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1. STRUCTURE

This service manual has been prepared as an aid to improve the quality of repairs by giving the serviceman an accurate understanding of the product and by showing him the correct way to perform repairs and make judgements. Make sure you understand the contents of this manual and use it to full effect at every opportunity.
This service manual mainly contains the necessary technical information for operations performed in a service workshop.
For ease of understanding, the manual is divided into the following sections.

SECTION 1 GENERAL
This section explains the safety hints and gives the specification of the machine and major components.

SECTION 2 STRUCTURE AND FUNCTION
This section explains the structure and function of each component. It serves not only to give an understanding of the structure, but also serves as reference material for troubleshooting.

SECTION 3 HYDRAULIC SYSTEM
This section explains the hydraulic circuit, single and combined operation.

SECTION 4 ELECTRICAL SYSTEM
This section explains the electrical circuit, monitoring system and each component. It serves not only to give an understanding electrical system, but also serves as reference material for trouble shooting.

SECTION 5 MECHATRONICS SYSTEM
This section explains the computer aided power optimization system and each component.

SECTION 6 TROUBLESHOOTING
This section explains the troubleshooting charts correlating **problems** to **causes**.

SECTION 7 MAINTENANCE STANDARD
This section gives the judgement standards when inspecting disassembled parts.

SECTION 8 DISASSEMBLY AND ASSEMBLY
This section explains the order to be followed when removing, installing, disassembling or assembling each component, as well as precautions to be taken for these operations.

SECTION 9 COMPONENT MOUNTING TORQUE
This section shows bolt specifications and standard torque values needed when mounting components to the machine.

The specifications contained in this shop manual are subject to change at any time and without any advance notice. Contact your HYUNDAI distributor for the latest information.

2. HOW TO READ THE SERVICE MANUAL

Distribution and updating

Any additions, amendments or other changes will be sent to HYUNDAI distributors.

Get the most up-to-date information before you start any work.

Filing method

1. See the page number on the bottom of the page.
   File the pages in correct order.
2. Following examples shows how to read the page number.
   Example 1

   2 - 3

   - 2 : Item number(2. Structure and Function)
   - 3 : Consecutive page number for each item.

3. Additional pages : Additional pages are indicated by a hyphen(-) and number after the page number. File as in the example.

   10 - 4
   10 - 4 - 1 ┐
   10 - 4 - 2 ┘ Added pages
   10 - 5

Revised edition mark(①②③…)

When a manual is revised, an edition mark is recorded on the bottom outside corner of the pages.

Revisions

Revised pages are shown at the **list of revised pages** on the between the contents page and section 1 page.

Symbols

So that the shop manual can be of ample practical use, important places for safety and quality are marked with the following symbols.

Symbol	Item	Remarks
	Safety	Special safety precautions are necessary when performing the work.
		Extra special safety precautions are necessary when performing the work because it is under internal pressure.
※	Caution	Special technical precautions or other precautions for preserving standards are necessary when performing the work.

3. CONVERSION TABLE

Method of using the Conversion Table

The Conversion Table in this section is provided to enable simple conversion of figures. For details of the method of using the Conversion Table, see the example given below.

Example

1. Method of using the Conversion Table to convert from millimeters to inches
   Convert 55mm into inches.

   (1) Locate the number 50in the vertical column at the left side, take this as ⓐ, then draw a horizontal line from ⓐ.

   (2) Locate the number 5in the row across the top, take this as ⓑ, then draw a perpendicular line down from ⓑ.

   (3) Take the point where the two lines cross as ⓒ. This point ⓒ gives the value when converting from millimeters to inches. Therefore, 55mm = 2.165 inches.

2. Convert 550mm into inches.

   (1) The number 550 does not appear in the table, so divide by 10(Move the decimal point one place to the left) to convert it to 55mm.

   (2) Carry out the same procedure as above to convert 55mm to 2.165 inches.

   (3) The original value(550mm) was divided by 10, so multiply 2.165 inches by 10(Move the decimal point one place to the right) to return to the original value.
   This gives 550mm = 21.65 inches.

Millimeters to inches ⓑ 1mm = 0.03937 in

	0	1	2	3	4	5	6	7	8	9
0		0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
ⓐ 50	1.969	2.008	2.047	2.087	2.126	ⓒ 2.165	2.205	2.244	2.283	2.323
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717
70	2.756	2.795	2.835	2.874	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

Millimeters to inches

1mm = 0.03937in

	0	1	2	3	4	5	6	7	8	9
0		0.039	0.079	0.118	0.157	0.197	0.236	0.276	0.315	0.354
10	0.394	0.433	0.472	0.512	0.551	0.591	0.630	0.669	0.709	0.748
20	0.787	0.827	0.866	0.906	0.945	0.984	1.024	1.063	1.102	1.142
30	1.181	1.220	1.260	1.299	1.339	1.378	1.417	1.457	1.496	1.536
40	1.575	1.614	1.654	1.693	1.732	1.772	1.811	1.850	1.890	1.929
50	1.969	2.008	2.047	2.087	2.126	2.165	2.205	2.244	2.283	2.323
60	2.362	2.402	2.441	2.480	2.520	2.559	2.598	2.638	2.677	2.717
70	2.756	2.795	2.835	2.874	2.913	2.953	2.992	3.032	3.071	3.110
80	3.150	3.189	3.228	3.268	3.307	3.346	3.386	3.425	3.465	3.504
90	3.543	3.583	3.622	3.661	3.701	3.740	3.780	3.819	3.858	3.898

Kilogram to Pound

1kg = 2.2046lb

	0	1	2	3	4	5	6	7	8	9
0		2.20	4.41	6.61	8.82	11.02	13.23	15.43	17.64	19.84
10	22.05	24.25	26.46	28.66	30.86	33.07	35.27	37.48	39.68	41.89
20	44.09	46.30	48.50	50.71	51.91	55.12	57.32	59.5.	61.73	63.93
30	66.14	68.34	70.55	72.75	74.96	77.16	79.37	81.57	83.78	85.98
40	88.18	90.39	92.59	94.80	97.00	99.21	101.41	103.62	105.82	108.03
50	110.23	112.44	114.64	116.85	119.05	121.25	123.46	125.66	127.87	130.07
60	132.28	134.48	136.69	138.89	141.10	143.30	145.51	147.71	149.91	152.12
70	154.32	156.53	158.73	160.94	163.14	165.35	167.55	169.76	171.96	174.17
80	176.37	178.57	180.78	182.98	185.19	187.39	189.60	191.80	194.01	196.21
90	198.42	200.62	202.83	205.03	207.24	209.44	211.64	213.85	216.05	218.26

Liter to U.S. Gallon

1 ℓ = 0.2642 U.S.Gal

	0	1	2	3	4	5	6	7	8	9
0		0.264	0.528	0.793	1.057	1.321	1.585	1.849	2.113	2.378
10	2.642	2.906	3.170	3.434	3.698	3.963	4.227	4.491	4.755	5.019
20	5.283	5.548	5.812	6.6076	6.340	6.604	6.869	7.133	7.397	7.661
30	7.925	8.189	8.454	8.718	8.982	9.246	9.510	9.774	10.039	10.303
40	10.567	10.831	11.095	11.359	11.624	11.888	12.152	12.416	12.680	12.944
50	13.209	13.473	13.737	14.001	14.265	14.529	14.795	15.058	15.322	15.586
60	15.850	16.115	16.379	16.643	16.907	17.171	17.435	17.700	17.964	18.228
70	18.492	18.756	19.020	19.285	19.549	19.813	20.077	20.341	20.605	20.870
80	21.134	21.398	21.662	21.926	22.190	22.455	22.719	22.983	23.247	23.511
90	23.775	24.040	24.304	24.568	24.832	25.096	25.631	25.625	25.889	26.153

Liter to U.K. Gallon

1 ℓ = 0.21997 U.K.Gal

	0	1	2	3	4	5	6	7	8	9
0		0.220	0.440	0.660	0.880	1.100	1.320	1.540	1.760	1.980
10	2.200	2.420	2.640	2.860	3.080	3.300	3.520	3.740	3.950	4.179
20	4.399	4.619	4.839	5.059	5.279	5.499	5.719	5.939	6.159	6.379
30	6.599	6.819	7.039	7.259	7.479	7.969	7.919	8.139	8.359	8.579
40	8.799	9.019	9.239	9.459	9.679	9.899	10.119	10.339	10.559	10.778
50	10.998	11.281	11.438	11.658	11.878	12.098	12.318	12.528	12.758	12.978
60	13.198	13.418	13.638	13.858	14.078	14.298	14.518	14.738	14.958	15.178
70	15.398	15.618	15.838	16.058	16.278	16.498	16.718	16.938	17.158	17.378
80	17.598	17.818	18.037	18.257	18.477	18.697	18.917	19.137	19.357	19.577
90	19.797	20.017	20.237	20.457	20.677	20.897	21.117	21.337	21.557	21.777

kgf · m to lbf · ft

1kgf · m = 7.233lbf · ft

	0	1	2	3	4	5	6	7	8	9
		7.2	14.5	21.7	28.9	36.2	43.4	50.6	57.9	65.1
10	72.3	79.6	86.8	94.0	101.3	108.5	115.7	123.0	130.2	137.4
20	144.7	151.9	159.1	166.4	173.6	180.8	188.1	195.3	202.5	209.8
30	217.0	224.2	231.5	238.7	245.9	253.2	260.4	267.6	274.9	282.1
40	289.3	396.6	303.8	311.0	318.3	325.5	332.7	340.0	347.2	354.4
50	361.7	368.9	376.1	383.4	390.6	397.8	405.1	412.3	419.5	426.8
60	434.0	441.2	448.5	455.7	462.9	470.2	477.4	484.6	491.8	499.1
70	506.3	513.5	520.8	528.0	535.2	542.5	549.7	556.9	564.2	571.4
80	578.6	585.9	593.1	600.3	607.6	614.8	622.0	629.3	636.5	643.7
90	651.0	658.2	665.4	672.7	679.9	687.1	694.4	701.6	708.8	716.1
100	723.3	730.5	737.8	745.0	752.2	759.5	766.7	773.9	781.2	788.4
110	795.6	802.9	810.1	817.3	824.6	831.8	839.0	846.3	853.5	860.7
120	868.0	875.2	882.4	889.7	896.9	904.1	911.4	918.6	925.8	933.1
130	940.3	947.5	954.8	962.0	969.2	976.5	983.7	990.9	998.2	10005.4
140	1012.6	1019.9	1027.1	1034.3	1041.5	1048.8	1056.0	1063.2	1070.5	1077.7
150	1084.9	1092.2	1099.4	1106.6	1113.9	1121.1	1128.3	1135.6	1142.8	1150.0
160	1157.3	1164.5	1171.7	1179.0	1186.2	1193.4	1200.7	1207.9	1215.1	1222.4
170	1129.6	1236.8	1244.1	1251.3	1258.5	1265.8	1273.0	1280.1	1287.5	1294.7
180	1301.9	1309.2	1316.4	1323.6	1330.9	1338.1	1345.3	1352.6	1359.8	1367.0
190	1374.3	1381.5	1388.7	1396.0	1403.2	1410.4	1417.7	1424.9	1432.1	1439.4

kgf/cm^2 to lbf/in^2

1kgf / cm^2 = 14.2233lbf / in^2

	0	1	2	3	4	5	6	7	8	9
		14.2	28.4	42.7	56.9	71.1	85.3	99.6	113.8	128.0
10	142.2	156.5	170.7	184.9	199.1	213.4	227.6	241.8	256.0	270.2
20	284.5	298.7	312.9	327.1	341.4	355.6	369.8	384.0	398.3	412.5
30	426.7	440.9	455.1	469.4	483.6	497.8	512.0	526.3	540.5	554.7
40	568.9	583.2	597.4	611.6	625.8	640.1	654.3	668.5	682.7	696.9
50	711.2	725.4	739.6	753.8	768.1	782.3	796.5	810.7	825.0	839.2
60	853.4	867.6	881.8	896.1	910.3	924.5	938.7	953.0	967.2	981.4
70	995.6	1010	1024	1038	1053	1067	1081	1095	1109	1124
80	1138	1152	1166	1181	1195	1209	1223	1237	1252	1266
90	1280	1294	1309	1323	1337	1351	1365	1380	1394	1408
100	1422	1437	1451	1465	1479	1493	1508	1522	1536	1550
110	1565	1579	1593	1607	1621	1636	1650	1664	1678	1693
120	1707	1721	1735	1749	1764	1778	1792	1806	1821	1835
130	1849	2863	1877	1892	1906	1920	1934	1949	1963	1977
140	1991	2005	2020	2034	2048	2062	2077	2091	2105	2119
150	2134	2148	2162	2176	2190	2205	2219	2233	2247	2262
160	2276	2290	2304	2318	2333	2347	2361	2375	2389	2404
170	2418	2432	2446	2460	2475	2489	2503	2518	2532	2546
180	2560	2574	2589	5603	2617	2631	2646	2660	2674	2688
200	2845	2859	2873	2887	2901	2916	2930	2944	2958	2973
210	2987	3001	3015	3030	3044	3058	3072	3086	3101	3115
220	3129	3143	3158	3172	3186	3200	3214	3229	3243	3257
230	3271	3286	3300	3314	3328	3343	3357	3371	3385	3399
240	3414	3428	3442	3456	3470	3485	3499	3513	3527	3542

TEMPERATURE

Fahrenheit-Centigrade Conversion.

A simple way to convert a fahrenheit temperature reading into a centigrade temperature reading or vice verse is to enter the accompanying table in the center or boldface column of figures.

These figures refer to the temperature in either Fahrenheit or Centigrade degrees.

If it is desired to convert from Fahrenheit to Centigrade degrees, consider the center column as a table of Fahrenheit temperatures and read the corresponding Centigrade temperature in the column at the left.

If it is desired to convert from Centigrade to Fahrenheit degrees, consider the center column as a table of Centigrade values, and read the corresponding Fahrenheit temperature on the right.

°C		°F	°C		°F	°C		°F	°C		°F
-40.4	-40	-40.0	-11.7	11	51.8	7.8	46	114.8	27.2	81	117.8
-37.2	-35	-31.0	-11.1	12	53.6	8.3	47	116.6	27.8	82	179.6
-34.4	-30	-22.0	-10.6	13	55.4	8.9	48	118.4	28.3	83	181.4
-31.7	-25	-13.0	-10.0	14	57.2	9.4	49	120.2	28.9	84	183.2
-28.9	-20	-4.0	-9.4	15	59.0	10.0	50	122.0	29.4	85	185.0
-28.3	-19	-2.2	-8.9	16	60.8	10.6	51	123.8	30.0	86	186.8
-27.8	-18	-0.4	-8.3	17	62.6	11.1	52	125.6	30.6	87	188.6
-27.2	-17	1.4	-7.8	18	64.4	11.7	53	127.4	31.1	88	190.4
-26.7	-16	3.2	-6.7	20	68.0	12.8	55	131.0	32.2	90	194.0
-26.1	-15	5.0	-6.7	20	68.0	12.8	55	131.0	32.2	90	194.0
-25.6	-14	6.8	-6.1	21	69.8	13.3	56	132.8	32.8	91	195.8
-25.0	-13	8.6	-5.6	22	71.6	13.9	57	134.6	33.3	92	197.6
-24.4	-12	10.4	-5.0	23	73.4	14.4	58	136.4	33.9	93	199.4
-23.9	-11	12.2	-4.4	24	75.2	15.0	59	138.2	34.4	94	201.2
-23.3	-10	14.0	-3.9	25	77.0	15.6	60	140.0	35.0	95	203.0
-22.8	-9	15.8	-3.3	26	78.8	16.1	61	141.8	35.6	96	204.8
-22.2	-8	17.6	-2.8	27	80.6	16.7	62	143.6	36.1	97	206.6
-21.7	-7	19.4	-2.2	28	82.4	17.2	63	145.4	36.7	98	208.4
-21.1	-6	21.2	-1.7	29	84.2	17.8	64	147.2	37.2	99	210.2
-20.6	-5	23.0	-1.1	35	95.0	21.1	70	158.0	51.7	125	257.0
-20.0	-4	24.8	-0.6	31	87.8	18.9	66	150.8	40.6	105	221.0
-19.4	-3	26.6	0	32	89.6	19.4	67	152.6	43.3	110	230.0
-18.9	-2	28.4	0.6	33	91.4	20.0	68	154.4	46.1	115	239.0
-18.3	-1	30.2	1.1	34	93.2	20.6	69	156.2	48.9	120	248.0
-17.8	0	32.0	1.7	35	95.0	21.1	70	158.0	51.7	125	257.0
-17.2	1	33.8	2.2	36	96.8	21.7	71	159.8	54.4	130	266.0
-16.7	2	35.6	2.8	37	98.6	22.2	72	161.6	57.2	135	275.0
-16.1	3	37.4	3.3	38	100.4	22.8	73	163.4	60.0	140	284.0
-15.6	4	39.2	3.9	39	102.2	23.3	74	165.2	62.7	145	293.0
-15.0	5	41.0	4.4	40	104.0	23.9	75	167.0	65.6	150	302.0
-14.4	6	42.8	5.0	41	105.8	24.4	76	168.8	68.3	155	311.0
-13.9	7	44.6	5.6	42	107.6	25.0	77	170.6	71.1	160	320.0
-13.3	8	46.4	6.1	43	109.4	25.6	78	172.4	73.9	165	329.0
-12.8	9	48.2	6.7	44	111.2	26.1	79	174.2	76.7	170	338.0
-12.2	10	50.0	7.2	45	113.0	26.7	80	176.0	79.4	172	347.0

SECTION 1 GENERAL

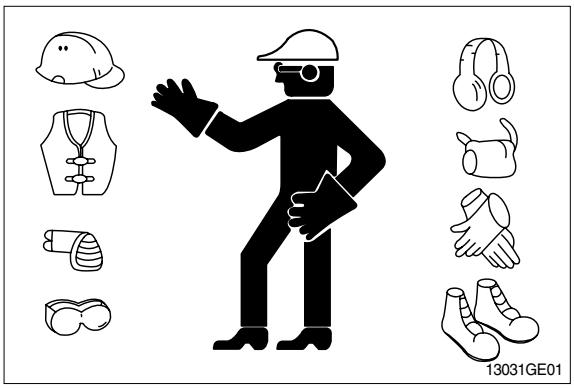
GROUP 1 SAFETY

FOLLOW SAFE PROCEDURE

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

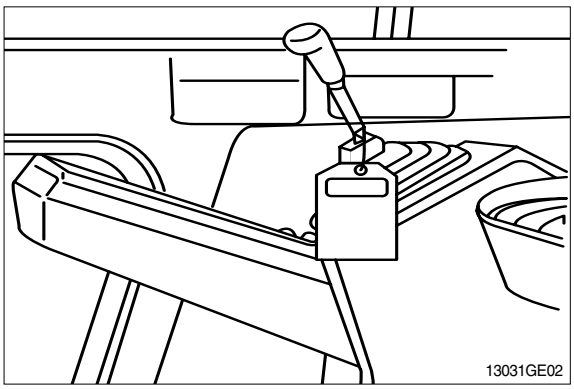
WEAR PROTECTIVE CLOTHING

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



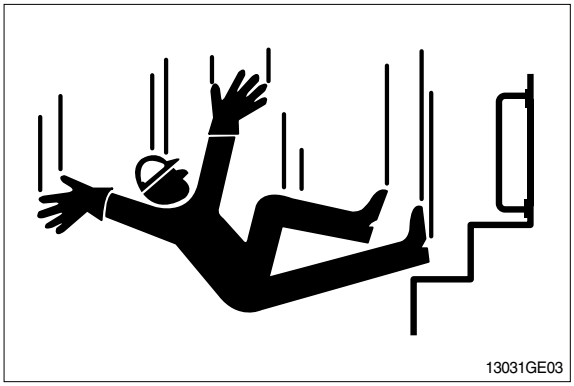
WARN OTHERS OF SERVICE WORK

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.

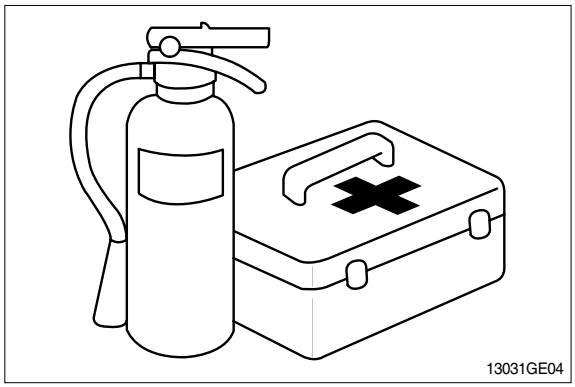


PREPARE FOR EMERGENCIES

Be prepared if a fire starts.

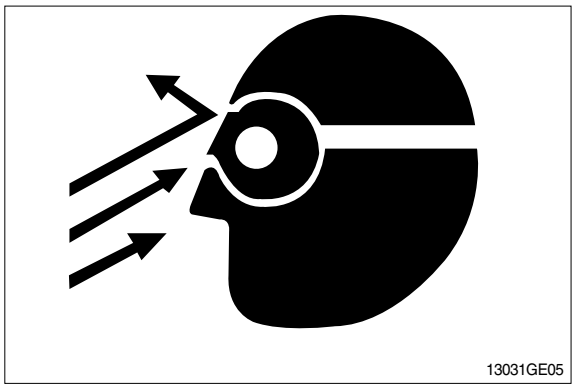
Keep a first aid kit and fire extinguisher handy.

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



PROTECT AGAINST FLYING DEBRIS

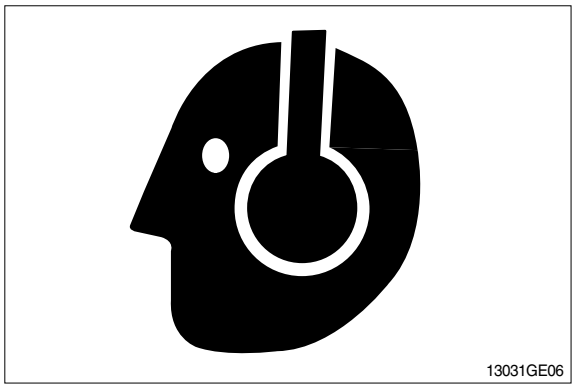
Guard against injury from flying pieces of metal or debris; Wear goggles or safety glasses.



PROTECT AGAINST NOISE

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

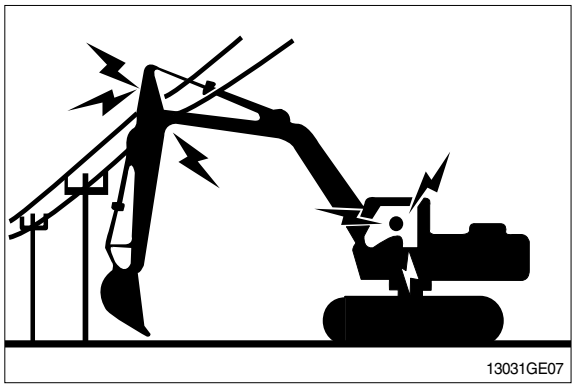
Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.



AVOID POWER LINES

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

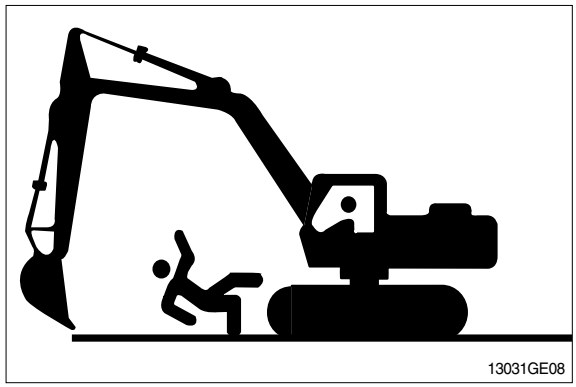
Never move any part of the machine or load closer to electric line than 3m(10ft) plus twice the line insulator length.



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.

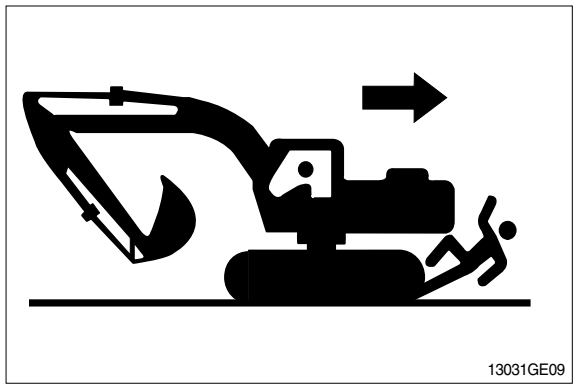


MOVE AND OPERATE MACHINE SAFELY

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.

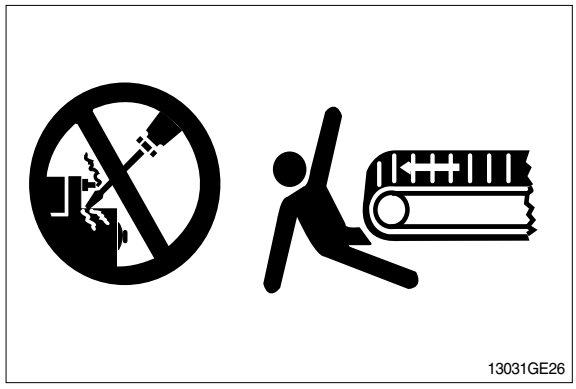
Use a signal person when moving, swinging, or operating the machine in congested areas. Coordinate hand signals before starting the excavator.



OPERATE ONLY FORM 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

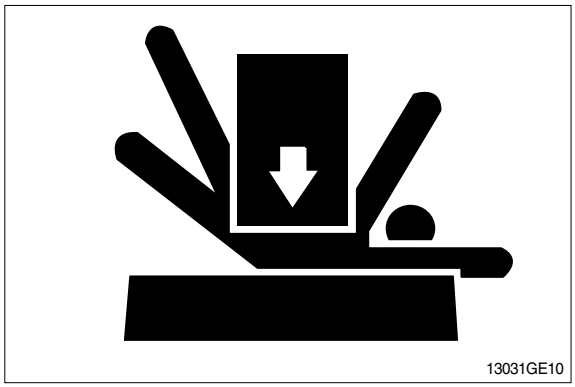
Before working on the machine:

- 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.

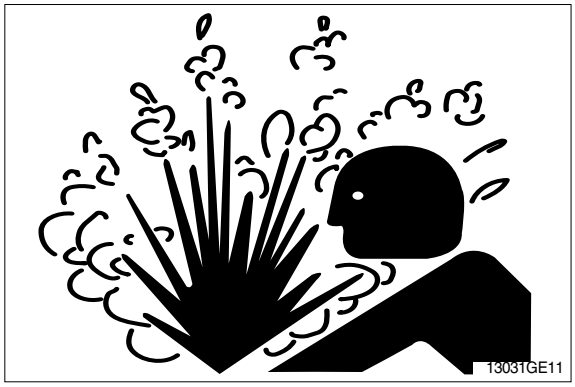
Do not support the machine on cinder blocks, hollow tiles, or props that may crumble under continuous load.
Do not work under a machine that is supported solely by a jack. Follow recommended procedures in this manual.



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.



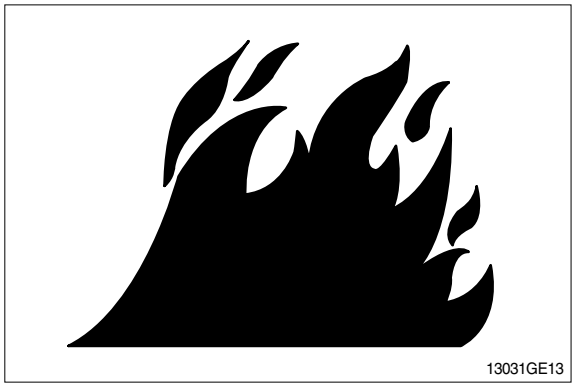
HANDLE FLUIDS SAFELY-AVOID FIRES

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

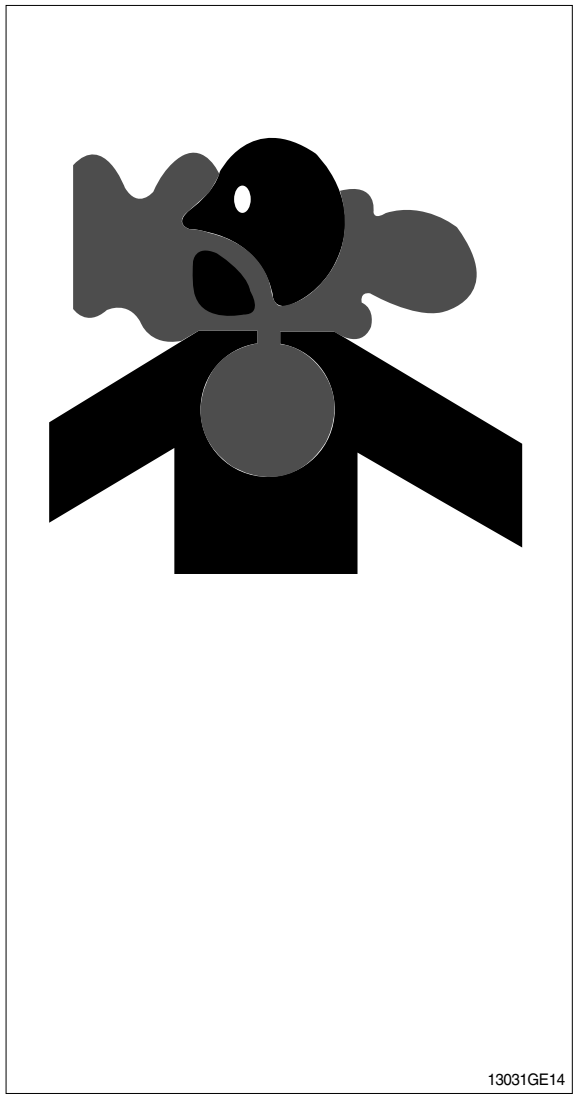
Avoid potentially toxic fumes and dust.

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.

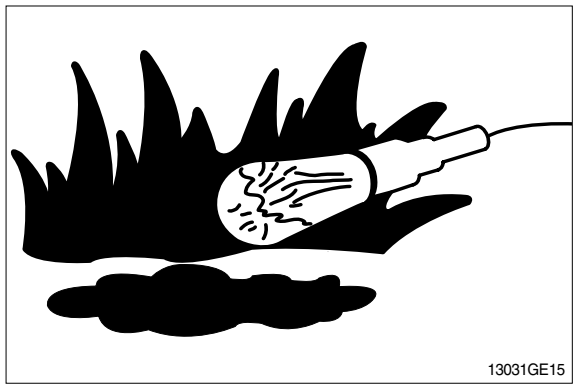
Remove paint before welding or heating:

- 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

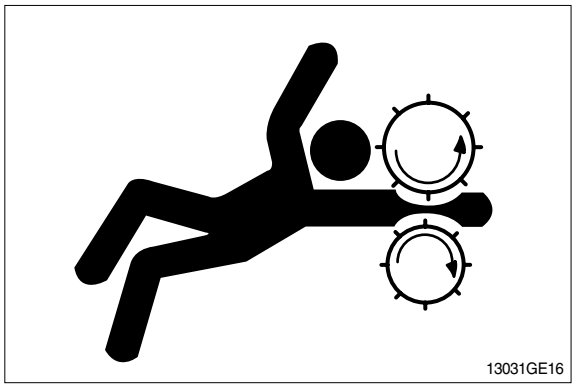
Illuminate your work area adequately but safely. Use a portable safety light for working inside or under the machine. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.



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.

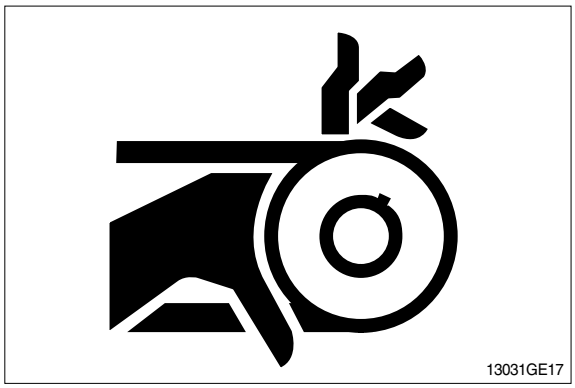
Remove rings and other jewelry to prevent electrical shorts and entanglement in moving parts.



STAY CLEAR OF MOVING PARTS

Entanglements in moving parts can cause serious injury.

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



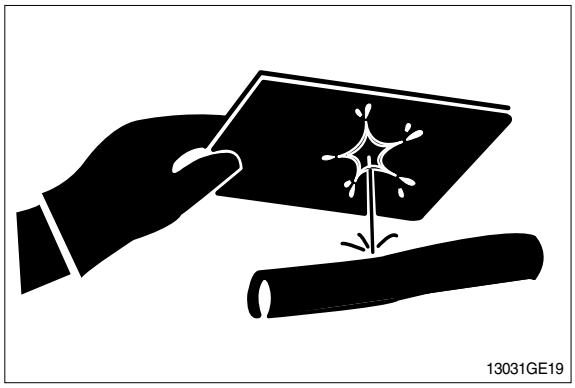
AVOID HIGH PRESSURE FLUIDS

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.


13031GE20

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).


13031GE21

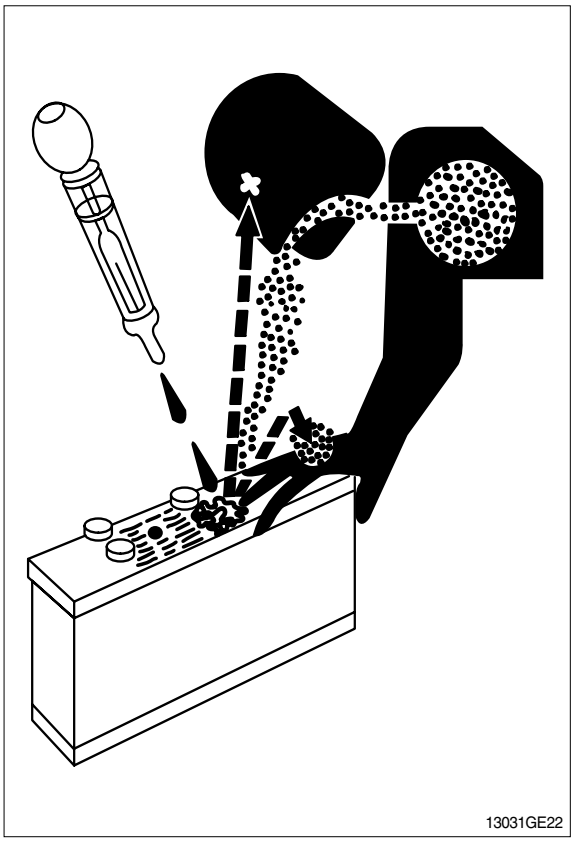
PREVENT ACID BURNS

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 of 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.


13031GE22

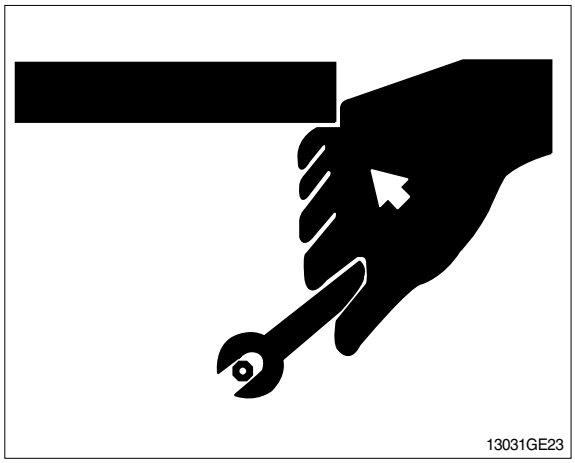
USE TOOLS PROPERLY

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.)

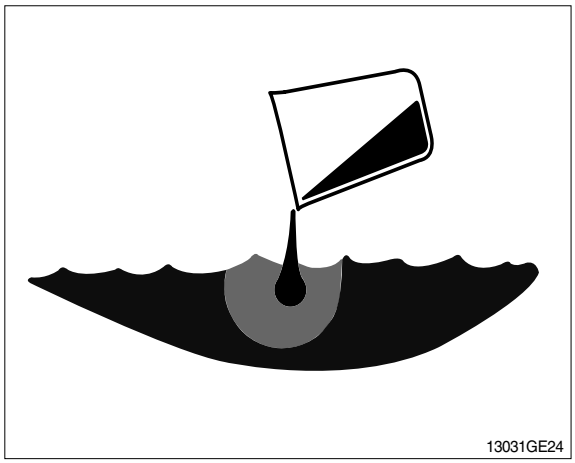


DISPOSE OF FLUIDS PROPERLY

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.

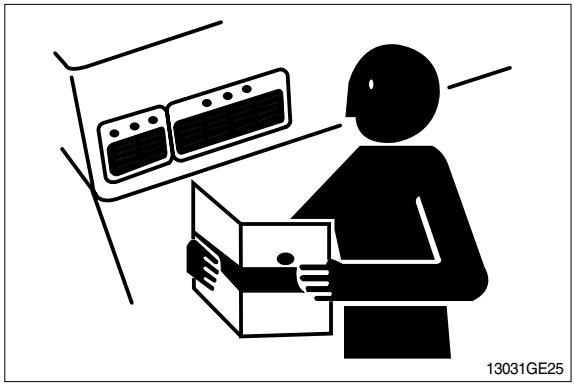
Use proper containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

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.

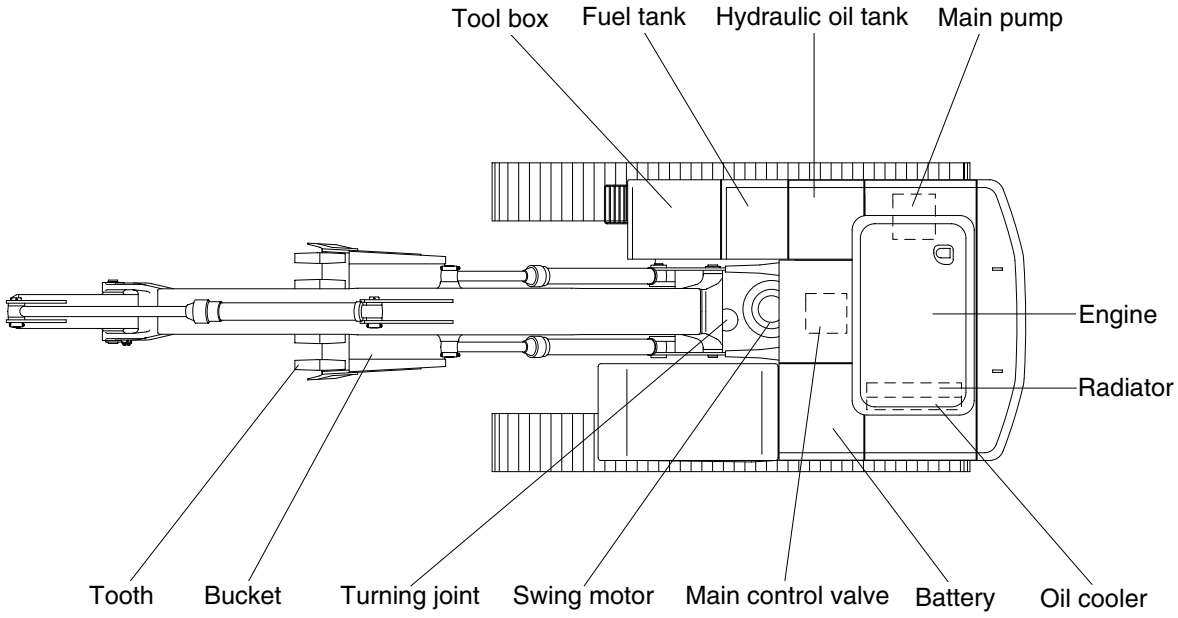


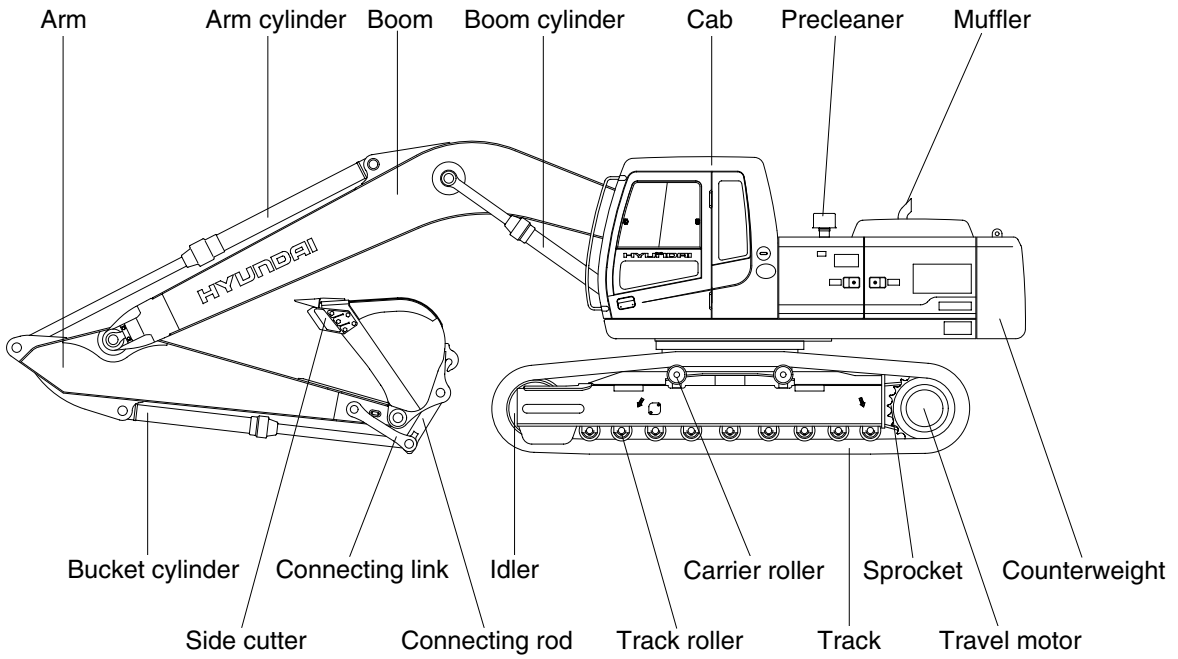
LIVE WITH SAFETY

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

GROUP 2 SPECIFICATIONS

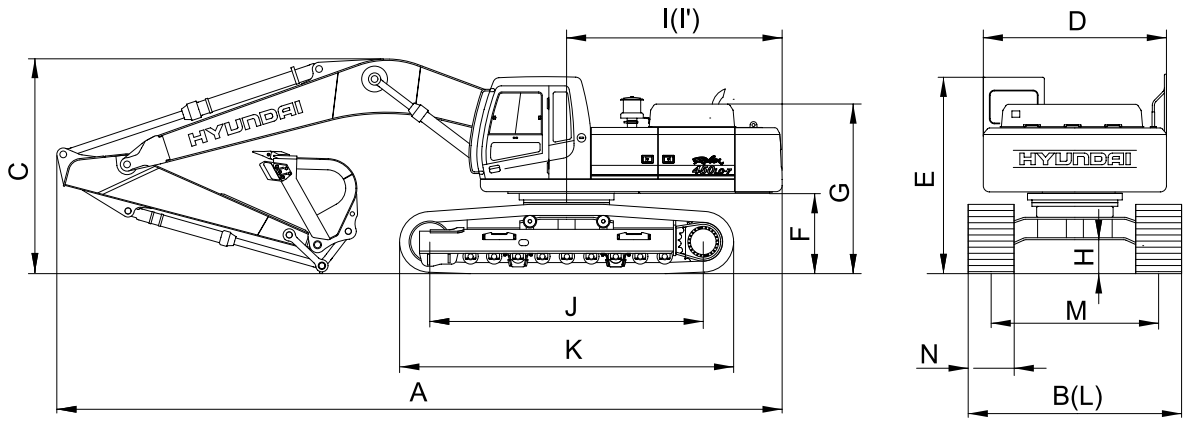
1. MAJOR COMPONENT





45072SP00

2. SPECIFICATIONS

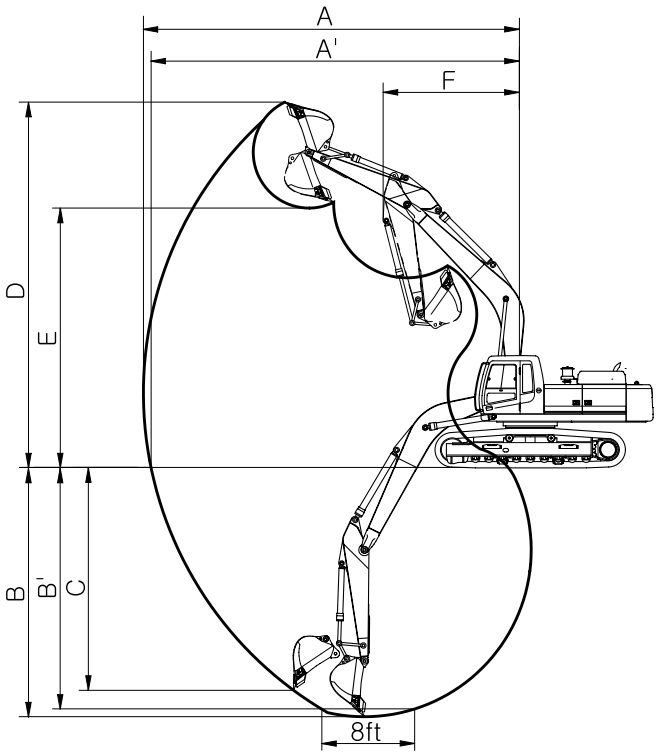


45072SP01

Description		Unit	Specification
Operating weight		kg(lb)	44900(99000,~#0463) 45200(99650,#0464~)
Bucket capacity(SAE heaped), standard		$m^3(yd^3)$	2.15(2.81)
Overall length	A	mm(ft-in)	12000(39' 4")
Overall width, with 600mm shoe	B		3340(10'11")
Overall height	C		3600(11'10")
Superstructure width	D		2980(9' 9")
Overall height of cab	E		3250(10' 8")
Ground clearance of counterweight	F		1340(4' 5")
Engine cover height	G		2792(9' 2")
Minimum ground clearance	H		555(1'10")
Rear-end distance	I		3665(12' 0")
Rear-end swing radius	I'		3720(12' 2")
Distance between tumblers	J		4470(14' 8")
Undercarriage length	K		5462(17'11")
Undercarriage width	L		3340(10'11")
Track gauge	M		2740(8'12")
Track shoe width, standard	N		600(24")
Travel speed(Low/high)		km/hr(mph)	3.2/5.3(2.0/3.3)
Swing speed		rpm	10.3
Gradeability		Degree(%)	35(70)
Ground pressure(600mm shoe)		$kgf/cm^2(psi)$	0.78(11.09)

3. WORKING RANGE

· 7.06m(23' 2") BOOM

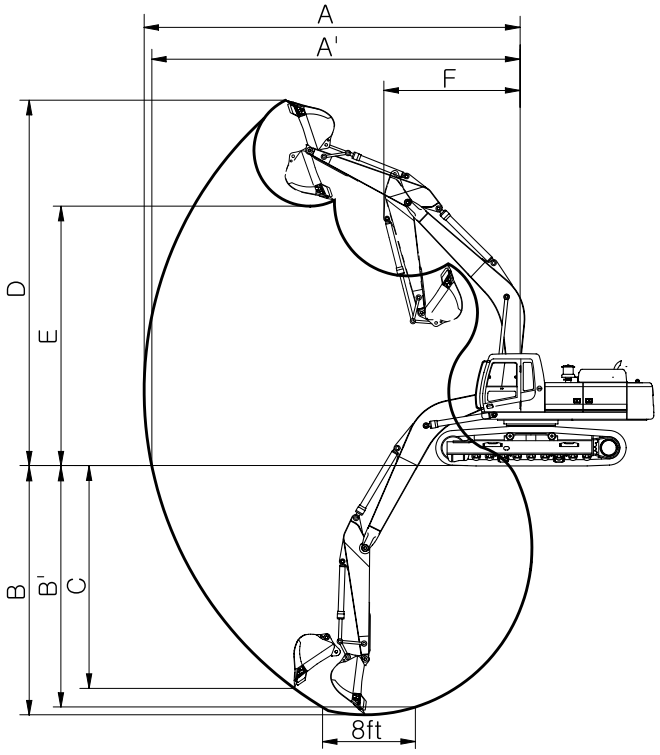


45072SP04

Description		2.40m(7'10") Arm	2.90m(9' 6") Arm	3.38m(11' 1") Arm	4.00m(13' 1") Arm	4.50m(14' 9") Arm
Max digging reach	A	11160mm (36' 7")	11550mm (37'11")	12100mm (39' 8")	12660mm (41' 6")	13150mm (43' 2")
Max digging reach on ground	A'	10940mm (35'11")	11340mm (37' 2")	11900mm (39' 1")	12470mm (40'11")	12960mm (42' 6")
Max digging depth	B	6810mm (22' 4")	7310mm (23'12")	7790mm (25' 7")	8410mm (27' 7")	8910mm (29' 3")
Max digging depth (8ft level)	B'	6620mm (21' 9")	7140mm (23' 5")	7640mm (25' 1")	8280mm (27' 2")	8790mm (28'10")
Max vertical wall digging depth	C	5990mm (19' 8")	5850mm (19' 2")	6560mm (21' 6")	7290mm (23'11")	7690mm (25' 3")
Max digging height	D	10600mm (34' 9")	10550mm (34' 7")	11030mm (36' 2")	11250mm (36'11")	11500mm (37' 9")
Max dumping height	E	7190mm (23' 7")	7240mm (23' 9")	7660mm (25' 2")	7880mm (25'10")	8120mm (26' 8")
Min swing radius	F	5090mm (16' 8")	4900mm (16' 1")	4780mm (15' 8")	4830mm (15'10")	4870mm (15'12")
Bucket digging force	SAE	224[244] kN	224[244] kN	224[244] kN	224[244] kN	224[244] kN
		22800[24870] kgf	22800[24870] kgf	22800[24870] kgf	22800[24870] kgf	22800[24870] kgf
		50270[54840] lbf	50270[54840] lbf	50270[54840] lbf	50270[54840] lbf	50270[54840] lbf
	ISO	256[279] kN	256[279] kN	256[279] kN	256[279] kN	256[279] kN
		26100[28470] kgf	26100[28470] kgf	26100[28470] kgf	26100[28470] kgf	26100[28470] kgf
		57540[62770] lbf	57540[62770] lbf	57540[62770] lbf	57540[62770] lbf	57540[62770] lbf
Arm crowd force	SAE	266[290] kN	216[235] kN	180[197] kN	164[179] kN	153[167] kN
		27100[29560] kgf	22000[24000] kgf	18400[20070] kgf	16700[18220] kgf	15600[17020] kgf
		59750[65180] lbf	48500[52910] lbf	40570[44260] lbf	36820[40170] lbf	34390[37520] lbf
	ISO	279[304] kN	226[246] kN	187[204] kN	170[185] kN	158[172] kN
		28400[30980] kgf	23000[25090] kgf	19100[20840] kgf	17300[18870] kgf	16100[17560] kgf
		62610[68300] lbf	50710[55320] lbf	42110[45940] lbf	38140[41610] lbf	35490[38720] lbf

[ ] : Power boost

· 6.55m(21' 6") BOOM

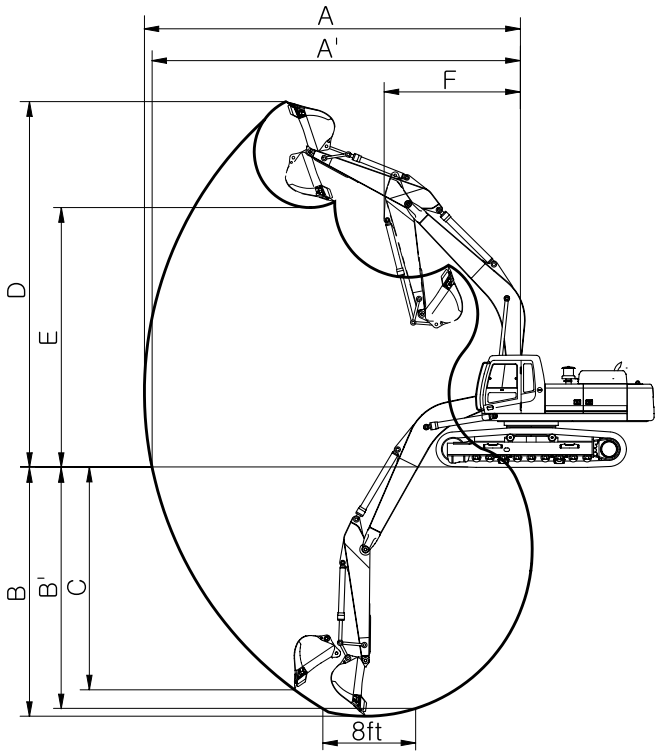


45072SP04

Description		2.40m(7' 10") Arm
Max digging reach	A	10610mm (34'10")
Max digging reach on ground	A'	10370mm (34' 0")
Max digging depth	B	6330mm (20' 9")
Max digging depth (8ft level)	B'	6150mm (20' 2")
Max vertical wall digging depth	C	5430mm (17'10")
Max digging height	D	10210mm (33' 6")
Max dumping height	E	6810mm (22' 4")
Min swing radius	F	4640mm (15' 3")
Bucket digging force	SAE	224[244] kN
		22800[24870] kgf
		50270[54840] lbf
	ISO	256[279] kN
		26100[28470] kgf
		57540[62770] lbf
Arm crowd force	SAE	266[290] kN
		27100[29560] kgf
		59750[65180] lbf
	ISO	279[304] kN
		28400[30980] kgf
		62610[68300] lbf

[ ] : Power boost

· 9.00m(29' 6") BOOM



45072SP04

Description		5.85m(19' 2") Arm
Max digging reach	A	16350mm (53' 8")
Max digging reach on ground	A'	16200mm (53' 2")
Max digging depth	B	11560mm (37'11")
Max digging depth (8ft level)	B'	11460mm (37' 7")
Max vertical wall digging depth	C	10320mm (33'10")
Max digging height	D	13840mm (45' 5")
Max dumping height	E	10440mm (34' 3")
Min swing radius	F	5940mm (19' 6")
Bucket digging force	SAE	224[244] kN
		22800[24870] kgf
		50270[54840] lbf
	ISO	256[279] kN
		26100[28470] kgf
		57540[62770] lbf
Arm crowd force	SAE	123[134] kN
		12500[13640] kgf
		27560[30070] lbf
	ISO	127[138] kN
		12900[14070] kgf
		28440[31030] lbf

[ ] : Power boost

4. WEIGHT

Item	R450LC-7	
	kg	lb
Upperstructure assembly	16790	37020
Main frame weld assembly	3520	7760
Engine assembly	940	2070
Main pump assembly	240	530
Main control valve assembly	420	930
Swing motor assembly	230	510
Hydraulic oil tank assembly	450	990
Fuel tank assembly	250	550
Counterweight	9200	20280
Cab assembly	310	680
Lower chassis assembly	19000	41890
Track frame weld assembly	7060	15570
Swing bearing	600	1320
Travel motor assembly	360	790
Turning joint	50	110
Track recoil spring and idler	300	660
Idler	250	550
Carrier roller	80	180
Track roller	80	180
Track-chain assembly(600㎜ standard triple grouser shoe)	6050	13330
Front attachment assembly(7.06m boom, 3.38m arm, 2.15m^3 PCSA heaped bucket)	8710	19200
7.06m boom assembly	3300	7360
3.38m arm assembly	1450	3200
2.15m^3 PCSA heaped bucket	1560	3440
Boom cylinder assembly	910	2010
Arm cylinder assembly	540	1190
Bucket cylinder assembly	300	660
Bucket control rod assembly	130	290

5. LIFTING CAPACITIES

1) 6.55m(21' 6") boom, 2.40m(7'10") arm equipped with 2.15m³(SAE heaped) bucket and 600mm (24") triple grouser shoe.

• : Rating over-front • : Rating over-side or 360 degree

Load point height		Load radius								At max. reach		
		3.0m(10.0ft)		4.5m(15.0ft)		6.0m(20.0ft)		7.5m(25.0ft)		Capacity		Reach
												m(ft)
6.0m (20.0ft)	kg					*12780	12740	*11340	8630	*9810	6110	9.15
	lb					*28180	28090	*25000	19030	*21630	13470	(30.0)
4.5m (15.0ft)	kg			*18830	*18830	*14310	12060	*11990	8340	9350	5390	9.65
	lb			*41510	*41510	*31550	26590	*26430	18390	20610	11880	(31.7)
3.0m (10.0ft)	kg					*15980	11290	*12790	7970	8850	5040	9.86
	lb					*35230	24890	*28200	17570	19510	11110	(32.3)
1.5m (5.0ft)	kg					*17140	10670	*13390	7630	8810	4980	9.80
	lb					*37790	23520	*29520	16820	19420	10980	(32.2)
Ground Line	kg			*23370	16020	*17360	10320	13260	7400	9240	5210	9.47
	lb			*51520	35320	*38270	22750	29230	16310	20370	11490	(31.1)
-1.5m (-5.0ft)	kg	*25360	*25360	*21560	16060	*16520	10220	*12770	7330	*9630	5840	8.83
	lb	*55910	*55910	*47530	35410	*36420	22530	*28150	16160	*21230	12870	(29.0)
-3.0m (-10.0ft)	kg	*22500	*22500	*18450	16320	*14370	10350			*8790	7250	7.80
	lb	*49600	*49600	*40680	35980	*31680	22820			*19380	15980	(25.6)
-4.5m (-15.0ft)	kg			*13260	*13260							
	lb			*29230	*29230							

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.

2) 7.06m(23' 2") boom, 2.40m(7' 10") arm equipped with 2.15m³(SAE heaped) bucket and 600mm (24") triple grouser shoe.

Load point height		Load radius										At max. reach		
		3.0m(10.0ft)		4.5m(15.0ft)		6.0m(20.0ft)		7.5m(25.0ft)		9.0m(30.0ft)		Capacity		Reach
														m(ft)
6.0m (20.0ft)	kg lb					*12300 *27120	*12300 *27120	*10680 *23550	8520 18780			*8940 *19710	5330 11750	9.75 (32.0)
4.5m (15.0ft)	kg lb					*13990 *30840	11690 25770	*11480 *25310	8150 17970			8360 18430	4740 10450	10.21 (33.5)
3.0m (10.0ft)	kg lb					*15700 *34610	10860 23940	*12360 *27250	7730 17040	10100 22270	5710 12590	7960 17550	4450 9810	10.41 (34.2)
1.5m (5.0ft)	kg lb					*16810 *37060	10250 22600	*13030 *28730	7370 16250	9890 21800	5520 12170	7920 17460	4390 9680	10.36 (34.0)
Ground Line	kg lb					*16990 *37460	9940 21910	12980 28620	7140 15740			8260 18210	4580 10100	10.05 (33.0)
-1.5m (-5.0ft)	kg lb			*20830 *45920	15630 34460	*16280 *35890	9880 21780	*12760 *28130	7070 15590			*8940 *19710	5080 11200	9.46 (31.0)
-3.0m (-10.0ft)	kg lb	*21370 *47110	*21370 *47110	*18310 *40370	15910 35080	*14570 *32120	10010 22070	*11280 *24870	7170 15810			*8410 *18540	6140 13540	8.51 (27.9)
-4.5m (-15.0ft)	kg lb			*14290 *31500	*14290 *31500	*11310 *24930	10380 22880					*6750 *14880	*6750 *14880	7.04 (23.1)

3) 7.06m(23' 2") boom, 2.90m(9' 6") arm equipped with 2.15m³(SAE heaped) bucket and 600mm (24") triple grouser shoe.

Load point height		Load radius										At max. reach		
		3.0m(10.0ft)		4.5m(15.0ft)		6.0m(20.0ft)		7.5m(25.0ft)		9.0m(30.0ft)		Capacity		Reach
														m(ft)
6.0m (20.0ft)	kg lb							*10030 *22110	8630 19030			*8310 *18320	4930 10870	10.17 (33.4)
4.5m (15.0ft)	kg lb			*17510 *38600	*17510 *38600	*13150 *28990	11890 26210	*10900 *24030	8230 18140	*9570 *21100	5950 13120	7830 17260	4400 9700	10.62 (34.8)
3.0m (10.0ft)	kg lb			*21350 *47070	16840 37130	*15000 *33070	11000 24250	*11880 *26190	7770 17130	*10050 *22160	5710 12590	7460 16450	4120 9080	10.80 (35.4)
1.5m (5.0ft)	kg lb			*22470 *49540	15690 34590	*16360 *36070	10300 22710	*12690 *27980	7360 16230	9860 21740	5490 12100	7410 16340	4060 8950	10.75 (35.3)
Ground Line	kg lb			*23020 *50750	15360 33860	*16880 *37210	9890 21800	12930 28510	7080 15610	9680 21340	5320 11730	7680 16930	4200 9260	10.46 (34.3)
-1.5m (-5.0ft)	kg lb	*19180 *42280	*19180 *42280	*21760 *47970	15380 33910	*16500 *36380	9740 21470	12780 28180	6950 15320			8400 18520	4620 10190	9.89 (32.4)
-3.0m (-10.0ft)	kg lb	*24800 *54670	*24800 *54670	*19550 *43100	15590 34370	*15180 *33470	9810 21630	*11820 *26060	6980 15390			*8390 *18500	5480 12080	9.00 (29.5)
-4.5m (-15.0ft)	kg lb	*19830 *43720	*19830 *43720	*16030 *35340	*16030 *35340	*12570 *27710	10080 22220					*7400 *16310	7350 16200	7.65 (25.1)

4) 7.06m(23' 2") boom, 3.38m(11' 1") arm equipped with 2.15m³(SAE heaped) bucket and 600mm (24") triple grouser shoe.

Load point height		Load radius										At max. reach		
		3.0m(10.0ft)		4.5m(15.0ft)		6.0m(20.0ft)		7.5m(25.0ft)		9.0m(30.0ft)		Capacity		Reach
														m(ft)
6.0m (20.0ft)	kg lb							*9550 *21050	8820 19440	*7560 *16670	6290 13870	*7870 *17350	4500 9920	10.76 (35.3)
4.5m (15.0ft)	kg lb					*12500 *27560	12190 26870	*10490 *23130	8420 18560	*9270 *20440	6090 13430	7230 15940	4060 8950	11.18 (36.7)
3.0m (10.0ft)	kg lb			*20340 *44840	17580 38760	*14490 *31940	11310 24930	*11570 *25510	7950 17530	*9840 *21690	5840 12870	6920 15260	3820 8420	11.35 (37.2)
1.5m (5.0ft)	kg lb			*22940 *50570	16230 35780	*16110 *35520	10570 23300	*12510 *27580	7520 16580	9970 21980	5590 12320	6880 15170	3770 8310	11.30 (37.1)
Ground Line	kg lb	*11840 *26100	*11840 *26100	*23480 *51760	15670 34550	*16930 *37320	10090 22240	13060 28790	7200 15870	9760 21520	5400 11900	7100 15650	3890 8580	11.03 (36.2)
-1.5m (-5.0ft)	kg lb	*17340 *38230	*17340 *38230	*22660 *49960	15550 34280	*16850 *37150	9870 21760	12860 28350	7030 15500	9640 21250	5300 11680	7680 16930	4220 9300	10.50 (34.4)
-3.0m (-10.0ft)	kg lb	*23020 *50750	*23020 *50750	*20790 *45830	15670 34550	*15850 *34940	9870 21760	*12340 *27210	7010 15450			*8000 *17640	4900 10800	9.67 (31.7)
-4.5m (-15.0ft)	kg lb	*23040 *50790	*23040 *50790	*17680 *38980	16000 35270	*13690 *30180	10050 22160	*10390 *22910	7170 15810			*7330 *16160	6270 13820	8.44 (27.7)
-6.0m (-20.0ft)	kg lb			*12600 *27780	*12600 *27780	*9460 *20860	*9460 *20860							

5) 7.06m(23' 2") boom, 4.00m(13' 1") arm equipped with 2.15m³(SAE heaped) bucket and 600mm (24") triple grouser shoe.

Load point height		Load radius												At max. reach		
		3.0m(10.0ft)		4.5m(15.0ft)		6.0m(20.0ft)		7.5m(25.0ft)		9.0m(30.0ft)		10.5m(35.0ft)		Capacity		Reach
																m(ft)
6.0m (20.0ft)	kg lb									*7910 *17440	6330 13960			7120 15700	3990 8800	11.35 (37.2)
4.5m (15.0ft)	kg lb							*9660 *21300	8480 18700	*8610 *18980	6100 13450	*4780 *10540	4460 9830	6570 14480	3600 7940	11.75 (38.5)
3.0m (10.0ft)	kg lb			*18460 *40700	18070 39840	*13420 *29590	11450 25240	*10820 *23850	7970 17570	*9260 *20410	5800 12790	*6430 *14180	4310 9500	6290 13870	3390 7470	11.91 (39.1)
1.5m (5.0ft)	kg lb			*21710 *47860	16420 36200	*15260 *33640	10590 23350	*11900 *26230	7480 16490	*9870 *21760	5510 12150	*7270 *16030	4160 9170	6240 13760	3330 7340	11.87 (38.9)
Ground Line	kg lb	*12610 *27800	*12610 *27800	*23080 *50880	15550 34280	*16410 *36180	9990 22020	*12650 *27890	7090 15630	9640 21250	5280 11640	*6780 *14950	4030 8880	6410 14130	3410 7520	11.61 (38.1)
-1.5m (-5.0ft)	kg lb	*16540 *36460	*16540 *36460	*22900 *50490	15240 33600	*16700 *36820	9670 21320	12690 27980	6850 15100	9470 20880	5130 11310			6870 15150	3680 8110	11.11 (36.5)
-3.0m (-10.0ft)	kg lb	*21150 *46630	*21150 *46630	*21550 *47510	15250 33620	*16100 *35490	9580 21120	*12490 *27540	6770 14930	9430 20790	5090 11220			*7560 *16670	4210 9280	10.34 (33.9)
-4.5m (-15.0ft)	kg lb	*26010 *57340	*26010 *57340	*19010 *41910	15490 34150	*14470 *31900	9690 21360	*11140 *24560	6850 15100					*7220 *15920	5230 11530	9.21 (30.2)
-6.0m (-20.0ft)	kg lb	*19460 *42900	*19460 *42900	*14810 *32650	*14810 *32650	*11280 *24870	10030 22110							*6010 *13250	*6010 *13250	7.55 (24.8)