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

Tractor – Two engine emission options are available:

- Meets U.S. EPA Tier 4 Final and EU Stage V emission standards, or equivalent to U.S. EPA Tier 2, or equivalent to U.S. EPA Tier 3 and EU Stage IIIA.
- 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 Protective Structure (ROPS) | ISO 3471:2008 for up to 26 600 kg (58,643 lb) |
| Falling Objects Protective Structure (FOPS) | ISO 3449:2005 Level II |
| Brakes | ISO 3450:2011 |
| Steering System | ISO 5010:2019 |
| Seat Belt | ISO 6683:2005, SAE J386 |
| Forward Horn and Reverse Alarm | ISO 9533:2010 |
| Exterior Sound Power Level for Standard Machine | ISO 6395:2008 is 116 dB(A) |
| Interior Sound Pressure Level for Standard Machine | ISO 6396:2008 is 77 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 |

## 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 $m^3$ | 32.0 $yd^3$ |
| Heaped | 33.6 $m^3$ | 44.0 $yd^3$ |
| Rated Load | 47 174 kg<br>46.4 tonnes | 104,000 lb<br>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

The exterior sound power level for the standard machine (ISO 6395:2008) is 116 dB(A).[1]

The interior sound pressure level for the standard machine (ISO 6396:2008) is 77 dB(A).[2]

- 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.

(1) 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.

(2) 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.

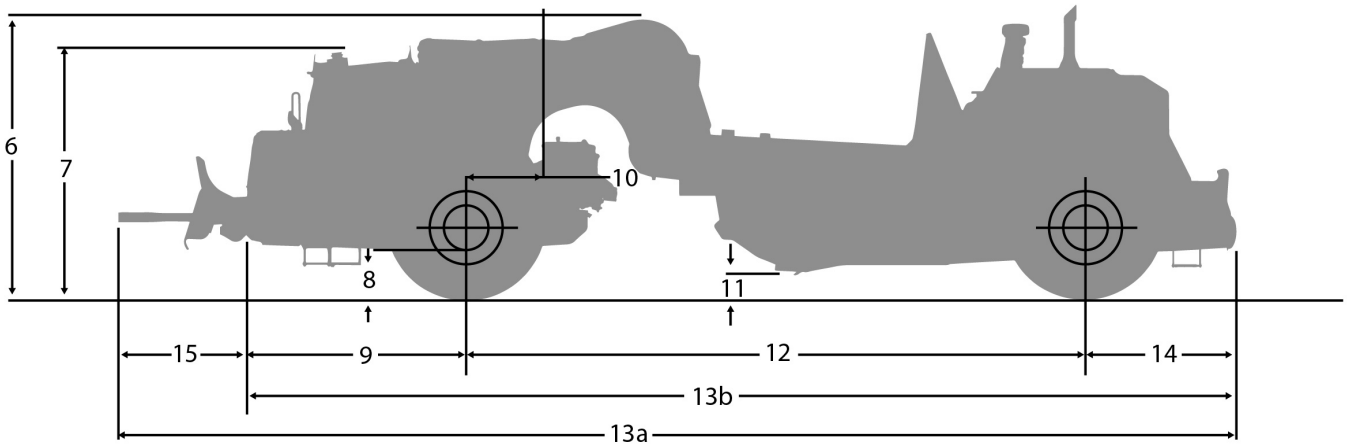
## Air Conditioning System

- 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 $CO_2$ equivalent of 2.86 metric tonnes (3.153 tons).

# 651 Wheel Tractor-Scraper Specifications

## Dimensions

All dimensions are approximate.


| | | 651 | |
|---|---|---|---|
| **1** | Overall Machine Width | 4.36 m | 14.30 ft |
| **2** | Tractor Width | 3.75 m | 12.30 ft |
| **3** | Scraper Width | 4.36 m | 14.30 ft |
| **4** | Inside of Bowl Width | 3.68 m | 12.07 ft |
| **5a** | Outside Rear Tires Width | 3.84 m | 12.60 ft |
| **5b** | Outside Bowl Width | 3.93 m | 12.89 ft |
| **6** | Overall Machine Height | 4.77 m | 15.65 ft |
| **7** | Height to Top of Cab | 3.92 m | 12.86 ft |
| **8** | Tractor Ground Clearance | 0.72 m | 2.36 ft |
| **9** | Front of Tractor to Front Axle | 4.55 m | 14.93 ft |
| **10** | Axle to Vertical Hitch Pin | 0.55 m | 1.80 ft |
| **11** | Cutting Edge Height – Maximum | 0.66 m | 2.17 ft |
| **12** | Wheelbase | 9.96 m | 32.68 ft |
| **13a** | Overall Machine Length – Bail Down | 17.97 m | 58.96 ft |
| **13b** | Overall Machine Length – Bail Up or NA | 17.05 m | 55.94 ft |
| **14** | 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 cab. 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 kg/metric ton (20 lb/U.S. ton) = 1% adverse grade

*Example:*

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

Total Effective Grade = 15% Grade Assistance – 5%

Rolling Resistance = 10% 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.

Empty weight + payload = Gross Weight = 60 950 kg + 47 175 kg = 108 125 kg (134,370 lb + 104,000 lb = 238,370 lb)

## 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.

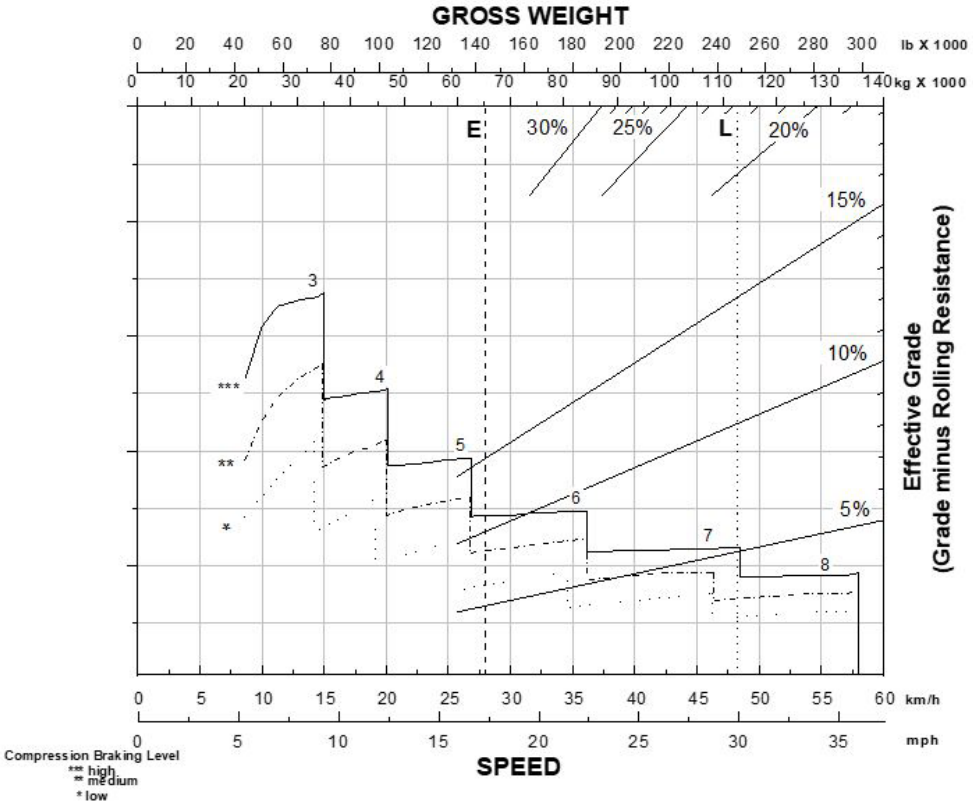
$$\frac{610 \text{ m}}{363 \text{ m/min}} = 1.68 \text{ min}$$

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

* (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 ÷ 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 × 610 m ÷ 21.7 km/h × 1000 = T.



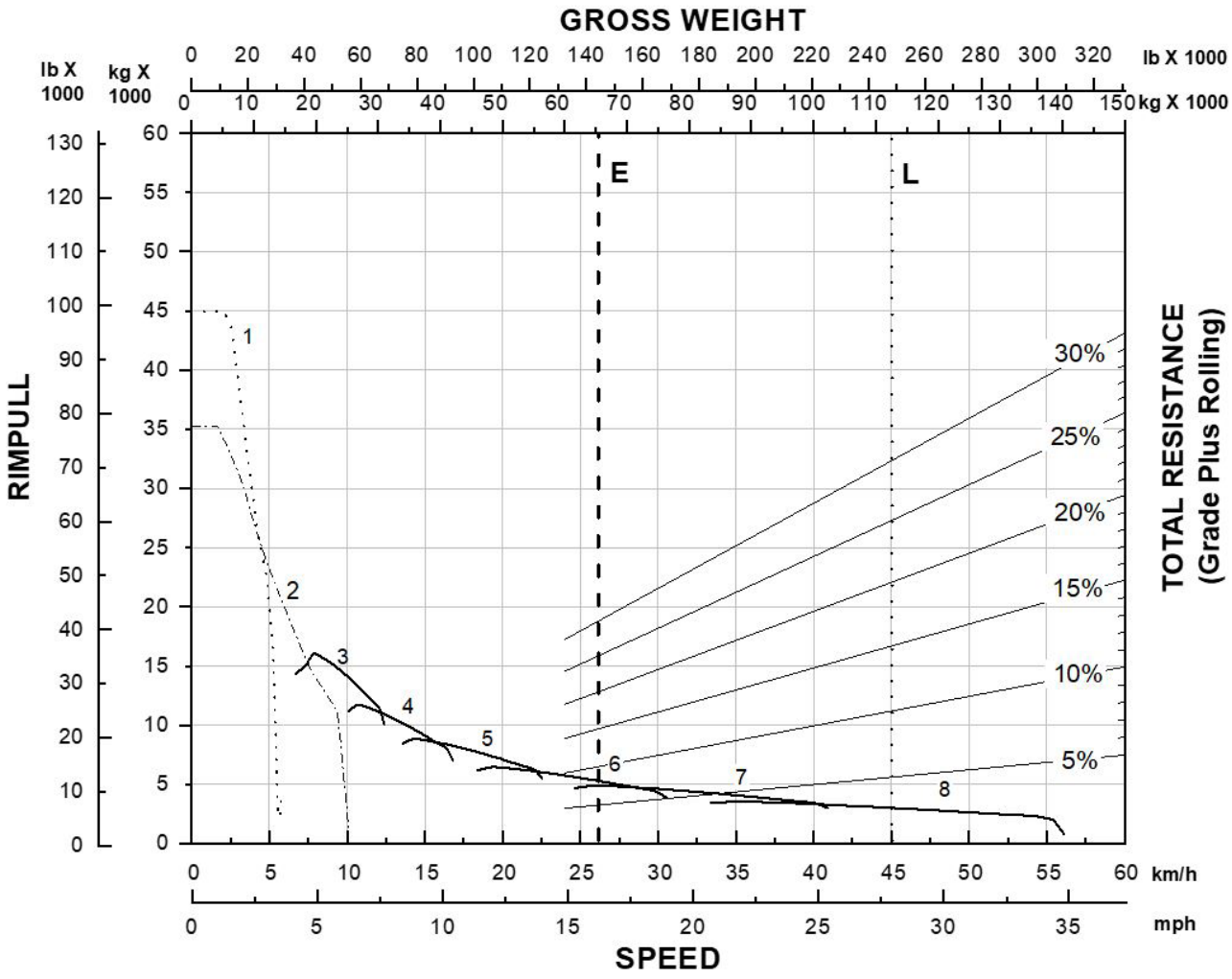

KEY

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)

## Rimpull-Speed-Gradeability Curve




*at sea level

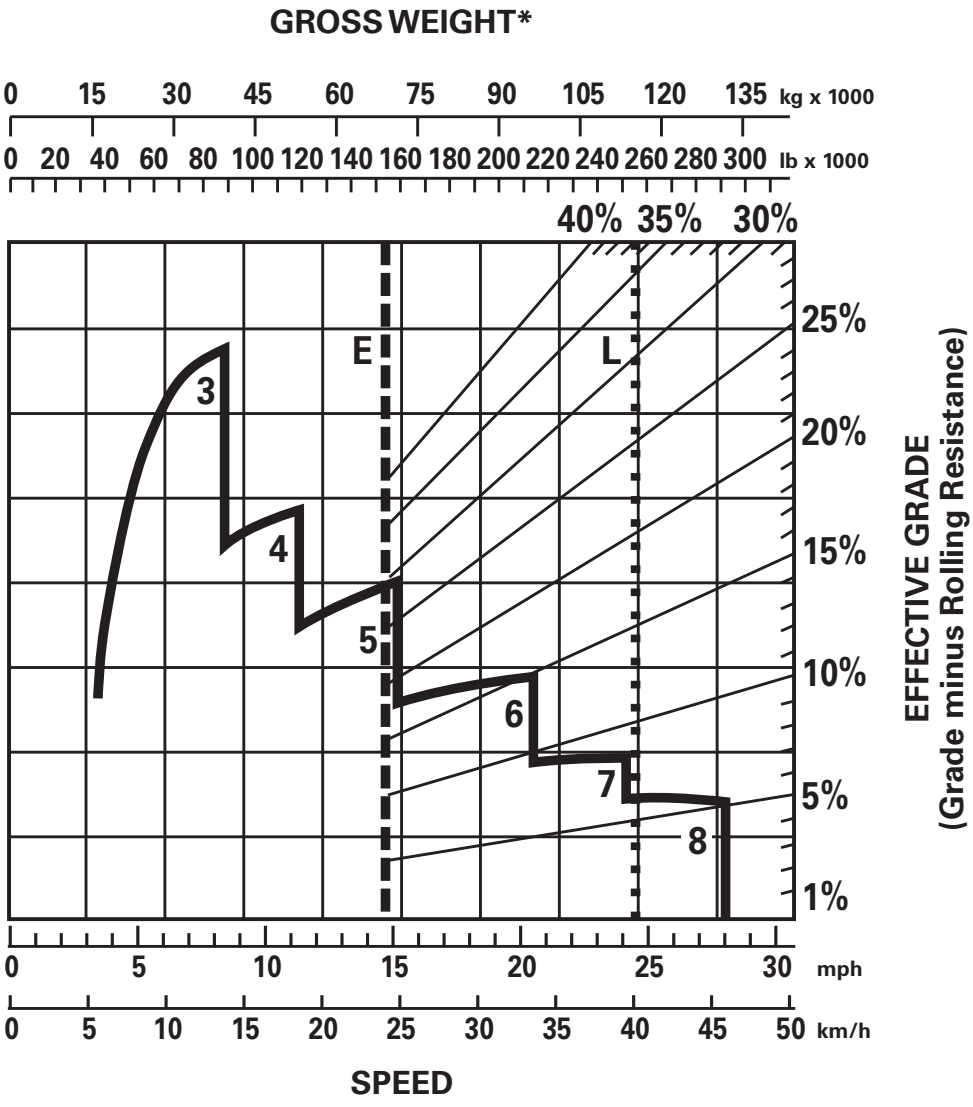
KEY

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)

## 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)

## Standard & Optional Equipment

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

| | Standard | Optional |
|---|---|---|
| **POWERTRAIN – TRACTOR** | | |
| Cat C18 (U.S. EPA Tier 4 Final and EU Stage V) | ✓ | |
| Cat engine brake | ✓ | |
| Electric start, 24V | ✓ | |
| Air cleaner, dry type | ✓ | |
| Fan, hydraulic | ✓ | |
| Ground level engine shutdown | ✓ | |
| Radiator | ✓ | |
| Guard, crankcase | ✓ | |
| Starting aid, ether | ✓ | |
| Braking system: primary and secondary, wet disc, hydraulic; parking, hydraulic-released, spring-applied | ✓ | |
| Throttle lock | ✓ | |
| Transmission: 8-speed planetary powershift, Electronic Clutch Pressure Control (ECPC), Advanced Productivity Electronic Control Strategy (APECS) software, programmable top gear selection, transmission hold, differential lock, guard – powertrain, ground speed control, machine speed limit | ✓ | |
| **POWERTRAIN – SCRAPER** | | |
| Cat C15 | ✓ | |
| Cat engine brake | ✓ | |
| Electric start, 24V | ✓ | |
| Fan, mechnical drive | ✓ | |
| Ground level engine shutdown | ✓ | |
| Starting aid, ether | ✓ | |
| Braking system: primary and secondary, wet disc, hydraulic; 8-speed planetary powershift, ECPC control, guard – powertrain, APECS software, programmable top gear selection, transmission hold | ✓ | |
| **ELECTRICAL – TRACTOR** | | |
| Alternator, 115 amp | ✓ | |
| Batteries (4), 12V, 1,000 CCA, maintenance free | ✓ | |
| Electrical system, 24V | ✓ | |
| Turn signals with hazard function | ✓ | |
| Starting/charging receptacle | ✓ | |
| **ELECTRICAL – SCRAPER** | | |
| 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 | ✓ | |

| | Standard | Optional |
|---|---|---|
| **OPERATOR ENVIRONMENT – TRACTOR** | | |
| HVAC system, heat, AC, defrost | ✓ | |
| Thermostat control of HVAC system | ✓ | |
| Coat hook | ✓ | |
| Lunchbox platform with holding strap | ✓ | |
| Diagnostic connection (2) | ✓ | |
| 12V power ports (2) | ✓ | |
| Differential lock (1) | ✓ | |
| Dome courtesy light | ✓ | |
| Horn, electric | ✓ | |
| T-handle implement control | ✓ | |
| Radio ready | ✓ | |
| Rollover protective structure/falling objects protective structure (ROPS/FOPS) cab, pressurized | ✓ | |
| Keypad switches: rear engine start; throttle lock; wipers/washers; hazard lights; worklights on, off; information mode; messenger display; safety tab rocker switches, parking brake | ✓ | |
| Seat belt, static two-piece | ✓ | |
| Windows, sliding | ✓ | |
| Windows, laminated, zipped in | ✓ | |
| Windshield wipers, front and rear windows, includes washers | ✓ | |
| Door lock | ✓ | |
| Messenger display gauges, warnings include: coolant temp; engine oil temp; hydraulic oil temp; DPF temp; fuel level; park brake; implement lockout; brake system, regeneration required; throttle lock; system voltage; secondary steering; bail down; differential lock; apron float; transmission hold; high beam lights; action lamp; engine speed, rpm; gear selection; DPF fill levels | ✓ | |
| Powered access ladder | | ✓ |
| Safety tab rocker switches | ✓ | |
| Seat – Cat Advanced Ride Management (ARM), Cat Comfort Series III, rotates 30 degrees | ✓ | |
| Steering wheel, tilt, telescoping, padded | ✓ | |
| Windows, right side emergency egress | ✓ | |
| Messenger display | ✓ | |
| **FLUIDS** | | |
| Extended life coolant to -37° C (-34° F) | ✓ | |

# 651 Wheel Tractor-Scraper Standard & Optional Equipment

## Standard & Optional Equipment

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

| | Standard | Optional |
|---|---|---|
| **OTHER STANDARD EQUIPMEMT – TRACTOR** | | |
| Accumulators (brake and cushion hitch) with Canadian Registration Number (CRN) | ✓ | |
| Fast oil change | ✓ | |
| Vandalism locks | ✓ | |
| Steering locks | ✓ | |
| Heater, engine coolant 120V | ✓ | |
| Cushion push plate/bail – standard open bowl only | ✓ | |
| **OTHER STANDARD EQUIPMEMT – SCRAPER** | | |
| Bowl | ✓ | |
| Fast oil change | ✓ | |
| Vandalism locks | ✓ | |
| Rear hook/radiator guard – standard open bowl only | ✓ | |
| Guard, overflow – standard open bowl only | ✓ | |
| Heater, engine coolant 120V | ✓ | |
| Hydraulic position sensing cylinders (bowl lift and apron) | ✓ | |

| | Standard | Optional |
|---|---|---|
| **OTHER ATTACHMENTS** | | |
| Camera arrangement – Work Area Vision System (WAVS) | | ✓ |
| Cab beacon with air horn | | ✓ |
| Wiring group | | ✓ |
| **STEERING ARRANGEMENTS** | | |
| Secondary steering (ground driven) | ✓ | |
| **INTEGRATED TECHNOLOGIES** | | |
| Product Link™ | ✓ | |
| Sequence Assist and Cat Payload | ✓ | |
| **SERVICE INSTRUCTIONS** | | |
| Film arrangement – U.S. (ANSI) | ✓ | |
| Film arrangement – International (ISO) | ✓ | |

# 651 Environmental Declaration

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).*

***Lower-carbon intensity fuels do not significantly reduce GHG's at the tailpipe.*

## 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 $CO_2$ 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

The exterior sound power level for the standard machine (ISO 6395:2008) is 116 dB(A).[1]

The interior sound pressure level for the standard machine (ISO 6396:2008) is 77 dB(A).[2]

- 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.

(1) 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.

(2) 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**.

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



AEXQ3297-02 (11-2024)
Replaces AEXQ3297-01
Build Number: 11A
(Global, excluding Japan)

CAT®