

TRACK LOADERS

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Features of 939C:

- **Hydrostatic drive train** offers infinitely variable speeds, fast acceleration, dynamic hydrostatic braking, superior maneuverability and excellent controllability.

Features common to all D-series models (953D-963D-973D):

- **Improved serviceability.** All D-series Track-Type Loaders are equipped with a tiltable cab that allows complete service of the hydraulic system. Most daily maintenance checks are performed from the machine's right side, facilitating quick start up. Easy access to major components enhances serviceability and increase uptime.
- **Operator Station.** Experience a high level of efficiency, comfort and productivity with the new D-series cab. The cab features a new gauge cluster, a fully air-suspension seat, the new seat mounted controls, an automatic air climate control and provides excellent visibility.
- **Messenger.** Messenger is a new electronic monitoring system with real time, visual feedback on engine and machine operating conditions. It provides information on diagnostic data, maintenance, and allows operating settings such as implement reactions.
- **Hydrostatic Drive.** The closed loop hydrostatic drive with electronic control provides precise modulation for quick, smooth operation and superior maneuverability. Shorter cycle times, high efficiency, and excellent maneuverability results in increased productivity.

Features common to all D-series models (953D-963D-973D) (continued):

- **Steering controls.** Now, both the 953D and 963D are offered with a choice of either the traditional V-lever with pedal steering or joystick control. With joystick control both steering and transmission functions are managed using the joystick. The joystick handles includes three buttons. The yellow buttons are used to increase/decrease the travel speed of the machine. The black button activates the horn. There are four different settings for both forward and reverse with the speed displayed on the multifunctional dashboard. This pattern is commonly referred to as S-pattern steering.
- **Electro-hydraulic implements controls.** The new electro hydraulic implement controls provide the operator with responsive, smooth and precise control of bucket and lift arms.
- **Kickout settings.** Automatic kickouts are part of the electro-hydraulic controls; adjust from inside the cab with a simple rocker switch. Kickout stops are hydraulically cushioned for greater operator comfort and less material spillage.
- **Positing Sensing Cylinder.** The D-series has electro-hydraulic implement controls for lower operator effort. The new position sensing cylinders allow setting detents at any positions from the cab. They feature also a load sensing implement pump which reduces engine power consumption.
- **Hydraulic on-demand fan.** The fan is a hydraulic demand type one with optional reversible function, operating in sucker mode. It gives the best efficiency and avoids also sucking the dust and debris coming from the outside into the cooling package.
- **Special Application Arrangements.** Special arrangements — Waste Handling, Demolition, Wide Gauge and more, are available or can be designed on request, to allow the D-series to work in special applications.

Features of 953D-963D:

- **C6.6 ACERT Engine.** The Cat C6.6 ACERT engine utilizes the Cat Common Rail fuel delivery system. Designed for performance, durability, serviceability, and fuel economy, it meets EPA Tier 3, EU Stage IIIA and Japan Ministry of Land, Infrastructure & Transport Step 3 emission standards.
- **SystemOne Moving U/C Standard.** The revolutionary Cat SystemOne™ Undercarriage provides maximum undercarriage life and reliability no matter the application, environment or underfoot conditions. Built to last longer and require less maintenance it ensures a dramatic drop in owning and operating costs.

Features of 973D:

- **C9 ACERT Engine.** The Cat® C9 ACERT engine is an 8.8 liter (537 in³) displacement, six-cylinder, in-line configured engine with hydraulically actuated electronic fuel injection or HEUI™. The 196 kW (263 hp) rated net power engine meets the latest worldwide emissions standards.
- **Special Application Arrangements.** The steel mill arrangement protects the 973D and its operator against extreme conditions to allow the machine to handle hot slag in steel mill operations. The special arrangement features additional guarding for critical components, sealed undercarriage, heat shields for fuel tank, power train and hydraulics, silicone seals and heat resistant windshield, remote parking brake release and fire-resistant fluids. The Steel Mill Arrangement provides the best protection available for this extremely difficult application.

Features of 973C:

- **Rear engine location** provides natural stability as a “working” counterweight, excellent visibility and good weight to horsepower ratio.
- **Electronic hydrostatic drive train with pedal steering** offers independent control of each track. Power turns, counterrotation infinitely variable speeds, and fast acceleration for increased maneuverability and production.
- **Variable displacement pump and motors** provide excellent efficiency and controllability.
- **Z-bar linkage** provides increased breakout force, fewer grease points and fast dump speed.
- **Special arrangements** including Wide Gauge, Waste Handling, Ship Hold, Tunneling and Steel Mill are available to tailor the machine to specific applications.
- **C-series cab and controls** offer a high level of operator comfort. Low sound level, large interior volume, two large storage compartments, fully adjustable armrests, ergonomic control, standard air conditioning and air suspension seat, adjustable steering pedal, Cat contour seat, and excellent visibility.
- **Computerized Monitoring System (CMS)** provides operator with gauges and other information, alerts of occurring or impending problems, registers fault codes and acts as an extended diagnostic system.
- **Pilot operated hydraulic controls** offer low lever forces for precise, consistent bucket control and reduces operator fatigue.
- **Implement power requirements** have priority over track requirements automatically ... full implement power available for maximum breakout force and simultaneous lift and dump capability results in fast loading and cycle times.
- **Oscillating track roller frames** decrease ground shock, increase machine stability and improve traction.

Features common to all models (C-series and D-series):

- **Unmatched versatility** — excavates, loads, dozes, grades, clears, strips, backfills in all underfoot conditions including those that could damage tires.
- **Sound-suppressed, air-pressurized, resiliently mounted ROPS cab** for superior working environment.
- **Sealed loader linkage** extends lubrication intervals and reduces maintenance time.
- **Automatic bucket controls** let bucket rise to pre-set dumping height and return to pre-set digging angle for fast cycle time.
- **General Purpose and Multi-Purpose** buckets, quick couplers and many other work tools are available to increase versatility.
- **Radial rippers** are Multishank with wide beam coverage for utility ripping close to walls, footings and embankments. Five shanks available for 939C. Three shanks for 953D, 963D, 973C and 973D.
- **Product Link System** reports machine location and hours and consequently makes the maintenance easier and reduces the downtime.
- **Cat Machine Security System** allows better machine protection by preventing theft. A microchip is embedded in the key to provide more security.
- **K System** is a Caterpillar exclusive which allows ease of installation and removal. New adapters provide better performance and offer a longer lasting life than J series (+30%).



MODEL	939C		953D		963D	
Flywheel Power	67.1 kW	90 hp	110 kW	148 hp	141 kW	189 hp
Operating Weight*†	9480 kg	20,900 lb	15 517 kg	34,209 lb	20 220 kg	44,577 lb
Engine Model	3046 T		C6.6 ACERT		C6.6 ACERT	
Rated Engine RPM	2400		2000		2000	
Bore	94 mm	3.7"	105 mm	4"	105 mm	4.13"
Stroke	120 mm	4.7"	127 mm	5"	127 mm	5"
No. Cylinders	6		6		6	
Displacement	5 L	305 in³	6.6 L	402.7 in³	6.6 L	402.7 in³
Speeds Forward/Reverse	0-9 km/h	0-5.6 mph	km/h	mph	km/h	mph
1st	—		0-10	0-6.2	0-10	0-6.2
2nd	—		Infinitely		Infinitely	
3rd	—		Variable		Variable	
Hydraulic Cycle Time, Bucket Empty, in Seconds:						
Raise	5.6		5.9		5.8	
Dump	2.4		1.5		1.3	
Lower (Empty, Float Down)	2.9		3.2		2.9	
Total	10.9		10.6		10.0	
Track Rollers (Each Side)	6		6		7	
Width of Standard Track Shoe	406 mm	16"	480 mm	19"	550 mm	21.6"
Length of Track on Ground†	2140 mm	84.4"	2323 mm	91.4"	2543 mm	100.1"
Ground Contact Area (with Standard Shoes)†	1.74 m ²	2700 in²	2.3 m ²	3565 in²	2.8 m ²	4340 in²
Ground Pressure†	53.7 kPa	7.8 psi	65.5 kPa	9.5 psi	71.5 kPa	10.3 psi
Ground Clearance	369 mm	14.5"	416 mm	16.3"	471 mm	18.5"
Track Gauge	1550 mm	61"	1800 mm	71"	1850 mm	72.8"
Width without Bucket (with Standard Shoes)	1960 mm	77"	2280 mm	89.7"	2400 mm	94.5"
Fuel Tank Refill Capacity	157 L	41.4 U.S. gal	316 L	83.5 U.S. gal	400 L	105.6 U.S. gal
Hydraulic System Refill Capacity	56.8 L	15 U.S. gal	70 L	18.5 U.S. gal	90 L	23.8 U.S. gal

*939C weights include basic machine (General Arrangement Number), lubricants, coolants, full fuel tank, operator, general purpose bucket and bucket teeth and OROPS. 953D and 963D include GP bucket with bolt-on adapters, long tips and segments.

†**SystemOne Undercarriage Changes (953D, 963D)**

With the introduction of New SystemOne Undercarriage, mentioned data may change. Specific conception or various modification in dimension affect the weight, the length and therefore the ground pressure. These differences don't have to be taken into account as long as they show a minimal change: $\pm 1\% \pm 0.2\%$ and depend on the undercarriage configuration and the use.



MODEL	973C		973D	
Flywheel Power	178 kW	239 hp	196 kW	263 hp
Operating Weight*	26 373 kg	58,142 lb	28 058 kg	61,857 lb
Engine Model	C9 ACERT		C9 ACERT	
Rated Engine RPM	2000		1900	
Bore	112 mm	4.41"	112 mm	4.41"
Stroke	149 mm	5.87"	149 mm	5.87"
No. Cylinders	6		6	
Displacement	8.8 L	537 in ³	8.8 L	537 in ³
Speeds Forward/Reverse	km/h	mph	km/h	mph
1st	0-10	0-6.2	—	—
2nd	Infinitely		Infinitely	
3rd	Variable		Variable	
Hydraulic Cycle Time, Bucket Empty, in Seconds:				
Raise	6.7		6.5	
Dump	1.5		1.4	
Lower (Empty, Float Down)	2.9		2.7	
Total	11.1		10.6	
Track Rollers (Each Side)	7		7	
Width of Standard Track Shoe	500 mm	19.7"	550 mm	21.7"
Length of Track on Ground	2930 mm	115"	2930 mm	115"
Ground Contact Area (with Standard Shoes)	2.93 m ²	4542 in ²	3.22 m ²	4991 in ²
Ground Pressure	91.2 kPa	13.2 psi	85.5 kPa	12.0 psi
Ground Clearance	457 mm	17.9"	482 mm	18.98"
Track Gauge	2080 mm	82"	2160 mm	85"
Width without Bucket (with Standard Shoes)	2580 mm	102"	2710 mm	106.7"
Fuel Tank Refill Capacity	430 L	113 U.S. gal	621 L	164.1 U.S. gal
Hydraulic System Refill Capacity	62 L	16.4 U.S. gal	189 L	49.9 U.S. gal

*973C includes GP bucket with bolt-on adapters, long tips and segments.

BUCKET	General Purpose		Multi-Purpose	
Capacity, Rated (Nominal Heaped)	1.15 m ³	1.5 yd ³	1.15 m ³	1.5 yd ³
Struck	0.95 m ³	1.25 yd ³	0.95 m ³	1.25 yd ³
Bucket Width*	2160 mm	7'1"	2160 mm	7'1"
Dump Clearance at Full Lift and 45° Discharge	2667 mm	8'9"	2604 mm	8'6.5"
Maximum Reach at Full Lift and 45° Discharge	866 mm	2'10.1"	877 mm	2'10.5"
Digging Depth	127 mm	5"	165 mm	6.5"
Overall Length	4359 mm	14'3.6"	4359 mm	14'4"
Overall Height	4384 mm	14'4.6"	4384 mm	14'4.6"
Static Tipping Load	6607 kg	14,560 lb	6396 kg	14,100 lb
Breakout Force**	89.9 kN	20,200 lb	92 kN	20,690 lb
Operating Weight***	9484 kg	20,910 lb	10 030 kg	22,110 lb

*Bolt-on teeth increase bucket width by 42 mm (1.65"). Bolt-on cutting edge increases bucket width by 10 mm (0.39").

**Breakout force is measured 102 mm (4") behind tip of cutting edge with bucket hinge pin as pivot point.

***Operating weight includes coolant, lubricants, full fuel tank, bottom guards (STD), bucket teeth, ROPS canopy and operator. 454 kg (1000 lb) rear counterweight is also removed while using Multi-Purpose bucket.

Machine stability can be affected by the addition of other attachments. Add or subtract the following to/from machine operating weight and static tipping load:

	Change in Operating Weight		Change in Static Tipping Load	
	kg	lb	kg	lb
Cab, ROPS	+204	+450	+266	+586
Bucket teeth (long) & segments	+118	+260	-150	-330
Air Conditioner	+ 77	+170	+ 88	+194
Ripper with 3 teeth (includes removal of 295 kg (650 lb) rear counterweight)	+ 17	+ 37	+ 49	+108
Rear counterweight (per plate)	+115	+255	+203	+448

BUCKET	General Purpose Bare		General Purpose Bolt-on Adapters, Long Teeth & Segments		General Purpose Bolt-on Cutting Edge		General Purpose Flush Weld-on Adapters & Long Teeth	
	m ³	yd ³	m ³	yd ³	m ³	yd ³	m ³	yd ³
Capacity, Rated (Nominal Heaped) Struck	1.75 m ³	2.29 yd³	1.85 m ³	2.42 yd³	1.85 m ³	2.42 yd³	1.85 m ³	2.42 yd³
Cutting Edge, Type	Straight		Straight		Straight		—	
Bucket Width◀	2392 mm	94.2"	2485 mm	97.8"	2395 mm	94.3"	2438 mm	96"
Teeth	None		8, bolt-on plus replaceable tips		None		8, bolt-on plus replaceable tips	
Dump Clearance @ Full Lift and 45° Discharge	2855 mm	112.4"	2616 mm	102.9"	2786 mm	109.6"	2659 mm	104.7"
Reach at 45° Discharge Angle 2133 mm (7'0") Clearance	1550 mm	61"	1630 mm	64.2"	1559 mm	61.4"	1656 mm	65.2"
Reach @ Full Lift and 45° Discharge	928 mm	36.5"	1099 mm	43.3"	961 mm	37.8"	1104 mm	43.5"
Digging Depth	92 mm	3.6"	140 mm	5.5"	117 mm	4.6"	105 mm	4.1"
Ground Clearance from Face of Shoes	416 mm	16.3"	416 mm	16.3"	416 mm	16.3"	416 mm	16.3"
Overall Machine Width without Bucket (with Standard Track) 480 mm (19")	2280 mm	89.7"	2280 mm	89.7"	2280 mm	89.7"	2280 mm	89.7"
Overall Machine Width without Bucket (with Narrow Track) 380 mm (15")	2180 mm	85.8"	2180 mm	85.8"	2180 mm	85.8"	2180 mm	85.8"
Overall Length	5926 mm	233.3"	6252 mm	246.1"	6017 mm	236.9"	6198 mm	244"
Overall Height	3105 mm	122.2"	3105 mm	122.2"	3105 mm	122.2"	3105 mm	122.2"
Static Tipping Load	11 431 kg	25,201 lb	11 089 kg	24,447 lb	11 252 kg	24,806 lb	11 255 kg	24,813 lb
Breakout Force*	160.5 kN	36,092 lb	157.8 kN	35,491 lb	159.3 kN	35,828 lb	162.5 kN	36,549 lb
Operating Weight**	15 517 kg	34,209 lb	15 758 kg	34,740 lb	15 638 kg	34,475 lb	15 635 kg	34,469 lb

* Breakout force is measured 100 mm (3.94") behind tip of cutting edge with bucket hinge pin as pivot point.

** Operating weight includes coolant, lubricants, full fuel tank, ROPS cab, bucket, and 75 kg (165 lb) operator.

◀ Bolt-on teeth increase bucket width by 52 mm (2"). Bolt-on cutting edge increases bucket width by 17 mm (0.67").

Machine stability can be affected by the addition of other attachments. Add or subtract the following to/from machine operating weight and static tipping load:

	Change in Operating Weight		Change in Static Tipping Load for General Purpose Bucket	
	kg	lb	kg	lb
Ripper (includes ripper, rear lines, and third valves)	+461	+1016	+967	+2131
Air conditioner	Standard		Standard	
Wide track shoes, 480 mm (19") double grouser	-588	-1296	-405	- 892
Rear bumper (removal)	-185	- 408	-411	- 906

BUCKET	Multi-Purpose Bare		Multi-Purpose Bolt-on Adapters, Long Tips & Segments		Multi-Purpose Bolt-on Cutting Edge	
Capacity, Rated (Nominal Heaped)	1.5 m ³	1.96 yd³	1.6 m ³	2.09 yd³	1.6 m ³	2.09 yd³
Struck	1.25 m ³	1.63 yd³	1.35 m ³	1.76 yd³	1.35 m ³	1.76 yd³
Cutting Edge, Type	Straight		Straight		Straight	
Bucket Width◀	2378 mm	93.6"	2471 mm	97.3"	2395 mm	94.3"
Teeth	None		8, bolt-on plus replaceable tips		None	
Dump Clearance @ Full Lift and 45° Discharge	2738 mm	107.7"	2499 mm	98.3"	2669 mm	105"
Reach at 45° Discharge Angle 2133 mm (7'0") Clearance	1434 mm	56.5"	1457 mm	57.4"	1428 mm	56.2"
Reach @ Full Lift and 45° Discharge	973 mm	38.3"	1144 mm	45"	1006 mm	39.6"
Digging Depth	142 mm	5.6"	190 mm	7.5"	147 mm	5.8"
Overall Length	6077 mm	239.3"	6401 mm	252"	6167 mm	242.8"
Overall Height	3105 mm	122.2"	3105 mm	122.2"	3105 mm	122.2"
Static Tipping Load	10 831 kg	23,878 lb	10 492 kg	23,130 lb	10 663 kg	23,507 lb
Breakout Force*	137.2 kN	30,843 lb	134.3 kN	30,191 lb	135.5 kN	30,461 lb
Operating Weight**	16 062 kg	35,410 lb	16 302 kg	35,939 lb	16 183 kg	35,677 lb

* Breakout force is measured 100 mm (3.94") behind tip of cutting edge with bucket hinge pin as pivot point.
 ** Operating weight includes coolant, lubricants, full fuel tank, ROPS cab, General Purpose bucket, and 80 kg (176 lb) operator.
 ◀ Bolt-on teeth increase bucket width by 52 mm (2"). Bolt-on cutting edge increases bucket width by 17 mm (0.67").

Machine stability can be affected by the addition of other attachments.

BUCKET	General Purpose Bare		General Purpose Bolt-on Cutting Edge		General Purpose Flush Weld-on Adapters & Long Tips		General Purpose Bolt-on Adapters, Long Tips & Segments	
Capacity, Rated (Nominal Heaped)	2.3 m ³	3.0 yd³	2.45 m ³	3.2 yd³	2.45 m ³	3.2 yd³	2.45 m ³	3.2 yd³
Struck	2.0 m ³	2.6 yd³	2.14 m ³	2.8 yd³	2.0 m ³	2.6 yd³	2.14 m ³	2.8 yd³
Cutting Edge, Type	Straight		Straight		—		Straight	
Bucket Width*	2508 mm	98.7"	2539 mm	99.9"	2583 mm	101.6"	2612 mm	102.8"
Teeth	None		None		8, weld-on plus replaceable tips		8, weld-on plus replaceable tips	
Dump Clearance @ Full Lift and 45° Discharge	3155 mm	124.2"	3068 mm	120.7"	2951 mm	116.1"	2915 mm	114.7"
Reach at 45° Discharge Angle 2133 mm (7'0") Clearance	1771 mm	69.7"	1793 mm	70.5"	1926 mm	75.8"	1886 mm	74.2"
Reach @ Full Lift and 45° Discharge	1060 mm	41.7"	1215 mm	47.8"	1397 mm	55"	1373 mm	54"
Digging Depth	80 mm	3.1"	115 mm	4.5"	95 mm	3.7"	138 mm	5.4"
Ground Clearance from Face of Shoes	471 mm	18.5"	471 mm	18.5"	471 mm	18.5"	471 mm	18.5"
Overall Machine Width without Bucket (with Standard Track) 550 mm (21.6")	2400 mm	94.5"	2400 mm	94.5"	2400 mm	94.5"	2400 mm	94.5"
Overall Machine Width without Bucket (with Narrow Track) 450 mm (18")	2300 mm	90.5"	2300 mm	90.5"	2300 mm	90.5"	2300 mm	90.5"
Overall Length	6584 mm	259.2"	6676 mm	262.8"	6883 mm	270.9"	6896 mm	271.4"
Overall Height	3335 mm	131.3"	3335 mm	131.3"	3335 mm	131.3"	3335 mm	131.3"
Static Tipping Load	14 969 kg	33,000 lb	14 685 kg	32,375 lb	14 815 kg	32,661 lb	14 482 kg	31,927 lb
Breakout Force**	208.6 kN	46,895 lb	206.1 kN	46,333 lb	207.4 kN	46,625 lb	203.8 kN	45,816 lb
Operating Weight***	20 220 kg	44,585 lb	20 433 kg	45,055 lb	20 332 kg	44,832 lb	20 592 kg	45,405 lb

*With bolt-on cutting edge add 17 mm (0.67"), with bolt-on teeth add 52 mm (2"), for flush weld-on teeth add 75 mm (3").

**Breakout force is measured 100 mm (3.94") behind tip of cutting edge with bucket hinge pin as pivot point.

***Operating weight includes coolant, lubricants, full fuel tank, ROPS cab, bucket, and 75 kg (165 lb) operator.

Machine stability can be affected by the addition of other attachments. Add or subtract the following to/from machine operating weight and static tipping load:

	Change in Operating Weight		Change in Static Tipping Load for General Purpose Bucket	
	kg	lb	kg	lb
	Ripper (includes ripper, rear lines, and third valves)	+639	+1409	+1421
Rear bumper (removal)	-195	- 430	- 464	-1023

BUCKET	Multi-Purpose Bare		Multi-Purpose Bolt-on Segments & Long Teeth		Multi-Purpose Bolt-on Cutting Edge	
Capacity, Rated (Nominal Heaped)	1.9 m ³	2.5 yd³	2.0 m ³	2.6 yd³	2.0 m ³	2.6 yd³
Struck	1.6 m ³	2.1 yd³	1.7 m ³	2.2 yd³	1.7 m ³	2.2 yd³
Cutting Edge, Type	Straight		Straight		Straight	
Bucket Width*	2482 mm	97.7"	2575 mm	101.3"	2515 mm	99"
Teeth	None		8, bolt-on plus replaceable tips		None	
Dump Clearance @ Full Lift and 45° Discharge	3000 mm	118.1"	2772 mm	109.1"	2909 mm	114.5"
Reach at 45° Discharge Angle 2133 mm (7'0") Clearance	1598 mm	62.9"	1650 mm	65.0"	1607 mm	63.3"
Reach @ Full Lift and 45° Discharge	1065 mm	41.9"	1240 mm	48.8"	1119 mm	44"
Digging Depth	161 mm	6.3"	209 mm	8.2"	191 mm	7.5"
Ground Clearance from Face of Shoes	471 mm	18.5"	471 mm	18.5"	471 mm	18.5"
Overall Machine Width without Bucket (with Standard Track) 550 mm (21.6")	2400 mm	94.5"	2400 mm	94.5"	2400 mm	94.5"
Overall Machine Width without Bucket (with Narrow Track) 450 mm (18")	2300 mm	90.5"	2300 mm	90.5"	2300 mm	90.5"
Overall Length	6698 mm	263.7"	7013 mm	276.1"	6820 mm	268.5"
Overall Height	3335 mm	131.3"	3335 mm	131.3"	3335 mm	131.3"
Static Tipping Load	14 487 kg	31,944 lb	14 124 kg	31,143 lb	14 208 kg	31,329 lb
Breakout Force**	193.2 kN	43,333 lb	189.2 kN	42,533 lb	193.7 kN	43,545 lb
Operating Weight***	20 710 kg	45,666 lb	20 975 kg	46,250 lb	20 911 kg	46,109 lb

*With bolt-on cutting edge add 17 mm (0.67"), for bolt-on teeth add 52 mm (2").
 **Breakout force is measured 100 mm (3.94") behind tip of cutting edge with bucket hinge pin as pivot point.
 ***Operating weight includes coolant, lubricants, full fuel tank, ROPS cab, bucket, and 75 kg (165 lb) operator.

Machine stability can be affected by the addition of other attachments.

BUCKET	General Purpose Bare		General Purpose Bolt-on Adapters, Long Tips & Segments		General Purpose Bolt-on Cutting Edge		General Purpose Weld-on Flush Adapters & Tips	
Capacity, Rated (Nominal Heaped) Struck	2.8 m ³	3.66 yd³	3.2 m ³	4.19 yd³	3.2 m ³	4.19 yd³	2.8 m ³	3.66 yd³
Cutting Edge, Type	2.41 m ³	3.15 yd³	2.77 m ³	3.62 yd³	2.77 m ³	3.62 yd³	2.41 m ³	3.15 yd³
Bucket Width◀	Straight		Straight		Straight		Spade	
Teeth	2854 mm	112.4"	2854 mm	112.4"	2854 mm	112.4"	2934 mm	115.5"
	None		8, bolt-on plus replaceable tips		None		8, weld-on plus replaceable tips	
Dump Clearance @ Full Lift and 45° Discharge	3358 mm	132"	3154 mm	124"	3281 mm	129"	3154 mm	124.2"
Reach @ 45° Discharge Angle 2133 mm (7'0") Clearance	1992 mm	78"	2096 mm	82"	2031 mm	80"	2096 mm	82.5"
Reach @ Full Lift and 45° Discharge	1313 mm	51"	1482 mm	58"	1357 mm	53"	1482 mm	58.3"
Digging Depth	92 mm	3.6"	143 mm	5.6"	122 mm	4.8"	92 mm	3.6"
Ground Clearance from Face of Shoes	457 mm	17.9"	457 mm	17.9"	457 mm	17.9"	457 mm	17.9"
Overall Machine Width without Bucket (with Standard Track)	2580 mm	102"	2580 mm	102"	2580 mm	102"	2580 mm	102"
Overall Machine Width without Bucket (with Wide Track)	2930 mm	115.8"	2930 mm	115.8"	2930 mm	115.8"	2930 mm	115.8"
Overall Length	7092 mm	279"	7362 mm	290"	7175 mm	282"	7372 mm	290.2"
Overall Height	3500 mm	137.8"	3500 mm	137.8"	3500 mm	137.8"	3500 mm	137.8"
Static Tipping Load	20 249 kg	44,649 lb	19 747 kg	43,542 lb	19 908 kg	43,897 lb	20 010 kg	44,122 lb
Breakout Force*	213.3 kN	47,992 lb	194.5 kN	43,762 lb	195.7 kN	44,032 lb	181.3 kN	40,792 lb
Operating Weight**	26 373 kg	58,153 lb	26 731 kg	58,941 lb	26 616 kg	58,688 lb	26 542 kg	58,525 lb

* Breakout force is measured 100 mm (3.94") behind tip of cutting edge with bucket hinge pin as pivot point.

** Operating weight includes lubricants, full fuel tank, ROPS cab, General Purpose bucket, and 80 kg (176 lb) operator.

◀ Bolt-on teeth increase bucket width by 63.8 mm (2.5"). Bolt-on cutting edge increases bucket width by 19 mm (0.74").

Machine stability can be affected by the addition of other attachments. Add or subtract the following to/from machine operating weight and static tipping load:

	Change in Operating Weight		Change in Static Tipping Load	
	kg	lb	kg	lb
Ripper (includes 3 shanks and rear hydraulic arrangement)	+616	+1359	+ 208	+ 458.6
Rear bumper (removal)	-582	-1283	-1339	-2952.5

BUCKET	Multi-Purpose Bare		Multi-Purpose Bolt-on Adapters, Long Tips & Segments & Long Teeth		Multi-Purpose Bolt-on Cutting Edge		Steel Mill Arrangement Slag Bucket	
Capacity, Rated (Nominal Heaped) Struck	2.6 m ³	3.4 yd³	2.9 m ³	3.79 yd³	2.9 m ³	3.79 yd³	2.8 m ³	3.7 yd³
Cutting Edge, Type	2.19 m ³	2.86 yd³	2.56 m ³	3.35 yd³	2.56 m ³	3.35 yd³	—	—
Bucket Width◀	Straight		Straight		Straight		Straight	
Teeth	2710 mm	106.7"	2710 mm	106.7"	2710 mm	106.7"	2716 mm	106.9"
	None		8, bolt-on plus replaceable tips		None		8, weld-on plus replaceable tips	
Dump Clearance @ Full Lift and 45° Discharge	3049 mm	120"	2828 mm	111.3"	2966 mm	116"	2986 mm	117.5"
Reach @ 45° Discharge Angle 2133 mm (7'0") Clearance	1832 mm	72.1"	1936 mm	76.22"	1871 mm	73.6"	1784 mm	70.2"
Reach @ Full Lift and 45° Discharge	1261 mm	49.6"	1403 mm	55.3"	1293 mm	50.9"	1237 mm	48.7"
Digging Depth	200 mm	7.9"	254 mm	10"	230 mm	9.05"	118 mm	4.6"
Overall Length	7333 mm	288.7"	7591 mm	298.9"	7415 mm	291.9"	7600 mm	299.2"
Overall Height	3500 mm	137.8"	3500 mm	137.8"	3500 mm	137.8"	3500 mm	137.8"
Static Tipping Load	19 095 kg	42,104 lb	18 615 kg	41,046 lb	18 309 kg	40,371 lb	18 470 kg	40,720 lb
Breakout Force*	173.9 kN	39,127 lb	159.7 kN	35,932 lb	161.1 kN	36,247 lb	203 kN	45,760 lb
Operating Weight**	27 532 kg	60,698 lb	27 875 kg	61,454 lb	27 775 kg	61,233 lb	29 560 kg	65,180 lb

* Breakout force is measured 100 mm (3.94") behind tip of cutting edge with bucket hinge pin as pivot point.

** Operating weight includes lubricants, full fuel tank, ROPS cab, General Purpose bucket, and 80 kg (176 lb) operator.

◀ Bolt-on teeth increase bucket width by 63.8 mm (2.5"). Bolt-on cutting edge increases bucket width by 19 mm (0.74").

Machine stability can be affected by the addition of other attachments.

BUCKET	General Purpose Bare		General Purpose Bolt-on Adapters, Long Tips & Segments		General Purpose Bolt-on Cutting Edge		General Purpose Flush Weld-on Adapters & Long Tips	
Capacity, Rated (Nominal Heaped)	2.86 m ³	3.74 yd³	3.21 m ³	4.20 yd³	3.04 m ³	3.98 yd³	3.21 m ³	4.20 yd³
Struck	2.44 m ³	3.19 yd³	2.81 m ³	3.68 yd³	2.66 m ³	3.48 yd³	2.81 m ³	3.68 yd³
Cutting Edge, Type	Straight		Straight		Straight		Spade	
Bucket Width◀	2910 mm	114.6"	2910 mm	114.6"	2910 mm	114.6"	2990 mm	117.7"
Teeth	None		8, bolt-on plus replaceable tips		None		8, weld-on plus replaceable tips	
Dump Clearance @ Full Lift and 45° Discharge	3375 mm	132.9"	3013 mm	118.6"	3193 mm	125.7"	3069 mm	120.8"
Reach @ 45° Discharge Angle 2133 mm (7'0") Clearance	1839 mm	72.4"	2065 mm	81.3"	1929 mm	75.9"	2110 mm	83.1"
Reach @ Full Lift and 45° Discharge	1165 mm	45.9"	1327 mm	52.2"	1199 mm	47.2"	1357 mm	53.4"
Digging Depth	97 mm	3.8"	159 mm	6.3"	127 mm	5.0"	129 mm	5.1"
Ground Clearance from Face of Shoes	483 mm	19.0"	483 mm	19.0"	483 mm	19.0"	483 mm	19.0"
Overall Machine Width without Bucket (with Standard Track)	2710 mm	106.7"	2710 mm	106.7"	2710 mm	106.7"	2710 mm	106.7"
Overall Machine Width without Bucket (with Optional Track)	2835 mm	111.6"	2835 mm	111.6"	2835 mm	111.6"	2835 mm	111.6"
Overall Length	7194 mm	283.2"	7305 mm	287.6"	7275 mm	286.4"	7479 mm	294.4"
Overall Height	3510 mm	138.2"	3510 mm	138.2"	3510 mm	138.2"	3510 mm	138.2"
Static Tipping Load	21 179 kg	46,700 lb	20 831 kg	45,932 lb	20 959 kg	46,215 lb	21 006 kg	46,318 lb
Breakout Force*	281 kN	63,225 lb	220 kN	49, 500 lb	261 kN	58,725 lb	—	—
Operating Weight**	27 371 kg	60,353 lb	27 744 kg	61,176 lb	27 648 kg	60,964 lb	27 478 kg	60,589 lb

* Breakout force is measured 100 mm (3.94") behind tip of cutting edge with bucket hinge pin as pivot point.

** Operating weight includes lubricants, full fuel tank, ROPS cab, General Purpose bucket, and 80 kg (176 lb) operator.

◀ Bolt-on teeth increase bucket width by 63.8 mm (2.5"). Bolt-on cutting edge increases bucket width by 19 mm (0.74").

Machine stability can be affected by the addition of other attachments. Add or subtract the following to/from machine operating weight and static tipping load:

	Change in Operating Weight		Change in Static Tipping Load	
	kg	lb	kg	lb
Ripper (includes 3 shanks and rear hydraulic arrangement)	—	—	—	—
Rear bumper (removal)	—	—	—	—

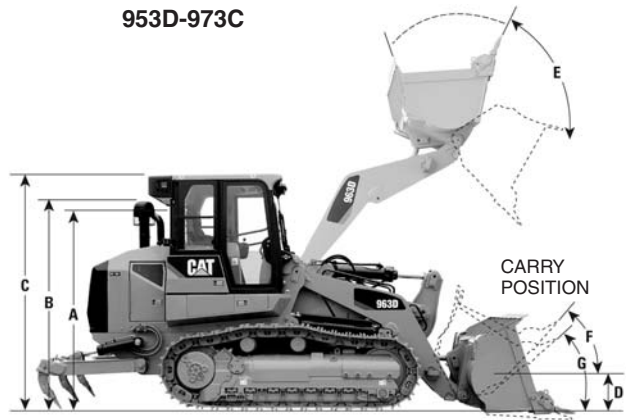
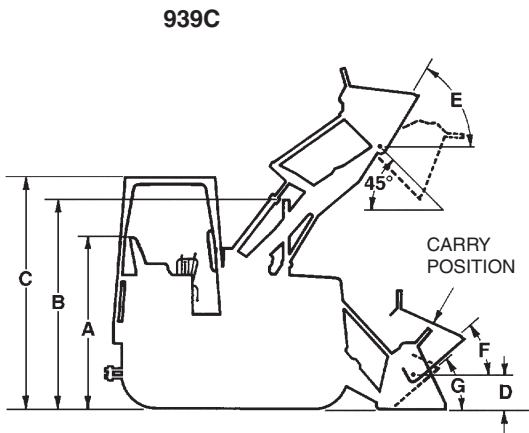
BUCKET	Multi-Purpose Bare		Multi-Purpose Bolt-on Segments & Long Teeth		Multi-Purpose Bolt-on Cutting Edge	
Capacity, Rated (Nominal Heaped)	2.75 m ³	3.60 yd³	3.05 m ³	3.99 yd³	2.86 m ³	3.74 yd³
Struck	2.33 m ³	3.05 yd³	2.7 m ³	3.53 yd³	2.44 m ³	3.19 yd³
Cutting Edge, Type	Straight		Straight		Straight	
Bucket Width ◀	2972 mm	117.0"	2972 mm	117.0"	2972 mm	117.0"
Teeth	None		8, bolt-on plus replaceable tips		None	
Dump Clearance @ Full Lift and 45° Discharge	3300 mm	129.9"	3106 mm	122.3"	3229 mm	127.1 mm
Reach @ 45° Discharge Angle 2133 mm (7'0") Clearance	2110 mm	83.1"	2327 mm	91.6"	2160 mm	85.0"
Digging Depth	188 mm	7.4"	244 mm	9.6"	219 mm	8.6"
Ground Clearance from Face of Shoes	582 mm	22.9"	582 mm	22.9"	582 mm	22.9"
Overall Machine Width without Bucket (with Standard Track)	2710 mm	106.7"	2710 mm	106.7"	2710 mm	106.7"
Overall Machine Width without Bucket (with Optional Track)	2835 mm	111.6"	2835 mm	111.6"	2835 mm	111.6"
Overall Length	7445 mm	293.1"	7743 mm	304.8"	7527 mm	296.3"
Overall Height	3510 mm	138.2"	3510 mm	138.2"	3510 mm	138.2"
Static Tipping Load	19 810 kg	43,681 lb	19 455 kg	42,898 lb	19 535 kg	43,075 lb
Breakout Force*	236 kN	53,100 lb	193 kN	43,425 lb	222 kN	49,950 lb
Operating Weight**	28 866 kg	63,650 lb	29 225 kg	64,441 lb	29 143 kg	64,260 lb

* Breakout force is measured 100 mm (3.94") behind tip of cutting edge with bucket hinge pin as pivot point.

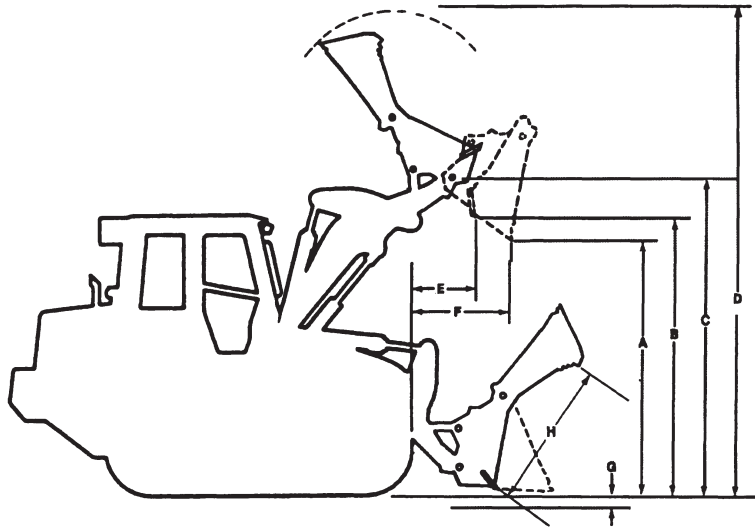
** Operating weight includes lubricants, full fuel tank, ROPS cab, General Purpose bucket, and 80 kg (176 lb) operator.

◀ Bolt-on teeth increase bucket width by 63.8 mm (2.5"). Bolt-on cutting edge increases bucket width by 19 mm (0.74").

Machine stability can be affected by the addition of other attachments.



	939C		953D		963D	
A Height to Top of Seat	2000 mm	79"	2560 mm	100.7"	2790 mm	109.8"
B Height to Top of Stack	2810 mm	110"	2783.5 mm	109.6"	2953 mm	116"
C Height to Top of ROPS	2760 mm	108"	3105 mm	122.2"	3335 mm	131"
D Hinge Pin Height at Carry Position	414 mm	16.3"	421 mm	16.5"	467 mm	18"
E Rollback at Maximum Lift		67.7°		56°		52°
F Rollback at Carry Height		51.2°		48°		50°
G Rollback at Ground Level		42.6°		41°		43°
Grading Angle (Bare Edge)		—		74°		63°
Width without Bucket (standard track)	1960 mm	77"	2280 mm	89.7"	2400 mm	94"
(optional track)	2010 mm	79"	2180 mm	85.8"	2300 mm	90.5"
Weight of General Purpose Bucket with Teeth & Segments		—	1266 kg	2792 lb	1866 kg	4114 lb
	973C		973D			
A Height to Top of Seat	2970 mm	116.92"	2975 mm	117.1"		
B Height to Top of Stack	2989 mm	117.67"	3018 mm	118.8"		
C Height to Top of ROPS	3500 mm	137.79"	3510 mm	138.2"		
D Hinge Pin Height at Carry Position	505 mm	19.58"	483 mm	19.0"		
E Rollback at Maximum Lift		58°		59°		
F Rollback at Carry Height		51°		49°		
G Rollback at Ground Level		42°		42°		
Grading Angle (Bare Edge)		69°		85°		
Width without Bucket (standard track)	2580 mm	101.57"	2710 mm	106.7"		
(optional track)	2755 mm	108.5"	2835 mm	111.6"		
Weight of General Purpose Bucket with Teeth & Segments	2183 kg	4814 lb	2090 kg	4608 lb		



	939C		953D		963D	
A Forward Dump Clearance*	2680 mm	106"	2738 mm	107.7"	3000 mm	118"
B Bottom Dump Clearance*	3050 mm	120"	3181 mm	125.2"	3450 mm	135.8"
C Hinge Pin Height*	3320 mm	131"	3610 mm	142.1"	3940 mm	155"
D Overall Height	4680 mm	184"	4871 mm	192"	5308 mm	209"
E Bottom Dump Reach	453 mm	18"	559 mm	22"	627 mm	24.7"
F Forward Dump Reach*	776 mm	31"	973 mm	38"	1079 mm	42.5"
G Digging Depth	127 mm	5"	142 mm	5.6"	161 mm	6.3"
H Bucket Opening	930 mm	36"	1061 mm	41.7"	1248 mm	49"
Reach at 2133 mm (7'0") Height*	1200 mm	47"	1434 mm	56.4"	1598 mm	63"
Tilt Back at Ground Level		43°		42°		45°
Closure Force, Clamp to Cutting Edge	56.8 kN	12,780 lb		N/A		N/A
Weight of Bucket with Teeth, Segments and Additional Hydraulics	1005 kg	2216 lb	1762 kg	3884.5 lb	2236 kg	4930 lb
	973C		973D			
A Forward Dump Clearance*	2830 mm	111.41"	3138 mm		123.5"	
B Bottom Dump Clearance*	3660 mm	144.09"	3670 mm		144"	
C Hinge Pin Height*	4240 mm	166.92"	4234 mm		166.7"	
D Overall Height	5800 mm	228.34"	5651 mm		222.4"	
E Bottom Dump Reach	693 mm	27.28"	655 mm		26"	
F Forward Dump Reach*	1403 mm	55.23"				
G Digging Depth	254 mm	9.99"	159 mm		6.26"	
H Bucket Opening	1380 mm	54.33"				
Reach at 2133 mm (7'0") Height*	1936 mm	76.22"	2327 mm		92"	
Tilt Back at Ground Level		45°			45°	
Closure Force, Clamp to Cutting Edge	89 kN	20,000 lb				
Weight of Bucket with Teeth, Segments and Additional Hydraulics	3560 kg	7850 lb	3453 kg		7614 lb	

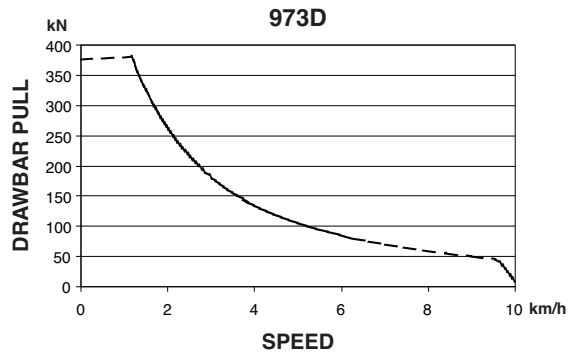
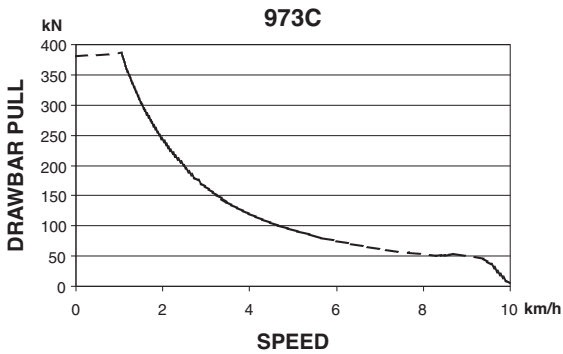
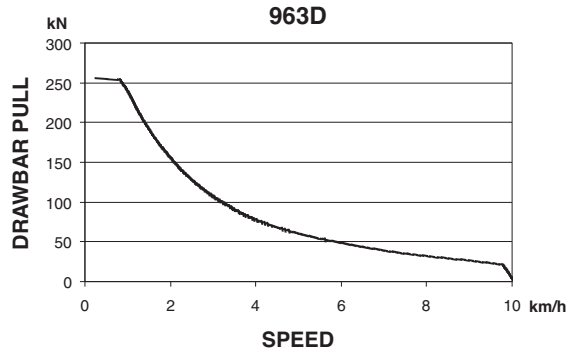
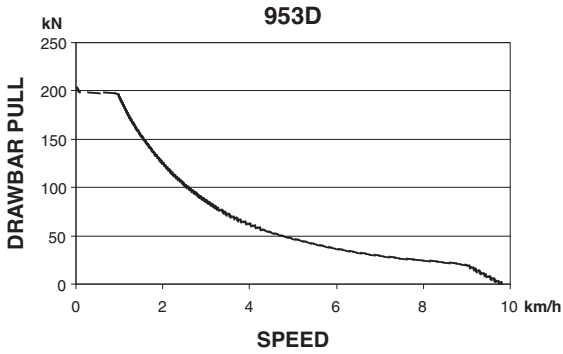
*45° Discharge and full lift.
 Operator may prefer to tip bucket forward when bottom dumping.

TRACK LOADER	939C		953D		963D	
Ripper-Scarifier Type	Radial		Radial		Radial	
Dimensions:						
Ripper Shank						
Maximum Penetration Depth	205 mm	8.1"	240 mm	9.45"	330 mm	12.99"
Maximum Reach at Ground Line (from track to teeth on ground)	627 mm	24.7"	1350 mm	53"	1585 mm	62.4"
Maximum Ground Clearance under Tip (shank pinned in bottom hole)	593 mm	23.3"	552 mm	21.7"	667 mm	26.3"
Maximum Ramp Angle, Ripper Up (shank pinned in bottom hole)	33.5°		18°		17°	
Shank Section	36 × 76 mm 1.4" × 3"		50 × 109 mm 2.0" × 4.3"		58.5 × 138 mm 2.3" × 5.4"	
Ripper Beam						
Overall Width	1580 mm	62"	1950 mm	76.8"	1950 mm	76.7"
Height	130 mm	5.1"	165 mm	6.5"	165 mm	6.5"
Length	140 mm	5.5"	211 mm	8.3"	211 mm	8.3"
Number of Pockets	5		3		3	
Pocket Spacing	356 mm	14"	900 mm	35.4"	896 mm	35.2"
Shank Gauge	1420 mm	56"	1800 mm	70.8"	1792 mm	70.5"
Track Clearance with Standard Shoe	139 mm	5.5"	105.2 mm	4.1"	225.3 mm	8.9"
Installed Weights:						
Ripper with Standard Shank (1 shank)	250 kg	550 lb	581 kg	1281 lb	713 kg	1572 lb
Each Additional Shank	11 kg	24 lb	25 kg	55 lb	36 kg	79 lb
Ripper Forces*						
Penetration Force at Ground Level	2687 kg	5924 lb	50 kN	11,240 lb	64 kN	14,400 lb
Pryout Force at Maximum Digging Depth	5265 kg	11,610 lb	116 kN	26,077 lb	151 kN	33,946 lb

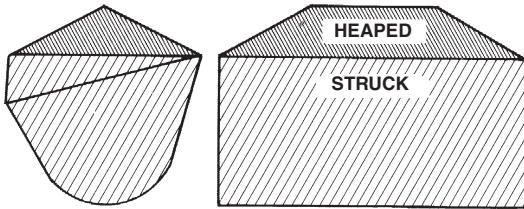
*These values may vary slightly with different vehicle configurations.

TRACK LOADER	973C		973D	
Ripper-Scarifier Type	Radial		Parallelogram	
Dimensions:				
Ripper Shank				
Maximum Penetration Depth	377 mm	14.84"	397 mm	15.6"
Maximum Reach at Ground Line (from track to teeth on ground)	1770 mm	69.7"	1938 mm	76.3"
Maximum Ground Clearance under Tip (shank pinned in bottom hole)	688 mm	27.09"	888 mm	34.9"
Maximum Ramp Angle, Ripper Up (shank pinned in bottom hole)		20°		28.5°
Shank Section		74 × 175 mm 2.9" × 6.9" (Curved)		74 × 175 mm 2.9" × 6.9"
Ripper Beam				
Overall Width	2200 mm	86.61"	2200 mm	86.6"
Height	216 mm	8.5"	216 mm	8.5"
Length	254 mm	10"	254 mm	10"
Number of Pockets		3		3
Pocket Spacing	1000 mm	39.36"	875 mm	34.4"
Shank Gauge	2000 mm	78.73"	1750 mm	68.9"
Track Clearance with Standard Shoe		N/A		N/A
Installed Weights:				
Ripper with Standard Shank (1 shank)	1196 kg	2636 lb	1700 kg	3747 lb
Each Additional Shank		3 shanks std.		3 shanks std.
Ripper Forces*				
Penetration Force at Ground Level	85 kN	19,125 lb	100 kN	22,500 lb
Pryout Force at Maximum Digging Depth	175 kN	39,375 lb	242 kN	54,450 lb

*These values may vary slightly with different vehicle configurations.



NOTES: Usable pull will depend upon weight and traction of equipped tractor.
 Assumes sufficient machine weight for <5% track slip at POR pressure.
 Assumes pumps and motors are broken in.
 Assumes nominal engine power and valve settings.
 Drawbar pull at track stall will be lower.

SAE BUCKET RATING**SAE Bucket Capacities**

Struck capacity is that volume contained in a bucket after a load is leveled by drawing a straight edge resting on the cutting edge and the back of the bucket.

Heaped capacity is a struck capacity *plus* that additional material that would heap on the struck load at a 2:1 angle of repose with the struck line parallel to the ground.

SAE J742 (Oct. 79) specifies that the addition of any auxiliary spill guard to protect against spillage of material which might injure the operator will not be included in bucket capacity ratings. Buckets with irregular shaped cutting edges (vee edge) the strike plane should be drawn at one-third the distance of the protruding portion of the cutting edge. Cat rock buckets are built with integral see-through rock guards. Cat light material buckets come standard with bolt-on edges. These features which add to actual bucket capacity are included in published ratings.

Dump Height

SAE J732 JUN92 specifies that dump height is the vertical distance from the ground to the lowest point of the cutting edge with the bucket hinge pin at maximum height and the bucket at a 45° dump angle. Dump angle is the angle in degrees that the longest flat section of the inside bottom of the bucket will rotate below horizontal.

Static Tipping Load

The minimum weight at center of gravity of “SAE Rated” load in bucket which will rotate rear of machine to a point where, on track loaders, front rollers are clear of the track under the following conditions:

- a. Loader on hard level surface and stationary.
- b. Unit at standard operating weight.
- c. Bucket at maximum rollback position.

- d. Load at maximum forward position during raising cycle.
- e. Unit with standard equipment as described in specifications unless otherwise noted under the heading.

Operating Load

In order to comply with SAE standard J818 MAY87, the operating load for track loaders should not exceed 35% of the Static Tipping load rating. See “Performance Data” of each machine in this handbook for increases to static tipping load by adding cab, counterweights, ripper-scarifier, etc.

SELECTING A MACHINE**Steps in selecting the proper size loader:**

1. Determine production required or desired.
2. Determine loader cycle time and cycles per hour. A machine size must be assumed to select a basic cycle time.
3. Determine required payload per cycle in loose cubic yards and pounds (meters and kilograms).
4. Determine bucket size needed.
5. Make machine selection using bucket size and payload as criteria to meet production requirements.
6. Compare the loader cycle time used in calculations to the cycle time of the machine selected. If there is a difference, rework the process beginning at step 2.

1. Production Required

The production required of a track loader should be slightly greater than the production capability of the other critical units in the earth or material moving system. For example, if a hopper can handle 300 tons per hour, a loader capable of slightly more than 300 tons should be used. Required production should be carefully calculated so the proper machine and bucket selections are made.

2. Loader Cycle Times

Material type, pile height, and other factors may improve or reduce production, and should be added to or subtracted from the basic cycle time when applicable.

When hauls are involved, obtain haul and return portions of the cycle from the estimated travel chart (this section). Add the haul and return times to the estimated basic cycle time to obtain total cycle time.

CYCLE TIME FACTORS

A basic cycle time (Load, Dump, Maneuver) of 0.25-0.35 minutes is average for a track loader [the basic cycle for large track loaders, 2 m³ (2.6 yd³) and up, can be slightly longer], but variations can be authenticated in the field. The following values for many variable elements are based on normal operations. Adding or subtracting any of the variable times will give the total basic cycle time.

Estimating Cycle Time

Cycle time of a track loader needs to be determined to find loads per hour. Total cycle time includes the following segments:

Load Time + Maneuver Time + Travel Time + Dump Time

Load Time —

Material	Minutes
Uniform aggregates	0.03-0.05
Moist mixed aggregates	0.03-0.06
Moist loam	0.03-0.07
Soil, boulders, roots	0.04-0.20
Cemented materials	0.05-0.20

Maneuver Time — includes basic travel, four changes of direction and turning time, and will be about 0.20 minutes with a competent operator.

Travel Time — in a load and carry operation is comprised of haul and return times which can be determined by the travel charts in this section.

Dump Time — is dictated by the size and strength of the dump target and varies from 0.00 to 0.10 minutes. Typical dump times into highway trucks are from 0.04 to 0.07 minutes.

NOTE: When comparing hydrostatic track loaders with former power shift models (using the production estimating method) two factors must be considered: (1) The hydrostatic track loaders on the average outcycle power shift models by up to 10 percent due to faster machine speed and easier operation. (2) Larger, rear engine hydrostatic track loaders incorporate Z-bar linkage, which provides substantially better bucket fill factors. The degree to which each factor affects estimated production should be left to the user's judgment depending on the particular job application and conditions.

Example: Moist loam is being excavated from a bank and loaded into trucks.

	Minutes
Load — moist loam	0.05
Maneuver Time	0.20
Travel — none required	0.00
Dump	<u>0.05</u>
Total Cycle	0.30 min. or 200 cycles per 60 min. hour

*Minutes added (+)
or Subtracted (-)
From Basic Cycle*

Materials

- Mixed+0.02
- Up to 3 mm (1/8 in)+0.02
- 3 mm (1/8 in) to 20 mm (3/4 in)-0.02
- 20 mm (3/4 in) to 150 mm (6 in) 0.00
- 150 mm (6 in) and over+0.03 and Up
- Bank or broken+0.04 and Up

Pile

- Conveyor or Dozer piled 3 m (10 ft) and up 0.00
- Conveyor or Dozer piled 3 m (10 ft) or less+0.01
- Dumped by truck+0.02

Miscellaneous

- Common ownership of trucks and loadersUp to -0.04
- Independently owned trucksUp to +0.04
- Constant operationUp to -0.04
- Inconsistent operationUp to +0.04
- Small targetUp to +0.04
- Fragile targetUp to +0.05

Using actual job conditions and the above factors, total cycle time can be estimated. Convert total cycle time to cycles per hour.

$$\text{Cycles per hour at 100\% Efficiency} = \frac{60 \text{ Min}}{\text{Total Cycle Time in Minutes}}$$

Job efficiency is an important factor in machine selection. Efficiency is the actual number of minutes worked during an hour. Job efficiency accounts for operator breaks, and other work interruptions. See "Efficiency Considerations" page 13-23.

- Bucket Fill Factors
 - Recommended Operating Capacities
- ## Loader Production

Bucket Fill Factors

The following indicates the approximate amounts of material as a percent of rated bucket capacity which will actually be delivered per bucket per cycle. This is known as “Bucket Fill Factor.”

Loose Material	Fill Factor
Mixed Moist Aggregates	95-110%
Uniform Aggregates	
up to 3 mm (1/8 in)	95-110
3 mm-9 mm (1/8 in-3/8 in)	90-110
12 mm-20 mm (1/2 in-3/4 in)	90-110
24 mm and over (1 in)	90-110
Blasted Rock	
Well	80-95%
Average	75-90
Poor	60-75
Other	
Rock Dirt Mixtures	100-120%
Moist Loam	100-120
Soil, Boulders, Roots	80-100
Cemented Materials	85-100

Fill factors on track loaders are affected by bucket penetration, breakout force, rackback angle, bucket profile and ground engaging tools such as bucket teeth and segments or bolt-on replaceable cutting edges.

GENERAL PURPOSE BUCKET W/TEETH & SEGMENTS MAXIMUM OPERATING CAPACITIES

MODEL	GENERAL PURPOSE BUCKET SIZE		MAXIMUM OPERATING CAPACITY	
	m ³	yd ³	kg	lb
939C	1.15	1.5	2040	4500
953D	1.85	2.4	3182	7015
963D	2.45	3.2	4214	9290
973C	3.2	4.2	5504	12,134
973D	3.21	4.2	5521	12,174

LOADER PRODUCTION

Loader production equals quantity of material the bucket carries per load × number of bucket loads per hour.

Estimating Bucket Load

The quantity of material in a loader bucket is estimated by two methods, depending on whether the material being loaded is in a loose or bank state.

1. When the material is loose, as in stockpile loading, the bucket load is estimated in loose meters (or cubic yards) by a Bucket Fill Factor (see Tables Section or chart following this discussion). The quantity of material is determined as follows:

$$\text{Rated Bucket Capacity} \times \text{Bucket Fill Factor} = \text{Bucket Payload in Loose m}^3 \text{ (yd}^3\text{)}$$

For example, a 973 with a 3.2 m³ (4.2 yd³) General Purpose bucket loading moist loam material will carry:

$$3.2 \text{ m}^3 \times 1.15 = 3.68 \text{ loose cubic meters}$$

$$(4.2 \text{ yd}^3 \times 1.15 = 4.83 \text{ loose cubic yards})$$

Once the potential bucket load has been determined, check the static tipping load ratings on the specific machine to determine if bucket load is in fact a safe operating load. (*Safe operating load as defined by SAE for track loaders should not exceed 35% of static tipping load.*)

Productivity in many applications is measured in tons. See Tables Section for material densities if conversion to tons is desired.

2. When material is in the bank state, as in excavation, productivity is measured in bank meters (cubic yards). Bucket load in Bm³ (BCY) is estimated by applying one of the load factors from the Tables section to convert the excavated material in the bucket from Bm³ (BCY) to Lm³ (LCY) to allow for the digging and carrying characteristics of the material. The quantity of excavated material a bucket carries is then determined as follows:

$$\text{Rated Bucket Capacity} \times \text{Load Factor} \times \text{Bucket Fill Factor} = \text{Bucket Payload in Bm}^3 \text{ (BCY)}$$

Example: a 953D with a 1.85 m³ (2.4 yd³) General Purpose bucket loading wet loam earth from bank:

$$1.85 \text{ m}^3 \times 0.79 \times 1.15 = 1.68 \text{ Bm}^3$$

$$(2.4 \text{ yd}^3 \times 0.79 \times 1.15 = 2.18 \text{ BCY})$$

- Estimating Production
- Alternative Machine Selection Method

Estimating Production

Machine and job considerations include:

- Machine model and bucket size
- Material type, particle size, density and load factor (see Tables Section)
- Bucket fill factor
- Haul distance
- Underfoot conditions
- Altitude
- Dump target size, height, and type

Example:

Conditions —

Machine	953D
Bucket size	1.85 m ³ (2.4 yd ³)
Material	Moist Loam
Bucket fill factor	1.15
Haul length	30 m (100 ft)
Dump target	Pile
Travel in forward speed	

Cycle Time

Minutes

Load time	0.15
Maneuver time	0.20
Travel time (from curves)	0.40
Dump time	0.05
Total	0.80

Loads Per Hour —

$$\frac{60 \text{ min/hr}}{0.80 \text{ min/cycle}} = 75 \text{ cycles per hour @ 100\% efficiency}$$

Load Per Cycle —

$$1.85 \text{ m}^3 \times 1.15 \text{ BFF} = 2.13 \text{ Lm}^3 \times 0.81 \text{ LF} = 1.72 \text{ Bm}^3$$

$$(2.4 \text{ yd}^3 \times 1.15 \text{ BFF} = 2.76 \text{ LCY} \times 0.81 \text{ LF} = 2.24 \text{ BCY})$$

Hourly Production —

$$1.72 \text{ Bm}^3 \times 75 \text{ cycles/h} = 129 \text{ Bm}^3/\text{h}$$

$$(2.24 \text{ BCY} \times 75 \text{ cycles/hr} = 168 \text{ BCY/hr})$$

More accurate production estimates can be made by recording actual machine cycle times in the same or similar application. Then visually verify the approximate bucket fill factor.

Efficiency Considerations

Loader capacity should always be matched to peak production requirements of the job. Actual “on-the-job” loader productivity will be influenced by factors such as operator skill, personal delays, job layout and other delays. Experience and knowledge of local conditions will be the best indicators of actual job efficiency.

<u>Operation</u>	<u>Working Hour</u>	<u>Efficiency Factor</u>
Day	50 min/Hr	0.83

An Alternative Machine Selection Method

Another method of selecting the right Track Loader and bucket to meet production requirements is by use of the nomographs on the following pages. The method is quicker and easier than the preceding example because it does not require as many calculations, yet the accuracy is about the same within the normal limits of input data.

Be careful when entering and reading data from the nomographs because some scales increase from bottom to top, while others are the reverse. Do not be overly concerned with the precision as affected by pencil line width or reading to the hundredth of a m³ (yd³). Remember that bucket fill factor, material density, and cycle time are at best close estimates.

Example problem

A track loader must produce 200 Lm³ (262 LCY) per hour. Estimated cycle time is 0.5 minutes, working 50 minutes per hour. Bucket fill factor is 110% and the material density is 1600 kg/Lm³ (2700 lb/LCY).

Determine bucket size, machine model and hourly production in tons and yards.

Solution

At full efficiency, it will cycle 120 times per hour. Since only an average 50 minutes are available, only 100 cycles will be completed per hour.

Starting on Scale A at 100 cycles per hour draw a straight line intersecting 200 m³/hr (262 yd³/hr) on Scale B and continuing the line on to Scale C giving 2.0 m³ (2.62 yd³) required payload.

Follow steps 1 through 7 on the next two pages.

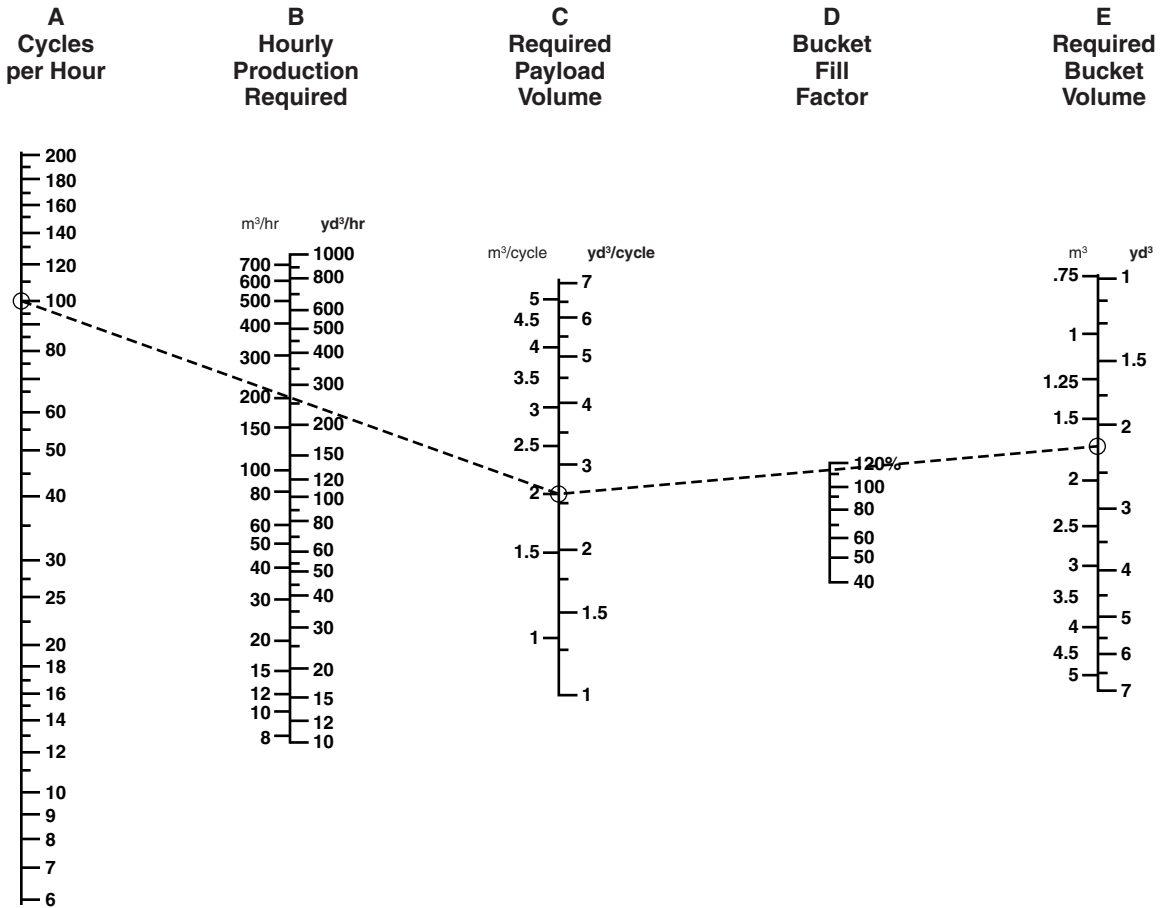


Track Loaders

Production and Machine Selection Nomograph

- To find required bucket payload and bucket size

- 1) Enter Scale A cycles per hour (100) and B hourly production 200 m³/hr (262 yd³/hr).
- 2) Connect A and B and extend to C to find required payload 2.0 m³ (2.62 yd³).
- 3) Connect C to bucket fill factor on Scale D (110%) and extend to E to find required bucket size 1.8 m³ (2.35 yd³).
- 4) Transfer Scale A and C readings to nomograph on following page.



Production and Machine Selection Nomograph

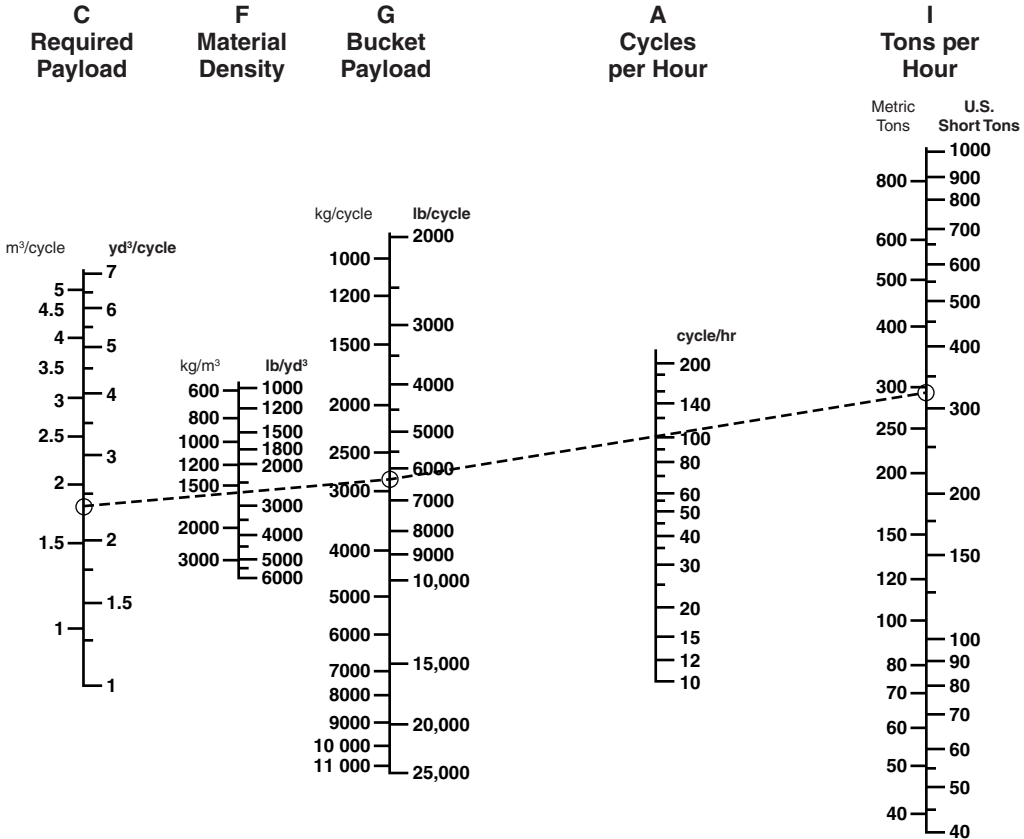
Track Loaders

- To find payload weight for stability and output in tons per hour

- 5) Connect C 1.8 m³ (2.35 yd³) to F 1600 kg/m³ (2700 lb/yd³) and extend to G to find payload weight 2880 kg (6345 lb).
- 6) Compare G bucket payload weight 2880 kg (6345 lb) with maximum operating capacities table in this section to see if the 1.85 m³ (2.4 yd³) bucket can handle the desired payload. Table indicates the

953D with a 1.85 m³ (2.4 yd³) bucket equipped with bolt-on cutting edge or teeth and segments has a greater operating capacity of 3343 kg (7370 lb), therefore stability is okay.

- 7) Extend Scale G reading 2880 kg (6345 lb) through Scale A (100) to Scale I to find tons per hour 288 metric ton/hr (317 U.S. ton/hr).



TRAVEL TIME CHARTS

Conditions:

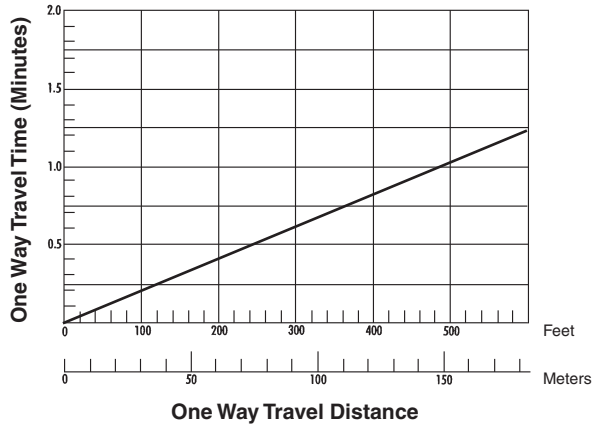
- No grades.
- Speeds loaded and empty essentially the same.
- Bucket position constant during travel.
- Travel encountered in maneuver time portion of cycle not included.
- Acceleration time accounted for in maneuver time.

Travel Time (in minutes) =

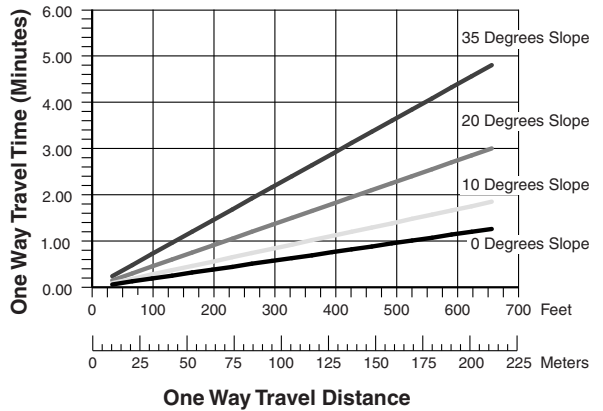
$$\text{Metric} - \frac{\text{number of meters traveled}}{\text{speed (in km/h)} \times 16.67}$$

$$\text{English} - \frac{\text{number of feet traveled}}{\text{speed (in mph)} \times 88}$$

939C



953D

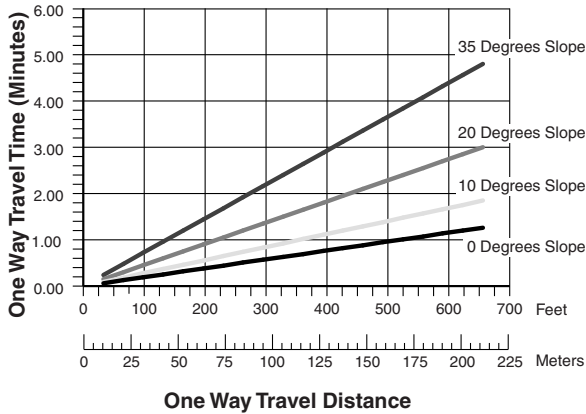


KEY

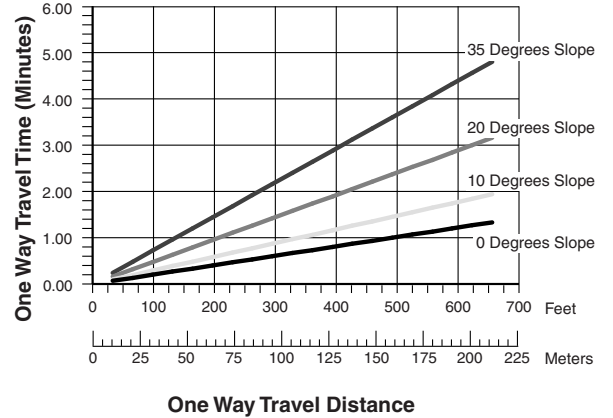
939C — Hydrostatic top speed both forward and reverse 10 km/h (6.2 mph).

953D — Hydrostatic top speed both forward and reverse 10 km/h (6.2 mph)

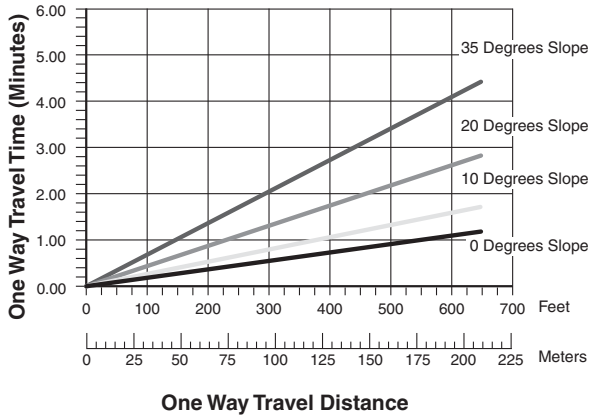
963D



973C



973D



TRAVEL TIME CHARTS

Conditions:

- No grades.
- Speeds loaded and empty essentially the same.
- Bucket position constant during travel.
- Travel encountered in maneuver portion of cycle not included.
- Acceleration time accounted for in maneuver time.

Travel Time (in minutes) =

$$\text{Metric} - \frac{\text{number of meters traveled}}{\text{speed (in km/h)} \times 16.67}$$

$$\text{English} - \frac{\text{number of feet traveled}}{\text{speed (in mph)} \times 88}$$

KEY

- 963D — Hydrostatic top speed both forward and reverse 10 km/h (6.2 mph)
- 973C — Hydrostatic top speed both forward and reverse 10 km/h (6.2 mph)
- 973D — Hydrostatic top speed both forward and reverse 11 km/h (6.83 mph)

Track Loaders

Production Estimating Table

- m^3 or $yd^3/60$ min. hour
- Estimated bucket payload in bank m^3 or yd^3

Bucket Size (m^3 or yd^3)		1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Cycle Time Hundredths of a minute	Cycles Per Hr	Unshaded area indicates average work range								
		0.25	240	240	360	480	600	720	840	960
0.30	200	200	300	400	500	600	700	800		
0.35	171	171	257	342	428	513	599	684	769	
0.40	150	150	225	300	375	450	525	600	675	750
0.45	133	133	200	268	332	400	466	530	600	665
0.50	120	120	180	240	300	360	420	480	540	600
0.55	109	109	164	218	272	328	382	436	490	545
0.60	100	100	150	200	250	300	350	400	450	600
0.65	92	92	138	184	230	276	322	368	416	460

Work Tools	939C	953D	963D	973C	973D
Quick Coupler	X	X	X	X	X
General Purpose (GP) bucket	X	X	X	X	X
GP bucket with trash rack		X	X	X	X
MP bucket with trash rack		X	X	X	X
Landfill bucket		X	X	X	X
Landfill Multi-purpose		X	X	X	X
Multi-purpose (MP) bucket	X	X	X	X	X
Trim blade		X	X	X	X
Slag bucket				X	X
Forks (for QC or bucket)		X	X	X	X
Material handling arm		X	X	X	X
Loader rake		X	X	X	X
Top-Clamp bucket		X		X	X
Side Dump bucket		X	X	X	X

SHOE OPTIONS



① **Double Grouser Shoes**

- **Extreme service shoes** are available which have more hardened wear material for longer wear life and higher impact applications.



② **Trapezoidal Center Hole Shoes**



③ **Single Grouser Shoes**

- **Wider shoes** are also available to reduce ground pressure in soft underfoot conditions.



④ **Chopper Shoes**

Other shoe options are available. Consult a Cat dealer for more information.

SYSTEMONE SHOES



Double Grouser Shoes

- Work best in applications that require less penetration and traction.
- Recommended for applications that require better turning capability and less ground disturbance.
- Feature two or three short grousers instead of one tall grouser.



Center Hole Shoes

- Work best in applications where packing causes the track to tighten. They are recommended for applications with large amounts of debris that tend to pack in the track.
- Reduces extricable packing between the shoe and the bushing since they allow the sprocket to punch out dirt and debris.

