

SECTION 1 GENERAL



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SECTION 1 GENERAL

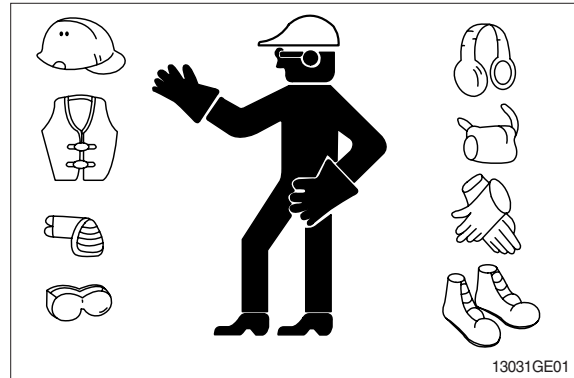
GROUP 1 SAFETY

FOLLOW SAFE PROCEDURE

Unsafe work practices are dangerous. Understand service procedure before doing work; Do not attempt shortcuts.

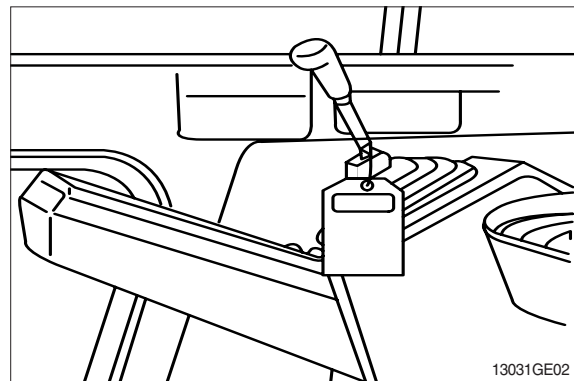
WEAR PROTECTIVE CLOTHING

Wear close fitting clothing and safety equipment appropriate to the job.



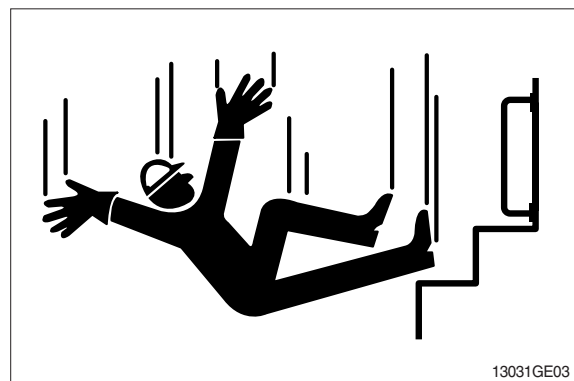
WARN OTHERS OF SERVICE WORK

Unexpected machine movement can cause serious injury. Before performing any work on the excavator, attach a 「Do Not Operate」 tag on the right side control lever.



USE HANDHOLDS AND STEPS

Falling is one of the major causes of personal injury. When you get on and off the machine, always maintain a three point contact with the steps and handrails and face the machine. Do not use any controls as handholds. Never jump on or off the machine. Never mount or dismount a moving machine. Be careful of slippery conditions on platforms, steps, and handrails when leaving the machine.

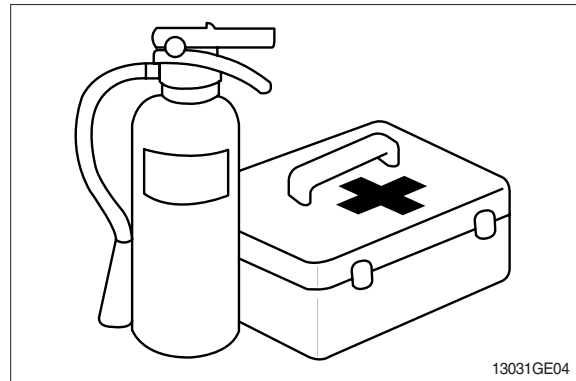


PREPARE FOR EMERGENCIES

Be prepared if a fire starts.

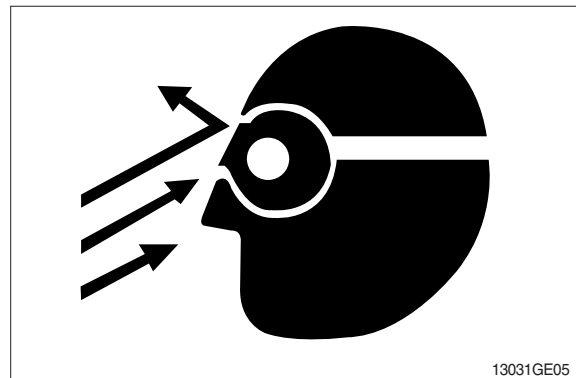
Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.



PROTECT AGAINST FLYING DEBRIS

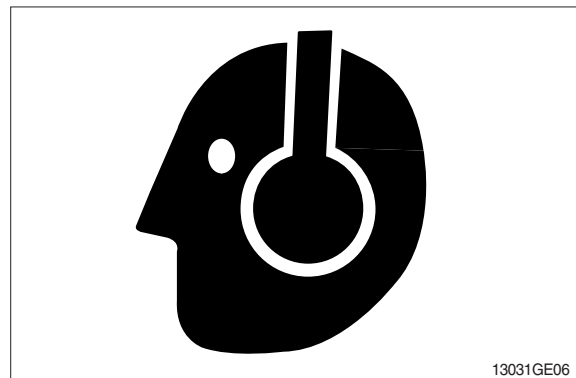
Guard against injury from flying pieces of metal or debris; Wear goggles or safety glasses.



PROTECT AGAINST NOISE

Prolonged exposure to loud noise can cause impairment or loss of hearing.

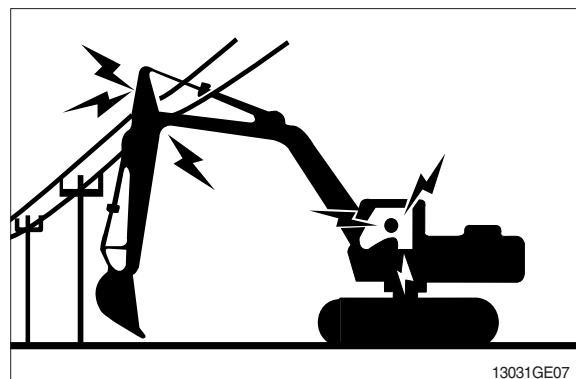
Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.



AVOID POWER LINES

Serious injury or death can result from contact with electric lines.

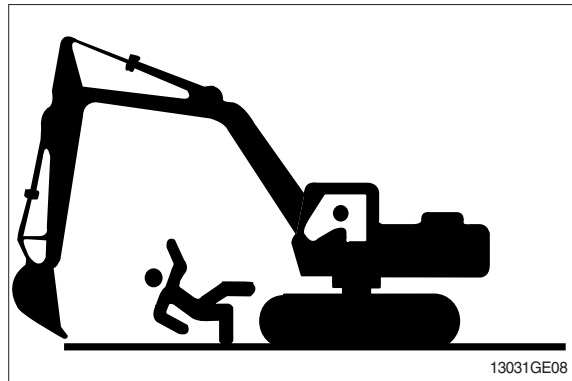
Never move any part of the machine or load closer to electric line than 3m(10ft) plus twice the line insulator length.



KEEP RIDERS OFF EXCAVATOR

Only allow the operator on the excavator. Keep riders off.

Riders on excavator are subject to injury such as being struck by foreign objects and being thrown off the excavator. Riders also obstruct the operator's view resulting in the excavator being operated in an unsafe manner.

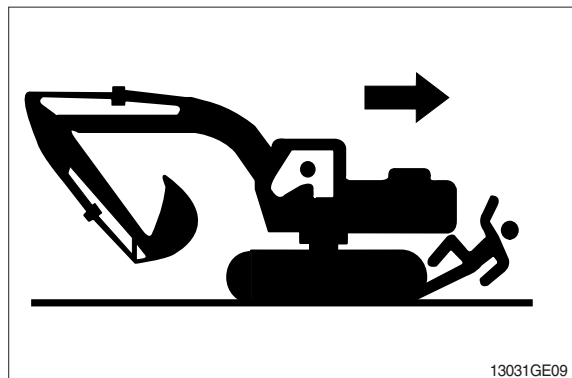


MOVE AND OPERATE MACHINE SAFELY

Bystanders can be run over. Know the location of bystanders before moving, swinging, or operating the machine.

Always keep the travel alarm in working condition. It warns people when the excavator starts to move.

Use a signal person when moving, swinging, or operating the machine in congested areas. Coordinate hand signals before starting the excavator.



OPERATE ONLY FROM OPERATOR'S SEAT

Avoid possible injury machine damage. Do not start engine by shorting across starter terminals.

NEVER start engine while standing on ground. Start engine only from operator's seat.



PARK MACHINE SAFELY

Before working on the machine:

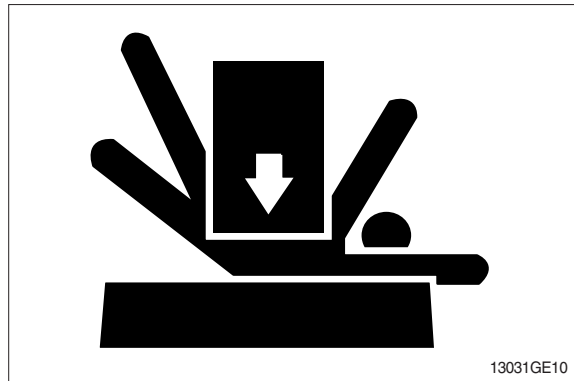
- Park machine on a level surface.
- Lower bucket to the ground.
- Turn auto idle switch off.
- Run engine at 1/2 speed without load for 2 minutes.
- Turn key switch to OFF to stop engine. Remove key from switch.
- Move pilot control shutoff lever to locked position.
- Allow engine to cool.

SUPPORT MACHINE PROPERLY

Always lower the attachment or implement to the ground before you work on the machine. If you must work on a lifted machine or attachment, securely support the machine or attachment.

Do not support the machine on cinder blocks, hollow tiles, or props that may crumble under continuous load.

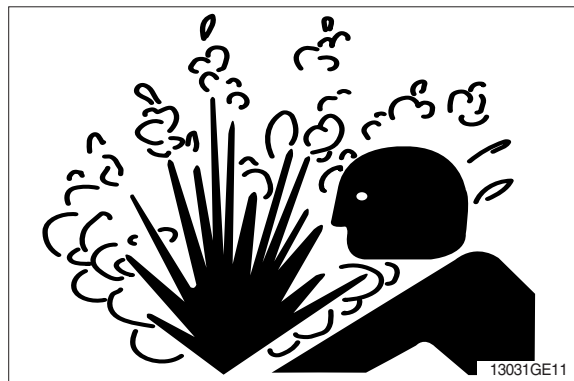
Do not work under a machine that is supported solely by a jack. Follow recommended procedures in this manual.



SERVICE COOLING SYSTEM SAFELY

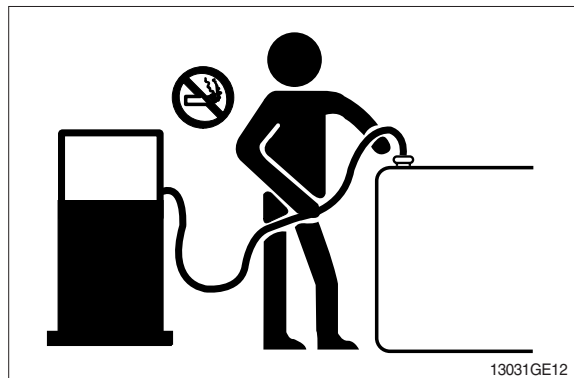
Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands.



HANDLE FLUIDS SAFELY-AVOID FIRES

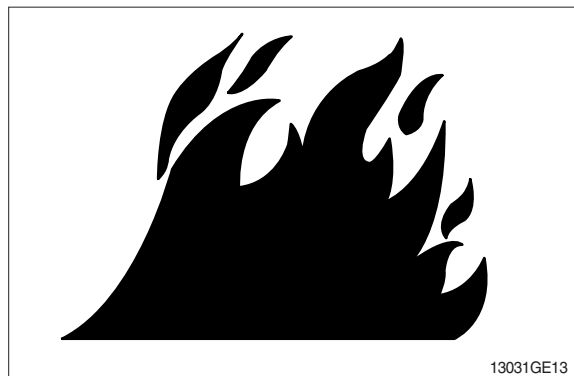
Handle fuel with care; It is highly flammable. Do not refuel the machine while smoking or when near open flame or sparks. Always stop engine before refueling machine. Fill fuel tank outdoors.



Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

Do not store oily rags; They can ignite and burn spontaneously.



BEWARE OF EXHAUST FUMES

Prevent asphyxiation. Engine exhaust fumes can cause sickness or death.

If you must operate in a building, be positive there is adequate ventilation. Either use an exhaust pipe extension to remove the exhaust fumes or open doors and windows to bring enough outside air into the area.

REMOVE PAINT BEFORE WELDING OR HEATING

Avoid potentially toxic fumes and dust.

Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch.

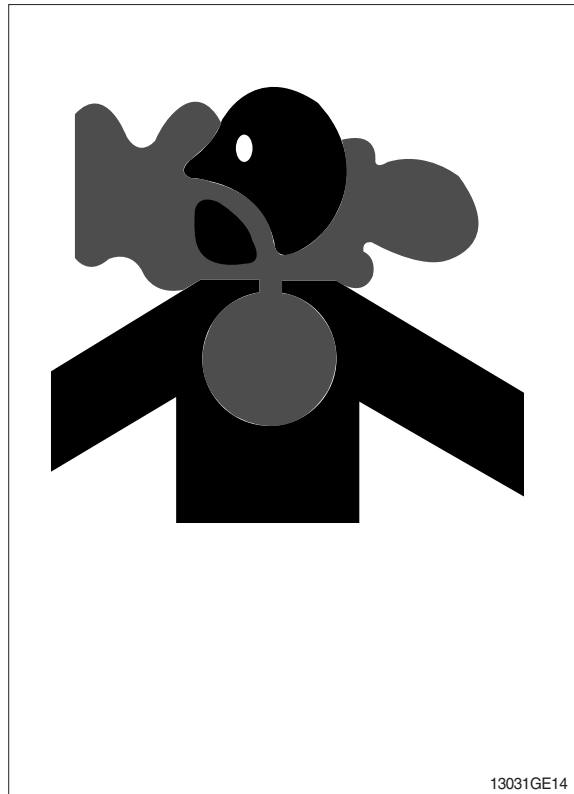
Do all work outside or in a well ventilated area. Dispose of paint and solvent properly.

Remove paint before welding or heating:

- If you sand or grind paint, avoid breathing the dust.
Wear an approved respirator.
- If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.

ILLUMINATE WORK AREA SAFELY

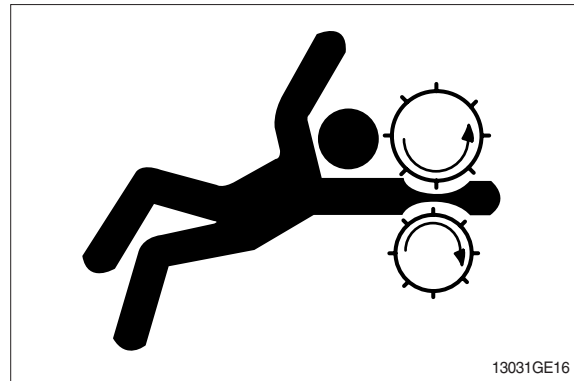
Illuminate your work area adequately but safely. Use a portable safety light for working inside or under the machine. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.



SERVICE MACHINE SAFELY

Tie long hair behind your head. Do not wear a necktie, scarf, loose clothing or necklace when you work near machine tools or moving parts. If these items were to get caught, severe injury could result.

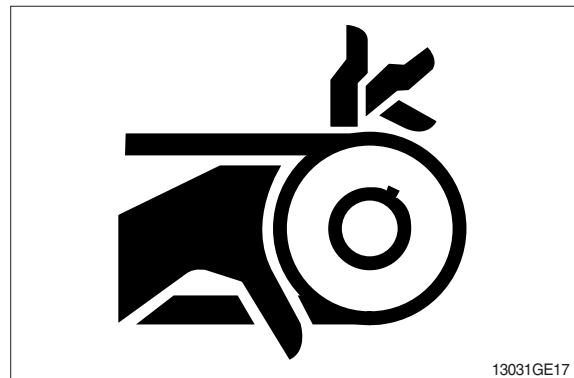
Remove rings and other jewelry to prevent electrical shorts and entanglement in moving parts.



STAY CLEAR OF MOVING PARTS

Entanglements in moving parts can cause serious injury.

To prevent accidents, use care when working around rotating parts.



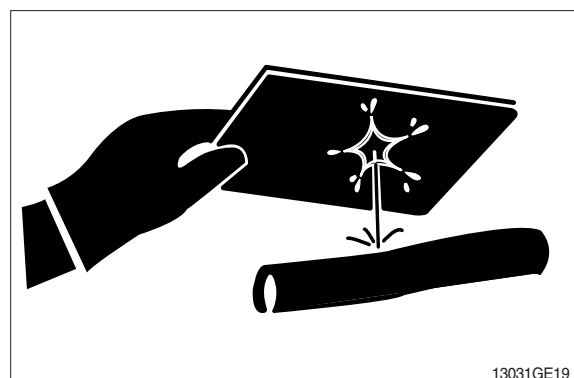
AVOID HIGH PRESSURE FLUIDS

Escaping fluid under pressure can penetrate the skin causing serious injury.

Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure.

Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result.



AVOID HEATING NEAR PRESSURIZED FLUID LINES

Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders. Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials.

Pressurized lines can be accidentally cut when heat goes beyond the immediate flame area. Install fire resisting guards to protect hoses or other materials.



PREVENT BATTERY EXPLOSIONS

Keep sparks, lighted matches, and flame away from the top of battery. Battery gas can explode.

Never check battery charge by placing a metal object across the posts. Use a volt-meter or hydrometer.

Do not charge a frozen battery; It may explode. Warm battery to 16° C (60° F).



PREVENT ACID BURNS

Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

Avoid the hazard by:

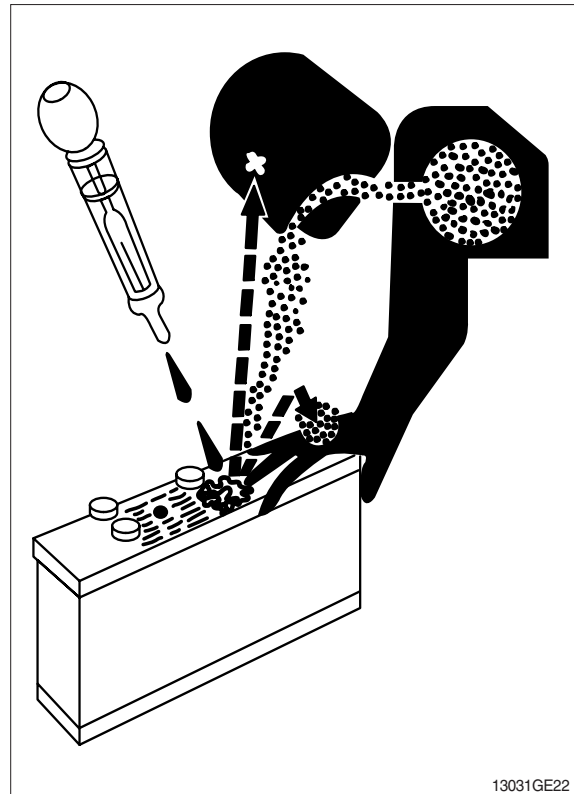
1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling or dripping electrolyte.
5. Use proper jump start procedure.

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.

If acid is swallowed:

1. Drink large amounts of water or milk.
2. Then drink milk of magnesia, beaten eggs, or vegetable oil.
3. Get medical attention immediately.



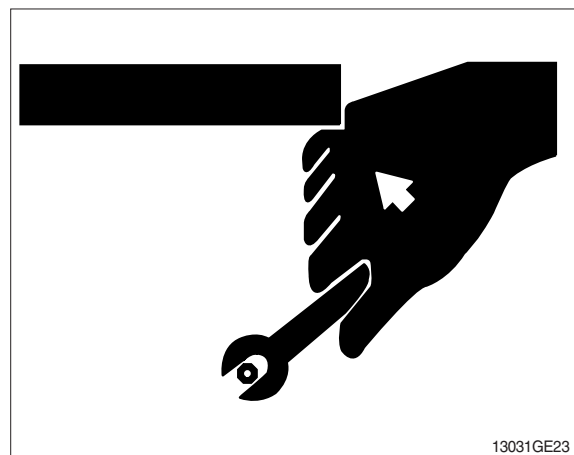
USE TOOLS PROPERLY

Use tools appropriate to the work. Makeshift tools, parts, and procedures can create safety hazards.

Use power tools only to loosen threaded tools and fasteners.

For loosening and tightening hardware, use the correct size tools. **DO NOT** use U.S. measurement tools on metric fasteners. Avoid bodily injury caused by slipping wrenches.

Use only recommended replacement parts. (See Parts catalogue.)

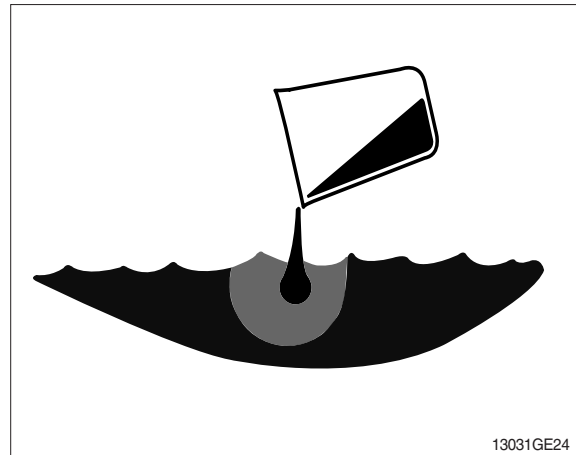


DISPOSE OF FLUIDS PROPERLY

Improperly disposing of fluids can harm the environment and ecology. Before draining any fluids, find out the proper way to dispose of waste from your local environmental agency.

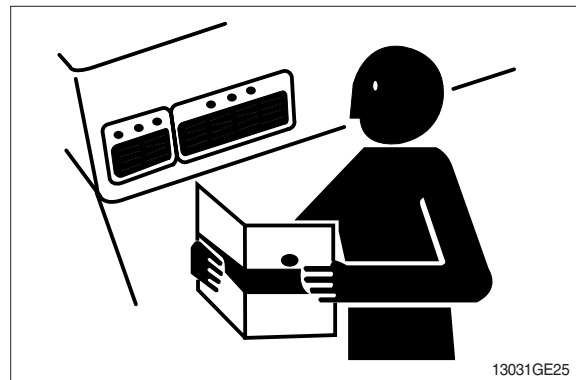
Use proper containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

DO NOT pour oil into the ground, down a drain, or into a stream, pond, or lake. Observe relevant environmental protection regulations when disposing of oil, fuel, coolant, brake fluid, filters, batteries, and other harmful waste.



REPLACE SAFETY SIGNS

Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.

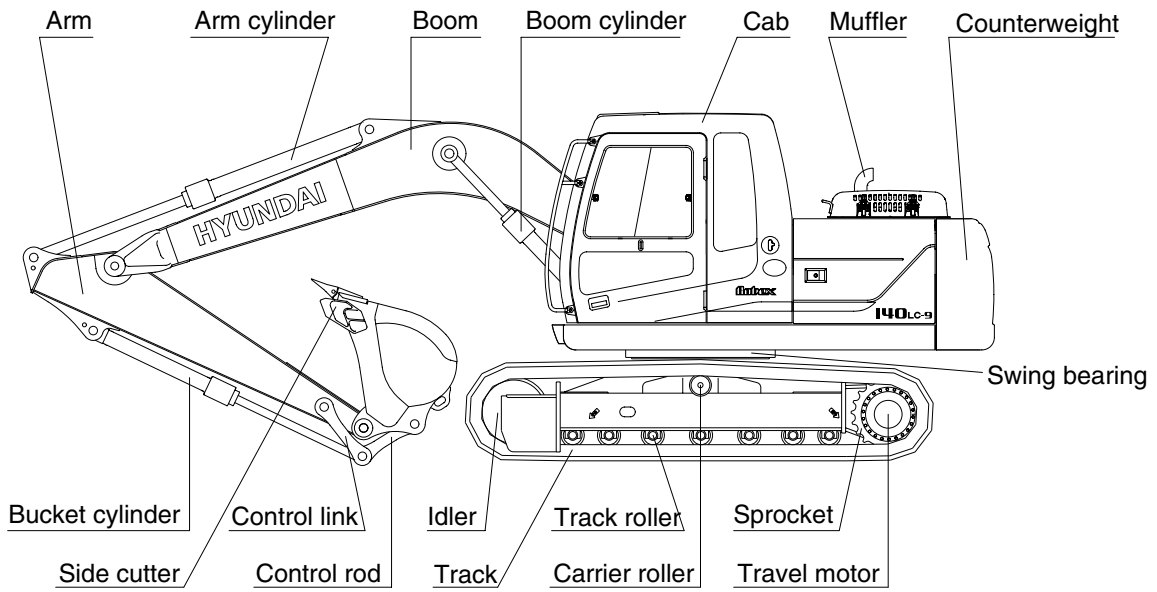
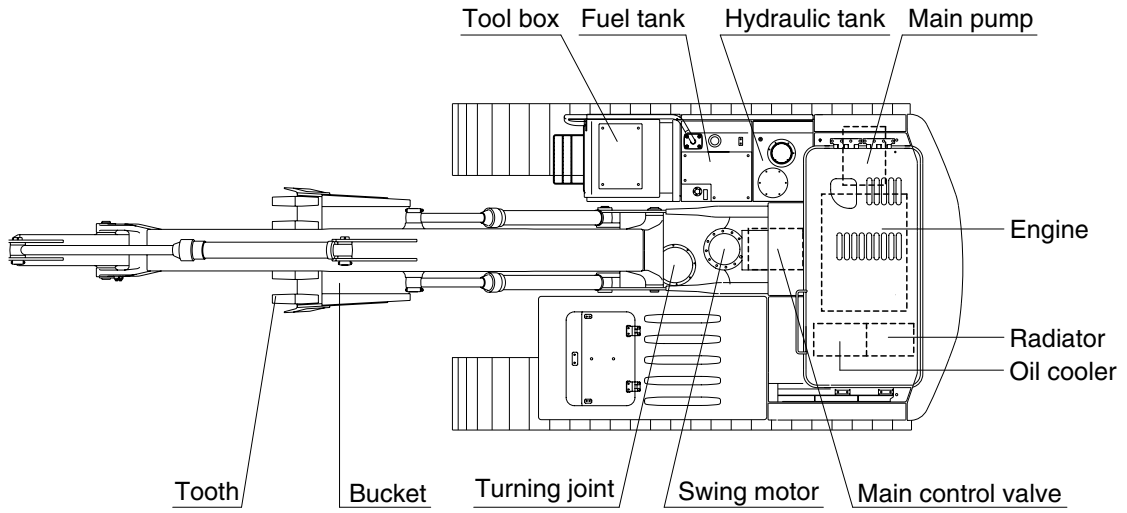


LIVE WITH SAFETY

Before returning machine to customer, make sure machine is functioning properly, especially the safety systems. Install all guards and shields.

GROUP 2 SPECIFICATIONS

1. MAJOR COMPONENT

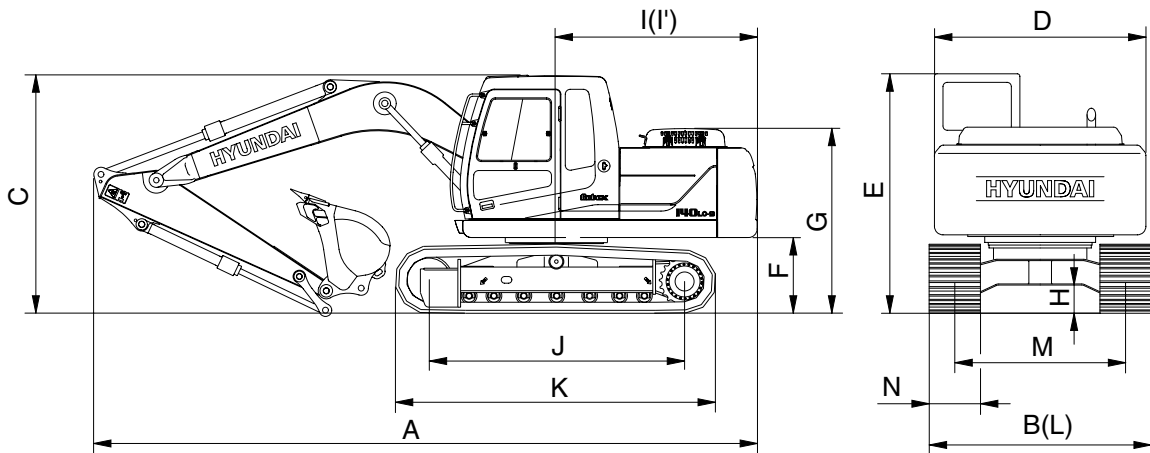


140D92SP01

2. SPECIFICATIONS

1) R140LC-9

· 4.60 m (15' 1") BOOM and 2.10 m (6' 11") ARM



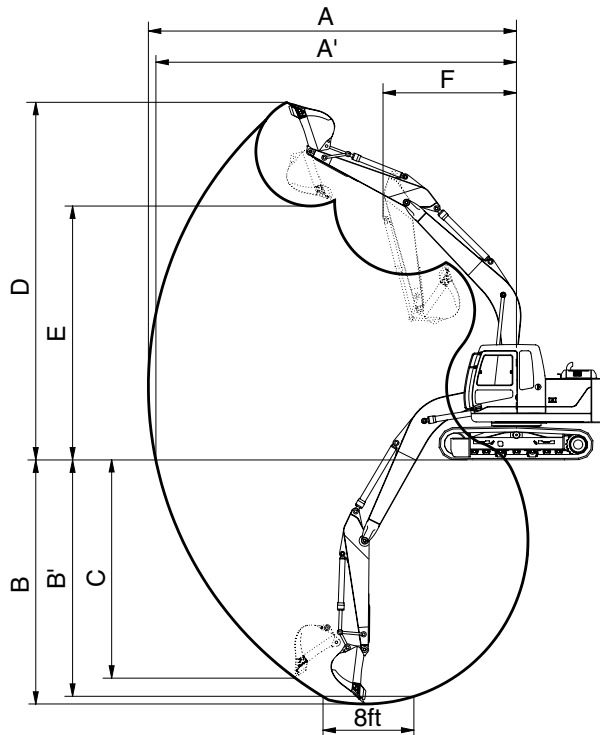
140D92SP02

Description		Unit	Specification
Operating weight		kg (lb)	13980 (30820)
Bucket capacity (SAE heaped), standard		m ³ (yd ³)	0.65 (0.85)
Overall length	A	mm (ft-in)	7850 (25' 8")
Overall width, with 600 mm shoe	B		2600 (8' 6")
Overall height	C		2760 (9' 1")
Superstructure width	D		2600 (8' 6")
Overall height of cab	E		2860 (9' 5")
Ground clearance of counterweight	F		940 (3' 1")
Engine cover height	G		2210 (7' 3")
Minimum ground clearance	H		440 (1' 5")
Rear-end distance	I		2330 (7' 8")
Rear-end swing radius	I'		2330 (7' 8")
Distance between tumblers	J		3000 (9' 10")
Undercarriage length	K		3750 (12' 4")
Undercarriage width	L		2600 (8' 6")
Track gauge	M		2000 (6' 7")
Track shoe width, standard	N		600 (24")
Travel speed (low/high)			km/hr (mph)
Swing speed		rpm	12.0
Gradeability		Degree (%)	35 (70)
Ground pressure (600 mm shoe)		kgf/cm ² (psi)	0.36 (5.12)
Max traction force		kgf (lbf)	13300 (29320)

3. WORKING RANGE

1) R140LC-9

(1) 4.60 m (15' 1") MONO BOOM



14092SP06

Description		※ 2.10 m (6' 11") Arm
Max digging reach	A	7920 mm (25'11")
Max digging reach on ground	A'	7780 mm (25' 6")
Max digging depth	B	5200 mm (17' 1")
Max digging depth (8ft level)	B'	4950 mm (16' 3")
Max vertical wall digging depth	C	4590 mm (15' 1")
Max digging height	D	8140 mm (26' 8")
Max dumping height	E	5710 mm (18' 9")
Min swing radius	F	2680 mm (8'10")
Bucket digging force	SAE	87.3 [94.8] kN
		8900 [9660] kgf
		19620 [21300] lbf
	ISO	102 [110.8] kN
		10400 [11290] kgf
		22930 [24890] lbf
Arm crowd force	SAE	73.6 [79.9] kN
		7500 [8140] kgf
		16530 [17950] lbf
	ISO	77.5 [84.1] kN
		7900 [8580] kgf
		17420 [18910] lbf

※ : STD

[] : Power boost

4. WEIGHT


1) R140LC-9

Item	R140LC-9	
	kg	lb
Upper structure assembly	5630	12420
Main frame weld assembly	1120	2470
Engine assembly	550	1210
Main pump assembly	100	220
Main control valve assembly	140	310
Swing motor assembly	120	260
Hydraulic oil tank assembly	160	350
Fuel tank assembly	130	290
Counterweight	1900	4190
Cab assembly	310	680
Lower chassis assembly	5340	11760
Track frame weld assembly	1590	3510
Swing bearing	215	475
Travel motor assembly	480	1060
Turning joint	50	110
Track recoil spring	210	460
Sprocket	80	180
Idler	250	550
Carrier roller	40	90
Track roller	490	1080
Track-chain assembly (600 mm standard triple grouser shoe)	2050	4520
Front attachment assembly (4.6 m boom, 2.1 m arm, 0.65 m ³ SAE heaped bucket)	2380	5250
4.6 m boom assembly	830	1830
2.1 m arm assembly	370	820
0.65 m ³ SAE heaped bucket	560	1235
Boom cylinder assembly	130	290
Arm cylinder assembly	160	350
Bucket cylinder assembly	100	220
Bucket control rod assembly	90	200











5. LIFTING CAPACITIES

1) R140LC-9

(1) 4.60 m (15' 1") boom, 2.10 m (6' 11") arm equipped with 0.65 m³ (SAE heaped) bucket and 600 mm (24") triple grouser shoe.

•  : Rating over-front

•  : Rating over-side or 360 degree

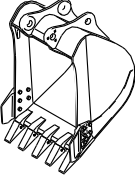
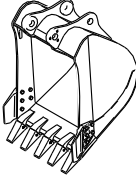
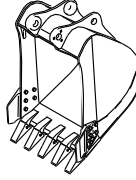
Load point height		Load radius								At max. reach		
		1.5 m (5 ft)		3.0 m (10 ft)		4.5 m (15 ft)		6.0 m (20 ft)		Capacity		Reach
												m (ft)
6.0 m (20.0 ft)	kg lb					*3080 *6790	*3080 *6790			*3020 *6660	2160 4760	6.17 (20.2)
4.5 m (15.0 ft)	kg lb					*3330 *7340	*3330 *7340	*2890 *6370	2180 4810	2640 5820	1630 3590	7.09 (23.3)
3.0 m (10.0 ft)	kg lb			*5800 *12790	*5800 *12790	*4220 *9300	3450 7610	3420 7540	2120 4670	2330 5140	1410 3110	7.54 (24.7)
1.5 m (5.0 ft)	kg lb			*8750 *19290	5960 13140	5300 11680	3190 7030	3310 7300	2010 4430	2240 4940	1340 2950	7.62 (25.0)
Ground Line	kg lb			*8480 *18700	5630 12410	5090 11220	3000 6610	3210 7080	1930 4250	2350 5180	1400 3090	7.35 (24.1)
-1.5 m (-5.0 ft)	kg lb	*6380 *14070	*6380 *14070	*9770 *21540	5600 12350	5010 11050	2940 6480	3180 7010	1900 4190	2740 6040	1650 3640	6.68 (21.9)
-3.0 m (-10 ft)	kg lb	*10300 *22710	*10300 *22710	*8570 *18890	5720 12610	5060 11160	2980 6570			*3690 *8140	2370 5220	5.41 (17.7)

- Note
1. Lifting capacity are based on SAE J1097 and ISO 10567.
 2. Lifting capacity of the ROBEX series does not exceed 75% of tipping load with the machine on firm, level ground or 87% of full hydraulic capacity.
 3. The load point is a hook located on the back of the bucket.
 4. *indicates load limited by hydraulic capacity.

6. BUCKET SELECTION GUIDE

1) R140LC-9

(1) General bucket

		
0.52 m ³ SAE heaped bucket	※ 0.65 m ³ SAE heaped bucket	0.72 m ³ SAE heaped bucket

Capacity		Width		Weight	Recommendation
SAE heaped	CECE heaped	Without side cutter	With side cutter		4.6 m (15' 1") boom
					2.1 m (6' 11") arm
0.52 m ³ (0.68 yd ³)	0.45 m ³ (0.59 yd ³)	935 mm (36.8")	1035 mm (40.8")	460 kg (1010 lb)	
※ 0.65 m ³ (0.85 yd ³)	0.55 m ³ (0.72 yd ³)	1110 mm (43.7")	1210 mm (47.6")	560 kg (1235 lb)	
0.72 m ³ (0.93 yd ³)	0.60 m ³ (0.78 yd ³)	1205 mm (47.4")	1305 mm (51.4")	540 kg (1190 lb)	

※ : Standard bucket

Applicable for materials with density of 2000 kg/m³ (3370 lb/yd³) or less

Applicable for materials with density of 1600 kg/m³ (2700 lb/yd³) or less

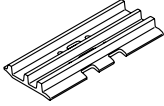
Applicable for materials with density of 1100 kg/m³ (1850 lb/yd³) or less

7. UNDERCARRIAGE

1) TRACKS

X-leg type center frame is integrally welded with reinforced box-section track frames. The design includes dry tracks, lubricated rollers, idlers, sprockets, hydraulic track adjusters with shock absorbing springs and assembled track-type tractor shoes with triple grousers.

2) TYPES OF SHOES

Model	Shapes		Triple grouser		
					
R140LC-9	Shoe width	mm (in)	500 (20)	* 600 (24)	700 (28)
	Operating weight	kg (lb)	13790 (30400)	13980 (30820)	14210 (31330)
	Ground pressure	kgf/cm ² (psi)	0.43 (6.11)	0.36 (5.12)	0.31 (4.41)
	Overall width	mm (ft-in)	2500 (8' 2")	2600 (8' 6")	2700 (8' 10")

* : Standard

3) NUMBER OF ROLLERS AND SHOES ON EACH SIDE

Item	Quantity
Carrier rollers	1 EA
Track rollers	7 EA
Track shoes	46 EA

4) SELECTION OF TRACK SHOE

Suitable track shoes should be selected according to operating conditions.

Method of selecting shoes

Confirm the category from the list of applications in **table 2**, then use **table 1** to select the shoe.

Wide shoes (Categories B and C) have limitations on applications. Before using wide shoes, check the precautions, then investigate and study the operating conditions to confirm if these shoes are suitable.

Select the narrowest shoe possible to meet the required flotation and ground pressure.

Application of wider shoes than recommendations will cause unexpected problem such as bending of shoes, crack of link, breakage of pin, loosening of shoe bolts and the other various problems.

※ **Table 1**

Track shoe	Specification	Category
600 mm triple grouser	Standard	A
500 mm triple grouser	Option	A
700 mm triple grouser	Option	B

※ **Table 2**

Category	Applications	Applications
A	Rocky ground, river beds, normal soil	<ul style="list-style-type: none"> Travel at low speed on rough ground with large obstacles such as boulders or fallen trees
B	Normal soil, soft ground	<ul style="list-style-type: none"> These shoes cannot be used on rough ground with large obstacles such as boulders or fallen trees Travel at high speed only on flat ground Travel slowly at low speed if it is impossible to avoid going over obstacles

8. SPECIFICATIONS FOR MAJOR COMPONENTS

1) ENGINE

Item	Specification
Model	Kirloskar 4R 1040T
Type	4-cycle turbocharged diesel engine
Cooling method	Water cooling
Number of cylinders and arrangement	4 cylinders, in-line
Firing order	1-3-4-2
Combustion chamber type	Direct injection type
Cylinder bore × stroke	105 × 120 mm
Piston displacement	4160 cc (254 cu in)
Compression ratio	17 : 1
Rated gross horse power (SAE J1995)	105 Hp (77.2 kW) at 2200 rpm
Maximum torque	38.2 kgf · m (276 lbf · ft) at 1400 rpm
Engine oil quantity	17.5 l (4.6 U.S. gal)
Dry weight	550 kg (1210 lb)
High idling speed	2400 ± 50 rpm
Low idling speed	850 ± 50 rpm
Rated fuel consumption	162.8 g/Hp · hr at 1400 rpm
Starting motor	24 V-4.5 kW
Alternator	24 V-55 A
Battery	2 × 12 V × 80 Ah

2) MAIN PUMP

Item	Specification
Type	Variable displacement tandem axis piston pumps
Capacity	2 × 62 cc/rev
Maximum pressure	350 kgf/cm ² (4980 psi) [380 kgf/cm ² (5400 psi)]
Rated oil flow	2 × 114.7 l /min (30.3 U.S. gpm / 25.2 U.K. gpm)
Rated speed	2200 rpm

[] : Power boost

3) GEAR PUMP

Item	Specification
Type	Fixed displacement gear pump single stage
Capacity	15cc/rev
Maximum pressure	35 kgf/cm ² (500 psi)
Rated oil flow	27.75 l /min (7.3 U.S. gpm / 6.1 U.K. gpm)

4) MAIN CONTROL VALVE

Item	Specification
Type	11 spools
Operating method	Hydraulic pilot system
Main relief valve pressure	350 kgf/cm ² (4980 psi) [360 kgf/cm ² (5120 psi)]
Overload relief valve pressure	380 kgf/cm ² (5400 psi)

[] : Power boost

5) SWING MOTOR

Item	Specification
Type	Fixed displacement axial piston motor
Capacity	72 cc/rev
Relief pressure	285 kgf/cm ² (4054 psi)
Braking system	Automatic, spring applied hydraulic released
Braking torque	Minimum 30 kgf · m (217 lbf · ft)
Brake release pressure	15~50 kgf/cm ² (213~711 psi)
Reduction gear type	2 - stage planetary

6) TRAVEL MOTOR

Item	Specification	
	Type 1	Type 2
Type	Two kinds of displacement axial piston motor	
Relief pressure	350 kgf/cm ² (4980 psi)	365 kgf/cm ² (5192 psi)
Capacity (max / min)	77/45 cc/rev	
Reduction gear type	2-stage planetary	
Braking system	Automatic, spring applied hydraulic released	
Brake release pressure	9.5 kgf/cm ² (135 psi)	8.75 kgf/cm ² (125 psi)
Braking torque	Min 19.7 kgf · m (143 lbf · ft)	

7) CYLINDER

Item		Specification
Boom cylinder	Bore dia × Rod dia × Stroke	∅ 105 × ∅ 75 × 1075 mm
	Cushion	Extend only
Arm cylinder	Bore dia × Rod dia × Stroke	∅ 115 × ∅ 80 × 1138 mm
	Cushion	Extend and retract
Bucket cylinder	Bore dia × Rod dia × Stroke	∅ 100 × ∅ 70 × 840 mm
	Cushion	Extend only

※ Discoloration of cylinder rod can occur when the friction reduction additive of lubrication oil spreads on the rod surface.

※ Discoloration does not cause any harmful effect on the cylinder performance.

8) SHOE

Item		Width	Ground pressure	Link quantity	Overall width
R140LC-9	Standard	600 mm (24")	0.36 kgf/cm ² (5.12 psi)	46	2600 mm (8' 6")
	Option	500 mm (20")	0.43 kgf/cm ² (6.11 psi)	46	2500 mm (8' 2")
		700 mm (28")	0.31 kgf/cm ² (4.41 psi)	46	2700 mm (8' 10")

9) BUCKET

Item		Capacity		Tooth quantity	Width	
		SAE heaped	CECE heaped		Without side cutter	With side cutter
R140LC-9	Standard	0.65 m ³ (0.85 yd ³)	0.55 m ³ (0.72 yd ³)	5	1110 mm (43.7")	1210 mm (47.6")
	Option	0.52 m ³ (0.68 yd ³)	0.45 m ³ (0.59 yd ³)	5	935 mm (36.8")	1035 mm (40.8")
		0.72 m ³ (0.93 yd ³)	0.60 m ³ (0.78 yd ³)	5	1205 mm (47.4")	1305 mm (51.4")

9. RECOMMENDED OILS

Use only oils listed below or equivalent.
Do not mix different brand oil.

Service point	Kind of fluid	Capacity l (U.S. gal)	Ambient temperature °C (°F)						
			-20 (-4)	-10 (14)	0 (32)	10 (50)	20 (68)	30 (86)	40 (104)
Engine oil pan	Engine oil	17.5 (4.6)	SAE 30						
			SAE 10W						
			SAE 10W-30						
							SAE 15W-40		
Swing drive	Grease	0.35 (0.09)	NLGI NO.1						
							NLGI NO.2		
Swing drive	Gear oil	2.5 (0.7)							
Final drive		2.2 × 2 (0.6 × 2)	SAE 85W-140						
Hydraulic tank	Hydraulic oil	Tank : 124 (32.8) System : 210 (55.5)	ISO VG 32						
						ISO VG 46			
						ISO VG 68			
Fuel tank	Diesel fuel	270 (71.0)	ASTM D975 NO.1						
							ASTM D975 NO.2		
Fitting (Grease nipple)	Grease	As required	NLGI NO.1						
						NLGI NO.2			
Radiator (Reservoir tank)	Mixture of antifreeze and water 50 : 50	15.5 (4.1)	Ethylene glycol base permanent type						

SAE : Society of Automotive Engineers

API : American Petroleum Institute

ISO : International Organization for Standardization

NLGI : National Lubricating Grease Institute

ASTM : American Society of Testing and Material