



# 651

## Wheel Tractor-Scraper

# Technical Specifications

Configurations and features may vary by region. Please consult your Cat® dealer for availability in your area.

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# 651 Wheel Tractor-Scraper Specifications

## Engine

Engine Model: Tractor	Cat® C18	
Rated Engine Speed: Tractor	2,000 rpm	
Net Power (SAE J1349:2011/ ISO 9249:2007) Tractor	436 kW	585 hp
Gross Power (SAE J1995:2014): Tractor	475 kW	637 hp
Engine Power (ISO 14396:2002): Tractor	469 kW	629 hp

Tractor – Two engine emission options are available:

1. U.S. EPA Tier 4 Final.
2. EU Stage V.

• Maximum Speed: Length × Width × Height.

Net power available at the flywheel when the engine is equipped with fan, air cleaner, aftertreatment, and alternator with engine speed at 2,200 rpm.

## Safety Criteria Compliance Standards

Rollover Protection Structure (ROPS)	ISO 3471:2008 for up to 26 600 kg (58,643 lb)
Falling Object Protective Structure (FOPS)	ISO 3449:2005 Level II
Brakes	ISO 3450:2011
Steering System	ISO 5010:2007
Seat Belt	SAE J386:AUG2012
Forward Horn and Reverse Alarm	ISO 9533:2010
Exterior Sound power level for standard machine	ISO 6393:2008 is 116 dB(A)

## Implement Cycle Times

Apron Lower	4.1 seconds
Apron Raise	4.4 seconds
Bail Lower	1.9 seconds
Bail Raise	1.7 seconds
Bowl Lower	4.5 seconds
Bowl Raise	4.2 seconds
Ejector Extend	9.2 seconds
Ejector Retract	7.8 seconds

## Transmission

Forward 1	5.7 km/h	3.5 mph
Forward 2	10.5 km/h	6.5 mph
Forward 3	12.5 km/h	7.8 mph
Forward 4	17.0 km/h	10.6 mph
Forward 5	22.8 km/h	14.2 mph
Forward 6	30.9 km/h	19.2 mph
Forward 7	41.4 km/h	25.7 mph
Forward 8	56.1 km/h	34.9 mph
Reverse	10.8 km/h	6.7 mph

# 651 Wheel Tractor-Scraper Specifications

## Service Refill Capacities

Crankcase: Tractor	38.0 L	10.0 gal
Transmission System: Tractor	136.0 L	35.9 gal
Cooling System: Tractor	88.6 L	23.4 gal
Fuel Tank	1628.0 L	430.1 gal
Hydraulic System	150.0 L	39.6 gal
Diesel Exhaust Fluid: Tractor	30.5 L	8.1 gal

## General Data

Fuel Tank Refill Capacity	860 L	227.2 gal
Shipping (Split Configuration):		
Tractor Width	3.90 m	12.8'
Tractor Height	4.52 m	14.8'
Scraper Width	4.08 m	13.4'
Scraper Height	3.90 m	12.8'
Scraper Capacity:		
Struck	24.5 m <sup>3</sup>	32.0 yd <sup>3</sup>
Heaped	33.6 m <sup>3</sup>	44.0 yd <sup>3</sup>
Rated Load	47 174 kg 46.4 tonnes	104,000 lb 52.0 tons
Width of Cut	3.8 m	12.5'
Maximum Depth of Cut (Cushion Hitch Locked)	440 mm	17.3"
Maximum Depth of Spread (Cushion Hitch Locked)	530 mm	20.9"
Maximum Depth of Spread	660 mm	26.0"
Top Speed (Loaded)	56.1 km/hr	34.9 mph
180° Curb-to-Curb Turning Width (Right)	13.6 m	44.6'
Tire Size	40.5/75 R39 ** E-3	
Operating weight (Michelin Tires, Full Fuel, Without Operator)		
Unloaded	74 253 kg	163,700 lb
With Rated Load	121 427 kg	267,700 lb
Overall Length	17.97 m	58.96'

## Sound Performance

Sound Level	Test Method	
Operator Sound Pressure Level	77 dB(A)	"ISO 6396:2008" <sup>(1)</sup>
Equivalent Sound Pressure Level (Leq)	77 dB(A)	"ANSI/SAW J1166 FEB 2009" <sup>(2)</sup>

- Hearing protection may be needed when operating with an open operator station and cab (when not properly maintained or doors/windows open) for extended periods or in a noisy environment.

<sup>(1)</sup>The measurement was conducted at 100% of the maximum engine cooling fan speed. The sound level may vary at different engine cooling fan speeds. The measurement was conducted with the cab doors and the cab windows closed. The cab was properly installed and maintained.

<sup>(2)</sup>This is a work cycle sound exposure level. The measurement was conducted with the cab doors and the cab windows closed. The cab was properly installed and maintained.

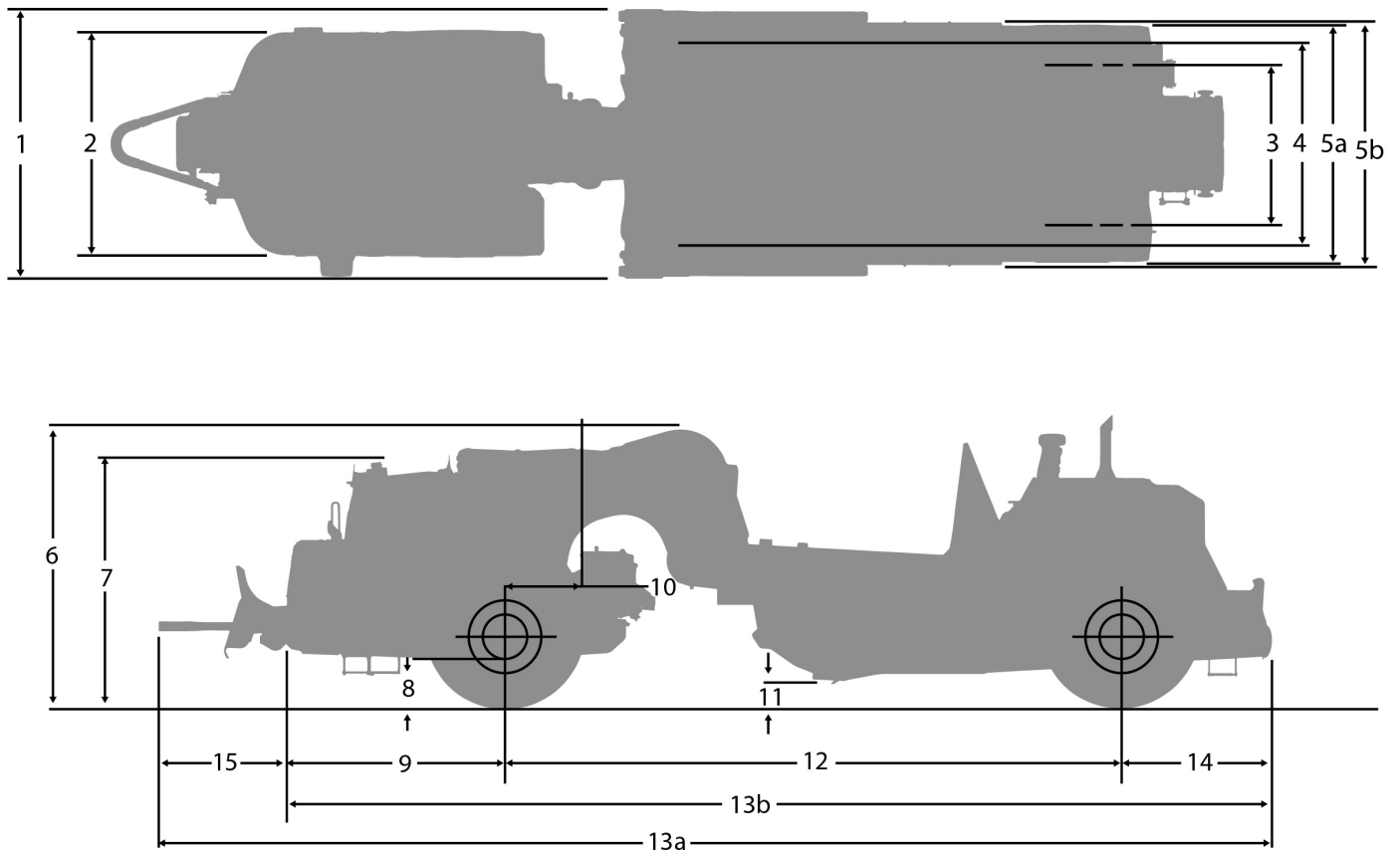
## Air Conditioning System

- The air conditioning system on this machine contains the fluorinated greenhouse gas refrigerant R134a (Global Warming Potential = 1430). The system contains 2.0 kg (4.4 lb) of refrigerant which has a CO<sub>2</sub> equivalent of 2.86 metric tonnes (3.153 tons).

# 651 Wheel Tractor-Scraper Specifications

## Dimensions

All dimensions are approximate.



<b>651</b>			
<b>1</b>	Overall Machine Width	4.36 m	14.30 ft
<b>2</b>	Tractor Width	3.75 m	12.30 ft
<b>3</b>	Scraper Width	4.36 m	14.30 ft
<b>4</b>	Inside of Bowl Width	3.68 m	12.07 ft
<b>5a</b>	Outside Rear Tires Width	3.84 m	12.60 ft
<b>5b</b>	Outside Bowl Width	3.93 m	12.89 ft
<b>6</b>	Overall Machine Height	4.77 m	15.65 ft
<b>7</b>	Height to Top of Cab	3.92 m	12.86 ft
<b>8</b>	Tractor Ground Clearance	0.72 m	2.36 ft
<b>9</b>	Front of Tractor to Front Axle	4.55 m	14.93 ft
<b>10</b>	Axle to Vertical Hitch Pin	0.55 m	1.80 ft
<b>11</b>	Cutting Edge Height – Maximum	0.66 m	2.17 ft
<b>12</b>	Wheelbase	9.96 m	32.68 ft
<b>13a</b>	Overall Machine Length – Bail Down	17.97 m	58.96 ft
<b>13b</b>	Overall Machine Length – Bail Up or NA	17.05 m	55.94 ft
<b>14</b>	Rear Axle to Rear of Machine	2.46 m	8.07 ft

## Typical Fixed Times Retarder Curves

### TYPICAL FIXED TIMES FOR SCRAPERS

(Times may vary depending on job conditions)

Model	Loaded By	Load Time (Min.)	Maneuver and Spread or Maneuver and Dump (Min.)
613G	Self	0.9	0.7
623K	Self	0.9	0.7
621K	One D8	0.5	0.7
627K	One D8	0.5	0.6
621K	One D9	0.4	0.7
627K	One D9	0.4	0.6
627K/PP	Self	0.9*	0.6
631K	One D9	0.6	0.7
637K	One D9	0.6	0.6
631K	One D10	0.5	0.7
637K	One D10	0.5	0.6
637K/PP	Self	1.0*	0.6
657	One D11	0.6	0.6
657	Push Pull Self	1.1*	0.6
637K	Coal	0.8	0.7
657	Coal	0.8	0.6

\*Load time per pair, including transfer time.

**Note:** Empty weights shown on the Wheel Tractor-Scraper charts include ROPS canopy. When calculating TMPH loadings, any additional weight must be considered in establishing mean tire loads.

### USE OF RETARDER CURVES

The following explanation applies to retarder curves for Wheel Tractor-Scrapers and Articulated Trucks.

The speed that can be maintained (without use of service brake) when the machine is descending a grade with retarder fully on can be determined from the retarder curves in this section if gross machine weight and total effective grade are known.

**Total Effective Grade (or Total Resistance)** is grade assistance minus rolling resistance.

$$10 \text{ kg/metric ton (20 lb/U.S. ton)} = 1\% \text{ adverse grade}$$

*Example:*

**15% favorable grade with 5% rolling resistance.** Find Total Effective Grade.

$$\text{Total Effective Grade} = 15\% \text{ Grade Assistance} - 5\%$$

$$\text{Rolling Resistance} = 10\% \text{ Total Effective Grade Assistance}$$

*Example Problem:*

**A 651 with an estimated payload of 47 175 kg (104,000 lb) descends a 10% total effective grade.** Find constant speed and gear range with maximum retarder effort. Find travel time if the slope is 610 m (2,000 ft) long.

$$\begin{aligned} \text{Empty weight} + \text{payload} &= \text{Gross Weight} = 60\,950 \text{ kg} + 47\,175 \text{ kg} \\ &= 108\,125 \text{ kg (134,370 lb + 104,000 lb = 238,370 lb)} \end{aligned}$$

# 651 Wheel Tractor-Scraper Specifications

## Retarder Curves

**Solution:** Using the retarder curve below, read from 108 125 kg (238,370 lb) (point A) on top of Gross Weight scale down the line to the intersection of the 10% Effective Grade line (point B).

Go across horizontally from point B to the intersection of the retarder curve (point C). Point C intersects at the 5 (5th gear) range.

Where point C intersects the retarder curve, read down vertically to point D on the bottom scale to obtain the constant speed: 21.7 km/h (13.5 mph).

**Answer:** The 651 will descend the slope at 21.7 km/h (13.5 mph) in 5th gear. Travel time is 1.68 minutes.

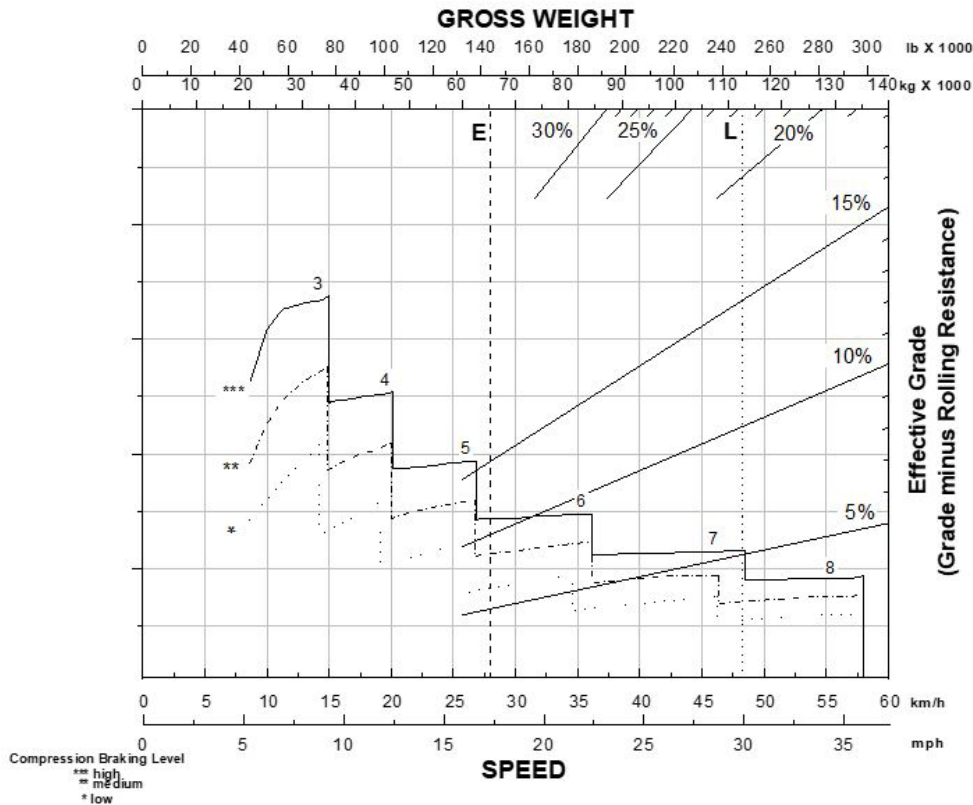
$$\frac{610 \text{ m}}{363 \text{ m/min}} = 1.68 \text{ min}$$

$$\frac{2000 \text{ ft}}{13.5 \text{ mph} \times 88^*} = 1.68 \text{ min}$$

\* (mph x 88 = F.P.M.)

$$\frac{60 \times 610}{21.7 \times 1000} = T = (1.68)$$

**Note:** The basic Distance-Speed-Time formula is  $60 D \div S = T$  (or “60 D Street”), where 60 is minutes, D is distance, S is speed, and T is time. In the above problem,  $60 \times 610 \text{ m} \div 21.7 \text{ km/h} \times 1000 = T$ .



### KEY

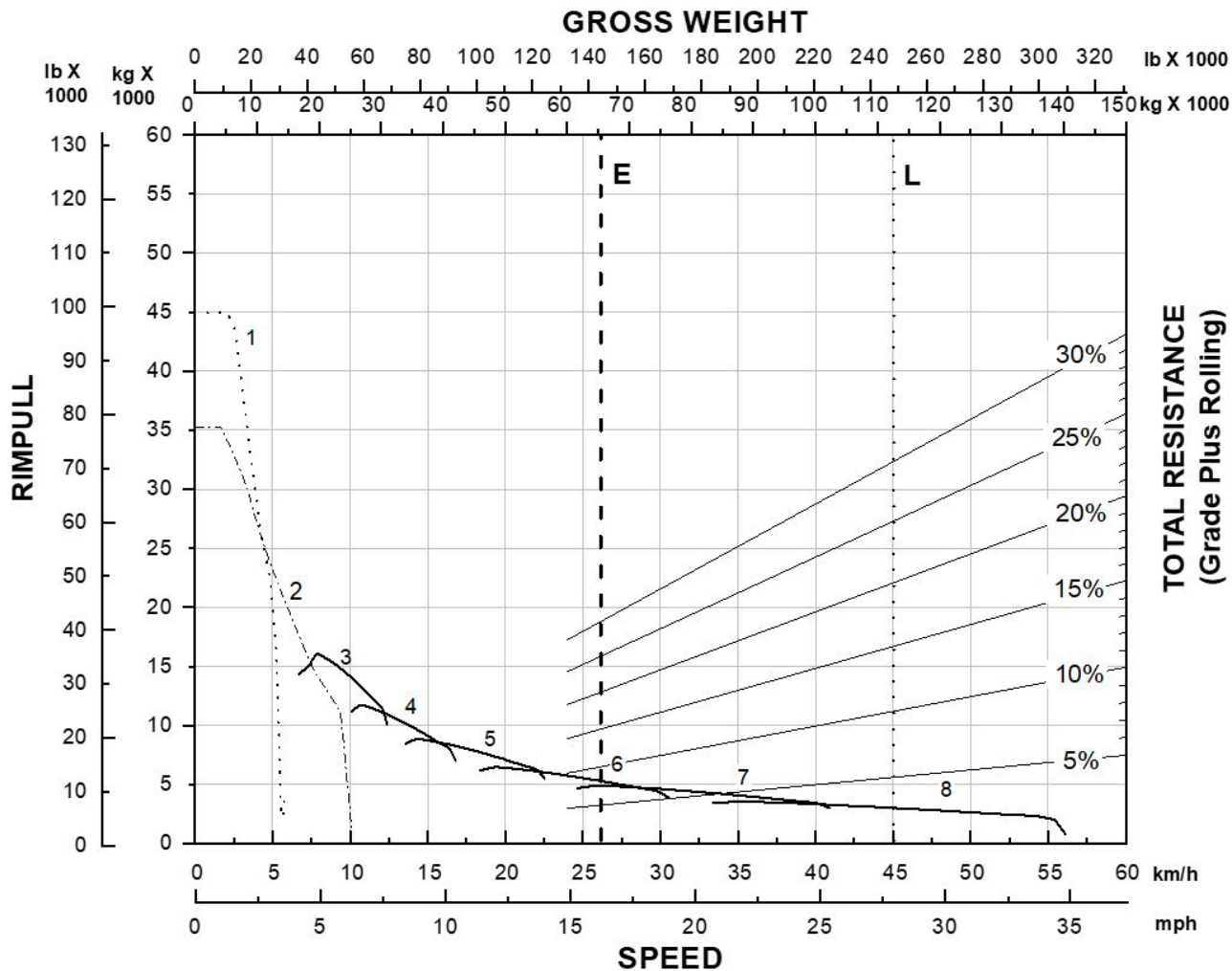
- 3 — 3rd Gear Direct Drive
- 4 — 4th Gear Direct Drive
- 5 — 5th Gear Direct Drive
- 6 — 6th Gear Direct Drive
- 7 — 7th Gear Direct Drive
- 8 — 8th Gear Direct Drive

### KEY

- A — Loaded 108 125 kg (238,370 lb)
- B — Intersection with 10% effective grade line
- C — Intersection with retarder curve (5th gear)
- D — Constant speed 21.7 km/h (13.5 mph)

# 651 Wheel Tractor-Scraper Specifications

## Rimpull-Speed-Gradeability Curve



\*at sea level

### KEY

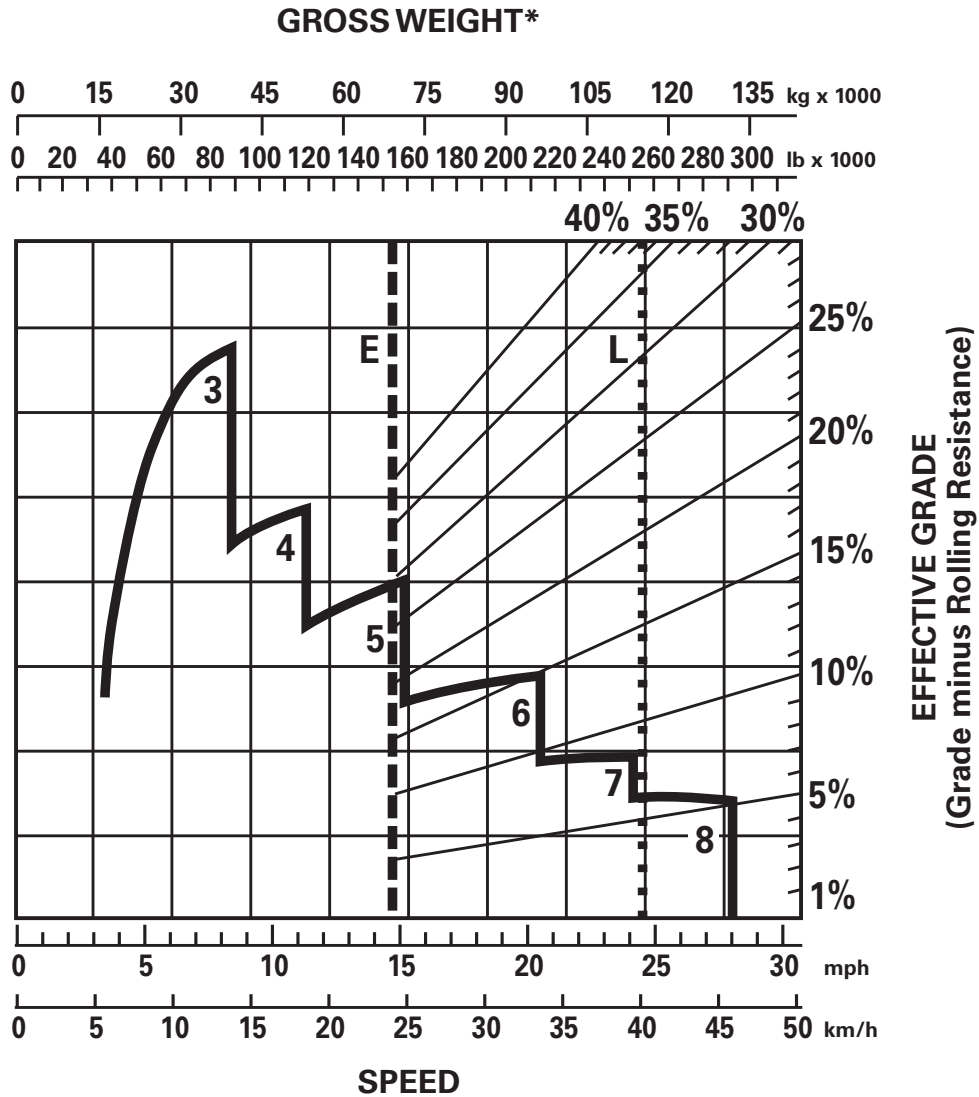
- 1 — 1st Gear Torque Converter Drive
- 2 — 2nd Gear Torque Converter Drive
- 3 — 3rd Gear Direct Drive
- 4 — 4th Gear Direct Drive
- 5 — 5th Gear Direct Drive
- 6 — 6th Gear Direct Drive
- 7 — 7th Gear Direct Drive
- 8 — 8th Gear Direct Drive

### KEY

- E — Empty 72 804 kg (160,505 lb)
- L — Loaded 119 978 kg (264,505 lb)

# 651 Wheel Tractor-Scraper Specifications

## Rimpull-Retarding Curve



\*at sea level

**KEY**

- 3 — 3rd Gear Direct Drive
- 4 — 4th Gear Direct Drive
- 5 — 5th Gear Direct Drive
- 6 — 6th Gear Direct Drive
- 7 — 7th Gear Direct Drive
- 8 — 8th Gear Direct Drive

**KEY**

- E — Empty 72 804 kg (160,505 lb)
- L — Loaded 119 978 kg (264,505 lb)



# 651 Wheel Tractor-Scraper Specifications

## Standard & Optional Equipment

Standard and optional equipment may vary. Consult your Cat dealer for details.

	Standard	Optional		Standard	Optional
<b>POWER TRAIN – TRACTOR</b>			<b>OPERATOR ENVIRONMENT – TRACTOR</b>		
Cat C18 (U.S. EPA Tier 4 Final and EU Stage V)	✓		HVAC system, heat, AC, defrost	✓	
Cat engine brake	✓		Thermostat control of HVAC system	✓	
Electric start, 24V	✓		Coat hook	✓	
Air cleaner, dry type	✓		Lunchbox platform with holding strap	✓	
Fan, hydraulic	✓		Diagnostic connection (2)	✓	
Ground level engine shutdown	✓		12V power ports (2)	✓	
Radiator	✓		Differential lock (1)	✓	
Guard, crankcase	✓		Dome courtesy light	✓	
Starting aid, ether	✓		Horn, electric	✓	
Braking system: primary and secondary, wet disc, hydraulic; parking, hydraulic-released, spring-applied	✓		T-handle implement control	✓	
Throttle lock	✓		Radio ready	✓	
Transmission: 8-speed planetary powershift, ECPC control, APECS software, programmable top gear selection, transmission hold, differential lock, guard – power train, ground speed control, machine speed limit	✓		ROPS/FOPS cab, pressurized	✓	
<b>POWER TRAIN – SCRAPER</b>			<b>FLUIDS</b>		
Cat C15	✓		Extended life coolant to -37° C (-34° F)	✓	
Cat engine brake	✓				
Electric start, 24V	✓				
Fan, mechanical drive	✓				
Ground level engine shutdown	✓				
Starting aid, ether	✓				
Braking system: primary and secondary, wet disc, hydraulic; 8-speed planetary powershift, ECPC control, guard – power train, APECS software, programmable top gear selection, transmission hold	✓				
<b>ELECTRICAL – TRACTOR</b>					
Alternator, 115 amp	✓				
Batteries (4), 12V, 1,000 CCA, maintenance free	✓				
Electrical system, 24V	✓				
Turn signals with hazard function	✓				
Starting/charging receptacle	✓				
<b>ELECTRICAL – SCRAPER</b>					
Alarm, backup	✓				
Batteries (4), 12V, 1,000 CCA, maintenance free	✓				
Lighting system: headlights – halogen, turn signals with hazard functions – LED, floodlights, (2) cutting edge and (1) bowl, side vision – halogen	✓				
Starting/charging receptacle	✓				

# 651 Wheel Tractor-Scraper Standard & Optional Equipment

## Standard & Optional Equipment

Standard and optional equipment may vary. Consult your Cat dealer for details.

	Standard	Optional		Standard	Optional
<b>OTHER STANDARD EQUIPMENT – TRACTOR</b>			<b>OTHER ATTACHMENTS</b>		
Accumulators (brake and cushion hitch) with Canadian Registration Number (CRN)	✓		Camera arrangement – Work Area Vision System (WAVS)		✓
Fast oil change	✓		Cab beacon		✓
Vandalism locks	✓		Air horn		✓
Steering locks	✓		Air horn and beacon		✓
Heater, engine coolant 120V	✓		Wiring group		✓
Cushion push plate/bail – standard open bowl only	✓		<b>STEERING ARRANGEMENTS</b>		
<b>OTHER STANDARD EQUIPMENT – SCRAPER</b>			<b>INTEGRATED TECHNOLOGIES</b>		
Bowl	✓		Secondary steering (ground driven)		✓
Fast oil change	✓		<b>SERVICE INSTRUCTIONS</b>		
Vandalism locks	✓		Cat Production Measurement		✓
Rear hook/radiator guard – standard open bowl only	✓		Product Link™		✓
Guard, overflow – standard open bowl only	✓		Sequence Assist with Payload Estimator		✓
Heater, engine coolant 120V	✓		<b>SERVICE INSTRUCTIONS</b>		
Hydraulic position sensing cylinders (bowl lift and apron)	✓		Film arrangement – U.S. (ANSI)		✓
			Film arrangement – International (ISO)		✓

The following information applies to the machine at the time of final manufacture as configured for sale in the regions covered in this document. The content of this declaration is valid as of the date issued; however, content related to machine features and specifications are subject to change without notice. For additional information, please see the machine's Operation and Maintenance Manual.

For more information on sustainability in action and our progress, please visit <https://www.caterpillar.com/en/company/sustainability>.

## Engine

- The Cat® C18 engine meets U.S. EPA Tier 4 Final and EU Stage V emission standards..
- Cat diesel engines are required to use ULSD (ultra-low sulfur diesel fuel with 15 ppm of sulfur or less) or ULSD blended with the following lower-carbon intensity fuels up to:
  - ✓ 20% biodiesel FAME (fatty acid methyl ester)\*
  - ✓ 100% renewable diesel, HVO (hydrotreated vegetable oil) and GTL (gas-to-liquid) fuels

Refer to guidelines for successful application. Please consult your Cat dealer or “Caterpillar Machine Fluids Recommendations” (SEBU6250) for details.

*\*Engines with no aftertreatment devices can use higher blends, up to 100% biodiesel (for use of blends higher than 20% biodiesel, consult your Cat dealer).*

## Air Conditioning System

- The air conditioning system on this machine contains the fluorinated greenhouse gas refrigerant R134a (Global Warming Potential = 1430). The system contains 2.0 kg (4.4 lb) of refrigerant which has a CO2 equivalent of 2.86 metric tonnes (3.153 tons).

## Paint

- Based on best available knowledge, the maximum allowable concentration, measured in parts per million (PPM), of the following heavy metals in paint are:
  - Barium < 0.01%
  - Cadmium < 0.01%
  - Chromium < 0.01%
  - Lead < 0.01%

## Sound Performance

Sound Level	Test Method	
Operator Sound Pressure Level	77 dB(A)	“ISO 6396:2008” <sup>(1)</sup>
Equivalent Sound Pressure Level (Leq)	77 dB(A)	“ANSI/SAW J1166 FEB 2009” <sup>(2)</sup>

- Hearing protection may be needed when operating with an open operator station and cab (when not properly maintained or doors/windows open) for extended periods or in a noisy environment.
  - <sup>(1)</sup> The measurement was conducted at 100% of the maximum engine cooling fan speed. The sound level may vary at different engine cooling fan speeds. The measurement was conducted with the cab doors and the cab windows closed. The cab was properly installed and maintained.
  - <sup>(2)</sup> This is a work cycle sound exposure level. The measurement was conducted with the cab doors and the cab windows closed. The cab was properly installed and maintained.

## Oils and Fluids

- Caterpillar factory fills with ethylene glycol coolants. Cat Diesel Engine Antifreeze/Coolant (DEAC) and Cat Extended Life Coolant (ELC) can be recycled. Consult your Cat dealer for more information.
- Cat Bio HYDO™ Advanced is an EU Ecolabel approved biodegradable hydraulic oil. Additional fluids are likely to be present, please consult the Operations and Maintenance Manual or the Application and Installation guide for complete fluid recommendations and maintenance intervals.

## Features and Technology

- The following features and technology may contribute to fuel savings and/or carbon reduction. Features may vary. Consult your Cat dealer for details.
  - Ground speed control helps lower fuel burn by allowing the operator to set the desired top speed and the machine will find the optimal gear for the engine and transmission
  - Optional Cat® Load Assist helps you avoid excessive fuel burn and greenhouse gas emissions from inexperienced operators by automating bowl loading with the push of a button
  - Optional Sequence Assist automates repetitive tasks, such as loading, hauling and dumping, to help reduce operator fatigue and rework caused during manual operation and to help reduce fuel burn and greenhouse gas emissions
  - Advanced Productivity Electronic Control System (APECS) allows the engines and transmission to communicate on a high level to better utilize the power and torque
  - Optional Cat Grade Control helps operators of all skill levels avoid costly rework, wasteful fuel burn and greenhouse gas emissions to execute the design plan with greater speed and accuracy.
  - On-demand hydraulic fan helps reduce fuel consumption and under-hood heat for longer component life
  - Improve jobsite efficiency with lower operating costs with Product Link™ and VisionLink® insights



For more complete information on Cat products, dealer services, and industry solutions, visit us on the web at [www.cat.com](http://www.cat.com).

Materials and specifications are subject to change without notice. Featured machines in photos may include additional equipment. See your Cat dealer for available options.

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Build Number: WSJ  
(Global except Jpn  
and China)

