

SECTION 1 GENERAL

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SECTION 1 GENERAL

GROUP 1 SAFETY HINTS

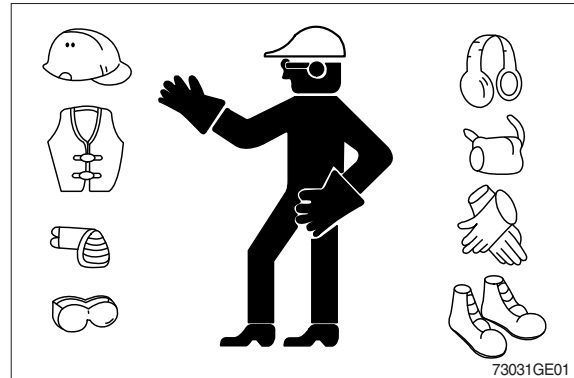
FOLLOW SAFE PROCEDURE

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.

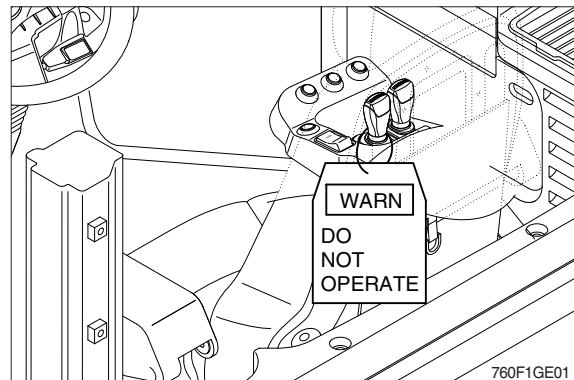
- Do not wear loose clothing and accessories. Secure long hair. These items can snag on controls or on other parts of equipment.
- Do not wear oily clothes. They are highly flammable.
- Wear a hard hat, safety shoes, safety goggles, mask, leather gloves, earplugs and other protective equipment, as required.
- While working on machine, never use inadequate tools. They could break or slip, or they may not adequately perform intended.



WARN OTHERS OF SERVICE WORK

Unexpected machine movement can cause serious injury.

Before performing any work on the wheel loader, attach a **「Do Not Operate」** tag on the right side controller lever.



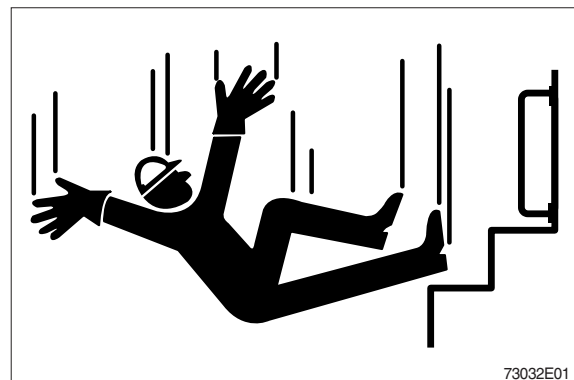
USE HANDHOLDS AND STEPS

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.

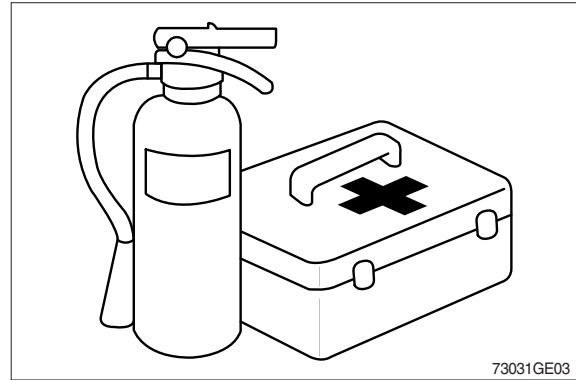


PREPARE FOR EMERGENCIES

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

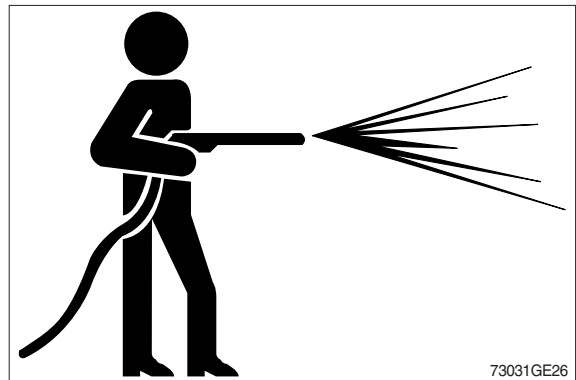
Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.



WORK IN CLEAN AREA

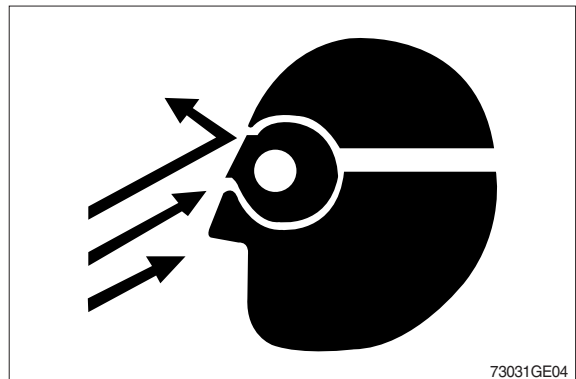
Before starting a job :

- Clean work area and machine.
- Make sure you have all necessary tools to do your job.
- Have the right parts on hand.
- Read all instructions thoroughly; Do not attempt shortcuts.



PROTECT AGAINST FLYING DEBRIS

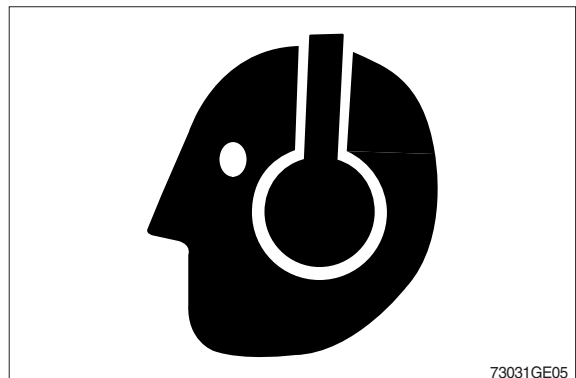
Guard against injury from flying pieces of metal or debris; Wear goggles or safety glasses.



PROTECT AGAINST NOISE

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

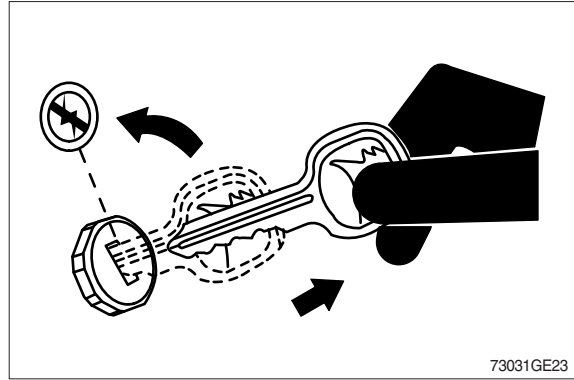
Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.



PARK MACHINE SAFELY

Before working on the machine:

- Park machine on a level surface.
- Lower bucket to the ground.
- 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.

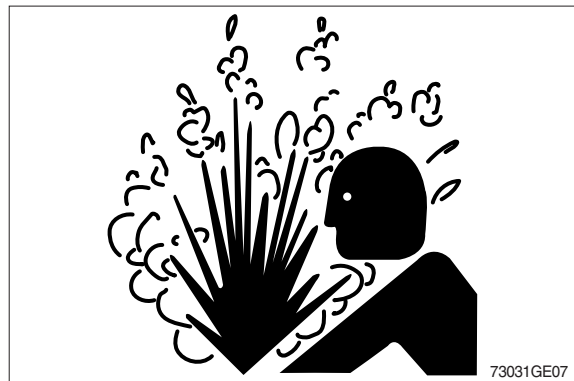
Do not work under a machine that is supported solely by a jack. Follow recommended procedures in this manual.



SERVICE COOLING SYSTEM SAFELY

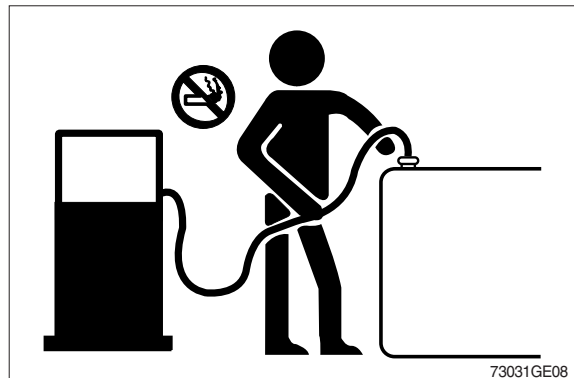
Explosive release of fluids from pressurized cooling system can cause serious burns.

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

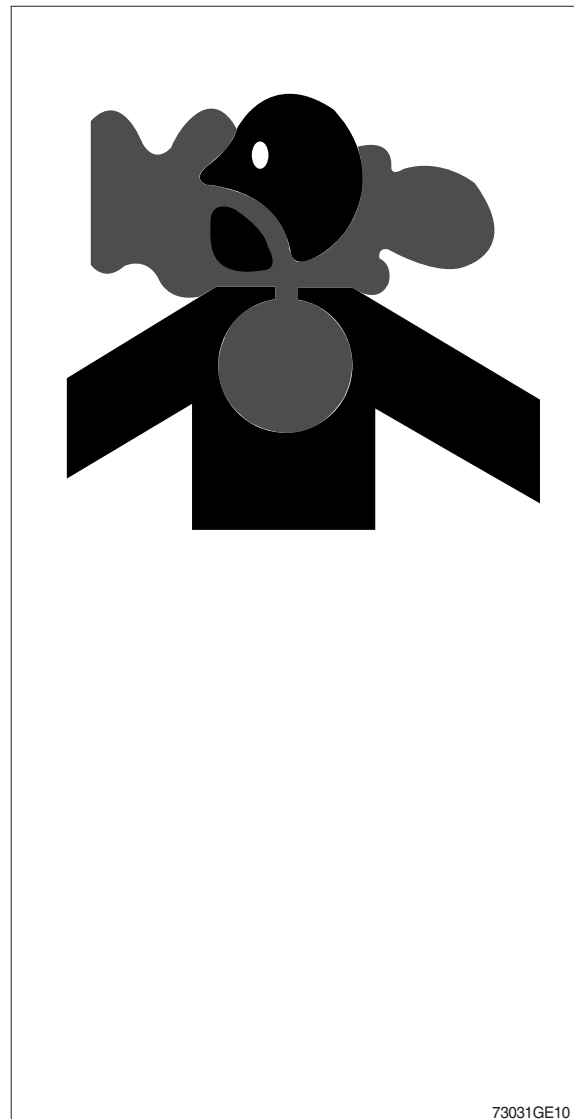
Avoid potentially toxic fumes and dust.

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.

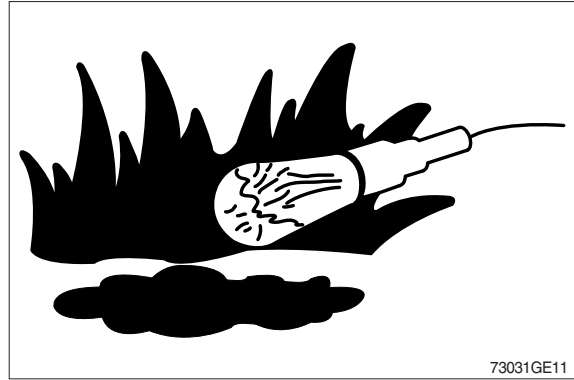
Remove paint before welding or heating:

- 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

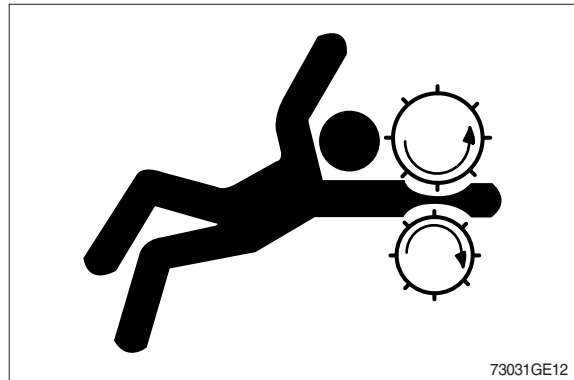
Illuminate your work area adequately but safely. Use a portable safety light for working inside or under the machine. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.



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.

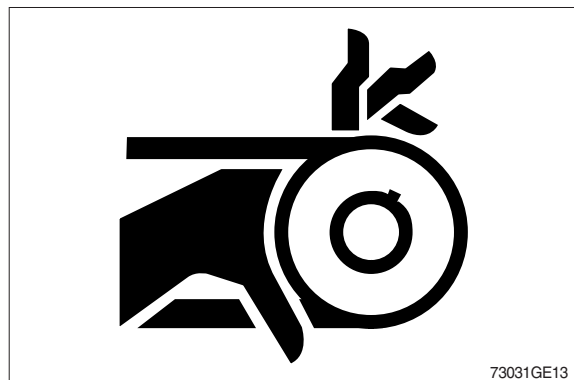
Remove rings and other jewelry to prevent electrical shorts and entanglement in moving parts.



STAY CLEAR OF MOVING PARTS

Entanglements in moving parts can cause serious injury.

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



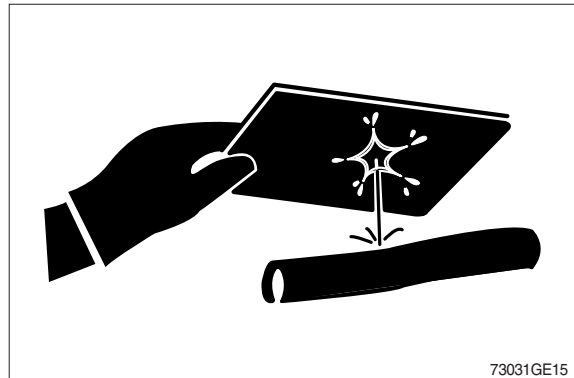
AVOID HIGH PRESSURE FLUIDS

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.

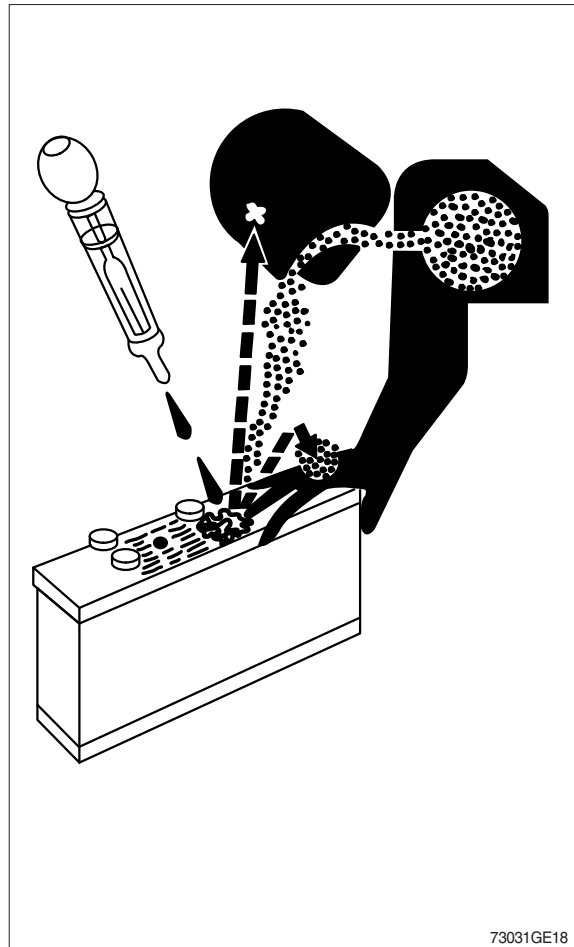
Do not charge a frozen battery; It may explode. Warm battery to 16°C (60°F).



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.

1. Avoid the hazard by:
 2. Filling batteries in a well-ventilated area.
 3. Wearing eye protection and rubber gloves.
Avoiding breathing fumes when electrolyte is added.
 4. Avoiding spilling or dripping electrolyte.
 5. Use proper jump start procedure.
1. If you spill acid on yourself:
 2. Flush your skin with water.
Apply baking soda or lime to help neutralize the acid.
 3. Flush your eyes with water for 10-15 minutes.
Get medical attention immediately.
1. If acid is swallowed:
 2. Drink large amounts of water or milk.
Then drink milk of magnesia, beaten eggs, or vegetable oil.
 3. Get medical attention immediately.



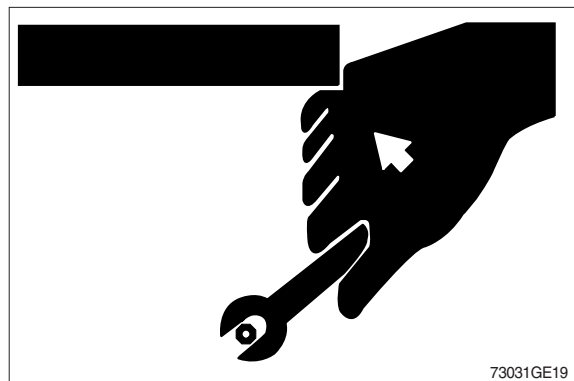
USE TOOLS PROPERLY

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. Avoid bodily injury caused by slipping wrenches.

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



SERVICE TIRES SAFELY

Explosive separation of a tire and rim parts can cause serious injury or death.

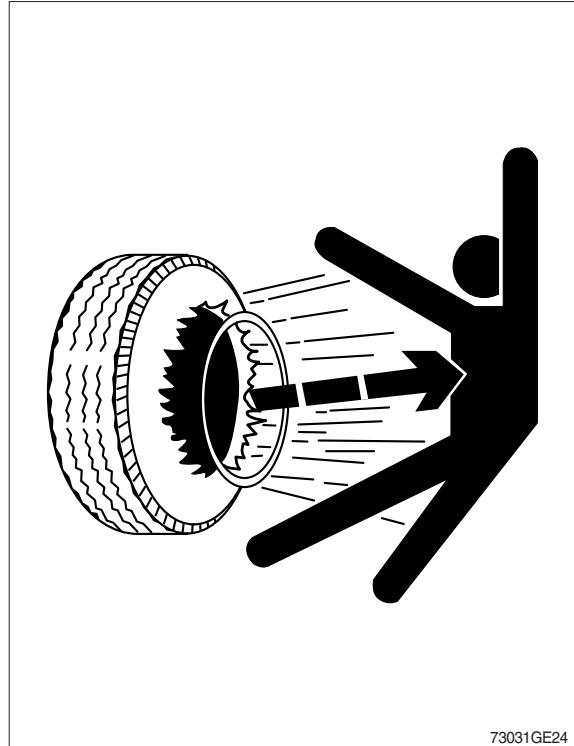
Do not attempt to mount a tire unless you have the proper equipment and experience to perform the job.

Always maintain the correct tire pressure. Do not inflate the tires above the recommended pressure. Never weld or heat a wheel and tire assembly. The heat can cause an increase in air pressure resulting in a tire explosion.

Welding can structurally weaken or deform the wheel.

When inflating tires, use a clip-on chuck and extension hose long enough to allow you to stand to one side and not in front of or over the tire assembly. Use a safety cage if available.

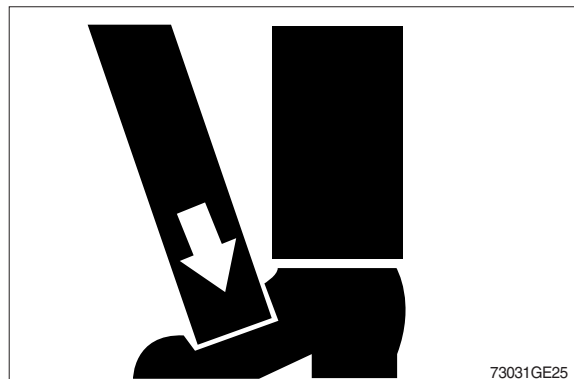
Check wheels for low pressure, cuts, bubbles, damaged rims or missing lug bolts and nuts.



USE PROPER LIFTING EQUIPMENT

Lifting heavy components incorrectly can cause severe injury or machine damage.

Follow recommended procedure for removal and installation of components in the manual.

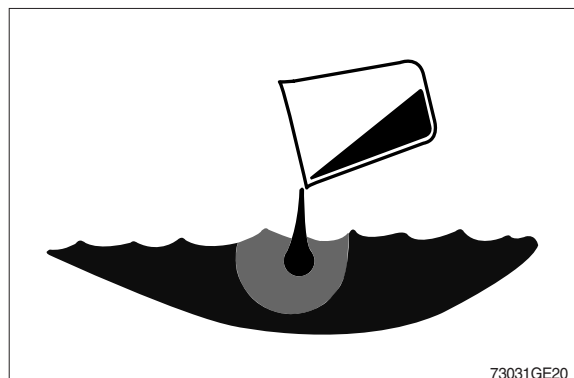


DISPOSE OF FLUIDS PROPERLY

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.

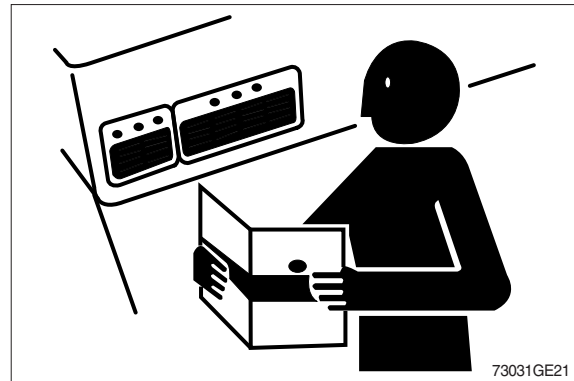
Use proper containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

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.



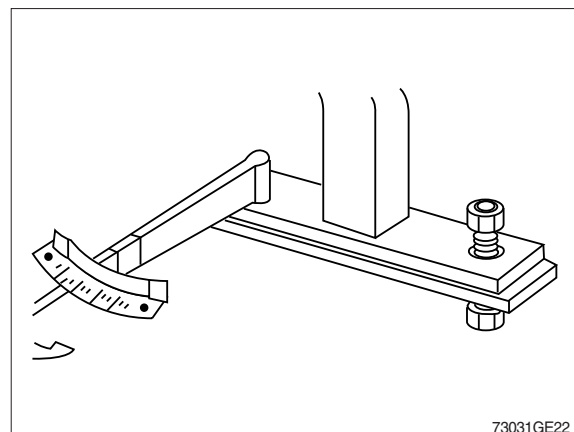
LIVE WITH SAFETY

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

KEEP ROPS INSTALLED PROPERLY

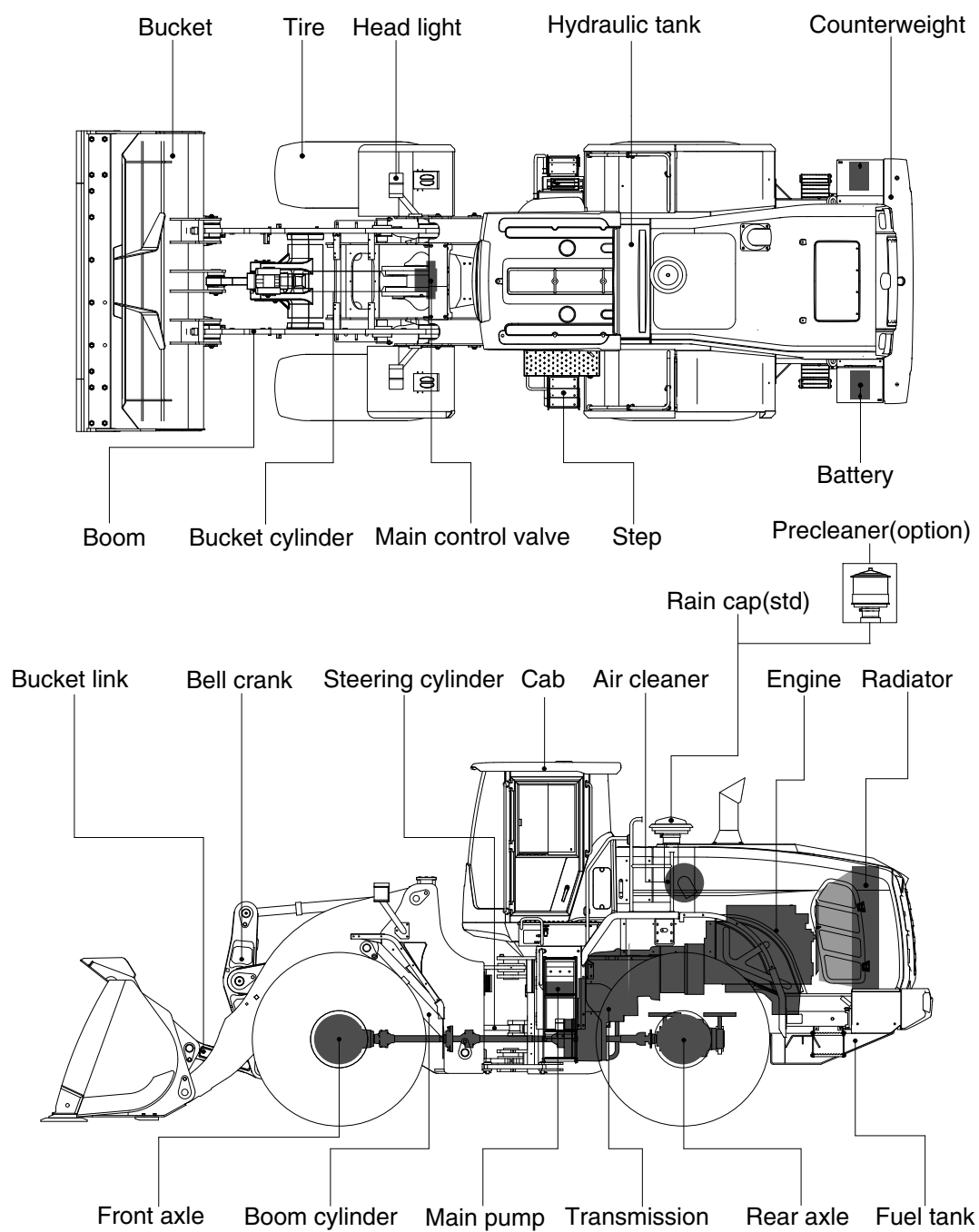
Make certain all parts are reinstalled correctly if the roll-over protective structure (ROPS) is loosened or removed for any reason. Tighten mounting bolts to proper torque.

The protection offered by ROPS will be impaired if ROPS is subjected to structural damage, is involved in an overturn incident, or is in any way altered by welding, bending, drilling, or cutting. A damaged ROPS should be replaced, not reused.



GROUP 2 SPECIFICATIONS

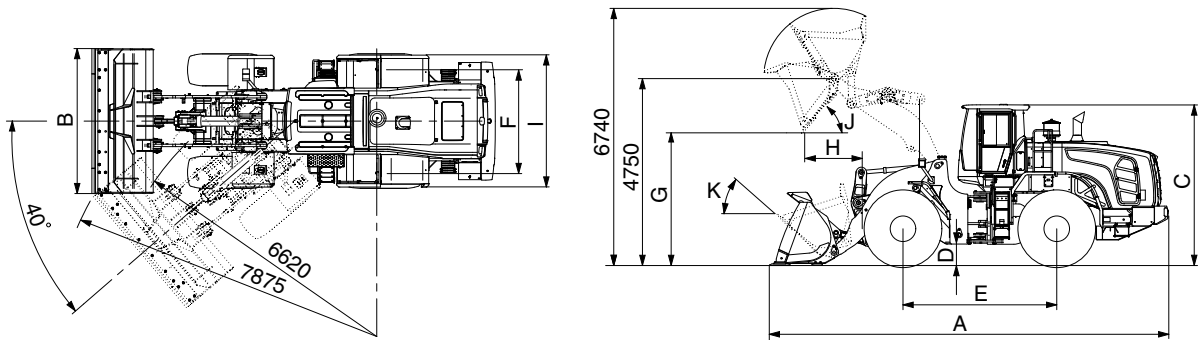
1. MAJOR COMPONENT



985A2SE01

2. SPECIFICATIONS

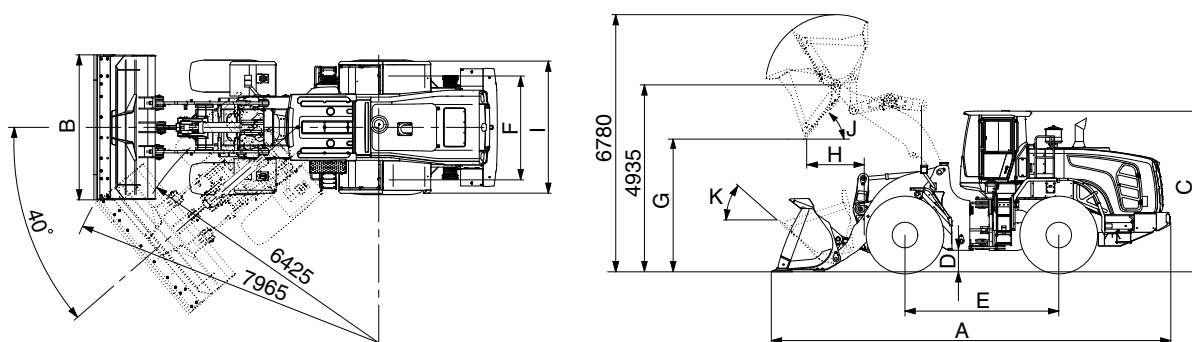
1) WITH BOLT-ON CUTTING EDGE TYPE BUCKET (HL985A)



985A2SE03

Description			Unit	Specification
Operating weight			kg (lb)	33800 (74520)
Bucket capacity	Struck		m³ (yd³)	5.6 (7.3)
	Heaped			6.5 (8.5)
Overall length	A		mm (ft-in)	10000 (32' 10")
Overall width	B			3600 (11' 10")
Overall height	C			3865 (12' 8")
Ground clearance	D			495 (1' 7")
Wheelbase	E			3800 (12' 6")
Tread	F			2540 (8' 4")
Dump clearance at 45°	G			3360 (11' 0")
Dump reach (full lift)	H			1550 (5' 1")
Width over tires	I			3420 (11' 3")
Dump angle	J		degree (°)	48
Rollback angle (carry position)	K			47
Cycle time	Lift (with load)		sec	6.1
	Dump (with load)			1.7
	Lower (empty)			4.3
Maximum travel speed			km/hr (mph)	40.0 (24.9)
Braking distance			m (ft-in)	13.3 (43' 8")
Minimum turning radius (center of outside tire)				6.62 (21' 9")
Gradeability			degree (°)	30
Breakeout force			kg (lb)	28400 (62615)
Travel speed	Forward	First gear	km/hr (mph)	6.2 (3.9)
		Second gear		12.0 (7.5)
		Third gear		18.6 (11.6)
		Fourth/Fifth gear		27.2(16.9)/40.0 (24.9)
	Reverse	First gear		6.2 (3.9)
		Second gear		12.0 (7.5)
		Third gear		27.2 (16.9)

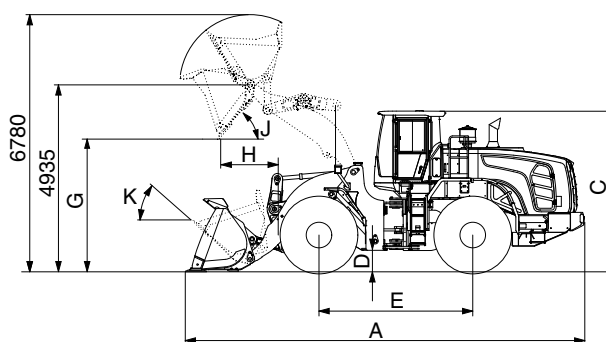
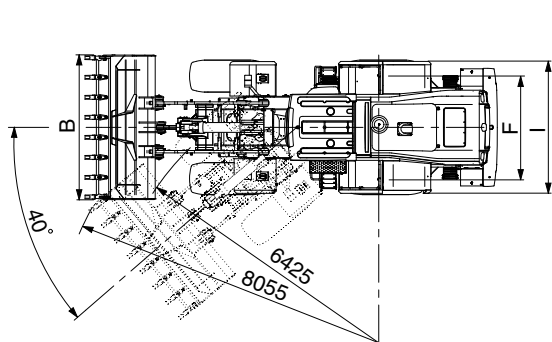
WITH BOLT-ON CUTTING EDGE TYPE BUCKET (HL985A)



985A2SE03-1

Description			Unit	Specification
Operating weight			kg (lb)	34080 (75135)
Bucket capacity	Struck		m³ (yd³)	5.9 (7.7)
	Heaped			7.0 (9.2)
Overall length	A		mm (ft-in)	10300 (32' 10")
Overall width	B			3600 (11' 10")
Overall height	C			3865 (12' 8")
Ground clearance	D			495 (1' 7")
Wheelbase	E			3800 (12' 6")
Tread	F			2540 (8' 4")
Dump clearance at 45°	G			3145 (10' 4")
Dump reach (full lift)	H			1760 (5' 9")
Width over tires	I			3420 (11' 3")
Dump angle	J			degree (°)
Rollback angle (carry position)	K		47	
Cycle time	Lift (with load)		sec	6.1
	Dump (with load)			1.7
	Lower (empty)			4.3
Maximum travel speed			km/hr (mph)	40.0 (24.9)
Braking distance			m (ft-in)	13.3 (43' 8")
Minimum turning radius (center of outside tire)				6.62 (21' 9")
Gradeability			degree (°)	30
Brokeout force			kg (lb)	23800 (52475)
Travel speed	Forward	First gear	km/hr (mph)	6.2 (3.9)
		Second gear		12.0 (7.5)
		Third gear		18.6 (11.6)
		Fourth/Fifth gear		27.2(16.9)/40.0 (24.9)
	Reverse	First gear		6.2 (3.9)
		Second gear		12.0 (7.5)
		Third gear		27.2 (16.9)

WITH 2-PIECE TOOTH & SEGMENT TYPE BUCKET (HL985A)



985A2SE04

Description			Unit	Specification
Operating weight			kg (lb)	34210 (75425)
Bucket capacity	Struck		m³ (yd³)	5.9 (7.7)
	Heaped			7.0 (9.2)
Overall length	A		mm (ft-in)	10495 (34' 5")
Overall width	B			3600 (11' 10")
Overall height	C			3865 (12' 8")
Ground clearance	D			495 (1' 7")
Wheelbase	E			3800 (12' 6")
Tread	F			2540 (8' 4")
Dump clearance at 45°	G			2995 (9' 10")
Dump reach (full lift)	H			1885 (6' 2")
Width over tires	I			3420 (11' 3")
Dump angle	J			degree (°)
Rollback angle (carry position)	K		47	
Cycle time	Lift (with load)		sec	6.1
	Dump (with load)			1.7
	Lower (empty)			4.3
Maximum travel speed			km/hr (mph)	40.0 (24.9)
Braking distance			m (ft-in)	13.3 (43' 8")
Minimum turning radius (center of outside tire)				6.62 (21' 9")
Gradeability			degree (°)	30
Brokeout force			kg (lb)	23800 (52475)
Travel speed	Forward	First gear	km/hr (mph)	6.2 (3.9)
		Second gear		12.0 (7.5)
		Third gear		18.6 (11.6)
		Fourth/Fifth gear		27.2(16.9)/40.0 (24.9)
	Reverse	First gear		6.2 (3.9)
		Second gear		12.0 (7.5)
		Third gear		27.2 (16.9)

3. WEIGHT

Item	kg	lb
Front frame assembly	3112	6865
Rear frame assembly	3346	7380
Front fender (LH/RH)	53/53	116/116
Rear fender (LH/RH)	86/86	190/190
Counterweight	2625	5790
Cab assembly	936	2065
Engine assembly	860	1895
Transmission assembly (5-speed)	816	1800
Driveshaft (front)	32	75
Driveshaft (center)	103	230
Driveshaft (rear)	31	70
Front axle (include differential)	1820	4015
Rear axle (include differential)	1820	4015
Tire (875/65 R29 L3 ★★)	860	1900
Hydraulic tank assembly	251	555
Fuel tank assembly	498	1100
Main pump assembly	65	145
Steering pump assembly	65	145
Fan & brake pump assembly	13	30
Main control valve (2 spool/3 spool)	95/110	210/245
Steering valve(Priority valve)	29	65
Boom assembly	2260	4985
Bell crank assembly	700	1545
Bucket link	103	227
5.6 m³ bucket, with bolt on cutting edge	3080	6795
7.0 m³ bucket, with bolt on cutting edge	3360	7410
7.0 m³ bucket, with tooth and segment	3490	7695
Boom cylinder assembly (LH/RH)	326/326	660/660
Bucket cylinder assembly	330	730
Steering cylinder assembly (LH/RH)	62/62	135/135
Seat (Including suspension and armrest)	70	155
Battery (1EA)	53	120
Under guard kit	110	245
Engine hood assembly	473	1045
Mud guard assembly (LH/RH)	38/38	80/80

4. SPECIFICATION FOR MAJOR COMPONENTS

1) ENGINE

Item	Specification
Model	Cummins X12
Type	4-cycle turbocharged, charge air cooled electronic controlled diesel engine
Cooling method	Water cooled
Number of cylinders and arrangement	6 cylinders, in-line
Firing order	1-5-3-6-2-4
Combustion chamber type	Direct injection type
Cylinder bore × stroke	132 × 144 mm (5.2" × 5.7")
Piston displacement	11800 cc (720 cu in)
Compression ratio	17.0 : 1
Gross power	430 hp (321 kW) at 2100 rpm
Net power	420 hp (313 kW) at 2100 rpm
Maximum power	473 hp (353 kW) at 1700 rpm
Peak gross torque	235 kgf · m (1696 lbf · ft) at 1400 rpm
Engine oil quantity	34 ℓ (9.0 U.S. gal)
Wet weight	860 kg (1896 lb)
Starting motor	24 V - 7.5 kW
Alternator	28 V - 110 Amp
Battery	2 × 12 V × 220 Ah

2) MAIN PUMP

Item	Specification
Type	Load sensing hydraulic system
Pump	Variable displacement piston pump
Rated oil quantity	520 ℓ /min (137.4 U.S.gpm)
System pressure	315 kgf/cm ² (4569 psi)

3) STEERING PUMP

Item	Specification
Type	Load sensing hydrostatic articulated steering
Pump	Variable displacement piston pump
Rated oil quantity	280 ℓ /min (74 U.S.gpm)
System pressure	210 kgf/cm ² (3046 psi)

4) FAN + BRAKE PUMP

Item	Specification
Type	Variable piston pump
Capacity	28 cc/rev
Maximum operating pressure	250 kgf/cm ² (3980 psi)
Rated oil quantity	74.3 ℓ /min (19.6 U.S.gpm)

5) MAIN CONTROL VALVE

Item	Specification
Type	2 spool / 3 spool
Operating method	Hydraulic pilot assist
Main relief valve pressure	315 kgf/cm ² (4569 psi)
Overload relief valve pressure	365 kgf/cm ² (5293 psi)

6) ELECTRO-HYDRAULIC BLOCK

Item	Specification
Type	Proportional pressure reducing valve
Control current	0~950 mA
Resistance	10.5 Ω
Normal flow	12 ℓ /min (3.17 U.S.gpm)

7) REMOTE CONTROL VALVE (EH TYPE)

Item	Specification
Type	Fingertip
Axle	Single axle for boom, bucket, auxiliary
Operating voltage	4.5~5.5 V
Output signal	0.5~4.5 V (neutral 2.5 V)

8) REMOTE CONTROL VALVE (FNR TYPE)

Item	Specification
Type	Joystick
Axle	Two axle for boom, bucket, roller for auxiliary
Operating type	CAN J1939
Baud rate	500 kbps

9) CYLINDER

Item		Specification
Boom cylinder	Bore dia × Rod dia × Stroke	Ø 190 × Ø 110 × 890 mm
Bucket cylinder	Bore dia × Rod dia × Stroke	Ø 210 × Ø 115 × 550 mm
Steering cylinder	Bore dia × Rod dia × Stroke	Ø 110 × Ø 60 × 460 mm

10) DYNAMIC POWER TRANSMISSION DEVICES

Item			Specification
5-speed transmission	Model		ZF 5WG 310
	Type	Converter	3-Elements, Single-stage, Single-phase
		Transmission	Full-automatic power shift
	Gear shift		Forward fifth gear, reverse third gear
	Control		Electrical single lever type, kick-down system Automatic kick down from 2nd to 1st gear FNR switch on joystick lever (option)
	Travel speed	Forward 1/2/3/4/5	6.2 / 12 / 18.6 / 27.2 / 40.0 km/hr
		Reverse 1/2/3	6.2 / 11.2 / 27.2 km/hr
Axle	Drive devices		4-wheel drive
	Front		Front fixed location
	Rear		Oscillation $\pm 11^\circ$ of center pin-loaded
Wheels	Tires		875/65 R29 L3 ★★
Brakes	Travel		Four-wheel, wet-disc type, full hydraulic
	Parking		Spring applied, hydraulic released brake on T/M
Steering	Type		Full hydraulic, articulated
	Steering angle		40° to both right and left angle, respectively

5. TIGHTENING TORQUE

Use following table for unspecified torque.

1) BOLT AND NUT

(1) Coarse thread

Bolt size	8.8T		10.9T		12.9T	
	kgf · m	lbf · ft	kgf · m	lbf · ft	kgf · m	lbf · ft
M 6×1.0	0.8 ~ 1.2	5.8 ~ 8.6	1.2 ~ 1.8	8.7 ~ 13.0	1.5 ~ 2.1	10.9 ~ 15.1
M 8×1.25	2.0 ~ 3.0	14.5 ~ 21.6	2.8 ~ 4.2	20.3 ~ 30.4	3.4 ~ 5.0	24.6 ~ 36.1
M10×1.5	4.0 ~ 6.0	29.0 ~ 43.3	5.6 ~ 8.4	40.5 ~ 60.8	6.8 ~ 10.0	49.2 ~ 72.3
M12×1.75	6.8 ~ 10.2	50.0 ~ 73.7	9.6 ~ 14.4	69.5 ~ 104	12.3 ~ 16.5	89.0 ~ 119
M14×2.0	10.9 ~ 16.3	78.9 ~ 117	16.3 ~ 21.9	118 ~ 158	19.5 ~ 26.3	141 ~ 190
M16×2.0	17.9 ~ 24.1	130 ~ 174	25.1 ~ 33.9	182 ~ 245	30.2 ~ 40.8	141 ~ 295
M18×2.5	24.8 ~ 33.4	180 ~ 241	34.8 ~ 47.0	252 ~ 340	41.8 ~ 56.4	302 ~ 407
M20×2.5	34.9 ~ 47.1	253 ~ 340	49.1 ~ 66.3	355 ~ 479	58.9 ~ 79.5	426 ~ 575
M22×2.5	46.8 ~ 63.2	339 ~ 457	65.8 ~ 88.8	476 ~ 642	78.9 ~ 106	570 ~ 766
M24×3.0	60.2 ~ 81.4	436 ~ 588	84.6 ~ 114	612 ~ 824	102 ~ 137	738 ~ 991
M30×3.5	120 ~ 161	868 ~ 1164	168 ~ 227	1216 ~ 1641	202 ~ 272	1461 ~ 1967

(2) Fine thread

Bolt size	8.8T		10.9T		12.9T	
	kgf · m	lbf · ft	kgf · m	lbf · ft	kgf · m	lbf · ft
M 8×1.0	2.1 ~ 3.1	15.2 ~ 22.4	3.0 ~ 4.4	21.7 ~ 31.8	3.6 ~ 5.4	26.1 ~ 39.0
M10×1.25	4.2 ~ 6.2	30.4 ~ 44.9	5.9 ~ 8.7	42.7 ~ 62.9	7.0 ~ 10.4	50.1 ~ 75.2
M12×1.25	7.3 ~ 10.9	52.8 ~ 78.8	10.3 ~ 15.3	74.5 ~ 110	13.1 ~ 17.7	94.8 ~ 128
M14×1.5	12.4 ~ 16.6	89.7 ~ 120	17.4 ~ 23.4	126 ~ 169	20.8 ~ 28.0	151 ~ 202
M16×1.5	18.7 ~ 25.3	136 ~ 182	26.3 ~ 35.5	191 ~ 256	31.6 ~ 42.6	229 ~ 308
M18×1.5	27.1 ~ 36.5	196 ~ 264	38.0 ~ 51.4	275 ~ 371	45.7 ~ 61.7	331 ~ 446
M20×1.5	37.7 ~ 50.9	273 ~ 368	53.1 ~ 71.7	384 ~ 518	63.6 ~ 86.0	460 ~ 622
M22×1.5	51.2 ~ 69.2	370 ~ 500	72.0 ~ 97.2	521 ~ 703	86.4 ~ 116	625 ~ 839
M24×2.0	64.1 ~ 86.5	464 ~ 625	90.1 ~ 121	652 ~ 875	108 ~ 146	782 ~ 1056
M30×2.0	129 ~ 174	933 ~ 1258	181 ~ 245	1310 ~ 1772	217 ~ 294	1570 ~ 2126

2) PIPE AND HOSE (FLARE type)

Thread size	Width across flat (mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130
1"	41	21	152
1-1/4"	50	35	253

3) PIPE AND HOSE (ORFS type)

Thread size	Width across flat (mm)	kgf · m	lbf · ft
9/16-18	19	4	28.9
11/16-16	22	5	36.2
13/16-16	27	9.5	68.7
1-3/16-12	36	18	130
1-7/16-12	41	21	152
1-11/16-12	50	35	253

4) FITTING

Thread size	Width across flat (mm)	kgf · m	lbf · ft
1/4"	19	4	28.9
3/8"	22	5	36.2
1/2"	27	9.5	68.7
3/4"	36	18	130
1"	41	21	152
1-1/4"	50	35	253

5) TIGHTENING TORQUE OF MAJOR COMPONENT

No.	Descriptions		Bolt size	Torque	
				kgf · m	lbf · ft
1	Engine	Engine mounting bolt, nut (rubber, 4EA)	M24×3.0	76.5 ± 7.7	553 ± 55.7
2		Engine mounting bolt (bracket, 16EA)	M14×2.0	18.4 ± 2.8	133 ± 20.3
3		Fan motor mounting bolt	M12×1.75	12.8 ± 3.0	92.6 ± 21.7
4		Radiator mounting bolt	M16×2.0	29.7 ± 5.9	215 ± 42.7
5		Fuel tank mounting bolt, nut	M16×2.0	29.7 ± 4.5	215 ± 32.5
6	Hydraulic system	Main pump mounting bolt	M14×2.0	19.6 ± 2.9	142 ± 21.0
7		Steering pump mounting bolt	M14×2.0	19.6 ± 2.9	142 ± 21.0
8		Fan & Brake pump mounting bolt	M14×2.0	19.6 ± 2.9	142 ± 21.0
9		Main control valve mounting bolt	M12×1.75	12.8 ± 3.0	92.6 ± 21.7
10		Steering unit mounting bolt	M10×1.5	6.9 ± 1.4	50 ± 10.1
11		Flow amplifier mounting bolt	M10×1.5	6.9 ± 1.4	50 ± 10.1
12		Brake valve mounting bolt	M8×1.25	2.5 ± 0.5	18.1 ± 3.6
13		Cut-off valve mounting bolt	M8×1.25	2.5 ± 0.5	18.1 ± 3.6
14		EH control block mounting bolt	M8×1.25	2.5 ± 0.5	18.1 ± 3.6
15		Safety valve mounting bolt	M10×1.5	6.9 ± 1.4	50 ± 10.1
16		Hydraulic oil tank mounting bolt	M16×2.0	29.7 ± 4.5	215 ± 32.5
17	Power train system	Transmission mounting bolt, nut (rubber, 4EA)	M24×3.0	76.5 ± 7.7	553 ± 55.7
18		Transmission mounting bolt (bracket, 12EA)	M20×2.5 M14×2.0	56.1 ± 8.4 18.4 ± 2.8	406 ± 60.8 133 ± 20.3
19		Front axle mounting bolt, nut	M36×3.0	280 ± 30	2025 ± 217
20		Rear axle support mounting bolt, nut	M36×3.0	280 ± 30	2025 ± 217
21		Tire mounting nut	M22×1.5	60 ± 2.0	433 ± 14.5
22		Drive shaft joint mounting bolt	1/2-20UNF	15 ± 2.0	108 ± 14.5
23	Others	Counterweight mounting bolt	M30×3.5 M24×3.0	199 ± 30 100 ± 15	1439 ± 216 723 ± 108
24		Operator's seat mounting bolt	M8×1.25	3.4 ± 0.8	24.6 ± 5.0
25		ROPS Cab mounting bolt (4EA)	M30×3.5	199 ± 30	1440 ± 216
		ROPS Cab mounting nut (4EA)	M16×2.0	20.5 ± 4.7	148± 34

6) NEW MACHINE

New machine used and filled with following lubricants.

Description	Specification
Engine oil (API CJ-4)	SAE 15W-40, ^{★2} SAE 5W-40
DEF/AdBlue®	ISO 22241 (32.5% high-purity urea and 67.5 deionized water)
Hydraulic oil	HD Hyundai Construction Equipment genuine long life (ISO VG 46, VG 68 only) Conventional (ISO VG15 ^{★2}) HD Hyundai Construction Equipment Bio Hydraulic Oil (HBHO, ISO VG 46)
Transmission oil	SAE 15W-40 (Oils of the API CI-4+, CJ-4, CK-4, SM, or ACEA specification, Category E9 are not permitted to use for the transmission)
Axle oil	[★] Refer to below list
Grease	Lithium base grease NLGI No. 2
Fuel	ASTM D975-No. 2, ^{★1} Ultra low sulfur diesel
Coolant	ASTM D6210 Mixture of 50% ethylene glycol base antifreeze and 50% water Mixture of 60% ethylene glycol base antifreeze and 40% water ^{★2}

SAE : Society of Automotive Engineers	[★] Recommended oil list
API : American Petroleum Institute	- Gear oil with limited-slip additive
ISO : International Organization for Standardization	- Viscosity grades: SAE 75W-90/75W-110/ 75W-140 /80W-90/85W-90
NLGI : National Lubricating Grease Institute	- Universal axle and transmission oil
ASTM : American Society of Testing and Material	- Premium universal axle and transmission oil
DEF : Diesel Exhaust Fluid DEF compatible with AdBlue®	^{★1} Ultra low sulfur diesel - sulfur content ≤ 15 ppm ^{★2} Cold region Russia, CIS, Mongolia

2) RECOMMENDED OILS

HD Hyundai Construction Equipment genuine lubricating oils have been developed to offer the best performance and service life for your equipment. These oils have been tested according to the specifications of HD Hyundai Construction Equipment and, therefore, will meet the highest safety and quality requirements.

We recommend that you use only HD Hyundai Construction Equipment genuine lubricating oils and grease officially approved by HD Hyundai Construction Equipment.

- ※ Using any lubricating oils other than HD Hyundai Construction Equipment genuine products may lead to a deterioration of performance and cause damage to major components.
- ※ Do not mix HD Hyundai Construction Equipment genuine oil with any other lubricating oil as it may result in damage to the systems of major components.
- ※ Do not use any engine oil other than that specified above, as it may clog the diesel particulate filter(DPF).
- ※ For HD Hyundai Construction Equipment genuine lubricating oils and grease for use in regions with extremely low temperatures, please contact HD Hyundai Construction Equipment dealers.

Service point	Kind of fluid	Capacity ℓ (U.S. gal)	Ambient temperature °C(°F)								
			-50 (-58)	-30 (-22)	-20 (-4)	-10 (14)	0 (32)	10 (50)	20 (68)	30 (86)	40 (104)
Engine oil pan	Engine oil	34 (9.0)									
					SAE 15W-40						
				★ ² SAE 5W-40							
			SAE 0W-40								
DEF/ AdBlue® tank	Mixture of urea and deionized water	49.2 (13.0)									
			ISO 22241, High-purity urea + deionized water (32.5 : 67.5)								
Transmission	Engine oil	56.2 (14.8)		SAE 10W-30							
				SAE 15W-40							
Axle (with oil cooler)	UTTO	FR : 70.5 (18.6) RR: 68.7 (18.1)	★ Refer to below list								
Hydraulic tank	Hydraulic oil	Tank: 200 (52.8)	★ ² ISO VG 15								
		System: 360 (95.1)	ISO VG 46, HBHO VG 46★ ⁴								
			ISO VG 68								
Fuel tank	Diesel fuel★ ¹	440 (116.2)	★ ² ASTM D975 NO.1								
			ASTM D975 NO.2								
Fitting (grease nipple)	Grease	As required	★ ² NLGI NO.1								
			NLGI NO.2								
Radiator (reservoir tank)	Mixture of antifreeze and soft water★ ³	45.5 (12.0)	Ethylene glycol base permanent type (50 : 50)								
			★ ² Ethylene glycol base permanent type (60 : 40)								

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

UTTO : Universal Tractor Transmission Oil

DEF : Diesel Exhaust Fluid

DEF compatible with AdBlue®

★¹ Ultra low sulfur diesel

- sulfur content ≤ 15 ppm

★ Recommended oil list

- Gear oil with limited-slip additive

- Viscosity grades: SAE 75W-90/75W-110/
75W-140 /80W-90/85W-90

- Universal axle and transmission oil

- Premium universal axle and transmission oil

★² Cold region : Russia, CIS, Mongolia

★³ Soft water : City water or distilled water

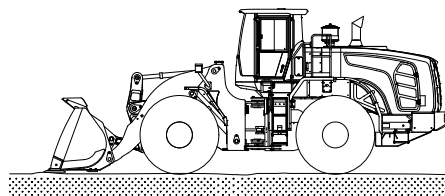
★⁴ Hyundai Bio Hydraulic Oil

GROUP 3 OPERATIONAL CHECKOUT RECORD SHEET

- Owner :
- Date :
- Hours :
- Serial No. :
- Technician :

※ Use this sheet to record operational checkout results.

Perform the operational check before installing any test equipment.



9801GE02

Item	OK	NOT OK	Comments
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1. Monitor indicator and gauge checks (engine OFF)

- Hourmeter and gauge check ☐ ☐ _____
- Battery check ☐ ☐ _____
- Monitor indicator circuit check ☐ ☐ _____
- Cluster turn signals and warning indicator check ☐ ☐ _____

2. Transmission, axle and engine, neutral start switch and reverse warning alarm switch checks

- Transmission control lever and neutral ☐ ☐ _____
- Neutral start and reverse warning ☐ ☐ _____
- Alarm circuit checks ☐ ☐ _____

3. Monitor indicator and gauge checks (engine running)

- Monitor display and alternator output checks ☐ ☐ _____
- Monitor bypass circuit and seat belt indicator check ☐ ☐ _____
- Monitor primary and secondary level check ☐ ☐ _____
- Transmission oil warm up procedure ☐ ☐ _____
- Transmission temperature gauge check ☐ ☐ _____

4. Brake system and clutch cut off checks

· Park brake capacity check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Park brake transmission lockout check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Service brake pump flow check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Service brake capacity check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Brake accumulator precharge check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Brake system leakage check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Service brake pedal check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Service and park brake system drag check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Clutch cut off check	<input type="checkbox"/>	<input type="checkbox"/>	_____

5. Driving checks

· Transmission oil warm up procedure	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Transmission noise check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Speedometer check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Transmission kick down system check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· 1st, 2nd, 3rd and 4th speed clutch pack drag check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Transmission pressure, pump flow and leakage check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Transmission shift modulation check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Torque converter check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Engine power check	<input type="checkbox"/>	<input type="checkbox"/>	_____

6. Hydraulic system checks

· Hydraulic system warm up procedure	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Hydraulic pump performance check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Pilot control valve boom float check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Boom down solenoid valve check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Control valve lift check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Bucket rollback circuit relief valve check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Bucket dump circuit relief			
Low pressure check	<input type="checkbox"/>	<input type="checkbox"/>	_____
High pressure check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Boom and bucket cylinder drift check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Boom down solenoid valve leakage check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Pilot controller check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Return to dig check	<input type="checkbox"/>	<input type="checkbox"/>	_____
· Boom height kickout check-if equipped	<input type="checkbox"/>	<input type="checkbox"/>	_____

7. Steering system checks

- | | | | |
|---------------------------------|--------------------------|--------------------------|-------|
| · Steering unit check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Steering system leakage check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Steering valve (EHPS) | | | |
| Low check pressure | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| High check pressure | <input type="checkbox"/> | <input type="checkbox"/> | _____ |

8. Accessory checks

- | | | | |
|---------------------------------------|--------------------------|--------------------------|-------|
| · Operating lights check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Work light check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Brake light check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Cab light check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Horn circuit check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Windshield washer and wiper check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Defroster blower check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Heater/Air conditioner blower check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Heater functional check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Air conditioner functional check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Start aid system check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |

9. Cab components and vandal protection checks

- | | | | |
|------------------------------------|--------------------------|--------------------------|-------|
| · Cab door latch check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Cab door hold open latch check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Cab door release button check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Cab door lock check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Cab door window check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Cab window latch check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Steering column adjustment check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Seat and seat belt check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Air intake filter door check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Engine side panels check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Radiator cap access door check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Frame locking bar check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Boom lock check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |
| · Service decal check | <input type="checkbox"/> | <input type="checkbox"/> | _____ |