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LOWER STRUCTURE

ELECTRICAL SYSTEM

ENGINE

INSPECTION, MAINTENANCE AND ADJUSTMENT

TESTING, TROUBLESHOOTING AND ADJUSTING

To the Operator of a Daewoo Excavator

⚠ DANGER!!!

Unsafe use of the excavator could lead to serious injury of death. Operating procedures, maintenance and equipment practices or traveling or shipping methods that do not follow the safety guidelines on the following pages could cause serious, potentially fatal injuries or extensive damage to the machine or nearby property.

Please respect the importance of taking responsibility for your own safety, and that of other people who may be affected by your actions.

The safety information on the following pages is organized into nine topic sections:

I. **General Safety Essentials**
II. **Location of Safety Labels**
III. **Summary of Safety Precautions for Lifting in Leveling Mode I**
IV. **Work-site Precautions**
V. **Operation**
VI. **Equipment**
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IX. **Excavator Rated Lift Capacity Tables**

General Safety Essentials

Accessory Applications

The excavator has been primarily designed for moving earth with a bucket. For use as a grapple or for other object handling, contact Daewoo. Lifting work applications (unless restricted or prohibited by local regulations) are permitted in approved lift configuration, to rated capacity only, with no sideloading. DO NOT use the machine for activities for which it was not intended. DO NOT use the bucket for lifting work, unless lift slings are used in the approved configuration.

Use of an accessory hydraulic hammer (breaker), work in rough terrain, demolition applications or other hazardous operation may require installation of additional protective structures to safeguard the operator.

Refer to Section 3 for additional information on Falling Object Protective Structures (F.O.P.S.) and other reinforcement systems.

Lifting Capacity Rating Configuration

Lifting-capacity ratings that are printed at the end of this safety section are based on the machine being level, on a firm supporting surface, with hooks and slings attached in approved configuration. Loads must be balanced and supported evenly. Use taglines to keep the load steady if wind conditions and a large surface area are a problem. Work crew hand signals, individual tasks, and safe procedures, should all be universally understood before the lift is made.

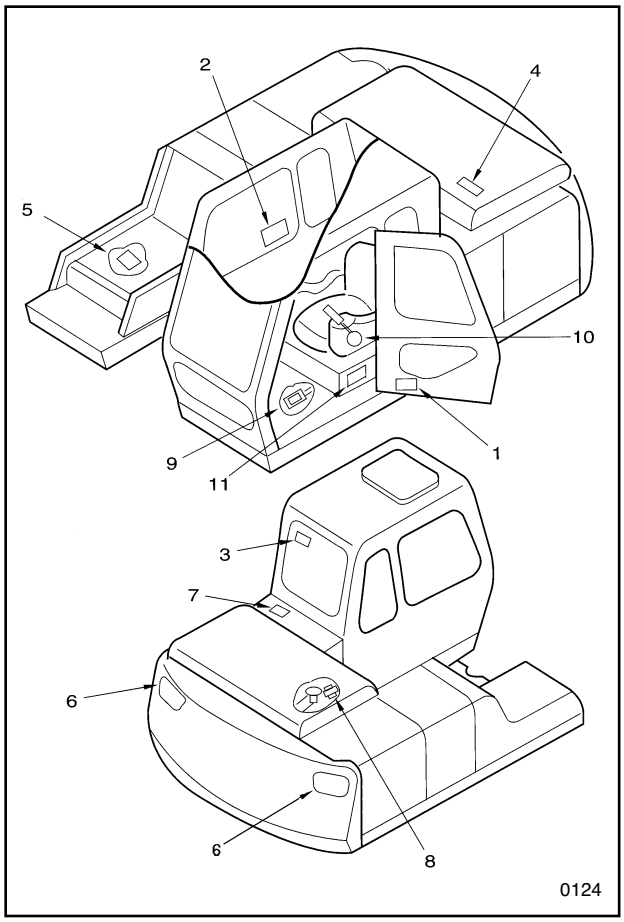
IMPORTANT

Before using the excavator to make lifts check municipal and regional regulations or statutes that could apply. Governing ordinances may require that all heavy lifting be done with single purpose equipment specifically designed for making lifts, or other local restrictions may apply. Making heavy lifts with a general purpose excavator that can be used for digging, loading, grading or other work may be expressly forbidden by a regional injunction or other legal prohibition. Always follow all of the other instructions, guidelines and restrictions for Safe Lifting in the Operation and Maintenance and Shop Manuals.

Locations of Safety Labels

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

There are other labels in addition to the safety labels that follow, so handle them in the same way. Safety labels may be available in languages other than English. To find out what labels are available, contact your Daewoo distributor.

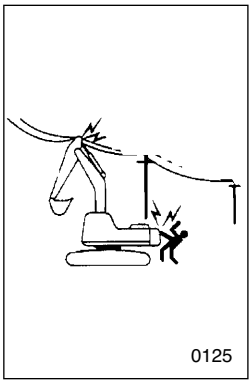


1. Warning for operation, inspection and maintenance (2190 – 2530).

CAUTION

- Read manual and labels before operation and maintenance. Follow instructions and warnings in manual and on labels on the machine.
- Never get in under the machine while it is being jacked up with boom and arm.
- For transporting the machine, the swing lock must be hung on.
- Turn Auto-Idle switch OFF, when loading the machine.
- Sound the horn to alert the people nearby before operating, and make sure all persons are clear of area.
- Always make sure when leaving operator's seat to:
  - Lower bucket or other working tools to the ground.
  - Move SAFETY LOCK DEVICE (located near seat) to LOCK position.
  - Turn key switch OFF. Remove key from switch.
- If hydraulic components and units are ABNORMAL, consult nearest DAEWOO dealer or authorized service shop. Do not attempt to make an overhaul.

2. Warnings for high voltage (2190 – 2532).



DANGER

Serious injury or death can occur if machine or attachments contact with electric lines. Never move any part of unit or load closer to electric lines than 3 m (10') plus twice the line insulator length.

3. **Warning when opening front window (2190 – 2526).**

WARNING

When raising window,
lock it in place with lock
pins on both sides.

Falling window can cause
injury.

4. **Warnings when opening engine hood (2190 – 2525).**

WARNING

Before opening bonnet stop engine.

5. **Warning for battery maintenance (2190 – 2533).**

DANGER

- Battery fumes can explode. Keep sparks and flames away from batteries.
- Always avoid storing metals like tools or inflammable materials around or on the batteries.
  Explosion or fire can be caused by short circuiting batteries.
- Sulfuric acid in battery is poisonous. It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed in eyes.

  If you spill acid on yourself:

  1. Flush your skin with water.
  2. Apply baking soda or lime to help neutralize the acid.
  3. Flush your eyes with water for 10 – 15 minutes.
     Get medical attention immediately.

6. **Keep out of the swing area (2190 – 2534).**

DANGER

KEEP OFF SWING AREA

7. **Warning for high temperature hydraulic oil (2190 – 2529).**

WARNING

HYDRAULIC OIL

To prevent hot oil from spurting out:

- Turn engine off.
- Allow oil to cool.
- Slowly loosen cap to relieve pressure before removing.

8. **Warning for high temperature coolant (2190 – 2531).**

WARNING

To prevent hot water from spurting out:

- Turn engine off.
- Allow water to cool.
- Slowly loosen cap to relieve pressure before removing.

9. Warning for handling accumulator (2190 – 2528).

WARNING

- Keep away from flame.
- Do not weld or drill.

Explosion hazard

Accumulator

The pilot control hydraulic system is equipped with an accumulator. The accumulator will store a pressure charge that may enable the hydraulic controls to be activated for a brief period of time after the engine has been shut down. Activation of any of the controls may enable the selected function to operate under the force of gravity.

CAUTION!!!

Any raised attachment will lower to the ground if the accumulator holds a charge.

Before shutting the machine down, lower the front attachment to the ground. After the engine has been shut down, move the joystick controls to release the pressure in the accumulator.

IMPORTANT

Consult the appropriate section of the Shop Manual for service procedures. Do not unthread any pilot line connections until pressure has been released from the accumulator.

10. Warning when inspecting hydraulic circuits (2190 – 2549).

11. Warning when adjusting track tension (2190 – 2527).

WARNING

The track adjuster adjustment and handling:

- The spring in the track adjuster is loaded with great force and the pressure in the cylinder is very high. For this reason there is a possibility of accident which may involve injury to personnel. It is very dangerous to make mistakes in handling such an adjustment or disassembly.
- Be sure to read the procedures described in the Operation and Maintenance Manual carefully before adjusting the track tension.

Summary of Safety Precautions for Lifting in Leveling Mode I

⚠ DANGER!!!

Unsafe use of the excavator in Leveling Mode I could cause serious, potentially fatal injuries or extensive damage to the machine or nearby property. Do not let anyone operate the machine unless they've been properly trained and understand the information in the Operation and Maintenance Manual.

To operate safely while lifting, carefully evaluate the following items:

- Condition of ground support
- Excavator configuration and attachments
- Weight, lifting height and lifting radius
- Safe rigging of the load
- Proper handling of the suspended load

All items should be evaluated by the operator and work-site crew.

Taglines on opposite sides of the load can be very helpful in keeping a suspended load secure, if they are anchored safely to control points on the ground.

⚠ WARNING!!!

1. **NEVER wrap a tagline around your hands or body.**
2. **NEVER rely on taglines or use the excavator in lifting mode when wind gusts are in excess of 48.3 km/h (30 mi/h). Be prepared for any type of wind gust when working with loads that have a large surface area.**

Engage the **"Leveling Mode I"** control on the Instrument Panel before using the excavator for lifting work.

IMPORTANT

If you need more information or have any questions or concerns about safe operating procedures or working the excavator correctly in a particular application or in the specific conditions of your individual operating environment, please consult your local Daewoo representative.

Unauthorized Modifications

Any modification made without authorization or written approval from Daewoo can create a safety hazard, for which the machine owner must be held responsible.

For safety's sake, replace all OEM parts with the correct authorized or genuine Daewoo part. For example, not taking the time to replace fasteners, bolts or nuts with the correct replacement parts could lead to a condition in which the safety of critical assemblies is dangerously compromised.

Attachment Precautions

Options kits are available through your dealer. Contact Daewoo for information on available one-way (single-acting) and two-way (double-acting) piping/valving/ auxiliary control kits. Because Daewoo cannot anticipate, identify, or test all of the attachments that owners may wish to install on their machines, please contact Daewoo for authorization and approval of attachments, and their compatibility with options kits.

Work-site Precautions

Avoid High-voltage Cables

Serious injury or death can result from contact or proximity to high-voltage electric lines. The bucket does not have to make physical contact with power lines for current to be transmitted.

Use a spotter and hand signals to stay away from power lines not clearly visible to the operator.

Depending upon the voltage in the line and atmospheric conditions, strong current shocks can occur with the boom or bucket as far away as 4 m – 6 m (13' 0" – 20' 0") from the power line. Very high voltage and rainy weather could further decrease that safety margin.

⚠ DANGER!!!

Before starting any type of operation near power lines (either above ground or buried cable-type), you should always contact the power utility directly and work out a safety plan with them.

Before Starting to Dig, Contact Authorities

Below ground hazards also include natural gas lines, water mains, tunnels and buried foundations. Know what's underneath the work-site before starting to dig.

Be Aware of Height Obstacles

Any type of object in the vicinity of the boom could represent a potential hazard, or cause the operator to react suddenly and cause an accident. Use a spotter or signal person when working near bridges, phone lines, work-site scaffolds, or other obstructions.

Use Care on Loose Support

Working heavy loads over loose, soft ground or uneven, broken terrain can cause dangerous side load conditions and possible tipover and injury. Travel without a load or a balanced load may also be hazardous under these conditions.

If temperatures are changing, be cautious of dark and wet patches when working or traveling over frozen ground. Stay away from ditches, overhangs and all other weak support surfaces. Halt work and install support mats or blocking if work is required in an area of poor track support.

Use Solid Support Blocking

Never rely on lift jacks or other inadequate supports when work is being done. Block tracks front and rear to prevent any movement.

Digging Beneath Overhangs

Digging beneath an overhang is dangerous. The overhang could collapse on top of the operator and cause serious injury or death. Go on to another digging area before steep overhangs are formed. Know the height and reach limits of the excavator and plan ahead while working. Park the excavator away from overhangs before work shutdown.

Digging Beneath the Excavator

Digging beneath the excavator is dangerous. The earth beneath the excavator could collapse. This could cause the excavator to tip, which could cause serious injury or death to the operator. Working around deep pits, trenching, or along high walls may require support blocks, especially after heavy rainfalls or during spring thaws.

Sloping Terrain Requires Caution

Dig evenly around the work-site whenever possible, trying to gradually level any existing slope. If it's not possible to level the area or avoid working on a slope, reducing the size and cycling rate of the workload is recommended.

On sloping surfaces, use caution when positioning the excavator prior to starting a work cycle. Stay alert for instability situations in order to avoid getting into them. For example, you should always avoid working the bucket over downhill crawler tracks when parked perpendicular to the slope. Slow all downhill swing movements and avoid full extensions of the bucket in a downhill direction. Lifting the bucket too high, too close to the machine, while the excavator is turned uphill can also be hazardous.

Stay Alert for People Moving through the Work Area

- When loading a truck you should always know where the driver is.
- Avoid loading over the cab of a truck even if the driver is in a safe spot. Someone else could have gone inside. Avoid working where unseen passersby might be.
- Slow down the work cycle and use slower travel speeds in congested or populated areas. Use a commonly understood signal so that other members of the work crew can warn the operator to slow or halt work in an impending hazard situation.

Operation

Be Prepared – Get to Know All Operating and Safety Instructions

This is the Safety Alert Symbol. Wherever it appears – in this manual or on safety signs on the machine – you should be alert to the potential for personal injury or accidents. Always observe safety precautions and follow recommended procedures.

Operate While Seated at the Operator's Station ONLY

Never reach in through a window to work a control. Do not try to operate the excavator unless you're in the command position – seated at the controls. You should stay alert and focused on your work at all times but DO NOT twist out of the seat if job activity behind you (or to the side) requires your attention.

Use a spotter or signal person if you can't see clearly and something is happening behind you.

Replace damaged safety labels and lost or damaged owner's manuals.

Do not let anyone operate the machine unless they've been fully and completely trained, in safety and in operation of the machine.

Learn the Signal Words Used with the Safety Alert Symbol

The words **"CAUTION," "WARNING,"** and **"DANGER"** used throughout this manual and on labels on the machine indicate degree of risk of hazards, or unsafe practice. All three degrees of risk indicate that safety is involved. Observe precautions indicated whenever you see the Safety Alert "Triangle," no matter which signal word appears next to the "Exclamation Point" symbol.

⚠CAUTION!!!

Indicates the presence of a hazardous situation that, if not avoided, could result in minor or moderate injury. It may also be used to alert against a generally unsafe practice.

⚠WARNING!!!

Indicates the presence of a hazardous situation that, if not avoided, could result in serious injury or death. It may also be used to alert against a highly unsafe practice.

⚠DANGER!!!

Indicates the imminent hazard of a situation that, if not avoided, is very likely to cause death or extremely serious injury. It may also be used to alert against equipment that may explode or detonate if handled or treated carelessly.

Before Starting the Engine

Do a "pre-start" safety check:

- Walk around your machine before getting in the operator's cab. Look for evidence of leaking fluid, loose fasteners, misaligned assemblies or any other indications of possible equipment hazard.
- All equipment covers and machinery safety guards must be in place, to protect against injury while the machine is being operated.
- Look around the work-site area for potential hazards, or people or property that could be at risk while operation is in progress.
- NEVER start the engine if there is any indication that maintenance or service work is in progress, or if a warning tag is attached to controls in the cab.
- A machine that has not been used recently, or is being operated in extremely cold temperatures, could require a warmup or maintenance service prior to start-up.
- Check gauges and monitor displays for normal operation prior to starting the engine. Listen for unusual noises and remain alert for other potentially hazardous conditions at the start of the work cycle.

Never Use Ether Starting Aids

An electric-grid type manifold heater is used for cold starting. The glowing heater element can cause ether or other starting fluid to detonate, causing injury.

Mounting and Dismounting

- NEVER get on or off a moving machine. Do not jump on/off. The entry/egress path should be clear of mud, oil and spills and mounting hardware must be kept tight and secure.
- Always use handholds, steps or track shoes and maintain at least 3-point contact of hands and feet. Never use controls as handholds.
- NEVER get up from the operator's seat or leave the operator's station and dismount the machine if the engine is running.

Observe General Safety Rules

Only trained and authorized personnel, with a good knowledge and awareness of safe procedures, may be allowed to operate or perform maintenance or service on the excavator.

All personnel at the work-site should be aware of assigned individual responsibilities and tasks. Communication and hand signals used should be understood by everyone.

Terrain and soil conditions at the job-site, approaching traffic, weather-related hazards and any above or below ground obstacles or hazards should be observed and monitored by all work crew members.

Engine Ventilation

Engine exhaust gases can cause loss of judgement, loss of alertness, and loss of motor control. These gases can also cause unconsciousness, serious injury, and fatal accidents.

Make sure of adequate ventilation before starting the engine in any enclosed area.

You should also be aware of open windows, doors or ductwork into which exhaust may be carried, or blown by the wind, exposing others to danger.

Take Time to Provide Good Visibility

Halt work if visibility is poor. Strong rains, snow, fog and extremely dusty conditions can all obscure visibility so badly that it is best to wait for weather to change or dust to settle before continuing operation.

Night work in areas of limited visibility should be stopped and extra work lights on the machine (or in the work area) should be installed.

Keep dirt and dust off of windows and off the lens surfaces of work lights. Stop working if lights, windows or mirrors need cleaning or adjustment.

Fuel, Oil and Hydraulic Fluid Fire Hazards

Add fuel, oil, antifreeze and hydraulic fluid to the machine only in a well ventilated area. The machine must be parked with controls, lights and switches turned off. The engine must be off and any flames, glowing embers, auxiliary heating units or spark-causing equipment must be doused, turned off and/or kept well clear of the machine.

Static electricity can produce dangerous sparks at the fuel filling nozzle. In very cold, dry weather or other conditions that could produce static discharge, keep the tip of the fuel nozzle in constant contact with the neck of the fuel filling nozzle, to provide a ground.

Keep fuel and other fluid reservoir caps tight and do not start the engine until caps have been secured.

Boost Starting or Charging Engine Batteries

Turn off all electrical equipment before connecting leads to the battery. This includes electrical switches on the battery charger or boost starting equipment.

When boost-starting from another machine or vehicle do not allow the two machines to touch. Wear safety glasses or goggles while required parallel battery connections – positive to positive and negative to negative – are made.

(24 volt battery units consisting of two series-connected twelve volt batteries have a cable connecting one positive terminal on one of the 12 volt batteries to a negative terminal on the other battery. Booster or charger cable connections must be made between the non-series-connected positive terminals and between the negative terminal of the booster battery and the metal frame of the machine being boosted or charged.) Refer to the procedure and illustration in the "Operating Instructions" section of this book.

Connect positive cable first when installing cables and disconnect the negative cable first when removing them. The final cable connection, at the metal frame of the machine being charged or boost-started, should be as far away from the batteries as possible.

Travel Controls May Produce Reversed Operations

Before starting the machine you should always check to see which end of the track frame is under the operator's cab. In the normal travel configuration, track frame travel motors are at the rear of the machine, under the engine and counterweight. If the operator swings the cab 180°, travel motors will be underneath the operator's cab, toward the front of the track frame and operating travel will be reversed.

When traveling the excavator always keep lights on; make sure that you are in compliance with all state and local regulations concerning warning flags and signs and keep the operator's cab positioned over the idler end of the track frame. That will keep travel controls in their intended configuration and at the same time, maintain the proper orientation of lights on the machine and posted flags and signs.

Keep "Pinch Point" Areas Clear – Use Caution in Reverse & Swing

Use a signal person in high traffic areas and whenever the operator's view is not clear, such as when traveling in reverse. Make sure that no one comes inside the swing radius of the machine.

Anyone standing near the track frames, or working assemblies of the attachment, is at risk of being caught between moving parts of the machine.

Never allow anyone to ride on any part of the machine or attachment, including any part of the turntable or operator's cab.

Travel Precautions

Attachment control levers should not be operated while traveling.

Do not change selected travel mode (FAST/SLOW) while traveling.

Fold in work equipment so that the outer end of the boom is as close to the machine as possible, and is low – 203 mm – 304 mm (8" – 12") above ground.

Never travel over obstacles or slopes that will cause the machine to tilt severely. Travel around any slope or obstacle that causes 10 degrees tilt, or more.

Operate Carefully on Snow and Ice and in Very Cold Temperatures

In icy cold weather avoid sudden travel movements and stay away from even very slight slopes. The machine could skid off to one side very easily.

Snow accumulation could hide or obscure potential hazards. Use care while operating or while using the machine to clear snow.

Warming up the engine for a short period may be necessary, to avoid operating with sluggish or reduced working capacity. The jolting shocks and impact loads caused by bumping or bottoming the boom or attachment are more likely to cause severe stress in very cold temperatures. Reducing work cycle rate and work load may be necessary.

Parking the Machine

Avoid making sudden stops, or parking the machine wherever it happens to be at the end of the work day. Plan ahead so that the excavator will be on a firm, level surface away from traffic and away from high walls, cliff edges and any area of potential water accumulation or runoff. If parking on inclines is unavoidable, block the crawler tracks to prevent movement. Lower the bucket or other working attachment completely to the ground, or to an overnight support saddle. There should be no possibility of unintended or accidental movement.

Shutdown Control Functions

After the machine has been lowered to the overnight storage position and all switches and operating controls are in the OFF position, the control stand lock lever must be engaged. Release the left console to disable all pilot circuit control functions.

Insert the swing lock pin and engage all brakes and lock-down security equipment that may have been installed on the machine.

IMPORTANT

When hydraulic system maintenance or service work must be performed, you should be aware that an accumulator in the system stores fluid under pressure after system lock down, even after the control stand is raised. Release this energy by working the controls with the engine off, until pressure in the pilot circuit has been completely bled away.

Equipment

Rough Operation May Require Use of Certified Safety Equipment

Work in mines, tunnels, deep pits or on loose or wet surfaces could produce danger from falling rock, roll over or hazardous flying objects. Additional protection for the operator's cab could be required in the form of a FOPS/ Falling Object Protective Structure, ROPS/Roll Over Protective Structure and/or OPS/Operator Protective Structure reinforcement system.

Any reinforcement system that is installed on the machine must pass safety and certification standards and carry appropriate labeling and rating information. For example, the most often added type of reinforcement system, FOPS, must meet or exceed Society of Automotive Engineers standard SAE J1356, "Performance Criteria for Falling Object Guards for Excavators."

Never attempt to alter or modify any type of protective structure reinforcement system, by drilling holes, welding or remounting or relocating fasteners. Any serious impact or damage to the system requires a complete integrity reevaluation. Reinstallation, recertification and/or replacement of the system may be necessary.

Install Additional Safety Equipment If Conditions Require

When working with a breaker or in some shear work applications, a front guard over the windshield may be required. The windshield guard may or may not be OPS/certified, depending upon the specific application and working situation.

Laminate glass protection for the front, side or rear windows may also be recommended depending upon particular site conditions.

Contact your Daewoo distributor for available safety guards and/or recommendations if there is any danger of getting hit by objects that could strike the operator's cab. Make sure that all other work-site crew members are kept well away from the excavator and safe from potential hazards.

Movement Alarms

If the excavator is equipped with an audible travel movement alarm or visible swing movement alarm (strobe light), test the alarm on a daily basis. The audible alarm should sound as soon as the travel system is engaged. The strobe light should begin to flash as soon as the swing system is engaged.

Seat Belts Should Be Used at All Times

Whenever the engine is running, the operator should be seated at the control station with the seat belt properly engaged.

Keep a Fire Extinguisher at Hand

It is recommended that an appropriately sized (2.27 kg [5 lb] or larger) multi-purpose "A/B/C" fire extinguisher be mounted in the cab. Check and service the fire extinguisher at regular intervals and make sure that all work-site crew members are adequately trained in its use.

Maintain Standard Safety Equipment in Good Condition

Machinery guards and body panel covers must be in place at all times. Keep well clear of rotating parts. Pinch point hazards such as cooling fan and alternator drive belts could catch hair, jewelry or oversize or very loose clothing.

Safety labels must be replaced if they are damaged or become unreadable. The information on labels gives work crew members an important safety reminder exactly where it will do the most good. Part numbers for each label and required mounting locations are shown on Pages 1-2 through 1-4 of this section.

Safety-critical Parts Must Be Replaced Periodically

Replace the following fire-related components as soon as they begin to show any sign of wear, or at regular periodic intervals, whether or not deterioration is visible:

- Fuel system flexible hoses, the tank overflow drain hose and the fuel filler cap.
- Hydraulic system hoses, especially the pump outlet lines and front and rear pump branch hoses.
- Keep mounting brackets and hose and cable routing straps tight. Hose routing should have gradual bends.

Hydraulic Cylinder Seals Require Periodic Replacement

Check cylinder drift rate at regular intervals. Overhaul seal kits are available through Daewoo.

High Pressure Hydraulic Lines Can Store a Great Deal of Energy

Exposed hydraulic hoses on the arm or boom could react with explosive force if struck by a falling rock, overhead obstacle or other job-site hazard. Extra safety guards may be required. NEVER allow hoses to be hit, bent or interfered with during operation.

The Operator's Cab and Turntable Deck Should Be Kept Clean

Cleaning off accumulations of grease and dirt helps extend equipment service life. Cleaning also provides an opportunity to inspect equipment. Minor damage can be repaired or corrected before major problems result.

Keep the cab floor and consoles free of tools and personal items.

Wear Eye Protection and Safety Clothing – Use Proper Tools

Full eye protection, a hard hat, safety shoes and gloves may be required at the job-site.

While working on the machine, never use inadequate tools. They could break or slip, causing injury, or they may not adequately perform intended functions.

Breathing Masks, Ear Protection May Be Required

Don't forget that some risks to your health may not be immediately apparent. Exhaust gases and noise pollution may not be visible, but these hazards can cause disabling or permanent injuries.

NOTE

The sound level in the closed operator's cab is 75 dB(A). Additional information on the machine sound and vibration levels can be found in the Shop Manual.

Battery Electrolyte and Explosive Gases Can Be Lethal

Flush eyes with water for 10 –15 minutes if acid is splashed in the face. Anyone who swallows acid must have immediate medical aid. Call the Poison Control listing in the front cover of the telephone directory. Water, a popsicle or ice cream are likely better than old remedies that try to induce vomiting (which would expose tissue to damage twice).

Explosive battery gas can be set off by sparks from incidental contact or static discharge. Turn off all switches and the engine when working on batteries. Keep battery terminals tight. Contact between a loose terminal and post can create an explosive spark.

Disconnect Batteries for Electrical Service Before Electrical Welding

Remove cable from negative terminal first, when disconnecting cable. Connect positive terminal cables first when installing a battery.

Use Low Heat Portable Lighting

Hot surfaces on trouble lights or portable work lights can set off fuel or battery explosive gases.

Maintenance

Use Warning Tag Control Lockout Procedures During Service

Alert others that service or maintenance is being performed and tag operator's cab controls – and other machine areas if required – with a warning notice. OSHA-mandated control lever lockout can be made with any OSHA certified lockout device and a length of chain or cable to keep the left-hand control console in the fully raised, non-active position.

Warning tags for controls are available from Daewoo distributors.

Do not Run the Engine If Repairs Are Being Performed Alone

You should always have at least two people working together if the engine must be run during service. One person needs to remain in the operator's seat, ready to work the controls or stop the machine and shut off the engine.

Always Use Adequate Equipment Supports and Blocking

Do not allow weight or equipment loads to remain suspended. Lower everything to the ground before leaving the operator's seat. Do not use hollow, cracked or unsteady, wobbling weight supports. Do not work under any equipment supported solely by a lift jack.

Do Not Work on Hot Engines, Hot Cooling Systems or Hot Hydraulic Systems

Wait for the engine to cool off after normal operation. Park the excavator on a firm, level surface and lower all equipment before shutting down and switching off controls. When engine lube oil, gearbox lubricant or other fluids require change, wait for fluid temperatures to decrease to a moderate level before removing drain plugs.

NOTE

Oil will drain more quickly and completely if it is warm. Do not drain fluids at 95°C (203°F) temperatures but do not allow full cool-down.

Cool-down Is Required Prior to Radiator or Reservoir Checks

Stop the engine and allow heat to dissipate before performing service on the engine radiator or hydraulic fluid reservoir. Both assemblies have air vent levers at or near the filler cap for venting built-up air pressure. Release the levers before trying to take off filler caps and LOOSEN CAPS SLOWLY, prior to removal.

Pressurized Hydraulic Oil Fluid Leaks Can Be Dangerous

Fluid leaks from hydraulic hoses or pressurized components can be difficult to see but pressurized oil has enough force to pierce the skin and cause serious injury.

Always use a piece of wood or cardboard to check for suspected hydraulic leaks. Never use your hands or expose your fingers.

Obtain immediate medical attention if pressurized oil pierces the skin

IMPORTANT

Failure to obtain prompt medical assistance could result in gangrene or other serious damage to tissue.

Use Correct Replacement Fasteners Tightened to Proper Torque

Refer to the “General Maintenance” section of the Shop Manual for information on tightening torques and recommended assembly compounds and always use the correct part.

Poor or incorrect fastener connections can dangerously weaken assemblies.

Dispose of All Petroleum-based Oils and Fluids Properly

Physical contact with used motor oil may pose a health risk. Wipe oil from your hands promptly and wash off any remaining residue.

Used motor oil is an environmental contaminant and may only be disposed of at approved collection facilities. Never drain any petroleum-based product on the ground or dispose of old oil in municipal waste collection containers, or in metropolitan sewer systems or rural landfills.

Check state and local regulations for other requirements.

Track Tension Adjustments Require Caution

NEVER turn out the track tension grease fitting nut. To release pressure from the crawler frame track tension assembly, you should NEVER attempt to disassemble the track adjuster or attempt to remove the grease fitting or valve assembly.

Keep your face and body away from the valve. Refer to the track adjustment procedure in the Operation and Maintenance Manual or Shop Manual.

Shipping and Transportation

Obey State and Local Over-the-Road Regulations

Check state and local restrictions regarding weight, width and length of a load prior to making any other preparation for transport.

The hauling vehicle, trailer and load must all be in compliance with local regulations governing the intended shipping route.

Partial disassembly or tear-down of the excavator may be necessary to meet travel restrictions or particular conditions at the job-site. See section 3 of the Shop Manual for information on partial disassembly.

Refer to the Transportation and Shipping section of the Operation and Maintenance Manual for information on loading, unloading and towing.

Excavator Rated Lift Capacity Tables

⚠WARNING!!!

All rated lift capacities are based on the machine and the load both remaining level at all times. DO NOT EXCEED THE RATED LIFT CAPACITY. Lifting loads greater than those shown in the rated capacity tables can cause catastrophic equipment failure and/or structural collapse of the machine.

To operate safely the excavator should be on a firm, level and uniformly supporting surface. The operator is expected to make due allowance for all specific work-site and lift-related conditions, and respond to changes in those conditions that could pose a hazard. The following could all cause hazardous conditions and accidents or injuries:

- Soft or uneven ground
- Off-level terrain
- Side loads
- Modifications or poor maintenance of the excavator
- Failure to lift squarely over the end or squarely over the side of the machine

When a load is in the air, the operator must remain alert.

- Avoid side loads that may be caused by uneven slings, traveling with the load, or swinging too quickly.
- The load can become unbalanced if the hookline is twisted and starts to rotate. If the surface area of the load is large enough, wind gusts can create side loads.
- Keep the bucket hook point directly over the load. Taglines on opposite sides of the load can help maintain greater stability against side loads and wind gusts.

Avoid traveling with a suspended load. Before swinging (or if required, traveling), bring the load in to an arm position (radius and height) that has a safer weight capacity rating **and adequate movement clearance.** The operator and all work-site personnel should be thoroughly familiar with safety instructions and procedures within this Operation and Maintenance Manual.

Engage the **“Leveling Mode I”** control on the Instrument Panel before using the excavator for lifting work.

Taglines on opposite sides of the load can be very helpful in keeping a suspended load secure, if they are anchored safely to control points on the ground.

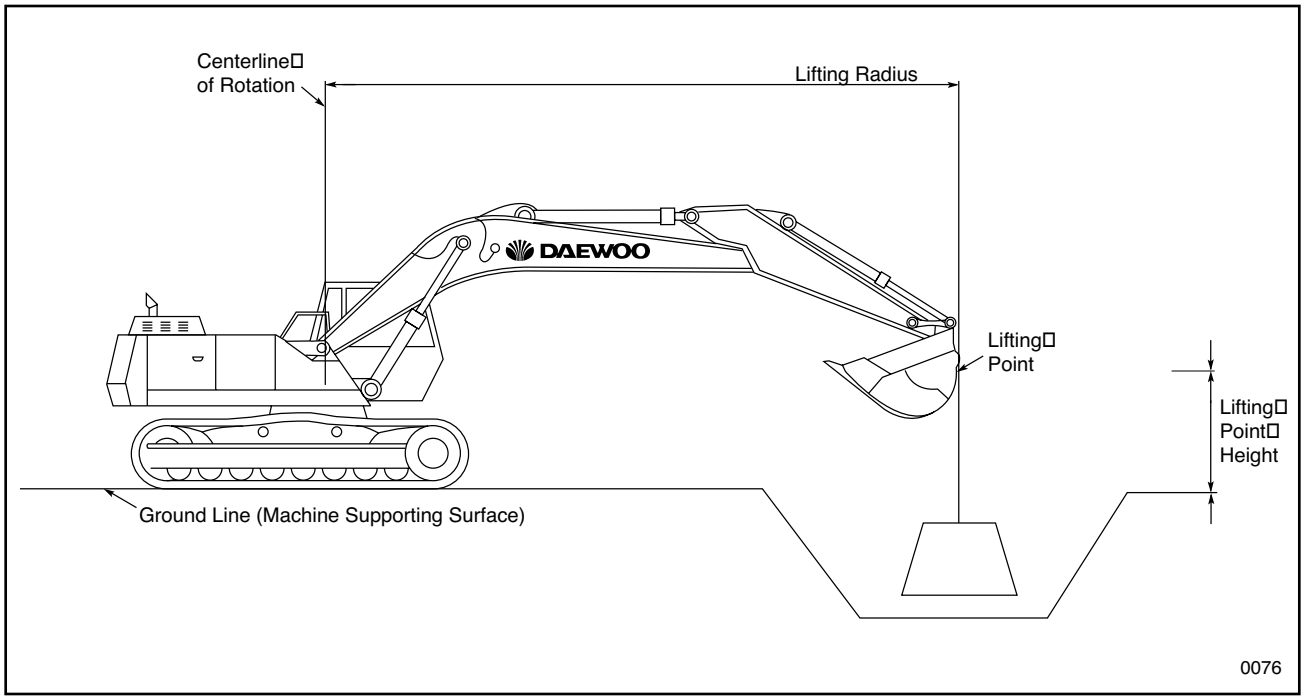
⚠WARNING!!!

1. **NEVER wrap a tagline around your hands or body.**
2. **NEVER rely on taglines or use the excavator in lifting mode when wind gusts are in excess of 48.3 km/hr (30 mi/hr). Be prepared for any type of wind gust when working with loads that have a large surface area.**

IMPORTANT

If you need more information or have any questions or concerns about safe operating procedures or working the excavator correctly in a particular application or in the specific conditions of your individual operating environment, please consult your local Daewoo representative or call Daewoo After Sales Service.

Excavator Rated Lift Capacity Tables (Continued)



The following weight loads are in compliance with SAE (J1097) and ISO applicable, recommended standards for hydraulic excavators performing lifting operation on a firm supporting surface. An asterisk (*) next to the lift rating indicates rated load does not exceed 87% of hydraulic capacity. All other ratings have been determined not to exceed 75% of tipping capacity.

DO NOT attempt to lift or hold any load that exceeds rated load capacity at the specified distances (from the machine's rotation centerline and height – see “lift radius” and “lift height” in the reference drawing).

The weight of slings and any auxiliary lifting device (and/or the weight difference of any attachment heavier than standard configuration) must be deducted from the rated lift capacity to determine allowable net lifting load. The lift point should be located on the back of the bucket, as shown in the reference drawing on this page.

IMPORTANT

Press the “Leveling Mode I” switch on the Instrument Panel before using the excavator for lifting work. Engine and hydraulic oil should both be fully warmed up to operating temperature before starting a lift.

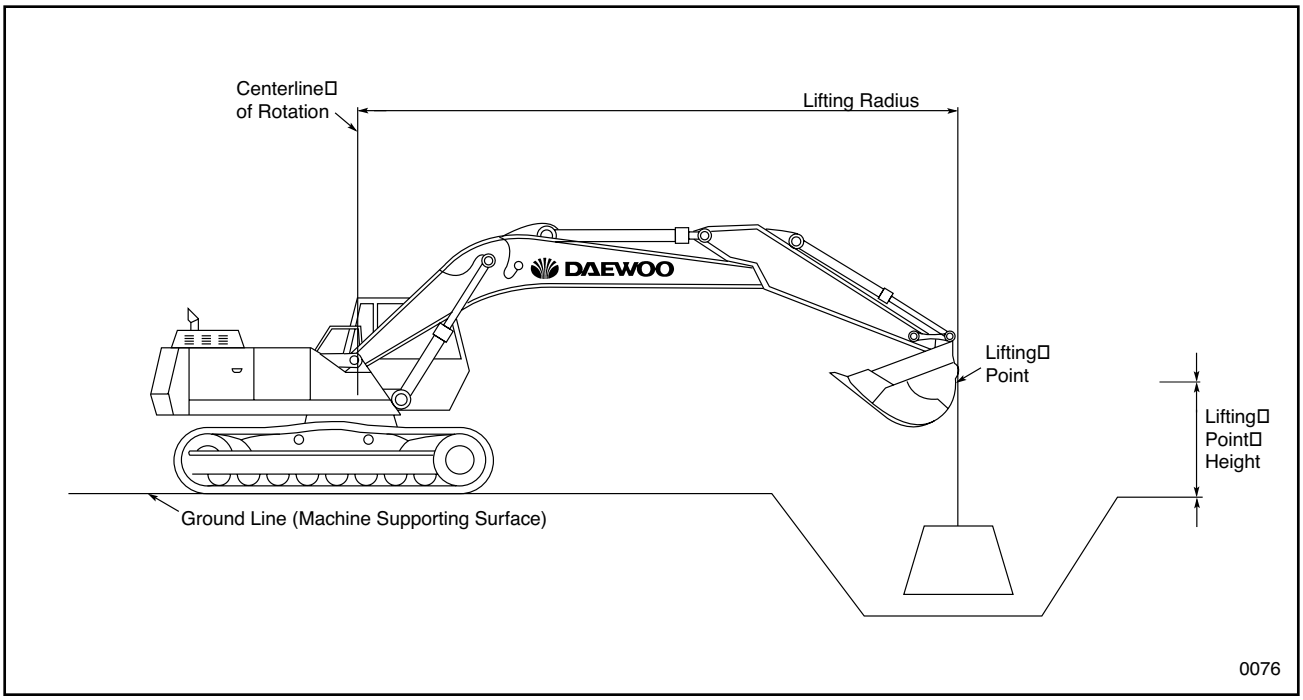
Excavator Rated LIft Capacity Tables (Continued)

Lift Ratings for Standard Configuration, Over Front ( ) in Kg (Lb)

Boom Length	Arm Length	Shoe Width	Counterweight	Bucket Size
6,500 mm (21' 4")	4,100 mm (13' 5")	600 mm (23.5")	Standard	1.3 m^3 (1.7 yd^3) (CECE), Std. Size

Lift Height	3.0 m Radius (10')	4.5 m Radius (15')	6.1 m Radius (20')	7.5 m Radius (25')	9.0 m Radius (30')	Maximum Radius Lift Capacity
7.5 m (25')				5,538 kg (12,210 lb)		2,790 kg (6,150 lb)
6.1 m (20')				5,756 kg (12,690 lb)	5,566 kg (12,270 lb)	2,522 kg (5,560 lb)
4.5 m (15')			7,149 kg (15,760 lb)	6,414 kg (14,140 lb)	6,069 kg (13,380 lb)	2,372 kg (5,230 lb)
3.0 m (10')		11,812 kg (26,040 lb)	8,809 kg (19,420 lb)	7,307 kg (16,110 lb)	6,500 kg (14,330 lb)	2,309 kg (5,090 lb)
1.5 m (5')		14,873 kg (32,790 lb)	10,414 kg (22,960 lb)	8,242 kg (18,170 lb)	6,817 kg (15,030 lb)	2,322 kg (5,120 lb)
Ground Line		16,465 kg (36,300 lb)	11,603 kg (25,580 lb)	8,972 kg (19,780 lb)	6,695 kg (14,760 lb)	2,418 kg (5,330 lb)
-1.5 m (-5')	10,950 kg (24,140 lb)	16,973 kg (37,420 lb)	12,174 kg (26,840 lb)	8,904 kg (19,630 lb)	6,632 kg (14,620 lb)	2,599 kg (5,730 lb)
-3.0 m (-10')	16,892 kg (37,240 lb)	16,393 kg (36,140 lb)	11,979 kg (26,410 lb)	8,877 kg (19,570 lb)		2,926 kg (6,450 lb)
-4.5 m (-15')	21,015 kg (46,330 lb)	14,733 kg (32,480 lb)	10,832 kg (23,880 lb)	7,652 kg (16,870 lb)		3,475 kg (7,660 lb)
-6.1 m (-20')	15,767 kg (34,760 lb)	11,163 kg (24,610 lb)	7,049 kg (15,540 lb)			4,504 kg (9,930 lb)

Excavator Rated Lift Capacity Tables (Continued)



The following weight loads are in compliance with SAE (J1097) and ISO applicable, recommended standards for hydraulic excavators performing lifting operation on a firm supporting surface. An asterisk (*) next to the lift rating indicates rated load does not exceed 87% of hydraulic capacity. All other ratings have been determined not to exceed 75% of tipping capacity.

DO NOT attempt to lift or hold any load that exceeds rated load capacity at the specified distances (from the machine's rotation centerline and height – see “lift radius” and “lift height” in the reference drawing).

The weight of slings and any auxiliary lifting device (and/or the weight difference of any attachment heavier than standard configuration) must be deducted from the rated lift capacity to determine allowable net lifting load. The lift point should be located on the back of the bucket, as shown in the reference drawing on this page.

IMPORTANT

Press the “Leveling Mode I” switch on the Instrument Panel before using the excavator for lifting work. Engine and hydraulic oil should both be fully warmed up to operating temperature before starting a lift.

Excavator Rated Lift Capacity Tables (Continued)

Lift Ratings for Standard Configuration, Over SIDE () in Kg (Lb)

Boom Length	Arm Length	Shoe Width	Counterweight	Bucket Size
6,500 mm (21' 4")	4,100 mm (13' 5")	600 mm (23.5")	Standard	1.3 m^3 (1.7 yd^3) (CECE) Std. Size

Lift Height	3.0 m Radius (10')	4.5 m Radius (15')	6.1 m Radius (20')	7.5 m Radius (25')	9.0 m Radius (30')	Maximum Radius Lift Capacity
7.5 m (25')				5,538 kg (12,210 lb)		2,790 kg (6,150 lb)
6.1 m (20')				5,756 kg (12,690 lb)	4,758 kg (10,490 lb)	2,522 kg (5,560 lb)
4.5 m (15')			7,149 kg (15,760 lb)	6,414 kg (14,140 lb)	4,704 kg (10,370 lb)	2,372 kg (5,230 lb)
3.0 m (10')		11,812 kg (26,040 lb)	8,809 kg (19,420 lb)	6,355 kg (14,010 lb)	4,586 kg (10,110 lb)	2,309 kg (5,090 lb)
1.5 m (5')		13,903 kg (30,650 lb)	8,305 kg (18,310 lb)	6,101 kg (13,450 lb)	4,459 kg (9,830 lb)	2,322 kg (5,120 lb)
Ground Line		13,231 kg (29,170 lb)	8,401 kg (18,520 lb)	5,892 kg (12,990 lb)	4,350 kg (9,590 lb)	2,418 kg (5,330 lb)
-1.5 m (-5')	10,950 kg (24,140 lb)	13,059 kg (28,790 lb)	8,200 kg (18,070 lb)	5,761 kg (12,700 lb)	4,291 kg (9,460 lb)	2,599 kg (5,730 lb)
-3.0 m (-10')	16,892 kg (37,240 lb)	13,018 kg (28,700 lb)	8,147 kg (17,960 lb)	5,733 kg (12,640 lb)		2,926 kg (6,450 lb)
-4.5 m (-15')	21,015 kg (46,330 lb)	13,213 kg (29,130 lb)	8,255 kg (18,200 lb)	5,869 kg (12,940 lb)		3,475 kg (7,660 lb)
-6.1 m (-20')	15,767 kg (34,760 lb)	11,163 kg (24,610 lb)	7,049 kg (15,540 lb)			4,504 kg (9,930 lb)

Excavator Machinery Plan

The excavator has 3 main component sections:

- The Upper Turntable
- The Lower Undercarriage and Track Frames
- The Excavator Front-end Attachment

The drawings identify main components and their location. See Figure 2-1.

1. Battery
2. Fuel Filler
3. Fuel Tank
4. Radiator & Oil Cooler
5. Counterweight
6. Engine
7. Cab
8. Storage
9. Hyd. Oil Tank
10. Muffler
11. Pumps
12. Air Cleaner
13. Arm Cylinder
14. Boom
15. Boom Cylinder
16. Seat
17. Center Joint
18. Swing Motor
19. Control Valves
20. Precleaner
21. Bucket Cylinder
22. Arm
23. Link
24. Bucket
25. Tooth Point
26. Side Cutter
27. Joystick Controls
28. Travel Lever
29. Track Link & Shoe
30. Idler
31. Track Adjuster
32. Track Guide
33. Upper Roller
34. Lower Roller
35. Travel Motor

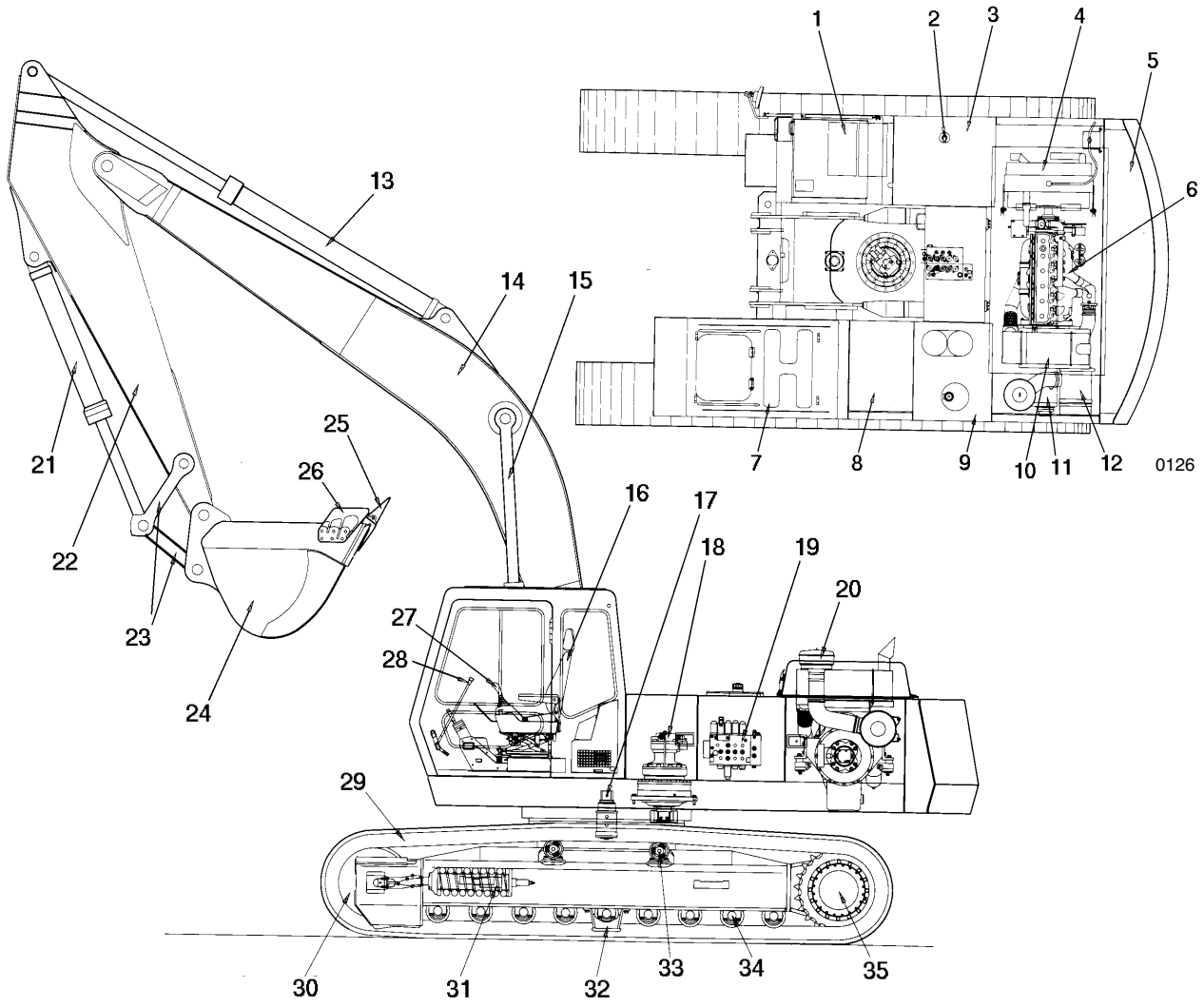


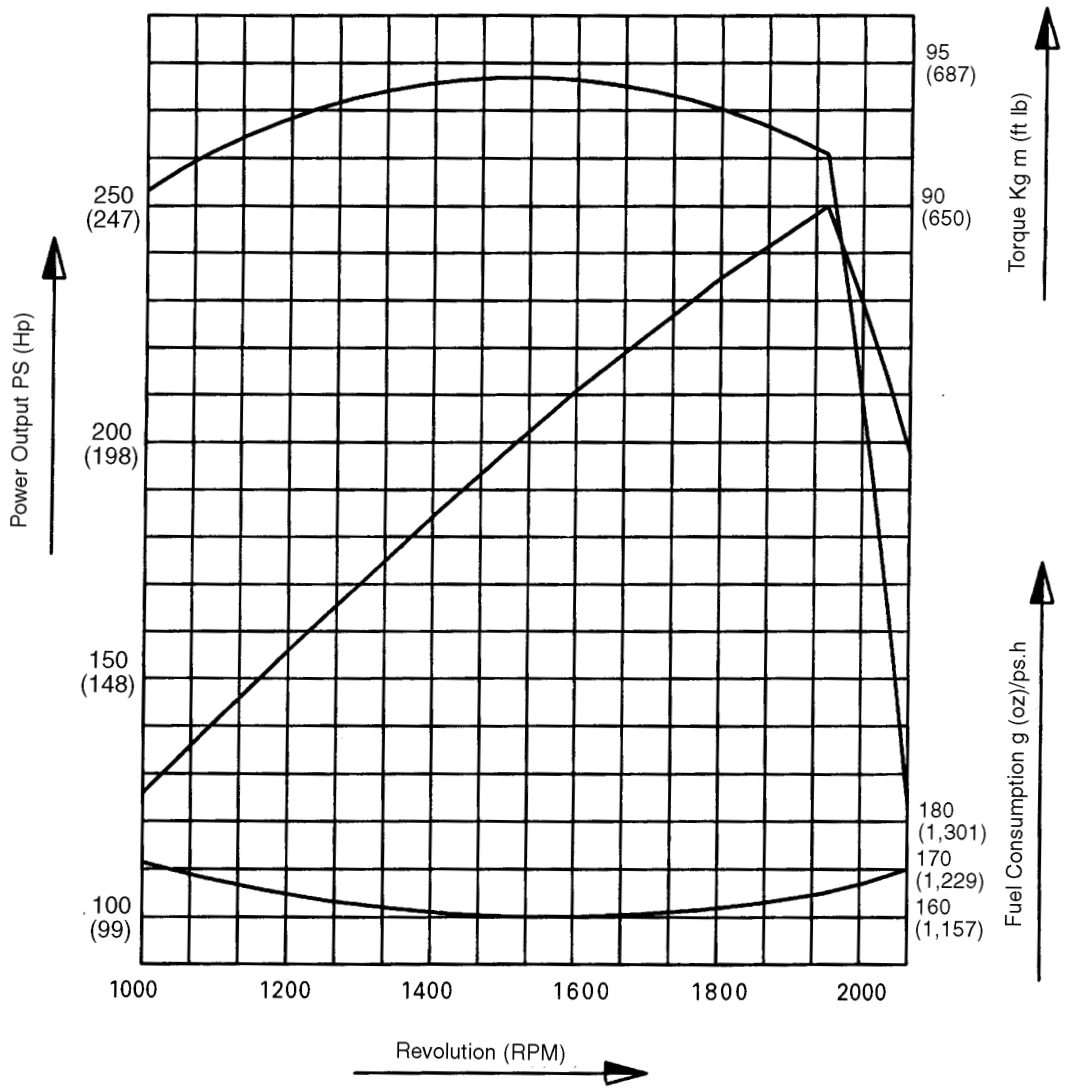
FIGURE 2-1

0127

Excavator Engine Specifications

Model	**Daewoo D2366T**
Type	4 Cycle In-line 6 Cylinder Diesel, Turbocharged, water-cooled
Engine Block	
Combustion Chamber	AVL Toroidal
Combustion System	Direct Injection
Cylinder Bore and Stroke	123 mm x 155 mm (4.84 in x 6.10 in)
Engine Displacement	11,051 cm^3 (674 in^3)
Direction of Rotation	Counterclockwise (viewed facing flywheel)
Compression Ratio	16.5 : 1
Compression Pressure (Engine Cylinder No-Load Test Pressure)	Over 29 kg/cm^2 (412 psi) or above @ 220 RPM
Cylinder Firing Order	1-5-3-6-2-4
Engine Valve Cold Lash Adjustment	0.3 mm (0.0118 in), intake & exhaust
Valve Timing	Intake Open @ 18° BTDC Intake Close @ 34° ABDC Exhaust Open @ 46° BBDC Exhaust Close @ 14° ATDC
Rated Flywheel Horsepower	250 Metric hp (247 hp) @ 1,950 RPM, 180 kw @ 1,950 RPM (DIN 6271)
Minimum No-Load RPM	800 plus or minus 50 RPM
Torque Output	100 kg m (723 ft lb) @ 1,400 RPM
Maximum Engine Tilt	35 degrees (Fore/Aft and Rt/Left)
Turbocharger Type	Exhaust Gas Driven
Rotor Shaft Axial Clearance	Max 0.25 mm (0.0098")
Rotor Shaft Radial Clearance	Max 0.5 mm (0.0197")
Mass (Dry)	924 kg (2,037 lb)
Fuel System	
Fuel Injection Pump	BOSCH P
Fuel Injection Pressure	210 kg/cm^2 (2,987 psi)
Fuel Injection Timing	17° BTDC
Injector Nozzle Type	Multi-hole
Fuel Filter (two-stage)	Felt Primary Element Paper Secondary Element
Governor	Mechanical (RSV)
Fuel Consumption	< 165 g per ps/hr, @ 2,000 RPM (5.9 oz. per Hp/hr)
Lubrication System	
Engine Oil System Capacity	25 l (6.6 gal.)
Engine Oil Pressure Ranges At Idle At Max Engine Speed	 0.8-1.4 kg/cm^2 (11.4-20 psi) 3.0-4.8 kg/cm^2 (42.6-68.3 psi)
Lubrication Pressures At Idle At Max Engine RPM	 Min 0.8 bar (11.6 psi) Min 2.0 bar (29 psi)
Engine Oil	American Petroleum Institute/SAE Class CC/CD or better (Class CD-II, CE, CF-4, CG-4)
Cooling System	
Coolant Capacity (Engine only)	19 l (20 qt)
Engine Coolant Thermostat	Wax-Spirit Type
Thermostat Temperatures	Opening begins at 92°C (197.6°F), Fully open @ 95°C (203°F)
Electrical System	
Batteries	2 x 12 V, 200 AH
Charging System Regulator	IC Type (Integrated Circuit)
Alternator	100 amp, 24 V (IC Type)
Starter	6.6 Kw, 24 V, Magnet Type

Engine Performance Curves (Per KS-R1004 Standard)



- Power Output – Metric Hp (Hp)/RPM : 250 (247)/1,950
- Torque – kg m (ft lb)/RPM : 100 (723)/1,400
- Fuel Consumption – g/ps.h (oz/Hp.h) : 163 (5.75)

FIGURE 2-2

3301

Hydraulic System Component Specifications

Main Pump		
	Quantity:	2
	Displacement:	143.6 cm^3/rev (8.76 in^3)
	Max Flow Rate:	280 l/min x 2 (74 gal/min) x 2
	Flow Regulator Type:	Negative Control
	Relief Pressure:	300 – 320 kg/cm^2 (4,267 – 4,552 psi)
Pilot Pump		
	Displacement:	15 cm^3/rev (0.92 cu in)
	Max Flow Rate:	29.2 l/min (7.7 gal/min)
	Relief Valve:	40 kg/cm^2 (569 lb/in^2)
Control Valve		
	Relief Valves (Main):	300 – 320 kg/cm^2 (4,266 – 4,550 psi)
	Left Side Spools: (and spool diameter)	Travel, left 28 mm (1.10") diameter Option, 28 mm (1.10") diameter Arm, 28 mm (1.10") diameter Swing, 28 mm (1.10") diameter
	Right Side Spools: (and spool diameter)	Travel, right 28 mm (1.10") diameter Bucket, 28 mm (1.10") diameter Boom, 28 mm (1.0") diameter
	Overload Relief Pressure:	340 kg/cm^2 (4,835 psi)
Travel Control Valve		
	Type:	Pilot Control
	Pressure/Stroke:	22 kg/cm^2 (313 psi) at 5.5 mm stroke
Implement Control Valve		
	Type:	Pilot Control
	Pressure/Stroke:	19.5 kg/cm^2 at 6.5 mm (0.256") stroke
Accumulator		
	Nitrogen Charge:	15 kg/cm^2 (213 psi)
	Volume:	320 cm^3 (19.5 in^3)

Hydraulic Pump Performance Characteristics

Main Pump Pressure/Flow Output

Engine Speed ..... 1,950 RPM

Engine Horsepower ..... 232 PS (“H-Mode,” High Output Power Mode III)
190 PS (“S-Mode,” Standard Output Power Mode II)

Main Pump Total Displacement ..... 143.6 cm^3/rev (8.76 in^3/rev) x 2 pumps

Main Pump Pressure ..... 320 kg/cm^2 (4,550 psi)

Pilot Pump Displacement ..... 15 cm^3/rev (0.92 in^3/rev)

Pilot Pump Pressure ..... 40 kg/cm^2 (569 psi)

NOTE: Values in the graph marked “k” are pressure, in kg/cm^2 (psi)
Values in the graph marked “L” are flow, in Liters/minute (gal/min)
Q = Output Volume Pi = Pilot Pressure P = Output Pressure

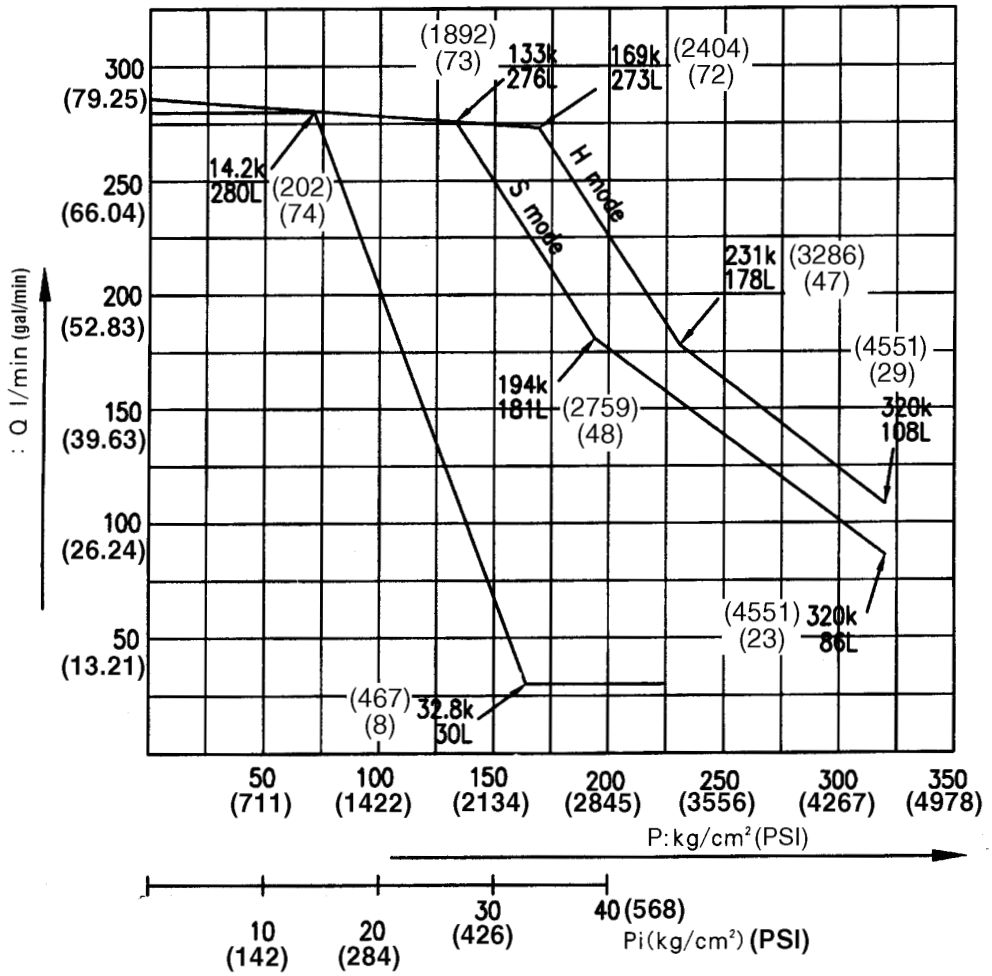


FIGURE 2-3

2818

Specifications

Operating Weight	31,800 Kg (31.8T)
Engine Weight (Dry)	924 Kg (2,037 lb)
Fuel Tank Capacity	520 l (137gal)
Hydraulic Tank Capacity	360 l (95 gal)
Bucket Capacities (CECE heaped)	1.3 m^3 (1.7 yd^3) Standard, 0.8m^3 (1.0yd^3) 1.1 m^3 (1.4 yd^3), 1.6m^3 (2.0yd^3) 1.7 m^3 (2.2 yd^3) 2.0m^3 (2.6yd^3)
Shoe Widths	Std. 600 mm (23.6"), 702 mm (27.5") 750 mm (29.5") 800 mm (31.5")
Excavator Ground Pressure For Various Shoe Widths	600 mm (23.6") : 0.61 kg/cm^2 (8.68 psi) 700 mm (27.5") : 0.53 kg/cm^2 (7.54 psi) 800 mm (32") : 0.47 kg/cm^2 (6.68 psi) 850 mm (31.5") : 0.44 kg/cm^2 (6.26 psi)
Transport Dimensions	Overall Shipping Length 11.105 mm (36' 4") (standard mono boom and 3,205 mm (10' 6") arm) Overall Shipping Width 3,280 mm (10' 9") (standard shoes) Overall Shipping Height 3,380 mm (11' 1") (to top of cylinder hose) Track Shipping Length 4,939 mm (16' 3")
Loading Ramp Allowable Slope	Maximum of 15°

General Dimensions

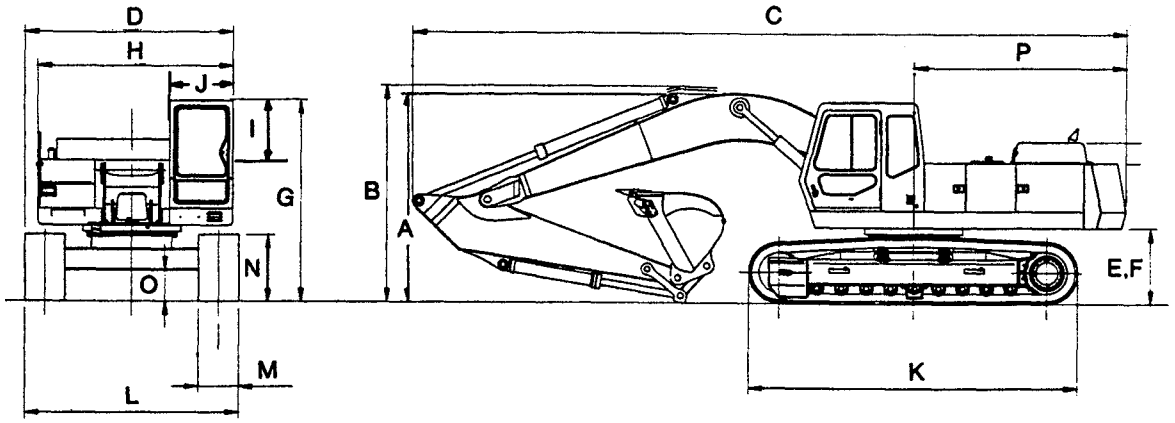


FIGURE 2-4

0075

	Boom Type	One Piece 6,500 mm (21' 4")		
	Arm Type	3,205 mm (10' 6")	2,500 mm (8' 2")	4,100 mm (13' 5")
	Bucket Type	1.27 m^3 (1.66 yd^3)	1.71 m^3 (2.24 yd^3)	1.13 m^3 (1.48 yd^3)
A	Shipping Height (Boom)	3,220 mm (10' 7")	3,570 mm (11' 9")	4,034 mm (13' 3")
B	Shipping Height (Hose)	3,380 mm (11' 1")	3,730 mm (12' 3")	4,194 mm (13' 9")
C	Shipping Length	11,105 mm (36' 5")	11,196 mm (36' 9")	10,935 mm (35' 11")
D	Shipping Width	3,280 mm (10' 9")	3,280 mm (10' 9")	3,280 mm (10' 9")
E	Counterweight Clearance	1,173 mm (3' 10")	1,173 mm (3' 10")	1,173 mm (3' 10")
F	Frame Clearance	1,173 mm (3' 10")	1,173 mm (3' 10")	1,173 mm (3' 10")
G	Height Over Cab	3,066 mm (10' 1")	3,066 mm (10' 1")	3,066 mm (10' 1")
H	House Width	2,990 mm (9' 10")	2,990 mm (9' 10")	2,990 mm (9' 10")
I	Cab Height Above House	895 mm (2' 11")	895 mm (2' 11")	895 mm (2' 11")
J	Cab Width	940 mm (3' 1")	940 mm (3' 1")	940 mm (3' 1")
K	Track Length	4,939 mm (16' 2")	4,939 mm (16' 2")	4,939 mm (16' 2")
L	Undercarriage Width	3,280 mm (10' 9")	3,280 mm (10' 9")	3,280 mm (10' 9")
M	Shoe Width	600 mm (2' 0")	600 mm (2' 0")	600 mm (2' 0")
N	Track Height	935 mm (3' 1")	935 mm (3' 1")	935 mm (3' 1")
O	Car Body Clearance	472 mm (1' 7")	472 mm (1' 7")	472 mm (1' 7")
P	Tail Swing Radius	3,335 mm (10' 11")	3,335 mm (10' 11")	3,335 mm (10' 11")

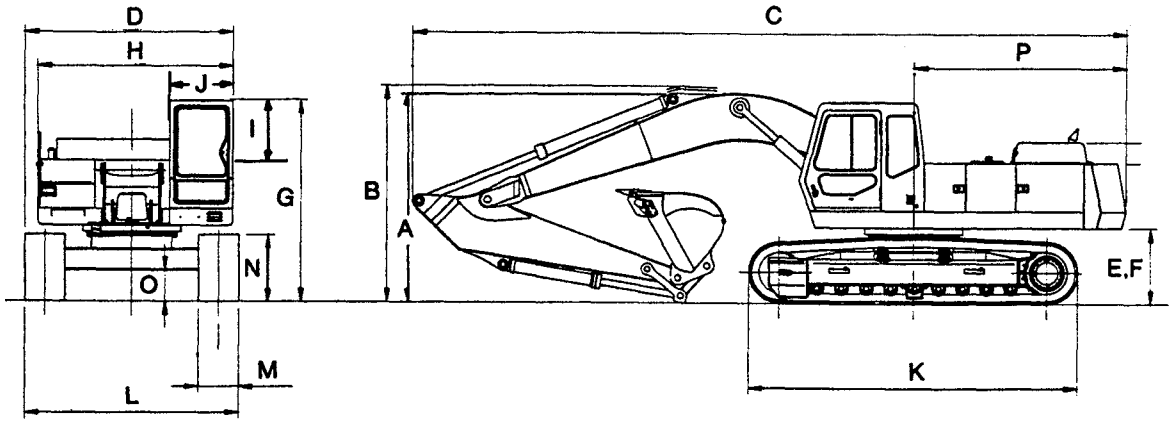


FIGURE 2-4

0075

	Boom Type	One Piece 5,800 mm (19' 0")
	Arm Type	2,500 mm (8' 2")
	Bucket Type	1.60 m^3 (2.09 yd^3)
A	Shipping Height (Boom)	3,655 mm (12' 0")
B	Shipping Height (Hose)	3,720 mm (12' 3")
C	Shipping Length	10,520 mm (34' 7")
D	Shipping Width	3,280 mm (10' 9")
E	Counterweight Clearance	1,173 mm (3' 10")
F	Frame Clearance	1,173 mm (3' 10")
G	Height Over Cab	3,066 mm (10' 1")
H	House Width	2,990 mm (9' 10")
I	Cab Height Above House	895 mm (2' 11")
J	Cab Width	940 mm (3' 1")
K	Track Length	4,939 mm (16' 2")
L	Undercarriage Width	3,280 mm (10' 9")
M	Shoe Width	600 mm (2' 0")
N	Track Height	935 mm (3' 1")
O	Car Body Clearance	472 mm (1' 7")
P	Tail Swing Radius	3,335 mm (10' 11")