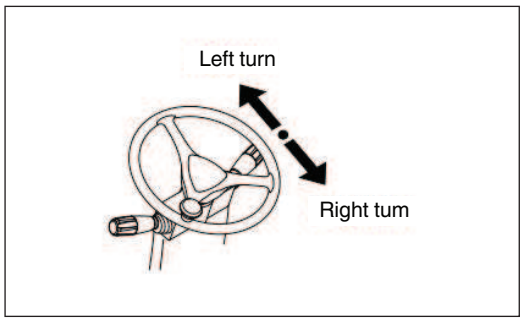
2) CHANGING TRAVEL DIRECTION

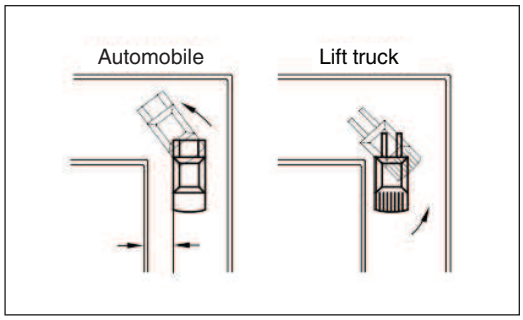
(1) Hold the steering wheel or the knob on the wheel with the left hand, and turn travel direction.

(2) Direction of lift truck is changed with the rear wheels.

(3) Therefore, the truck turns inward during forward driving, and outward during reverse driving.

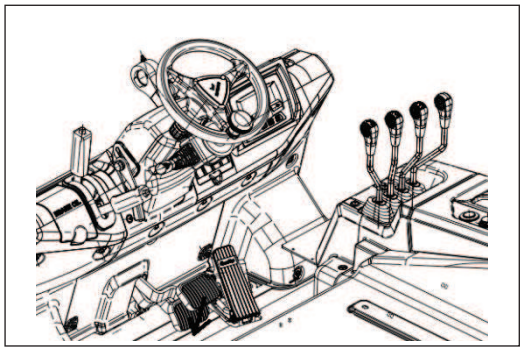
(4) Care should be exercised to prevent collision of the counterweight with other object when turning direction.



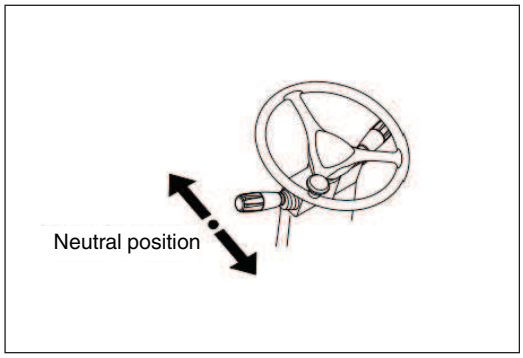


3) STOP AND PARKING

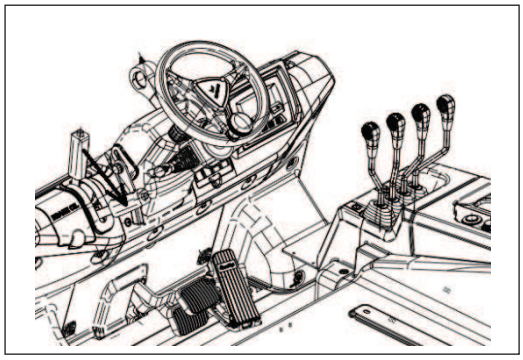
(1) Release the accelerator pedal to reduce speed, and apply brake to stop the truck.



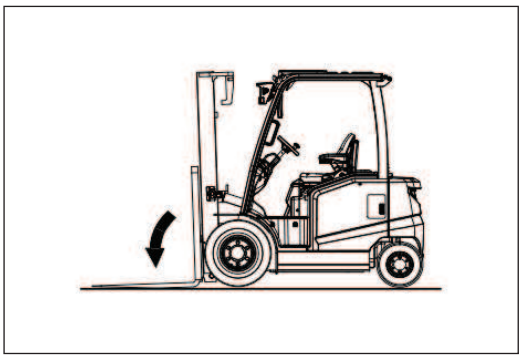
(2) Return the forward and the reverse levers to Neutral position when parking the truck.



(3) Fully pull the parking brake.



(4) Fully lower, and slightly incline mast forward.



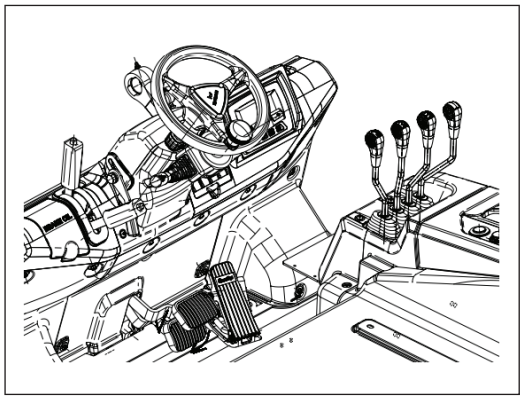
4. SPEED ADJUSTMENT

Position the forward or the reverse level on the forward or the reverse point, and gradually press the accelerator pedal until you achieve required speed.

5. BRAKE OPERATION

Release the accelerator pedal, and then press the brake pedal to stop the truck. Gradually and solidly press the brake pedal until the forklift stops.

⚠ **Stop the truck as slowly as possible. If the truck skips by sudden stop, risky situation may take place, abrasion increases, or cargo fall or the truck tips over.**



6. PLUGGING

1) It is allowed to change direction by making use of plugging without applying the brake. When operating the forward or the reverse lever in the opposite direction during travel, the truck slowly stops, and then starts driving in the opposite direction.

2) It is possible to adjust distance of change of direction with the accelerator pedal.
The harder you press the pedal, the smaller the distance of direction change is reduced.

⚠ **Sudden change of direction may cause movement of fall of cargo. Plugging function should be used with great care, accordingly.**

7. OPERATING SAFELY

Safe operation is the responsibility of the operator.

1) WATCHWHERE YOU ARE GOING. DON'T GO IF YOU CAN'T SEE.

(1) Before driving, check all around to be sure that your intended path of travel is clear of obstructions and pedestrians.

⚠ **LOOK WHERE YOU DRIVE. Watch out for pedestrians, other vehicles, obstructions (especially overhead), and drop-offs. If the load blocks your view, drive backwards, except up slopes.**

(2) Do not allow anyone to stand or pass under the load or raised forks.
Watch for people in your work area even if your truck has warning lights or alarms. They may not watch for you. Perform work with safety of person as the top priority at workplace.

(3) Sound horn at intersections and wherever vision is obstructed. Do not drive a truck up to anyone standing in front of an object.

2) PROTECT YOURSELF AND THOSE AROUND YOU

Operate the truck only from the designated operator's position. Stay within the confines of the lift truck profile dimensions. Keep all body parts inside the operator's compartment and away from the danger of passing obstructions. Keep yourself under the overhead guard while operating.

※ **An overhead guard and personal protection gadgets are intended to offer protection to the operator from falling objects, or other risk factors. But overhead guard cannot protect against every possible impact. Therefore, it should not be considered a substitute for good judgment and care in loading, handling, storage, etc.**

⚠ **Keep clean of the mast and lift mechanism. NEVER reach into or put hands, arms, legs, or head near the carriage or lift chains, or into or through the mast structure. Never put any part of your body between the mast and the truck.**

Don't use the mast as a ladder. Keep all other persons clear of the load and mast mechanism while attempting to handle a load.

3) NO RIDERS

Do not carry passengers. The operator is the only one who should be on the truck.

4) ALWAYS BE IN FULL CONTROL OF YOUR LIFT TRUCK

(1) Never operate a lift truck or its attachments if you are not in the designated operator's position.

(2) Never operate a lift truck when your hands and feet are wet or greasy.

(3) Always pick the smoothest travel route for your lift truck. Avoid loose objects or obstacles in your path that may cause the truck to swerve or tip. If these conditions are unavoidable, slow down and carefully drive past them. Slow down for wet or slippery surfaces.

(4) Avoid any sudden movement. It can cause the truck to tip-over. Start, stop, travel, steer, and brake smoothly.

(5) Operate your lift truck under all conditions at a speed that will permit it to be brought safely to a stop.

(6) Travel with the fork carriage tilted back and raised only enough to fully clear the ground or obstacles. In such a case, the fork carriage should fully be inclined backward. When the carriage (load) is in an elevated position the stability of the truck is reduced.

(7) Do not elevate the load except during stacking.

5) GRADES, RAMPS, AND INCLINES

(1) Use special care when operating on ramps, inclines, and uneven areas. Travel slowly. Travel straight up and down. Do not turn or drive at an angle across an incline or ramp. Do not attempt to operate on grades in excess of those specified and/or recommended by the manufacturer.

(2) When the truck is loaded, travel with the load upward. When the truck is empty, travel with lifting mechanism (mast) downward.

(3) Always brake with the right foot pedal (Not with the inching pedal) when traveling down incline.

6) PRACTICE SAFE OPERATION EVERY TIME YOU USE YOUR TRUCK

(1) Careful driving and operation is your responsibility. Be completely familiar with all the safe driving and load handling techniques in this Operator's Manual. Use common sense. Drive carefully; do not indulge in stunt driving or horseplay. Observe traffic rules. Watch for people and hazards. Slow down, be in full control of your lift truck at all times.

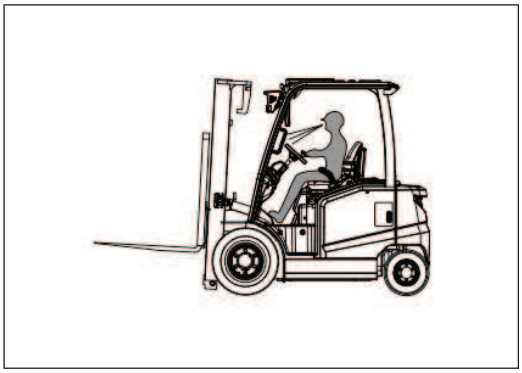
(2) Follow the instructions in this manual to avoid damage to your truck or the possibility of injury to yourself of others.

(3) During your work, observe all functions of your lift truck. This allows you to immediately recognize a problem or irregularity that could affect the safe operation of your truck.

(4) Periodically check the gauges and warning indicator lights in the cluster to be sure they indicate a normal condition. If an abnormal condition appears bring the truck to a safe condition and safe location, shut off the starting switch immediately and report the problem.

⚠ Do not continue to operate a truck that has a malfunction. Stop and have it fixed.

⚠ Always wear your seat belt when operating your truck.



8. LOAD HANDLING

1) GENERAL

Handle only loads that are within the truck rated capacity as shown on the nameplate. This rating specifies the maximum load that should be lifted. However, other factors such as special load handling attachments, load having a high center of gravity, or uneven terrain may dictate that the safe working load be less than the rated capacity. Under these conditions, the operator must reduce the load carried so that the lift truck remains stable.

Handle only stable or safely arranged loads. Do not handle loads made up of loose, unevenly stacked, or unstable items that can easily shift and fall. Take the time to stack correctly and handle loose items. Center the load on the forks.

Do not lift anything that might fall on the operator or a bystander. Do not handle loads that are higher than the fork carriage unless the load is secured so that no part of it can fall backward. Avoid such work.

Keep the load back against the load backrest. Loads placed out on the ends of the forks can make the lift truck less stable and more likely to tip up.

Lift and lower with the mast vertical or tilted slightly back. Never tilt it forward.

Operate lift and tilt controls slowly and smoothly. Never tilt the mast forward when the carriage (load) is raised, except to pick up or deposit a load over a rack or stack.

⚠ **Slack chains mean rail or carriage hang-up. Raise the mast before you move. If the mast malfunctions in any way or becomes stuck in a raised position, operate the lift control to eliminate any slack chains by raising the carriage. DO NOT go under a raised mast or forks to attempt repairs. DO NOT climb the mast or the truck.**

Remember your truck is designed to carry loads forward of the front wheels so that the weight of the load is counterbalanced by the weight of the truck.

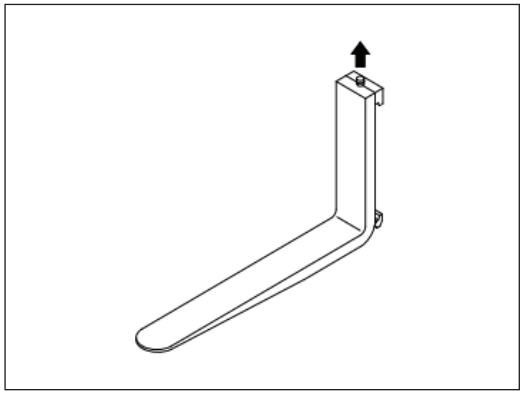
The farther the load is carried from the pivot point (Center of front wheels), the less the weight on the steer wheels (rear wheels). Therefore, always carry the load as close to the front wheels as possible (Back and flush against the face of the forks).

The capacity load shown on the nameplate is represented by a cube in weight is evenly distributed, with the center of gravity located a standard distance from the face of the forks. If the weight of the actual load to be handled is not evenly distributed, put the heaviest part closest to the carriage.

2) ADJUSTING THE LOAD FORKS

The load forks are adjustable on the hanger or the carriage. Forks should be spaced as far apart as the load will allow. Both forks should always be the same distance from the center of the fork carriage for ensure stability.

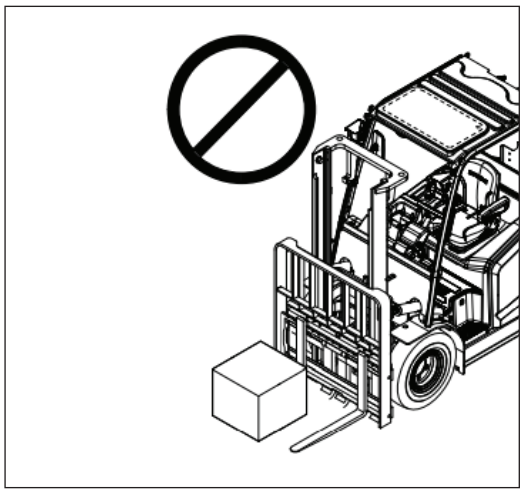
To adjust the forks, raise the carriage slightly, and tilt the mast fully forward to reduce friction and make the fork slide easier. Then, unlock the fork locking pins. Position the forks by pushing them away from you. Secure the fork locking pins.



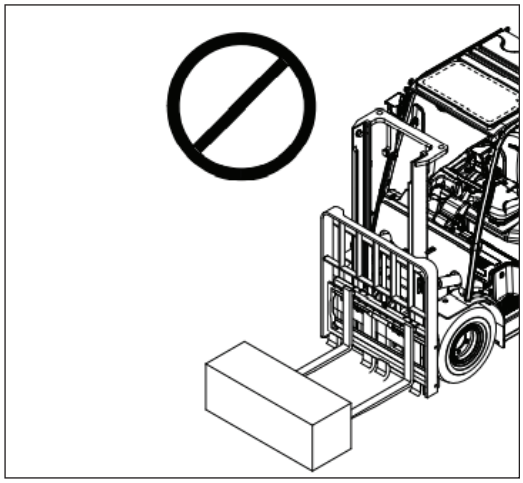
⚠ **Make sure the load backrest or fork retaining bolts are fasten securely in place.**

3) LOAD ON FORKS

(1) Do not elevate the load with one fork.
Loading with one fork can cause the tip over and serious injury or death of operator, and height difference between both fork tips due to overload.



(2) Do not elevate the load with the ends of the forks.
This can cause height difference between both fork tips due to overload in the end of the forks resulted from farther center of gravity of load.
The load should be loaded at least over 2/3 of fork length.



4) TRAVELING WITH LOAD

Travel with load or carriage as low as possible and tilted back. Never travel with the load or carriage raised (elevated) in a high position. Do not elevate the load except during stacking.

Observe all traffic regulations and watch for other traffic, pedestrians, and safe clearances. Always look in the direction of travel. Keep a clear view of the path of travel and when the load blocks your visibility, travel in reverse with load trailing (Except when climbing an incline).

Avoid sudden movements when carrying a load. Start, stop, travel, steer, and brake smoothly. Steer clear of bumps, holes, and loose materials or debris on the ground. Lift and tilt slowly and smoothly. Go slowly when turning. Cross railroad tracks slowly and at an angle wherever possible.

Use special care when handling and traveling with long, high, or wide loads-to avoid losing the load, striking bystanders or obstructions, or tipping the truck.

Watch clearances around the truck and load as you travel. Raise the forks or attachment only to pick up or stack a load. Look out for obstructions, especially overhead.

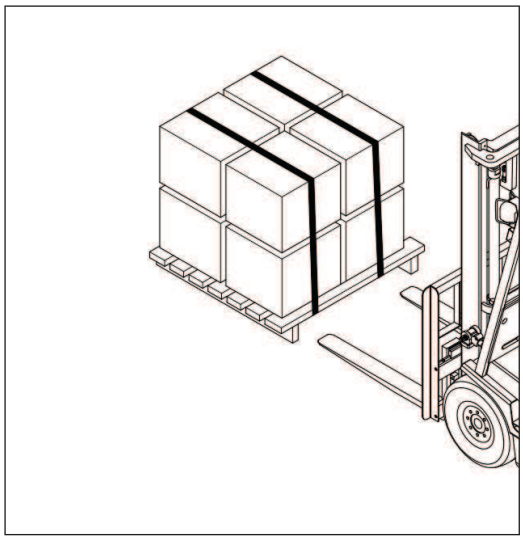
Be aware that exaggerated tail swing, when turning while traveling forward, is a characteristic of lift trucks that are steered by the rear wheels. Accordingly, you need to become accustomed to tail swing and always check the tail swing area of the counterweight to be sure it is clear before you turn.

Always be concerned about the stability of your lift truck. When attachments are used, extra care should be taken in securing, manipulating, positioning, and transporting the load. Because attach-

ments generally add extra weight and complexity to the truck, operate trucks equipped with attachments as partially-loaded trucks when not handling load.

5) PICKING UP AND MOVING LOADS

When picking up a load from the ground, approach the load slowly and carefully align the truck square with the load. The forks should be adjusted to fit the load or pallet being handle and spread as wide as possible to provide good stability and balance. Before lifting, be sure the load is centered and the forks are fully under and supporting the load. Fork length should be at least 2/3 of load length. With the lift and tilt controls, adjust the forks to the correct height and angle for freely engaging the load pallet. Move forward until the forks are squarely and completely under the load.



⚠ **Be sure that the forks do not extend beyond the load, causing damage or tipping of other adjacent loads or materials behind the load being moved.**

If the forks are longer than the load, move the tips partially under the load without extending beyond the load. Raise the load to clear the ground. Back out several inches, or whatever distance is necessary, then set the load down and move forward until the load is positioned against the carriage.

Raise the load from the ground or stack by tilting the mast back just enough to lift the load from the surface. When stacking or tiering, use only enough backward tilt to stabilize the load.

Then raise the load to traveling height and tilt fully back to travel (Except for loads that must be transported as level as possible).

6) UNLOADING

To deposit a load on the floor after being moved into the correct position, tilt the mast forward to a vertical position and lower the load.

Adjust the fork height and tilt the mast forward slightly, as necessary, for smooth removal of the forks from the load (Pallet).

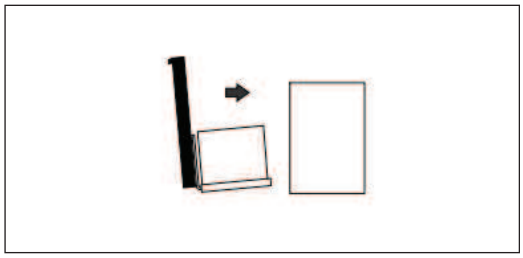
Carefully back away to clear the forks from the load.

Raise the forks to traveling height and tilt forks to a level position 150~200 mm (6-8 in) off the floor.

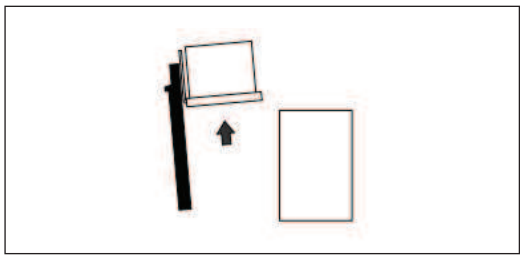
7) STACKING

(1) To put a load on a stack

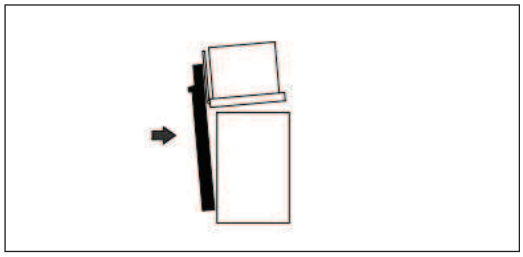
① Approach slowly and align the lift truck and load squarely with the stack.



② Raise the load as the lift truck nears the stack.

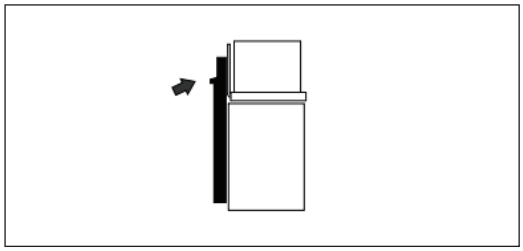


③ Move forward slowly until the load almost touches the stack. The leading edge and sides of the load pallet should line up exactly with the near edge and side of the load or rack on which you are stacking.

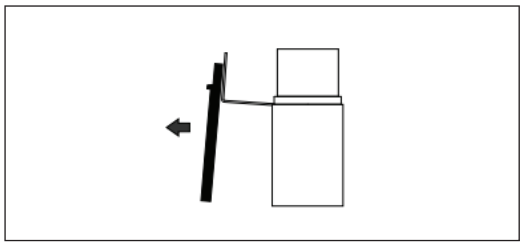


④ Stop close to the stack and further lift the load high enough to clear the top of the stack. Slowly move the load into position. Use care not to damage or move adjacent loads.

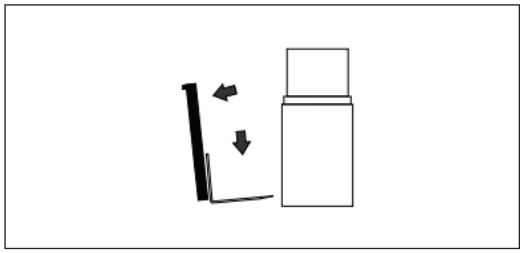
⑤ When the load is aligned with the stack beneath it, tilt the mast to the vertical position and carefully lower the load onto the top of the stack.



⑥ Lower the forks slightly to clear the load pallet. Tilt the forks forward slightly, if necessary.



⑦ Check your travel path, then carefully back away until the forks are clear of the stack. Stop and lower the forks to the travel position (150-200 mm) above the ground], then tilt back for travel.



(2) To move a load from a stack

Approach the stack carefully, truck lined up squarely with the load. With mast vertical, raise the forks to the correct height for freely engaging the load pallet. Adjust fork angle as necessary to fit squarely under the load.

Be sure that the forks do not extend beyond the load, causing damage or tipping of other be sure that the forks do not extend beyond the load adjacent loads or materials behind the load being moved. If the forks are longer than the load, move the tips partially under the load without extending beyond the load.

Raise the load to clear the ground. Back out several inches, then set the load down and move forward until the front face of the forks contacts the load. Be careful that the fork tips now clear the adjacent load or material behind the load being moved.

Raise the load from the stack by tilting the mast back just enough to lift the load from the surface.

Or, with the mast still vertical, raise the forks until they begin to lift the load. At this point, apply the minimum back tilt that will stabilize the load.

Check your travel path, slowly back up until clear of the stack, stop, and then lower the load to the travel position (150-200 mm off the ground). Tilt full back to travel (Except for certain loads that may have to be transported as level as possible). Be sure the load is back flush against the carriage or front face of the forks.

※ **Certain loads must be transported as level as possible.**

9. SHUT DOWN PROCEDURE

※ **Always leave your lift truck in a safe condition.**

1) WHEN YOU LEAVE YOUR TRUCK, OR PARK IT, FOLLOW THESE SAFETY RULES

(1) Park in a safe area away from normal traffic.

(2) Never park on a grade.

(3) Never park in areas that block emergency routes or equipment, access to fire aisles, or stairways and fire equipment.

2) BEFORE LEAVING THE OPERATOR'S EFORE LEAVING THE OPERATOR'S POSITION

(1) Fully stop the lift truck.

(2) Return the forward and reverse levers to the neutral position.

(3) Apply the parking brake.

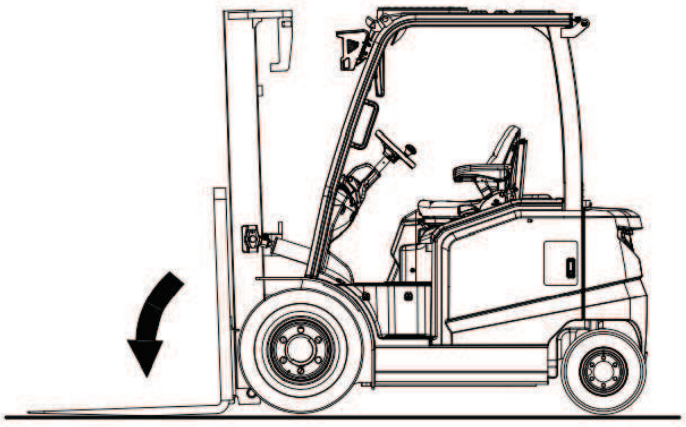
(4) Lower the lifting mechanism-carriage and forks or attachment fully to the ground.

3) IN ADDITION, WHEN LEAVING THE N ADDITION, WHEN LEAVING THE TRUCK UNATTENDED

(1) Tilt the mast forward until the forks are level and flat on the ground. Let the engine run at idle speed.

(2) Turn the start switch to the OFF position and remove the key.

(3) Block the wheels, if the truck must be left on an incline or you have any doubt about the truck moving from a safe position.



1. HOW TO TOW A DISABLED TRUCK

If your lift truck becomes disabled but it can be moved freely on its own wheels without further damage, use the following procedures to tow it safely to a repair area (Failed lift truck freely movable with its wheel).

※ **It is important for your safety and the care of your lift truck to use the proper equipment and carefully follow these recommendations for safe towing.**

⚠ **DO NOT tow a lift truck if there is a problem with the brakes or tires or the steering cannot be operated. DO NOT tow up or down ramps and steep inclines. DO NOT attempt to tow a lift if traction or weather conditions are poor.**

1) **Be sure to apply the parking brake or block the drive wheels on the disabled truck while working around it.**

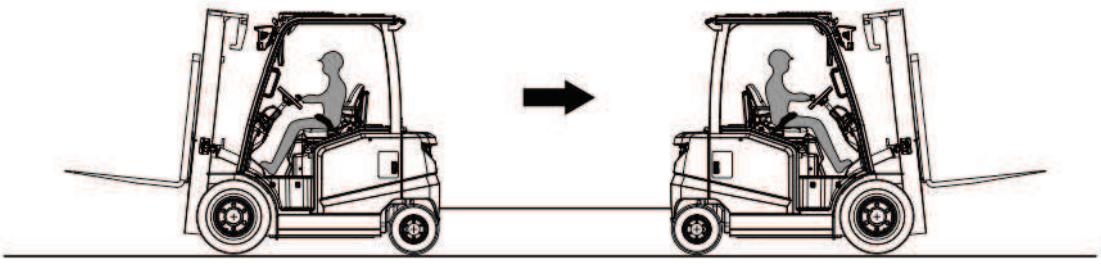
2) **When possible, raise the carriage (forks) on the disabled truck about 300 mm from the floor or ground. Secure the carriage with a chain.**

3) **Obtain another lift truck of equal or larger size carrying a partial load for traction.**

4) **Use an approved, solid metal tow bar with towing couplers that connect to the towing pins in the counterweights.**

5) **Release the parking brake on the towed truck.**

6)

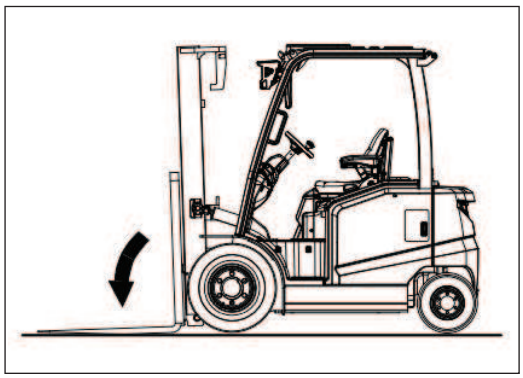


Put the gear selector lever in the NEUTRAL position.

7) **Tow the disabled truck backward. An operator must be on the towed truck. Tow the truck slowly. Careful towing is necessary to prevent injury to personnel or damage to the truck. The truck should be towed at a speed of less than 8 km/h with a driver in the seat. Do not lift the truck or any wheels off the floor or ground while the truck is being towed.**

⚠ **The power steering will not operate on the disabled truck when the pump motor is not running.**

8) **Park the disabled truck in authorized areas only. Fully lower the forks to the floor, put the gear selector lever in the NEUTRAL position and turn the starting switch to the OFF position. Apply the parking brake. Remove the start switch and, when necessary, block the wheels to prevent the truck from rolling.**

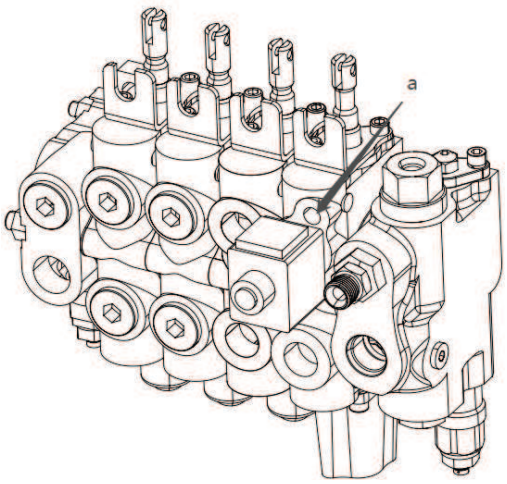


⚠ **Always apply the parking brake when parking a lift truck.**
The truck can move and cause injury or death to personnel near it.

2. EMERGENCY MAST LOWERING

In case that the mast can't be lowered due to a problem in the controller, activate the emergency lowering valve on the MCV assy by rotating the valve (a).

⚠ **Manual override features are intended for emergency use, not for continuous-duty operation.**



1) **Loosen and remove the MCV cover connecting bolts.**

2) **Use the L-wrench (3 mm) to loosen the bolts counterclockwise until lowering of the mast begins.**

※ **Do not undo the bolts more than 1.5 turns.**

※ **If lowering still does not begin, there is a mechanical block. Do not under any circumstances continue to unscrew the emergency lowering feature.**

3) **After lowering is complete, the valve must be screwed back in again.**

※ **Do not exceed a tightening torque of maximum 1.5-1.8 kgf·m.**

⚠ **When operating the emergency lowering valve in order to lower the mast inevitably, always make certain that any person should not stand or pass under the mast, the fork and platform so as to avoid from unexpected accident such severe personal injury or death.**

PLANNED MAINTENANCE AND LUBRICATION

1. INTRODUCTION

ONLY TRAINED AND AUTHORIZED PERSONNEL should perform planned maintenance. Local HD HYUNDAI dealers are prepared to help customers put in place a maintenance program for checking and maintaining their lift trucks according to applicable safety regulations.

⚠ Powered industrial trucks may become hazardous if maintenance is neglected.

As outlined in section 4, operator maintenance and care on page 4-1, the operator should make a safety inspection of the lift truck before operating it. The purpose of this daily examination is to check for any obvious damage and maintenance problems, and to have minor adjustments and repairs made to correct any unsafe condition.

In addition to the operator's daily inspection, HD HYUNDAI recommends that the owner set up and follow a periodic planned maintenance (PM) and inspection program. Performed on a regular basis by trained personnel, the program provides through truck. The PM identifies needed adjustments, repairs, or replacements so they can be made before failure occurs. The specific schedule (frequency) for the PM inspections depends on the particular application and lift truck usage.

This section recommends typical planned maintenance and lubrication schedules for items essential to the safety, life, and performance of the truck. It also outlines safe maintenance practices and gives brief procedures for inspections, operational checks, cleaning, lubrication, and minor adjustments.

Specifications for selected components, fuel, lubricants, critical bolt torques, refill capacities, and settings for the truck are found in section 8 on page 8-1.

If you have needed for more information on the care and repair of your truck, see your HD HYUNDAI dealer.

2. SAFE MAINTENANCE PRACTICES

The following instructions have been prepared from current industry and government safety standards applicable to industrial truck operation and maintenance. These recommended procedures specify conditions, methods, and accepted practices that aid in the safe maintenance of industrial trucks. They are listed here for the reference and safety of all workers during maintenance operations. Carefully read and understand these instructions and the specific maintenance procedures before attempting to do any repair work. When in doubt of any maintenance procedure, please contact your local HD HYUNDAI dealer.

1) Powered industrial trucks can become hazardous if maintenance is neglected. Therefore, suitable maintenance facilities and trained personnel and procedures shall be provided.

2) Maintenance and inspection of all lift trucks shall be performed in conformance with the manufacturer's recommendations.

3) Follow a scheduled planned maintenance, lubrication, and inspection system.

4) Only trained and authorized personnel are permitted to maintain, repair, adjust, and inspect trucks and must do so in accordance with the manufacturer's specifications.

5) Always wear safety glasses. Wear a safety (hard) hat in industrial plants and in special work areas where protection is necessary and required.

6) Properly ventilate work area, vent exhaust fumes, and keep shop clean and floors dry.

7) Avoid fire hazards and have fire protection equipment present in the work area. Do not use an open flame to check for level or leakage fuel, or coolant.

8) Before starting work on truck

(1) Raise drive wheels free of floor and use oak blocks or other positive truck positioning devices.

(2) Remove all jewelry (watches, rings, bracelets, etc.).

(3) Put oak blocks under the load engaging means, inner masts, or chassis before working on them.

(4) Disconnect the battery ground cable (-) before working on the electrical system.

※ **Refer to the jacking and blocking section on Page 1-17 for proper procedures.**

9) Operation of the truck to check performance must be conducted in an authorized, safe, clear area.

10) Before starting to operate the truck

(1) Be seated in a safe operating position and fasten your seat belt.

(2) Make sure parking brake is applied.

(3) Put the gear selector lever in NEUTRAL.

(4) Check functioning of lift and tilt systems, direction and speed controls, steering, brakes, warning devices, and load handling attachments.

11) Before leaving the truck.

(1) Stop the truck.

(2) Fully lower the load-engaging means (mast, carriage, forks or attachment), and incline the mast forward.

(3) Put the gear selector lever in NEUTRAL.

(4) Apply the parking brake.

(5) Turn the start switch to OFF position.

(6) Put blocks at the wheels if the truck must be left on an incline.

12) Brakes, steering mechanisms, control mechanisms, warning devices, lights, governors, lift overload devices, lift and tilt mechanisms, articulating axle stops, load backrest, overhead guard and frame members must be carefully and regularly inspected and maintained in a safe operating condition.

13) Special trucks or devices designed and approved for hazardous area operation must receive special attention for maintenance.

14) All hydraulic systems must be regularly inspected and maintained in conformance with good practice. Tilt and lift cylinders, valves, and other parts must be checked to assure that drift or leakage has not developed to the extent that it would create a hazard.

15) When working on the hydraulic system, be sure the engine is turned off, mast is in the fully-lowered position, and hydraulic pressure is relieved in hoses and tubing.

⚠ Always put oak blocks under the carriage and mast rails when it is necessary to work with the mast in an elevated position.

16) The truck manufacturer's capacity, operation, and maintenance instruction plates, tags, or decals must be maintained in legible condition.

17) Batteries, limit switches, protective devices, electrical conductors, and connections must be maintained in conformance with good practice. Special attention must be paid to the condition of electrical insulation.

18) To avoid injury to personnel or damage to the equipment, consult the manufacturer's procedures in replacing contacts on any battery connection.

19) Trucks must be kept in a clean condition to minimize fire hazards and help in detection of loose or defective parts.

20) Modifications and additions that affect capacity and safe truck operation must not be done without the manufacturer's prior written approval. This is an OSHA requirement. Capacity, operation, and maintenance instruction plates, tags, or decals must be changed accordingly.

21) Care must be taken to assure that all replacement parts, including tires, are interchangeable with the original parts and of a quality at least equal to that provided in the original equipment.

22) When removing tires follow industry safety practices. Most importantly, deflate pneumatic tires completely prior to removal. Following assembly of tires on multi-piece rims, use a safety cage or restraining device while inflating.

23) Use special care when removing heavy components, such as counterweight, mast, etc. Be sure that lifting and handling equipment is of the correct capacity and in good condition.

3. INSTRUCTIONS BEFORE MAINTENANCE

1) INTERVAL OF MAINTENANCE

(1) You may inspect and service the truck by the period as described at based on service meter of LCD. Since service meter is virtually identical with period, it is allowed to perform inspection and maintenance in scheduled interval.

(2) The scheduled maintenance list is developed based on standard working. Shorten the interval of inspect and service depending on site condition (Such as dusty area, quarry, sea shore and etc.).

(3) Practice the entire related details at the same time when the service interval is doubled.
For example, in case of 250 hours, carry out all the maintenance each 250hours, each 100 hours and daily service at the same time.

※ **Time intervals between maintenance are largely determined by operating conditions. For example, operation in sandy, dusty locations requires shorter maintenance intervals than operation in clean warehouses. The indicated intervals are intended for normal operation. The operating condition classifications are;**

- **Normal operation**
  Eight hours material handling, mostly in buildings or in clean, open air on clean paved surfaces.
- **Harsh operation**
  - **All harsh working environment**
  - **Long term heavy load operation**
  - **High and low temperature working environment**
  - **Sudden change in temperature**
  - **Dusty or sandy working environment**
  - **Highly corrosive chemical working environment**
  - **Damp working environment**

※ **Since the operating environment of lift trucks varies widely, the above descriptions are highly generalized and should be applied as actual conditions dictate.**

2) PRECAUTION

(1) Fully understand Safety Hints and lift trucks, and perform inspection and maintenance for preventing personal injury or damage to the truck.

(2) Reading the cluster does not fully guarantee the conditions of the truck. Perform routine maintenance in accordance with the specifics in the inspection and maintenance checklists.

(3) Ask to your local dealer or HD Hyundai for maintenance advise it unknown. Engine and hydraulic components have been preset in the factory.
Do not allow unauthorized personnel to reset them.

(4) Drain the used oil and coolant in a container and handle according to the method of handling for industrial waste to meet with regulations of each province or country.

3) PROPER MAINTENANCE

(1) Replacement and repair of parts
It is required to replace the wearable and consumable parts such as hose, tube and filter etc., regularly. Replacing damaged or worn parts at proper time to keep the performance of truck.

(2) Use HD Hyundai genuine parts.

(3) Use the recommended oil.

(4) Remove the dust or water around the inlet of oil tank before supplying oil.

(5) Drain oil when the temperature of oil is warm.

(6) Do not repair anything while operating the engine.

(7) Stop the engine when you fill the oil.

(8) Relieve hydraulic system of the pressure by opening of breather when repairing the hydraulic system.

(9) Reading cluster gauges
Confirm if the cluster is in the normal condition after completion of service.

(10) Please contract HD Hyundai dealer for information of adjustment, disassembling and repair of power transmission, hydraulic devices and electronic devices (e.g., check unit).

※ **Be sure to start the maintenance after fully understanding the Section 1 Safety Hints on page 1-1.**

4) PRECAUTION WHEN INSTALLING HYDRAULIC HOSES OR PIPE

(1) Special care should be exercised for preventing joints of hose, pipe and functional part from damage, and intrusion of foreign substances such as dusts or particles. Take dust-preventing measures for each part.

(2) Clean joints and surroundings of hose, pipe and functional part, remove cleaning solution clear, and then dry the parts before assembling.

(3) Use HD Hyundai genuine parts. Do not damaged or degraded O-rings. Using parts other than genuine parts may cause oil leak or significant reduction of service life because of different materials or harness.

(4) Do not assemble the hose in the condition of twisted or sharp radius. Service life of hose may significantly be reduced.

(5) Keep the specified tighten torque.

5) PERIODICAL REPLACEMENT OF SAFETY PARTS

(1) It is desirable to perform periodical maintenance on lift trucks for operating the trucks safely for a long time, and it is recommended to replace parts relevant to safety upon regular basis for enhancing safety.

(2) These parts are subject to variation of materials over time, and deterioration, abrasion and fatigue upon repeated use to cause critical personal and property disasters. The parts are hard to judge remainder service life by operation with his/her operation experiences or visual inspection.

(3) Repair or replace if an abnormality of these parts is found even before the recommend replacement interval.

(4) Please consult HD Hyundai dealer or service shop for replacement of these safety parts.

No.	Name	Replacement cycle
1	Master cylinder and wheel cylinder caps dust seals	Every 1 year
2	Lift cylinder hose	Every 1 year (harsh operation) Every 2 years (normal operation)
3	Tilt cylinder hose	
4	Side shift cylinder hose	
5	Brake hose or tube	
6	Hydraulic pump hose	Every 2 years
7	Power steering hose	
8	Coolant hose and clamps	
9	Packing, seal, and O-ring of steering cylinder	Every 2 years (harsh operation) Every 4 years (normal operation)
10	Lift chain	
11	Brake oil tank tube	
12	Hydraulic pump seal kit	Every 3 years
13	Pressure sensor	Every 5 years

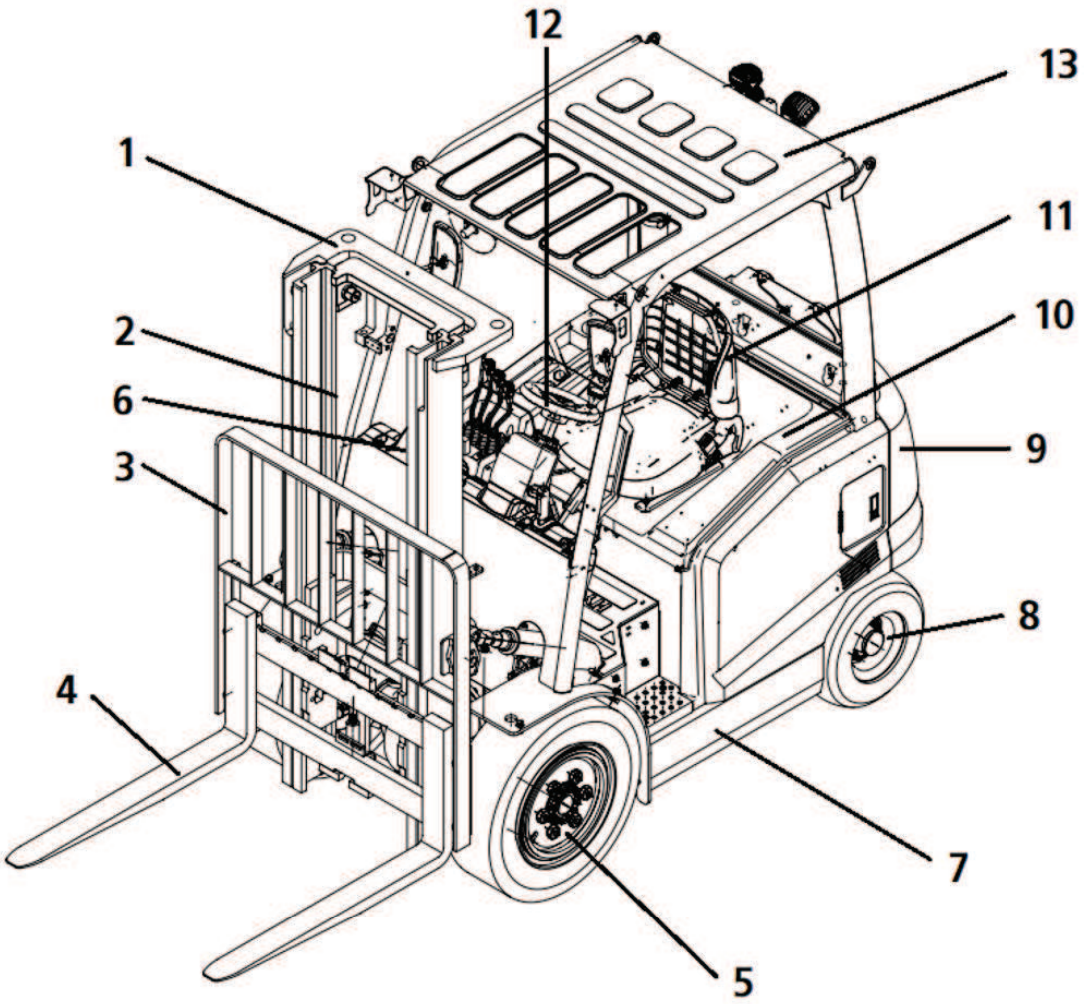
※ **Replace the O-ring and gasket at the same time when replacing the hose.**

※ **Replace clamp at the same time if the hose clamp is cracked when checking and replacing hose.**

※ **Refer to the page 6-1 about the harsh and normal operation.**

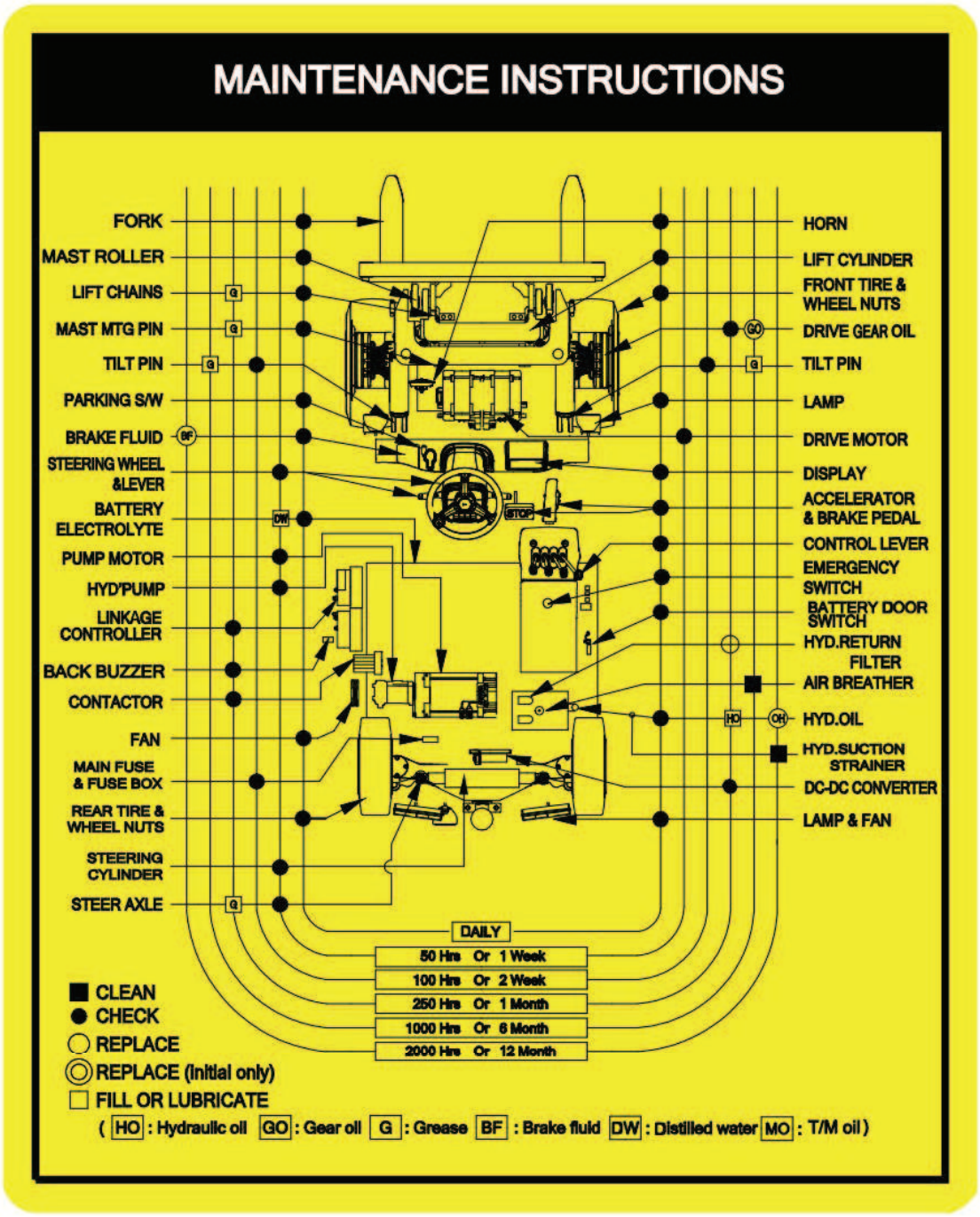
4. MAJOR COMPONENT LOCATIONS

See the figure below to find functional parts for planned maintenance procedures:



1	Mast	6	Cluster	11	Operator's seat
2	Lift Cylinder	7	Frame	12	Steering wheel
3	Carriage and backrest	8	Steering	13	Overhead guard
4	Forks	9	Counterweight		
5	Drive axle	10	Battery cover		

5. MAINTENANCE CHECKLIST



6. HOW TO PERFORM PLANNED MAINTENANCE

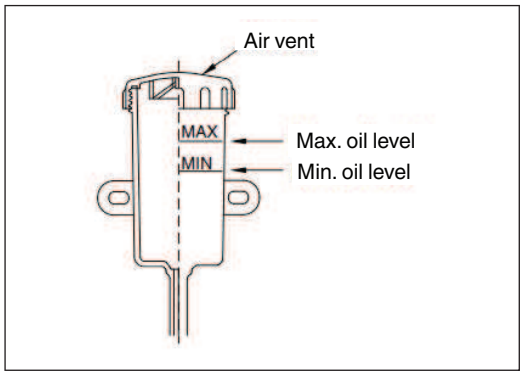
1) BRAKE OIL MAKEUP

Hydraulic brake oil level is checked by viewing oil level in the reserve tank, and made up, if required.

(1) Do not mix with brake oil of different types.

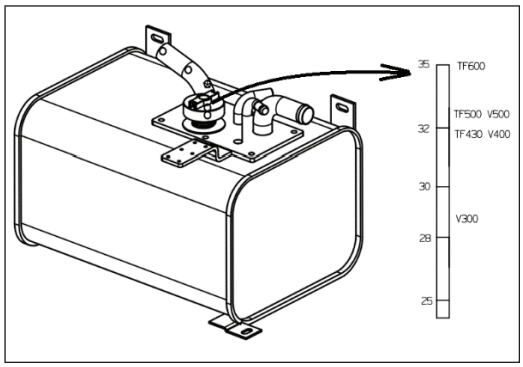
(2) Protect the air vent of the oil container stop from clogging by dust.

(3) Brake oil change requires skills and experiences. Have designated shop change the oil.



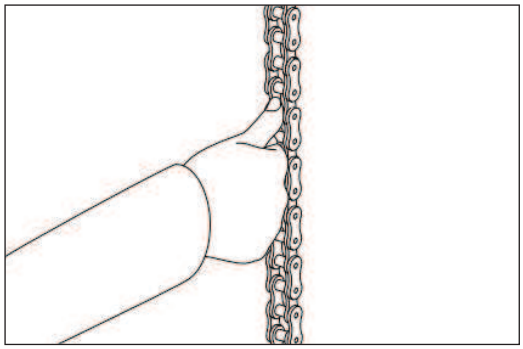
2) Hydraulic oil makeup

Stop the lift truck on flat ground, and fully lower the forks. Check the hydraulic oil level with oil level gauge, make up the oil, if required.



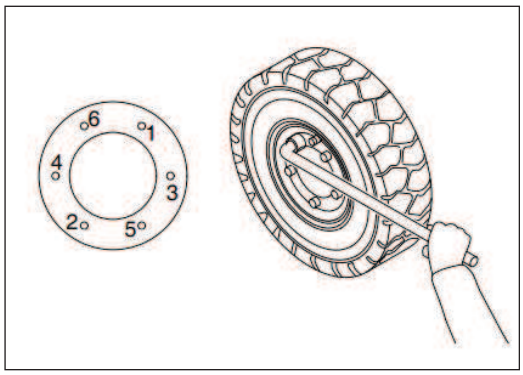
3) CHECKING AND ADJUSTING LIFT CHAIN TENSION

Stop the truck at level ground, lift forks kept horizontal 20-30 cm above the ground, and push the chain with the both hands. If any side of the chain shows excessively high or low tension, adjust the chain with the anchor bolt.



4) CHECKING HUB NUT

Security tighten the hub nut.
Tighten the hub nut in alternate directions for even tightening. (See the figure.)



Item	Nut	Torque (kgf·m)
Front	M16	30 ± 3
Rear	M14	25 ± 3

5) GREASE APPLYING

Wipe the surface with brush or cloth clean, and apply grease.

⚠ Do not apply excessive grease.

Applying	number of applications
Mast support	2 points
Tilt cylinder plate	4 points
Steering cylinder link	4 points
Kingpin	4 points
Steering axle mounting	2 points
Idle wheel bracket	2 points
Mast roller bearing	4 points (V), 8 points (TF, TS), 12 points (QF)

6) GREASE APPLYING ON INDIVIDUAL PARTS

Wipe the surface clean before applying grease.

(1) Lift chain: Wipe with SAE 20-30 oil, and then apply grease (applying with brush with gear oil of low viscosity).

(2) Working surface of mast guide rail roller: Apply grease with brush.

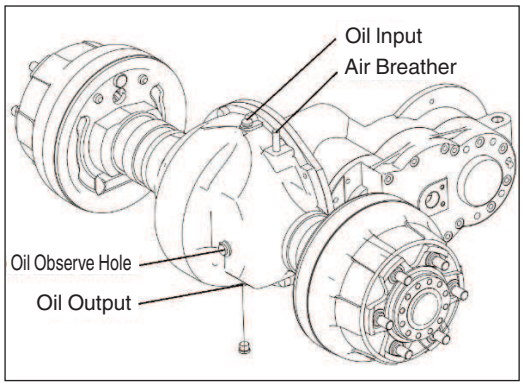
(3) Slide guide and slide rail: Apply grease evenly.

(4) Sliding section between inner and outer masts: Apply grease evenly.

(5) Sliding section between forks and finger bar: Apply grease with brush.

7) DRIVE AXLE OIL LEVEL

Remove the plug from the drive axle, and check the oil level.

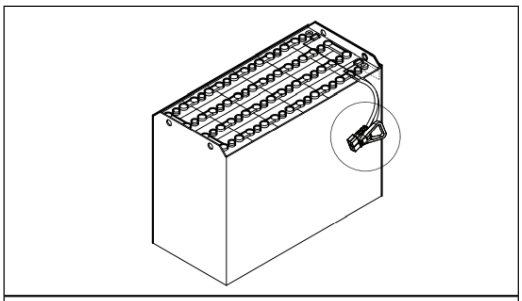


8) TRUCK BODY INSPECTION

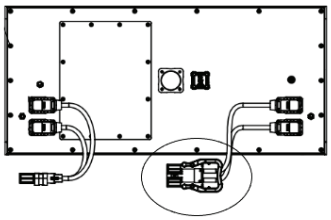
Inspect the truck body, and immediately consult with the shop for any defects, if any.

9) FUSE EXCHANGE

(1) Separate the battery connector.

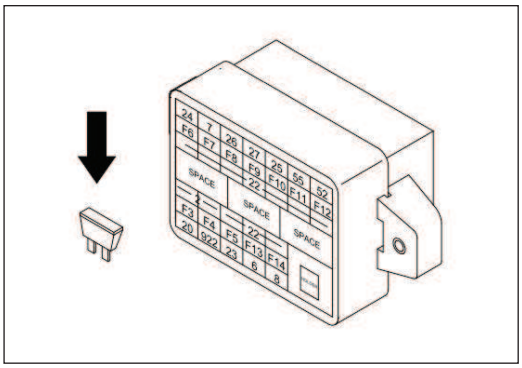


Lithium ion battery (opt)



(2) Remove burnt fuse, and install new fuse.

※ **Use new fuse with capacity same as burnt fuse. If fuses are frequently burnt, contact the shop for inspection. Never use power cable in lieu of fuse.**



10) LIFT CHAIN MAINTENANCE

The chain system on the mast was designed for safe, efficient, and reliable transmission of lifting force from hydraulic cylinder to the forks. Safe use of your truck with minimum down time depends on the correct care and maintenance of the lift chains. Most complaints of unacceptable chain performance are a result of poor maintenance. Chains need periodic maintenance to give maximum service life.

⚠ **Do not attempt to repair a worn chain. Replace worn or damaged chains with a set (LH & RH). Do not piece chains together.**

11) INSPECTION AND MEASUREMENT OF LIFT CHAIN

Inspect and lubricate the lift chains in planned maintenance period (500 hours). When operating in corrosive environments, inspect the chains in shorter period. During inspection, check for the following conditions:

(1) Rust and corrosion, cracked plates, raised or turned pins, tight joints, wear, and worn pins or holes.

(2) When the pins or holes become worn, the chain becomes longer. When a section of chain is 3% longer than a section of new chain, the chain is worn and must be discarded.

(3) Chain wear can be measured by using a chain scale or a steel tape measure. When checking chain wear, be sure to measure a segment of chain that moves over a sheave. Do not repair chains by cutting out the worn section and joining in a new piece. If part of a chain is worn, replace all the chains of both sides on a truck.

12) LIFT CHAIN LUBRICATION

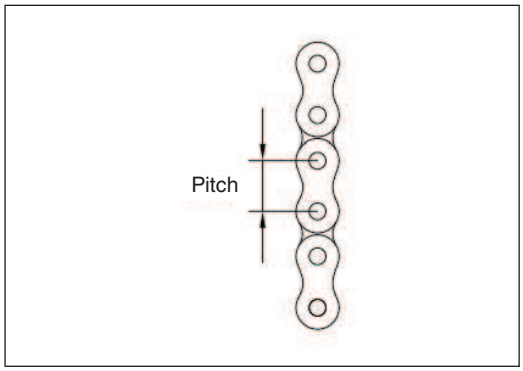
Lift chain lubrication is an important part of your maintenance program. The lift chains operate more safely and have longer life if they are regularly and correctly lubricated. HD HYUNDAI chain lubricant is recommended; it is easily sprayed on and provides superior lubrication. Heavy motor oil may also be used as a lubricant and corrosion inhibitor.

13) LIFT CHAIN WEAR AND REPLACEMENT CRITERIA

All chains must be replaced if any link has worn from the center of a pin to the center of the next pin of 3% or more, or if any of the damaged conditions notes above are found during inspection. Order replacement chains from your HD HYUNDAI dealer. Replace all chains as a set.

Do not remove factory lubrication or paint new chains. Replace anchor pins and worn or broken anchors when installing new chains.

Adjust tension on new chains. Lubricate chains when they are installed on the mast.



※ **Please refer to your service manual for additional information on lift chain measurement and maintenance.**

7. VISUAL INSPECTION

First, perform a visual inspection of the lift truck and its components.

- Walk around the truck and take note of any obvious damage or maintenance problems. Check fastened and fit parts for loosening.
- Check to be sure all capacity, safety, and warning plates and decals are attached and legible.

※ **NAMEPLATES AND DECALS: Do not operate a lift truck with damage or lost decals and nameplates. Replace them immediately. They contain important information.**

- **Check for hydraulic oil leaks from the drive axle.**
- **Check for hydraulic oil leaks and loose fittings.**

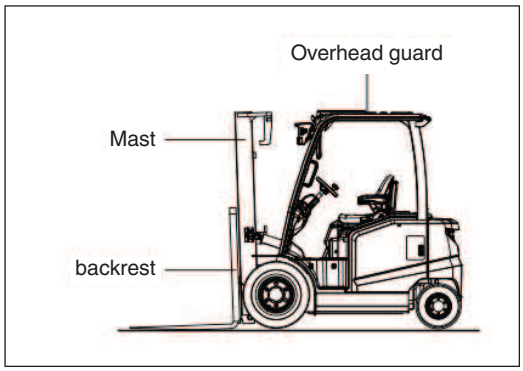
⚠ **HYDRAULIC FLUID PRESSURE: Do not use your hands to check for hydraulic leakage. Fluid under pressure can penetrate your skin and cause serious injury.**

- **Be sure that the driver's overhead guard, backrest and any safety devices are in place, undamaged, and attached securely.**

Then, inspect all of major parts handling or moving loads.

1) OVERHEAD GUARD

Check the overhead guard for any damage. Be sure that the driver's overhead guard and any safety devices are in place, undamaged, and attached securely.



2) BACKREST

Check the backrest for damage. Be sure that it is properly positioned on the carriage, and free from cracks. Check all mounting fasteners are in place and tight.

3) MAST

Inspection of mast: Inspect rails, carriage rollers, lift chains, and lift and tilt cylinders. Look for obvious wear and maintenance problems and damaged or missing parts. Check for any loose parts or fittings. Check for leaks, damaged or loose rollers, and rail wear. Check connections of all of lift line hydraulic connections for oil leak.

4) LIFT CHAIN

Carefully check the lift chains for wear, rust, corrosion, cracked or broken links, stretching, etc. Check that the lift and carriage chains are correctly adjusted to have equal tension. Check that the lift chain anchor fasteners and locking means are in place and tight.

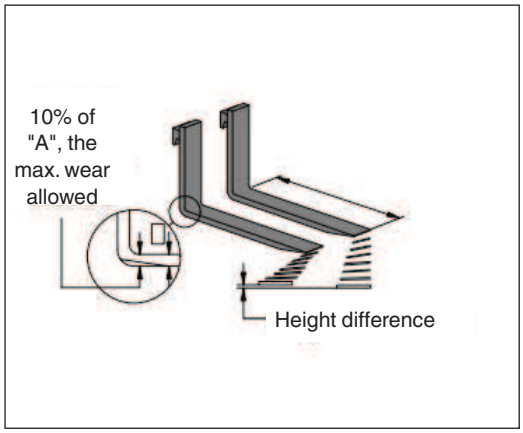
⚠ **Mast and lift chains require special attention and maintenance to remain in safe operating condition.**

- **Mast may suddenly drop. Carefully examine the mast; however, never put your hand in it.**
- **Repair and adjustment of the lift chain should be performed by authorized and skilled experts.**

5) FORKS

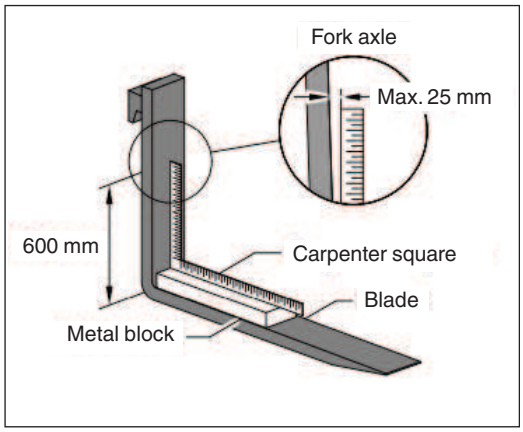
Inspect the load forks for cracks, breaks, bending, and wear. The fork top surfaces should be level and even with each other. The height difference between both fork tips refer to below table:

Model	Fork length (mm)	Height difference (mm)
All	≤1500	3
	≥1500	4



⚠ **If the fork blade at the heel is worn down by 10% or more, the load capacity is reduced and the fork must be replaced.**

Inspect the forks for twists and bends. Put a 50 mm (2 in) thick metal block, at least 100 mm (4 in) wide by 600 mm (24 in) long with parallel sides, on the blade of the fork with the 100 mm (4 in) surface against the blade. Put a 600 mm (24 in) carpenter's square on the top of the block and against the shank. Check the fork 500 mm (20 in) above the metal block to make sure it is not bent more than 25 mm (1 in) maximum.



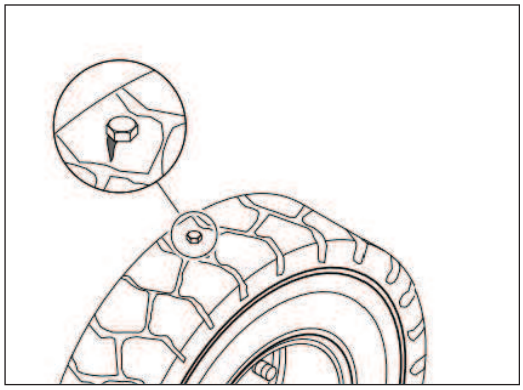
※ **If the fork blades are obviously bent or damaged, have them inspected by a trained maintenance person before operating the truck.**

Inspect the fork locking pins for cracks or damage. Reinsert them and note whether they fit properly.

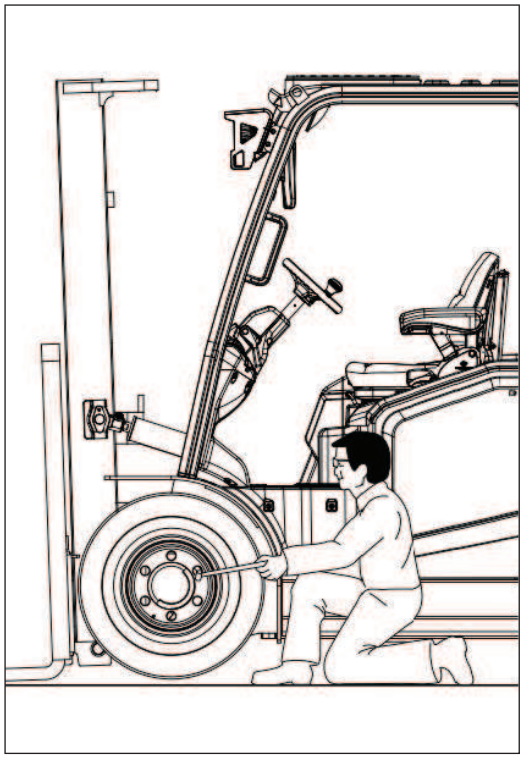
6) WHEEL AND TIRES

Check the condition of the drive and steering wheels and tires. Remove objects that are embedded in the tread. Inspect the tires for excessive wear and breaks or chunking out.

Check all wheel lug nuts or bolts to be sure none are loose or missing. Replace missing bolts or lug nuts. Torque loose or replaced items to specifications.



⚠ **Check tire pressure from a position facing the tread of the tire, not form the side. Use a long-handled gauge parallel with driving direction. If tires are low, do not operate and do not add air. Check with a mechanic. The tire may require removal and repair. Incorrect (low) tire pressure can reduce the stability of your lift truck. Do not operate truck with low tire pressure which may result in tire broken or other damages.**



DESCRIPTION	Air pressure		
	bar	kgf/cm^2	psi
Front tire	10	10	145
Rear tire	9	9	130

8. CHANGE OF HYDRAULIC OIL AND CONSUMABLES

1) CHANGE THE HYDRAULIC OIL HANGE THE HYDRAULIC OIL

(1) Lower the forks on the ground and extend the tilt cylinder to the maximum.

(2) Loosen the cap and relieve the pressure in the tank.

(3) Prepare a suitable drain pan (33L) and loosen the drain plug.

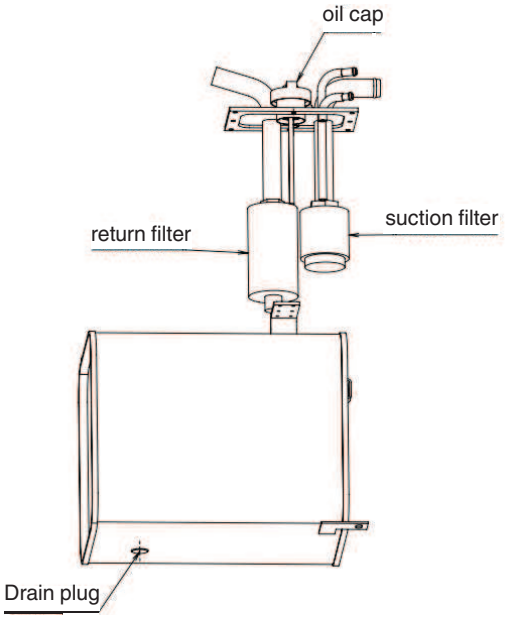
(4) After draining oil, tighten the drain plug.
Tightening torque: 2-2.2 kgf·m

(5) Loosen the fastening bolt of the rear flange, remove and clean the suction strainer, and then mount them again.
Tightening torque: 1.8-2.0 kgf·m

(6) Fill proper amount of recommended oil.

(7) Start engine and run continually. Release the air by full stroke of control lever.

※ **The oil must be free of bubbles. If bubbles are present in the oil, air is entering the hydraulic system. Inspect the suction hoses and hose clamps for leakage or damage.**

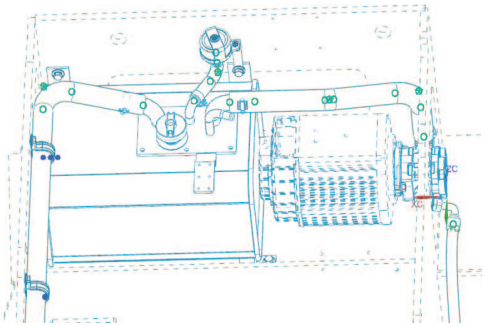


2) HYDRAULIC OIL RETURN FILTER EXCHANGING

Observing precautions for supply and change of hydraulic oil, perform the followings:

(1) Loosen the fastening bolt to remove the top flange.
Tightening torque: 1.8-2.0 kgf·m

(2) Remove the filter fastening bolt, and replace the return filter element with a new one.
Tightening torque: 1.5-1.8 kgf·m



3) REPLACEMENT OF AIR BREATHERE ELEMENT

(1) Loosen the cap and relieve the pressure in the tank.

(2) Loosen the screw on the top of the air breather, and remove the cover.

(3) Replace the element with a new one.

9. TORQUE CHECKS

Parts in highly loaded (critical) components can quickly fail if they become loosened. Also, loose fasteners can cause damage or failure of the component. For safety, it is important that the correct torque be maintained on all critical fasteners of the components that directly support, handle, or control the load and protect the operator.
Critical items include:

- Steering axle mounting
- Drive axle mounting
- Counterweight mounting
- Load backrest extension
- Overhead guard
- Tilt cylinder mounting and yokes
- Mast mounting and components

See Section 8 Specifications for fastening torques on page 8-4.

10. AIR CLEANING

Always maintain a lift truck in a clean condition. Do not allow dirt, dust, lint, or other contaminants to accumulate on the truck. Keep the truck free from leaking oil and grease. Wipe up all oil spills. Keep the controls and floorboards clean, dry, and safe. A clean truck makes it easier to see leakage and loose, missing, or damaged parts, and helps prevent fires. A clean condition helps fire prevention, and keeping cool temperature in cabin during drive of the truck.

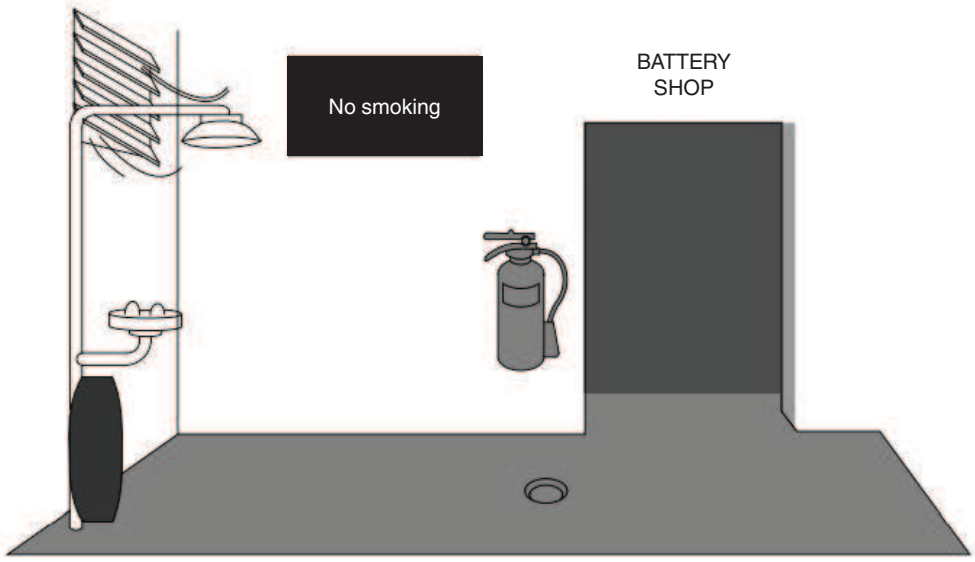
The environment in which a lift truck operates determines how often and to what extent cleaning is necessary.

Use an air hose with special adapter or extension, a control valve, and a nozzle to direct the air properly. Use clean, dry, low pressure, compressed air. Restrict air pressure to 2.0 psi (207 kPa). (OSHA requirements)

⚠ **Wear suitable eye protection and protective clothing when air cleaning.**

Air clean the mast assembly, drive axle, radiator- from both counterweight and engine side, engine and accessories, drive line and related components, and steering axle and cylinder.

11. BATTERY MAINTENANCE



Battery charging, replacement and removing should be performed at designated battery shop only. The shop should be free of inflammable materials or combustibles.
Facilities mandatory for the shop:

- Electrolyte cleaning facility
- Fire preventing and fire-fighting facility
- Facility protecting battery from systems
- Ventilation facility for gas from battery

Protection goggles should be worn when handling strong-acid solution of concentration of 50% or higher (density of 1.400 or more), and washing bowl should be provided for emergency.
Transportation facilities such as conveyor and crane should be provided for handling the batteries.

⚠ **The battery of the lift truck is very heavy, and hard to handle. The battery is filled with toxic chemical solutions, and hydrogen and oxygen are generated during charging. These gases may be mixed and explodes. This may lead to large-scale accident. Read and understand the manual before removing, servicing or installing batteries, and comply with the cautions.**

12. BATTERY HANDLING

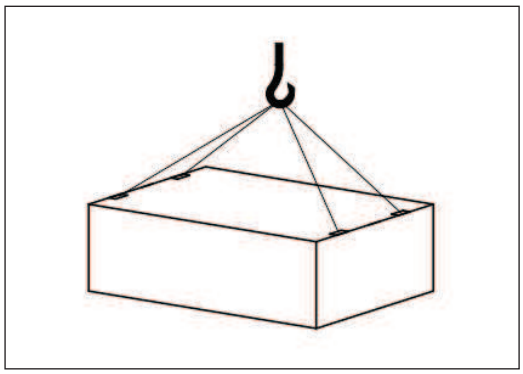
1) **Battery charging, replacement and removing should be performed at designated battery shop only.**

2) **The battery shop should operate electrolyte cleaning facility, battery gas ventilation facility, and fire- preventing and fire-fighting facilities.**

3) **Transportation facilities such as conveyor or crane should provide at the shop for removing and installing batteries. Lifting hook with safety locking device should be used.**

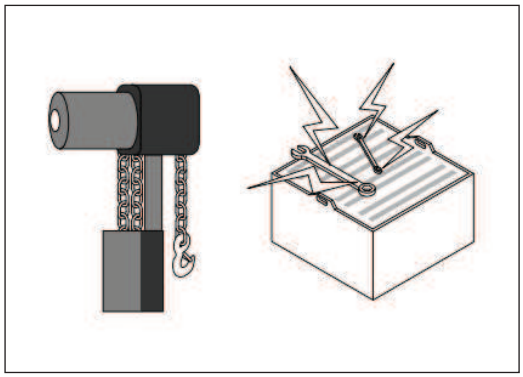
4) **Always use specific lifting tools including insulated cable for lifting batteries. Lifting hook of insulated cable should be compatible with lifting hook of battery to prevent damage to batteries. If lifting hook of insulated cable is mobile type, directly pull the cable upward, and carefully adjust the location (width) of the hook to prevent dispersion of (vertical) lateral load or force (pressure) to battery case. The hook should be of size precisely fitting with the hook of the battery.**

5) **If there is no battery cover, or terminal or connector is exposed, cover the battery with wooden sheet or thick cardboard to make insulation.**



6) **Chain container should be mounted on chain crane or motor-driven crane for accommodating excessive length of chain.**

7) **Any tool or other metal object should not contact with terminal.**



13. BATTERY CHARGING

Battery is automatically charge by charger. All you have to do is connecting the plug.

1) HOW TO USE CHARGER

(1) Connecting the plug and the battery connector lights up the input power lamp, and the charging indicator lamp, and charging starts few seconds later. Once charging is complete, power is automatically shut down.

(2) Normal charging:

① Connect the battery; Pay attention to the positive and negative polarity! At the same time, the connecting wires should be firm and not be loosened.

② Connect the power supply. The charger automatically starts charging after 10 seconds delay detection according to the program. The charger shows charging current, charging voltage, charging capacity and time. Shut down automatically when sufficient. There is no need to operate the charger during charging.

(3) Balanced charging function: Press and hold the message sparingly for about 5 seconds until the equalizing lamp is turned on and loosened, that is, the manual equalizing setting for this charging has been completed.

(4) Desulfurization Charging Function: Press and hold the information key for 10 seconds continuously until the desulfurization lamp is turned on and loosen. The desulfurization charging setting for this charging has been completed.

(5) Initial charging function: The initial charging settings have been completed by holding down the information key for about 15 seconds until both the equally charged lamp and the desulfurization lamp are on and off simultaneously.

(6) Information key:

① Press the "Information" button for 5S to set up the balanced charging function.

② Press the "Information" button for 10s to set up the desulfurization charging function.

③ Press the "Information" button for 15s to set up the initial charging function.

④ Press the "information" button for 3S to cancel the functions of balanced charging, initial charging and desulfurization charging.

⑤ Press the "Information" key 2s to enter the query interface. (on shutdown or standby)

2) INSTALLATION OF CHARGER

(1) Installation place

The charger should be installed at a place of well ventilation, low temperature/humidity, and free from dusts.

(2) Check input power the charger for adequacy with input power of distribution panel.

(3) Check grounding line of the charging cable for well grounding of the grounding line.

3) NORMAL CHARGING

(1) The charging procedures are as follows:
   ① Remove the key from the starting switch.
   ② Be sure the switch is in the CHARGE position.
   ③ Connect the battery connector the charge connector.
   ④ Make sure that the indicator lamps normally light up.

(2) The procedures after charging are as follows:
   ① Make sure that CHARGE COMPLETE indicator lamp lights up.
   ② Remove the battery connector from the charger connector.

(3) The procedures of stopping during charging are as follows:
   ① Press Manual Stop button.
   ② Remove the battery connector from the charger connector.

4) EVEN CHARGING

Repeated normal charging causes difference of capacity among cells. In such a case, overcharging is often performed to keep capacities of cells uniform; this is called even charging.

(1) Even charging should be performed in any of the cases listed below.

(2) When battery charging and discharging are repeated every day, even charging should be performed once a month:

(3) Battery discharged below specified capacity;

(4) Recharging not performed after discharging; and Shot.

(5) Even charging method is same as normal charging. All you have to do is press the "Information" button for 5s when starting charging.

⚠ Excessive even charging may reduce service life of the battery.

5) MAKEUP CHARGING

If daily charged capacity is not sufficient for a day's work, normal charging should be performed during idling time.

6) PRECAUTIONS

(1) Check input power when installing the charger, and use the charger compatible with the voltage of region.

(2) Charge the battery immediately after exhaustively using it. Charge the battery once a month when the battery is kept in standby mode for an extended period of time.

(3) Prevent drop of density of the battery, particularly, in winter.

(4) Immediately stop charging the battery if temperature of electrolyte exceeds 50˚C during charging.

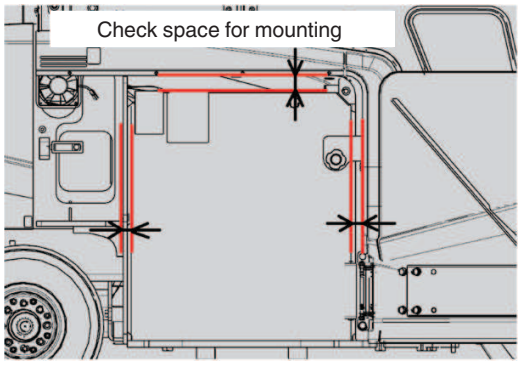
(5) Combustible gases are generated from the battery during charging. Pay special attention to fire prevention, and ventilation.

14. BATTERY REPLACEMENT

1) GENERAL

- **Battery can be replaced by making use of lift truck, or palette truck and exclusive jigs.**
- **Capacity of the lift truck for battery replacement should be 2-3 tons, and palette truck of 1.5-2 tons.**
- **Replacing the battery with inadequate method may cause accident by tip-over of battery.**
- **Replace the battery on flat and even ground.**
- **Perform works in accordance with the manual.**
- **When the truck tips over with the locking device of the battery not fastened, the battery may fall outside the truck.**
- **Operate the truck only after the battery locking device is locked.**

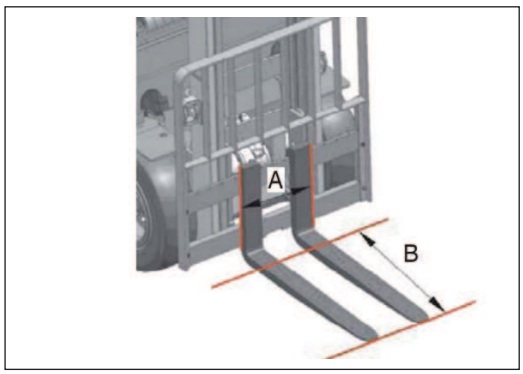
2) CAUTIONS ON REPLACEMENT OF BATTERY



- **Make sure of mounting space of the battery before replacing the battery.**
- **Open the top cover and the side door of the battery.**
- **Disconnect the battery cable.**
- **Arrange the battery connectors and cables tidy on the cells to prevent protrusion of the connectors or the cables above the metal housing during replacement of the battery. Protruded cable above the metal housing may be caught in the frame during replacement of the battery.**
- **If it is not allowed to release the locking device with the hands since the battery is attached closely to the locking device, slightly push the battery with the forks or the jig inward, and then release the locking device.**

3) REPLACEMENT WITH LIFT TRUCK

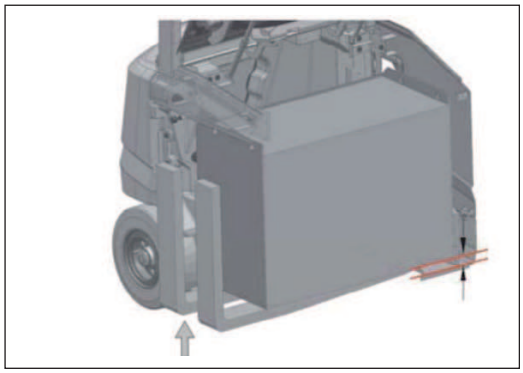
(1) Adjust the width of the forks (A) aligned with the opening of the frame floor, and mark insertion depth (B).
- Width (A): 326 mm
- Depth (B): 830 mm



(2) Replace the battery by working in pair (operator, and signal man). Insert the forks under the center of the battery while preventing collision with the door.

(3) Slowly lift the forks to raise the battery above the frame (10-15 mm), tilt the forks to keep the battery horizontal with the ground.

(4) Drive the lift truck backward while preventing collision between the top cover and the frame, and cable being caught to remove the battery.



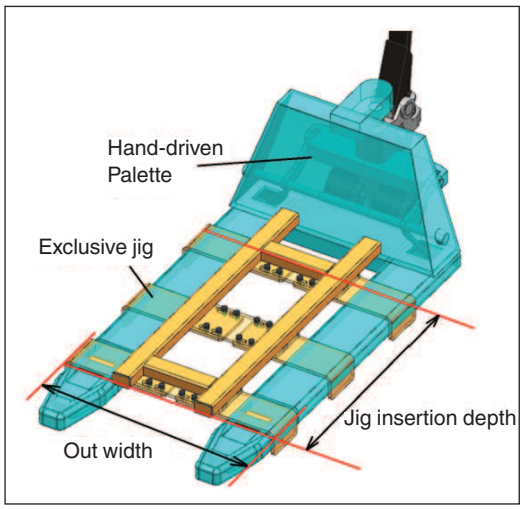
4) REPLACEMENT WITH PALETTE TRUCK

(1) Prepare hand-driven palette (outer width of 680 mm), and exclusive jigs.

(2) Align the exclusive jig on the center of the palette, mark jig insertion depth (B: 780 mm).

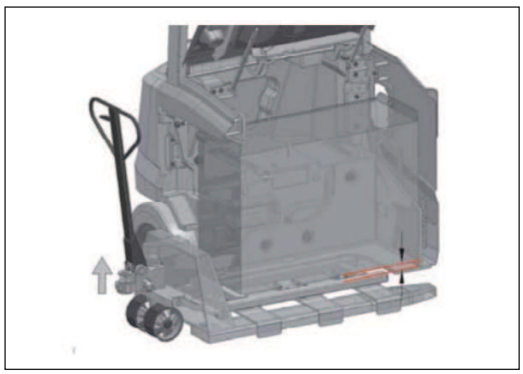
(3) Keep the lift truck at elevation of 140 mm from the ground.

※ **Refer to the min. height of battery lifting.**

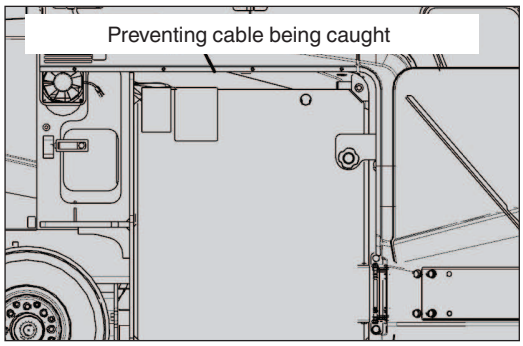


(4) Insert the palette under the center of the battery.

(5) Slowly lift the forks to raise the battery above the frame (10-15 mm), tilt the forks to keep the battery horizontal with the ground.

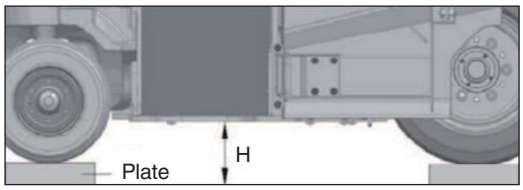


(6) Drive the lift truck backward while preventing collision between the top cover and the frame, and cable being caught to remove the battery.



5) MIN. HEIGHT OF BATTERY LIFTING

- **If the tires have excessively been worn, the height of the lift truck from the ground will be reduced, and the height for inserting the jig may not be allowed.**
- **Install plates (10-20 mm) under the front and the rear wheels to compensate abrasion of tire.**



- **Determine the height of the front and there are plates to keep the lift truck level.**
- **Align the plate height to keep the elevation above the ground (H) at 140 mm or more.**

6) TRANSPORTATION OF BATTERY

- **Extreme care should be exercised for driving while transporting the battery.**
- **Transport the battery on flat and even ground only.**
- **(Not on slope or uneven surface)**
- **Drive at low speed, and slowly steer.**
- **Cautiously brake.**
- **Do not travel long distance with the battery loaded on lift truck or palette truck.**

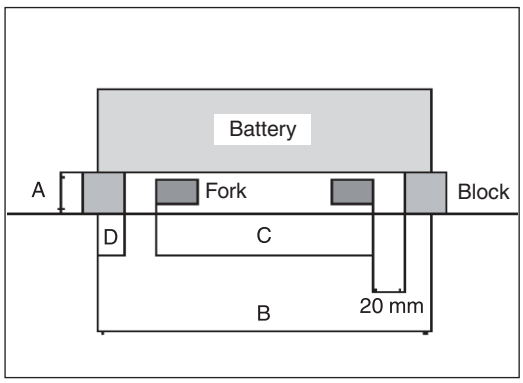
7) BATTERY DOCKING

- **Prepare a dock by referring to the recommended dimensions of battery dock.**
- **Slowly insert the forks of lift truck or palette truck under the center of the dock.**
- **Slowly lower the forks of lift truck or palette truck to seat the battery on the dock.**
- **Ensure that the battery is stably docked, and then drive lift truck or palette truck slowly backward to withdraw the forks.**

(1) Battery docking with lift truck

- Use block of height of 60 mm or more (A).

Battery width (B)	466mm
Fork width (C)	326mm
Block height (D)	50mm

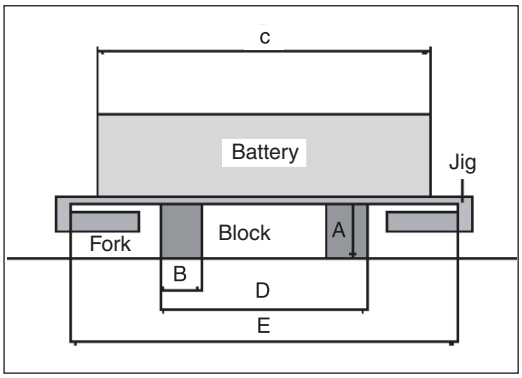


(2) Battery docking with palette truck

- Use block of height (A) of 90 mm and width (B) of 60 mm or more.

- When operating the truck without interruption by replacing the battery with palette truck, number of jigs for battery replacement should be same as batteries under operation.

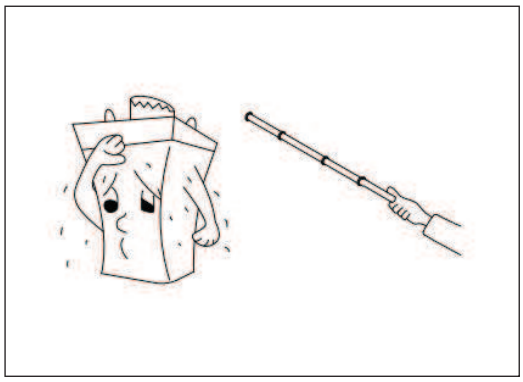
Battery width (C)	466mm
Block gap (D)	300mm
Outer width of fork (E)	680mm



15. BATTERY MAINTENANCE

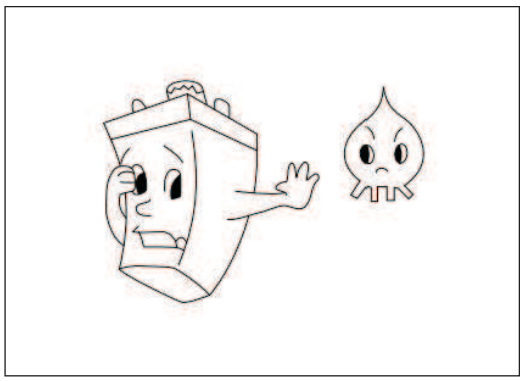
1) PROHIBITION OF OVER-DISCHARGE

If the battery is so exhaustively consumed that the truck cannot move anymore, the service life of the battery is reduced. When turning the starting switch to ON position, and the battery charging indicator bar blinks, immediately charge the battery.



2) STRICT PREVENTION OF OPEN FLAME

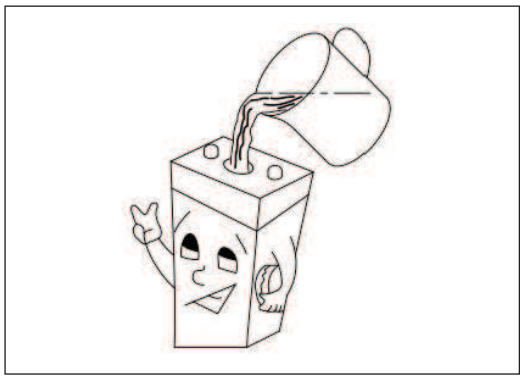
The battery contains inflammable gas. Never let open fame get near the battery.



3) MAKEUP WITH DISTILLED WATER

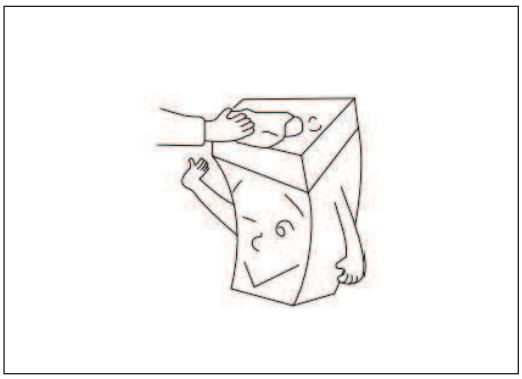
Electrolyte is reduced by dissolution during charging, and natural evaporation. Make up the electrolyte with distilled water up to the specified level before performing even charging. It is not required to make up with thin sulfuric acid except overflow of electrolyte.

※ **Regularly check the electrolyte level, and make up with distilled to keep the normal level. If electrolyte is higher than the specified level, electrolyte overflows to cause damage and failure of the truck.**



4) KEEPING BATTERY CLEAN

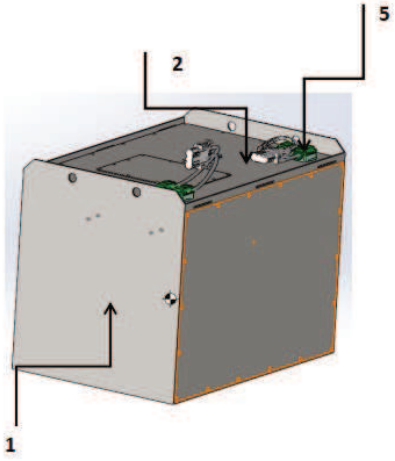
Keep the top of the battery clean and dry. Securely tighten the stopper of the solution port.

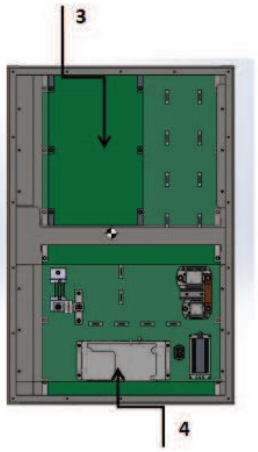


16. LITHIUM ION BATTERY (OPT)

1) STRUCTURE

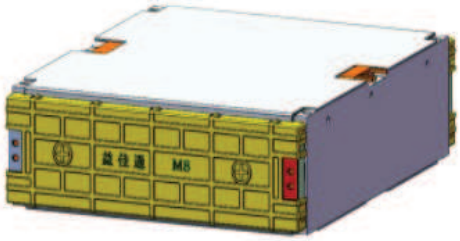
(1) Battery pack

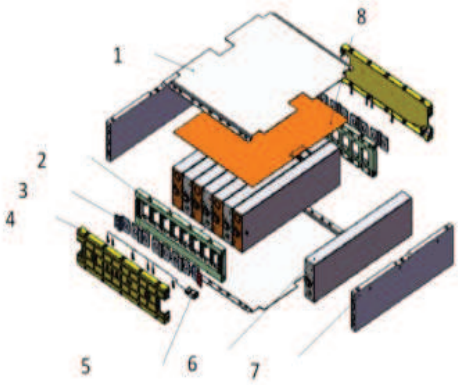




1	Housing	2	Top case	3	Module
4	BMS	5	Cable		

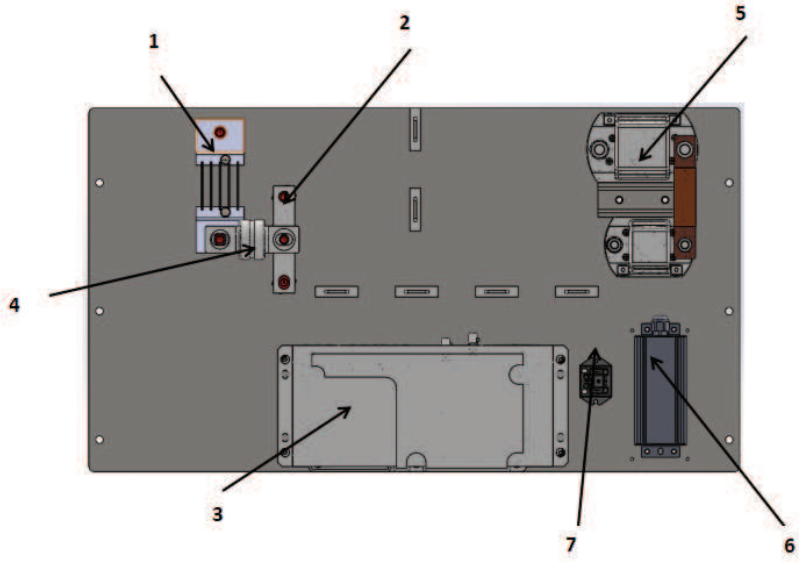
(2) Battery module





1	Aluminum cover plate	2	Wire harness bracket	3	Tandem array	4	Plastic cover
5	Acquisition harness	6	Electric core	7	End plate	8	Heating plate

(3) BMS and BPU



1	Diverter	2	Wiring busbar	3	BMS	4	Fuse
5	Relay	6	DC-DC	7	Relay		

2) INSPECTION PROCEDURES

(1) Daily inspection before starting

- Make sure that the battery pack charging terminal (DIN320 connector) is disconnected on the charge.
- Check the battery pack charging terminal for fixed state.
- Check the battery pack charging terminal for damage.
- Check the battery pack charging terminal and system load for fixed state.

(2) Measures for abnormality before starting

① Voltage on charging and discharging terminals of battery pack

- Servicing is required for troubleshooting of failure by molten relay, short on both ends of relay.
- Servicing is required in cases of function failure of BMS, or power supply to BMS.

② Measures for poor stationary conditions of charging and discharging terminals of battery pack

- Check tightening status of bolts of charging/discharging terminals.
- Fasten the bolt at specified torque.

③ Damage of battery pack charging terminal

- Replace with specified connector (DIN320).

(3) Checking for defects after start stopping

- Check if starting is stopped before connecting charging terminal on battery pack charging terminal.
- Check if voltage is detected before connecting charging terminal on battery pack charging terminal.
- Check the battery pack charging terminal for damage.

(4) Measure for defects after start stopping

① When starting is not stopped

- Starting should be stopped.

② Voltage detected on charger terminal
- Make sure that starting is stopped. If so, take servicing action.
- Failure by molten relay is suspected. Take servicing action.

③ Charging terminal of charger or battery pack damaged
- Replace with specified connector (DIN320).

3) Charging process

(1) The relationship between battery temperature and charging current when the battery charge SOC ＜ 100% is shown in the following table.

Battery temperature T(℃)	Charging current I(A)
≤0	0
≤5	60
≤10	90
≤15	120
≤55	150
≤65	120

(2) Current drop at charging end

① When the cell voltage Vmax ≥ 3550 mV, the charging current is 90A.

② When the cell voltage Vmax ≥ 3580 mV, the charging current is 30A.

③ When the cell voltage Vmax ≥ 3600mV, full-charge calibration is carried out to calibrate SOC to 100% charge stop.

4) Battery charging heating mode (OPT)

16/20BE-X Charge heating			
Minimum battery temperature	Heating function (current)	Charging function (current)	Total output current
T ≤ 0℃	O(13A)	X	13A
0℃ ＜ T ≤ 5℃	O(13A)	O(60A)	73A
5℃ ＜ T ≤ 10℃	O(13A)	O(90A)	103A
10℃ ＜ T ≤ 15℃	O(13A)	O(120A)	133A
15℃ ＜ T	X	O(150A)	150A

5) Battery discharge heating mode (OPT)

(1) When the minimum battery temperature is T≤-30℃, heating mode cannot start.

(2) When the minimum battery temperature is -30℃＜ T≤-20℃, the battery is turned on in heating mode, and the vehicle cannot run or lift. The fault code “B 49 Battery heating. Vehicle stops” will be displayed on the instrument.

(3) When the minimum battery temperature -20℃＜ T≤-15℃, the battery is turned on in heating mode, and the maximum speed of the vehicle is 8km/h. The fault code “B 1 BMS CUT-BACK, B 7 discharge cell temp.low_2” will be displayed on the instrument.

(4) When the minimum battery temperature -15℃＜ T≤5℃, The battery is in heating mode and the vehicle is working normally.

(5) When the minimum battery temperature T ＞ 5 ℃, turn off the heating mode, normal operation of vehicle.

Note: Discharge heating, turn on the vehicle key switch to heat, when the battery heating minimum temperature rises to 6℃, stop heating, this time if the vehicle key switch does not restart, then the minimum temperature must be -11℃ when the heating function will be turned on again.

17. LITHIUM ION BATTERY CHARGER (OPT)

※ **Read and understand the following instructions before connecting battery charger to power source and battery.**

1) USE AND OPERATION

(1) When using battery charger, safety requirements should be satisfied pursuant to the local laws and regulations, and regulations stipulated by local authorities.

(2) User should use charging system by complying with current regulations, avoid actions that may endanger lives and health of others, and prevent damage to properties.

2) WARNING ON INSTALLATION AND SAFETY

Read and understand the following instructions before connecting battery charger to power source and battery.

(1) Mount the battery charger on the wall, and fix the charger with plug though slot for ensuring correct functions and improving yield. Special attention should be paid protecting ventilation slots from clogging.

(2) Authorized skilled experts are only allowed of opening battery charger.

(3) Vent insulation sections of power cable and battery connector before operating the battery charger.

(4) Skilled engineers are only allowed of performing works on electric apparatus.

(5) Shut power off before connecting or disconnecting the battery.

(6) The battery under charging generates explosive gases. Do not smoke in the vicinity of the truck. Avoid open flame and spark, and prevent access of other truck that may cause risky situations on human beings and properties.

(7) The battery charger contains electric components generating electric arc and spark, and should be positioned on place adequate for functions of the charger when using it in confined space. Every standard battery charger should be used on hard and flat floor in contained space of well ventilation and free from rainwater and/or water splash. In particular, place of dusty environment, or with water or heat source, or high humidity should be avoided. Do not place the battery charger on floor and/or shelf made of wooden material or other inflammable materials, or do not stack objects around the charger. Never put any item or solution container on the lid of the charger.

(8) The battery charger should be connected to grounded receptacle/socket for preventing shock. Further, receptacle/socket for connecting with the battery charger should compliant with the charger capacity, and should be protected by proper electric devices pursuant to the standards (e.g., fuse and auto switch). Protection system should have calibration margin of 10% or higher based on current absorption ratio of the truck for sufficient selectivity.

(9) Always use special bipolar connector (DIN 320 REMA).

(10) Do not extent existing power connection with additional cable.

(11) The charger is free from maintenance except routine cleaning. Cleaning should be performed regularly dependent upon working environments. Disconnect power cable and battery connection cable from power source before cleaning the charger.

3) POWER CONNECTION

The battery charger should be connected to power receptacle compatible with capacity of installed battery charger. Correctly connect the charger to grounding line. It is desirable to verify that main power of 3-phase is supplied on place for operating the battery charger while installing the charger (or moving the batteries).

Battery voltage (V)	Charger current (A)	Module power (kW)	Input LAC norm (A)
51.2	200	12	24
83.2	200	20	40

4) BATTERY CONNECTION

It is recommended to use bipolar connector compliant with the specification pursuant to the standards to prevent inverse connection of the polarity of the battery. Check the cable connection of the connector contact. Skilled engineers are only allowed of performing this work.

※ **USB port should only be used for programming charging variables, and downloading history data and graphs. Disconnect USB cable from the charger to prevent unexpected consequences on the battery charger and the battery by interruption of charging process from EMI noise.**

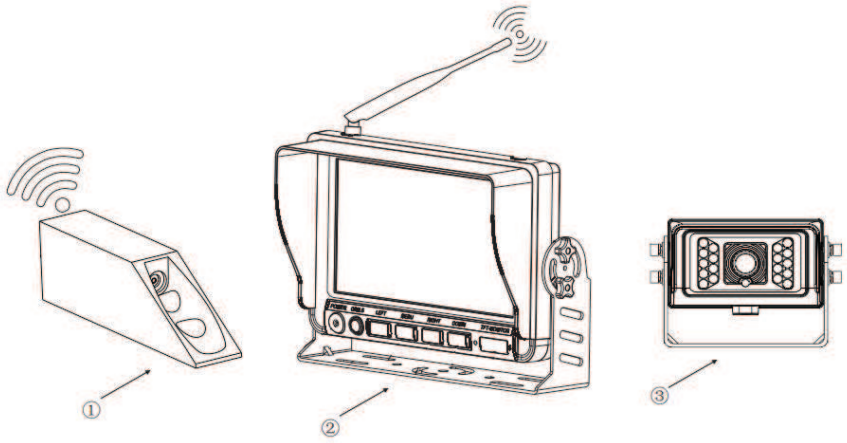
5) PRECAUTION DURING CHARGING

Shut down starting switch, and emergency stop switch of the truck before battery charging.
Completely connect the battery charger to the battery connector for charging. Check texts of CAM Bus on the bottom left of the charger monitor after beginning charging.
Do not disconnect the connector during charging. (Never forget to press the ON/ OFF switch of the charger to stop operation of the charger before disconnecting the connector.)

18. CAMERA (OPT)

1) STRUCTURE

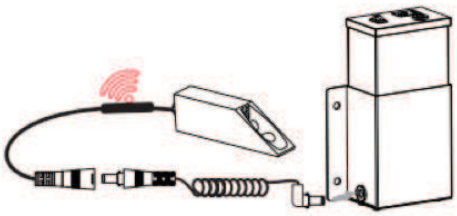
Camera components Front camera, rear camera, and display panel.



1 Front camera 2 Display screen 3 Rear camera

2) FRONT CAMERA

The front-facing camera has a portable power supply.



(1) This device used for temporary power supply for monitor system Bank Application Manual of forklift, reach trunk, portable device and other small digital electronic products.

(2) The power is stored in polymer core battery, with high density energy, long cycling life, environment friendly.

(3) With spilt design, stainless fixed base + battery with stainless steel housing, built-in strong magnetic, super easy mounting, user friendly.

(4) Built-in short circuit & overcurrent & overcharge protection.

(5) Support DC12.6V(1A-4A) fast charge.

(6) Smart Charger: Input: AC110-240V; Output: DC12.6V(3A):

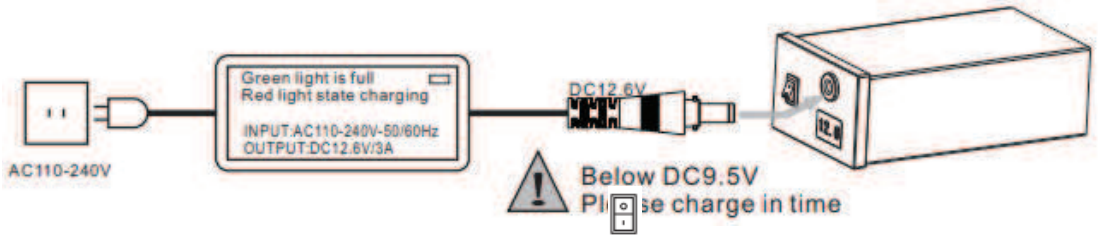
(7) Base: output DC port; Battery: input DC port, protective rating: IP66.

(8) LED Display Board Power Display (＞ DC9.9V 25%/＞ DC10.7V 50% ＞ DC11.4V 75%/＞ DC12.2V 100%)

How to use

Charge with smart power adapter/auto stop voltage: DC12.6V/1-4A.

Charging Voltage Display: > DC9.9V 25%/ > DC10.7V 50% > DC11.4V 75%/ > DC12.2V 100%.



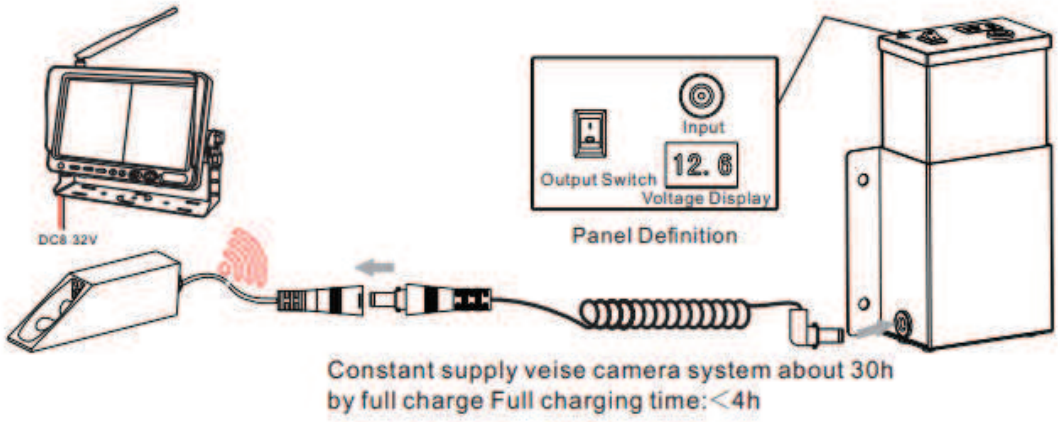
Connect monitor camera to mobile power bank, press on/off.

Discharge Battery Voltage Display: > DC9.9V 25%/ > DC10.7V 50% > DC11.4V 75%/ > DC12.2V 100%.

Protection status:

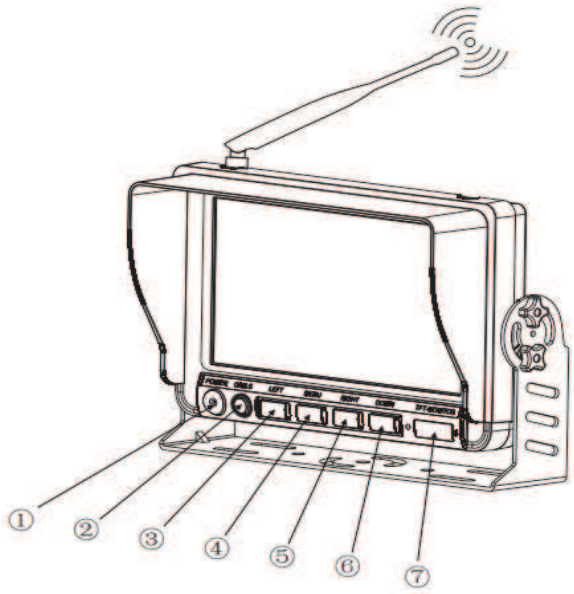
Short circuit protection: no power output if loading short circuit.

Over discharge protection: Auto power off if voltage lower than DC9.5V.



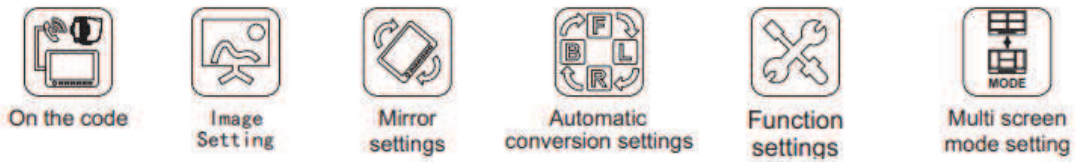
※ **Remark: When the discharge voltage is lower than 9.9V, charge the battery.**

3) DISPLAY SCREEN

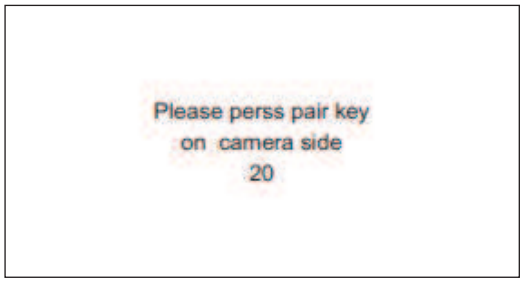


1	Power	4	Menu	7	Nameplate
2	OK	5	Right key / volume +		
3	Left key / volume -	6	Down (CH switch)		

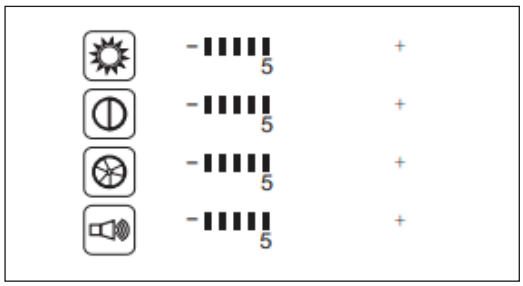
How to use



(1) Code settings: Enter the menu, check the code options menu, press the confirmation button to start the code, display the code. Character Please press pair Keyon camera side 20, pair code time. The countdown is 20 seconds, the camera is recharged and waited for 5~10 seconds to display and photograph. The machine connects to the communication and displays the image normally.



(2) Image settings: Enter the menu, select the image settings options menu, press the confirmation button to enter the image settings:



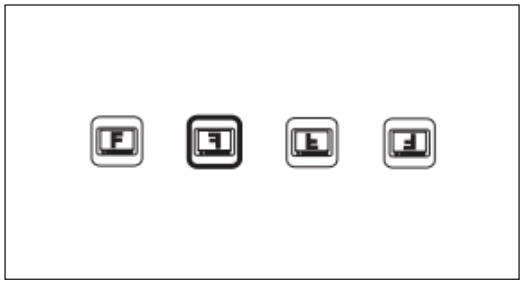
① Brightness setting: 0-9 (left / right key adjustment step size)

② Contrast settings: 0-9 (left / right key adjustment step size)

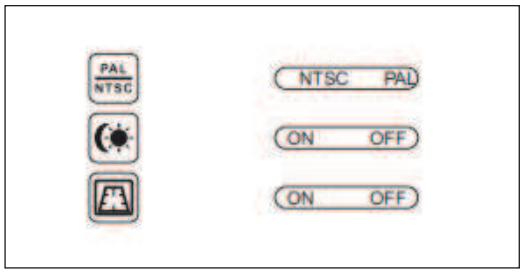
③ Color settings: 0-9 (left / right key adjustment step size)

④ Volume control: 0-9 (left / right key adjustment step size)

(3) Mirror settings: Set the four states of the CAM1/CAM2 channel image: Positive image, mirror image, vertical flip image and vertical flip mirror, Default state: Positive image.



(4) Automatic switch mode settings: 1.Set up CAM1/CAM2 channel automatic switching mode to turn on and off: 2. Set CAM1/CAM2 channel automatic switching mode time value 5~45, Default state: 5S.

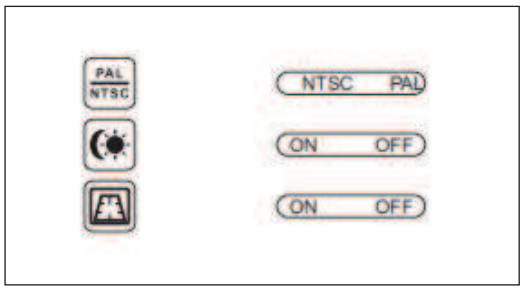


(5) Function settings:

① Switch between NTSC and PAL, Default state: NTSC:

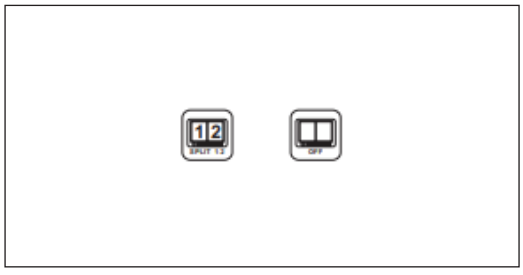
② Set up the LED screen environment light source mode to turn on and off;

③ Reversing scale setting: set up CAM2 channel reversing scale open and close.



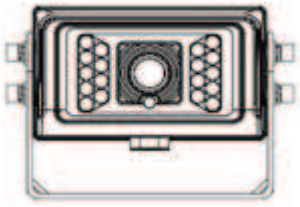
(6) Multiscreen mode display settings:

① Settings screen can be switched to two-screen display, open by default.



4) REAR CAMERA

The rear camera connects to the display via a wireless signal.



19. STORAGE

※ **Cautions**
Improper storage of the truck may cause damage and corrosion of major functional parts, or damage and discharging of the battery. The battery of the lift truck should be stored in indoor environment to prevent damage by rainfall.

1) DAILY STORAGE

Follow the instructions below when storing the lift truck in a warehouse.

(1) Place the lift truck in dry and clean environment of well ventilation, and free from frost.

(2) Make sure parking brake is applied.

(3) Make sure that the forks have been lowered on the floor, and the mast vertically inclined.

(4) Turn both of the starting switch and the emergency stop switch to OFF position to shut off power to the battery.

2) LONG-TERM STORAGE

Notes on storage

(1) Clean the truck clear.

(2) Check the functions of the brake, the mast, motor starting, steering, horn, and electric parts.

(3) Check the hydraulic oil level, and makeup the oil, if required (See Table Recommended Lubricants on page 7-46).

(4) Apply thin film of oil or grease on all of surfaces not coated with paint.

(5) Supply grease to the lift truck at injection points specified in 'Regular Checklist.'

(6) Coat all of exposed electric connections with adequate spray.

(7) Disconnect the battery cable, and then clean the battery. When the lift truck is to store for a month or longer, remove the battery from the truck, and store it in indoor place.

- **Refer to 'Battery Maintenance' on Page 7-20 for further information of maintenance of the battery.**

3) NOTES DURING STORAGE

(1) Drive the truck for a short distance while operating the attachments (e.g., lift, tilt, etc.).

(2) Check exposed parts for rust once a month.

(3) Check voltage of the battery once a month, and recharge the battery, if required.

4) NOTES AFTER STORAGE

(1) Clean the lift truck clear.

(2) Reconnect the battery cable, and check the battery voltage.
- Recharge the battery, if required, and then check specific gravity of electrolyte.

(3) Lubricate the lift truck with grease at injection points specified in 'Regular Checklist.'

(4) Check for condensed water in hydraulic oil, gear oil, brake oil, drive axle oil, and driver oil, and drain water or replace the oil, if required.

(5) Start the truck, and check for all of functions and oil leak.
- Move the truck up to the final cylinder stroke ten times or more to bleed air from the tank to operate the attachments.
- Points and electric parts of operation, steering, and noise.
- Leak from cylinder, MCV, pump, powertrain part, tube and hose.

20. LUBRICANTS FOR NEW TRUCK

Lubricants and oils listed below are used on new truck for shipping.

Item	Specifications
Gear oil	85W90 GL5
Hydraulic oil and steering oil	ISO VG32, VG4, VG68, Hyundai's long-life hydraulic oil ISO VG15, Hydraulic oil★
Brake oil	DOT3
Grease	NLGI No.2

ATF : Automatic Transmission Fluid
ISO : International Organization for Standardization
NLGI : National Lubricating Grease Institute
★ : Regions of cold climate (Russia, CIS, Mongolia)

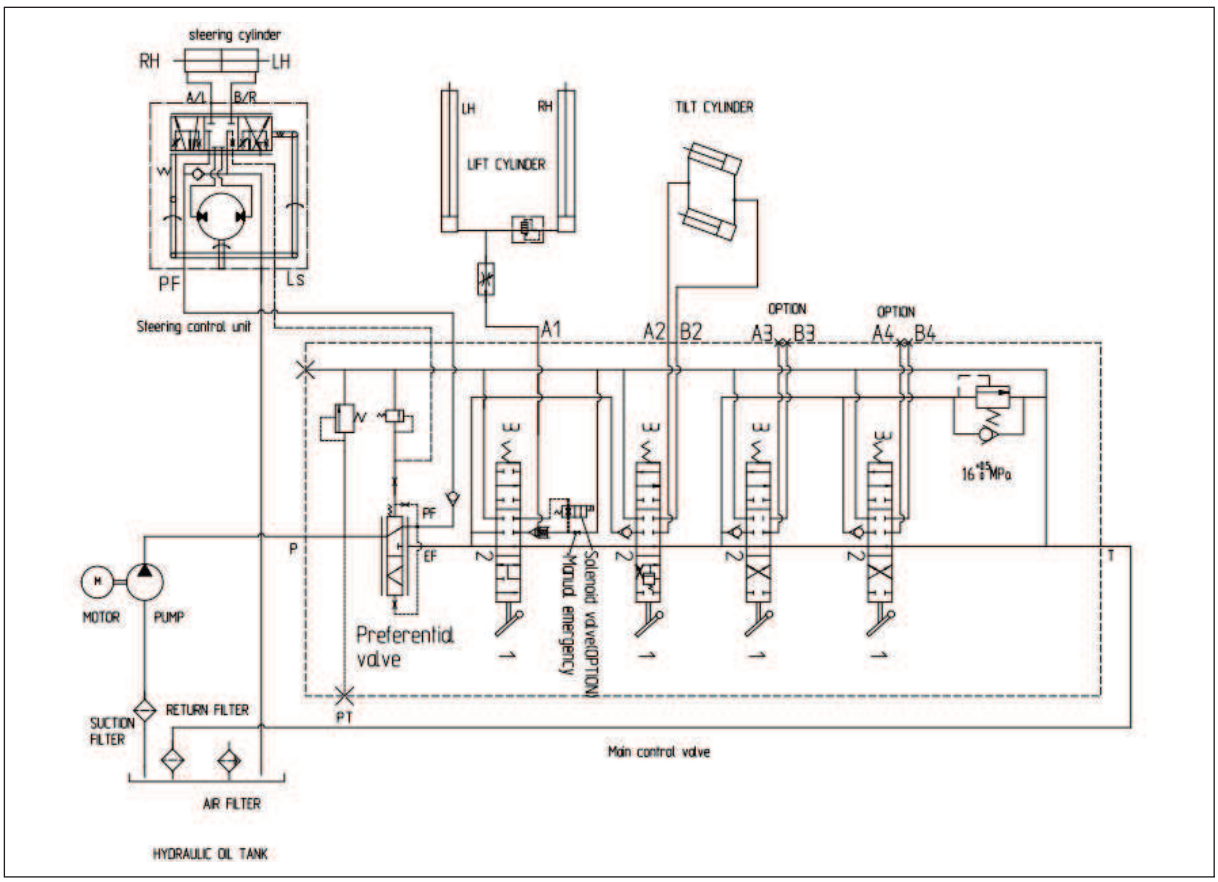
21. RECOMMENDED LUBRICANT

Item	Lubricant type	Capacity (l)	Ambient temperature °C (°F)								
			-50	-30	-20	-10	0	10	20	30	40
			(-58)	(-22)	(-4)	(14)	(32)	(50)	(68)	(86)	(104)
Axle	Gear oil	3.5	★ 85W90 GL5								
Hydraulic oil tank	Hydraulic oil	33	★ ISO VG 15								
				ISO VG 32							
					ISO VG 46						
						ISO VG 68					
Brake system	Brake oil	0.25	★ DOT3								
Fitting (Grease nipple)	Grease	0.1	★ NLGI No.1								
						NLGI No.2					

★ Regions of cold climate (Russia, CIS, Mongolia)

22. SCHEMATIC DIAGRAM

1) HYDRAULIC CIRCUIT



(1) LIFT ASCENDING, TILTING REAR

When pulling lift and tilt operation lever, spools of first and second blocks move to position of lift ascending tilting backward. Hydraulic oil of hydraulic pump flows into main control valve to push rod check valve of spool to large chamber of lift cylinder and small chamber of tilt cylinder.

At the same time, hydraulic oil from small chamber of lift cylinder and large chamber of tilt cylinder returns to hydraulic oil tank. This hydraulic oil flow forms lift ascending and tile backward.

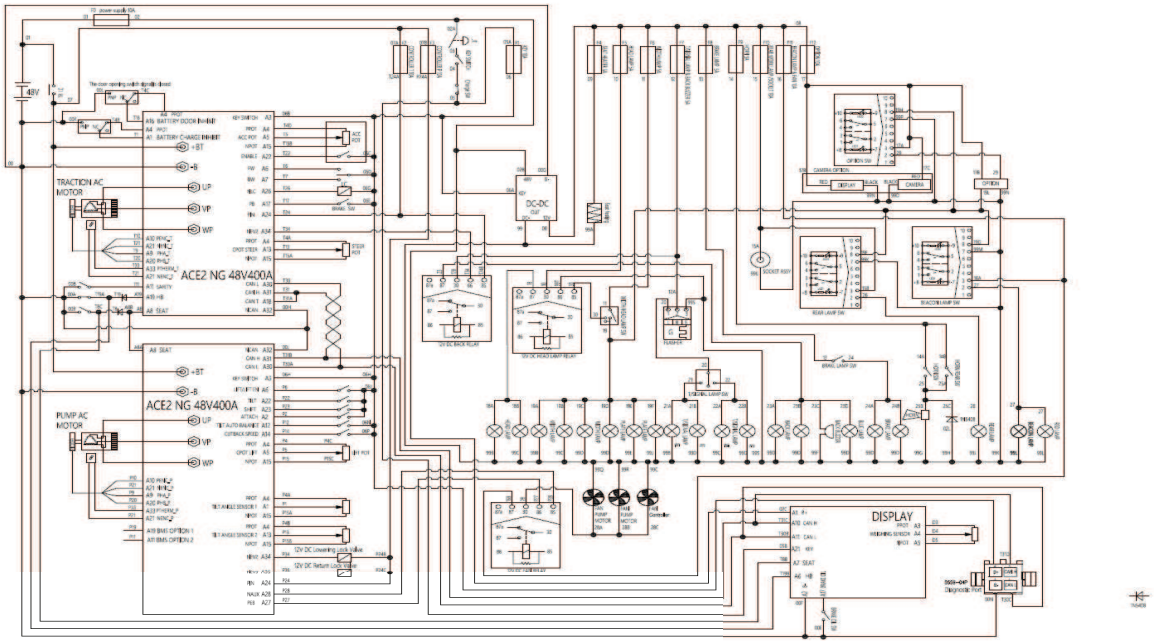
(2) LIFT DESCENDING, TILTING FORWARD

When pushing lift and tilt operation lever, spools of first and second blocks move to position of lift descending tilting forward. Hydraulic oil of hydraulic pump flows into main control valve to push rod check valve of spool to move to large chamber of tilt cylinder.

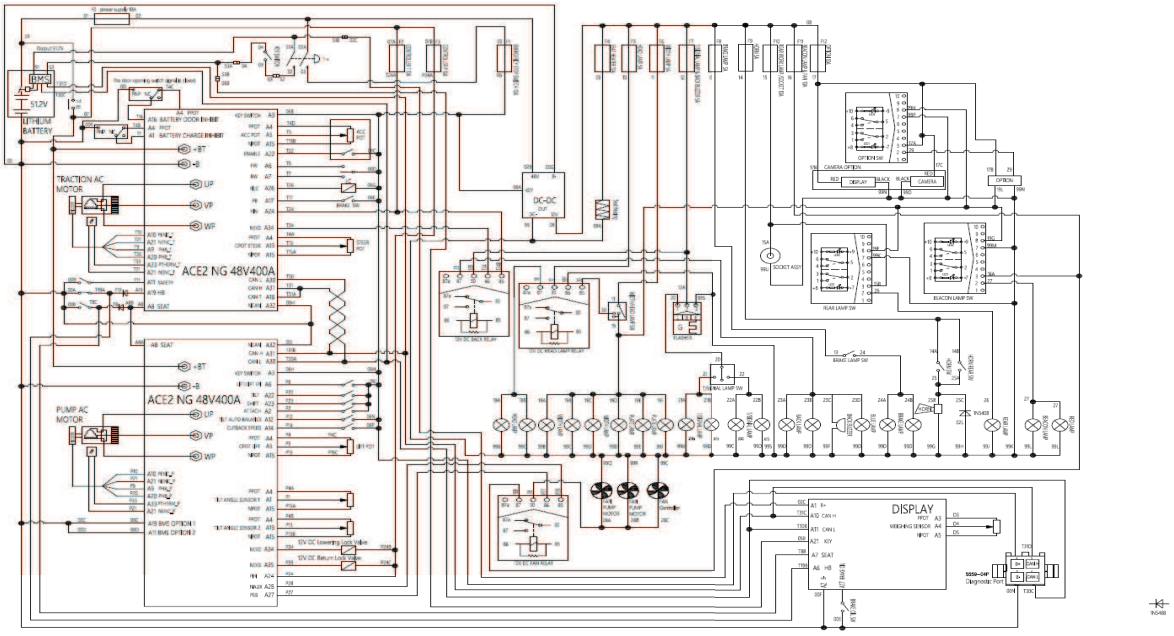
Large and small chambers of lift cylinder are connected to return path to let return of hydraulic oil, and mast descends with weight of forks.

Hydraulic oil from small chamber of tilt cylinder is returned to hydraulic oil tank. This hydraulic oil flow forms tilting forward.

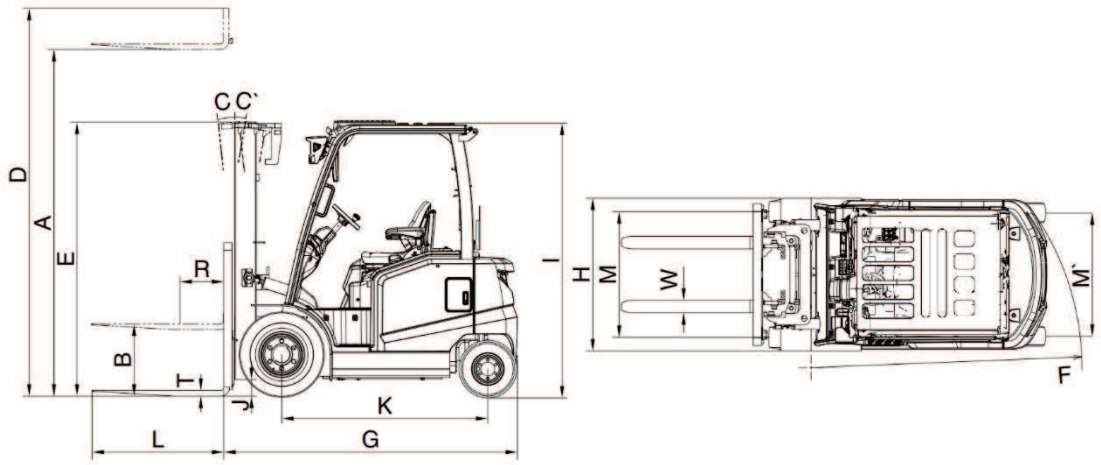
2) ELECTRICAL SCHEMATIC DIAGRAM OF LEAD-ACID BATTERY 16/20BE-X



3) ELECTRICAL SCHEMATIC DIAGRAM OF LITHIUM BATTERY 16/20BE-X (OPT)



1. SPECIFICATION TABLE



Item			Unit	16BE-X	20BE-X
Rated load			kg	1600	2000
Center of gravity		R	mm	500	←
Weight			kg	3323	3678
Forks	Lifting height	A	mm	3000	←
	Free lift	B	mm	35	←
	Lifting speed (load/non-load)		mm/sec	330/500	←
	Lowering speed (load/non-load)		mm/sec	500/450	←
	Length × width × thickness		mm	900 × 100 × 40	←
Mast	Tilt angle(F/R)	C/C'	Degree	5/7	←
	Max. height	D	mm	4020	←
	Min. height	E	mm	1977	←
Others	Travel speed (load/non-load)		km/h	14/15	←
	Max. gradeability (load)		%	16	←
	Min. turning radium (outside)	F	mm	1890	1910
	Max. hydraulic force		MPa	19.0	←
	Hydraulic oil tank		l	33	←
Overall length		G	mm	3000	3020
Overall width		H	mm	1185	←
Overhead guard height		I	mm	2125	←
Ground clearance (mast)		J	mm	110	←
Distance between axles		K	mm	1370	←
Distance between wheels		M/M'	mm	980/945	←

2. SPECIFICATION FOR MAJOR COMPONENTS

1) CONTROLLER

Item	Unit	16/20BE-X	
Controller	-	Drive	Pump
Model	-	ZAPI ACE2 NEWGEN	←
Type	-	AC	←
Current limit	V-A	48-400	←
Communication	-	CAN	←

2) MOTOR

Item	Unit	16/20BE-X	
Motor	-	Drive	Pump
Type	-	YST8H4-9-001	YSP5H4-13-001
Rated voltage	Vac	29.5	29.5
Output	kW	9	13
Insulator	-	H	H

3) BATTERY

Item	Unit	16BE-X	20BE-X
Type	-	Plumbic acid	←
Rated voltage	V	48	←
Capacity	AH/hr	420/5	←
Electrolyte	-	Wet	←
Dimensions (W × L × H)	mm	826 × 422 × 744	←
Connector	-	SB350	←
Weight	kg	727	←

LITHIUM ION BATTERY (OPT)

Item	Unit	16BE-X	20BE-X
Rated voltage	V	51.2	←
Capacity	AH	300	←
Dimensions (W × L × H)	mm	826 × 422 × 744	←
Weight	kg	727	←
Connector	-	DIN 320	←

4) CHARGER

Item	Unit	16BE-X	20BE-X
Capacity of battery for charging	V-AH	48V/420-450	←
AC input	V	3-Phase,220	←
		3-Phase,380	←
		3-Phase,440	←
DC output	V	68 ± 0.5	←
Charging time	hr	8 ± 1	←
Connector	-	SB 350 or SR 350	←

LITHIUM ION CHARGER (OPT)

Item	Unit	16BE-X	20BE-X
Capacity of battery for charging	V-AH	51.2-300	←
AC input	V	3-Phase, 380-440	←
DC output	V	57.5-58	←
Charging time	hr	2.5	←
Connector	-	DIN 320	←

5) GEAR PUMP

Item	Unit	16BE-X	20BE-X
Type	-	Out gear pump	←
Capacity	cc/rev	21	←
Max. working pressure	bar	206	←
Rated rotation rate (max/min)	rpm	3000/500	←

6) MAIN CONTROL VALVE

Item	Unit	16/20BE-X
Type	-	2/3/4 spools
Operating mode	-	Mechanical
Primary relief valve pressure	bar	195
Secondary relief valve pressure	bar	160

7) T/M

Item	Unit	16/20BE-X
Type	-	Integrated
Stage	-	1/1
Transmission ratio	-	25.047
Noise (Rated input speed)	dB(a)	86
Transmission efficiency	-	≥90%

8) WHEEL

Item	16BE-X	20BE-X
Type (front/rear)	Solid (opt: pneumatic, no-marking)	←
Quantity (front/rear)	2/2	←
Front-wheel drive	21*8-9-16PR	28*9-15-16PR
Rear-wheel drive	18*7-8-14PR	←

9) BRAKE AND STEERING SYSTEMS

Item		16/20BE-X
Brake	Traveling	Front-wheel mounted, dry disk mode
	Parking	Mechanical
Steering	Type	Hydraulic steering

3. FASTENING TORQUE

Sequences	Item		Screw specifications	kgf • m
1	Electric systems	hydraulic pump motor mounting nut	M10 × 1.5	5.0 ± 0.7
2		Drive motor mounting bolt	M14 × 1.5	15.7 ± 3.0
3	Hydraulic systems	hydraulic pump mounting bolt	M10 × 1.5	6.9 ± 0.5
4		MCV mounting bolt, nut	M10 × 1.5	6.9 ± 0.5
5		Steering unit mounting bolt	M10 × 1.5	5.0 ± 0.5
6		Tilt cylinder rod-end bolt, nut	M12 × 1.75	9.5 ± 0.5
7		Tilt cylinder pin mounting bolt	M10 × 1.5	6.9 ± 0.5
8	Powertrain system	Drive axle mounting bolt, nut	M16 × 2.0	29.5 ± 0.5
9		Steering axle mounting bolt, nut	M20 × 2.5	57.5 ± 8.0
10		Transmission mounting bolt, nut	M10 × 1.25	7.5 ± 0.5
11		Front wheel mounting nut	M16 × 1.5	30 ± 3.0
12		Rear wheel mounting nut	M14 × 1.5	21 ± 1.5
13	Others	Counterweight mounting bolt	M24 × 3.0	73.5 ± 15
14		Mast mounting bolt	M16 × 2.0	36.5 ± 7.0
15		Operator's seat mounting nut	M8 × 1.25	3.4 ± 0.7
16		Overhead guard mounting bolt (front)	M12 × 1.75	12.0 ± 0.5
17		Overhead guard mounting bolt (rear)	M12 × 1.75	12.0 ± 0.5

APPENDIX

1. REVISION TABLE

Revision	Version No.	Date	Note
00	9YMD-91010C	2023.05.08	The first printing
01	9YMD-91010C	2023.08.29	Correct errors

Electromagnetism compatibility is measured according to EN 12895:2015+A1:2019, and meet with Directive 2014/30/EU.
Products comply with the following EU directives and standards:
Machinery Directive 2006/42/EC
EMC Directive 2014/30/EU
LVD Directive 2014/35/EU
EN ISO 12100:2010
EN ISO 3691-1:2015+A1:2020
EN 1175:2020
EN 16307-1:2020
EN 12053:2001+A1:2008
EN 13059:2002+A1:2008
EN 60204-1:2018
EN 12895:2015+A1:2019

HD HYUNDAI XITESOLUTION | MATERIAL HANDLING

EN - English (E1) - June 2024
PART NO. : 9YMD-91010C