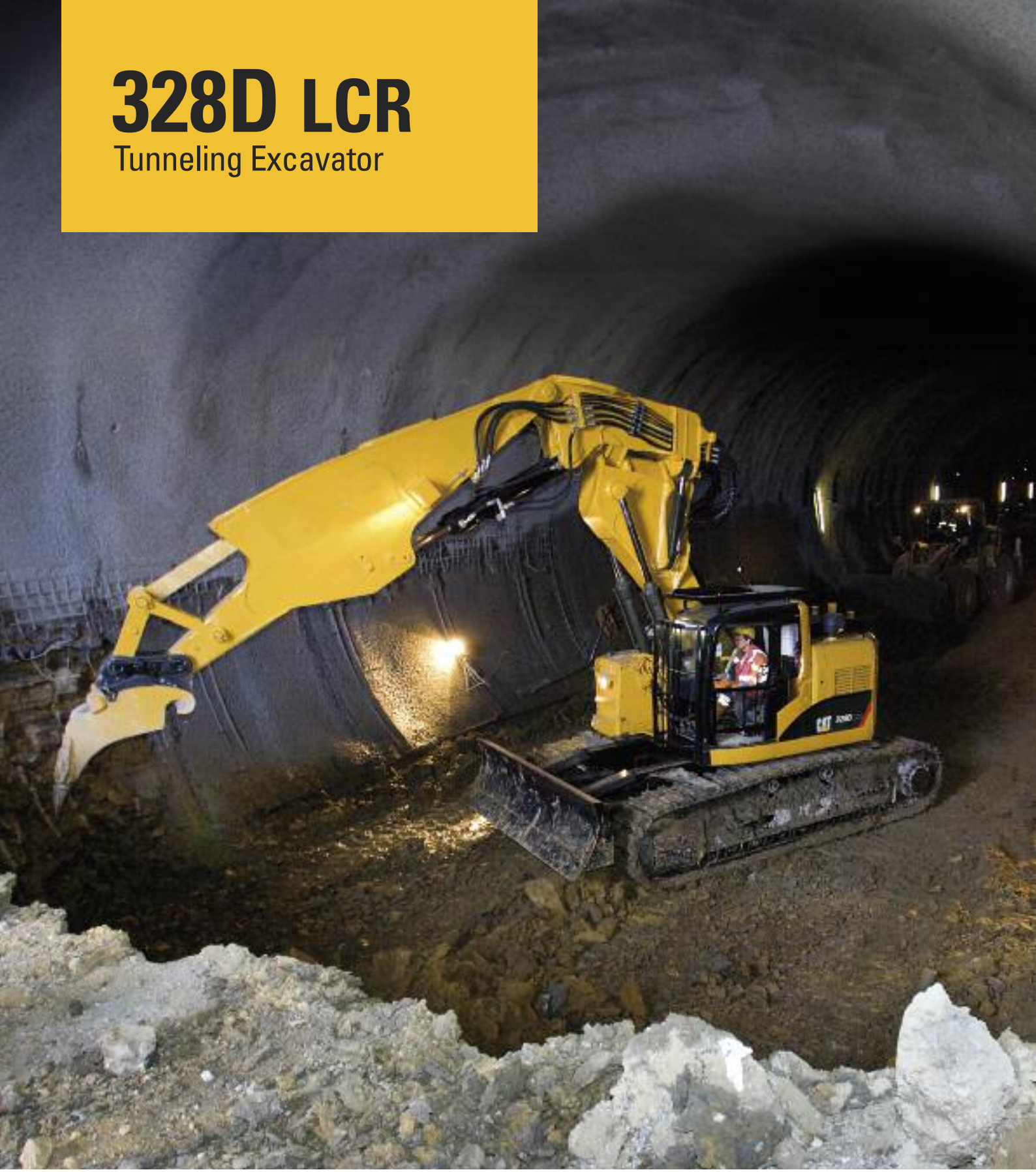
328D LCR
Tunneling Excavator



Cat® C7 Diesel Engine with ACERT™ Technology	
Net power (ISO 9249) at 1800 rpm	140 kW/190 PS
Operating Data	
Operating weight	43,5 t
Maximum reach at ground level	9 970 mm
Maximum digging depth	4 970 mm
Tail swing radius	1 900 mm
Maximum stick digging force	134 kN
Maximum bucket digging force	212 kN

ZEPPELIN CAT

328D Tunneling Excavator Features

C7 Cat Diesel Engine with ACERT™ Technology

ACERT Technology combines a whole host of individual innovations applied directly to fuel combustion to dramatically reduce emissions. This means that the C7 exhaust emissions fall below the strict requirements of Stage IIIA standards.

Hydraulics

The hydraulic system is noted for its high level of reliability and outstanding controllability. The attachment control further enhances operational flexibility.

Attachments

The following attachments are available for the tunneling excavator: A short measuring 3200 mm in length, a fontshovel version, and two special tunneling booms with additional swing control.

Structure

The specific design and manufacturing features assure the outstanding durability of these important components under the highest demands.

Serviceability

Extended service intervals, simplified maintenance, advanced filter systems, and electronic diagnostics all increase the availability of the machine and reduce operating costs.

Complete Cat Customer Support

Your local Cat dealer offers a whole host of useful services that can be individually added to your tailor-made service agreement.

Tunnel construction involves the toughest operating conditions and the narrowest of spaces – with its specially designed boom and a tail swing radius of just 1.90 m, the new 328D LCR tunneling excavator from Cat and Zeppelin is ideal for this type of work. The high-performance hydraulics on this machine offer outstanding tear and breakout forces. Its extremely robust construction, high-strength steels in areas under significant stress, additional struts, reinforced bearings, and generously dimensioned undercarriage ensure outstanding durability. The stable sliding door enables convenient entry and exit regardless of the position of the equipment. The comprehensive range of standard equipment also includes a quick coupler and special tunnel construction equipment such as particle filters and a fire extinguishing system. What's more, Caterpillar also provides you with a full range of work tools and attachments. The ever-present Caterpillar service network with its fast and reliable spare part supply creates a fundamental basis for the versatile, worldwide use of this special equipment.

With a tail swing radius of just 1.90 m, the 328D LCR is ideal for tunnel construction, an activity known for the toughest of operating conditions and the narrowest of spaces.

Compact radius upper structure

The reduced-size upper structure with minimal rear overhang facilitates working in confined areas – a key advantage in tunnel construction.

Short Tail

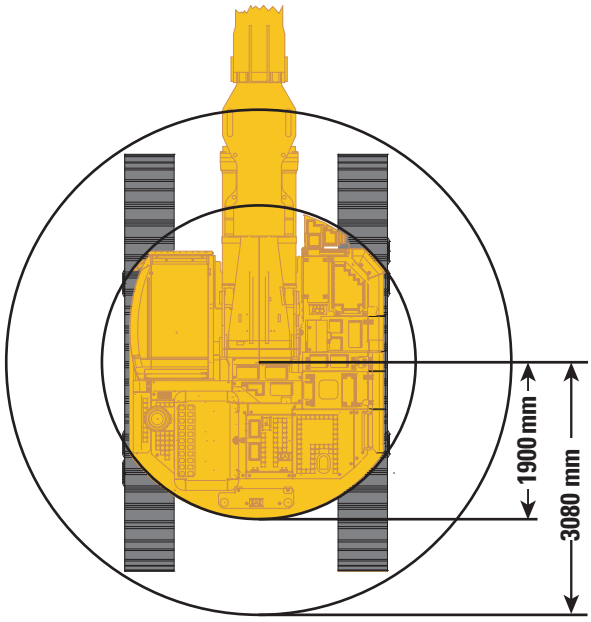
The particularly short design of the tail only marginally protrudes over the undercarriage, even when the upper structure is in a perpendicular position. This is ideal for managing heavy loads on restricted construction sites.

Tail Swing Radius

The small tail swing radius, which has been reduced from 3080 mm featured on the 329D L to just 1900 mm on the 328D LCR, means that the operator can focus on the positioning of the work tool when working in restricted spaces. It also makes it much easier to maneuver the machine.

Lift and Stability

The boom has been moved further towards the center of the machine. The 328D LCR therefore has a greater lift capacity over the front than the 329D L. The 328D LCR is also equipped with the undercarriage of the 336D L, thus offering outstanding stability for its class.



	328D LCR	329D L
Tail swing radius (mm)	1900	3080
Rear overhang (mm) with 600 mm track shoes	305	1485

Swing radius comparison The diagram shows the impressive comparison between the front and tail swing radius.

Diesel Engine

Compliant with EU Stage IIIA standards, sturdy, and economical: The Cat six-cylinder C7 engine.

Environmental Compliance
The Cat C7 also features ACERT technology, a concept combining a whole host of individual innovations. It is applied directly to fuel consumption to dramatically reduce emissions without compromising performance, reliability, or serviceability. The C7 fulfills the stringent limits of Stage IIIA standards. The tunneling excavator is also equipped with a particulate filter as standard.

Performance
The C7 engine provides 8% more power than its predecessor the 3126B, which was installed in the 325C LCR.

Automatic Engine Speed Control (AEC)
The two-stage AEC with its practical one-touch idle offers incredibly low fuel consumption and noise levels.

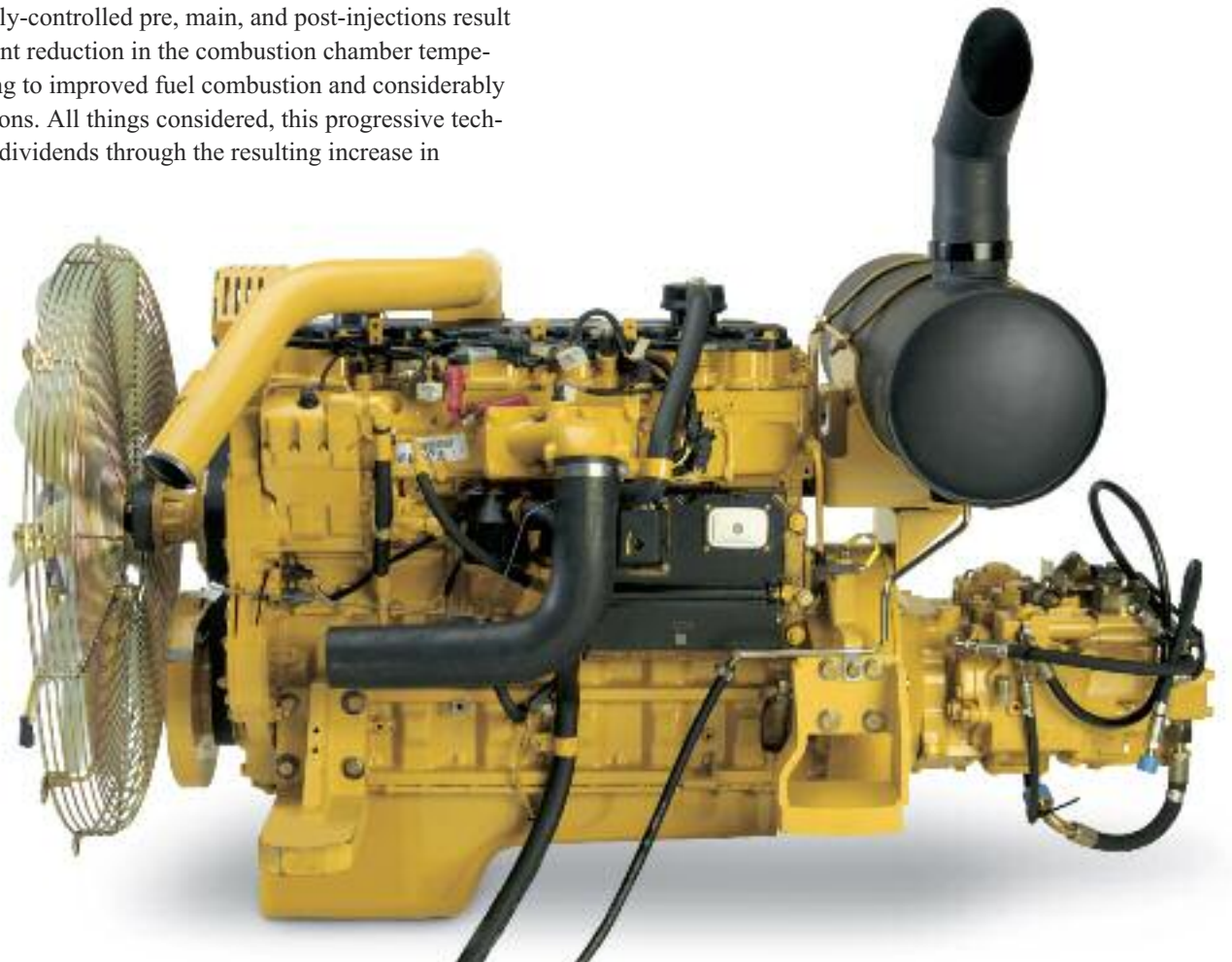
Engine Controller
The new ADEM™ A4 electronic control module manages and coordinates injection and the quantity of intake air in order to optimize the specific performance of the engine under any load condition. The variable performance characteristics control means it is possible to adapt immediately to changing operating situations.

Injection
The accurately-controlled pre, main, and post-injections result in a significant reduction in the combustion chamber temperature, leading to improved fuel combustion and considerably lower emissions. All things considered, this progressive technology pays dividends through the resulting increase in productivity.

Cooling System
The cooling fan is driven by a temperature-controlled viscous clutch clutch to minimize fan noise. The electronic control unit takes into account the engine speed, coolant temperature, and hydraulic oil temperature to set the optimum fan speed.

Air Cleaner
The main cartridges and safety cartridges of the quick-change dry air filter can be installed and removed without tools. An indicator in the monitoring system informs the operator when maintenance is required.

Noise Reduction
Numerous constructive measures have contributed to a considerable reduction in operational noise – such as carefully tailored rubber bearings, sound-absorbing material on the oil pan, valve covers, and spur-gear covers, plus an additional reinforced engine block. Furthermore, the performancecharacteristic- controlled multiple injection ensures that fuel consumption is noticeably quieter.



Hydraulics

The powerful and fast excavator hydraulics from Cat ensure high productivity in any operation.

Component Layout

All the main hydraulic components – the pumps, control blocks, and tank – are positioned as close to each other as possible to minimize friction and turbulence losses and thus optimize the efficiency of the system. The new radiator arrangement improves operator comfort, as the heated cooling air and diesel engine noise are expelled on the side away from the operator.

Pilot System

The pilot hydraulic pump is completely independent from the two main pumps and provides sensitive control for all the hydraulic systems.

Cross-Sensing Control

The hydraulic cross-sensing control makes the maximum horsepower of the diesel engine available to the two main pumps to ensure fast work cycles.

Boom and Stick Regeneration Circuit

The boom and stick circuits are fitted with an energy-recovery system, which noticeably improves the energy balance and accelerates work cycles.

Auxiliary Hydraulic Control Valve

The standard auxiliary control valve activates high and medium pressure hydraulic work tools such as hammers and drum cutters.

Hydraulic Cylinder Snubbers

Snubbers are located at the rod-end of the boom cylinders and both ends of the stick cylinders. Benefits include reducing sound levels, cushion shocks while extending component life.

Structures

The robust main and track roller frames ensure maximum endurance strength

Welding
Up to 95% of the structural welds on Caterpillar excavators are applied by robots. Robotic welds achieve considerably greater penetration than manual welds.

Carbody Design
The complex box-section, X-shaped carbody features excellent resistance to torsional bending and outstanding endurance strength, as do the pressed-steel, pentagonal track roller frames.

Heavy-Duty Dozer Blade
A robust heavy-duty dozer blade (3190 mm) is fitted to the carbody as standard, ensuring outstanding stability and also enabling any leveling or clearing work to be undertaken. Strong covers protect the top side of both blade cylinders.

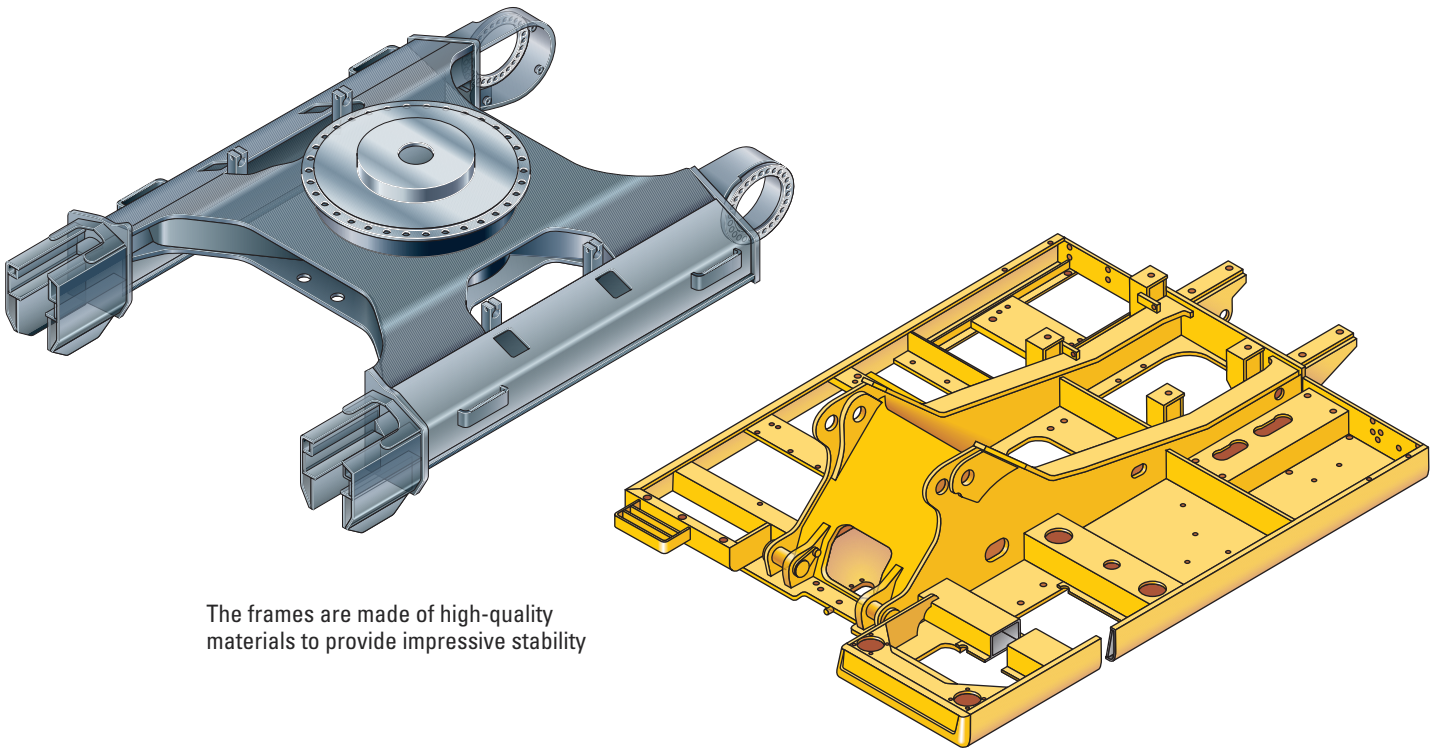
Main Frame
High-quality materials and care applied when manufacturing the main frame help to achieve its impressive stability.

Cross roller type swing bearing
Cat excavators use cross roller bearings instead of ball bearings as their greater contact surface is better suited to the high forces present where the superstructure and undercarriage meet.

Undercarriage
The durable Cat undercarriage with press-formed, pentagonal track-roller frames guarantees a long service life.

Idlers/Rollers
Track rollers, carrier rollers, and idlers are lubricated and fitted with slip rings for reliable, long-lasting sealing.

L undercarriage
Large track length on ground and track width of the L undercarriage help the 328D LCR achieve its excellent stability and load capacity. The grease lubricated track uses two additional links. Tunneling excavators are also fitted with rock deflectors as standard.

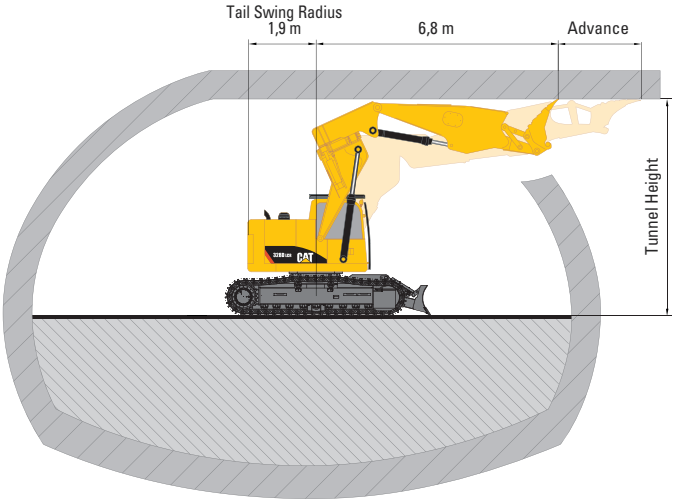


The frames are made of high-quality materials to provide impressive stability

Optional Tunneling Boom

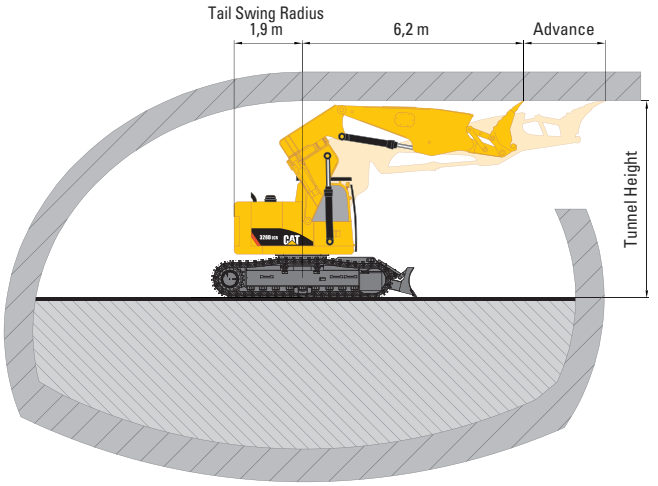
Two boom configurations are available for maximum productivity and to match to the European tunnel profiles

328D LCR with Standard Tunneling Boom



Tunnel Height	6,10	6,50	7,00	7,50	8,00	8,50	9,00
Advance	2,30	3,70	3,50	3,30	3,10	3,00	2,80

328D LCR with Short Tunneling Boom



Tunnel Height	4,80	5,00	5,50	6,10	6,50	7,00	7,50	8,00	8,50	9,00
Advance	1,30	1,60	2,30	2,40	2,35	2,20	2,00	1,90	1,80	1,50

Standard Tunneling boom

The generously dimensioned box section with torsion resistant cross-sections is the base for the tunneling boom with 2x45° tilting mechanism. The robust and extra reinforced swing bearing is built into the boom and can be tilted by up to 45° on both sides. This ensures maximum operational flexibility in narrow tunnel profiles. The tilt cylinders of the swing bearing are arranged as genuine actuating cylinders, and are thus capable of more than just aligning the equipment accordingly before operation. The bucket stick is 4,65 m long.

Linkage Pins

All pins in the attachment linkage have thick, hard-chromium plating for optimum protection against wear and corrosion. Their increased diameter ensures forces are distributed more evenly.

Short Tunneling Boom

Equipped with this boom, especially tailored for common European tunnel profiles and optimized for low working heights, the 328D LCR provides almost its maximum advance of 2,30 m at a working height as low as 5,50 m. That's why the 328D LCR is the only 43 t tunneling excavator requiring a work space like smaller 27 t machines, while providing a much better advance, due to higher performance. Less required space may also decrease the tunnel profile, which will reduce the material volume and enable a lighter tunnel construction.

Serviceability

Simplified maintenance and good accessibility lower operating costs

Access
Most maintenance points are easily accessible from ground level so that essential work can be carried out easily and quickly.

Air Filter Compartment
The two-stage dry filter system achieves an extremely high level of filtration efficiency. A maintenance indicator is activated on the monitor when filter contamination is excessive.

Pump Compartment
A service door provides access to the pump and pilot filter without having to climb on the machine.

Cooler Compartment
The left rear service door provides access to the radiator and oil coolers. The expansion tank and drain cock facilitate the servicing of the radiator.

Greasing Points
A remote lubrication rail on the boom provides a convenient way of delivering grease to hard-to-reach lubrication points from ground level.

Fan Guard
The radiator fan is completely enclosed by a fine-meshed guard in order to considerably reduce the risk of an accident.

Anti-Skid Plate
The anti-skid plate on top of the upper structure provides a high level of protection against slipping during maintenance work.

Diagnostics
The operator cab contains a diagnostics connector, which can be connected to a laptop to enable a quick test of the entire onboard electronic system. There are also valves to provide a clean method of extracting engine oil, hydraulic oil, and coolant samples.

Service Intervals
The service and maintenance intervals have been extended to reduce operating costs and increase machine availability.

Complete Customer Support

The high-achieving, customer-focused service organization of your Cat dealer has a high level of availability

Always at Your Side

Your Cat Dealer has a closely linked branch network featuring workshops kitted out with the best equipment. Just give him a call – and he'll immediately deal with the rest!

Reliable and Fast Supply of Spare Parts

The large number of Cat depots and the dealers central warehouses are permanently and seamlessly linked up via the latest computer technology and sound logistics. The result: Fast and reliable delivering!

Scheduled Oil Sampling

The regular oil diagnoses for the engine, axles, transmission, hydraulics, and cooling system provide useful information on the condition and operation of your machine, helping you to prevent accidents and even potentially increasing your oil-change intervals. Your machines function better, last longer, and as such are more economical overall.

Cut Costs with Exchange Parts

Cat exchange parts – a safe and cost-effective alternative to Cat original parts. A large number of Cat machines can benefit from a comprehensive exchange program offering new-part warranty.

328D LCR – Specifications

Diesel engine

Cat C7 with ACERT technology	
Net Power at 1800 rpm	
ISO 9249	140 kW/190 hp
80/1269/EEC	140 kW/190 hp
Bore	110 mm
Stroke	127 mm
Displacement	7,21

- The power ratings given were measured at the flywheel. The engine was equipped with fan, air filter, muffler, and alternator at the time of measurement.
- The C7 engine meets stage IIIA emissions requirements
- The altitude sensor automatically adjusts the engine horsepower at heights above 2300 m

Hydraulic System

Main System	
Max. flow	2 x 235 L/min
Maximum pressure	
Normal	350 bar
Heavy lift	360 bar
Travel	350 bar
Swing	275 bar
Pilot system	
Max. flow	32 L/min
Max. pressure	39 bar
Boom cylinder	
Bore	140 mm
Stroke	1407 mm

Powertrain

Maximum Travel Speed	4,2 km/h
Maximum Drawbar Pull	300 kN

Swing System

Swing Speed	10,2rpm
Swing Torque	82,2 kNm

Operator Cab

Cab FOGS meets ISO 10262

Sound Level

The sound power level is 104 dB(A), measured in accordance with EU directive 2000/14/EC.

Operating Weight

Actual weights and ground pressures will depend on final machine configuration.

Basic machine (heavy-duty dozer blade and 600 mm track shoes) with:	
3200 mm boom, 4000 mm stick	37 970 kg
3200 mm boom, 2500 mm stick	37 740 kg
Bottom Dump Bucket	37 440 kg
Standard Tunneling Boom with 45° tilting mechanism and stick 4650 mm	42 540 kg
Short tunneling boom	43 460 kg

Refill Capacities

	Liter
Fuel Tank	406
Cooling System	32
Engine Oil	32
Swing Drive	10
Final Drives	8 each
Hydraulic System (incl. tank)	290
Hydraulic Tank	153

With short boom or bottom dump bucket

Stick Cylinder	
Bore	150 mm
Stroke	1646 mm
Bucket Cylinder (CB2 range)	
Bore	135 mm
Stroke	1156 mm

With tunneling boom

Stick Cylinder (two piece)	
Bore	160 mm
Stroke	1055 mm
Bucket Cylinder	
Bore	150 mm
Stroke	1156 mm

Undercarriage

Track Shoes	600 mm
Track Shoes per side	49
Track Rollers per side	9
Carrier Rollers per side	2

Standard Equipment

Equipment may vary depending on the country of delivery. Contact Zeppelin for exact details.

Onboard Electrical System (24 V)
65 A alternator
Heavy-duty starter batteries (2), maintenance-free
Working lights (upper structure, cab, boom)
Horn (signaling/warning)
Pre-start fluid level monitoring system (engine/hydraulic oil, engine coolant)

Open Operator Station with Guard
Ashtray
Beverage/Cup holder
Coat Hook
Floor mat, washable
Control/monitoring panel with color graphic-supporting monitor
Joysticks with integrated sliding switch
Interior light
Literature compartment
External mirrors, left/right
Hydraulic lockout lever (interrupts all functions and starter circuit)
Front windshield, two-section/raisable upper section
High-strength polycarbonate side windows
Emergency exit (rear window, emergency hammer)
Operator seat with suspension, extended back, and head rest
Automatic safety belt
Sun blind (skylight)
High-strength polycarbonate skylight (adjustable)
Travel pedals with removable hand levers

Powertrain
Cat C7 ACERT engine
Inlet air heater
Air-to-air aftercooler
Hydraulic electronic unit injectors (HEUI)
2300 m altitude capability without derate
Automatic engine speed control with one-touch idle
Freeze protection (–20 °C)
Straight line travel
Two speed auto-shift travel
Fuel-water separator with service indicator
Dry air filter (two-stage) with cyclone prefilter
Particulate filter
Automatic start/stop

Guards
Heavy-duty bottom guards (upper structure)
Heavy-duty travel motor guards
Track roller guard (entire length)
Heavy-duty swivel guard
Falling Object Guarding System (FOGS)
Track deflectors (idlers/frame center)
Protectors in boom area
"Fogmaker" fire-extinguishing system (manual activation possible)
Emergency stop switch with three trip points
Automatic start/stop

Hydraulics
Auxiliary high pressure and medium pressure lines (boom, stick)
Work tool control
Two-way high pressure hydraulic circuit
Medium pressure hydraulic circuit
Attachment storage

Undercarriage
Grease lubricated track
Double grouser track shoes 600 mm
Heavy-duty track rollers
Hydraulic track adjuster
Steps (6)
Heavy-duty dozer blade, 3190 mm

Miscellaneous
Automatic swing brake
Lowering check valve (boom cylinders)
Counterweight, 7720 kg
Caterpillar one key security system with locks for doors, cab and fuel cap
Heavy lift mode
Oil sampling valves (engine/hydraulic oil)
Travel alarm
Rear view camera mounted on counterweight (displays through cab monitor)
CW45S quick coupler (mechanical)
Anti-skid plate on top of upper structure
Acustic warning signal during engine start-up and transition to travel function
Cat Product Link (satellite-based global positioning and machine health data system)

Optional Equipment

Contact Zeppelin for exact details.

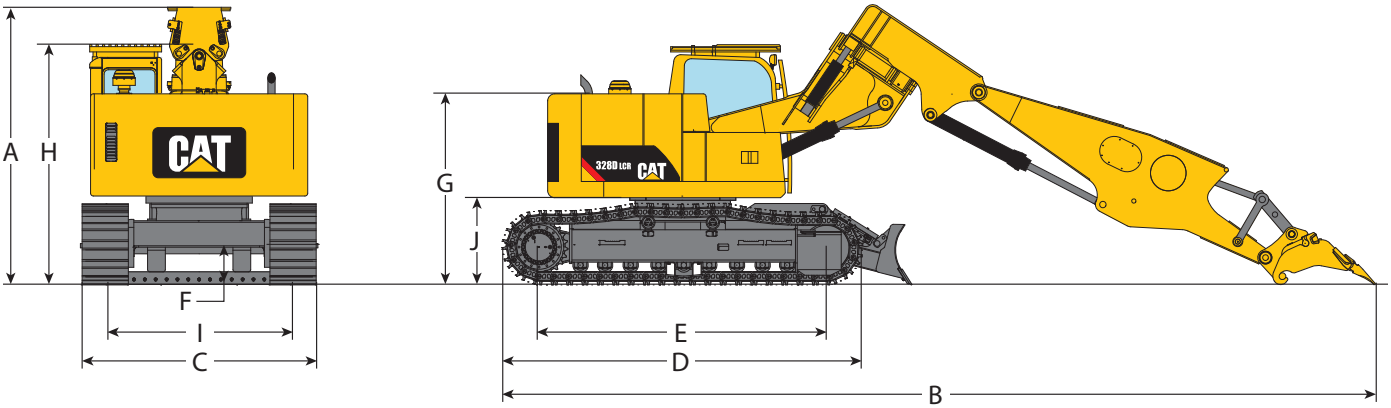
Attachments
3200 mm excavation bucket boom for tunneling
2500 mm stick
4000 mm stick
Bottom dump bucket
Tunneling boom (two different sizes, 45° tilting mechanism, stick 4650 mm)
Excavation buckets, rotary cutters, hammers

Operator Cab
Fully enclosed, pressurized cab with air conditioning and defroster
Sun blind (skylight)
High-strength polycarbonate skylight (adjustable)
Windshield wiper and washer

Miscellaneous
Central lubrication system
Unpressurized return oil line for rotary cutter operation
CW45S quick coupler (hydraulic)

328D LCR – Specifications

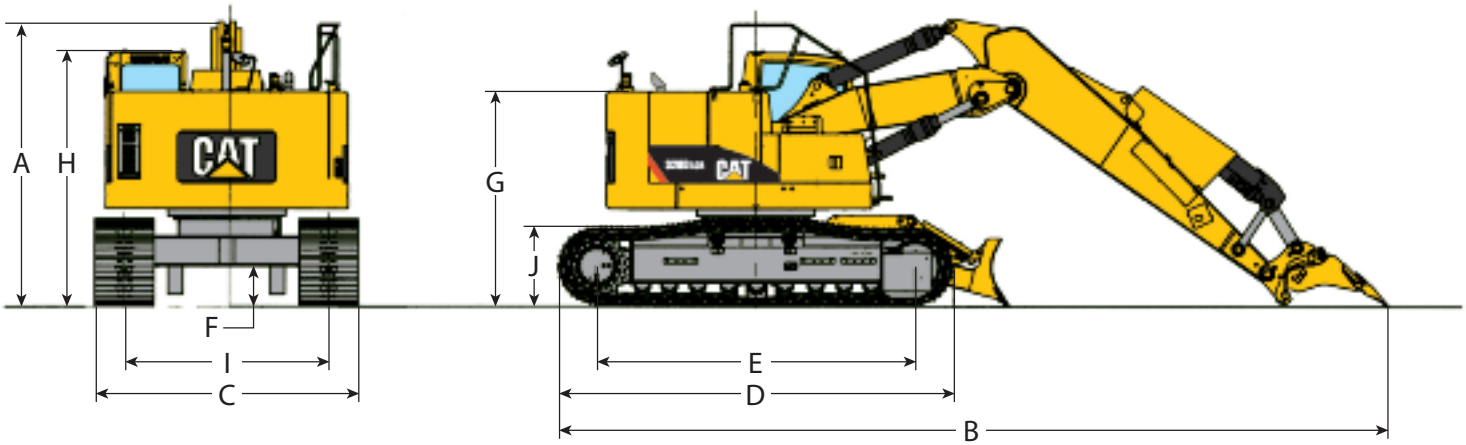
Dimensions – Machines with Standard and Short Tunneling Boom (all dimensions are approximate)



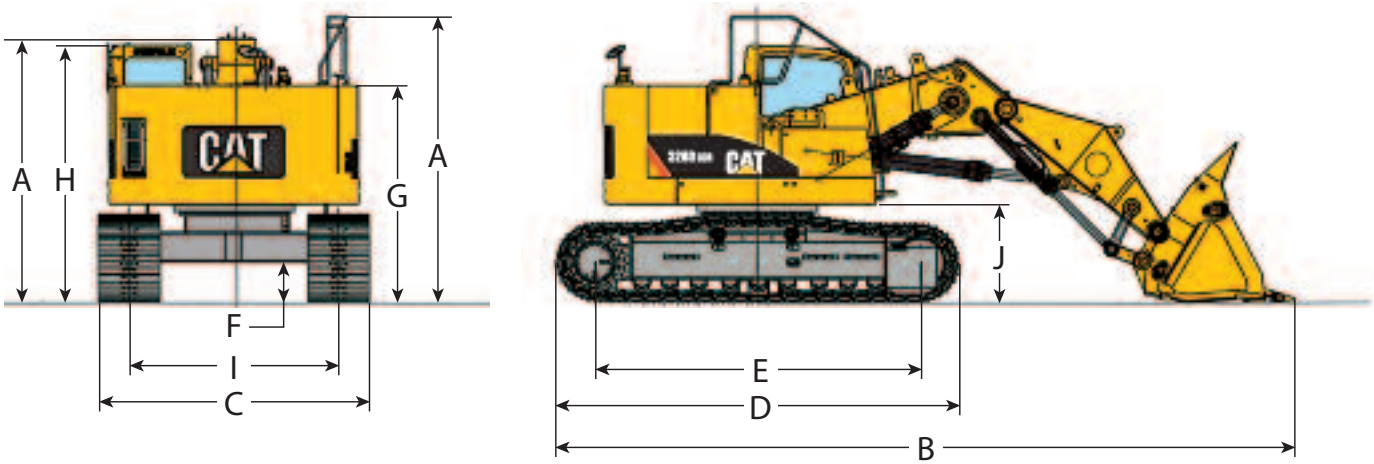
Dimensions – Standard Tunneling Boom	mm
A Transport Height	3943
B Transport Length	12265
C Transport Width (600 mm track shoes)	3190
D Track Length	5021
E Track on Ground	4040
F Ground Clearance	508
G Upper Structure Height	2688
H Cab Height	3185
Including FOGS	3380
I Track Gauge	2590
J Counterweight Clearance	1227

Dimensions – Short Tunneling Boom	mm
A Transport Height	3794
B Transport Length	11530
C Transport Width (600 mm track shoes)	3190
D Track Length	5021
E Track on Ground	4040
F Ground Clearance	508
G Upper Structure Height	2688
H Cab Geight	3185
Including FOGS	3380
I Track Gauge	2590
J Counterweight Clearance	1227

Dimensions – Excavation Bucket Configuration (all dimensions are approximate)



Dimensions – Bottom Dump Bucket Configuration (all dimensions are approximate)

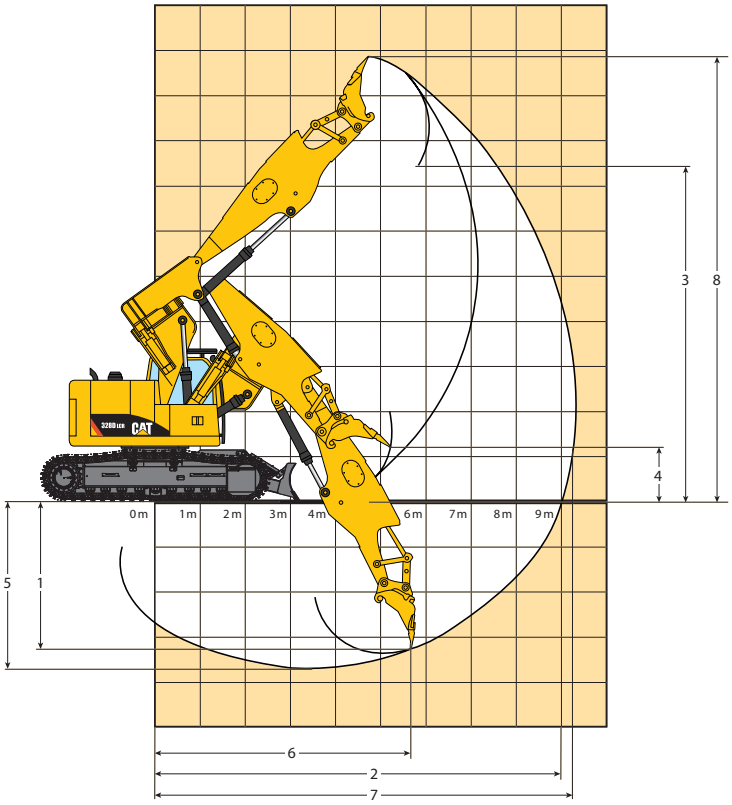


Dimensions – Excavation Bucket Configuration	mm
A Transport Height	
3200 mm boom	
4000 mm stick	3565
2500 mm stick	3538
B Transport Length	
3200 mm boom	
4000 mm stick	10543
2500 mm stick	9103
C Transport Width (600 mm track shoes)	3190
D Track Length	5021
E Track on Ground	4040
F Ground Clearance	508
G Upper Structure Height	2688
H Cab Height	3185
Including FOGS	3380
I Track Gauge	2590
J Counterweight Clearance	1227

Dimensions – Bottom Dump Bucket Configuration	mm
A Transport Height	3538
B Transport Length	9174
C Transport Width (600 mm track shoes)	3190
D Track Length	5021
E Track on Ground	4040
F Ground Clearance	508
G Upper Structure Height	2688
H Cab Height	3185
Including FOGS	3380
I Track Gauge	2590
J Counterweight Clearance	1227

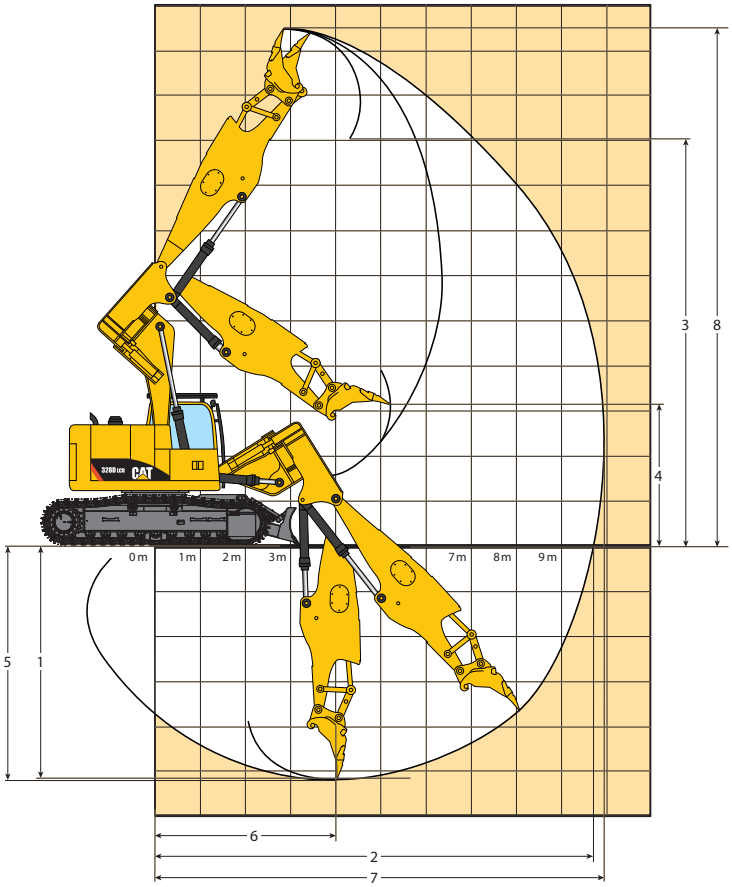
328D LCR – Specifications

Short Tunneling Boom



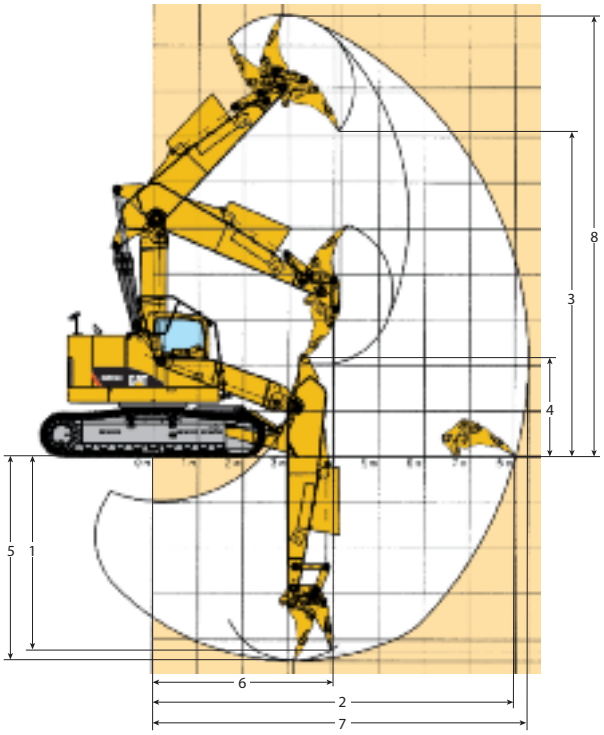
Short Tunneling Boom	mm
1 Maximum Digging Depth	3382
2 Maximum Reach at Ground Level	8993
3 Maximum Loading Height	7453
4 Minimum Loading Height	1912
5 Maximum Digging Depth	3701
6 Minimum Front Swing Radius	5670
7 Maximum Reach	9253
8 Maximum Cutting Height	9865

Standard Tunneling Boom



Standard Tunneling Boom	mm
1 Maximum Digging Depth	5146
2 Maximum Reach at Ground Level	9729
3 Maximum Loading Height	9061
4 Minimum Loading Height	3153
5 Maximum Digging depth	5198
6 Minimum Front Swing Radius	4046
7 Maximum Reach	9969
8 Maximum Cutting Height	11481

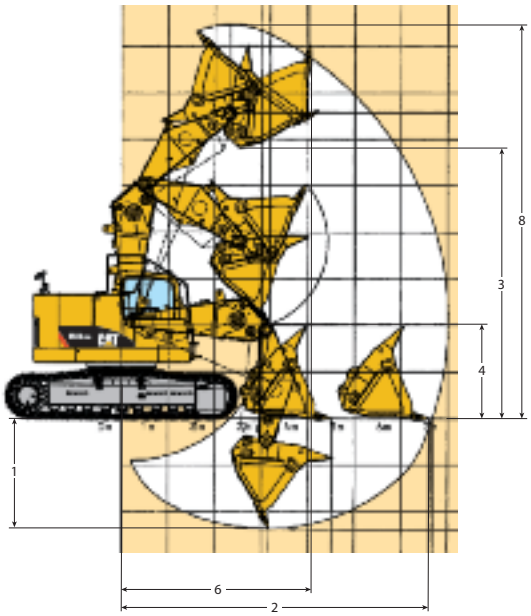
Excavation Bucket Boom



Excavation Bucket Boom 3200 mm*	mm	mm
Stiellänge	4000	2500
1 Maximum Digging Depth	4480	2980
2 Maximum Reach at Ground Level	8030	6590
3 Maximum Loading Height	7110	5890
4 Minimum Loading Height	2020	2770
5 Maximum Digging Depth	4250	2720
6 Minimum Front Swing Radius	4120	2710
7 Maximum Reach	8300	6920
8 Maximum Cutting Height	9670	8600

* With ripper tooth

Bottom Dump Bucket Boom



Bottom Dump Bucket Boom**	mm
1 Maximum Digging Depth	2380
2 Maximum Reach at Ground Level	6690
3 Maximum Loading Height	5860
4 Minimum Loading Height	2020
5 Maximum Digging Depth	–
6 Minimum Front Swing Radius	3950
7 Maximum Reach	–
8 Maximum Cutting Height	8440

** With 2.3 m³ bottom dump bucket

For more Information please ask your Cat dealer or Zeppelin Boeblingen in Germany!

The 328D LCR tunnel excavators have been developped and manufactured - based on Caterpillar components – by Zeppelin at Boeblingen/Germany. Please ask your local Caterpillar dealer for more information or contact Zeppelin Tunnel excavators directly.

INX4735 0410 (0.5)

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