GRADE

TECHNOLOGIES FOR EXCAVATORS

CAT®

CAT® GRADE TECHNOLOGY
BOOSTS YOUR PRODUCTIVITY

Digging a foundation. Trenching for a water line. Working on a slope. These jobs demand the precision and speed you get from Cat® Grade technologies. Combining advanced guidance with optional automated machine control, Grade helps operators hit grading targets right on the money in fewer passes.

ACCURATE DIGGING. FASTER. EASIER. SAFER. EVERY TIME.

Four ways Cat Grade delivers results for excavator applications:

- **REDUCED COSTS:** SAVES TIME, LABOR AND FUEL COSTS.
- **IMPROVED ACCURACY:** PRECISE GUIDANCE REDUCES WASTED EFFORT.
- **BETTER OPERATOR EFFICIENCY:** EXPERIENCED OPERATORS WORK MORE ACCURATELY THAN EVER. NEW OPERATORS GET UP TO SPEED MORE QUICKLY.
- **ENHANCED SAFETY:** FEWER SITE PERSONNEL ARE NEEDED ON THE GROUND.

DEEP INTEGRATION

MEANS SMOOTH OPERATION

Cat Grade technologies are deeply integrated into new Cat equipment to provide smooth, precise operation. Some Grade technologies are available as aftermarket upgrades as well to add advanced capabilities.

THE RIGHT TECHNOLOGY FOR ANY JOB

Cat Grade for excavators includes 2D and 3D technologies to suit a range of application needs and operating budgets. Plus, the Assist feature allows you to partially automate some operations for even more efficiency and productivity.

Contact your Cat dealer to discuss the best systems and options for your fleet, operators and applications.

GRADE TECHNOLOGY

CHOOSE WHAT MATCHES YOUR WORK

GRADE WITH 2D

BOOST OPERATOR EFFICIENCY BY UP TO 35%*

Cat Grade with 2D helps excavator operators work up to 35% more efficiently in a wide variety of applications. Delivering real-time guidance for accurate vertical and horizontal control, Grade with 2D helps to ensure that cuts and fills are made to exact specifications – without under- or overcutting.

+ **Eliminates ground stakes** in most applications.
+ **Displays target grade** with visual guidance plus height and depth.
+ **Easily adjust to target depth and slope** using joystick commands, a touchscreen interface or a jog dial.
+ **Integrated components are protected** from damage, ensuring long life.
+ **Move and maintain consistent grade** with optional laser catcher capability.
+ **Enable single-lever digging** by combining this system with Cat Grade with Assist.

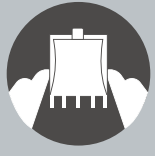
*Compared with traditional grading methods.

RECOMMENDED FOR: GENERAL APPLICATIONS

Use the Grade with 2D system to increase efficiency and productivity when digging and grading basements, footings, foundations, utility trenches, slopes and drainage ditches.

DIGGING

GRADING



TRENCHING

SLOPING

RECOMMENDED FOR: SITE PADS, TRENCHING AND MORE

Grade with Advanced 2D is a cost-effective solution for commercial site pad designs, trenches, commercial septic systems and other similar applications.

DIGGING

TRENCHING

COMMERCIAL PROJECTS

GRADE WITH ADVANCED 2D

EXPANDED GUIDANCE CAPABILITIES

CREATE AND WORK TO BASIC SITE DESIGNS

The Advanced 2D system adds cross slope and main fall guidance. These help the operator maintain accuracy and precision across larger job sites in more complex applications. Grade with Advanced 2D is available from the factory, or it can be added as an upgrade to the standard Grade with 2D system.

Grade with Advanced 2D also upgrades the standard 2D system with in-field design capability. Using an additional high-resolution touchscreen monitor, the system enables easy input and editing of grade plans from the operator's seat. The monitor shows the position of the bucket in real time, and the operator can select from a number of different viewing angles. This system enables the operator to:

+ **Create** a section on the screen using a known grade point.
+ **Monitor progress** toward the grade plan.
+ **Accurately dig** to the plan without over- or undercutting.
+ **Improve job site efficiency by up to 45%** (with Grade with Assist), saving time and avoiding rework.
+ **Increase machine versatility** across more jobs and larger sites.

GRADE WITH 3D

WORK TO COMPLEX DESIGNS ACROSS MULTIPLE MACHINES

Grade with 3D adds real-time satellite positioning guidance. This system uses two GNSS receivers and a correctional data source to achieve Real Time Kinematic (RTK) positioning guidance in three-dimensional space.

Full 3D helps operators maximize productivity and job site efficiency when working to the complex designs often found on large infrastructure and commercial site projects.

+ **Maintain accuracy across large job sites and multiple machines** with in-field design plan functionality and control.
+ **Tracks the machine and bucket's absolute location** on the job site.
+ **Automatically compensates for excavator pitch and roll** caused by sloping ground conditions.
+ **Uses the same added touchscreen monitor** as Grade with Advanced 2D.
+ **All Cat Grade systems are compatible** with radios and base stations from Trimble, Topcon and Leica.

RECOMMENDED FOR: COMPLEX AND VERY LARGE JOBS

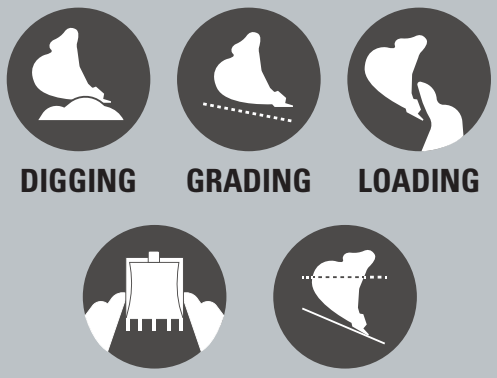
Grade with 3D is ideal for complex cuts and fills requiring pinpoint precision, as well as large infrastructure, civil, heavy highway, and commercial site projects.

COMMERCIAL PROJECTS

PRECISION PROJECTS

RECOMMENDED FOR: MOST APPLICATIONS

Grade with Assist enables operators of all skill levels to work more confidently, efficiently and productively in most digging, sloping, leveling, fine grading, trenching and loading jobs.



GRADE WITH ASSIST

Grade with Assist adds semi-autonomous digging to boost operator efficiency up to 45%. This system works with Grade with 2D, Grade with Advanced 2D and Grade with 3D, allowing you to optimize your Grade system to your applications.

SINGLE-LEVER DIGGING SIMPLIFIES OPERATION

Single-lever digging automates boom and bucket movements for more accurate cuts, using both standard and rotating attachments. Using a single lever reduces manual inputs, errors and fatigue – improving grading consistency for operators at all experience levels. The guidance system, machine display and easy joystick control make operation easy, with speed control and less operator effort.

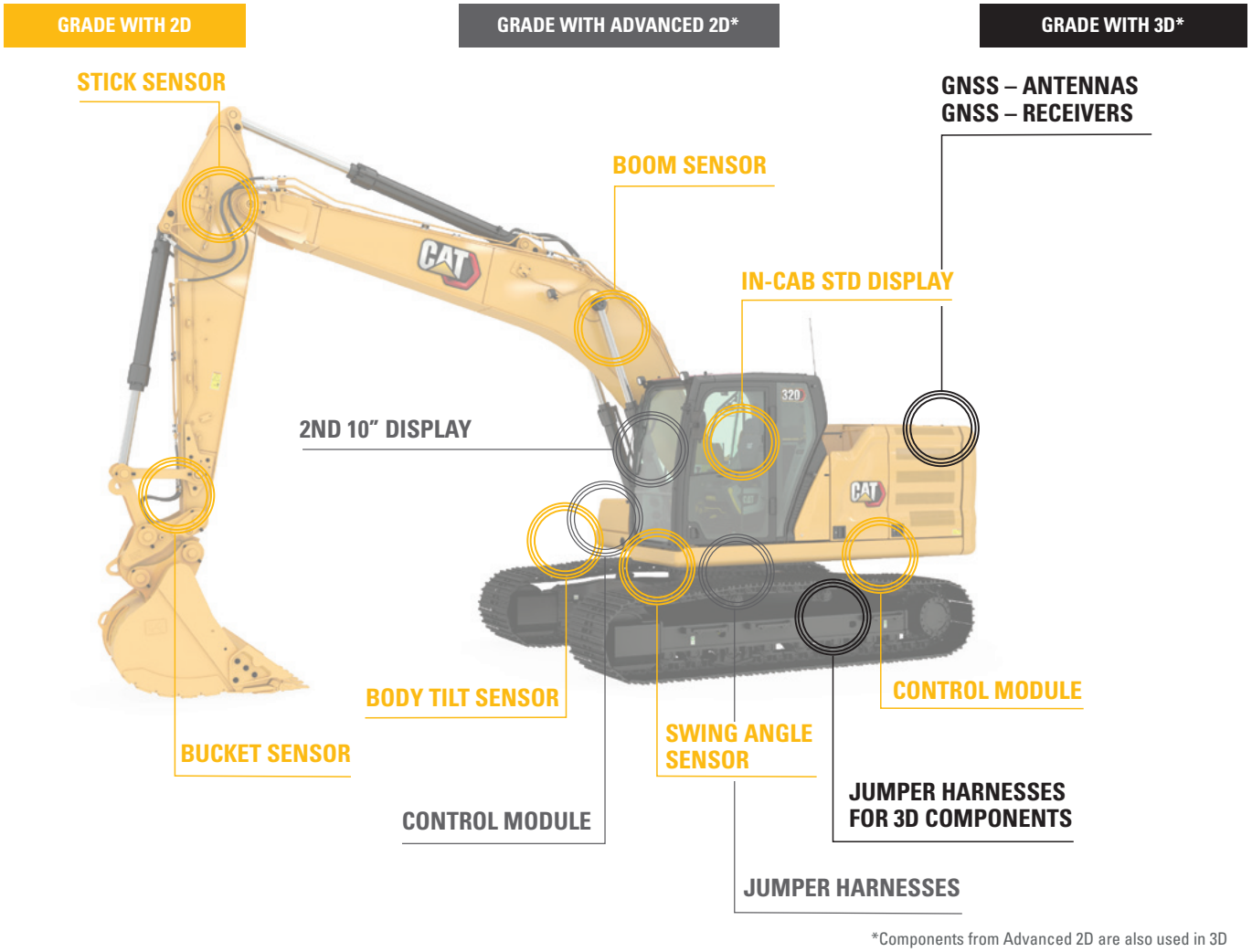
FOUR TYPES OF AUTOMATED ASSISTANCE AVAILABLE

+ **Grade Assist** – Takes over boom and bucket functions to maintain desired depth and slope. The operator sets the target grade and controls stick speed with one hand.
+ **Bucket Assist** – Maintains bucket angle and keeps the cut accurate in sloping, leveling, fine grading and trenching applications.
+ **Boom Assist** – Automatically raises the boom to keep the excavator from lifting off the ground when digging, lifting or rotating under load.
+ **Swing Assist** – Automatically stops excavator swing at defined points when truck loading and trenching, reducing fuel usage and improving cycle times.

GRADE TECHNOLOGY

MODULAR COMPONENTS, EASY UPGRADES

Cat Grade is a modular system that can be optimized and upgraded to meet the needs of a wide range of applications and site requirements. Features and availability may vary. Consult your Cat dealer for model-specific information.



*Components from Advanced 2D are also used in 3D

GRADE WITH 2D

Grade with 2D is the base-level system. Components are factory integrated with machine systems. This system comes standard on many new Cat excavators.

GRADE WITH 3D

Grade with 3D components include GNSS receivers and antennas. A site radio is required. As with the Advanced 2D system, Grade with 3D can be added at the factory or as an aftermarket upgrade.

GRADE WITH ADVANCED 2D

Grade with Advanced 2D can be added at the factory or as an aftermarket upgrade. Additional components include a second high-resolution monitor for grade plan creation, editing and viewing, plus an additional control module that enables expanded functionality.

ADDITIONAL COMPONENTS

LASER CATCHER (OPTIONAL)

A laser catcher (or laser receiver) senses when the device is centered directly in a red-wavelength rotating laser plane. When working in 2D mode, this enables the Grade system to transfer and maintain the elevation target while moving or re-orienting the machine.

ROTATING LASER TRANSMITTER (REQUIRED FOR LASER REFERENCE)

A high-quality rotating laser transmitter is recommended for best accuracy and ease of referencing from the laser plane. See your Cat dealer for recommendations.

BASE STATION (REQUIRED FOR RTK MAPPING CAPABILITY)

A GNSS base station is required when using a Real Time Kinematic (RTK) mapping system. A base station may be tripod-mounted for portability or mast-mounted on a semi-permanent location. All Cat Grade systems are compatible with radios and base stations from Trimble, Topcon and Leica.

GRADE TECHNOLOGY

HOW IT WORKS

GRADE WITH 2D

Cat Grade with 2D is an indicate-only system that provides elevation and slope guidance to the operator.

This system continually calculates the elevation difference between a reference benchmark (such as a known ground point, string line, laser reference, etc.) and a focus point on the cutting edge of the bucket.

Cat Grade with 2D informs the operator of the distance above, below or on-grade between the bucket cutting edge and the benchmark point.

The status screen provides the following views:

+ BUCKET PROFILE
+ BUCKET CROSS SECTION
+ BUCKET SLOPE ANGLE AND DIRECTION
+ DEPTH TO GRADE DATA WITH DIRECTION INDICATOR
+ ROTATION ANGLE AND DIRECTION (WHEN USING A ROTATION SENSOR)
+ BENCHMARK STATUS ICON
+ LINKAGE ELEVATION STATUS ICON

GRADE WITH ADVANCED 2D

Cat Grade with Advanced 2D allows the operator to set additional parameters for digging and leveling operations, including:

+ CROSS SLOPE
+ WORKSITE MAIN-FALL

Grade with Advanced 2D also lets the operator input, edit and work to basic two-dimensional design plans from the operator's seat.

+ THE STANDARD IN-CAB DISPLAY SHOWS BUCKET POSITION.
+ A SECOND IN-CAB DISPLAY SHOWS DESIGN PLANS AS 2D "ON-PAPER" IMAGES.

GRADE WITH 3D

Cat Grade with 3D for excavators adds deeper design capabilities, plus GNSS technology for RTK positioning guidance for more complex planes, slopes, contours and curves.

+ PROVIDES THE OPERATOR WITH BUCKET POSITIONING IN RELATION TO PRELOADED 3D DESIGN FILES OR BACKGROUND MAPS.
+ HELPS TO COORDINATE MULTIPLE MACHINE OPERATIONS WHILE MAINTAINING ACCURATE DIGGING PARAMETERS ACROSS LARGE JOB SITES.

SIMPLE TO OPERATE

USING GRADE WITH 2D

SET BENCH

STEP 1:

Set a benchmark by touching a known reference point with the bucket tip or bottom on the bucket edge.

DEPTH

STEP 2:

When the target elevation has been set, the Grade system will show the vertical distance between the work tool tip and the target elevation.

GRADE CONTROL

STEP 3:

Complete work in the first machine position and orientation, using the guidance values, monitor views and audible signals for assistance.

TOUCH POINT

STEP 4:

To move into a new position, first position the work tool tip on any fixed reference point that may be reached from both the current and new positions (a stake, rock, curb, etc.). Press “Touch Point” on the display menu to save the reference point.

GRADE CONTROL

STEP 5:

Move the machine to the new position, touch the reference point again and press Apply. The system will reset the target elevation automatically, enabling the operator to quickly resume work.

Basic operation is roughly equivalent for laser-guided Advanced 2D and 3D operation. The 3D system does not require re-benching when moving to a new position. Consult each system’s Operation Manual for detailed instructions.

CAT GRADE EASILY WINS IN SIDE-BY-SIDE PRODUCTION STUDY

STUDY SET UP:
Two Cat hydraulic excavators on identical job sites – one with Cat Grade with 2D, one without.

ASSIGNMENT:
Dig a partial basement square, trench at a 10% slope to a second location and dig a second basement square.

GOAL:
Compare time to grade and grading accuracy.

OPERATION:
The machine using conventional methods repeatedly stopped to wait for the grade checker. Grade checker was idle most of the time. The machine with Cat Grade continued to work at full pace, re-benching as needed – no grade checker required.

RESULTS:

Grade-equipped machine finished in 1 hour 17 minutes.
Non-equipped machine finished in 1 hour 40 minutes.

27 MINUTES SAVED

35% INCREASE IN PRODUCTIVITY

LOWER COSTS
for fuel and manpower

IMPROVED SITE SAFETY
with no personnel needed on the ground

GRADE TECHNOLOGY FOR EXCAVATORS

COMPARISONS AT A GLANCE

CAT GRADE SYSTEMS AT A GLANCE

FEATURE	GRADE WITH 2D	GRADE WITH ADVANCED 2D	GRADE WITH 3D
Real-time depth and slope guidance relative to target grade with in-cab indicators	●	●	●
Available factory-installed	●	●	●
Fully integrated components protected from damage	●	●	●
Overcut prevention with Grade with Assist	●	●	●
Laser compatibility	●	●	●
Compatibility with integrated Cat® onboard technologies: – Product Link™ telematics hardware system – Cat Command advanced semi-autonomous technology – 2D E-fence excavator safety system – Cat Payload onboard weighing system	●	●	●
Compatibility with off-board back-office systems: – VisionLink® connected asset monitoring and equipment management software – Cat App equipment health and management software – Cat Productivity production management technologies – Cat API software modules for machine systems integration	●	●	●
Compatibility with radios and base stations from Trimble, Topcon and Lieca	●	●	●
Cross slope and main fall guidance		●	●
Ability to create/edit 2D site designs in cab on second HD monitor		●	●
Aftermarket kit availability		●	●
Ability to create/edit 3D site designs for planes, slopes, contours and complex curves in cab on second HD monitor			●
GPS/GLONASS compatibility			●

● – available

For more complete information on Cat products, dealer services and industry solutions, visit us on the web at www.cat.com.

PEDJ0697
(Global)