

MOTOR GRADERS

CONTENTS

Industries Served	11-1
Features	11-2
Applications.	11-6
Truck to Motor Grader Match	11-8
Specifications: Standard Versions	11-9
Specifications: Global Versions.	11-12
Travel Speeds	11-19
All Wheel Drive (AWD)	11-21
Mid Mount and Front Mount Scarifiers	11-21
Rear Ripper and Rear Ripper Scarifier	11-22
Production	11-27
Formulas	11-29
Extreme Slope Operation	11-30
Work Tools.	11-31

INDUSTRIES SERVED

The motor grader is one of the most versatile work tools in the Cat® product line. The M Series machines are used in numerous applications within a wide range of industries. The major industries using Cat motor graders, along with the typical applications within each, are summarized below.

● Heavy Construction

- Highway Construction
- Paving/Resurfacing
- Airport Construction
- Railroad Construction
- Dam and Levee Construction
- Haul Road Maintenance

● Governmental

- Road Maintenance
- Road Construction
- Ditch Building/Cleaning
- Snow Removal

● Building Construction

- Residential Construction
- Commercial Construction
- Industrial Construction
- Sewer and Water Systems

● Industrial

- Waste Disposal
- Pipeline Construction

● Mining

- Haul Road Maintenance
- Snow Removal

● Forestry

- Access Road Construction
- Forest Development
- Snow Removal
- Haul Road Maintenance

- **Geographic Versions** — Cat motor graders were specifically designed to meet the needs of different geographic regions and regulations. K/K2 Series for less regulated locations and M/M2/M3 Series are available with an assortment of standard features and optional equipment. All motor graders feature advanced electronically controlled Cat engines, power train components, hydraulics and machine structures.

FEATURES, M Series Motor Graders:

Building on the strong heritage of the H Series, the M Series delivers multiple technological breakthroughs, setting the new standard for motor graders. The H Series has been the industry standard in a variety of heavy construction, mining, road building and governmental applications. The M Series continues this tradition, incorporating revolutionary, customer-driven enhancements by:

- Improving ease of operation and operation training time
- Offering best-in-class operator station and unmatched visibility
- Delivering maximum productivity
- Improving availability and decreasing maintenance time

The M Series line includes eleven models: 120, 120 AWD, 140, 140 AWD, 160, 160 AWD, 12, 12 AWD, 14, 16, 24. The 120 through 14 meet construction, road building, and governmental applications. The All Wheel Drive models improve traction in poor underfoot conditions such as snow, mud, and sand. The 16 and 24 meet the specialized needs of large mining customers.

- **Operation Station:** The 120 through 16 models feature a revolutionary cab design that provides unmatched comfort, visibility, storage and ease of use, which can enhance operator confidence and productivity. The interior noise level is maintained between 70 and 74 dB(A) with the doors and windows closed.

Ease of Operation. The revolutionary joystick controls and exceptional visibility make operating easier without sacrificing control. The intuitive joystick control pattern allows both new and experienced operators to become productive quickly. Logical grouping of hydraulic functions in the joysticks allow any operator to easily control several functions at the same time. This allows the operator to be more productive and remain comfortable throughout the work shift.

Advanced Joystick Controls. Two electro-hydraulic joysticks reduce hand and wrist movement as much as 78% compared to conventional lever controls for greatly enhanced operator efficiency. The intuitive pattern is easy to learn and provides the precise implement control to allow both new and experienced operators to become productive quickly. Logical grouping of hydraulic functions in the joysticks allow any operator to control several functions at the same time for more productivity.

Visibility. The 120 through 16 models boast excellent visibility to the work area, made possible with angled cab doors, a tapered engine enclosure and a patented sloped rear window. Ample glass area and carefully placed components provide excellent visibility to enhance operator confidence and productivity in all motor grader applications. The cab design gives the operator an exceptional view forward to the blade, working surface and front tires. The black glare-reducing paint on the front frame and engine enclosure enhances visibility.

- **Drawbar, Circle and Moldboard:** The 120 through 16 models provide a broad range of extended blade positions particularly beneficial in mid-range bank sloping, ditch cutting and ditch cleaning. A long wheel base allows for an aggressive blade angle permitting material to roll more freely, reducing power requirements. Top-accessible drawbar wear inserts and the shimless moldboard retention system make DCM adjustments fast and simple, delivering more precise material control while lowering operating costs.

Top-Adjust Drawbar Wear Strips. The patented top-adjust wear strips dramatically reduce drawbar/circle adjustment time. By removing the access plates on top of the drawbar, shims and wear strips can easily be added or replaced. This feature reduces service downtime and lowers overall machine operating costs.

Shimless Moldboard Retention System. The unique shimless moldboard retention system reduces the potential for blade chatter. Adjusting screws keep the moldboard's wear strips aligned for precise blade control and dramatic reductions in service time.

- **Power Train:** Integrated, electronically controlled systems, deliver smooth reliable performance with reduced operating costs.

Smooth Shifting Transmission. The transmission design combines several key innovations to ensure smooth, powerful shifts throughout the gear range.

Advanced Productivity Electronics Control Strategy (APECS). APECS utilizes an electronic control strategy to read the input from sensors to shift the transmission at the optimal point. Event based shifting allows operators to experience faster, smoother and more consistent shifts. Note: M Series 3 Only.

Electronically Controlled Shifting. The full Electronic Clutch Pressure Control (ECPC) system optimizes inching modulation and smoothes shifting between all gears and directional changes. This provides outstanding control and also extends the life of the transmission by reducing stress on gears.

Load Compensation. This standard feature ensures consistent shift quality regardless of blade or machine load.

Hydraulic Brakes. The oil bathed, multi-disc service brakes are hydraulically actuated, providing smooth predictable braking and lower operating costs. With brakes located at each tandem wheel, the Cat motor graders offer the largest total brake surface area in the industry, delivering dependable stopping power and longer brake life.

- **Engine:** The Cat motor grader combines power management with ACERT™ Technology to deliver maximum power and efficiency while reducing the environmental impact.

ACERT Technology. ACERT Technology allows Cat engines to supply more power per unit of displacement without causing premature wear. This breakthrough technology reduces emissions during the combustion process by using advanced technology in the air and fuel systems, in conjunction with integrated electronics. ACERT Technology enhances overall engine performance while dramatically reducing exhaust emissions.

Power Management. Power Management utilizes Variable Horse Power (VHP) and Variable Horse Power Plus (VHP Plus) to optimize motor grader performance. VHP delivers additional power in the working gear while balancing fuel consumption, traction and horsepower. VHP Plus, delivers additional power in each forward gear 5th through 8th for increased speed on grade and performance.

Exhaust Emission Standards. The Cat ACERT Technology engines in the M Series Motor Graders meet U.S. EPA Tier 3/EU Stage IIIA equivalent/Japan 2006 (Tier 3) emission standards. The M Series 2 machines meet U.S. EPA Tier 4 Interim/EU Stage IIIB/Japan 2011 (Tier 4 Interim) equivalent emission standards. The M Series 3 machines meet U.S. EPA Tier 4 Final/EU Stage IV/Japan 2014 (Tier 4 Final) emission standards.

- **Hydraulics:** Electro-hydraulics enable advanced machine controls with precise and predictable movements.

Advanced Electro-Hydraulic System. The Cat motor grader product line incorporates a state-of-the-art electro-hydraulic system. This technology is the foundation for revolutionary changes of the machine and implement controls. Advanced joystick controls provide unmatched controllability with precise, predictable hydraulic movements and the reliability you expect from Cat products.

Load Sensing Hydraulics (PPPC). The time proven load-sensing system and the advanced Proportional Priority Pressure-Compensating (PPPC, or “triple-PC”) electro-hydraulic valves are designed to provide superior implement control and enhanced machine performance in all applications. Continuous matching of hydraulic flow and pressure to power demands creates less heat and reduces power consumption.

- **Serviceability:**

Grouped Service Points. Grouped daily service points in the left side service center help ensure proper maintenance and inspection routines.

Extended Service Intervals. Extended service intervals, such as 500-hour engine oil changes and 4000-hour hydraulic oil changes, reduce machine service time and increase availability.

Ecology Drains. Conveniently located ecology drains shorten service times and help keep the environment safe by preventing spills.

Diagnostics and Monitoring. Cat Messenger and Cat Message are offered as standard equipment to enhance diagnostic capabilities by displaying machine system errors and fault codes. Cat Electronic Technician is a two way communication tool that provides easy access to stored diagnostic data and lets technicians configure machine parameters through the Cat Data Link. Product Link™ provides a communication flow of vital machine data and location. Cat motor graders integrate Cat Messenger, Cat Electronic Technician, and S•O•SSM analysis for easy monitoring and fast troubleshooting, keeping your machine up and running. Note: Cat Messenger is standard on M Series and M Series 2 only. Cat Message is standard on M Series 3 only.

- **Safety.** Safety is an integral part of all machine and system designs. Cat motor graders provide a safe working environment for both the operator and ground personnel. ROPS and FOPS structures meeting current SAE and ISO requirements are standard on all Global machines. Back-up alarms are a standard feature.

Operator Presence System. The Operator Presence System keeps the parking brake engaged until the operator is seated for safe operation.

Secondary Steering System. The standard secondary steering system automatically engages in case of a drop in steering pressure, allowing the operator to steer the machine to a stop.

Speed Sensitive Steering. The steering software automatically provides an infinitely variable ratio between the joystick and the steer tires, resulting in less sensitive steering as the groundspeed increases.

Hydraulic Lockout. A simple switch located in the cab disables all implement functions while still providing machine steering control. This safety feature is especially useful while the machine is roading.

Circle Drive Slip Clutch. This standard feature protects the drawbar, circle and moldboard from shock loads when the end of the blade encounters immovable objects. It also reduces the possibility of abrupt directional changes in poor traction conditions, protecting the machine, operator and surroundings.

Blade Lift Accumulators. This optional feature uses accumulators to help absorb impact loads to the moldboard by allowing vertical blade travel. Blade lift accumulators reduce unnecessary wear and help to avoid unintended machine movement for increased operator safety.

Drop-Down Rear Lights. Optional drop-down lights fold out from the rear of the machine. This creates a wider, lower profile, to be better aligned with passenger cars.

Rearview Camera. Visibility is further enhanced with an optional Work Area Vision System (WAVS) LCD color monitor in the cab.

- **Automatic Differential Lock/Unlock.** The Auto Diff-Lock feature automatically unlocks the differential during a turn, re-locks when straight, for easier operation and improved power train protection.
- **Swing Out Cooling Fan.** This standard feature allows for easy access to the cooling cores reducing time required for clean out. The latched door requires no tools for opening and closing. Note: M Series 2 and M Series 3 Only.

FEATURES, K Series Motor Graders:

Overview

The K Series model line-up is targeted to meet customer requirements in less regulated countries. Built on the success of the Standard H Series, the K Series delivers multiple improvements in emissions control and operator features, while still maintaining the industry standard for reliability. The K Series model line up consists of the 120K, 120K2, 12K, 140K, 140K2, and 160K.

Engine

- **ACERT Engine Technology:** Cat ACERT engine technology utilizes numerous advanced components to efficiently produce more power and reduce emissions.
- **Emissions:** The K Series Motor Graders meet U.S. EPA Tier 2/EU Stage II equivalent emission standards. The K Series 2 machines are certified to Bharat Stage III and China Stage II emission standards.
- **Power Management Strategy:** The K Series power management strategy provides an additional 7.5 kW (10 hp) increase in third and another 7.5 kW (10 hp) in fourth gear through Variable Horsepower (VHP). This allows the operator to maintain maximum rim-pull while increasing ground speed and productivity.

Power Train

- **Electronic Clutch Pressure Control (ECPC):** This standard feature smoothes shifts and improves inching control. The system uses input from the transmission and operator controls to modulate the directional clutches and produce consistent shifting.
- **Autoshift:** This optional feature improves ease of operation and maximizes productivity by automatically shifting the transmission at optimal shifting points.

Serviceability

- **Grouped Service Points:** Grouped daily service points in the left side service center help ensure proper maintenance and inspection routines.
- **Diagnostic Capability:** The improved dash cluster keeps the operator informed of critical system conditions. Cat Electronic Technician is also offered, allowing faster diagnostic capabilities by service personnel. Product Link allows tracking of vital machine data and location, providing a convenient way to track the machine.
- **Extended Service Intervals:** Improvements in serviceability allow increased machine operation between service intervals. The machines can operate a full 500 hours between engine oil and filter changes, 4,000 hours between hydraulic oil changes, and 12,000 hours between engine coolant changes. This reduces downtime and operating expense.

APPLICATIONS, Motor Graders:

The broad line of Cat motor graders allows the customer to choose a motor grader that best fits the intended application. Below is a summary of the typical motor grader applications.

Finish Grading

This application involves preparing a roadway or site surface for future paving or other construction activity. The material being moved is usually a hard, dry base material on a solid underfoot. Finish blading is the motor grader application that requires the highest degree of accuracy. Thus, it is primarily done at low operating speeds — usually less than 5 km/h (3 mph) — in gears 1 and 2. To ensure a smooth, even finished surface, one gear is usually maintained for a given pass. Pass lengths during this application are usually less than 600 m (2000 feet) for road construction and 150 m (500 feet) for site development. Most finish blading is performed by contractors in the Heavy Construction and Building Construction industries.

Heavy Blading

This application involves cutting, moving, and mixing material, usually in the initial stages of surface preparation. A variety of material types are moved in this manner, and the blade tip position varies accordingly. Full blade loads are usually experienced during heavy blading, since moving material is the primary goal. Pass lengths within this application vary, but are usually less than 600 m (2000 feet). Unlike finish blading, the speed of the machine is dependent on the load being moved when heavy blading material. Typical operating speeds are from 0-10 km/h (0 to 6 mph). Therefore, gears 2 through 4 are frequently used in this application. Most heavy blading activity is performed by contractors in the Heavy Construction, Governmental, Industrial, and Forestry industries.

Site Preparation

This application involves any material cutting, moving, and mixing necessary to prepare a residential, commercial, or industrial site for construction. A variety of materials are encountered in this application. Blade loads vary depending on the activity being performed. Both heavy blading and finish blading are performed when preparing a site. Pass lengths are typically in the range of 30-300 m (100 to 1000 feet). Typical operating speeds for site preparation vary depending on whether heavy blading or finish blading activities are being performed. Most site preparation activities are performed by contractors in the Building Construction industry.

Road Maintenance

This application involves reshaping dirt or gravel roads to maintain a crown or superelevation, or restoring the surface itself. This generally involves secondary roads maintained by governmental bodies such as townships and counties. Materials being moved in this application vary from extremely hard dirt bases to moist gravel surfaces. The typical blade load falls between that of finish blading and heavy blading. Pass lengths are frequently longer than 600 m (2000 feet) and can extend for miles. The general speed range for this application is 5-16 km/h (3 to 10 mph), corresponding to gears 2 (heavy dirt) through 5 (soft gravel). As with finish blading, accuracy of the graded surface is the primary concern in this application. Thus, frequent shifts should be avoided whenever possible. A gear should be chosen and maintained unless there is a significant change in the material being moved. Most road maintenance activities are performed by the Governmental industry.

Haul Road Maintenance

This application of the motor grader involves reshaping haul roads at mining, construction, or forestry work sites, usually for the purpose of maintaining smooth travel surfaces for equipment. Materials being moved while maintaining haul roads vary widely. Typical blade loads are about one-third to half of full capacity. Haul roads that experience large hauling units travelling on soft material may require heavy blade loads in order to reshape the road surface. Pass lengths vary depending on the application but can extend for miles on remote forestry or large mine haul roads. The general speed range for haul road maintenance is heavily dependent on the material being moved as well as the grade of the haul road. Many mine sites are in mountainous areas, requiring haul roads with steep grades. Generally, haul-road maintenance is performed at speeds similar to those required for general road maintenance 5-16 km/h (3 to 10 mph).

A travel surface that allows for the safe and efficient movement of machinery is the ultimate goal with this motor grader application. Very precise roadway elevations and slopes are desired but less crucial than when finish blading. Most haul road maintenance activities are performed by the Mining, Heavy Construction, and Forestry industries.

Side/Bank Slope Work

This application involves preparing side slopes or bank slopes along roadways by placing the moldboard on a sloped surface. Slopes of up to a 2:1 angle can be cut using a motor grader. Often the motor grader is operated on the level surface adjacent to the slope, and the moldboard is extended outward to the sloped surface. Fine soils are generally encountered in this application of the motor grader. Blade loads are usually less than half of the full blade capacity, and pass lengths are seldom longer than 600 m (2000 feet). A smooth-graded sloped surface is the primary concern in this application so frequent shifts should be avoided. The typical speed range is 0-6 km/h (0 to 4 mph), corresponding to a gear selection of 1 to 3. The nominal speed is heavily dependent on the type of material being moved and on the slope of the surface. Most side/bank slope work is performed by the Heavy Construction and Governmental industries.

Ditch Building/Cleaning

This application involves cutting “V” and flat-bottom ditches for drainage purposes and rebuilding them when necessary. Due to excessive rain and/or poor material, ditches often need cleaning and reshaping. When building ditches, materials with a wide range of densities are encountered. Blade loads vary accordingly, from half to full-blade capacity. Pass lengths are usually less than 600 m (2000 feet). The primary objective is to move material in a manner that yields a ditch with the desired slope. Ditch building often involves cutting and moving material of high density. Therefore, typical speed ranges vary. Most ditch building work, however, is performed in gears 1 through 3, corresponding to a maximum speed of about 8 km/h (5 mph). Ditch cleaning usually involves blading moist materials underneath a sod cover. Blade loads are usually less than half of full blade capacity when cleaning ditches, and pass lengths are similar to those encountered in ditch building. Typical maximum speeds for this activity are similar to that of ditch building, but less of a blade load is experienced. Ditch building and cleaning activities are usually performed by the Heavy Construction and Governmental industries.


















Ripping/Scarifying

This application involves conditioning hard, rough soils before they are bladed. Shanks on the ripper and/or scarifier are pushed into the ground, thus breaking up otherwise hard surfaces. Hard materials such as asphalt can also be loosened in order to make grading operations less damaging to the moldboard. Rippers and scarifiers can also be used to mix aggregates together. The materials being ripped/scarified are usually hard and dry. Rippers generally penetrate 150-300 mm (6 to 12 inches) into the ground, while scarifiers typically penetrate to a depth of 25-200 mm (1 to 8 inches). Pass lengths are generally less than 600 m (2000 feet) for both activities. Since the material being ripped/scarified is generally hard, the typical maximum speed for this application is about 6 km/h (4 mph) gears 1-2. If the ripper/scarifier is used for mixing aggregates, the typical operating range becomes 6-20 km/h (4 to 12 mph) gears 3-6. Most ripping/scarifying activities are performed by the Heavy Construction and Governmental industries.

Snow Removal

Snow removal is the process of cutting and removing snow or ice from the roadway. In addition to the standard motor grader moldboard, other attachments such as a snow wing, V-plow, one-way plow, or reversible plow can be used to remove the snow. The moldboard itself is the most commonly used attachment for snow plowing. It is used in areas where snow depths are low, the terrain is relatively flat, and where excessive drifting does not occur. A snow wing is a moldboard that attaches to the machine's right side. The wing's curvature lifts the snow and "wings" it off the plowed surface. The snow wing is often used in conjunction with the standard moldboard, where the moldboard cuts the material and feeds it onto the wing. V-plows are mounted in front of the motor grader and are designed to dig into and lift packed snow. The typical speed range for snow removal is 10-30 km/h (6 to 18 mph), corresponding to a gear range of 3 to 7. Snow plowing often involves lower speeds than snow removal. The typical operating range for snow plowing is 8-19 km/h (5 to 12 mph) gears 2 to 4. The majority of Snow Removal/Plowing operations are performed by the Governmental, Mining, and Forestry industries.

TRUCK TO MOTOR GRADER MATCH

	740	770	775	777	785	789	793	797
12/140/160								
14								
16								
18								
24								

NOTE: Calculations based on 30 degree blade angle, standard moldboard width.
 May not be applicable in all applications depending on haul road damage.
 Rule of thumb 2.5 times the truck width.

MODEL	120K		12K	
Net Flywheel Power: Gears 4-8	108 kW	145 hp	123 kW	165 hp
Gear 3▲	101 kW	135 hp	116 kW	156 hp
Gears 1-2▲	93 kW	125 hp	108 kW	145 hp
Operating Weight (Typical)*	13 843 kg	30,519 lb	14 308 kg	31,543 lb
Engine Model	C7 ACERT VHP		C7 ACERT VHP	
Rated Engine RPM	2000		2000	
No. of Cylinders	6		6	
Displacement	7.2 L	439 in ³	7.2 L	439 in ³
Max. Torque	774 N·m	571 lb-ft	881 N·m	650 lb-ft
No. of Speeds Forward/Reverse	8/6		8/6	
Top Speed: Forward	47.5 km/h	29.5 mph	46.8 km/h	29.0 mph
Reverse	37.5 km/h	23.3 mph	36.8 km/h	22.9 mph
Std. Tires — Front and Rear	13.00-24 (12 PR) (G-2)		13.00-24 (12 PR) (G-2)	
Front Axle/Steering:				
Oscillation Angle	32°		32°	
Wheel Lean Angle	18°		18°	
Steering Angle	47.5°		47.5°	
Articulation Angle	20°		20°	
Minimum Turning Radius**	7.3 m	23'11"	7.5 m	24'7"
Front Frame Section Modulus:				
Min.	1619 cm ³	99 in ³	2083 cm ³	127 in ³
Max.	3681 cm ³	225 in ³	4785 cm ³	291 in ³
No. Circle Support Shoes	4		6	
Hydraulics: Pump Type	Variable Piston		Variable Piston	
Max. Pump Flow	210 L/min	55.7 gpm	210 L/min	55.7 gpm
Reservoir Tank Capacity	55 L	14.5 U.S. gal	55 L	14.5 U.S. gal
Implement Pressure: Max.	25 500 kPa	3699 psi	25 500 kPa	3699 psi
Min.	3600 kPa	522 psi	3600 kPa	522 psi
Electrical:				
System Size	24V		24V	
Std. Battery CCA @ 0° F	750		750	
Std. Alternator	115 amp		115 amp	
GENERAL DIMENSIONS:				
Height (to top of ROPS)	3.33 m	10'11"	3.35 m	11'0"
Height (No Cab/Canopy)***	2.88 m	9'6"	3.05 m	10'0"
Overall Length	8.24 m	27'0"	8.50 m	27'11"
With Ripper and Pushplate	9.77 m	32'1"	10.01 m	32'10"
Wheelbase	5.87 m	19'3"	6.09 m	20'0"
Blade Base	2.60 m	8'6"	2.60 m	8'6"
Overall Width (at top of front tires)	2.46 m	8'1"	2.48 m	8'2"
Standard Blade: Length	3.66 m	12'0"	3.66 m	12'0"
Height	610 mm	2'0"	610 mm	2'0"
Thickness	22 mm	0.87"	22 mm	0.87"
Lift Above Ground	410 mm	16"	480 mm	18.9"
Max. Shoulder Reach:◀				
Frame Straight — Right	1.93 m	6'4"	1.81 m	5'11"
Frame Straight — Left	1.76 m	5'9"	1.86 m	6'1"
Fuel Tank Capacity	305 L	80.6 U.S. gal	305 L	80.6 U.S. gal

*Typical Operating Weight — based on standard machine configuration, with Cab High Profile ROPS, 13.00-24 12 PR (G-2) tires, full fuel tank, coolant, lubricants and operator.

**Minimum Turning Radius — combining the use of articulated frame steering, front wheel steer and unlocked differential.

***Height (No Cab/Canopy) — without ROPS, exhaust, or other easily removed encumbrances.

◀ Applicable for the standard blade with hydraulic sideshift and tip control. Maximum shoulder reach is obtainable to the right.

▲ Engine Power Management automatically reduces power in gears 1F-3F and 1R-2R.

Motor Graders Standard Versions

Specifications

MODEL	140K		160K	
Net Flywheel Power: Gears 4-8	143 kW	191 hp	154 kW	206 hp
Gear 3▲	135 kW	181 hp	147 kW	196 hp
Gears 1-2▲	128 kW	171 hp	139 kW	186 hp
Operating Weight (Typical)*	15 108 kg	33,307 lb	15 873 kg	34,994 lb
Engine Model	C7 ACERT VHP		C7 ACERT VHP	
Rated Engine RPM	2000		2000	
No. of Cylinders	6		6	
Displacement	7.2 L	439 in ³	7.2 L	439 in ³
Max. Torque	996 N·m	735 lb-ft	1076 N·m	794 lb-ft
No. of Speeds Forward/Reverse	8/6		8/6	
Top Speed: Forward	47.3 km/h	29.4 mph	46.9 km/h	29.1 mph
Reverse	37.4 km/h	23.2 mph	37.0 km/h	23.0 mph
Std. Tires — Front and Rear	14.00-24 (12 PR) (G-2)		14.00-24 (12 PR) (G-2)	
Front Axle/Steering:				
Oscillation Angle	32°		32°	
Wheel Lean Angle	18°		18°	
Steering Angle	47.5°		47.5°	
Articulation Angle	20°		20°	
Minimum Turning Radius**	7.5 m	24'7"	7.5 m	24'7"
Front Frame Section Modulus:				
Min.	2083 cm ³	127 in ³	2083 cm ³	127 in ³
Max.	4785 cm ³	291 in ³	4785 cm ³	291 in ³
No. Circle Support Shoes	6		6	
Hydraulics: Pump Type	Variable Piston		Variable Piston	
Max. Pump Flow	210 L/min	55.7 gpm	210 L/min	55.7 gpm
Reservoir Tank Capacity	55 L	14.5 U.S. gal	55 L	14.5 U.S. gal
Implement Pressure: Max.	25 500 kPa	3699 psi	25 500 kPa	3699 psi
Min.	3600 kPa	522 psi	3600 kPa	522 psi
Electrical:				
System Size	24V		24V	
Std. Battery CCA @ 0° F	750		750	
Std. Alternator	115 amp		115 amp	
GENERAL DIMENSIONS:				
Height (to top of ROPS)	3.35 m	11'0"	3.35 m	11'0"
Height (No Cab/Canopy)***	3.05 m	10'0"	3.05 m	10'0"
Overall Length	8.50 m	27'11"	8.50 m	27'11"
With Ripper and Pushplate	10.01 m	32'10"	10.01 m	32'10"
Wheelbase	6.09 m	20'0"	6.09 m	20'0"
Blade Base	2.60 m	8'6"	2.60 m	8'6"
Overall Width (at top of front tires)	2.48 m	8'2"	2.48 m	8'2"
Standard Blade: Length	3.66 m	12'0"	4.27 m	14'0"
Height	610 mm	2'0"	686 mm	2'3"
Thickness	22 mm	0.87"	25 mm	1"
Lift Above Ground	480 mm	18.9"	452 mm	17.8"
Max. Shoulder Reach:◀				
Frame Straight — Right	1.98 m	6'6"	2.26 m	7'5"
Frame Straight — Left	1.90 m	6'3"	2.22 m	7'4"
Fuel Tank Capacity	305 L	80.6 U.S. gal	344 L	90.9 U.S. gal

***Typical Operating Weight** — based on standard machine configuration, with Cab High Profile ROPS, 14.00-24 12 PR (G-2) tires, full fuel tank, coolant, lubricants and operator.

****Minimum Turning Radius** — combining the use of articulated frame steering, front wheel steer and unlocked differential.

*****Height (No Cab/Canopy)** — without ROPS, exhaust, or other easily removed encumbrances.

◀ Applicable for the standard blade with hydraulic sideshift and tip control. Maximum shoulder reach is obtainable to the right.

▲ Engine Power Management automatically reduces power in gears 1F-3F and 1R-2R.

MODEL	120K2		140K2	
Net Flywheel Power: Gears 4-8	108 kW	145 hp	143 kW	191 hp
Gear 3▲	101 kW	135 hp	135 kW	181 hp
Gears 1-2▲	93 kW	125 hp	128 kW	171 hp
Operating Weight (Typical)*	13 843 kg	30,519 lb	15 108 kg	33,307 lb
Engine Model	C7 ACERT VHP		C7 ACERT VHP	
Rated Engine RPM	2000		2000	
No. of Cylinders	6		6	
Displacement	7.2 L	439 in ³	7.2 L	439 in ³
Max. Torque	774 N·m	571 lb-ft	996 N·m	735 lb-ft
No. of Speeds Forward/Reverse	8/6		8/6	
Top Speed: Forward	47.5 km/h	29.5 mph	47.3 km/h	29.4 mph
Reverse	37.5 km/h	23.3 mph	37.4 km/h	23.2 mph
Std. Tires — Front and Rear	14.00-24 12 PR (G-2)		14.00 24 (10 PR) (G-2)	
Front Axle/Steering:				
Oscillation Angle	32°		32°	
Wheel Lean Angle	18°		18°	
Steering Angle	47.5°		47.5°	
Articulation Angle	20°		20°	
Minimum Turning Radius**	7.3 m	23'11"	7.5 m	24'7"
Front Frame Section Modulus:				
Min.	1619 cm ³	99 in ³	2083 cm ³	127 in ³
Max.	3681 cm ³	225 in ³	4785 cm ³	291 in ³
No. Circle Support Shoes	4		6	
Hydraulics: Pump Type	Variable Piston		Variable Piston	
Max. Pump Flow	210 L/min	55.7 gpm	210 L/min	55.7 gpm
Reservoir Tank Capacity	55 L	14.5 U.S. gal	55 L	14.5 gal
Implement Pressure: Max.	25 500 kPa	3699 psi	25 500 kPa	3699 psi
Min.	3600 kPa	522 psi	3600 kPa	522 psi
Electrical:				
System Size	24V		24V	
Std. Battery CCA @ 0° F	750		750	
Std. Alternator	115 amp		115 amp	
GENERAL DIMENSIONS:				
Height (to top of ROPS)	3.33 m	10'11"	3.35 m	11'0"
Height (No Cab/Canopy)***	2.88 m	9'6"	3.05 m	10'0"
Overall Length	8.24 m	27'0"	8.50 m	27'11"
With Ripper and Pushplate	9.77 m	32'1"	10.01 m	32'10"
Wheelbase	5.87 m	19'3"	6.09 m	20'0"
Blade Base	2.60 m	8'6"	2.60 m	8'6"
Overall Width (at top of front tires)	2.46 m	8'1"	2.48 m	8'2"
Standard Blade: Length	3.66 m	12'0"	3.66 m	12'0"
Height	610 mm	2'0"	610 mm	2'0"
Thickness	22 mm	0.87"	22 mm	0.87"
Lift Above Ground	410 mm	16"	480 mm	18.9"
Max. Shoulder Reach:◀				
Frame Straight — Right	1.93 m	6'4"	1.98 m	6'6"
Frame Straight — Left	1.76 m	5'9"	1.90 m	6'3"
Fuel Tank Capacity	305 L	80.6 U.S. gal	305 L	80.6 U.S. gal

*Typical Operating Weight — based on standard machine configuration, with Cab High Profile ROPS, 14.00-24 12 PR (G-2) tires, full fuel tank, coolant, lubricants and operator.

**Minimum Turning Radius — combining the use of articulated frame steering, front wheel steer and unlocked differential.

***Height (No Cab/Canopy) — without ROPS, exhaust, or other easily removed encumbrances.

◀ Applicable for the standard blade with hydraulic sideshift and tip control. Maximum shoulder reach is obtainable to the right.

▲ Engine Power Management automatically reduces power in gears 1F-3F and 1R-2R.

MODEL	120M		12M	
Base Power — Net	103 kW	138 hp	136 kW	183 hp
VHP Range — Net	103-114 kW	138-153 hp	136-144 kW	183-193 hp
VHP Plus Range — Net	103-136 kW	138-182 hp	136-159 kW	183-213 hp
Operating Weight*	14 493 kg	31,951 lb	16 231 kg	35,783 lb
Engine Model	C6.6 ACERT		C7 ACERT	
Rated Engine RPM	2000		2000	
No. of Cylinders	6		6	
Displacement	6.6 L	403 in³	7.2 L	439 in³
Max. Torque	906 N·m	668 lb-ft	1052 N·m	776 lb-ft
No. of Speeds Forward/Reverse	8/6		8/6	
Top Speed: Forward	47.5 km/h	29.5 mph	46.6 km/h	29.0 mph
Reverse	37.5 km/h	23.3 mph	36.8 km/h	22.9 mph
Std. Tires — Front and Rear	14.00 24 (12 PR) (G-2)		14.00 24 (10 PR) (G-2)	
Front Axle/Steering:				
Oscillation Angle	32°		32°	
Wheel Lean Angle	18.0°		18.0°	
Steering Angle	47.5°		47.5°	
Articulation Angle	20°		20°	
Minimum Turning Radius**	7.3 m	24'1"	7.6 m	24'10"
No. Circle Support Shoes	4		6	
Hydraulics:				
Pump Type	Variable Piston		Variable Piston	
Max. Pump Flow	210 L	55.7 gpm	210 L/min	55.7 gpm
Tank Capacity	64 L	16.9 U.S. gal	64 L	16.9 U.S. gal
Implement Pressure: Max.	24 150 kPa	3500 psi	24 150 kPa	3500 psi
Min.	3100 kPa	450 psi	3100 kPa	450 psi
Interior Sound Level/SAE J919	70 dB(A)		70 dB(A)	
Electrical:				
System Size	24V		24V	
Std. Battery CCA @ 0° F	1125		1125	
Std. Alternator	80		80	
GENERAL DIMENSIONS:				
Height (to top of ROPS)	3308 mm	130.2"	3308 mm	130.2"
Overall Length	8436 mm	332.1"	8754 mm	344.6"
With Ripper and Pushplate	9930 mm	390.9"	10 136 mm	399.1"
Wheelbase	5915 mm	233.0"	6123 mm	241.1"
Blade Base	2511 mm	98.9"	2511 mm	98.9"
Overall Width (at top of front tires)	2491 mm	98.1"	2511 mm	98.9"
Standard Blade: Length	3658 mm	12'0"	3658 mm	12'0"
Height	610 mm	24.0"	610 mm	24.0"
Thickness	22 mm	0.87"	22 mm	0.87"
Lift Above Ground	427 mm	16.8"	480 mm	18.9"
Max. Shoulder Reach:***				
Frame Straight — Left	1742 mm	68.6"	1790 mm	70.5"
Frame Straight — Right	1905 mm	75"	1978 mm	77.9"
Fuel Tank Capacity	378 L	100 U.S. gal	416 L	110 U.S. gal

***Operating Weight** — based on standard machine configuration with full fuel tank, coolant, lubricants and operator.

****Minimum Turning Radius** — combining the use of articulated frame steering, front wheel steer and unlocked differential.

***Applicable for the standard blade with hydraulic sideshift and tip control. Maximum shoulder reach is obtainable to the right.

MODEL	140M		160M	
Base Power — Net	136 kW	183 hp	159 kW	213 hp
VHP Range — Net	136-155 kW	183-208 hp	159-170 kW	213-228 hp
VHP Plus Range — Net	136-174 kW	183-233 hp	159-185 kW	213-248 hp
Operating Weight*	16 581 kg	36,554 lb	16 820 kg	37,082 lb
Engine Model	C7 ACERT/C9 ACERT (AWD)		C9 ACERT	
Rated Engine RPM	2000		2000	
No. of Cylinders	6		6	
Displacement	7.2 L/8.8 L	439 in³ /537 in³	8.8 L	537 in³
Max. Torque	1159 N·m/1344 N·m	855 lb-ft/991 lb-ft	1237 N·m	912 lb-ft
No. of Speeds Forward/Reverse	8/6		8/6	
Top Speed: Forward	46.6 km/h	29.0 mph	47.4 km/h	29.5 mph
Reverse	36.8 km/h	22.9 mph	37.4 km/h	23.3 mph
Std. Tires — Front and Rear	14.00 24 (10 PR) (G-2)		14.00 24 (10 PR) (G-2)	
Front Axle/Steering:				
Oscillation Angle	32°		32°	
Wheel Lean Angle	18.0°		18.0°	
Steering Angle	47.5°		47.5°	
Articulation Angle	20°		20°	
Minimum Turning Radius**	7.6 m	24'10"	7.6 m	24'10"
No. Circle Support Shoes	6		6	
Hydraulics:				
Pump Type	Variable Piston		Variable Piston	
Max. Pump Flow	210 L/min	55.7 gpm	210 L/min	55.7 gpm
Tank Capacity	64 L	16.9 U.S. gal	64 L	16.9 U.S. gal
Implement Pressure: Max.	24 150 kPa	3500 psi	24 150 kPa	3500 psi
Min.	3100 kPa	450 psi	3100 kPa	450 psi
Interior Sound Level/SAE J919	70 dB(A)		70 dB(A)	
Electrical:				
System Size	24V		24V	
Std. Battery CCA @ 0° F	1125		1125	
Std. Alternator	80		80	
GENERAL DIMENSIONS:				
Height (to top of ROPS)	3308 mm	130.2"	3308 mm	130.2"
Overall Length	8754 mm	344.6"	8754 mm	344.6"
With Ripper and Pushplate	10 136 mm	399.1"	10 136 mm	399.1"
Wheelbase	6123 mm	241.1"	6123 mm	241.1"
Blade Base	2511 mm	98.9"	2511 mm	98.9"
Overall Width (at top of front tires)	2511 mm	98.9"	2511 mm	98.9"
Standard Blade: Length	3658 mm	12'0"	3658 mm	12'0"
Height	610 mm	24.0"	610 mm	24.0"
Thickness	22 mm	0.87"	22 mm	0.87"
Lift Above Ground	480 mm	18.9"	452 mm	17.8"
Max. Shoulder Reach:***				
Frame Straight — Left	1790 mm	70.5"	2090 mm	82.3"
Frame Straight — Right	1978 mm	77.9"	2278 mm	89.7"
Fuel Tank Capacity	416 L	110 U.S. gal	416 L	110 U.S. gal

*Operating Weight — based on standard machine configuration with full fuel tank, coolant, lubricants and operator.

**Minimum Turning Radius — combining the use of articulated frame steering, front wheel steer and unlocked differential.

***Applicable for the standard blade with hydraulic sideshift and tip control. Maximum shoulder reach is obtainable to the right.

MODEL	120M2		12M2	
Base Power — Net	108 kW	145 hp	129 kW	173 hp
VHP Plus Range — Net	108-141 kW	145-189 hp	129-166 kW	173-223 hp
Operating Weight*	15 887 kg	35,025 lb	16 849 kg	37,145 lb
Engine Model	C7.1 ACERT		C9.3 ACERT	
Rated Engine RPM	2100		2100	
No. of Cylinders	6		6	
Displacement	7.01 L	428 in³	9.3 L	567 in³
Max. Torque	939 N·m	693 lb-ft	1138 N·m	839 lb-ft
No. of Speeds Forward/Reverse	8/6		8/6	
Top Speed: Forward	45.7 km/h	28.4 mph	46.6 km/h	29.0 mph
Reverse	36.1 km/h	22.4 mph	36.8 km/h	22.9 mph
Std. Tires — Front and Rear	13.00 24 (12 PR) (G-2)		14.00R24 ★ (G-2)	
Front Axle/Steering:				
Oscillation Angle	32°		32°	
Wheel Lean Angle	18°		18°	
Steering Angle	47.5°		47.5°	
Articulation Angle	20°		20°	
Minimum Turning Radius**	7.3 m	24'1"	7.6 m	24'10"
No. Circle Support Shoes	6		6	
Hydraulics:				
Pump Type	Variable Piston		Variable Piston	
Max. Pump Flow	210 L/min	55.7 gpm	210 L/min	55.7 gpm
Tank Capacity	64 L	16.9 U.S. gal	64 L	16.9 U.S. gal
Implement Pressure: Max.	24 150 kPa	3500 psi	24 150 kPa	3500 psi
Min.	4200 kPa	609 psi	4200 kPa	609 psi
Interior Sound Level/SAE J919	71 dB(A)		71 dB(A)	
Electrical:				
System Size	24V		24V	
Std. Battery CCA @ 0° F	1125		1125	
Std. Alternator	150 amp		150 amp	
GENERAL DIMENSIONS:				
Height (to top of ROPS)	3308 mm	130.2"	3308 mm	130.2"
Overall Length	8820 mm	347.2"	8912 mm	350.9"
With Ripper and Pushplate	10 032 mm	395.0"	10 136 mm	399.1"
Wheelbase	5917 mm	233.0"	6123 mm	241.1"
Blade Base	2510 mm	98.8"	2552 mm	100.5"
Overall Width (at top of front tires)	2511 mm	98.9"	2511 mm	98.9"
Standard Blade: Length	3658 mm	12'0"	3658 mm	12'0"
Height	610 mm	24.0"	610 mm	24.0"
Thickness	22 mm	0.87"	22 mm	0.87"
Lift Above Ground	427 mm	16.8"	480 mm	18.9"
Max. Shoulder Reach:***				
Frame Straight — Left	1742 mm	68.6"	1790 mm	70.5"
Frame Straight — Right	1905 mm	75"	1978 mm	77.9"
Fuel Tank Capacity	378 L	100 U.S. gal	416 L	110 U.S. gal

***Operating Weight** — based on standard machine configuration with full fuel tank, coolant, lubricants and operator.

****Minimum Turning Radius** — combining the use of articulated frame steering, front wheel steer and unlocked differential.

***Applicable for the standard blade with hydraulic sideshift and tip control. Maximum shoulder reach is obtainable to the right.

MODEL	140M2		160M2	
Base Power — Net	144 kW	193 hp	159 kW	213 hp
VHP Plus Range — Net	144-181 kW	193-243 hp	159-196 kW	213-263 hp
Operating Weight*	17 198 kg	37,916 lb	17 438 kg	38,443 lb
Engine Model	C9.3 ACERT		C9.3 ACERT	
Rated Engine RPM	2100		2100	
No. of Cylinders	6		6	
Displacement	9.3 L	567 in ³	9.3 L	567 in ³
Max. Torque	1247 N·m	920 lb-ft	1355 N·m	1000 lb-ft
No. of Speeds Forward/Reverse	8/6		8/6	
Top Speed: Forward	46.6 km/h	29.0 mph	47.4 km/h	29.5 mph
Reverse	36.8 km/h	22.9 mph	37.4 km/h	23.3 mph
Std. Tires — Front and Rear	14.00R24 ★ (G-2)		14.00R24 ★ (G-2)	
Front Axle/Steering:				
Oscillation Angle	32°		32°	
Wheel Lean Angle	18.0°		18.0°	
Steering Angle	47.5°		47.5°	
Articulation Angle	20°		20°	
Minimum Turning Radius**	7.6 m	24'10"	7.6 m	24'10"
No. Circle Support Shoes	6		6	
Hydraulics:				
Pump Type	Variable Piston		Variable Piston	
Max. Pump Flow	210 L/min	55.7 gpm	210 L/min	55.7 gpm
Tank Capacity	64 L	16.9 U.S. gal	64 L	16.9 U.S. gal
Implement Pressure: Max.	24 150 kPa	3500 psi	24 150 kPa	3500 psi
Min.	4200 kPa	609 psi	4200 kPa	609 psi
Interior Sound Level/SAE J919	71 dB(A)		71 dB(A)	
Electrical:				
System Size	24V		24V	
Std. Battery CCA @ 0° F	1125		1125	
Std. Alternator	150		150	
GENERAL DIMENSIONS:				
Height (to top of ROPS)	3308 mm	130.2"	3308 mm	130.2"
Overall Length	8912 mm	350.9"	8912 mm	350.9"
With Ripper and Pushplate	10 136 mm	399.1"	10 136 mm	399.1"
Wheelbase	6123 mm	241.1"	6123 mm	241.1"
Blade Base	2552 mm	100.5"	2552 mm	100.5"
Overall Width (at top of front tires)	2511 mm	98.9"	2511 mm	98.9"
Standard Blade: Length	3658 mm	12'0"	4267 mm	14'0"
Height	610 mm	24.0"	610 mm	24.0"
Thickness	22 mm	0.87"	22 mm	0.87"
Lift Above Ground	480 mm	18.9"	452 mm	17.8"
Max. Shoulder Reach:***				
Frame Straight — Left	1790 mm	70.5"	2090 mm	82.3"
Frame Straight — Right	1978 mm	77.9"	2278 mm	89.7"
Fuel Tank Capacity	416 L	110 U.S. gal	416 L	110 U.S. gal

*Operating Weight — based on standard machine configuration with full fuel tank, coolant, lubricants and operator.

**Minimum Turning Radius — combining the use of articulated frame steering, front wheel steer and unlocked differential.

***Applicable for the standard blade with hydraulic sideshift and tip control. Maximum shoulder reach is obtainable to the right.

MODEL	12M3		140M3		160M3	
Base Power — Net	133 kW	179 hp	149 kW	200 hp	165 kW	221 hp
VHP Plus Range — Net	133-172 kW	179-231 hp	149-188 kW	200-252 hp	165-203 kW	221-272 hp
Operating Weight (Typical)*	16 974 kg	37,420 lb	17 323 kg	38,191 lb	17 563 kg	38,719 lb
Engine Model	C9.3 ACERT		C9.3 ACERT		C9.3 ACERT	
Rated Engine RPM	2000		2000		2000	
No. of Cylinders	6		6		6	
Displacement	9.3 L	567 in³	9.3 L	567 in³	9.3 L	567 in³
Max. Torque	1138 N·m	840 lb-ft	1247 N·m	920 lb-ft	1355 N·m	1000 lb-ft
No. of Speeds Forward/Reverse	8/6		8/6		8/6	
Top Speed: Forward	46.6 km/h	29.0 mph	46.6 km/h	29.0 mph	47.4 km/h	29.5 mph
Reverse	36.8 km/h	23.0 mph	36.8 km/h	23.0 mph	37.4 km/h	23.3 mph
Std. Tires — Front and Rear	14.00R24 * (G-2)		14.00R24 * (G-2)		14.00R24 * (G-2)	
Front Axle/Steering:						
Oscillation Angle	32°		32°		32°	
Wheel Lean Angle	18.0°		18.0°		18.0°	
Steering Angle	47.5°		47.5°		47.5°	
Articulation Angle	20°		20°		20°	
Minimum Turning Radius**	7.6 m	24'10"	7.6 m	24'10"	7.6 m	24'10"
No. Circle Support Shoes	6		6		6	
Hydraulics:						
Pump Type	Variable Piston		Variable Piston		Variable Piston	
Max. Pump Flow	210 L/min	55.7 gpm	210 L/min	55.7 gpm	210 L/min	55.7 gpm
Tank Capacity	64 L	16.9 U.S. gal	64 L	16.9 U.S. gal	64 L	16.9 U.S. gal
Implement Pressure: Max.	24 150 kPa	3500 psi	24 150 kPa	3500 psi	24 150 kPa	3500 psi
Min.	6100 kPa	885 psi	6100 kPa	885 psi	6100 kPa	885 psi
Interior Sound Level/SAE J919	71 dB(A)		71 dB(A)		71 dB(A)	
Electrical:						
System Size	24V		24V		24V	
Std. Battery CCA @ 0° F	1125		1125		1125	
Std. Alternator	150		150		150	
GENERAL DIMENSIONS:						
Height (to top of ROPS)	3308 mm	130.2"	3308 mm	130.2"	3308 mm	130.2"
Overall Length	8912 mm	350.9"	8912 mm	350.9"	8912 mm	350.9"
With Ripper and Pushplate	10 136 mm	399.1"	10 136 mm	399.1"	10 136 mm	399.1"
Wheelbase	6123 mm	241.1"	6123 mm	241.1"	6123 mm	241.1"
Blade Base	2552 mm	100.5"	2552 mm	100.5"	2552 mm	100.5"
Overall Width (at top of front tires)	2511 mm	98.9"	2511 mm	98.9"	2511 mm	98.9"
Standard Blade: Length	3658 mm	12'0"	3658 mm	12'0"	4267 mm	14'0"
Height	610 mm	24.0"	610 mm	24.0"	610 mm	24.0"
Thickness	22 mm	0.87"	22 mm	0.87"	22 mm	0.87"
Lift Above Ground	480 mm	18.9"	480 mm	18.9"	480 mm	18.9"
Max. Shoulder Reach:***						
Frame Straight — Left	1790 mm	70.5"	1790 mm	70.5"	2090 mm	82.3"
Frame Straight — Right	1978 mm	77.9"	1978 mm	77.9"	2278 mm	89.7"
Fuel Tank Capacity	394 L	104 U.S. gal	394 L	104 U.S. gal	394 L	104 U.S. gal
Diesel Exhaust Fluid Capacity	22.0 L	5.8 U.S. gal	22.0 L	5.8 U.S. gal	22.0 L	5.8 U.S. gal

***Operating Weight** — based on standard machine configuration with full fuel tank, coolant, lubricants and operator.

****Minimum Turning Radius** — combining the use of articulated frame steering, front wheel steer and unlocked differential.

***Applicable for the standard blade with hydraulic sideshift and tip control. Maximum shoulder reach is obtainable to the right.

MODEL	14M3		16M3	
Base Power — Net	178 kW	238 hp	216 kW	290 hp
VHP Range — Net	178-213 kW	238-285 hp	216-259 kW	290-348 hp
VHP Plus Range — Net	180-215 kW	241-289 hp	—	—
Operating Weight*	25 968 kg	57,250 lb	32 411 kg	71,454 lb
Engine Model	C13 ACERT		C13 ACERT	
Rated Engine RPM	1850		2000	
No. of Cylinders	6		6	
Displacement	12.5 L	763 in³	12.5 L	763 in³
Max. Torque:				
Tier 4 Final ¹	1542 N·m	1137 lb-ft	1771 N·m	1306 lb-ft
Tier 2 and Tier 3 Equivalent ²	1542 N·m	1137 lb-ft	1721 N·m	1270 lb-ft
No. of Speeds Forward/Reverse	8/6		8/6	
Top Speed: Forward	50.5 km/h	31.4 mph	51.7 km/h	32.1 mph
Reverse	39.9 km/h	24.8 mph	40.8 km/h	25.3 mph
Std. Tires — Front and Rear	20.5R25		23.5R25	
Front Axle/Steering:				
Oscillation Angle	32°		35°	
Wheel Lean Angle — Left/Right	17.1°/17.1°		18°/17°	
Steering Angle	50°		47.5°	
Articulation Angle	20°		20°	
Minimum Turning Radius**	7.9 m	25'11"	9.3 m	30'6"
No. Circle Support Shoes	6		6	
Hydraulics:				
Pump Type	Variable Piston		Variable Piston	
Max. Pump Flow	257 L/min	68 gpm	280 L/min	74 gpm
Tank Capacity	64 L	16.9 U.S. gal	70 L	18.5 U.S. gal
Implement Pressure: Max.	24 100 kPa	3495 psi	24 750 kPa	3590 psi
Min.	3400 kPa	493 psi	3400 kPa	493 psi
Interior Sound Level/SAE J919:				
Tier 4 Final/EU Certified ¹	73 dB(A)		71 dB(A)	
Tier 2 and Tier 3 Equivalent ²	73 dB(A)		72 dB(A)	
Electrical:				
System Size	24V		24V	
Std. Battery CCA @ 0° F	1125		1400	
Std. Alternator	150		150	
GENERAL DIMENSIONS:				
Height (to top of ROPS)	3566 mm	140.4"	3719 mm	146.4"
Overall Length	9677 mm	381"	10 593 mm	417"
With Ripper and Pushplate	10 899 mm	429.1"	12 051 mm	474.4"
Wheelbase	6616 mm	260.5"	7365 mm	290"
Blade Base	2880 mm	113.4"	3066 mm	120.7"
Overall Width (at top of front tires)	3050 mm	120.1"	3411 mm	134.3"
Standard Blade: Length	4267 mm	14'0"	4877 mm	16'0"
Height	585 mm	23.0"	787 mm	31.0"
Thickness	25.4 mm	1.0"	25 mm	1.0"
Lift Above Ground	438 mm	17.2"	400 mm	15.7"
Max. Shoulder Reach:***				
Frame Straight — Left	3460 mm	136.2"	2311 mm	91"
Frame Straight — Right	3350 mm	131.9"	2311 mm	91"
Fuel Tank Capacity	416 L	109.9 U.S. gal	496 L	131 U.S. gal

***Operating Weight** — based on standard machine configuration with full fuel tank, coolant, lubricants and operator.

****Minimum Turning Radius** — combining the use of articulated frame steering, front wheel steer and unlocked differential.

***Applicable for the standard blade with hydraulic sideshift and tip control. Maximum shoulder reach is obtainable to the right.

¹ Meets Tier 4 Final/Stage IV/Japan 2014 (Tier 4 Final) emission standards.

² Meets Tier 2/Stage II/Japan 2001 (Tier 2) equivalent and Tier 3/Stage IIIA/Japan 2006 (Tier 3) equivalent emission standards.

MODEL	18M3		24M	
Base Power — Net	227 kW	304 hp	397 kW	533 hp
VHP Range — Net	227-266 kW	304-357 hp	—	—
Operating Weight*	32 794 kg	72,298 lb	62 726 kg	138,287 lb
Engine Model	C13 ACERT		C18 ACERT	
Rated Engine RPM	2000		1800	
No. of Cylinders	6		6	
Displacement	12.5 L	763 in³	18.1 L	1104.5 in³
Max. Torque:	—		2713 N·m	2001 lb-ft
Tier 4 Final ¹	1771 N·m	1306 lb-ft	—	—
Tier 2 and Tier 3 Equivalent ²	1721 N·m	1270 lb-ft	—	—
No. of Speeds Forward/Reverse	8/6		6/3	
Top Speed: Forward	51.7 km/h	32.1 mph	43.4 km/h	27.0 mph
Reverse	40.8 km/h	25.3 mph	41.6 km/h	25.8 mph
Std. Tires — Front and Rear	23.5R25		29.5R29	
Front Axle/Steering:	—		—	
Oscillation Angle	35°		32°	
Wheel Lean Angle — Left/Right	18°/17°		18°/ 18°	
Steering Angle	47.5°		47.5°	
Articulation Angle	20°		25°	
Minimum Turning Radius**	9.3 m	30'6"	12.4 m	40'9"
No. Circle Support Shoes	6		6	
Hydraulics:	—		—	
Pump Type	Variable Piston		Variable Piston	
Max. Pump Flow	280 L/min	74 gpm	550 L/min	145 gpm
Tank Capacity	70 L	18.5 U.S. gal	135 L	36 U.S. gal
Implement Pressure: Max.	24 750 kPa	3590 psi	24 150 kPa	3500 psi
Min.	3400 kPa	493 psi	3100 kPa	450 psi
Interior Sound Level/SAE J919:	—		74 dB(A)	
Tier 4 Final/EU Certified ¹	71 dB(A)		—	
Tier 2 and Tier 3 Equivalent ²	72 dB(A)		—	
Electrical:	—		—	
System Size	24V		24V	
Std. Battery CCA @ 0° F	1400		1500	
Std. Alternator	150		150	
GENERAL DIMENSIONS:	—		—	
Height (to top of ROPS)	3719 mm	146.4"	4452 mm	175.3"
Overall Length	10 593 mm	417"	14 194 mm	558.8"
With Ripper and Pushplate	12 051 mm	474.4"	16 102 mm	633.9"
Wheelbase	7365 mm	290"	10 278 mm	404.6"
Blade Base	3066 mm	120.7"	4048 mm	159.4"
Overall Width (at top of front tires)	3411 mm	134.3"	4280 mm	168.5"
Standard Blade: Length	5511 mm	18'0"	7315 mm	24'0"
Height	787 mm	31.0"	1025 mm	40.0"
Thickness	25 mm	1.0"	50 mm	2.0"
Lift Above Ground	400 mm	15.7"	634 mm	25.0"
Max. Shoulder Reach:***	—		—	
Frame Straight — Left	2605 mm	102.6"	3222 mm	126.9"
Frame Straight — Right	2605 mm	102.6"	3228 mm	127.1"
Fuel Tank Capacity	496 L	131 U.S. gal	1326 L	350 U.S. gal

***Operating Weight** — based on standard machine configuration with full fuel tank, coolant, lubricants and operator. 24M includes ripper.

****Minimum Turning Radius** — combining the use of articulated frame steering, front wheel steer and unlocked differential.

***Applicable for the standard blade with hydraulic sideshift and tip control. Maximum shoulder reach is obtainable to the right.

¹ Meets Tier 4 Final/Stage IV/Japan 2014 (Tier 4 Final) emission standards.

² Meets Tier 2/Stage II/Japan 2001 (Tier 2) equivalent and Tier 3/Stage IIIA/Japan 2006 (Tier 3) equivalent emission standards.

TRAVEL SPEEDS @ MAXIMUM RPM WITH STD. TIRES (M/M2/M3 SERIES)

Gear		1		2		3		4		5		6		7		8	
		km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph
120M	Forward	4.1	2.6	5.6	3.5	8.2	5.1	11.2	7.0	17.5	10.8	23.7	14.8	32.7	20.3	47.5	29.5
	Reverse	3.3	2.0	6.1	3.8	8.9	5.5	13.8	8.6	25.8	16.0	37.5	23.3	—	—	—	—
120M2	Forward	4.0	2.5	5.4	3.4	7.8	4.8	10.8	6.7	16.8	10.4	22.8	14.2	31.4	19.5	45.7	28.4
	Reverse	3.1	1.9	5.9	3.9	8.5	5.3	13.2	8.2	24.8	15.4	36.1	22.4	—	—	—	—
12M	Forward	4.0	2.5	5.5	3.4	8.0	5.0	11.0	6.8	17.1	10.6	23.3	14.5	32.0	19.9	46.6	29.0
	Reverse	3.2	2.0	6.0	3.7	8.7	5.4	13.5	8.4	25.3	15.7	36.8	22.9	—	—	—	—
12M2	Forward	4.1	2.5	5.5	3.4	8.0	5.0	11.0	6.9	17.1	10.6	23.3	14.5	32.0	19.9	46.6	29.0
	Reverse	3.2	2.0	6.0	3.7	8.7	5.4	13.5	8.4	25.3	15.7	36.8	22.9	—	—	—	—
12M3	Forward	4.1	2.5	5.5	3.4	8.0	5.0	11.0	6.9	17.1	10.6	23.3	14.5	32.0	19.9	46.6	29.0
	Reverse	3.2	2.0	6.0	3.7	8.7	5.4	13.5	8.4	25.3	15.7	36.8	23.0	—	—	—	—
140M	Forward	4.0	2.5	5.5	3.4	8.0	5.0	11.0	6.9	17.1	10.6	23.3	14.5	32.0	19.9	46.6	29.0
	Reverse	3.2	2.0	6.0	3.7	8.7	5.4	13.5	8.4	25.3	15.7	36.8	22.9	—	—	—	—
140M2	Forward	4.1	2.5	5.5	3.4	8.0	5.0	11.0	6.9	17.1	10.6	23.3	14.5	32.0	19.9	46.6	29.0
	Reverse	3.2	2.0	6.0	3.7	8.7	5.4	13.5	8.4	25.3	15.7	36.8	22.9	—	—	—	—
140M3	Forward	4.1	2.5	5.5	3.4	8.0	5.0	11.0	6.9	17.1	10.6	23.3	14.5	32.0	19.9	46.6	29.0
	Reverse	3.2	2.0	6.0	3.7	8.7	5.4	13.5	8.4	25.3	15.7	36.8	23.0	—	—	—	—
160M	Forward	4.1	2.5	5.6	3.5	8.1	5.0	11.2	7.0	17.4	10.8	23.7	14.7	32.6	20.3	47.4	29.5
	Reverse	3.3	2.0	6.1	3.8	8.8	5.5	13.7	8.5	25.7	16.0	37.4	23.3	—	—	—	—
160M2	Forward	4.1	2.6	5.6	3.5	8.1	5.1	11.2	7.0	17.4	10.8	23.7	14.7	32.6	20.3	47.4	29.5
	Reverse	3.3	2.0	6.1	3.8	8.9	5.5	13.7	8.5	25.7	16.0	37.4	23.3	—	—	—	—
160M3	Forward	4.1	2.6	5.6	3.5	8.1	5.1	11.2	7.0	17.4	10.8	23.7	14.7	32.6	20.3	47.4	29.5
	Reverse	3.3	2.0	6.1	3.8	8.8	5.5	13.7	8.5	25.7	16.0	37.4	23.3	—	—	—	—
14M3	Forward	4.4	2.7	5.9	3.7	8.6	5.3	11.8	7.4	18.4	11.4	24.9	15.5	34.3	21.3	49.9	31.0
	Reverse	3.4	2.1	6.4	4.0	9.4	5.8	14.5	9.0	27.0	16.8	39.4	24.5	—	—	—	—
16M3	Forward	4.5	2.8	6.1	3.8	8.9	5.5	12.3	7.6	19.0	11.8	25.8	16.0	35.5	22.0	51.7	32.1
	Reverse	3.6	2.2	6.6	4.1	9.7	6.0	15.0	9.3	28.0	17.4	40.8	25.3	—	—	—	—
18M3	Forward	4.5	2.8	6.1	3.8	8.9	5.5	12.3	7.6	19.0	11.8	25.8	16.0	35.5	22.0	51.7	32.1
	Reverse	3.6	2.2	6.6	4.1	9.7	6.0	15.0	9.3	28.0	17.4	40.8	25.3	—	—	—	—
24M	Forward	3.7	2.3	5.7	3.6	9.7	6.0	15.1	9.4	28.0	17.4	43.4	27.0	—	—	—	—
	Reverse	5.5	3.4	14.5	9.0	41.6	25.8	—	—	—	—	—	—	—	—	—	—

NOTE: 120M speeds were calculated with a 628 mm (24.7") tire at 2000 rpm rated speed.
 120M2 speeds were calculated with a 620 mm (24.4") tire at high idle, 2150 rpm.
 12M2-160M2 speeds were calculated with a 655 mm (25.8") tire at high idle, 2150 rpm.
 12M3-160M3 speeds were calculated with a 655 mm (25.8") tire at 2000 rpm rated speed.

TRAVEL SPEEDS @ MAXIMUM RPM WITH STD. TIRES (K/K2 SERIES)

Gear		1		2		3		4		5		6		7		8	
		km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph	km/h	mph
120K	Forward	4.1	2.5	5.5	3.4	8.0	5.0	11.1	6.9	17.5	10.8	23.7	14.8	32.7	20.3	47.5	29.5
	Reverse	3.2	2.0	6.0	3.7	8.7	5.4	13.8	8.6	25.8	16.0	37.5	23.3	—	—	—	—
120K2	Forward	4.1	2.5	5.5	3.4	8.0	5.0	11.1	6.9	17.5	10.8	23.7	14.8	32.7	20.3	47.5	29.5
	Reverse	3.2	2.0	6.0	3.7	8.7	5.4	13.8	8.6	25.8	16.0	37.5	23.3	—	—	—	—
12K	Forward	4.0	2.5	5.4	3.4	7.9	4.9	10.9	6.8	17.1	10.6	23.3	14.5	32.0	19.9	46.8	29.0
	Reverse	3.2	2.0	5.9	3.7	8.6	5.3	13.5	8.4	25.3	15.7	36.8	22.9	—	—	—	—
140K	Forward	4.1	2.5	5.5	3.4	8.0	5.0	11.0	6.9	17.4	10.8	23.6	14.7	32.5	20.2	47.3	29.4
	Reverse	3.2	2.0	6.0	3.7	8.7	5.4	13.7	8.5	25.7	16.0	37.4	23.2	—	—	—	—
140K2	Forward	4.1	2.5	5.5	3.4	8.0	5.0	11.0	6.9	17.4	10.8	23.6	14.7	32.5	20.2	47.3	29.4
	Reverse	3.2	2.0	6.0	3.7	8.7	5.4	13.7	8.5	25.7	16.0	37.4	23.2	—	—	—	—
160K	Forward	4.1	2.5	5.5	3.4	8.1	5.0	11.1	6.9	17.2	10.7	23.4	14.6	32.2	20.0	46.9	29.1
	Reverse	3.2	2.0	6.0	3.7	8.8	5.4	13.6	8.4	25.4	15.8	37.0	23.0	—	—	—	—

All Wheel Drive
Mid Mount and Front Mount Scarifiers

Motor Graders

ALL WHEEL DRIVE (AWD) 120M/120M2, 12M2/M3, 140M/M2/M3, 160M/M2/M3

Working Range:	
Forward Gears	gears 1-7
Reverse Gears	gears 1-5
Pump Type	Variable Displacement Axial Piston Pumps (2)
Motor Type	Variable Displacement Axial Piston Motors (2)
Front Wheel Gear Reduction	Double Planetary Reduction
Maximum Pump Flow (each pump)	125 L/min 33 gpm
Front Wheel Torque	13 998 N·m 10,325 lb-ft
Control Type	Speed control with closed-loop feedback

The optional AWD system utilizes dedicated left and right pumps for precise hydraulic control.

Hydrostatic Mode disengages the transmission and provides hydraulic power to the front wheels only-ininitely variable to 8 km/h (5 mph).

Exclusive AWD Steering Compensation adjusts outside front tire speed up to 50% faster than the inside tire.

Operating Pressure depends on engine speed, gear selection and operating conditions.

M10 — MID MOUNT SCARIFIER 120M/M2, 12M/M2/M3, 140M/M2/M3, 160M/M2/M3

	V-type		Straight type*	
Type				
Working Width	1184 mm	46.6"	1800 mm	71"
Depth (Max.)	292 mm	11.5"	317 mm	12.5"
Number of Shank Holders	11		17	
Spacing	116 mm	4.6"	111 mm	4.4"

*Available on M Series Global Versions only.

FRONT MOUNT SCARIFIER 120M/M2, 12M/M2/M3, 140M/M2/M3, 160M/M2/M3

	V-type	
Type		
Working Width	1205 mm	47.4"
Depth (Max.)	467 mm	18.4"
Number of Shank Holders	11	
Spacing	116 mm	4.6"

MOTOR GRADER/RIPPER	120M		120M2		12M		12M2	
Parallelogram – Rear Mounted	Ripper/Scarifier		Ripper/Scarifier		Ripper/Scarifier		Ripper/Scarifier	
Tire Size (Std.)	13.00 24		13.00 24		14R24		14.00R24	
Front and Rear	12PR (G-4)		12PR (G-2)		12PR (G-2)		★ (G-2)	
Scarifier								
Maximum Digging Depth	267 mm	10.5"	267 mm	10.5"	267 mm	10.5"	267 mm	10.5"
Number of Pockets	9		9		9		9	
Spacing	267 mm	10.5"	267 mm	10.5"	267 mm	10.5"	267 mm	10.5"
Ripper Shank								
Maximum Digging Depth	428 mm	16.9"	428 mm	16.9"	428 mm	16.9"	428 mm	16.9"
Maximum Reach at Ground Line	973 mm	38.3"	973 mm	38.3"	973 mm	38.3"	973 mm	38.3"
Maximum Ground Clearance under Tip (shank pinned in bottom hole)	502 mm	19.8"	502 mm	19.8"	502 mm	19.8"	502 mm	19.8"
Maximum Ramp Angle, Ripper Up, Shanks in Working Position (shank pinned in bottom hole)	14.5°		13.5°		14.5°		15.0°	
Shank Section	59 × 138 mm 2.3" × 5.4"		59 × 138 mm 2.3" × 5.4"		59 × 138 mm 2.3" × 5.4"		59 × 138 mm 2.3" × 5.4"	
Ripper Beam								
Overall Width	2.31 m	7'7"	2.31 m	7'7"	2.31 m	7'7"	2.31 m	7'7"
Height	152 mm	6.0"	152 mm	6.0"	152 mm	6.0"	152 mm	6.0"
Length	230 mm	9.1"	230 mm	9.1"	230 mm	9.1"	230 mm	9.1"
Number of Pockets	5		5		5		5	
Pocket Spacing:								
Inside	533 mm	1'9"	533 mm	1'9"	533 mm	1'9"	533 mm	1'9"
Middle	533 mm	1'9"	533 mm	1'9"	533 mm	1'9"	533 mm	1'9"
Outside	533 mm	1'9"	533 mm	1'9"	533 mm	1'9"	533 mm	1'9"
Shank Gauge	2.13 m	7'0"	2.13 m	7'0"	2.13 m	7'0"	2.13 m	7'0"
Installed Weights:								
Ripper with Standard Shank	1100 kg	2425 lb	1100 kg	2425 lb	1111 kg	2449 lb	1086 kg	2394 lb
Each Additional Shank	31 kg	68 lb	31 kg	68 lb	31 kg	68 lb	31 kg	68 lb
Ripper Forces:								
Penetration Force	8454 kg	18,638 lb	9106 kg	20,075 lb	9189 kg	20,258 lb	9440 kg	20,812 lb
Pryout Force	10 024 kg	22,099 lb	10 616 kg	23,404 lb	11 635 kg	25,651 lb	12 430 kg	27,403 lb

MOTOR GRADER/RIPPER	12M3		140M		140M2		140M3	
Parallelogram – Rear Mounted	Ripper/ Scarifier		Ripper/ Scarifier		Ripper/ Scarifier		Ripper/ Scarifier	
Tire Size (Std.)	14.00R24		14.00-24		14.00R24		14.00R24	
Front and Rear	★ (G-2)		10PR (G-2)		★ (G-2)		★ (G-2)	
Scarifier								
Maximum Digging Depth	267 mm	10.5"	261 mm	10.3"	265 mm	10.4"	265 mm	10.4"
Number of Pockets	9		9		9		9	
Spacing	267 mm	10.5"	267 mm	10.5"	267 mm	10.5"	267 mm	10.5"
Ripper Shank								
Maximum Digging Depth	428 mm	16.9"	422 mm	16.6"	426 mm	16.8"	426 mm	16.8"
Maximum Reach at Ground Line	973 mm	38.3"	973 mm	38.3"	973 mm	38.3"	973 mm	38.3"
Maximum Ground Clearance under Tip (shank pinned in bottom hole)	502 mm	19.8"	508 mm	20"	488 mm	19.2"	488 mm	19.2"
Maximum Ramp Angle, Ripper Up, Shanks in Working Position (shank pinned in bottom hole)	15.0°		15.3°		15.0°		15.0°	
Shank Section	59 × 138 mm 2.3" × 5.4"		59 × 138 mm 2.3" × 5.4"		59 × 138 mm 2.3" × 5.4"		59 × 138 mm 2.3" × 5.4"	
Ripper Beam								
Overall Width	2.31 m	7'7"	2.31 m	7'7"	2.31 m	7'7"	2.31 m	7'7"
Height	152 mm	6.0"	152 mm	6.0"	152 mm	6.0"	152 mm	6.0"
Length	230 mm	9.1"	230 mm	9.1"	230 mm	9.1"	230 mm	9.1"
Number of Pockets	5		5		5		5	
Pocket Spacing:								
Inside	533 mm	1'9"	533 mm	1'9"	533 mm	1'9"	533 mm	1'9"
Middle	533 mm	1'9"	533 mm	1'9"	533 mm	1'9"	533 mm	1'9"
Outside	533 mm	1'9"	533 mm	1'9"	533 mm	1'9"	533 mm	1'9"
Shank Gauge	2.13 m	7'0"	2.13 m	7'0"	2.13 m	7'0"	2.13 m	7'0"
Installed Weights:								
Ripper with Standard Shank	1086 kg	2394 lb	1111 kg	2449 lb	1086 kg	2394 lb	1086 kg	2394 lb
Each Additional Shank	31 kg	68 lb	31 kg	68 lb	31 kg	68 lb	31 kg	68 lb
Ripper Forces:								
Penetration Force	9440 kg	20,812 lb	9440 kg	20,812 lb	9440 kg	20,812 lb	9440 kg	20,812 lb
Pryout Force	12 607 kg	27,794 lb	12 147 kg	26,780 lb	12 943 kg	28,534 lb	12 607 kg	27,794 lb

MOTOR GRADER/RIPPER	160M		160M2		160M3	
Parallelogram – Rear Mounted	Ripper/Scarifier		Ripper/Scarifier		Ripper/Scarifier	
Tire Size (Std.)	14.00-24		14.00R24		14.00R24	
Front and Rear	10PR (G-2)		★ (G-2)		★ (G-2)	
Scarifier						
Maximum Digging Depth	261 mm	10.3"	265 mm	10.4"	265 mm	10.4"
Number of Pockets	9		9		9	
Spacing	267 mm	10.5"	267 mm	10.5"	267 mm	10.5"
Ripper Shank						
Maximum Digging Depth	422 mm	16.6"	426 mm	16.8"	426 mm	16.8"
Maximum Reach at Ground Line	973 mm	38.3"	973 mm	38.3"	973 mm	38.3"
Maximum Ground Clearance under Tip (shank pinned in bottom hole)	508 mm	20"	488 mm	19.2"	488 mm	19.2"
Maximum Ramp Angle, Ripper Up, Shanks in Working Position (shank pinned in bottom hole)	15.3°		15.0°		15.0°	
Shank Section	59 × 138 mm 2.3" × 5.4"		59 × 138 mm 2.3" × 5.4"		59 × 138 mm 2.3" × 5.4"	
Ripper Beam						
Overall Width	2.31 m	7'7"	2.31 m	7'7"	2.31 m	7'7"
Height	152 mm	6.0"	152 mm	6.0"	152 mm	6.0"
Length	230 mm	9.1"	230 mm	9.1"	230 mm	9.1"
Number of Pockets	5		5		5	
Pocket Spacing:						
Inside	533 mm	1'9"	533 mm	1'9"	533 mm	1'9"
Middle	533 mm	1'9"	533 mm	1'9"	533 mm	1'9"
Outside	533 mm	1'9"	533 mm	1'9"	533 mm	1'9"
Shank Gauge	2.13 m	7'0"	2.13 m	7'0"	2.13 m	7'0"
Installed Weights:						
Ripper with Standard Shank	1111 kg	2449 lb	1086 kg	2394 lb	1086 kg	2394 lb
Each Additional Shank	31 kg	68 lb	31 kg	68 lb	31 kg	68 lb
Ripper Forces:						
Penetration Force	9440 kg	20,812 lb	9440 kg	20,812 lb	9440 kg	20,812 lb
Pryout Force	12 861 kg	28,354 lb	13 656 kg	30,106 lb	12 924 kg	28,493 lb

MOTOR GRADER/RIPPER	14M3		16M3	
Parallelogram — Rear Mounted	Ripper		Ripper	
Tire Size (Std.)	20.5R25		23.5-25	
Front and Rear	—		12PR (G-2)	
Ripper Shank				
Maximum Digging Depth	404 mm	15.9"	452 mm	17.8"
Maximum Reach at Ground Line	1062 mm	41.8"	1500 mm	4'11"
Maximum Ground Clearance under Tip (shank pinned in bottom hole)	617.7 mm	24.3"	673 mm	2'2.5"
Maximum Ramp Angle, Ripper Up, Shanks in Working Position (shank pinned in bottom hole)	14.5°		14.3°	
Shank Section	59 × 138 mm 2.3" × 5.4"		76 × 178 mm 3" × 7"	
Ripper Beam				
Overall Width	2595 mm	102.2"	2.98 m	9'9"
Height	165 mm	6.5"	214 mm	8.4"
Length	211 mm	8.3"	254 mm	10"
Number of Pockets	7		7	
Pocket Spacing:				
Inside	472 mm	18.6"	500 mm	1'8"
Middle	373 mm	14.7"	445 mm	17.5"
Outside	373 mm	14.7"	445 mm	17.5"
Installed Weights:				
Ripper with Standard Shank	1643 kg	3622 lb	2198 kg	4836 lb
Each Additional Shank	31 kg	68 lb	68 kg	150 lb
Ripper Forces:				
Penetration Force	13 116 kg	28,916 lb	13 749 kg	30,311 lb
Pryout Force	21 228 kg	46,800 lb	19 822 kg	43,700 lb

MOTOR GRADER/RIPPER	18M3		24M	
Parallelogram – Rear Mounted	Ripper		Ripper	
Tire Size (Std.)	23.5-25		29.5-29	
Front and Rear	12PR (G-2)		28PR	
Ripper Shank				
Maximum Digging Depth	452 mm	17.8"	490 mm	1'7.3"
Maximum Reach at Ground Line	1500 mm	4'11"	1165 mm	3'9.9"
Maximum Ground Clearance under Tip (shank pinned in bottom hole)	673 mm	2'2.5"	739 mm	2'5.1"
Maximum Ramp Angle, Ripper Up, Shanks in Working Position (shank pinned in bottom hole)	14.3°		12.5°	
Shank Section	76 × 178 mm 3" × 7"		76 × 178 mm 3" × 7"	
Ripper Beam				
Overall Width	2.98 m	9'9"	3.91 m	12'10"
Height	214 mm	8.4"	216 mm	8.5"
Length	254 mm	10"	254 mm	10"
Number of Pockets	7		7	
Pocket Spacing:				
Inside	500 mm	1'8"	593 mm	1'11.4"
Middle	445 mm	17.5"	604 mm	1'11.8"
Outside	445 mm	17.5"	604 mm	1'11.8"
Installed Weights:				
Ripper with Standard Shank	2198 kg	4836 lb	2812 kg	6186 lb
Each Additional Shank	68 kg	150 lb	68 kg	150 lb
Ripper Forces:				
Penetration Force	13 749 kg	30,311 lb	13 601 kg	29,985 lb
Pryout Force	19 822 kg	43,700 lb	18 621 kg	41,052 lb

PRODUCTION

The motor grader is used in a variety of applications in a variety of industries. Therefore, there are many ways to measure its operating capacity, or production. One method expresses a motor grader’s production in relation to the area covered by the moldboard.

Formula:

$$A = S \times (L_e - L_o) \times 1000 \times E \text{ (Metric)}$$

$$A = S \times (L_e - L_o) \times 5280 \times E \text{ (English)}$$

- where
- A: Hourly operating area (m²/h or ft²/h)
 - S: Operating speed (km/h or mph)
 - L_e: Effective blade length (m or ft)
 - L_o: Width of overlap (m or ft)
 - E: Job efficiency

Operating Speeds:

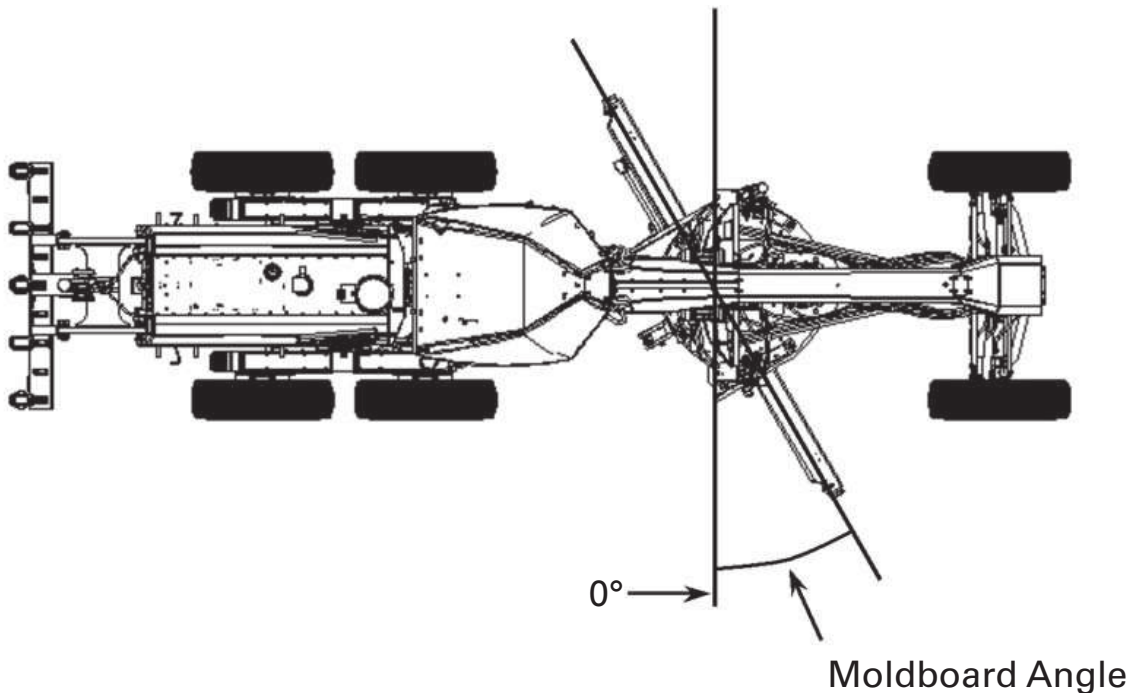
Typical operating speeds by application

Finish Grading:	0-4 km/h	(0-2.5 mph)
Heavy Blading:	0-9 km/h	(0-6 mph)
Ditch Repair:	0-5 km/h	(0-3 mph)
Ripping:	0-5 km/h	(0-3 mph)
Road Maintenance:	5-16 km/h	(3-9.5 mph)
Haul Road Maintenance:	5-16 km/h	(3-9.5 mph)
Snow Plowing:	7-21 km/h	(4-13 mph)
Snow Winging:	15-28 km/h	(9-17 mph)

Effective Blade Length:

Since the moldboard is usually angled when moving material, an effective blade length must be computed to account for this angle. This is the actual width of material swept by the moldboard.

NOTE: Angles are measured as shown below. The effective length becomes shorter as the angle increases.



Moldboard Length, m (ft)	Effective Length, m (ft) 30 degree blade angle	Effective Length, m (ft) 45 degree blade angle
3.658 (12)	3.17 (10.4)	2.59 (8.5)
4.267 (14)	3.70 (12.1)	3.02 (9.9)
4.877 (16)	4.22 (13.9)	3.45 (11.3)
7.315 (24)	6.33 (20.8)	5.17 (17.0)

For other blade lengths and carry angles:
 Effective length = COS [Radians (Blade L)] 3 Blade Length

Width of Overlap:

The width of overlap is generally 0.6 m (2.0 ft). This overlap accounts for the need to keep the tires out of the windrow on the return pass.

Job Efficiency:

Job efficiencies vary based on job conditions, operator skill, etc.

A good estimation for efficiency is approximately 0.70 to 0.85, but actual operating conditions should be used to determine the best value.

Example problem:

A Cat motor grader with a 3.66 m (12 ft) moldboard is performing road maintenance on a township road. The machine is working at an average speed of 13 km/h (8 mph) with a moldboard carry angle of 30 degrees. What is the motor grader’s production based on coverage area?

Note: Due to the long passes involved in road maintenance — fewer turnarounds — a higher job efficiency of 0.90 is chosen.

Solution:

From the table, the effective blade length is 3.17 m (10.4 ft).

Metric

$$\begin{aligned} \text{Production, A} &= 13 \text{ km/h} \times (3.17 \text{ m} - 0.6 \text{ m}) \times \\ &1000 \times 0.90 \\ &= \mathbf{30\,069 \text{ m}^2/\text{hr} (3.07 \text{ hectares/hr})} \end{aligned}$$

English

$$\begin{aligned} \text{Production, A} &= 8 \text{ mph} \times (10.4 \text{ ft} - 2.0 \text{ ft}) \times \\ &5280 \times 0.90 \\ &= \mathbf{319,334 \text{ ft}^2/\text{hr} (7.33 \text{ acres/hr})} \end{aligned}$$

To pinpoint the theoretical number of motor graders required to properly maintain your haul roads, based on your specific mining applications, please download the haul road maintenance calculator on <https://catminer.cat.com>.

Haul road maintenance impacts cycle time, tire, frame and drive train components, safety and ultimately your cost per ton. To achieve optimal truck productivity, your haul roads must be properly maintained.

- Moderate: ● Road Maintenance
 ● Pad Cleaning
 ● Rock Clearing
 ● Shoulder Sweeping

- Difficult: ● Ripping
 ● Spreading Dump Material
 ● Road Profiling/Reshaping

BLADE PULL

This specification is also known as drawbar pull. This spec can be calculated as follows:

Variables:

Rear weight of machine = W_r

Tire traction coefficient = T (Look up the table entitled “Coefficient of Traction Factors”)

$$W_r \times T = \text{Blade Pull}$$

Example problem:

Calculate the blade pull for a 140M Global Version machine operating in a quarry pit...

Metric

$RW = 10\,501\text{ kg}$

$T = 0.65$

$$10\,501 \times 0.65 = 6825.65$$

English

$RW = 23,151\text{ lb}$

$T = 0.65$

$$23,151 \times 0.65 = 15,048.15$$

BLADE DOWN PRESSURE

This spec can be calculated as follows:

Variables:

Blade to front axle length = BA

Wheel base length = WB

Weight on front wheels = FW

Blade down pressure = BD

$$\frac{WB}{(WB - BA)} \times FW = BD$$

Example problem:

Calculate the blade down pressure for a 140M Global Version machine...

Metric

$BA = 2565\text{ mm}$ $FW = 4223\text{ kg}$

$WB = 6086\text{ mm}$ $BD = ?$

$$\frac{6086}{(6086 - 2565)} \times 4223 = 7299\text{ kg}$$

English

$BA = 101\text{ in}$

$FW = 9310\text{ lb}$

$WB = 240\text{ in}$

$BD = ?$

$$\frac{240}{(240 - 101)} \times 9310 = 16,075\text{ lb}$$

This specification is only a minor indicator of a motor grader’s productivity. It alone gives no measure of overall machine productivity. When considering motor grader production you need an optimum balance between the machine’s front and rear weights. If a machine has too much weight on the front axle, it might have a high blade down pressure spec. It will, however, lack the essential rear weight and traction needed to push through the load. Too much weight in the rear and it will not have the necessary weight in the front during heavy cuts to maintain proper steering control.

Cat machines are built with this optimum balance in mind. A Cat motor grader is engineered with the proper weight distribution necessary for maximum productivity.

Effective Blade Length*

		Moldboard							
		3.66 m (12')		4.27 m (14')		4.88 m (16')		7.32 m (24')	
Angle°		m	ft	m	ft	m	ft	m	ft
	0°	3.66	12.00	4.27	14.00	4.88	16.00	7.32	24.00
	5°	3.64	11.95	4.25	13.95	4.86	15.94	7.29	23.91
	10°	3.60	11.82	4.20	13.79	4.80	15.76	7.21	23.64
	15°	3.53	11.59	4.12	13.52	4.71	15.45	7.07	23.18
	20°	3.44	11.28	4.01	13.16	4.58	15.04	6.87	22.55
	25°	3.32	10.88	3.87	12.69	4.42	14.50	6.63	21.75
	30°	3.17	10.39	3.69	12.12	4.22	13.86	6.33	20.78
	35°	3.00	9.83	3.50	11.47	4.00	13.11	5.99	19.66
	40°	2.80	9.19	3.27	10.72	3.74	12.26	5.61	18.39
45°	2.59	8.49	3.02	9.90	3.45	11.31	5.17	16.97	

*Effective blade length is the amount of blade coverage the machine is capable of when the blade is at a given angle.

EXTREME SLOPE OPERATION

There are two ways of defining slope work. The slope perpendicular to the machine's direction of travel is commonly referred to as "Side Sloping." The slope parallel to the machine's direction of travel — the machine's ability to travel up or down terrain, is commonly referred to as "Gradeability."

Side Sloping capability for our Cat graders is somewhat subjective, but general agreement among professional operators is that working on a slope ratio of 2.5:1 (21.8 degrees) is the safe limit ... an experienced operator may be able to operate on a 2:1 (28 degrees) slope. Many factors influence this limit such as operator experience, machine configuration, tires and soil conditions, but a 2.5:1 is achievable. Further, a 3:1 slope is the approximate maximum side slope a grader can work on in straight frame configuration. The steeper side slopes all require the machine be articulated to safely navigate the slope.

Gradeability is approximately 22 degrees. This is established by the grader's ability to stop without skidding the tires while moving downhill. The motor grader can, however, *climb* grades steeper than 22 degrees. The traction coefficient is the critical factor in determining whether a grader can safely navigate the slope. Caterpillar recommends that you never climb a slope steeper than you can safely descend.

Maximum lubrication angle: We have measured the graders on a tilt table and pump cavitation occurs around 30 degrees (58% or 1.7:1). This is beyond the grade or slope a motor grader can operate on.

When working side hills and slopes, consideration should be given to the following important points.

- **Speed of Travel** — At higher speeds, inertia forces tend to make the grader less stable.
- **Roughness of Terrain or Surface** — Ample allowance should be made where the terrain or surface is uneven.
- **Mounted Equipment** — Mounted attachments such as front plows, snow wings, rippers and other mounted equipment cause the tractor to balance differently.
- **Nature of Surface** — New earthen fills may give way with the weight of the grader. Rocky surfaces may promote side slipping of grader.
- **Excessive Loads or Side Draft** — This may cause wheel slippage, where the downhill tires "dig in," increasing the angle of grader.
- **Tire Selection and Maintenance** — Consideration should be given to proper tire selection and air pressure. For more information, consult Caterpillar publications — Motor Grader Tire Selection Guide and Operation and Maintenance Manual.
- **Drawbar, Circle and Blade Position** — The position of the blade can affect the stability of the machine.
- **Articulation Angle** — Articulation angle can affect the stability of the machine.
- **Wheel Lean Angle** — Wheel lean angle can affect the stability of the machine.

NOTE: Safe operation on steep slopes may require special machine maintenance as well as excellent operator skill and proper equipment setup for the specific application. Consult Caterpillar publications for further operating tips — Operation & Maintenance Manual, Motor Grader Application Guide, and the Grade Comparison Chart in the Tables section of this Performance Handbook.

Work Tool	120M/ 120M2	12M/ 12M2/ 12M3	140M/ 140M2/ 140M3	160M/ 160M2/ 160M3	16M3/ 18M3	14M3	24M
Lift Group	x	x	x	x	x	x	—
V-Plow	x	x	x	x	—	x	—
One Way Plow	x	x	x	x	—	x	—
Manual Reversible Plow	—	—	—	—	—	x	—
Hydraulic Reversible Plow	x	x	x	x	—	x	—
Snow Wing	x	x	x	x	—	x	—
Mid Mount Scarifier	x	x	x	—	—	—	—
Front Scarifier	x	x	x	x	—	x	—
Manual Angle Blade	x	x	x	x	—	x	—
Hydraulic Angle Blade	x	x	x	x	—	x	—
Straight Blade	x	x	x	x	x	x	—

This list is not all-inclusive.

See Price Lists, Cat Work Tools (Cat WT) Price List, and your Cat dealer for special attachment needs.

Attachments for Cat motor graders require additional hydraulics.

Most front-mounted attachments require a Quick Attach-Detach Parallel Lift Group.

Notes —