

AMPHIBIOUS EXCAVATOR SERIES

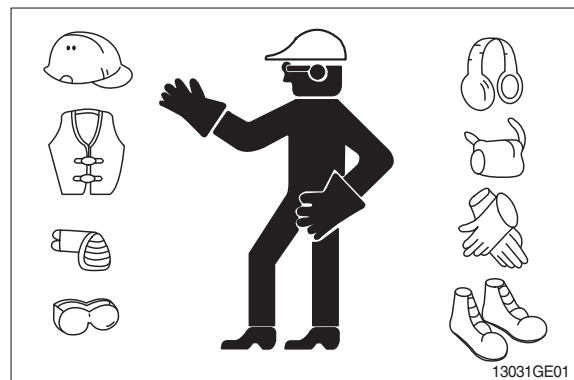
1. SAFETY OPERATION

1) UNDERSTAND MACHINE OPERATION

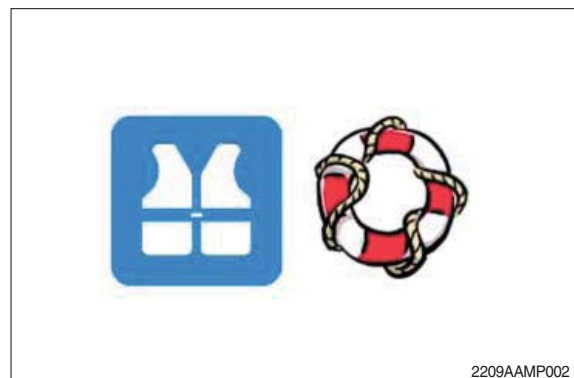
- (1) Only qualified operator with understanding and experience should operate the amphibious machine. This operation manual must be read carefully and operators must understand all the contents before operate the amphibious machine.
- (2) Operator must hold normal excavator license certified by local government. Training must be conducted to inexperienced operator before operate the machine.
- (3) Learn and remember the location and purpose of all controls, instruments, buttons, indicator lamps and caution signs.

2) WEAR PROTECTIVE CLOTHING

- (1) Wear protective clothing and other safety equipment during machine installation, operation and maintenance.

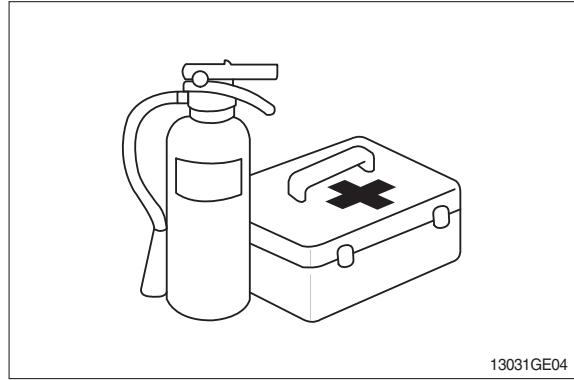


- (2) Prepare lifebelt inside the operator cabin before operate the machine in open water. Safety life jacket must be worn for safety reason.



3) PREPARE SAFETY EQUIPMENT

- (1) Stick any provided safety sign stickers at the glass inside the operator cabin. The stickers must be in position where the operator can clearly read the sign.
- (2) Fasten a complete first-aid kit and fully charged fire extinguisher at the amphibious machine and learn how to use them correctly.

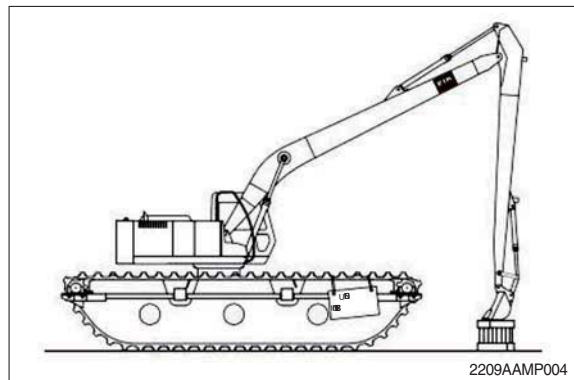


4) INSPECT THE MACHINE

- (1) Inspect your machine carefully every time before you use it. Check the base of the pontoons for damage or cracks. Do some repairing if the damage or the cracks are very serious prior to operation in open water or swampy area.
- (2) Do not start or operate the amphibious machine before you are in the operator's seat.
- (3) When you are to operate the machine, be sure that all personnel are away from the machine

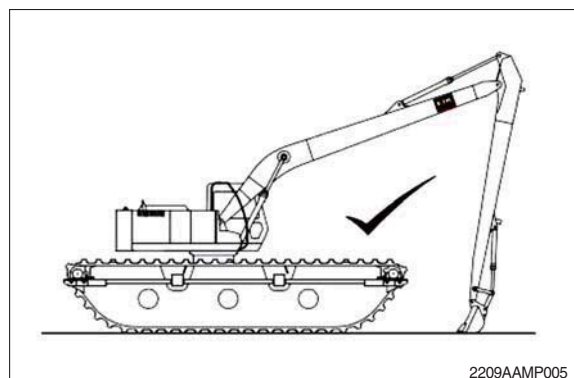
5) INSPECTION AND MAINTENANCE

- (1) Stop the engine before inspection or maintenance.
- (2) Use safety sign "under inspection and maintenance" in order to warn the others not to operate and keep away from the amphibious machine.

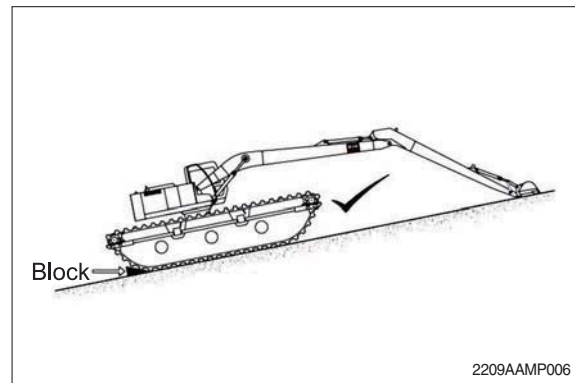


6) PARK MACHINE SAFELY

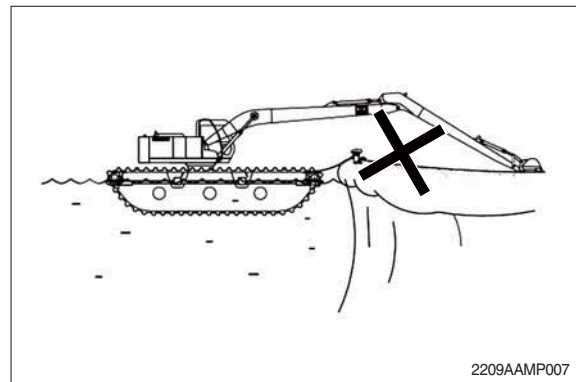
- (1) Be sure that you lower the bucket and stop the engine when you are going to park the machine. Put the control lever in neutral position before you leave the cab.



- (2) Put the blocks against the track if you park the machine on a slope and do not park the machine with the track pointed the downhill.

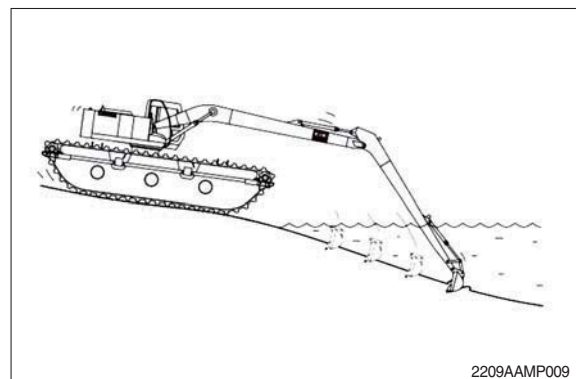
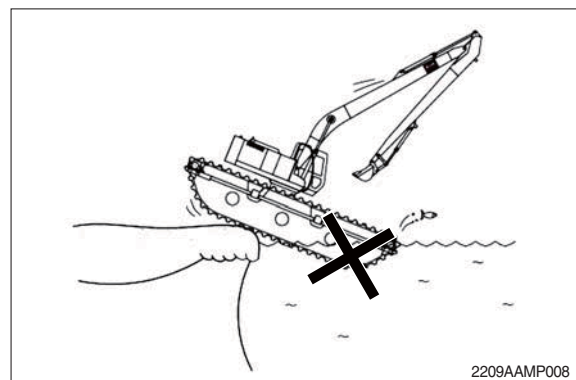


- (3) Take the engine and cab key with you before leave the machine.
- (4) Do not park your machine inside water.



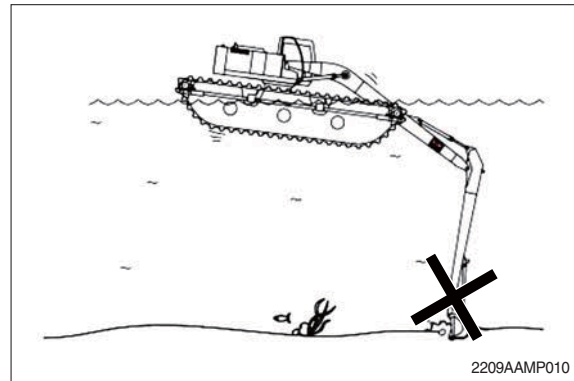
7) EXAMINE THE WATER DEPTH & WATER BED CONTOUR.

Always examine the water depth and the contour of the water bed with the excavator front attachment before launching the machine onto the water. Steep or sudden step or uneven contour may result in machine instability which could be hazardous during the launch. Do refer to see 9-5 page on the safe operating water depth for the machine.



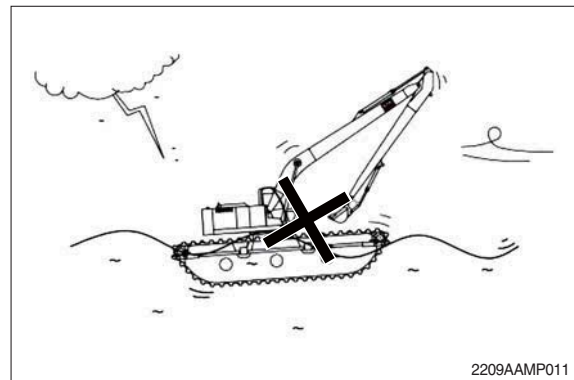
8) AVOID DIGGING JOB DURING FLOATED POSITION

In a floated position, the digging job application at the water depth more than 1.5 m is prohibited unless the machine is equipped with extra equipment such as additional pontoons and spud piles that could increase the stability of the whole machine.



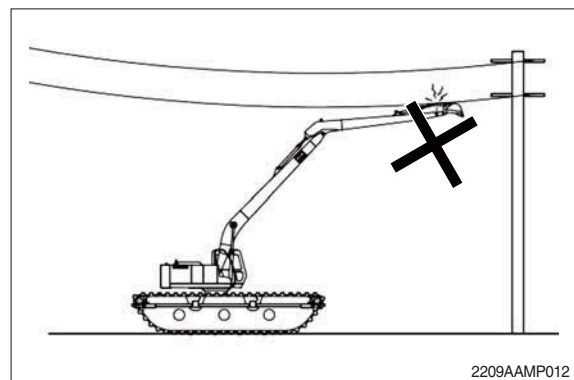
9) AVOID WATER TRAVELLING DURING BAD WEATHER CONDITION

Travelling in open water is limited to still water only. Do not try to operate the machine during the water is running stream or the wind is blowing over than 4 m/s.



10) BEWARE OF POWER LINE

Beware of power lines when travelling on land. Lower the long reach attachment if you need to pass over. Serious injury or death can result from contact with electric lines.



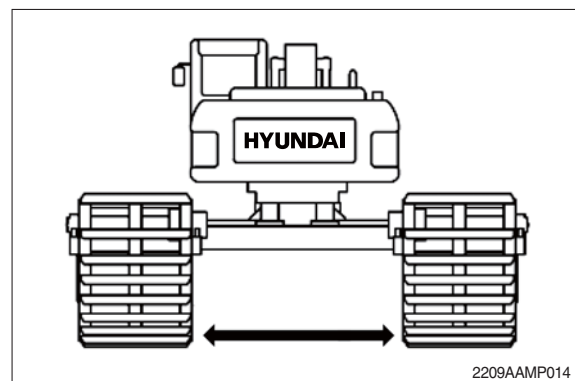
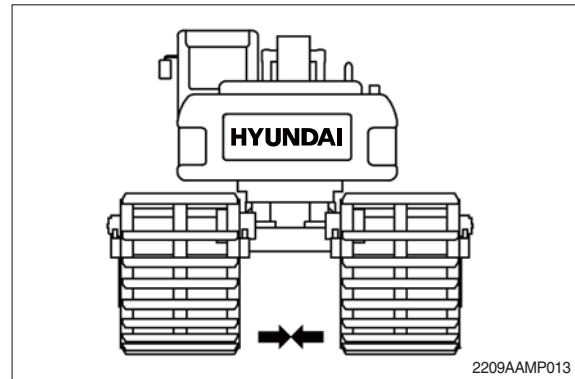
2. BASIC MACHINE OPERATION

1) OPERATING THE MACHINE

(1) Operate the machine with wider undercarriage

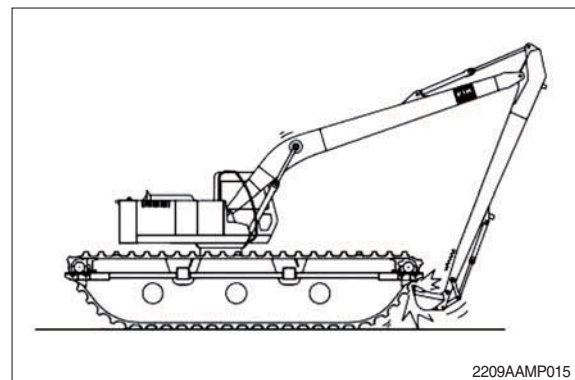
Since the undercarriage of the amphibious machine can be set to narrow mode as per figure 013 and wide mode as per figure 014, it is compulsory to operate the machine with wider undercarriage.

- ※ The undercarriage must be adjusted to the maximum width either manually or hydraulically. Narrow undercarriage is only applicable for non-operation application.



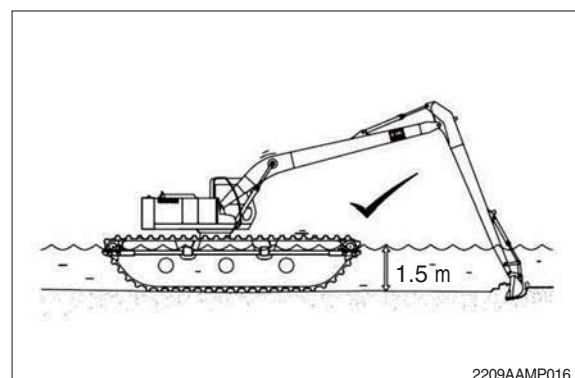
(2) Operate the boom, stick and bucket carefully

Since the machine is attached with a long reach, be careful when moving these attachments up, down and turn. Begin and end the operation with slowly and smoothly. The attachment may collide with the pontoons and cause severe damage to the structure and very troublesome for repairing.

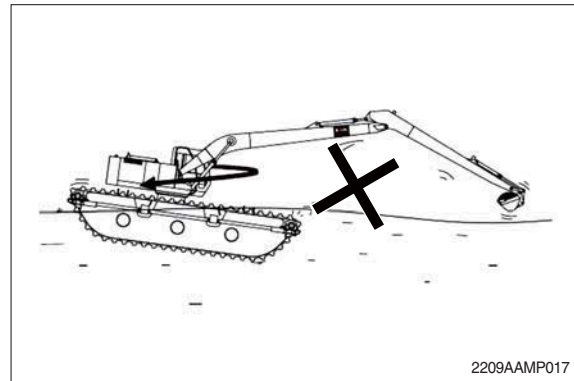


(3) Operate the machine safely

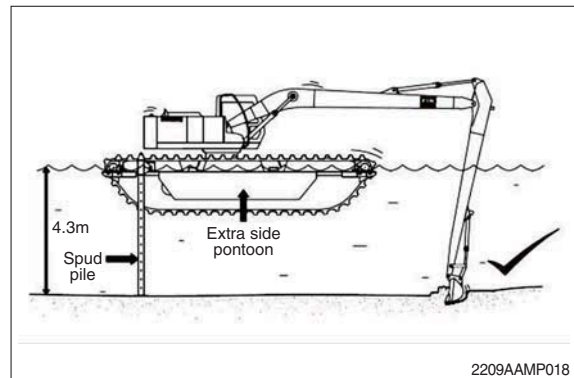
Without additional pontoons and spud piles, digging inside the water only valid for the depth up to 1.5 m only.



Do not put the front attachment (either with load or without load) in long reach position as per figure 017 and do not swing the machine when working in such condition at water depth more than 1.5 m.

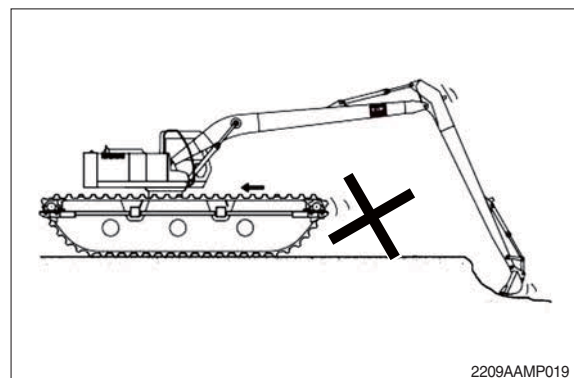


Spud piles and additional pontoons can stabilize the machine during floats up to 4.3 m water depth (depend on the spud piles and machine size).



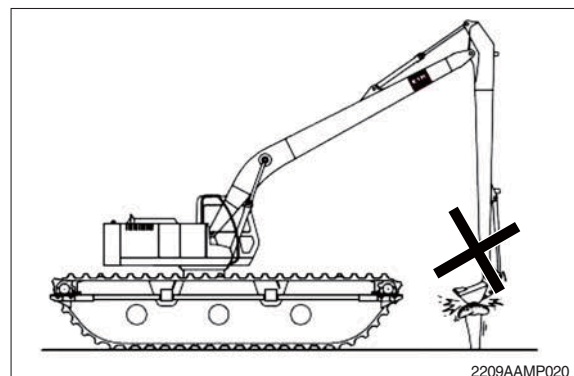
(4) Avoid abusive operation

Do not use travel force as additional digging technique. This operation will exert unreasonable force upon the machine structure especially to the front attachments and severe damage may result.



(5) Avoid hammering operation

Do not perform hammering and pilling operations using the bucket which could cause damage to the bucket and the front attachments of the machine. Such operations are dangerous and should be avoided in all circumstances.



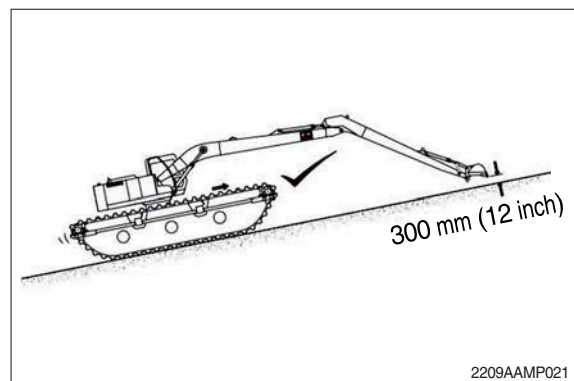
2) TRAVELLING THE MACHINE

(1) General

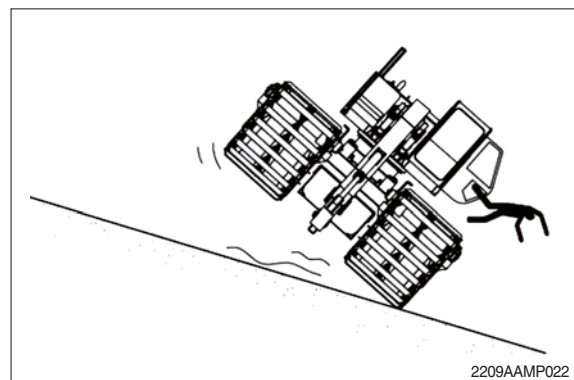
- ① Before launch the machine into water or sludge, check to see that the pontoons have serious damage or cracks.
- ② Check the track chain tension before start the work. Slack track chain may come off during steering. Adjust the track chain tension but do not excessively tight that would give high travel resistance to the machine.
- ③ Before operating the travel levers, confirm which direction the tracks and travel motor are facing. Refer to the arrows at the pontoon which are directed to the front side.

(2) Land

- ① Use a flagman when travelling on the shoulder of a road or in confined area.
- ② Travel on flat ground an in straight lines (turn with large angles) as much as possible. When turning the machine, use alternating forward and reverse movement as much as possible instead of making one sharp turn.
- ③ Avoid a hard travel on land with many stones, rocks and stub as much as possible that may shorten the track shoes life.
- ④ When travelling on rough ground, use low (1st) gear with low engine speed to reduce the shock to the pontoons and machine.
- ⑤ When ascending or descending slopes, keep the bucket 300 mm (12 in) above the ground which give you enough time to lower the bucket to the ground immediately if the machine start to slip.



- ⑥ Avoid changing directions on a slope. Otherwise the machine may turn over or slide sideways



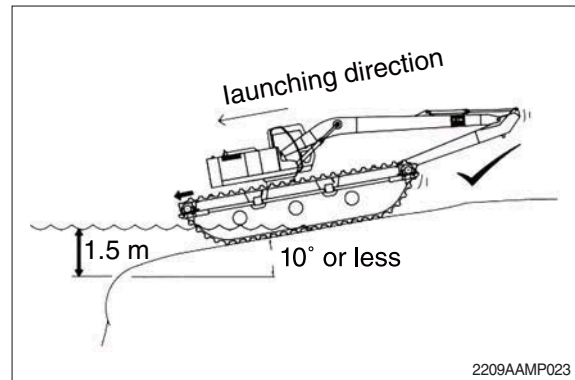
(3) Water

① Launching the machine in water

Do not directly launch the machine into open water without examine the water depth. Before launch the machine, choose a land with slope approximately 10° or less continues down to the the water until the machine can floats.

Lower the front attachment to create a low center of gravity for the machine which could stabilize the machine during launching.

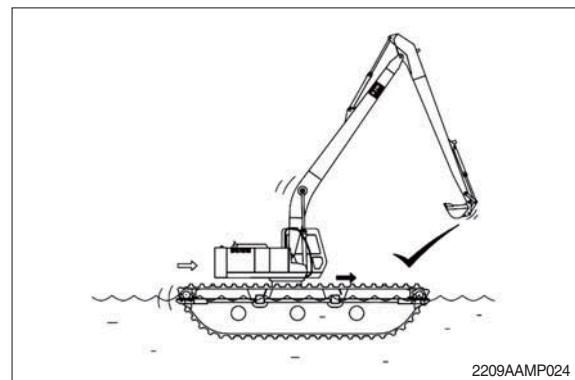
Launch the machine tailforemost at a slow speed. Refer to the arrow direction at the machine before launching.



② Before and during travelling the machine in water

Check to see first that there are no bubbles coming out from the pontoons after launching and before travelling. Make sure that the machine is not abnormally tipped to one side before proceed with operation.

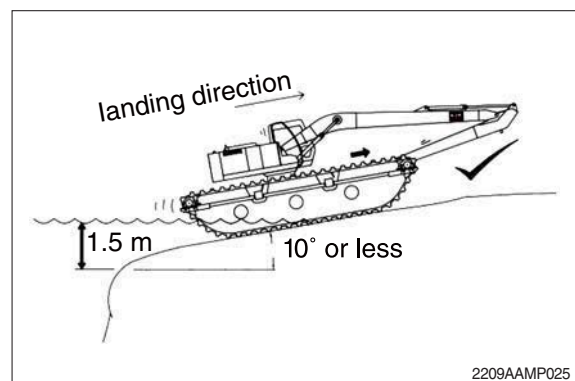
Travel the machine according to the arrow direction at the pontoon and smoothly adjust the front attachments position, up or down when you want to keep your machine horizontal and stable.



③ Landing the machine

Lower the front attachment once the front track catches the land during landing. If the track slips during landing, use the bucket to help your machine escape from water.

Make sure that your front machine is facing to the land during landing.



3. UNDERCARRIAGE MAINTENANCE

Regular, intervals of proper lubrication and maintenance are essential for long life of the parts and provide safe operation without drastically loss performance.

This chapter provides correct procedures for lubrication and maintenance for the undercarriage.

1) TRACK TENSION

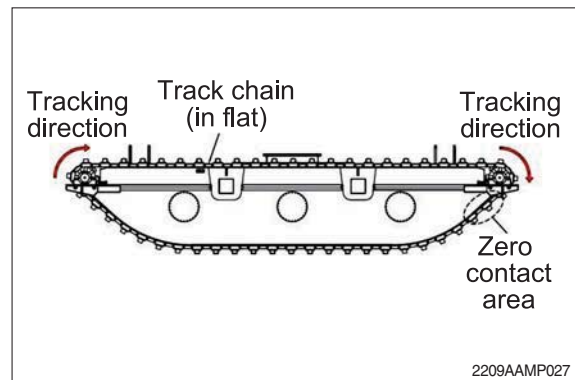
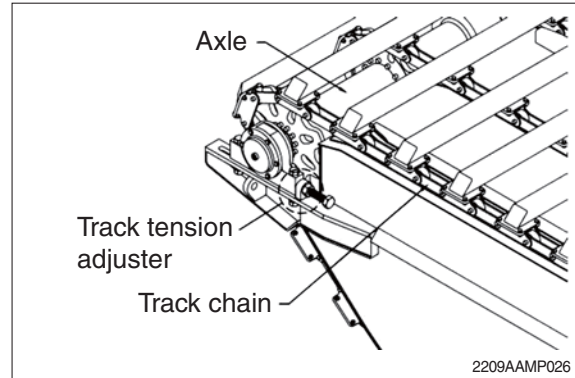
- (1) Check the track chain condition before and after travelling the machine.

The chain may come off from the track if it is too slack or loose during steering. Use bolts at track tension adjuster to adjust the track chain tension but do not over tight the track chain that would give high travel resistance to the machine.

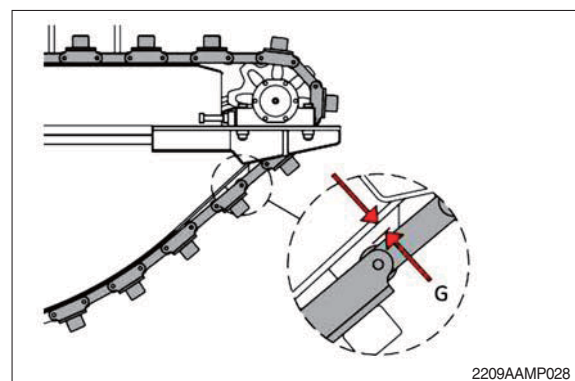
- (2) Before the track chain can be adjusted, the mechanic must examine how slack the track is and what is the suitable tension must be set.

- (3) Firstly, be sure that the bottom and the top track chains of the pontoon are in tension or flat. Use the axle tracking force to get the flat chain on top of the pontoon.

- (4) Check the track chain at the front side of the axle tracking direction. An area where the track rollers do not contact with the pontoon body (called as Zero Contact Area (ZCA)) should occur due to track chain movement as per figure 027.



- (5) Measure the gap between the track rollers and pontoon body at the ZCA as per figure 028. If the biggest gap, G is between 38.1~63.5 mm (1.5~2.5"), that means the track chain is in the good tension. If that gap is more than 63.5 mm (2.5"), the track chain is in the slack condition and must be tensed correctly.



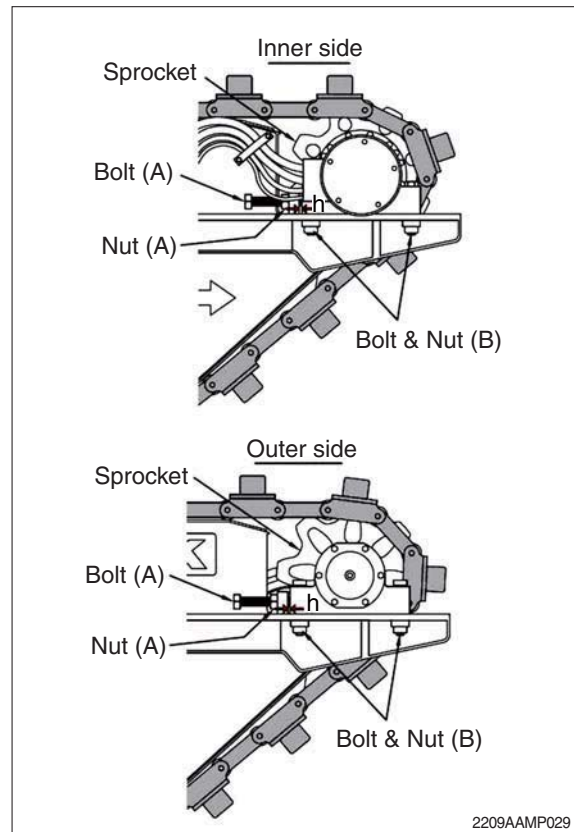
- (6) Loosen the lock nut (A) at the track tension adjuster and push out the axle by retighten the bolt (A) until the biggest gap between track roller and pontoon body at the ZCA is between 38.1~63.5 mm (1.5~2.5").

※ **Bolts and nuts (B) must be loosed before axle can be pushed out and both of axles (front and rear) must be pushed out with the same distance.**

▲ **Do not excessively tight the bolt until gap G is less than 38.1 mm (1.5").**

- (7) Measure the gap, *h* and adjust the track tension until all *h* are same at each end of pontoon to ensure that each axle aligns with the track chain as per figure 029.

※ **Misalignment between axle and track chain can cause excessive wear and tear to the sprockets and track chain.**

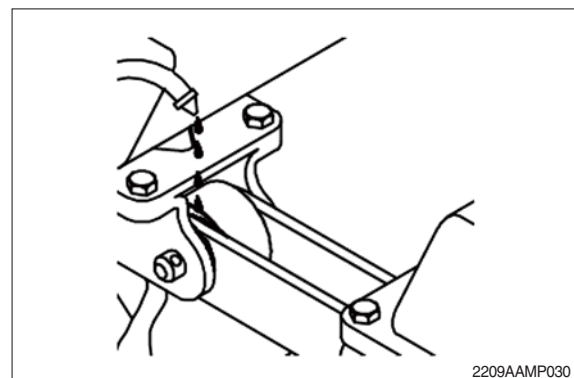


2) TRACK ROLLERS LUBRICATION

Lubricate the track rollers with waste oil especially after the machine has been exposed to water or sludge and after the machine is not use for a long period. The machine may travel smoothly and can longer the track rollers and pontoon life if the lubrication is done frequently.

※ **Before lubrication, please refer to your local environment laws & regulations.**

Waste oil may pollutes the environment especially water and plants.



3) GREASING

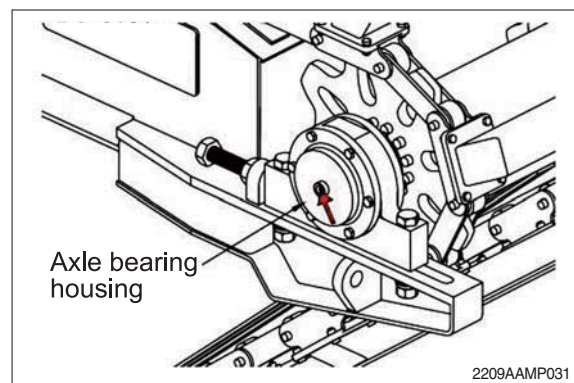
Greasing is very important for the frictional components such as bearing, pin and bushing or gear mechanism. The purpose of greasing is not only limited to reduce the friction between two or more contact parts but also as an additional protection from corrosion. The next figures show the most important components/parts on the amphibious undercarriage that must be regularly greased in order to slow down the wear rate, corrosion and hence longer the components life.

- ※ Before apply greasing; please refer to your local environment laws & regulations. Grease may pollutes the environment especially water, plants and animals.

(1) Axle Bearing

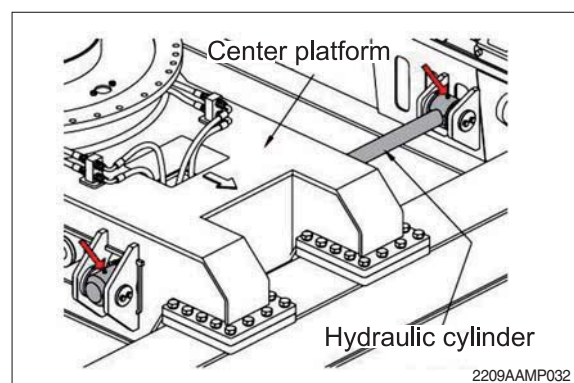
Spherical roller bearing is sealed inside the bearing housing at each axle on each pontoon. These bearings must be greased for every 50 hours (refer to figure 031).

- ※ Some models of Amphibious Undercarriage do not have axle bearing.
- ※ Grease must be pumped into each axle bearing housing until it is full.



(2) Pin & Bushing

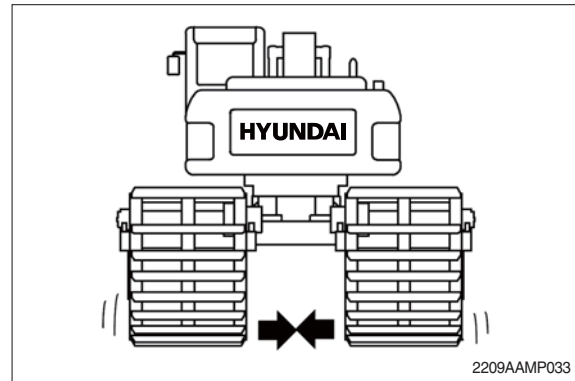
The application of pin and bushing on Amphibious Undercarriage is limited at extendable model only. These pin and bushing must be greased for every 50 hours.



4) HYDRAULIC CYLINDER

The application of hydraulic cylinders is limited at extendable model only. When extend, the hydraulic cylinder shaft is exposed to air, water and other solid objects that can cause corrosion or serious scratch. When the shaft surface is no longer smooth, the seals will damage and leaks will happen.

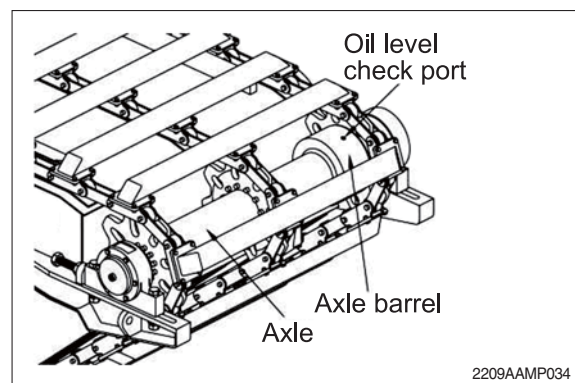
Since the shaft is not protected during extends, the only way to reduce the corrosion rate is by retracting the shaft during land travelling and parking. When the shaft is sealed inside the barrel, the hydraulic oil will protect it from outside contaminants hence longer the shaft life and maintain the hydraulic cylinder ability.



5) TRAVEL REDUCTION GEAR OIL

Check the gear oil condition of the travel reduction gear for every 250 hours.

Since the hydraulic travel motors were sealed inside the axle barrel, the gear oil condition can be checked, removed or replaced through the oil level check port as per figure 034.



- (1) Rotate the axle until the oil level check port is approximately horizontal to imaginary line as per figure 035.

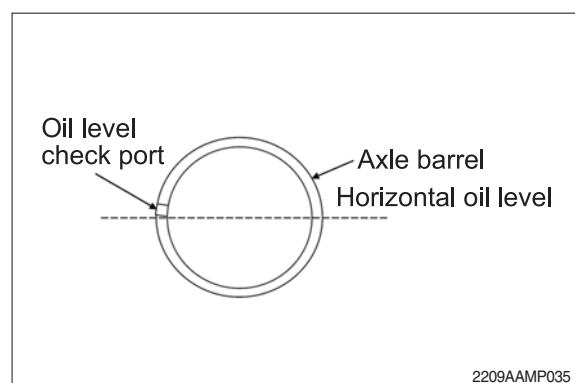
※ **Oil level check port must be a bit high than the oil level before remove the plug.**

- (2) Lower the bucket/attachments to the ground.

- (3) Run the engine at slow idle speed without load for five minutes.

※ **The turbocharger may be damaged if the engine is not properly shut down.**

- (4) Stop the engine. Remove the key from the key switch.



(6) Pull the safety lever to the LOCK position.

▲ Keep your body and face away from oil level check plug. Gear oil may be hot after operation. Wait until the gear oil cool and then gradually loosen the plug to release the pressure.

(7) After gear oil has cooled, slowly loosen the oil level check plug to release the pressure inside the axle barrel.

(8) Oil must be approximately horizontal to the hole.

(9) If necessary, add oil until the oil flows out from the oil level check plug hole.

(10) Wrap the plug threads with sealing-type tape. Install the plug and tighten the plug.

(11) Check the oil level in the other three reduction gear at each axle.

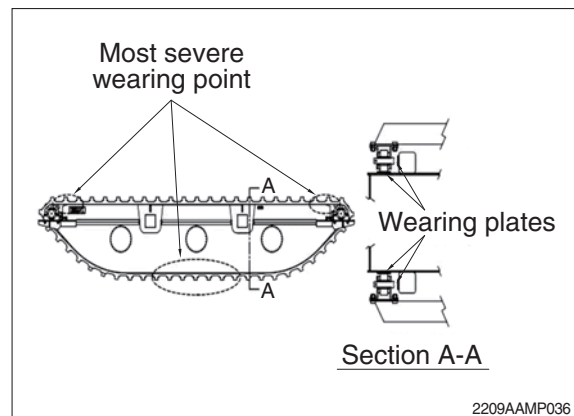
6) WEARING PLATES

Wearing plates are welded to the pontoon at the portions where the pontoon contacts and frictional with the track rollers or track pins during travelling and steering. Without these wearing plates, the said portions at the pontoon are very fast and very easy to get wear. Therefore, be sure to make the following checks in order to keep your pontoons are applicable for long term use:

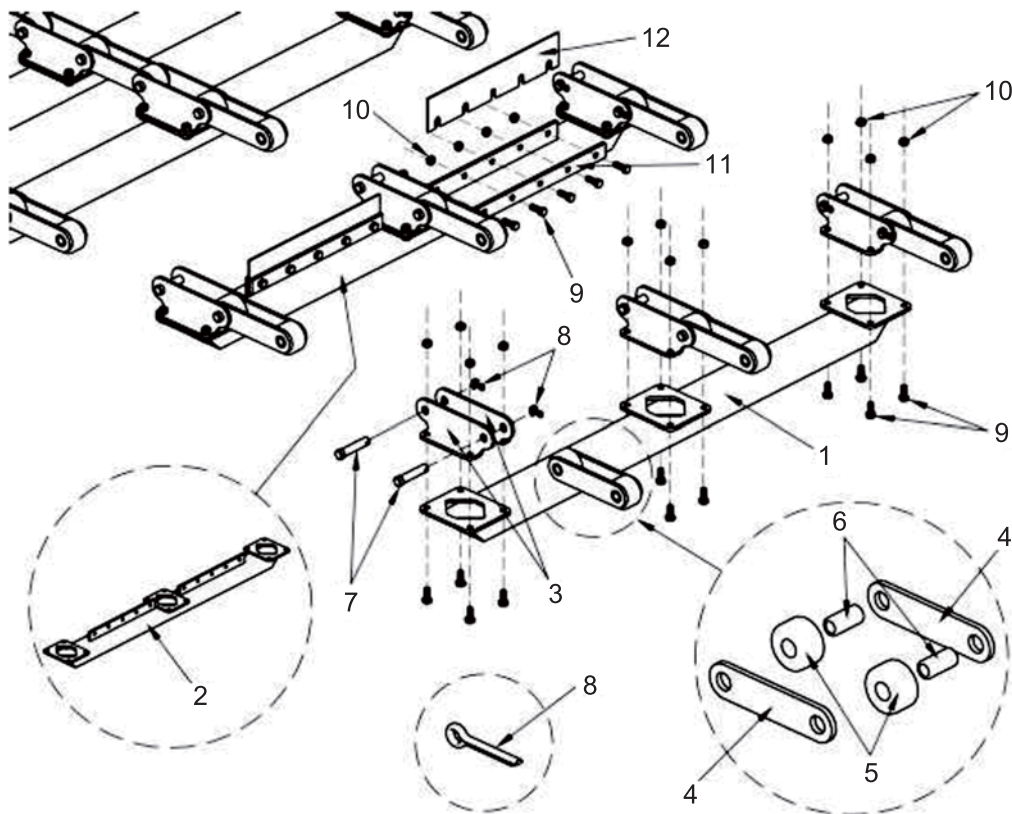
(1) The amount of wear and tear for the wearing plates should be checked at the bottom and the upper corner of the pontoons which are subjected to most severe wearing rate.

(2) Measure the thickness of the wearing plates for every 100 hours and make replacement if the remaining thickness of the plate is below 4 mm.

▲ Failure to replace the wear wearing plates could cause serious damage to pontoon body. Moving track chain is just like a blunt saw waiting to cut off the pontoon body after the wearing plate have been finished 'cut-off'.



7) TRACK PARTS



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- | | | | |
|---|------------------------------|----|----------------------|
| 1 | Normal track shoe | 7 | Track pin |
| 2 | Cleaning track shoe (option) | 8 | Cotter pin |
| 3 | Shoe link plate | 9 | Bolt |
| 4 | Roller link plate | 10 | Nut |
| 5 | Roller | 11 | Clamp plate (option) |
| 6 | Bushing | 12 | Dozer blade (option) |

(1) Inspect the track shoes for every 100 hours and make replacement if the part is seriously damaged and cannot be used anymore. Inspection rate must be more frequently than normal especially when the machine has been operated on the land for a long period.

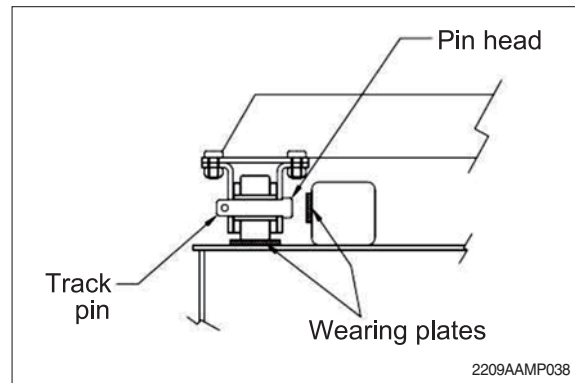
※ Track shoes are not limited for travelling on land only. Track shoes also are useful for paddling on open water. With the large surface area and big in quantity, it creates huge amount of resistance with water and help machine to move faster even without additional propelling devices.

Track shoes also can protect the bottom of the pontoon from unseen dangerous items when working in swampy or muddy areas such as sharp scrap metals, stumps or rocks.

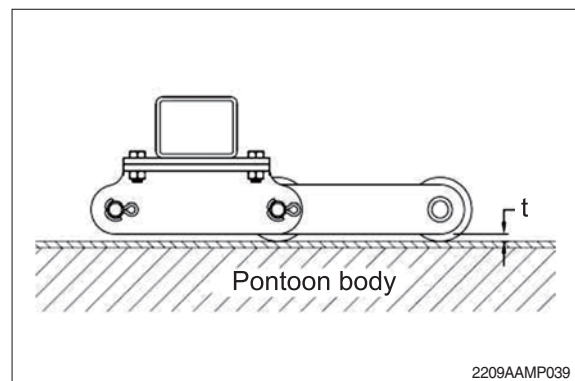
※ Failure to make replacement of the damage track shoes can affect the pontoon body and increase the cost for maintenance.

A track shoe life is varies substantially with different travel frequencies, quality of soil and water and application method of the machine.

- (2) Change the track pins if the head are seriously wear. Replace the pin if the head thickness wears until less than 4 mm. For every 100 hours, the track pin head must be inspected since the head is always contact and frictional with the wearing plate.



- (3) A roller must be replaced if the value of t is less than 3mm as per figure 039. Normally, a track roller and a bushing wear at the same rate and the replacement must be made simultaneously. Do not let until the rollers are completely wear and the track link contact with the pontoon body.



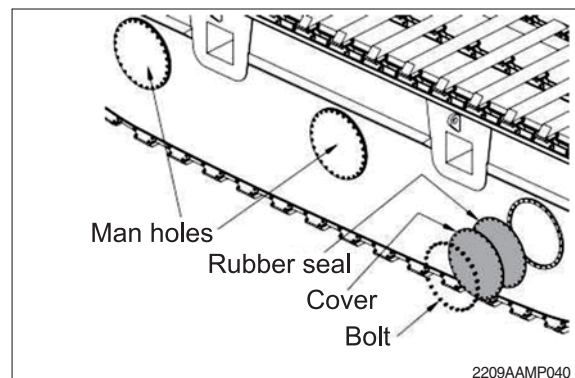
- ※ **Track rollers and bushings life are vary substantially with different travel frequencies and medium of operation. Track rollers and bushings are very fast to get wear when the machine is operated at sandy or muddy area. Wear rate of tracks rollers and bushings does not directly proportional with machine working hours.**

8) PONTOON

Pontoons provide sufficient buoyancy force to float the whole machine on open water. Sometimes, the leaks may happen at welding joints especially after the pontoons have been exposed to extreme environment for long period. Water leaks inspection must be made for every 500 hours in order to keep pontoons safe for operation. In other case, inspection must be made immediately if the machine is tipped abnormally to one side during operating on open water.

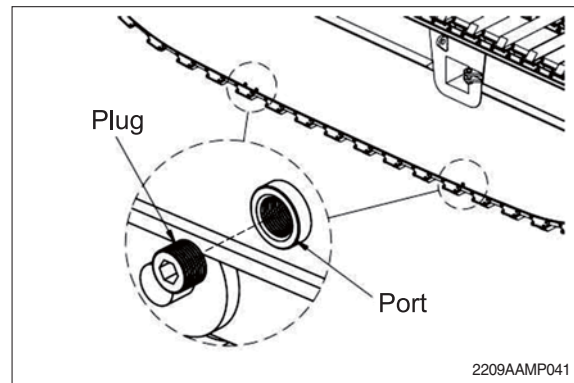
- (1) Each pontoon provides man holes at the side wall for maintenance purpose (as per figure 040).

- ※ **Serious damage or leaks maybe need to be repaired from inside. Small leaks can be inspected and repaired from outside.**



- (2) Remove all the drain port plugs for each compartment at the bottom of the inner side wall for suspected leakage pontoon.

※ **Compartment with plenty amount of water flows out from the drain port is subjected to leakage.**



- (3) All compartments of a pontoon that are required for buoyancy purpose are to be air tested to a pressure between 5 to 6 psi.

※ **The air pressure for the test may be measured by pressure gauges. When a pressure gauge is used, care must be taken to prevent the over pressuring of the compartment. This pressure testing must be carried out prior to the application of a protective coating on the pontoons or in way of the weld.**



※ **It is essential when using a pressure gauge to ensure that the gauge is correctly calibrated at all times.**

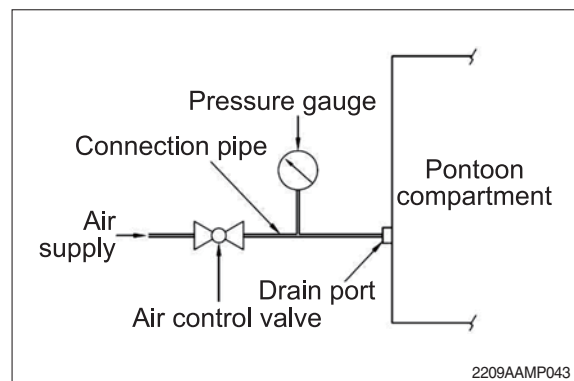
- (4) Install the pressure gauge and air supply valve to drain port of the subjected leakage compartment (refer to figure 043).

Air is supplied into the compartment until

- (5) the required test pressure is achieved.

The air is then shut off by closing the supply valve and all welded seams, joints and connections of the effected compartment

- (6) are tested with soapy water to determine if there are any leaks and the positions of the leaks.



- (7) Where leaks do occur, the leaks area is to be re-welded, and on completion, the air tested repeated on the compartment effected.
- ※ **This operation is to be repeated if necessary until no further leaks from that compartment are observed.**
 - ※ **The man hole must be tested with soapy water. The rubber pads that keep the compartment isolated are subjected to lose its elastic properties becoming very brittle and breaking into shards when struck. This case happens because rubber has moderate resistance to environmental damage by heat, light and ozone.**

9) HYDRAULIC LINE

Hydraulic line for amphibious undercarriage is built up from the combination of pipes and hydraulic hoses. Hydraulic hoses are used when pipes or tube cannot be used, usually to provide flexibility for machine operation or maintenance. It is more than half of amphibious undercarriage hydraulic line is covered by hydraulic hoses.

- (1) Since the hydraulic hoses are built up by rubber and steel layers, regular inspection must be made in order to keep the operation safe and steady.
Unseen hard and sharp objects could damage and burst the expose hydraulic hoses especially when operating the machine in swampy or muddy area.
- (2) Hydraulic hoses and pipes inside the pontoon are protected and do not required regular inspection as per external hydraulic hoses. Inspection is only needs if machine is keep losing the hydraulic oil but the leaks could not be detected from external hydraulic line. In this case, drain ports must be removed and compartment with plenty of hydraulic oil abnormally coming out from the drain port is subjected to leakage.
- (3) Access the compartment through the man hole and then fix the problems. The joints and the fittings maybe loosen or the O-rings have lost it elastic properties.

All the provided information are base to design specification and are gained from long term experience in design and manufacturing amphibious undercarriage. Hopefully all the information is not only help the users to operate the amphibious undercarriage safely and confidently but also could optimized the machine performance and then satisfaction is achieved with the return on investment.

4. ASSEMBLY MANUAL

1) INSTALLATION PRECAUTIONS

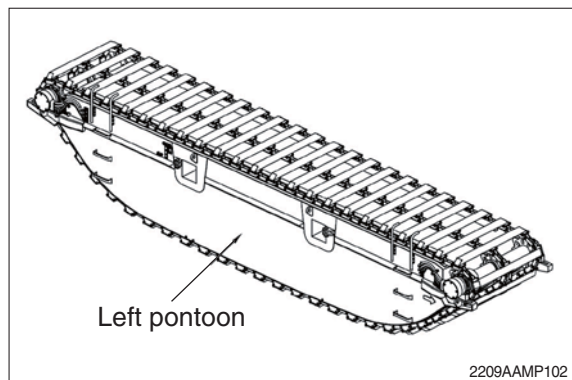
These precautionary steps are necessary to ensure the safety during the installation progress.

- (1) For safety, check the surroundings before start the installation.
- (2) Install the caution signs or caution tape surroundings the installation base.
- (3) Wear helmet and other safety clothing during the installation progress.
- (4) Keep all personnel and objects clear from the installation base except for the installation tools and workers.

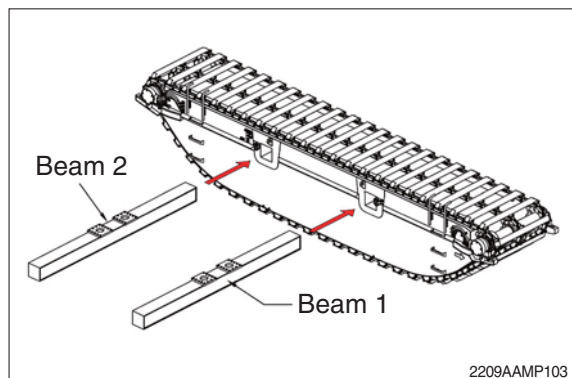


2) UNDERCARRIAGE AND BASE MACHINE INSTALLATION

- (1) Position one of the pontoons (either left or right) on a firm, flat and wide ground to ensure the stability of machine during the entire process.
- ⚠ Secure the chains/cables onto the lifting hooks located at the top side of the pontoon. Use proper chains or cables that are capable to withstanding the weight of the pontoon.**



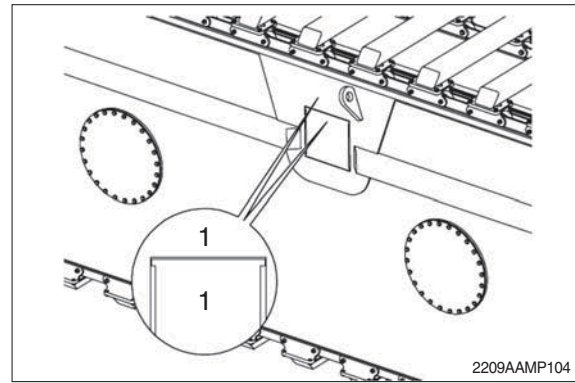
- (2) Lift the pontoon linkage beam one by one and slowly insert the beam into the square holes at the pontoon as per figure 103.



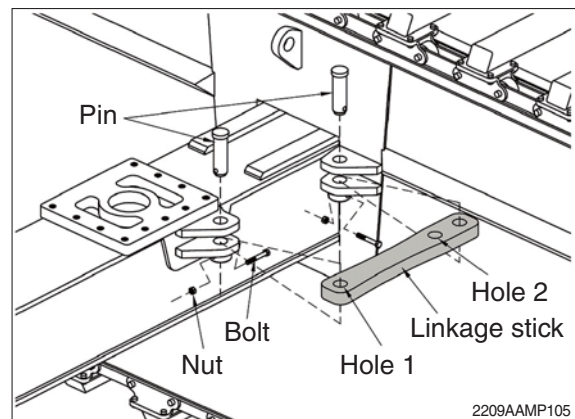
- ※ Identify which side of the pontoon is inner and which side is outer. Inner side is on the hydraulic motors with hydraulic hoses. Make sure that you install the beams from the inner side.

- ⚠ Carefully handle the beams movement from crashing the thin pontoon body or external hydraulic hoses that may cause serious damage.

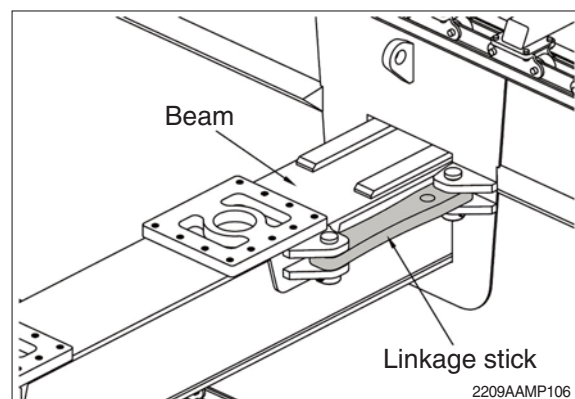
- ※ Each of the beams has its own marking number at one side of face end. During installation, confirm that these marking numbers are match with the square holes number located on the outer side of pontoon as shown in figure 104.



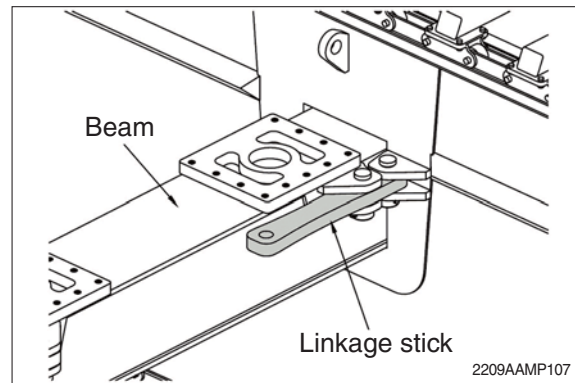
- (3) Lock and secure the beams to the pontoon with linkage sticks as per figure 105.



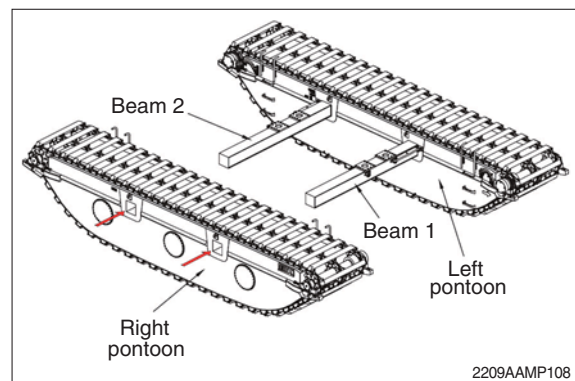
- ※ Please note that each linkage stick has three holes. Before install the linkage stick, refer to the labels at holes and match it with the pontoon. Lock the beam to hole 1 or hole 2 which could serve differ width for the machine, depends on the needs and working condition. Lock the pin with supplied bolt and nut.



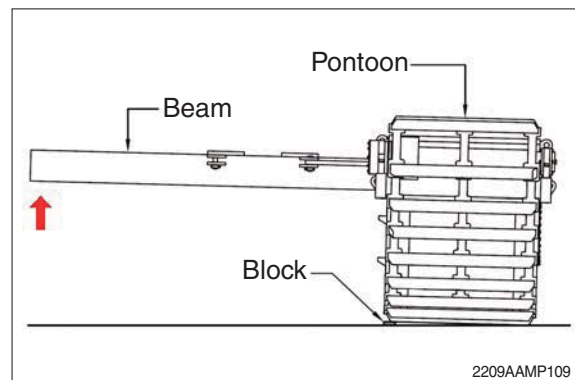
- ※ Figure 106 on previous page shows that the beam has been locked to hole 1 at linkage stick which serve the maximum width to the undercarriage. This position is recommended for operation mode.



- ※ Figure 107 above shows that the beam has been installed to hole 2 at linkage stick which serve the minimum width to the undercarriage. This position is ONLY recommended for transportation and NOT for operation mode.

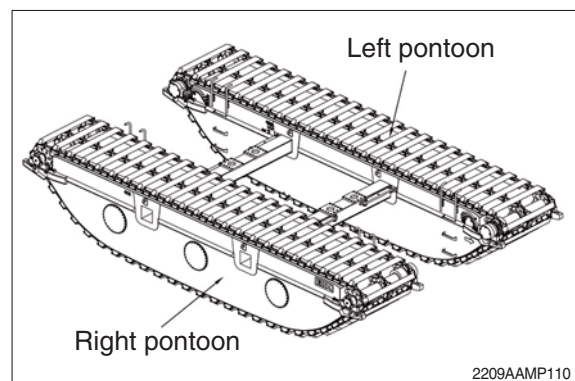


- (4) Lift the second pontoon and assemble it with the previous one as per figure 108. This step needs to be done carefully and slowly since pontoon is a heavy structure. Beware with the inertia and momentum of the pontoon during movement which could cause serious damage to surroundings and itself.

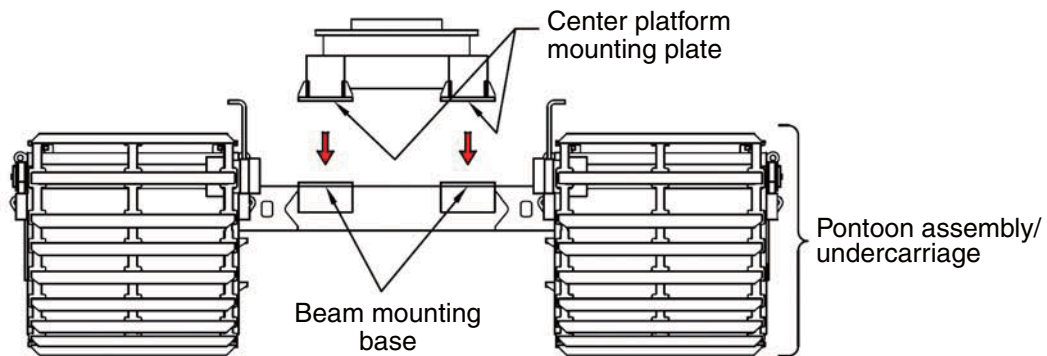


- ※ For easier and faster works, the beams must be leaned higher than its level by placing a thin blocks under the left pontoon as per figure 109.

- (5) Repeat step (3) and the pontoon assembly should look like figure 110.

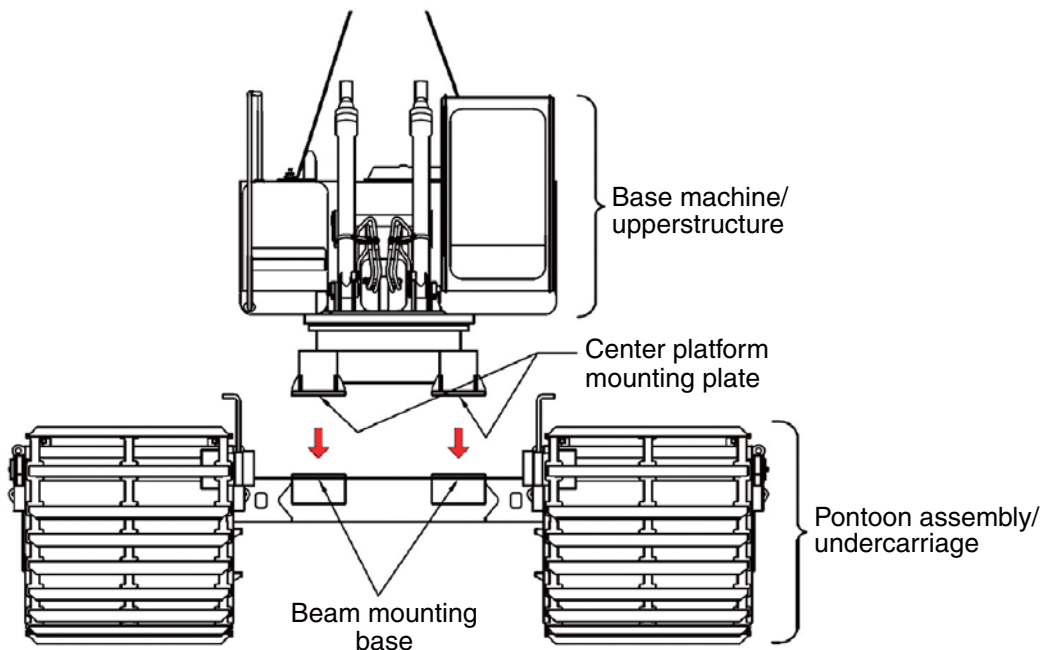


- (6) Lift and place the center platform onto the pontoon assembly carefully. Align the center platform mounting plate with beam mounting base on the beams as shown in figure 111.



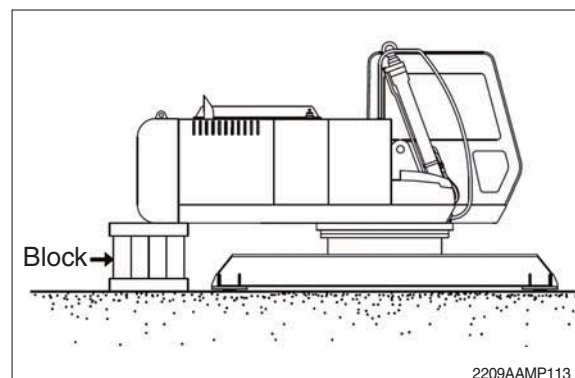
2209AAMP111

- ※ In other case, the center platform has been mounted together with the base machine due to shipping requirement. So, both of center platform and base machine need to be lifted together without dismantle them as per figure 112.



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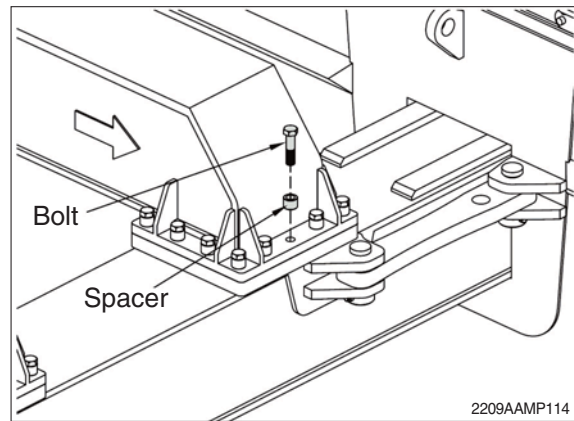
- ▲ If the center platform has been mounted together with the base machine, a block must be placed under the rear tip of the base machine to avoid tipping during the evacuation process.



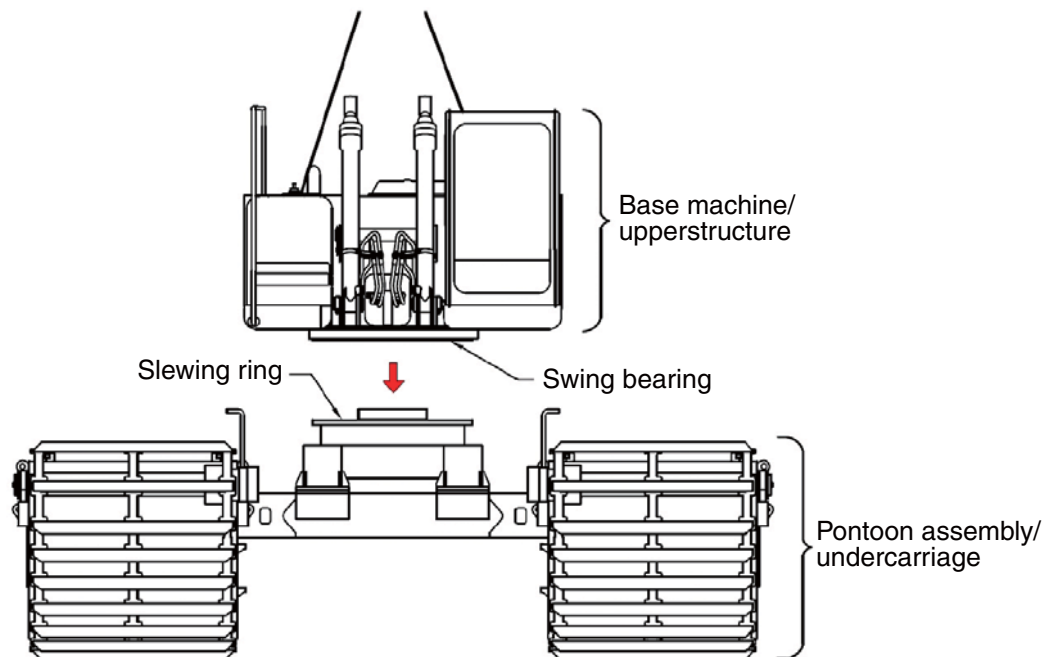
2209AAMP113

- (7) Use the supplied bolt and spring washers to lock the center platform at the beams as per figure 114.

※ Match the yellow arrows symbol direction at the pontoon and at the center platform. The arrows are directed to the front side.

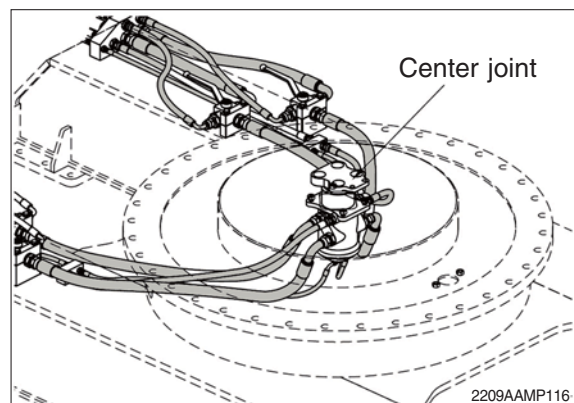


- (8) Lift and place the base machine onto the slewing ring at the center platform carefully as per figure 115 (if the center platform and base machine are separately delivered). Align and match the holes of base machine swing bearing with the slewing ring holes. Securely tighten all bolts before removing the lifting chains or cables.



※ Ensure that the center joint can be fitted to the center platform before installing the base machine. Make some modification if the center joint mounting on the center platform differs from the original. This case only happens if the center joint has been replaced with different type or model.

※ Dismantle the front attachment (boom, arm and bucket) from the base machine before do lifting.



(9) Install the center joint and connect all hydraulic hoses from center platform to center joint as per figure 116. Center joint also can be installed to the center platform after step (7).

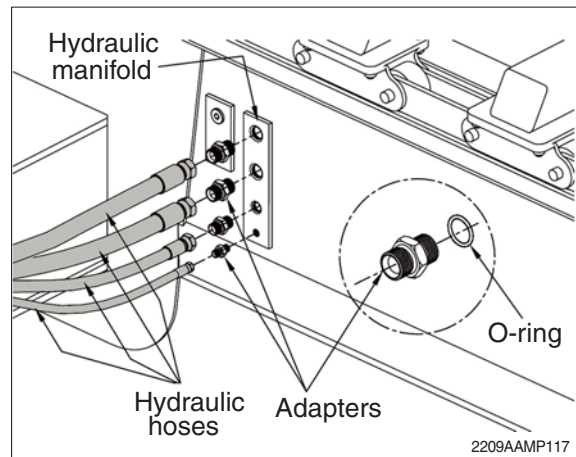
※ If the hydraulic hoses weren't supplied upon delivery, use the existing hydraulic hoses from the original machine or contact your supplier to get the necessary hydraulic hoses. Change the supplied fittings at center platform if they are not compatible with your center joint type.

※ For safety, do not yet connect the hydraulic hoses from the main pumps inside the base machine to the center joint. These hydraulic hoses only could be connected after all hydraulic connections for undercarriage are complete.

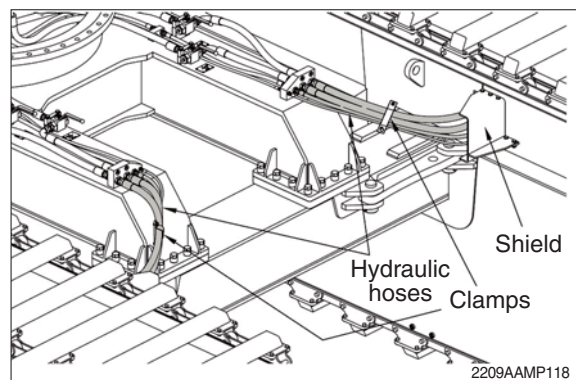
(10) The next process is to transfer the hydraulic pressure from the base machine to the travel motors at pontoons and hydraulic cylinders at the center platform by connecting all hydraulic hoses at the pontoons to the center platform.

(11) If the hydraulic hoses were delivered as loose parts, carefully reinstall the supplied hydraulic hoses and adapters to the hydraulic manifold located at both of pontoons as per figure 117.

※ Tight the adapter carefully so that the O-ring does not clipped between pontoon hydraulic manifold and adapter which could damage the O-ring and then cause leaking at the joint.

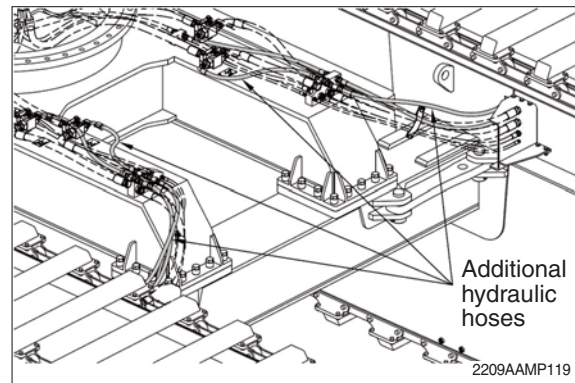


(12) After that, connect the previously installed hydraulic hoses from both of pontoons to hydraulic manifolds at the center platform. Use the supplied clamps to properly secure all hydraulic hoses. Install the shield to protect hydraulic hoses from any sharp and hard objects during working.

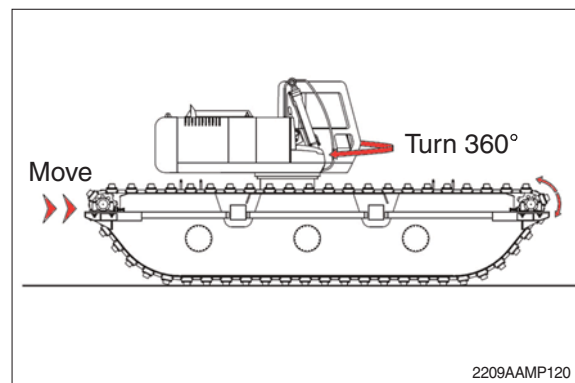


(13) Securely tight all adapters and hydraulic hoses to avoid leaking.

※ If the undercarriage was supplied with spud piles, the additional hydraulic hoses must be installed to link the hydraulic flow from the center platform to the spud pile through pontoons as per figure 117.



(14) Drive the machine freely to test either the hydraulic system is functioning properly or not. Observe again any oil leaks at the join before you satisfy with the installation.

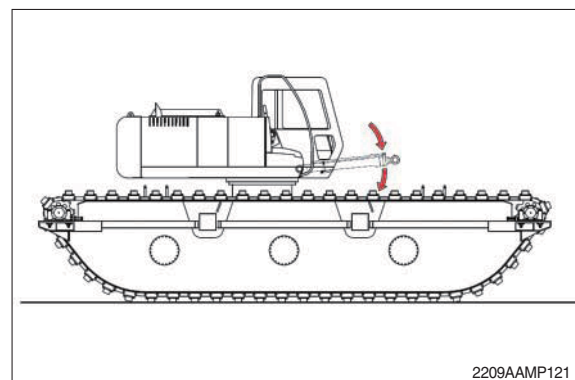


3) FRONT ATTCHMENTS MOUNTING PREPARATION

These preparation steps preferred to be done before front attachments installation.

A planning before start a work not only can result faster and easy work but also could save the life.

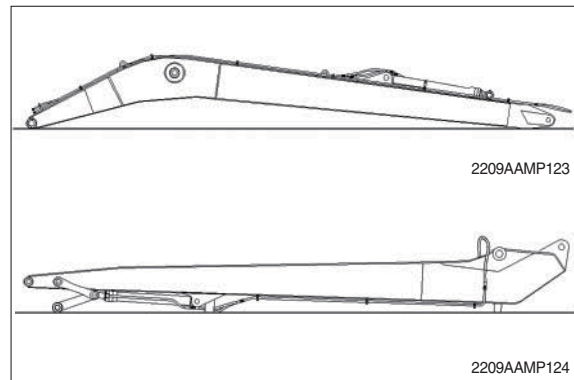
(1) After finish the assembly works for pontoon with the main machine, leave the 2 set of lifting boom cylinder/ram intact onto the machine body as shown in figure 121. Then, run the engine to ensure the boom cylinders are functioning properly.



- (2) Retrieve the boom mounting pin from the machine. Note that some machine models require removing the storage compartment on the right of the machine before the boom mounting pin could be removed directly.



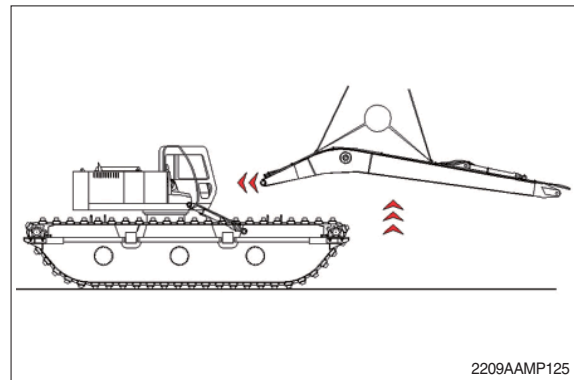
- (3) Position the long boom as in figure 123 and lay the long stick/dipper arm as shown in figure 124. Check and ensure the ground is firm and solid. Sufficient safety measures should be taken ensuring the long boom and stick will not tip over or falling side way during the course of subsequent installation works.



4) FRONT ATTACHMENTS MOUNTING PROCEDURES

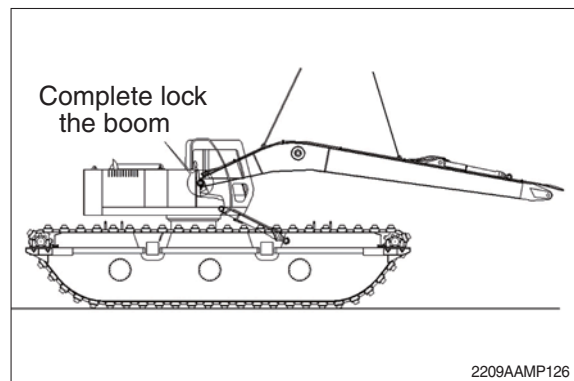
- (1) Lift the long boom carefully toward the machine. Align the boom boss hole to boom mounting bracket on the machine.

▲ Use only metal chain or cable that is capable of withstanding the weight of the boom.

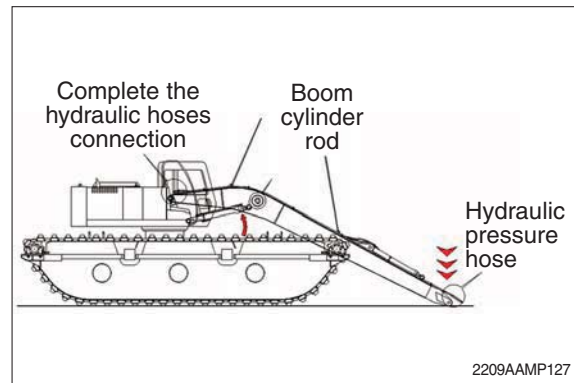


- (2) Secure the chain/cable onto the lifting hooks located at the top of the boom.
- (3) Upon proper alignment of the boom boss onto the mounting bracket, lock and secure the boom onto the machine with the boom mounting pin that has been removed before.

※ Reinstall the machine storage compartment after finish the boom installation



- (4) Lower the boom until the tip of the boom is firmly rested on the ground.
- (5) Lift both of the boom cylinders and align the head with the boom cylinder rod. Lock and secure the cylinders head with the pin that is readily at the boom as per figure 126.
- (6) Connect and securely fasten all hydraulic hoses linking between the machine and the boom, and at the end of boom.



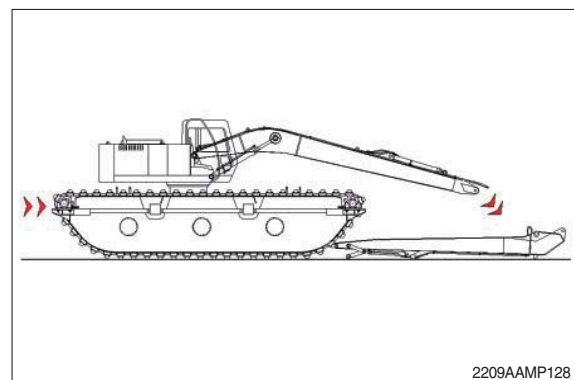
- (7) After connecting all the hydraulic hoses, you are now ready to verify if the hydraulic system is properly connected. Run the engine and test that the booms hydraulic system is functioning properly.

▲ Do not remove the chain/cable until you are completely satisfied with the hydraulic installation.

Do not remove hydraulic hose at the end of the boom which was supplied together with the package. Removing the hose at this instance will cause malfunction to the boom hydraulic system.

※ Observe for any oil leaks in the hydraulic system.

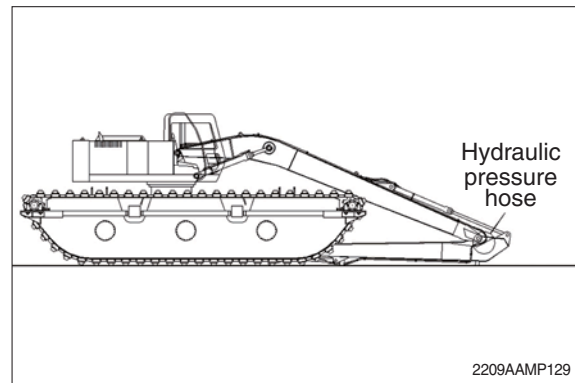
- (8) When you are completely satisfied with the proper functioning of the boom hydraulic system, lower the rest the boom onto the ground. Now, you may proceed to remove the chain/cable from the lifting hook.



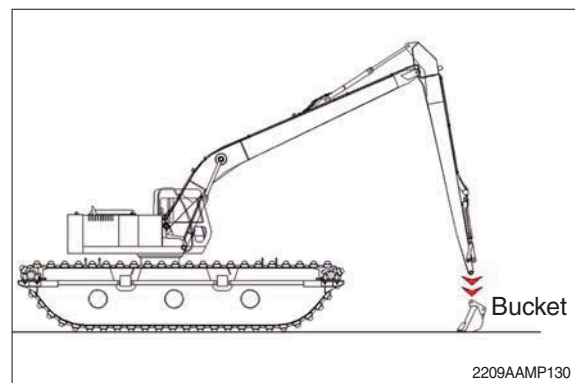
- (9) The boom cylinders are properly function by now and are able to lift the boom with ease. Position the boom yoke onto the stick/dipper arm as per figure 128. Once properly aligned, secure and lock it with the yoke pin that was supply with the package.

※ Remember that all the hydraulic hoses from the machine are readily connected with the pontoons. If the stick is positioned far from the assembly base, just drive the machine toward the stick without need to lift it nearly.

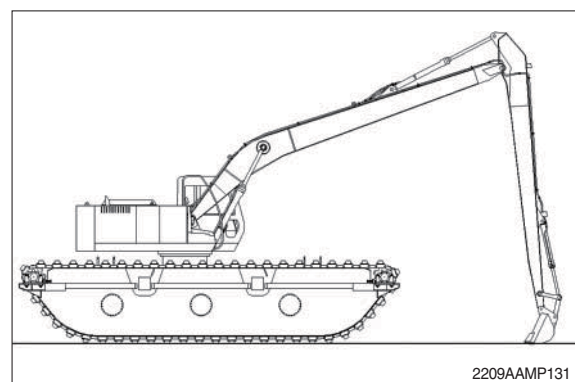
- (10) Mount the stick/dipper arm's cylinder/ram onto the stick/dipper arm with the pin supplied with the long reach package.
- (11) Connect and securely fasten all hydraulic hoses between the boom and stick/dipper arm.



- (12) Mount the bucket that was supplied with the package.



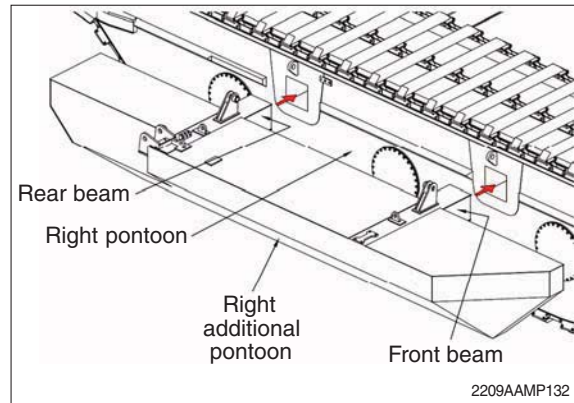
- (13) Perform a final round of checking to ensure all bolts, nuts, pins, hydraulic hoses are properly installed and tightened. When you are completely satisfied with the installation, you may proceed to test the entire long reach set up on your machine.



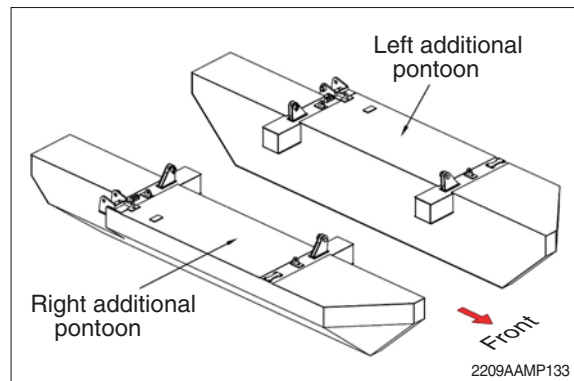
5) ADDITIONAL PONTOONS INSTALLATION (OPTIONAL)

Additional pontoons are the optional parts for amphibious excavator. By adding these pontoons, the amphibious excavator becomes more stable during travelling on open water but still not recommended for digging jobs at water level more than 1.5m depth.

- (1) Lift the additional pontoon slowly close to the main pontoon as per figure 132 and insert both of beams into the square holes at the main pontoon from outside.

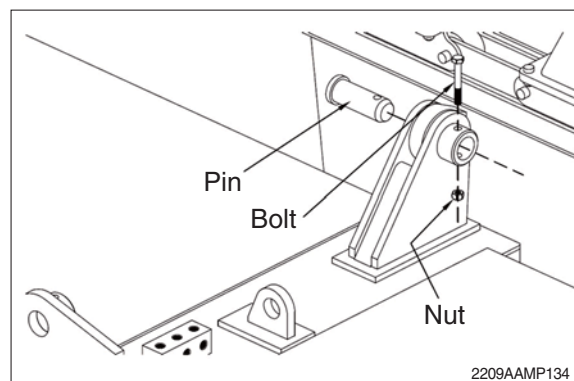


- ※ Identify which additional pontoon need to be assembled first since one of them is left and another one is right. Figure 133 shows the top view and directions of the additional pontoons.



- (2) Align the holes of additional pontoon mounting brackets and main pontoon lifting hooks. Use the supplied pins to lock both of pontoon together as per figure 134.
- (3) Repeat step (1) and step (2) for the second additional pontoon.

- ※ Lifting hooks at main pontoons may be having minor damage due to repeatedly lifting jobs. Examine all lifting hook holes at main pontoon by using the supplied pin and do some repairing if the pin could not get through the holes. It is very important to do this step for faster and efficient installation process.

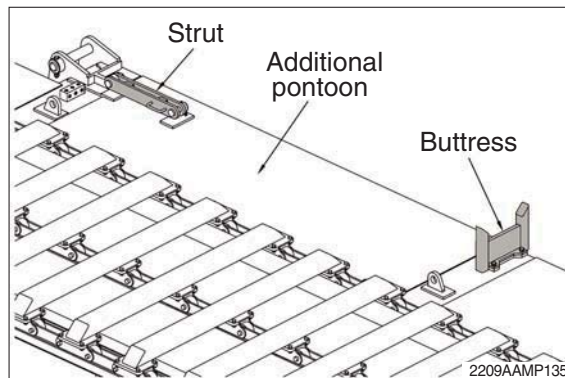


6) SPUD PILES INSTALLATION (OPTIONAL)

Spud piles are the optional parts for amphibious excavator. This type of spud piles must be installed to additional pontoons. By adding these spud piles, the digging jobs could be done at water level up to 4.5 m depth (depend on front attachment size and weight).

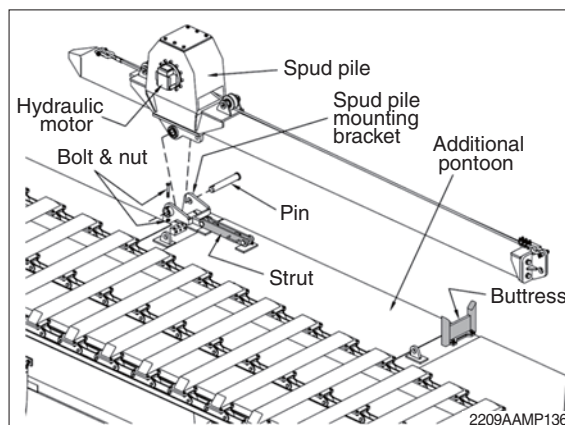
- (1) Before install the spud piles to the additional pontoons, ensure that the pile struts and pile buttress have been mounted to theirs position as per figure 135.

※ The strut and the buttress also could be installed to the additional pontoon at the last process.



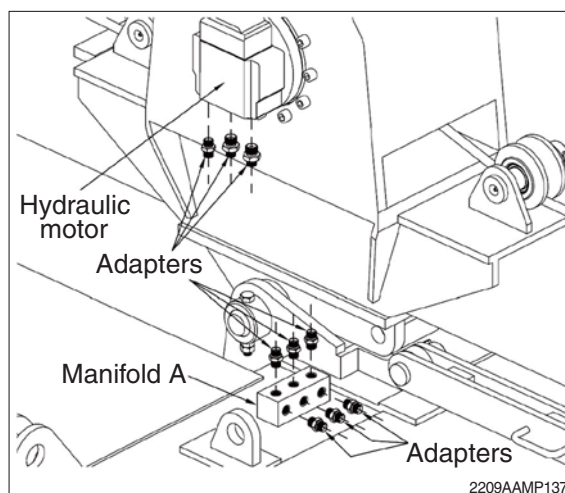
- (2) Lift and install one of the spud piles to the spud pile mounting bracket located at additional pontoon. Use the supplied pin, bolt and nut to securely lock the spud pile at the bracket as per figure 136.

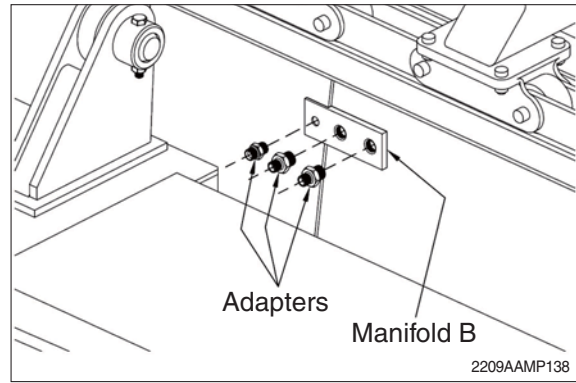
※ During installation, hydraulic motor at the spud pile must facing to the inner side of the undercarriage.



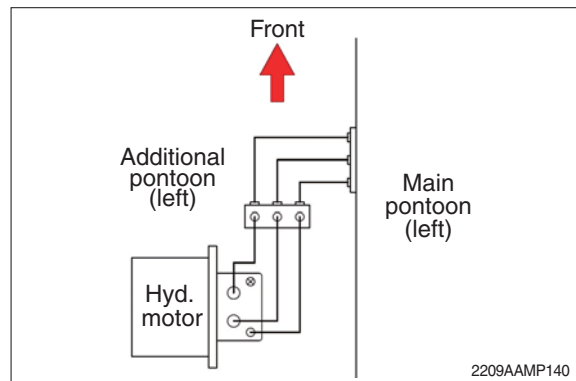
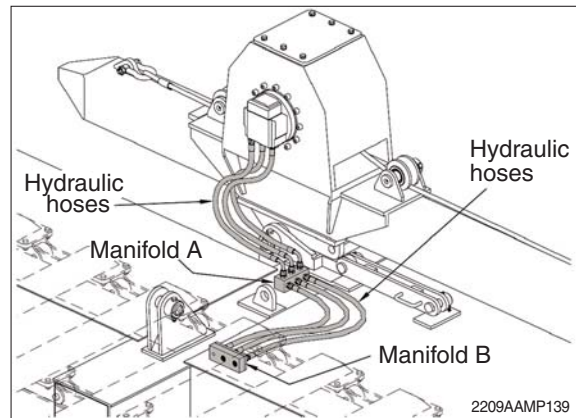
- (3) Install all supplied adapters (fittings) to hydraulic motor ports, manifold A at additional pontoon and manifold B at main pontoon as per figure 137 and figure 138.

※ In some cases, all adapters have been readily installed to all said parts.





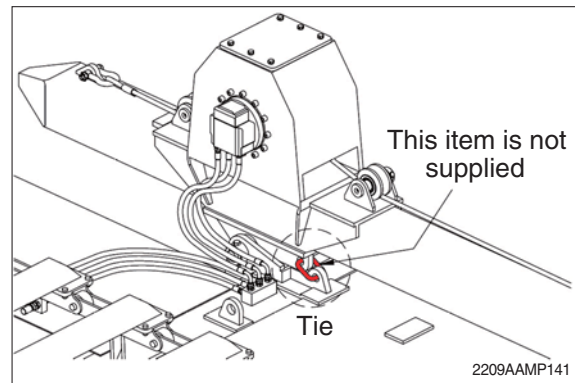
- (4) Complete the spud pile installation by connecting all the supplied hydraulic hoses from hydraulic motors at spud pile to main pontoons as per figure 139 and figure 140. Ensure that all hydraulic hoses and fittings are securely tight to avoid leaking.



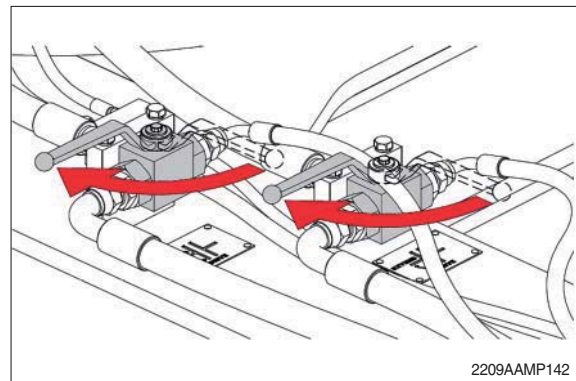
- (5) Repeat all step (1) to step (4) for second spud pile.

TEST THE SPUD PILES

- (6) If the strut and the buttress are not yet installed to the additional pontoon, you may do a quick test to the spud pile to test the hydraulic function.
- (7) Securely tie both of strut mounting holes at addition pontoon and spud pile together with chain or wire as per figure 141 to avoid the piles tipping to rear side.



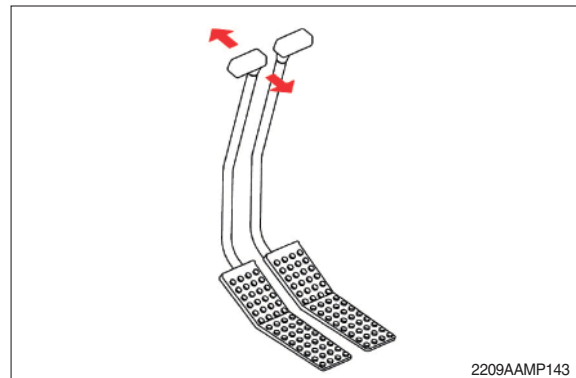
- (8) At the center platform, switch the direction of ball valve handle to other direction in order to divert the hydraulic flow to the spud pile hydraulic motors as per figure 142. (Follow the direction of sign plates if has any).



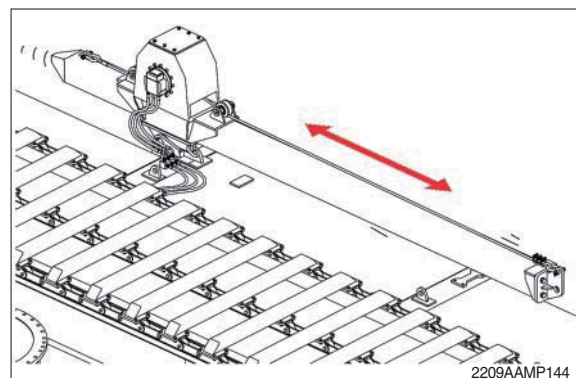
- (9) Use the pedal control inside the operator cabin to control the piles movement as per figure 143.

※ Although the hydraulic line has been designed so that the piles could be controlled by using pedal control on left hand side, test the right hand pedal control if the piles still not moving.

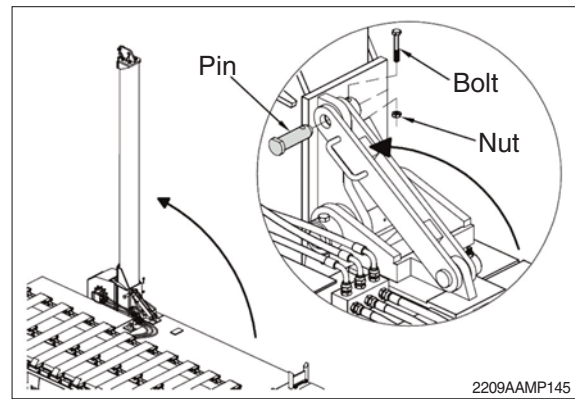
※ Since the hydraulic line from the base machine to the spud pile hydraulic motors is quite long, it took time for the hydraulic flows to reach there.



- (10) Test the both of piles movement until satisfy.



- (11) Untie the strut mounting holes and use the machine front attachment to lift the piles vertically. Install and let the strut to hold the piles vertically. Use the supplied bolt and nut to lock the pin as per figure 145.



- (12) Finally, the spud piles are completely installed and the whole machine is ready for action.

