

**MICHIGAN**

**L190**



## MICHIGAN L190 – HIGH PRODUCTIVITY, HIGH CAPACITY

The Michigan L190 is built with Michigan's years of experience and state-of-the-art technology. With 216 kW (290 hp), optional boom lengths, and bucket capacities from 3,8m<sup>3</sup> (5.0 yd<sup>3</sup>) to 6,9m<sup>3</sup> (9.0 yd<sup>3</sup>), the L190 can be matched to any working environment. The standard boom provides a dump height of 3251mm (10' 8") with an operating weight of 27 071 kg (59,680 lb), and the long boom has a dump height of 3759mm (12' 4") with an operating weight of 28 735 kg (63,350 lb).

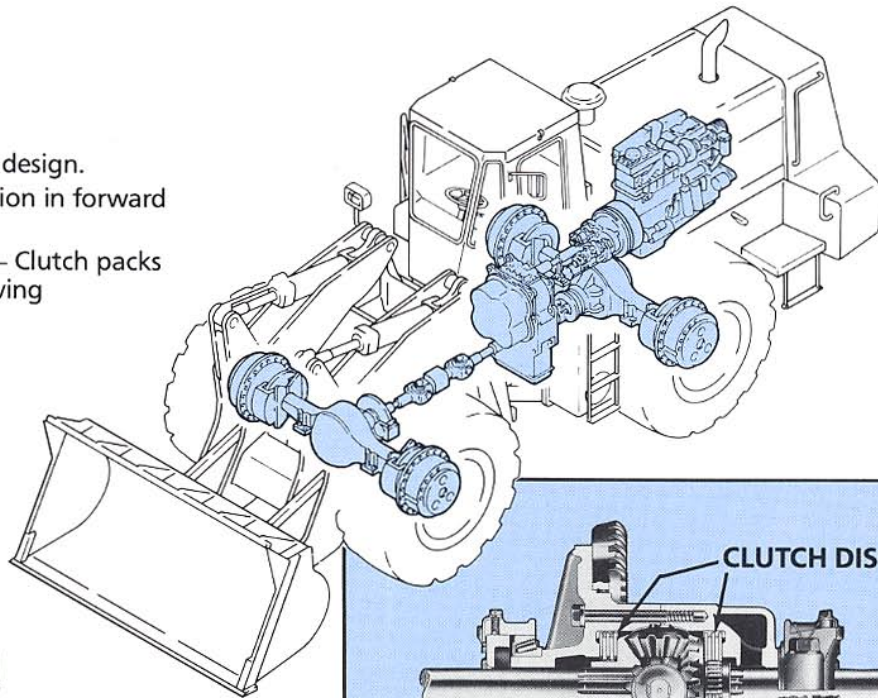
Truck loading, aggregate handling, load and carry, excavation, and primary production feeding

in crushing and sorting operations are examples of applications where the L190 is an excellent choice. The hydraulic system is designed to use only the power required to move the load. This, coupled with the optimum balance between hydraulics, engine, and transmission results in excellent fuel consumption and power availability for traction. The operator controls the L190 from a state-of-the-art integral ROPS cab which is ergonomically designed to allow the operator to work at his highest efficiency.

### DRIVETRAIN

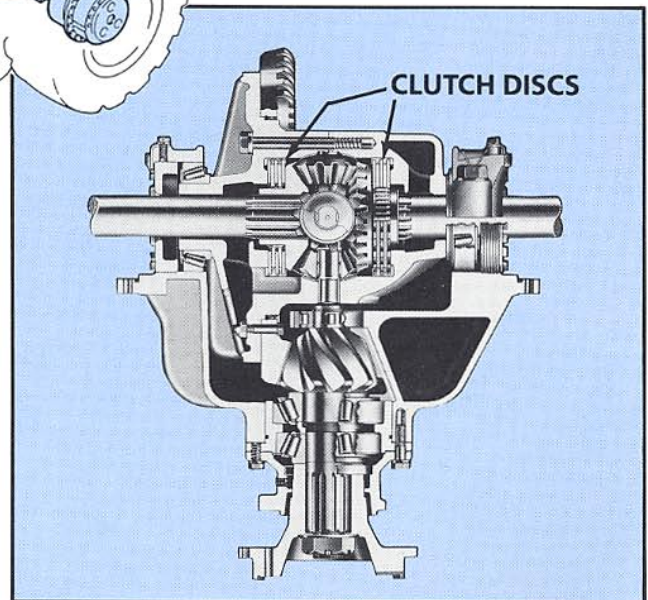
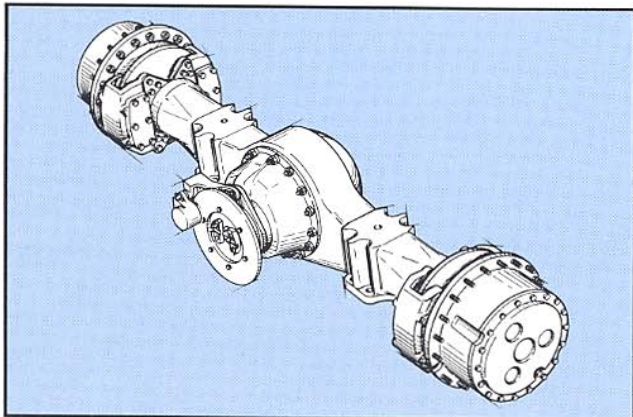
Transmission – Powershift.

- 4 Speeds forward – 4 reverse.
- Constant mesh – countershaft design.
- Full directional clutch modulation in forward and reverse for faster cycles.
- Reliable and easy to maintain – Clutch packs can be serviced without removing transmission from frame.



### AXLES – STRONG AND PROVEN

- Single piece cast housings for high strength – long life.
- Outboard mounted final drives with needle bearings, to minimize friction and power loss.

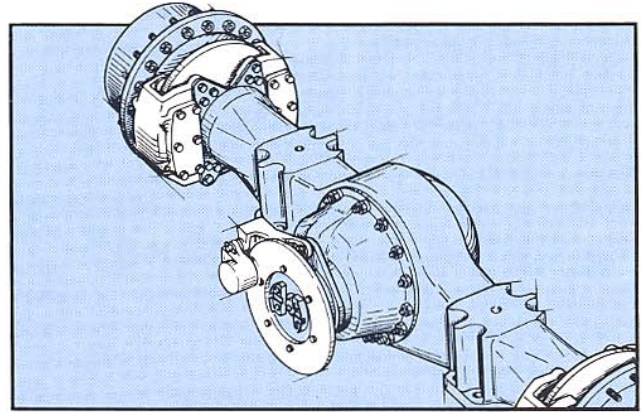


### LIMITED SLIP DIFFERENTIALS

Limited slip differentials are standard in both axles. Limited slip proportions power to the wheel with the best traction minimizing wheel spin and ensuring the best traction under adverse conditions.

## **BRAKES**

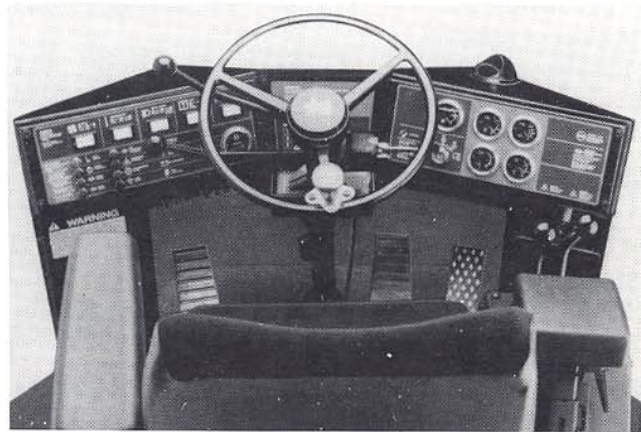
- Service brakes are outboard mounted, all-hydraulic dry disc type. Secondary braking is provided by the dual circuit axle-by-axle system and dead-engine braking is provided by nitrogen charged accumulators.
- Parking brake is mounted on the front axle input shaft. It is spring applied, hydraulically released. An interlock with the service brakes prevents the machine being moved with parking brake applied, and engine running.



## **INSTRUMENTS & CONTROLS**

### **VISIBLE & ACCESSIBLE**

The instrument panel has all of the instruments and controls located directly in front of the operator, with the boom and bucket controls located within easy reach to the operator's right. Instruments on the right monitor fuel level, engine oil pressure, engine coolant temperature, transmission oil temperature and electrical system voltage. The ignition switch and parking brake release are located on the right side panel. On the left panel are switches for fan speed, temperature control, working lights, cold start and a test switch for secondary steering (optional). A lamp warning system monitors brake circuit pressure front and rear, parking brake applied and other machine functions.



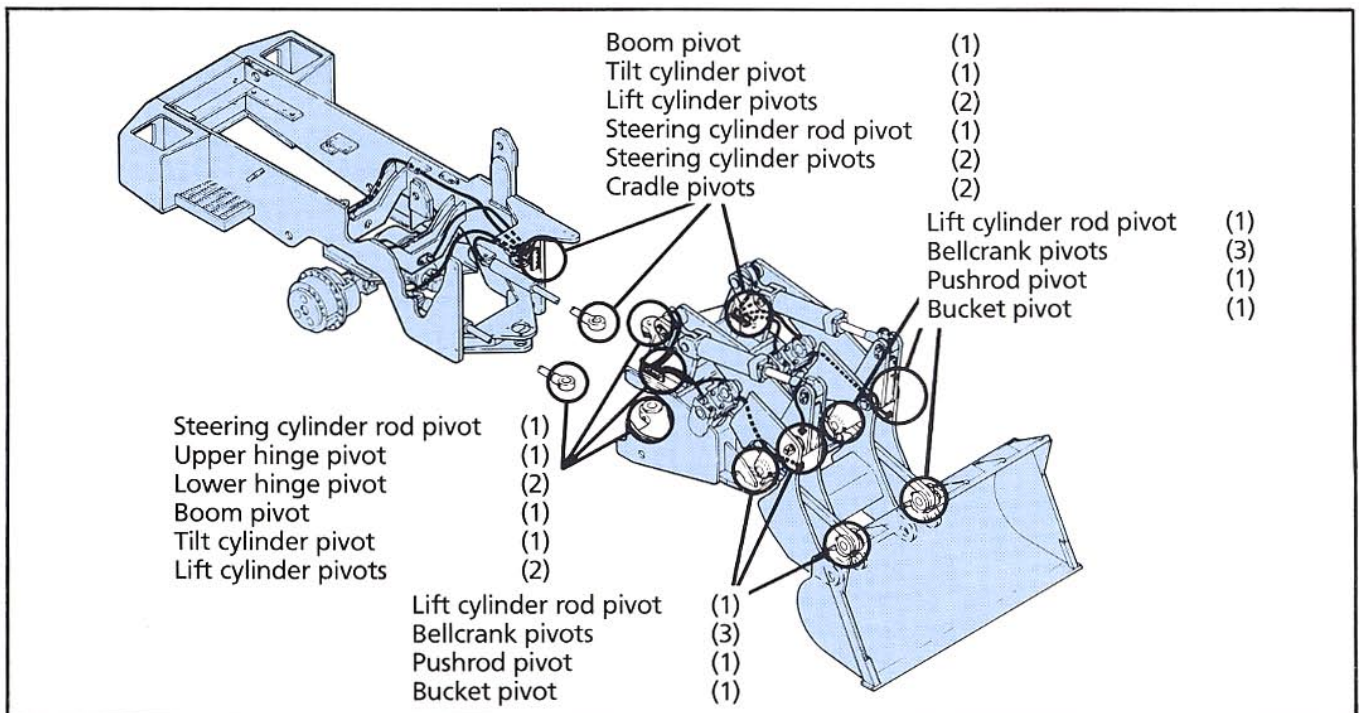
### **SERVICEABILITY**

- Grouping of lube points permits ground level lubrication at all lube points at the recommended 100 hour interval.
- Sight-gauges permit easy checking of oil levels.
- Quick-connect hydraulic test ports permit easy checking of machine functions.

### **CAB**

#### **QUIET AND COMFORTABLE**

The integral ROPS/FOPS cab is ergonomically designed to provide high operator comfort and efficiency. A six-way adjustable suspension seat and air conditioner/heater/pressurizer are standard equipment for maximum operator comfort.





## ENGINE

Direct-injected, turbocharged and after-cooled 6 cylinder, inline, 4-cycle diesel.

Make	Cummins			
Model	NTA 855C335			
Max. rating* at	rps	rpm	32	1900
SAE J1349 (ISO 1585)	kW	hp	240	322
Flywheel rating** at	rps	rpm	32	1900
SAE J1349 (ISO 1585)	kW	hp	216	290
DIN 70020/6271	kW	hp	216	290
Max. torque at	rps	rpm	23	1400
SAE J1349 (ISO 1585)	Nm	lbf ft	1364	1006
DIN 70020/6271	Nm	lbf ft	1335	985
Number of cylinders	6			
Displacement, total	dm <sup>3</sup> , l	in <sup>3</sup>	14,01	855
Bore	mm	in	140	5.50
Stroke	mm	in	152	6.00

### Air cleaner

1. Cyclone precleaner with automatic dust ejector.
2. Paper filter with indicator.
3. Replaceable safety filter.

\*Max. rating – Rating of engine equipped only with components essential for engine function, such as injection pump, oil pump, and water pump.

\*\*Flywheel rating – Net rating measured with fan, intake and exhaust system, cooling system, and alternator mounted.



## DRIVETRAIN

**Torque converter:** Clark, high-efficiency single-stage.

**Transmission:** Clark countershaft-type powershift transmission with directional clutch modulation.

**Axles:** Clark fully-floating axle shafts with planetary-type hub reductions. Single-piece cast axle housing. Fixed front axle and oscillating rear axle.

**Differential:** Clark limited slip differentials in front and rear axles.

**Hub reduction:** Clark planetary drive with low-friction roller bearings in each wheel hub.

**Tires:** Tubeless with nylon cord body. Other tires available for different applications.

Torque converter make, model	Clark, C-5602-202			
Torque multiplication	3.05:1			
Transmission make, model	Clark, 4425-200			
Speeds, forward/reverse				
1	km/h	mph	7,6	4.7
2	km/h	mph	12,1	7.5
3	km/h	mph	22,5	14.0
4	km/h	mph	35,9	22.3
Measured with tires	29.5-25 (22PR) L-3			
Front axle make, model	Clark, 19D-2748			
Rear axle make, model	Clark, 19D-2748			
Rear axle oscillation, total	deg		22	
	mm	in	457	18



## ELECTRICAL SYSTEM

The electrical system is well protected by circuit breakers. Pre-wired for optional equipment.

Voltage	V	24
Alternator	A	100
Batteries (12 volt)		4
Battery capacity, total	CCA	1250
Cranking capacity, ea.	CCA	625



## BRAKE SYSTEM

(SAE J1152) (ISO 3450)

**Service brakes:** Full hydraulic system. Outboard mounted dry disc brakes on each wheel.

Application of left pedal switches transmission from forward to neutral.

**Secondary:** Dual circuit axle-by-axle system. Actuated by service brake pedal. Audible and visual low pressure alarm. Dead engine braking capability provided by two nitrogen-charged accumulators.

**Parking brake:** Dry disc type mounted on front axle input shaft. Spring applied, hydraulically released; actuated by dash-mounted hand valve.

Transmission interlock applies service brakes if shifted into forward or reverse to prevent moving machine when parking brake is applied.

**Pump:** Piston pump, pressure compensated.

**Filtration:** Full flow, 10 micron filter.

Pressure setting	MPa	psi	20,7	3000
Service brake, disc dia.	mm	in	473,7	18.65
thickness	mm	in	15,9	.625
Parking brake, disc dia.	mm	in	457	18
thickness	mm	in	12,7	.5



## STEERING SYSTEM

Articulated frame. Fully hydraulic steering system with speed sensor hydraulics.

**Pump:** Tandem gear-type, mounted on the torque converter.

**Supply system:** The system is served by a large pump section and a smaller secondary main/steer pump section which is rpm and pressure sensitive and feeds either the main hydraulic or the steering system, or dumps to tank.

**Cylinders:** Two double acting cushioned cylinders with chrome plated piston rods.

Steering cylinders, number				<b>2</b>
Bore	mm	in	114	<b>4.5</b>
Stroke	mm	in	462	<b>18.2</b>
Relief pressure	MPa	psi	17,2	<b>2500</b>
Primary pump				
output	dm <sup>3</sup> ,l/min	US gal/min	166,5	<b>44</b>
at pressure	MPa	psi	69,0	<b>1000</b>
and engine speed	rps	rpm	14	<b>850</b>
Secondary pump				
output	dm <sup>3</sup> ,l/min	US gal/min	148	<b>39</b>
at pressure	MPa	psi	69,0	<b>1000</b>
and engine speed	rps	rpm	26	<b>1580</b>



## HYDRAULIC SYSTEM

Closed and pressurized load-sensing system with a sturdy plate-steel tank. Hydraulic oil is fully filtered and cooled. An access hole is provided in the tank for easy cleaning. An in-tank magnet provides extra protection.

**Pump:** Single gear-type, mounted on the torque converter.

**Supply system:** Main pump continuously serves main hydraulic system. Second section of steer pump can feed main hydraulic system when required.

**Valve:** Split-pool valve with built-in pressure relief valve. Actuated by a pilot valve, it is mounted on front frame for easy access.

**Lift function:** The valve has four positions: Raise, hold, lower and float. An automatic kickout detent is adjustable for any position between maximum reach and full lift height.

**Tilt function:** The valve has three positions: Rollback, hold and dump. Automatic bucket positioner adjustable to any desired loading angle.

**Cylinders:** Double-acting.

**Filters:** Full-flow 10 micron return filter (with two elements), located in hydraulic oil tank.

Relief pressure	MPa	psi	19,0	<b>2750</b>
Output	l/min	US gal/min	135	<b>35.5</b>
at	MPa	psi	6,9	<b>1000</b>
and engine speed	rps	rpm	26	<b>1580</b>
Lift cylinders, no.				<b>2</b>
Bore	mm	in	177,8	<b>7.0</b>
Stroke	mm	in	1084	<b>42.7</b>
Tilt cylinders, no.				<b>2</b>
Bore	mm	in	152,4	<b>6.0</b>
Stroke	mm	in	704,6	<b>27.7</b>
Raising time (with load)	s			<b>7.0</b>
Dumping time (with load)	s			<b>3.0</b>
Lowering time (empty)	s			<b>5.0</b>
Total cycle time	s			<b>15.0</b>



## CAB

Integral ROPS/FOPS cab (SAE J1040, ISO 3471) with two lockable doors. Sound-insulating lining.

Sliding self-locking windows. Tinted safety glass.

**Heater and defroster:** Heater provides filtered (10 microns) fresh air and has a three-speed fan and a defroster for the front and side windows. Air conditioning is standard.

**Operator's seat:** Fully adjustable suspension seat with seat belt (SAE #J386).

Noise level in cab, max.	dB(A)		<b>83</b>
Heating capacity	kW	BTU/h	13,2 <b>45,000</b>
Air conditioning	kW	BTU/h	6,3 <b>21,500</b>



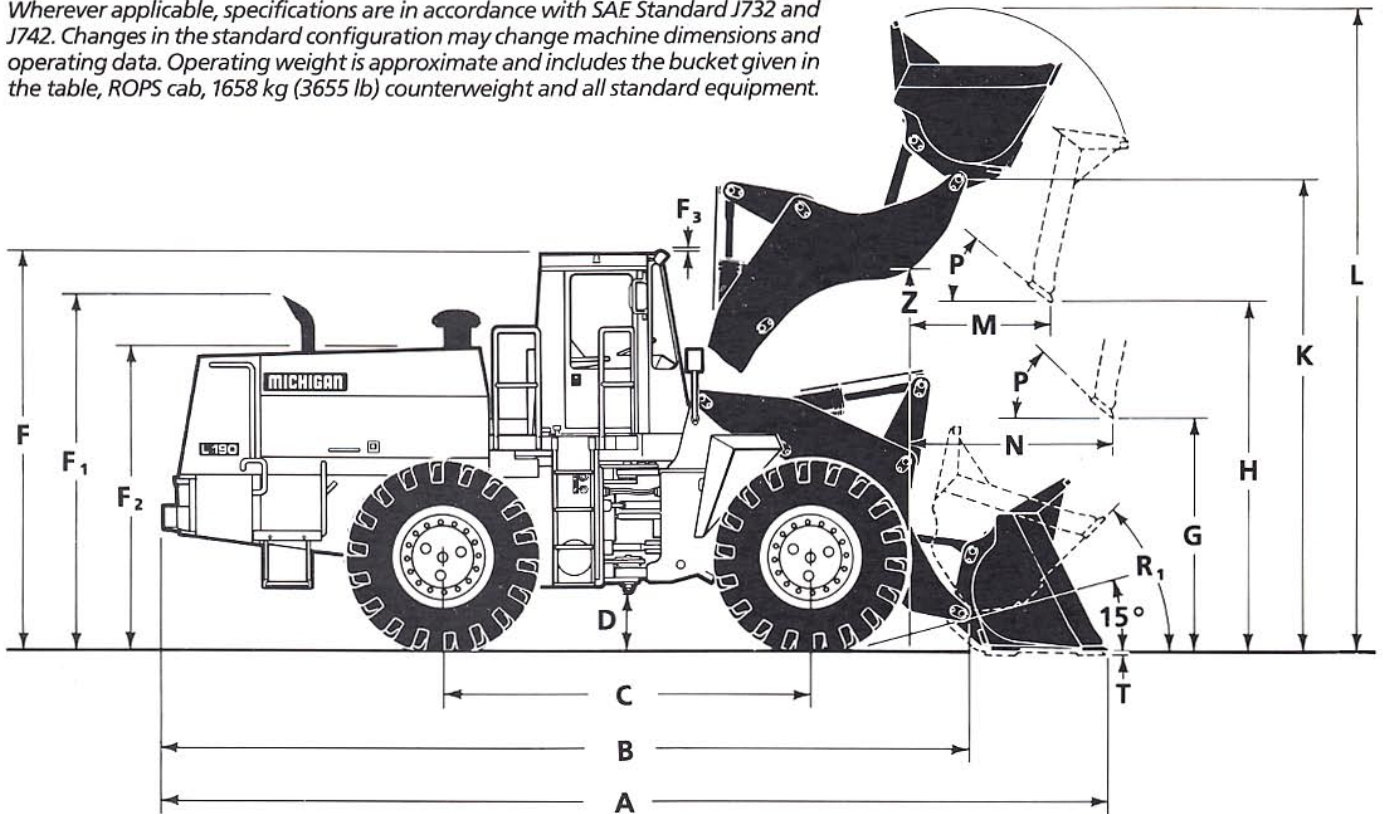
## SERVICE REFILL CAPACITIES

Crankcase	dm <sup>3</sup> ,l	US gal	34,1	<b>9.0</b>
Fuel tank (usable)	dm <sup>3</sup> ,l	US gal	409	<b>108</b>
Fuel tank (total)	dm <sup>3</sup> ,l	US gal	436	<b>115</b>
Cooling system	dm <sup>3</sup> ,l	US gal	75,7	<b>20</b>
Transmission, total	dm <sup>3</sup> ,l	US gal	47,3	<b>12.5</b>
Front wheel hubs, ea.	dm <sup>3</sup> ,l	US gal	4,7	<b>1.25</b>
Rear wheel hubs, ea.	dm <sup>3</sup> ,l	US gal	4,7	<b>1.25</b>
Front differential	dm <sup>3</sup> ,l	US gal	34,1	<b>9.0</b>
Rear differential	dm <sup>3</sup> ,l	US gal	34,1	<b>9.0</b>
Midmount bearing	dm <sup>3</sup> ,l	US gal	1,9	<b>0.5</b>
Hydraulic system, total	dm <sup>3</sup> ,l	US gal	322	<b>85</b>
Hydraulic tank	dm <sup>3</sup> ,l	US gal	238,4	<b>63</b>

## DIMENSIONS – MICHIGAN L190 (Standard Boom)

Tires: 29.5-25 (22PR) L-3

Wherever applicable, specifications are in accordance with SAE Standard J732 and J742. Changes in the standard configuration may change machine dimensions and operating data. Operating weight is approximate and includes the bucket given in the table, ROPS cab, 1658 kg (3655 lb) counterweight and all standard equipment.

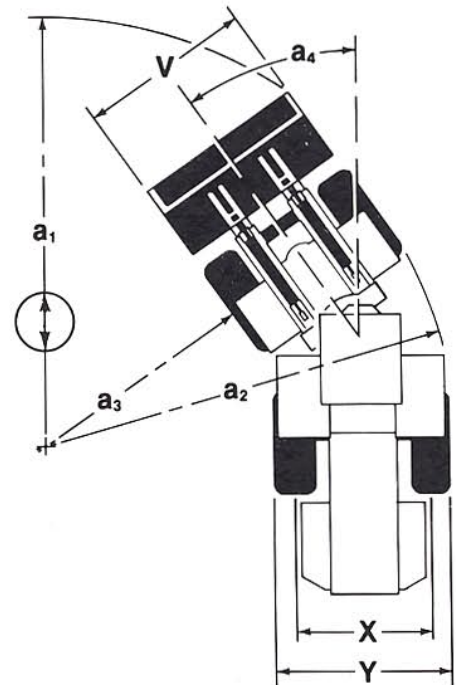


MACHINE DIMENSIONS THAT DO NOT CHANGE REGARDLESS OF CONFIGURATION				
C	mm	ft in	3505	11' 6"
F <sub>3</sub>	mm	ft in	64	2.5"
G	mm	ft in	2134	7' 0"
P	deg		45°	
X	mm	ft in	2260	7' 5"
a <sub>4</sub>	deg		35°	
Max. grading angle	deg		46° (Std. Boom)	

BUCKETS		
Straight edge rock	4,0 m <sup>3</sup>	5.25 yd <sup>3</sup>
Spade-nose rock	4,0 m <sup>3</sup>	5.25 yd <sup>3</sup>
General purpose	4,4 m <sup>3</sup>	5.75 yd <sup>3</sup>
Material handling	4,8 m <sup>3</sup>	6.25 yd <sup>3</sup>
Light materials	6,9 m <sup>3</sup>	9.0 yd <sup>3</sup>

BUCKET TEETH AND BOLT ON CUTTING EDGE		
Model 27R (8)	136 kg	300 lbs.
Model 27ARL (8)	136 kg	300 lbs.
Bolt on cutting edge	240 kg	530 lbs.



- Deduct 76 mm (3 in) for bolt on cutting edge
- ⊖ Deduct 178 mm (7 in) for bucket teeth
- Add 51 mm (2 in) for bolt on cutting edge
- ⊕ Add 119 mm (4.7 in) for bucket teeth
- ⊗ Add 32 mm (1.25 in) for bolt on cutting edge

## STANDARD BOOM

MACHINE INFORMATION		BUCKET TYPE				
		Straight Edge Rock	Spade-Nose Rock	General Purpose	Material Handling	Light Materials
Volume heaped	m <sup>3</sup>	4,0	4,0	4,4	4,8	6,9
	yd <sup>3</sup>	5.25	5.25	5.75	6.25	9.0
struck	m <sup>3</sup>	3,5	3,3	3,7	4,0	5,8
	yd <sup>3</sup>	4.54	4.3	4.86	5.21	7.6
Material weight	kg/m <sup>3</sup>	1790	1790	1624	1488	1035
	lb/yd <sup>3</sup>	3000	3000	2740	2520	1750
Bucket weight	kg	2041	2268	2087	2177	2449
	lb	4500	5000	4600	4800	5400
Operating capacity	kg	7144	7144	7144	7144	7144
	lb	15,750	15,750	15,750	15,750	15,750
Static tipping load, straight	kg	19 545	19 260	19 169	18 711	18 570
	lb	43,090	42,460	42,260	41,250	40,940
Full Turn	kg	17 532	17 259	17 200	16 788	16 665
	lb	38,650	38,050	37,920	37,010	36,740
Breakout force	kN	275,8	226,9	260,5	238,4	216,4
	lbf	62,000	51,000	58,550	53,590	48,640
A	mm	9042	9322	9119	9246	9677
	ft in	29'8"	30'7"	29'11"	30'4"	31'9"
B	mm	7569	7569	7569	7569	7569
	ft in	24'10"	24'10"	24'10"	24'10"	24'10"
D	mm	584	584	584	584	584
	ft in	1'11"	1'11"	1'11"	1'11"	1'11"
F	mm	3759	3759	3759	3759	3759
	ft in	12'4"	12'4"	12'4"	12'4"	12'4"
F <sub>1</sub>	mm	3416	3416	3416	3416	3416
	ft in	11'2.5"	11'2.5"	11'2.5"	11'2.5"	11'2.5"
F <sub>2</sub>	mm	2972	2972	2972	2972	2972
	ft in	9'9"	9'9"	9'9"	9'9"	9'9"
H	mm	3251 ○	3048 ○	3200 ○	3099 ○	2997
	ft in	10'8" ⊖	10'0" ⊖	10'6" ⊖	10'2" ⊖	9'10"
K	mm	4458	4458	4458	4458	4458
	ft in	14'7.5"	14'7.5"	14'7.5"	14'7.5"	14'7.5"
L	mm	5918	5944	5918	5918	6070
	ft in	19'5"	19'6"	19'5"	19'5"	19'11"
M	mm	1348 □	1549 □	1397 □	1499 □	1600
	ft in	4'5" ⊕	5'1" ⊕	4'7" ⊕	4'11" ⊕	5'3"
N	mm	1880	2083	1930	2032	2134
	ft in	6'2"	6'10"	6'4"	6'8"	7'0"
R <sub>1</sub>	deg	45	45	45	45	45
T	mm	101,6 ☒	101,6 ☒	101,6 ☒	76,0 ☒	76,0
	ft in	4"	4"	4"	3"	3"
V	mm	3302	3302	3302	3302	3924
	ft in	10'10"	10'10"	10'10"	10'10"	12'10.5"
Y	mm	3124	3124	3124	3124	3124
	ft in	10'3"	10'3"	10'3"	10'3"	10'3"
Z	mm	3581	3581	3581	3581	3581
	ft in	11'9"	11'9"	11'9"	11'9"	11'9"
a <sub>1</sub> Turning circle (over bucket) (bucket in carry position)	mm	15 316	15 316	15 316	15 316	15 570
	ft in	50'3"	50'3"	50'3"	50'3"	51'1"
Operating weight	kg	27 071	27 298	27 116	27 207	27 479
	lb	59,680	60,180	59,780	59,980	60,580

## STANDARD BOOM

SUPPLEMENTAL OPERATING DATA		Change in operating weight		Change in static tipping load straight		Change in static tipping load at full turn	
Bucket Teeth (27R)	kg lb	+ 136	+ 300	- 154	- 340	- 136	- 300
Bucket Teeth (27ARL)	kg lb	+ 136	+ 300	- 154	- 340	- 136	- 300
Bucket Teeth (27TFP)	kg lb	+ 136	+ 300	- 154	- 340	- 136	- 300
Bolt on Cutting Edge	kg lb	+ 240	+ 530	- 218	- 480	- 195	- 430
Counterweight	kg lb	+ 907	+ 2000	+ 1914	+ 4220	+ 1681	+ 3705
ROPS, 4 Post Open (in lieu of ROPS Cab)	kg lb	- 295	- 650	- 259	- 570	- 227	- 500
Std. ROPS Cab Removal	kg lb	- 748	- 1650	- 699	- 1540	- 617	- 1360
Fenders, Front	kg lb	+ 113	+ 250	0	0	0	0
3rd Hydraulic Control	kg lb	+ 52	+ 115	0	0	0	0
Secondary Steering	kg lb	+ 45	+ 100	+ 77	+ 170	+ 68	+ 150
Air Conditioning Removal	kg lb	- 45	- 100	- 68	- 150	- 61	- 135
Alternative tires (Set of four):							
26.5-25 (20PR) L-2	kg lb	- 839	- 1850	- 581	- 1280	- 522	- 1150
26.5-25 (20PR) L-3	kg lb	- 440	- 970	- 304	- 670	- 272	- 600
26.5-25 (20PR) L-4	kg lb	+ 36	+ 80	+ 27	+ 60	+ 23	+ 50
26.5-25 (20PR) L-5	kg lb	+ 327	+ 720	+ 227	+ 500	+ 204	+ 450
26.5-25 (26PR) L-3	kg lb	- 440	- 970	- 304	- 670	- 272	- 600
26.5R25 XRA*	kg lb	- 658	- 1450	- 458	- 1010	- 413	- 910
26.5R25 XRDNA*	kg lb	- 536	- 1180	- 372	- 820	- 336	- 740
26.5R25 XRD1A*	kg lb	- 186	- 410	- 127	- 280	- 114	- 250
26.5R25 RL-2F* L-2	kg lb	- 631	- 1390	- 436	- 960	- 390	- 860
29.5-25 (16PR) L-3	kg lb	- 73	- 160	- 50	- 110	- 45	- 100
29.5-25 (22PR) L-2	kg lb	- 368	- 810	- 254	- 560	- 227	- 500
29.5-25 (22PR) L-3 (Std.)	kg lb	0	0	0	0	0	0
29.5-25 (22PR) L-4	kg lb	+ 735	+ 1620	+ 508	+ 420	+ 459	+ 1010
29.5-25 (28PR) L-4	kg lb	+ 885	+ 1950	+ 613	+ 1350	+ 554	+ 1220
29.5R25 XRA*	kg lb	- 50	- 110	- 36	- 80	- 32	- 70
29.5R25 RL-2F* L-2	kg lb	- 50	- 110	- 36	- 80	- 32	- 70

## DIMENSIONS AFFECTED BY TIRE SIZE

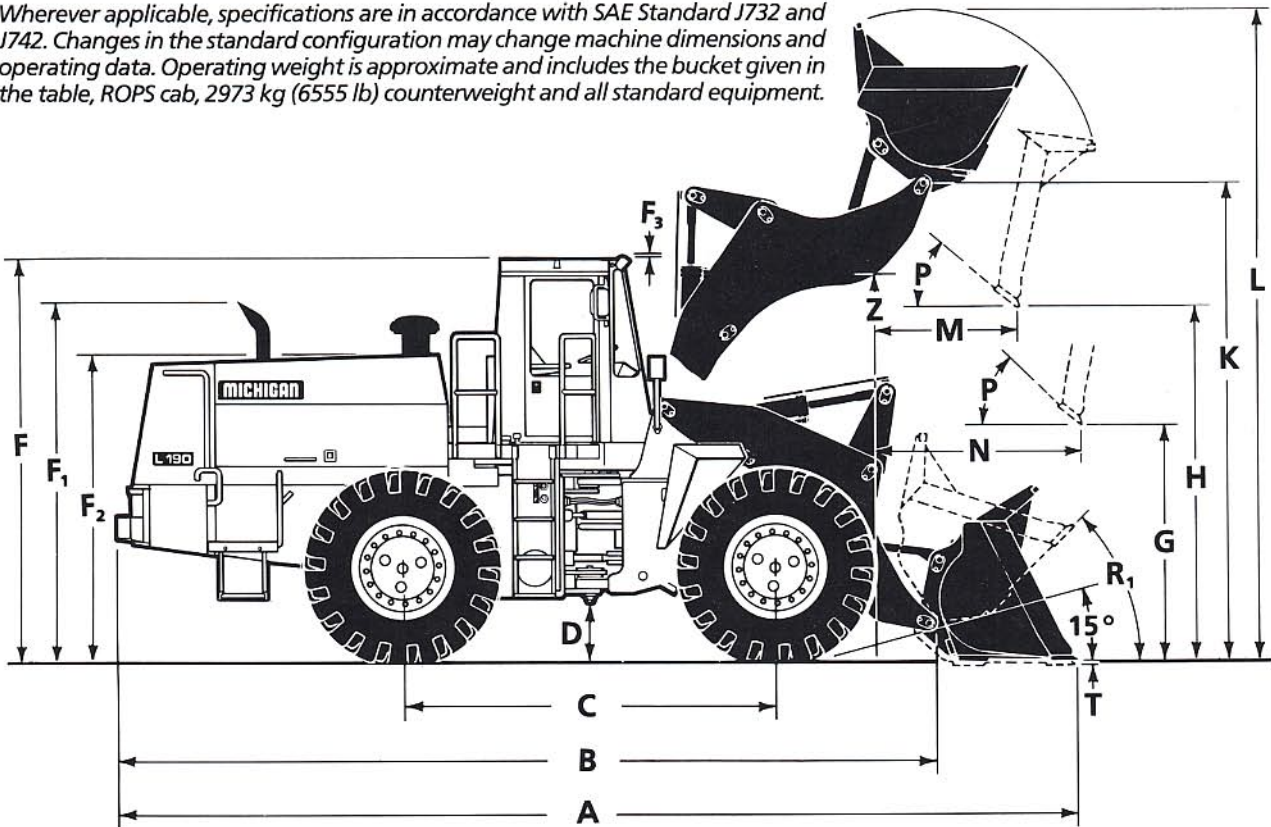
MACHINE DIMENSIONS		26.5-25 (L-2, L-3)	26.5-25 (L-4)	26.5-25 (L-5)	29.5-25 (L-2, L-3)	29.5-25 (L-4)
D	mm ft in	- 51 - 2"	- 25 - 1"	- 25 - 1"	0	+ 25 + 1"
F	mm ft in	- 51 - 2"	- 25 - 1"	- 25 - 1"	0	+ 25 + 1"
F <sub>1</sub>	mm ft in	- 51 - 2"	- 25 - 1"	- 25 - 1"	0	+ 25 + 1"
F <sub>2</sub>	mm ft in	- 51 - 2"	- 25 - 1"	- 25 - 1"	0	+ 25 + 1"
H	mm ft in	- 51 - 2"	- 25 - 1"	- 25 - 1"	0	+ 25 + 1"
K	mm ft in	- 51 - 2"	- 25 - 1"	- 25 - 1"	0	+ 25 + 1"
L	mm ft in	- 51 - 2"	- 25 - 1"	- 25 - 1"	0	+ 25 + 1"
M	mm ft in	+ 51 + 2"	+ 25 + 1"	+ 25 + 1"	0	- 25 - 1"
N	mm ft in	+ 51 + 2"	+ 25 + 1"	+ 25 + 1"	0	- 25 - 1"
T	mm ft in	+ 51 + 2"	+ 25 + 1"	+ 25 + 1"	0	- 25 - 1"
Y	mm ft in	- 76 - 3"	- 76 - 3"	- 76 - 3"	0	0 0
Z	mm ft in	- 51 - 2"	- 25 - 1"	- 25 - 1"	0	+ 25 + 1"
a <sub>2</sub>	mm ft in	7137 23'5"	7137 23'5"	7137 23'5"	7188 23'7"	7188 23'7"
a <sub>3</sub>	mm ft in	4039 13'3"	4039 13'3"	4039 13'3"	3988 13'1"	3988 13'1"



## DIMENSIONS – MICHIGAN L190 (Long Boom)

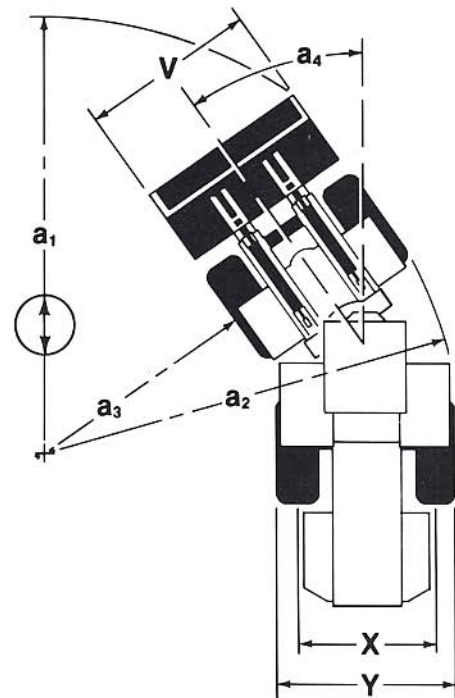
Tires: 29.5-25 (22PR) L-3

Wherever applicable, specifications are in accordance with SAE Standard J732 and J742. Changes in the standard configuration may change machine dimensions and operating data. Operating weight is approximate and includes the bucket given in the table, ROPS cab, 2973 kg (6555 lb) counterweight and all standard equipment.



MACHINE DIMENSIONS THAT DO NOT CHANGE REGARDLESS OF CONFIGURATION				
C	mm	ft in	3505	11' 6"
F <sub>3</sub>	mm	ft in	64	2.5"
G	mm	ft in	2134	7' 0"
P	deg		45°	
X	mm	ft in	2260	7' 5"
a <sub>4</sub>	deg		35°	
Max. grading angle	deg		66° (Long Boom)	

BUCKETS		
Straight edge rock	3,8 m <sup>3</sup>	5.0 yd <sup>3</sup>
General purpose	4,0 m <sup>3</sup>	5.25 yd <sup>3</sup>
Light materials	6,9 m <sup>3</sup>	9.0 yd <sup>3</sup>
BUCKET TEETH AND BOLT ON CUTTING EDGE		
Model 27	136 kg	300 lbs.
Model 27ARL	136 kg	300 lbs.
Bolt on cutting edge	240 kg	530 lbs.



## LONG BOOM

MACHINE INFORMATION			BUCKET TYPE					
			Straight Edge Rock		General Purpose		Light Materials	
Volume, heaped	m <sup>3</sup>	yd <sup>3</sup>	3,8	5.0	4,0	5.25	6,9	9.0
struck	m <sup>3</sup>	yd <sup>3</sup>	3,2	4.2	3,3	4.3	5,8	7.6
Material weight	kg/m <sup>3</sup>	lb/yd <sup>3</sup>	1790	3000	1703	2860	988	1670
Bucket weight	kg	lb	2014	4440	2041	4500	2449	5400
Operating capacity	kg	lb	6804	15,000	6804	15,000	6804	15,000
Static tipping load, straight	kg	lb	18647	41,110	18366	40,490	17731	39,090
Full turn	kg	lb	16729	36,880	16370	36,090	15962	35,190
Breakout force	kN	lbf	224,6	50,500	224,6	50,500	176,0	39,600
A	mm	ft in	9627	31'7"	9627	31'7"	10058	33'0"
B	mm	ft in	8230	27'0"	8230	27'0"	8230	27'0"
D	mm	ft in	584	1'11"	584	1'11"	584	1'11"
F	mm	ft in	3759	12'4"	3759	12'4"	3759	12'4"
F <sub>1</sub>	mm	ft in	3416	11'2.5"	3416	11'2.5"	3416	11'2.5"
F <sub>2</sub>	mm	ft in	2972	9'9"	2972	9'9"	2972	9'9"
H	mm	ft in	3759 ○	12'4" ⊖	3759 ○	12'4" ⊖	3454	11'4"
K	mm	ft in	5004	16'5"	5004	16'5"	5004	16'5"
L	mm	ft in	6452	21'2"	6452	21'2"	6604	21'8"
M	mm	ft in	1397 □	4'7" ⊕	1397 □	4'7" ⊕	1702	5'7"
N	mm	ft in	2337	7'8"	2337	7'8"	2642	8'8"
R <sub>1</sub>		deg		50°		50°		45°
T	mm	ft in	102 ⊠	4"	102 ⊠	4"	76	3"
V	mm	ft in	3302	10'10"	3302	10'10"	3924	12'10.5"
Y	mm	ft in	3124	10'3"	3124	10'3"	3124	10'3"
Z	mm	ft in	3962	13'0"	3962	13'0"	3962	13'0"
a <sub>1</sub> Turning circle (over bucket (bucket in carry position))	mm	ft in	16002	52'6"	16002	52'6"	16256	53'4"
Operating weight	kg	lb	28735	63,350	28763	63,410	29103	64,160

- Deduct 76 mm (3 in) for bolt on cutting edge    □ Add 51 mm (2 in) for bolt on cutting edge  
 ⊖ Deduct 178 mm (7 in) for bucket teeth        ⊕ Add 119 mm (4.7 in) for bucket teeth        ⊠ Add 32 mm (1.25 in) for bolt on cutting edge

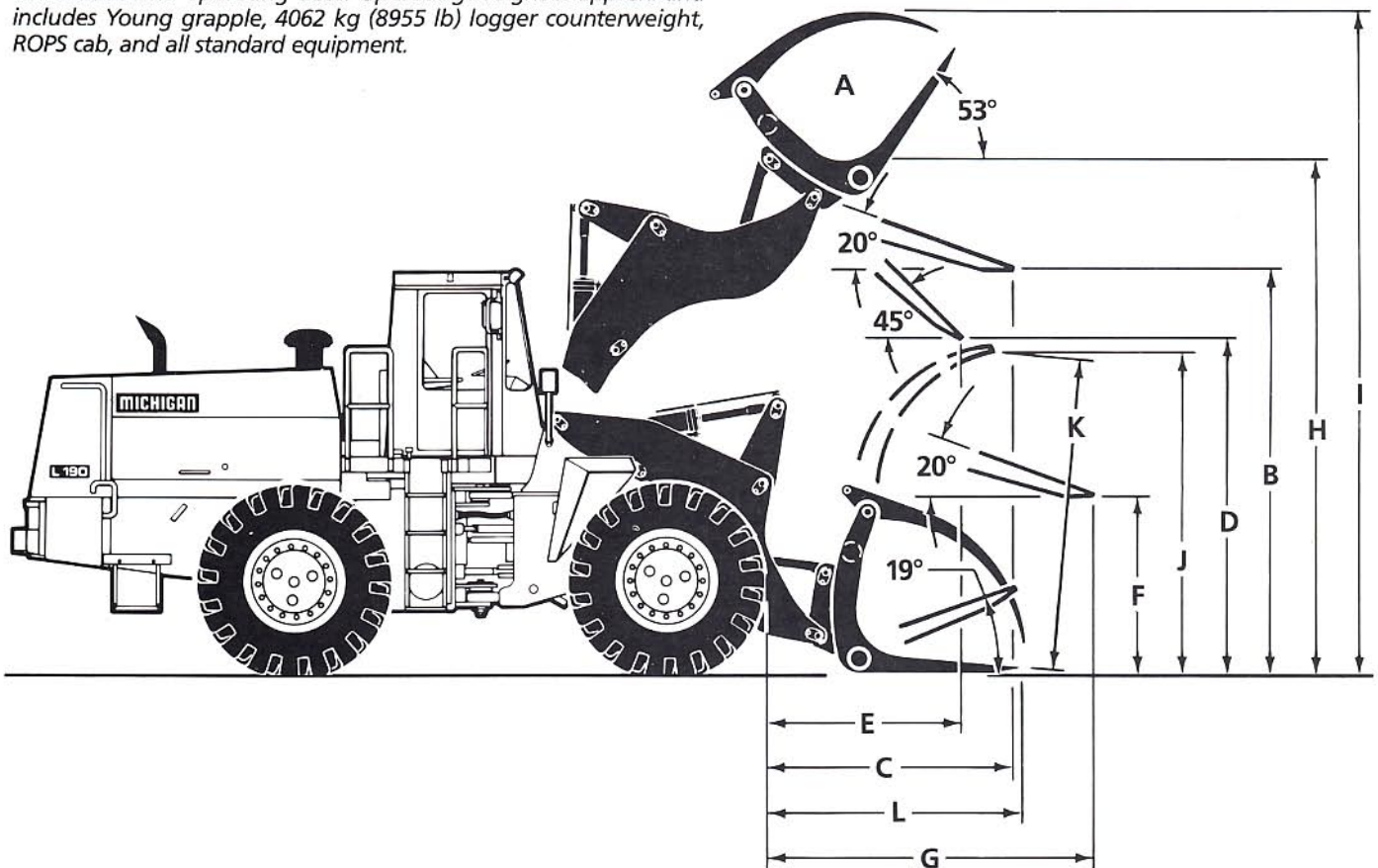
### DIMENSIONS AFFECTED BY TIRE SIZE

MACHINE DIMENSIONS		26.5-25 (L-2, L-3)	26.5-25 (L-4)	26.5-25 (L-5)	29.5-25 (L-2, L-3)	29.5-25 (L-4)
D	mm ft in	-51 -2"	-25 -1"	-25 -1"	0	+25 +1"
F	mm ft in	-51 -2"	-25 -1"	-25 -1"	0	+25 +1"
F <sub>1</sub>	mm ft in	-51 -2"	-25 -1"	-25 -1"	0	+25 +1"
F <sub>2</sub>	mm ft in	-51 -2"	-25 -1"	-25 -1"	0	+25 +1"
H	mm ft in	-51 -2"	-25 -1"	-25 -1"	0	+25 +1"
K	mm ft in	-51 -2"	-25 -1"	-25 -1"	0	+25 +1"
L	mm ft in	-51 -2"	-25 -1"	-25 -1"	0	+25 +1"
M	mm ft in	+51 +2"	+25 +1"	+25 +1"	0	-25 -1"
N	mm ft in	+51 +2"	+25 +1"	+25 +1"	0	-25 -1"
T	mm ft in	+51 +2"	+25 +1"	+25 +1"	0	-25 -1"
Y	mm ft in	-76 -3"	-76 -3"	-76 -3"	0	0 0
Z	mm ft in	-51 -2"	-25 -1"	-25 -1"	0	+25 +1"
a <sub>2</sub>	mm ft in	7137 23'5"	7137 23'5"	7137 23'5"	7188 23'7"	7188 23'7"
a <sub>3</sub>	mm ft in	4039 13'3"	4039 13'3"	4039 13'3"	3988 13'1"	3988 13'1"

## DIMENSIONS – MICHIGAN L190 LOG GRAPPLE

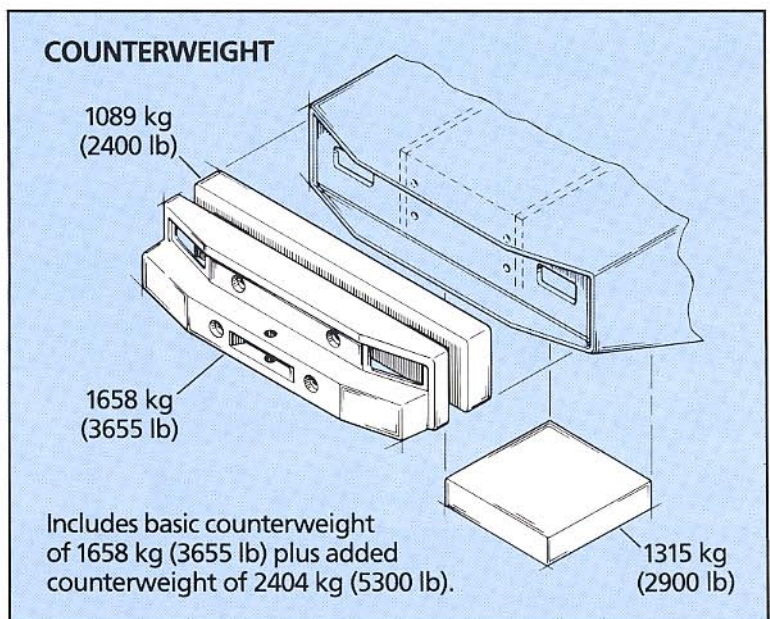
Tires: 29.5-25 (28PR) L-4

Changes from the standard configuration may change machine dimensions and operating data. Operating weight is approx. and includes Young grapple, 4062 kg (8955 lb) logger counterweight, ROPS cab, and all standard equipment.



### LOG GRAPPLE

MACHINE DIMENSIONS		29.5-25 (L-4)	
A	m <sup>2</sup> ft <sup>2</sup>	1.5	16
B	mm ft in.	3794	12'6"
C	mm ft in	2130	7'0"
D	mm ft in	3127	10'3"
E	mm ft in	1705	5'7"
F	mm ft in	1686	5'6"
G	mm ft in	2889	9'6"
H	mm ft in	4797	15'9"
I	mm ft in	6206	20'4"
J	mm ft in	3157	10'4"
K	mm ft in	2997	9'10"
L	mm ft in	2257	7'5"



## LOG GRAPPLE

MACHINE INFORMATION				
Grapple, make	<b>Young</b>			
model	<b>LP60-108</b>			
weight	kg	lb	2268	5000
Overall width	mm	ft in	2743	9' 0"
Tine, length (top surface level)	mm	ft in	1560	5' 1"
width	mm	ft in	127	5"
centers	mm	ft in	2616	8' 7"
Minimum closure	mm	ft in	914	3' 0"
Turn. circle over tines, (grapple in carry pos.)	mm	ft in	7713	25' 4"
Logger counterweight	kg	lb	2404	5300
Operating wt. (approx.)	kg	lb	30 412	67,045

HYDRAULIC SPEEDS, EMPTY, SEC				
Raise	Lower	Dump	Close	Open
6.2	4.0	5.0	2.3	2.5

LOAD INFORMATION				
<b>MAX. RECOMMENDED LOAD: 12 928 kg 28,500 lb</b>				
<b>MAX. HEIGHT – FORKS ROLLED BACK</b>				
*Tip load, straight	kg	lb	40 547	89,389
*Tip load, full turn	kg	lb	36 147	79,688
Hyd. lifting force	kg	lb	16 998	37,475
<b>MAX. REACH – FORKS LEVEL</b>				
*Tip load, straight	kg	lb	20 063	44,230
*Tip load, full turn	kg	lb	17 795	39,232
Hyd. lifting force	kg	lb	16 330	36,000
<b>GROUND POSITION – FORKS LEVEL</b>				
*Tip load, straight	kg	lb	26 045	59,623
*Tip load, full turn	kg	lb	24 068	53,060
Hyd. lifting force	kg	lb	23 132	50,996
*Static tip loads are based on estimated load center of gravity				

Contact your Michigan dealer for availability of alternate grapples.

SUPPLEMENTAL OPERATING DATA		Change in operating weight		Change in static tipping load straight		Change in static tipping load at full turn	
Belly Guard, Front	kg lb	+327	+720	+76	+171	+76	+171
Belly Guard, Rear	kg lb	+127	+280	+171	+377	+152	+336
Grille Guard	kg lb	+82	+180	+149	+328	+130	+286
ROPS Canopy (in lieu of ROPS Cab)	kg lb	-295	-650	-210	-464	-202	-444
Secondary Steering	kg lb	+45	+100	+36	+78	+34	+74
Transmission Guard	kg lb	+141	+310	+111	+244	+104	+230
Windshield Guard	kg lb	+90	+200	+43	+95	+43	+95

## LOG VOLUME & WEIGHTS TABLES

To determine the estimated weight of logs to be handled, first, determine the volume of the logs, then, multiply the volume by the lb/ft<sup>3</sup> figure of the specie involved from the "Weights of Wood" table. To determine the volume of the logs:

1. Measure the diameter of large end of log, above flare taper.
2. Measure the diameter of small end of log.
3. Pick out length of log across top of table, closest to the length to be handled.
4. Drop down the column to the horizontal lines from the two diameters.
5. Add these two values together, then, divide by two for the average log volume.

### LOG VOLUMES (in Cubic Feet\*)

Log Diameter (Inches)	LOG LENGTH (FEET)														
	8	12	16	20	24	28	32	36	40	50	60	70	80	90	100
4	0.7	1	1.4	1.7	2.1	2.4	2.8	3.1	3.5	4.3	5.2	6.1	7	7.8	8.7
6	1.6	2.4	3.1	3.9	4.7	5.5	6.3	7.1	7.8	9.7	12	13	16	18	20
8	2.8	4.2	5.6	7	8.4	9.8	11	13	14	16	21	24	28	31	35
10	4.4	6.5	8.7	11	13	15	17	20	22	27	33	38	44	49	55
12	6.3	9.4	13	16	19	22	25	28	31	39	47	55	63	71	79
14	8.5	13	17	21	26	30	34	39	43	53	64	74	86	96	101
16	11	17	22	28	34	39	45	50	56	70	84	98	112	126	140
18	14	21	28	35	42	49	57	64	71	88	106	124	141	159	177
20	17	26	35	44	52	61	70	79	87	109	131	153	175	196	218
22	21	32	42	53	63	74	85	95	106	132	158	185	211	238	264
24	25	38	50	63	75	88	101	113	126	157	189	220	251	283	314
26	29	44	59	74	89	103	118	133	147	184	221	258	295	332	369
28	34	51	68	86	103	120	137	154	171	213	256	299	342	385	428
30	39	59	79	98	118	137	157	177	196	245	295	344	393	442	491
32	45	67	89	118	134	156	179	201	223	279	335	391	447	503	559
34	50	76	101	126	151	177	202	227	252	315	378	441	504	567	631
36	57	85	113	141	170	198	226	255	282	353	424	495	566	637	707
38	63	95	126	158	189	220	252	284	315	394	473	551	630	709	788
40	70	105	140	175	210	244	279	314	349	436	524	611	698	785	873
50	109	164	218	273	327	382	436	491	545	677	818	955	1091	1227	1364
60	157	234	314	393	471	550	628	707	785	982	1178	1374	1571	1767	1964

\*Metric conversion: Cubic ft. x 0.028317 = cubic meter.

### WEIGHTS OF WOOD (Green)

SPECIES	kg/m <sup>3</sup>	lb/ft <sup>3</sup>	SPECIES	kg/m <sup>3</sup>	lb/ft <sup>3</sup>	SPECIES	kg/m <sup>3</sup>	lb/ft <sup>3</sup>
Alder, Red	737	46	Gum, Black	721	45	Pine, Jack	801	50
Ash, White	769	48	Blue	1121	70	Loblolly	993	62
Aspen	689	43	Red	801	50	Lodgepole	625	39
Baldcypress	817	51	Tupelo	897	56	Long Leaf	993	62
Basswood	673	42	Hemlock, Eastern	801	50	Norway (Red)	673	42
Beech	865	54	Western	961	60	Short Leaf	993	62
Birch, Paper	801	50	Hickory, Pecan	993	62	Slash	993	62
Yellow	929	58	True	1009	63	Sugar	817	51
Cedar, Alaska	577	36	Larch, Western	769	48	Western Yellow,	721	45
Incense	721	45	Locust, Black	929	58	(Ponderosa)		
Northern, White	449	28	Magnolia, Cucumber	785	49	White (Western)	561	35
Port-Orford	897	56	Maple, Big Leaf	753	47	White (Eastern)	577	36
Western Red	433	27	Black	865	54	Poplar, Yellow	609	38
Cherry, Black	721	45	Red	801	50	Redwood	801	50
Cottonwood, Eastern	785	49	Silver	721	45	Spruce, Black	513	32
Douglas Fir, (Coast)	881	55	Sugar	897	56	Engleman	625	39
(Inland Empire)	577	36	Oak, Black	1009	63	Red	545	34
Elm, American	865	54	Chestnut	977	61	Sitka	529	33
Fir, Alpine	449	28	Red	1009	63	White	545	34
Balsam	721	45	Red, Swamp	1073	67	Sweetgum	801	50
Nobel	481	30	Swamp Chestnut	1041	65	Sycamore	833	52
Red	769	48	White	993	62	Tamarack	753	47
Silver	577	36	White, Swamp	1105	69	Walnut, Black	929	58
White	753	47				Willow, Black	801	50

## STANDARD EQUIPMENT

AIR CLEANER, DRY TYPE,  
DUAL ELEMENT  
ALTERNATOR, 24V, 100 AMP  
BATTERY DISCONNECT, LOCKABLE  
BOOM AND BUCKET CONTROL  
LEVERS, DASH MOUNTED  
BOOM KICKOUT, AUTOMATIC  
BRAKES, 4-WHEEL HYDRAULIC  
DRY DISC  
BRAKE SYSTEM, SECONDARY  
BUCKET LEVELER, AUTOMATIC  
CAB ACCESS STEPS AND  
HAND RAILS, (SAE J185)  
CAB, ROPS (SAE J1040) (ISO 3471)  
Acoustical Lining  
Airducting, Built-In  
Doors (2); Lockable with Self-  
Locking, Sliding Glass Windows  
Door Hold-Open Struts (2)  
Electrical System: 24V,  
Circuit Breaker Protection  
Pre-wired for Optional  
Accessories  
Environmental Control:  
Air Conditioner 6,3 kW  
(21,500 Btu/hr)  
Heater/Defroster/Pressurizer  
13,2 kW (45,000 Btu/hr) with  
Three-Speed Blower Fan,  
Filtered Air  
Floor Mat and Sound Barriers  
Interior Work Lights, Red and White  
Interior Rearview Mirror  
Safety Glass, Tinted

Seat Belt (SAE J386)  
Seat, Suspension, 6-way adjustable  
Steering Wheel Spinner Knob  
Sun Visor  
Windshield Washer & Wipers,  
Front & Rear  
COLD START AID, ETHER  
DIFFERENTIALS, LIMITED SLIP,  
FRONT & REAR  
DRAWBAR WITH PIN  
GRILLE, REAR SWING-OUT  
HYDRAULIC FLUID TO AIR COOLER  
HYDRAULIC PRESSURE TEST PORTS,  
QUICK CONNECT  
INSTRUMENTS/GAUGES:  
Air Cleaner Restriction Indicator  
Engine Coolant Temperature  
Gauge  
Engine Oil Pressure Gauge  
Fuel Gauge  
Hourmeter  
Sight Gauges:  
Engine Coolant Level  
Hydraulic Fluid Level  
Transmission Fluid Level  
Transmission/Torque Converter  
Fluid Temperature Gauge  
Voltmeter  
ISOLATION MOUNTS:  
Cockpit  
Engine  
Radiator  
Transmission  
LIFTING LUGS

LIGHTS:  
Work Lights, Halogen  
2 Front, 200,000 Candlepower Spots  
2 Front, 40,000 Candlepower Floods  
4 Rear, 40,000 Candlepower Floods  
Stop and Tail combination, 2 Rear  
Turn Signals with Hazard  
Warning Switch  
LUBRICATION SYSTEM, MANIFOLD  
TYPE, GROUND ACCESSIBLE  
MIRRORS, REARVIEW (2), EXTERIOR  
NEUTRAL START FEATURE  
REMOTE DRAIN FOR ENGINE OIL  
SIDE PANELS, ENGINE HOOD  
STEERING FRAME LOCK  
TIRES: 29.5-25 (22PR) L-3 (General)  
TRANSMISSION: POWERSHIFT, WITH  
DIRECTIONAL CLUTCH MODULATION  
TRANSMISSION DECLUTCH  
VANDALISM LOCK, PROVISION FOR:  
Batteries  
Engine Coolant  
Fuel  
Hydraulic Fluid  
Transmission/Torque Converter Fluid  
WARNING ALARMS:  
Horn, Electric  
Reverse Alarm (SAE J994)  
WARNING & MONITORING LIGHTS:  
Air Conditioner Malfunction  
Brake Pump/Differential Pressure  
Brake System, Front  
Brake System, Rear  
Parking Brake Applied  
Transmission Filter Restriction

## OPTIONAL EQUIPMENT

Accessory Power Kit, 12V/6 Amp  
Air Pre-cleaner Kit  
Beacon, Amber Rotating  
Belly Guard, Front  
Belly Guard, Rear  
Cold Starting Aid, Engine  
Water & Oil Pre-heater  
\*Counterweight, 907 kg (2000 lb)  
Coupler, Fast Fuel (Wiggins)  
Engine Oil Fill &  
Evacuation (Wiggins)  
Engine Shutdown to Idle Kit  
Fenders and Mud Flaps, Front  
Grille Guard  
Hydraulic Control, 3rd  
Hydraulic Fluid Fill &  
Evacuation  
Instrument Cover Kit (ROPS Canopy)  
Radiator, L&M  
Radiator Sand Grid Kit  
Reversible Fan  
ROPS Canopy  
Secondary Steering (Electrical)  
Transmission Guard  
Warning & Monitor Lights  
Low Engine Oil Pressure  
Low Engine Coolant Level  
High Engine Coolant Temperature  
Windshield Guard

Tires  
26.5-25 (20PR) L-2  
26.5-25 (20PR) L-3  
26.5-25 (20PR) L-4  
26.5-25 (20PR) L-5  
26.5-25 (26PR) L-3  
26.5R25 XRA\*  
26.5R25 XRDNA\*  
26.5R25 XRD1A\*  
26.5R25 RL-2F\* L-2  
29.5-25 (16PR) L-3  
29.5-25 (22PR) L-2  
29.5-25 (22PR) L-4  
29.5-25 (28PR) L-4  
29.5R25 XRA\*  
29.5R25 RL-2F\* L-2

\*Standard Boom Loader Only

Under our policy of continuous product improvement, we reserve the right to change specifications and design without prior notice. The illustrations do not necessarily show the standard version of the machine.

## VME Americas Inc.

A subsidiary of VME Group N.V.

23001 Euclid Avenue  
P.O. Box 178017  
Cleveland, Ohio 44117-8017



FORM NO. L-345  
DATE 7/89  
Printed in U.S.A.