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Simulation-based learning solutions

Vortex® equipment training simulators provide operators with the skills they need to operate equipment safely and efficiently. Trainees can practice challenging real-world operations in complete safety, while key operating performance metrics are objectively logged and recorded throughout training.

Thanks to CM Labs simulators, operators can prepare for the routine as well as the unexpected. This makes our simulators an invaluable asset for teaching safe, productive, economic machine use. With swappable controls and configurations ranging from the desktop to an immersive five-display simulator, Vortex simulators are built to run a wide range of training packs. Each Simulator Training Pack features self-guiding, progressive learning programs, and best-in-class simulation.

Crane and Lifting Equipment

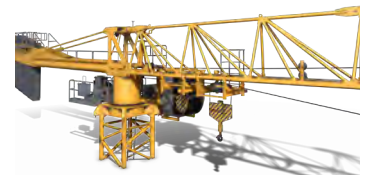|		
Boom Truck	Crawler Crane	Forklift
Luffing Tower Crane	Mobile Crane	Telehandler	Tower Crane

Earthmoving Equipment

Articulated Dump Truck	Backhoe	Compact Track Loader
Dozer	Excavator	Motor Grader	Wheel Loader

Vortex simulators: best-in-class training

Select from a range of training tools to develop transferable operator skills

Build Safer Operators

Trainees can practice challenging operations in situations that are impossible to replicate in real life without risk of injury or damage to equipment. Prepare them to respond to the unexpected by injecting system faults, load shifting, and inclement weather.

Reduce Your Training Costs

Each Vortex simulator reduces the time you need to spend on the real equipment. Plus, for what you'll spend on a single crane or machine, you can deploy a fleet of Vortex simulators with lower maintenance and fuel costs, and a reduced carbon footprint.

Train Faster

With simulators, you can provide concentrated seat time, and dramatically reduce 1-on-1 training hours. Thanks to an engaging learning experience, trainees acquire valuable skills even when the real equipment is unavailable.

> " Apprentices thrive with hands-on training. With CM Labs' simulators, they are learning faster, and the program is turning out better qualified operators than ever before.
>
> **Robbie Foxen**
> Executive Director, Missouri Valley Line Constructors
> Apprenticeship and Training Program

Vortex Edge Plus
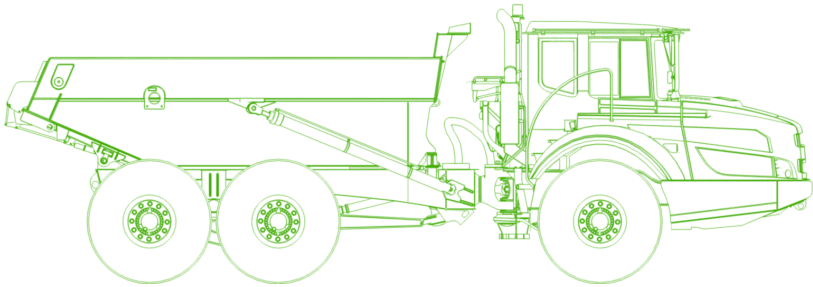
Vortex Edge Max

Vortex Advantage

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Vortex® is a registered trademark of CM Labs Simulations, Inc.

Articulated Dump Truck

Simulated equipment specs /

Product name:
Articulated Dump Truck

Specs: Automatic transmission, hydraulic braking system with engine brake, and anti-lock system

Operating capacity:
25 ton | 22.7 tonne

Engine power:
300-320 max hp

Overview /

The Articulated Dump Truck (ADT) Simulator Training Pack is the only solution that accurately replicates machine stability, providing training opportunities to reduce the likelihood of accidents due to tipping. The training works on optimal loading and improving teamwork skills.

Key features & benefits /

Part of the CM Labs' family of earthmoving machines simulation training solutions, the ADT simulator is an entry-level training pack, ideal for training schools or companies with a wide range of equipment in their fleet.

Progressive learning program
Helps build skills and confidence, including familiarization with load hauling, driving on even terrain, and team-related tasks.

Best-in-class vehicle simulation
Ensures trainees understand how the equipment works and what is required for efficient and safe operations.

Performance metrics and reporting
Provides trainers with real-time feedback on operator aptitudes, habits, and overall scoring.

Best-in-class simulation provides real learning benefits

Through CM Labs' Smart Training Technology™, our solution is the only simulator on the market that accurately replicates machine stability—providing real-world training opportunities to help reduce the risk of accidents.

Novice users gain understanding for braking strength and distance, blind spots, acceleration and smooth gear shifting, engine response under heavy loads, wheel deformation on rough ground, and rolling stability when driving. Replicated true vehicle vibration, material pilling, alarms, and other job site sounds ensure important audio cues for safe operation and task completion.

Comprised of proprietary and patented algorithms, the Smart Training Technology ensures precision engineering of the simulated equipment, delivering the most transferable operator skills anywhere, outside of the real equipment.

Supported hardware platforms

The training pack runs on CM Labs' motion-enabled **Vortex Edge Max**, the fully immersive **Vortex Advantage**, and the desktop **Vortex Edge Plus**.

Learning program

The ADT Simulator Training Pack features progressive learning exercises designed to build skill and confidence gradually.

✔ Basic controls & familiarization
✔ Driving on slope
✔ Loading & unloading trailer
✔ Hauling: side loading
✔ Hauling: back loading
✔ Excavator simulation tandem exercise

Using the optional Instructor Operating Station, trainers can trigger unexpected weather events in the exercise.
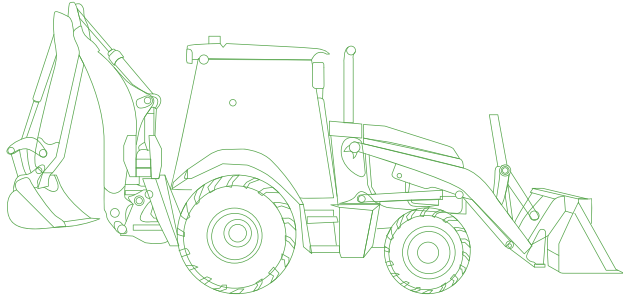
Performance measurement

The Training Pack gives trainers objective insight into trainee performance and abilities. Instructors can access key performance metrics in real time, such as:

✔ Safety violations (including tipping, collisions, vehicle or cabin flip, electric cable contact, and unsafe parking)
✔ Fuel efficiency
✔ Time to complete
✔ Cycle time efficiency

Trainers can generate reports based on customizable scoring parameters, and review against benchmarks or past training sessions.

Backhoe Loader Training Pack

Simulated Equipment Specs

Engine Power: 83 kW (111 HP) **Operating Weight:** 8300 kg (18,298 lbs)	**5-speed, PowerShift transmission with clutch cutoff** **Mechanical Front Wheel Drive (4WD)** **Extendable Dipperstick** **Hydraulic Quick Coupler**

Overview /

The Vortex® Backhoe Training Pack is the only training solution on the market that is capable of simulating a backhoe's backlash and instability. Thanks to this capability, it is ideal for teaching novices how to leverage the flexibility of this machine, and control its center of gravity for efficiency on the job site.

Key features & benefits /

With the Backhoe Training Pack, trainees learn the requirement for careful, methodical operations, thanks to the looseness in the machine's linkage that replicates that of the real backhoe.

The training pack also simulates changes in stability and traction as tires are placed under stress by rapid movements or heavy loads — and the simulated backhoe can even tip as a result of instability. This means trainees can feel free to fail without the risk of damaging equipment or themselves.

A progressive learning program covering basic operating skills ranging from maneuvering and controls handling, to trenching, bench loading, and truck loading.

On-screen indicators and best-practice hints that enable trainees to learn at their own pace, or as part of an instructor-led training program.

Performance metrics and customizable scoring that provide an objective assessment of operator capabilities and development.

A complete training solution

The Backhoe Training Pack features a mid-sized machine that provides trainees with experience on the type of backhoe they will be operating on the majority of job sites.

This training solution is unique on the market, in that trainees can switch between bucket and loader at any time to solve any operating challenge using their own best judgment.

The backhoe's hydraulic quick-coupler also allows trainees to switch out the bucket for forks or chains, to solve additional challenges.

Its advanced learning tools include a Grade Quality Sensor (GQS) overlay that can be activated at any time during the exercise. In addition to real-time feedback on excavation height, slope, and consistency, the GQS also provide an overall excavation performance score to operators.

The Training Pack's progressive learning exercise program is suitable for all training approaches, whether it's a quick refresher, a one-week training session, or a course that lasts several months.

Supported Vortex Hardware Platforms

The Vortex Backhoe Training Pack can be installed on any Vortex simulator hardware platform, with different configurations to meet your budget, space, and training requirements. Vortex simulators are built to last, designed for years of 24/7 operator training.

Vortex Edge laptop-based instructional platform

Vortex Trainer portable single display trainer

Vortex Advantage with one, three, or five immersive displays

Learning program

The Backhoe Training Pack features learning exercises ranging from beginner to advanced, designed to progressively teach precision and efficiencies:

- ✓ Understanding the controls and vehicle positioning
- ✓ Loading and unloading from trailer
- ✓ Bucket positioning
- ✓ Earth moving and transport
- ✓ Stockpile management
- ✓ Excavation and grading
- ✓ Truck loading
- ✓ Using the quick coupler

Performance measurement

The Backhoe Loader Training Pack gives trainers objective insight into student performance and abilities. Trainers can measure key student performance metrics such as:

- ✓ Movement efficiency and accuracy
- ✓ Collisions and shock loads
- ✓ Fuel consumption, cycle time, and idle time
- ✓ Volume of material excavated per bucket load and in total

Instructors can generate reports based on customizable scoring parameters, and review against benchmarks or past training sessions.
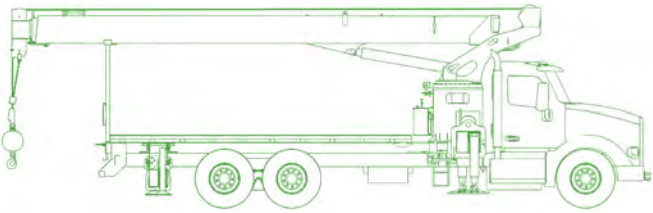
Boom Truck Simulator Training Pack

Simulated equipment specs /

Lifting capacity: 30 tons

Telescopic synchronized boom: 110ft (33.5m)

Telescopic outriggers and front jack

2 hook configurations

Overview /

The Boom Truck Simulator Training Pack was designed in collaboration with major original equipment manufacturers (OEMs) to ensure precision engineering and realistic machine behavior.

Key features & benefits /

With the Boom Truck Simulator, trainees progress through a curriculum developed in consultation with leading training organizations.

Industry-approved learning program as well as certification preparation.

Performance metrics and reporting that provide trainees with feedback on their operating and lifting skills.

Best-of-class cable and lifting simulation that ensures realistic crane and lifting behavior and skills that transfer to the real equipment.

Best-in-class simulation provides real learning benefits

Through CM Labs' Smart Training Technology™, everything from the Boom Truck's hydraulics system, engine behavior, cable dynamics, to boom deflection are accurately replicated. Smart Training Technology is comprised of CM Labs' proprietary and patented algorithms, and ensures precision engineering of the simulated equipment. That's why it delivers the most transferable operator skills anywhere, outside of the real equipment.

The Boom Truck Simulator can be paired with **CM Labs' Earthmoving and Lifting Equipment Training Packs** to provide utility organizations with comprehensive education for equipment operators.

Supported Vortex hardware platforms

The Boom Truck Simulator Training Pack runs on the desktop **Vortex Edge Plus**, the motion-enabled **Vortex Edge Max**, and the fully immersive **Vortex Advantage**, which can all be paired with control levers. Vortex simulators are built to last, designed for years of 24/7 operator training.

Learning program

The Boom Truck Training Pack features progressive learning exercises—from beginner to advanced—designed to teach skills and build confidence. Learning outcomes include:

- ✓ Controls familiarization
- ✓ Deploying outriggers
- ✓ Handling loads
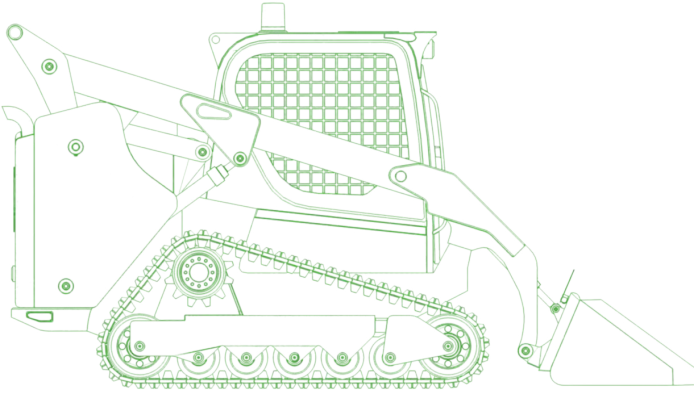- ✓ Preparation for certification
- ✓ Hoisting a pole

Performance measurement

The Boom Truck Training Pack gives trainers objective insight into performance and abilities. Trainers can measure:

- ✓ Safety violations
- ✓ Load control
- ✓ Efficiency

Compact Track Loader

Simulated equipment specs

Product name: Compact Track Loader
Attachments: Fork & bucket
Specs: Vertical lift, track loader
Operating capacity: 2,000 – 3,000 lbs \ 907 – 1,360 kg
Engine power: 65-80 hp

Overview /

Based on the most stringent labor competency recommendations, the Compact Track Loader Simulator Training Pack is the only solution that accurately replicates machine stability, providing training opportunities to reduce the likelihood of accidents due to tipping.

Key features & benefits /

The CTL is an entry-level simulator pack, rounding out the range of CM Labs' earth-moving machines available for training and ideal for training schools or companies with a wide range of equipment in their fleet.

Progressive learning program that helps build skills and confidence including familiarization with load handling, excavating, and more.

Best-in-class vehicle simulation that ensures trainees understand how the equipment works and what is required for efficient safe operations.

Performance metrics and reporting that provide trainers with real-time feedback on operator aptitudes, habits, and overall scoring.

Best-in-class simulation provides real learning benefits

Through CM Labs' Smart Training Technology™, our solution is the only simulator on the market that accurately replicates machine stability - providing real-world training opportunities to help reduce the risk of accidents.

The simulated machine behaviour helps operators gain a better feel for the impact of gear shifting and throttle use; improving lifting capacity and cycle times, ultimately reducing production costs.

Comprised of proprietary and patented algorithms, the Smart Training Technology ensures precision engineering of the simulated equipment; delivering the most transferable operator skills anywhere, outside of the real equipment.

Supported hardware platforms

The training pack runs on CM Labs' motion-enabled Vortex Edge Max, the fully immersive Vortex Advantage, and the desktop Vortex Edge Plus.

Learning program

The Compact Track Loader Simulator Training Pack features progressive learning exercises designed to gradually build skill and confidence:

- ✔ Controls familiarization
- ✔ Trailer loading and unloading
- ✔ Load handling
- ✔ Stockpiling
- ✔ Live attachment change
- ✔ Excavating and grading
- ✔ Truck loading
- ✔ Skills challenge
- ✔ Sandbox

Instructors can also use the optional Instructor Operating Station to trigger unexpected weather events, night or day scenarios, and insert faults into exercises.

Performance measurement

The Compact Track Loader Simulator Training Pack gives trainers objective insight into trainee performance and abilities. Instructors can access key performance metrics in real time, such as:

- ✔ Safety violations (such as tipping, or collisions)
- ✔ Cycle time efficiency

Instructors can also generate reports based on customizable scoring parameters, and review against benchmarks or past training sessions.
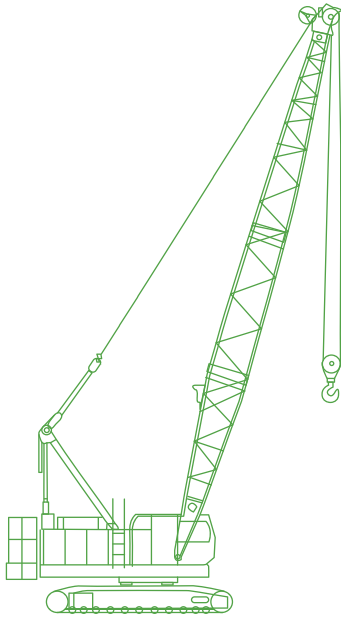
![cmlabs logo]

Crawler Crane Training Pack

Simulated Equipment Specs

80t (85USt) crawler crane

Boom length: 30m (100ft)

Engine power: 210kW (280HP)

Line pull: 75Kn (17,000lb)

Overview /

The Crawler Crane Simulator Training Pack is part of CM Labs' catalogue of construction equipment training packs. From basic controls and crane positioning to hook and load management, operators who train on Vortex simulators develop the aptitude, skills, and worksite awareness they need to master safe and efficient crawler crane operations.

With the Crawler Crane Training Pack, trainees gain valuable experience with lift planning and operations — in a safe environment, without incurring the expenses of operating a real crawler crane. It is also ideal for experienced operators looking to expand their skills from smaller lifting equipment to larger cranes.

A progressive learning program covering skills ranging from lift planning, crane set-up, and hook/load control, to working in confined spaces and preparing for certification exams.

Performance metrics and reporting that provides trainers with objective indications of trainee strengths as well as areas that require further development.

Best-of-class simulation that ensures the simulated crane travels and lifts just like the real thing. This helps trainees understand how the crane works and how it reacts to operator behaviour.

Crane simulation

The Crawler Crane Training Pack provides a complete engineering-grade simulation of the crawler crane, from tracks to boom tip. This includes all hoisting lines, blocks, rigging, and the complete power plant from engine to hoist drums and hydraulics – so the simulated crane travels and lifts just like the real thing. This helps trainees understand how the crane works and how it reacts to operator behaviour.

It also means trainers can expose novices to the kinds of operations that you would not expose them to on the real crane, so they can get valuable lifting experience before ever setting foot on the job site.

An operator touchscreen displays key operating information, updated in real time, including maximum load, current load, center of mass, and more. It also includes additional controls, such as brake switches, operator point of view controls, and working lights.

From the instructor operating station, trainers have access to a wide variety of tools for injecting lift challenges such as snagged loads, shifting load center of gravity, and rigging failures, as well as real worksite challenges, including changing weather and time of day.

Supported Vortex Hardware Platforms

The Vortex Crawler Crane Training Pack can be installed on any Vortex simulator hardware platform, with different configurations to meet your budget, space, and training requirements. Vortex simulators are built to last, designed for years of 24/7 operator training.

Vortex Edge laptop-based instructional platform

Vortex Trainer portable single display trainer

Vortex Advantage with one, three, or five immersive displays

Learning program

The Crawler Crane Training Pack features progressive learning exercises—from beginner to advanced—designed to gradually build skill and confidence:

- ✓ Understanding the controls, start up and shutdown
- ✓ Load management indicator configuration and alarms
- ✓ Hook and load management and pendulum control
- ✓ Complex lifts in confined spaces
- ✓ Nighttime operations
- ✓ Practicing for operator certification exams
- ✓ Lift planning and load charts

Trainees learn the basics of standard crawler crane work, including lift planning, load charts, set-up, travelling and positioning, and complex lifts. They'll also learn the fundamentals of safety systems including anti-2-block, and load moment pre-warning and limit alarms.

Performance measurement

As trainees work their way through Crawler Crane Training Pack exercises, the Vortex simulator tracks and reports on objective performance metrics such as:

- ✓ Time to complete tasks
- ✓ Pendulums and load/hook collisions
- ✓ Rough load handling
- ✓ Load trajectories
- ✓ Fuel consumption
- ✓ Ground pressure
- ✓ Idle time

With the optional instructor operating station, instructors can generate reports from training sessions, and review current and past performance.
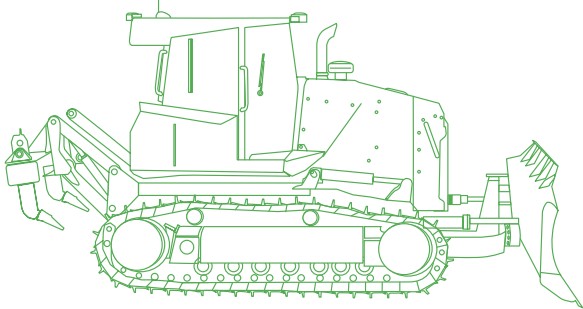
Dozer Training Pack

Simulated Equipment Specs

Machine weight: 22 t (24 USt)
Engine: 152 kW (204 HP)
Hydrostatic transmission
6-way blade

Blade capacity: 4.3 m³
Oscillating tracks
Halogen working lights

Overview /

From material spreading, excavating, loading, and levelling using Trimble® Earthworks Grade Control Platform, the Dozer Simulator Training Pack uses progressive exercises, on-screen tips, and built-in performance indicators; allowing trainees to learn at their own pace, or as part of an instructor-led training curriculum.

Key features & benefits /

The Dozer Simulator Training Pack provides trainees with the unique sensation of pushing soil and aggregate materials, promoting precision operating techniques as a result. Trainees can perform both heavy excavation and fine grading with the 6-way blade, and manage their work zone by controlling the position of the dump truck. This encourages the development of operator accuracy and efficiency, in an immersive, risk-free environment.

A progressive learning program
ranging from basic controls to advanced techniques that focus on operators' efficiency.

Performance metrics and reporting
that show trainees how to safely handle equipment and perform efficient dozer operations.

Best-of-class simulation
that ensures real skills development and learning opportunities that are transferable to the real machine and not always available on real equipment.

Best-in-class simulation provides real learning benefits

The Dozer Training Pack mimics real machine behavior including the tracks, blade, transmission, engine, and controls. It has the unique ability to engage a simulated transmission and engine the moment the virtual blade touches the virtual soil. Trainees learn proper techniques to move materials, or finish surfaces, and get a true understanding of the dozer's capabilities.

The training packs' advanced learning tools include Trimble® Earthworks Grade Control Platform which runs off a tablet that users can connect to the simulator. Visual aids are overlaid onto the existing ground along with cut/fill information, slope data and other customizable reference points to provide the user with a better understanding of the work that needs to be done.

The Dozer simulator is designed for beginner as well as advanced operators. From basic controls familiarization, trainees move on more complex techniques, providing a complete experience of driving a dozer that can be difficult or hazardous to replicate in real life.

Supported CM Labs Hardware Platforms

The Dozer Simulator Training Pack can be installed on any CM Labs simulator hardware platform, with different configurations to meet your budget, space, and training requirements. CM Labs' simulators are built to last, designed for years of 24/7 operator training.

Vortex Edge laptop-based instructional platform

Vortex Edge Plus portable single display trainer

Vortex Advantage with one, three, or five displays

Learning program

The Dozer Training Pack features progressive learning exercises—from beginner to advanced—designed to progressively teach skills and build confidence:

- ✓ Basic controls familiarization
- ✓ Setting correct blade angle
- ✓ Maintaining material in front of the blade
- ✓ Access Road Creation
- ✓ Material spreading
- ✓ Dump truck positioning
- ✓ Excavating a drainage inlet
- ✓ Excavating a transversal ditch
- ✓ Trailer loading/unloading
- ✓ Precise leveling with Trimble Earthworks
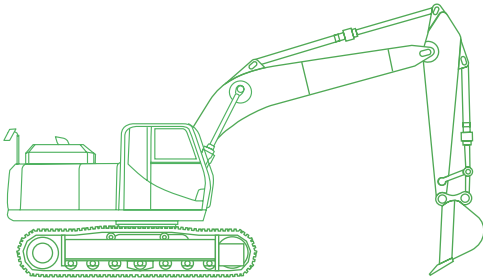
Performance measurement

The Dozer Training Pack gives trainers objective insight into performance and abilities. Trainers can score operators on performance metrics such as:

- ✓ Completion time
- ✓ Idle time and fuel consumption
- ✓ Blade efficiency
- ✓ Track spin
- ✓ Cycle time
- ✓ Amount of material pushed
- ✓ Collisions and other safety violations
- ✓ Contact with power lines, personnel, or vehicles

The optional Instructor Operating Station allows instructors to generate reports from dozer training sessions, and review current and past performance.

Excavator Training Pack

Simulated Equipment Specs /

Hydraulic excavator:
21 t (23 USt)

Engine: 119 kW / 160 hp

Swing speed: 13.3 RPM

Long carriage

Heavy-duty bucket

Halogen working lights

ISO and SAE Joystick Controls

Overview /

CM Labs' Excavator Simulator Training Pack immerses trainees in a virtual environment that promotes rapid skills acquisition — from excavating, to trailer loading, trenching and safety corridor management, to using Trimble® Earthworks Grade Control Platform.

By training operators in this virtual world, organizations will see reduced wear and tear on their equipment, while simultaneously reducing risks to trainees and other personnel.

Key features & benefits /

The Excavator Simulator Training Pack focuses on the three training pillars of safety, technique, and efficiency. While it automatically detects safety violations — including contacts with power lines or people, hazardous load trajectories, and turnovers — it also captures objective scores to indicate technical proficiency, including completion time, movement efficiency and accuracy, bucket efficiency, and more.

A progressive learning program covering standard excavator duties such as trenching, bench loading, and load handling in a realistic worksite.

Performance metrics and reporting that show trainees how to safely handle equipment and perform efficient excavation operations.

Best-of-class simulation that ensures real skills development and learning opportunities that are not available on the real machine.

Best-in-class simulation provides real learning benefits

The Excavator Simulator Training Pack's high-quality visuals include CM Labs' hallmark machine and work site realism, along with the most advanced earth-moving simulation in the industry. The award-winning soil graphics are the result of decades of academic research, resulting in an engaging learning experience that translates directly into work site skills.

The training packs' advanced learning tools include Trimble Earthworks Grade Control Platform which runs off a tablet that users can connect to the simulator. Visual aids are overlaid onto the existing ground along with cut/fill information, slope data, and other customizable reference points to provide the user with a better understanding of the work that needs to be done.

In addition, operators and instructors can change the time of day at any moment during exercises in order to practice for nighttime operations. They can also introduce inclement climate conditions, which can be difficult or impossible to recreate in a training yard.

Supported CM Labs Hardware Platforms

The Excavator Training Pack can be installed on any CM Labs simulator hardware platform, with different configurations to meet your budget, space, and training requirements. CM Labs' simulators are built to last, designed for years of 24/7 operator training.

Vortex Edge laptop-based instructional platform

Vortex Trainer portable single display trainer

Vortex Advantage with one, three, or five displays

Learning program

The Excavator Training Pack features progressive learning exercises—from beginner to advanced—designed to teach skills and build confidence:

- ✓ Basic controls familiarization
- ✓ Swing, boom and stick control
- ✓ Loading and unloading from trailer
- ✓ Picking up and handling loads
- ✓ Pipe placement in trench
- ✓ Traveling and proper positioning
- ✓ Bench loading into a haul truck
- ✓ Precision trenching with Trimble Earthworks

Performance measurement

The Excavator Training Pack gives trainers objective insight into performance and abilities. Trainers can measure performance metrics such as:

- ✓ Completion time
- ✓ Movement efficiency and accuracy
- ✓ Pendulums and collisions
- ✓ Maximum shock loads
- ✓ Volume of material excavated per bucket load and in total
- ✓ Cycle Time
- ✓ Contacts with power lines, personnel, or vehicles

The optional Instructor Operating Station allows trainers to generate reports and review current and past performance.
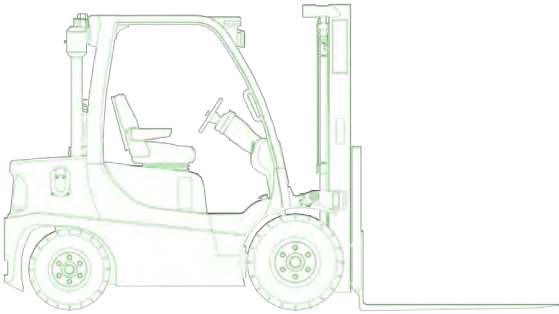
Forklift Simulator Training Pack

Simulated equipment specs /

3 ton lifting capacity

Counterbalance

Adjustable forks

2 stage mast

Rear rocking axel transmission

Overview /

The Forklift Simulator Training Pack teaches trainees to safely operate a forklift and avoid common hazards such as overturns and collisions. Operators learn the fundamentals such as driving around objects and inclines, aligning the forks with the pallet and handling different loads, while also being exposed to more complex scenarios like working in confined spaces as well as driving with and positioning a ramp.

Key features & benefits /

The Forklift Simulator Training Pack's goes beyond minimum requirements with certification preparation and advanced exercises. The result is safer and more competent operators.

Machine behavior accurately replicates instability when executing maneuvers like tight turns with the load high in the air, driving down a slope with a load and rapid braking with a load.

Visual aids like the mini-map, load calculations and the stability triangle, which depicts the machine's center of gravity, provide trainees with tools for success. A rear-view camera and mirrors allow for maximum situational awareness.

Optimized training experience including indoor and outdoor environments equipped with a variety of potential hazards such as pedestrians, power lines and racks, ensuring exposure to true-to-life settings.

Best-in-class simulation provides real learning benefits

The Forklift Simulator Training Pack is powered by Smart Training Technology™ which means that all machine components behave as they do on the actual equipment. Smart Training Technology is comprised of CM Labs' proprietary and patented algorithms, and ensures precision engineering of the simulated equipment inside the Forklift Training Pack. This gives trainees an exceptional opportunity to truly learn the consequences of their actions. The detailed simulation includes:

- Weight distribution
- Hydraulics system
- Powertrain
- Mast and forks

This training pack can also be bundled with CM Labs' full fleet of earthmoving and lifting equipment training packs.

Supported Hardware Platforms

The Forklift Training Pack runs on the desktop Vortex Edge Plus and the motion-enabled Vortex Edge Max. Vortex simulators are built to last, designed for years of 24/7 operator training.

Learning program

The Forklift Training Pack features progressive learning exercises—from beginner to advanced—designed to teach skills and ensure safe operations:
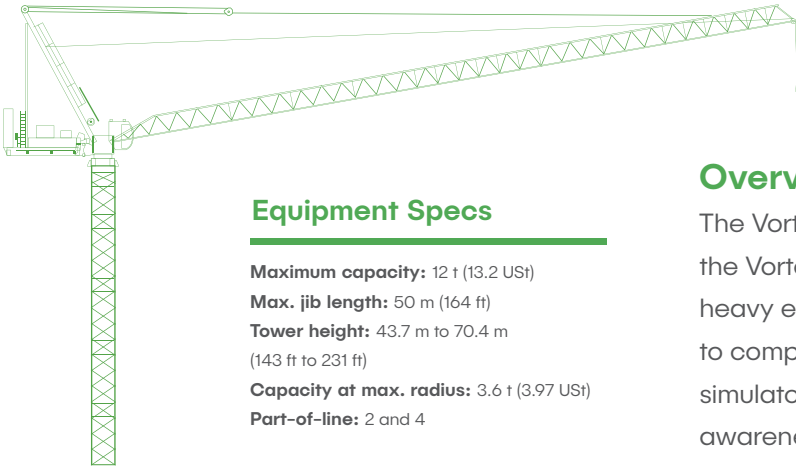
- ✓ Basic controls
- ✓ Loading dock
- ✓ Loading container
- ✓ Yard ramp
- ✓ Certification
- ✓ Freeform exercises

Performance measurement

The Forklift Training Pack gives instructors objective insight into performance and abilities. Performance metrics include:

- ✓ Overturns
- ✓ Contacts with objects or people
- ✓ Major collisions
- ✓ Forks over worker
- ✓ Load contact fail
- ✓ Vehicle stability

Luffing Tower Crane Training Pack

Equipment Specs

Maximum capacity: 12 t (13.2 USt)
Max. jib length: 50 m (164 ft)
Tower height: 43.7 m to 70.4 m
(143 ft to 231 ft)
Capacity at max. radius: 3.6 t (3.97 USt)
Part-of-line: 2 and 4

Overview /

The Vortex® Tower Crane Training Module is part of the Vortex Training suite for construction cranes and heavy equipment. From hook and load management to complex blind lifts, operators who train with Vortex simulators develop the skills, coordination, and worksite awareness they need to master safe lift operations.

Key features & benefits /

With the Tower Crane Training Module, operators gain valuable experience in safe lifting operations, with no wear and tear to the crane, and no risk to themselves or others. Operators build real skills faster than traditional training alone and learning organizations save instructor time and reduce equipment costs.
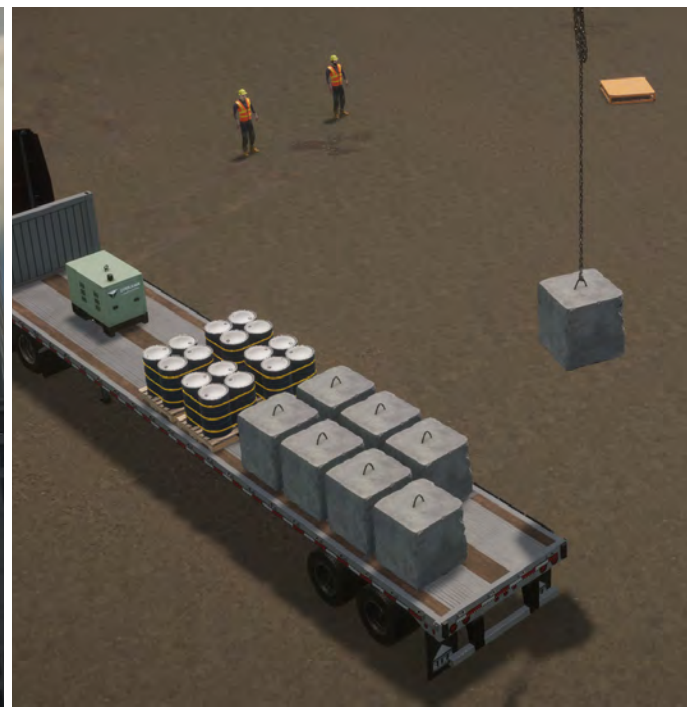
A progressive learning program covering basic craning skills such as hook and load control to working at height with various load types and more advanced lifts.

Performance metrics and reporting that provides students with the feedback on their operating and lifting skills.

Best-of-class tower crane simulation that ensures real skills development and behaves like the real crane.

Crane simulation

The Tower Crane Training Module provides the most realistic simulation-based training on the market. This ensures that students can transfer their skills directly from the simulator to the real world. There is no risk of negative training as with other game-based simulators.

Simulation of the crane is built on proven Vortex dynamics. Just as in real life, the simulated mast and jib bend and torque according to the weight of the load, dynamic movements, and actual crane characteristics.

All rigging and hoisting cables are simulated from the load to the drum using actual engineering properties, so that they behave appropriately as lines are placed under tension or the load is released. This means that all loads pendulum, snag, and collide just as they would in the real world, providing valuable experience to students without endangering them or others. Cables will collide with worksite obstructions and the crane boom.

Vortex simulators provide leading worksite visuals; the view from the cab accurately matches the view inside a real crane. An in-cab LMI is displayed on a touch screen mounted to the right of the operator chair, and displays key operational information as well as additional controls. Operators configure and learn LMI operation just like the real crane.

Supported Vortex Hardware Platforms

The Vortex Tower Crane training pack can be installed on any Vortex simulator hardware platform, with different configurations to meet your budget, space, and training requirements. Vortex simulators are built to last, designed for years of 24/7 operator training.

Vortex Edge laptop-based instructional platform

Vortex Trainer portable single display trainer

Vortex Advantage with one, three, or five immersive displays

Learning program

The Tower Crane Training Module features progressive learning exercises—from beginner to advanced—designed to gradually build student skill and confidence:

- ✓ Understand the controls, start up and shutdown
- ✓ LMI configuration and alarms
- ✓ Hook and load management and pendulum control
- ✓ Work in adverse wind and weather
- ✓ Unload materials on the worksite
- ✓ Move loads within the building site
- ✓ Erect steel structures and concrete panels
- ✓ Change part of line with pulley block
- ✓ Work at different heights and longer hook lines
- ✓ Practice CCO zigzag corridor and barrel test courses
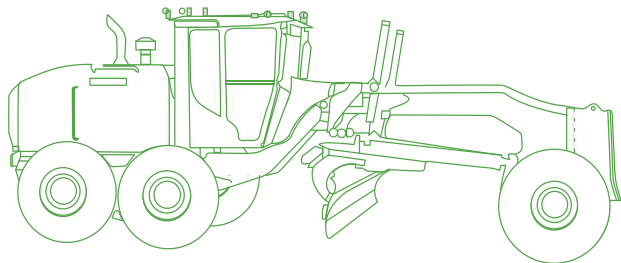
Performance measurement

The Tower Crane Training Module gives trainers objective insight into student performance and abilities. Student exercises can be recorded and played back for after-action lift team performance review. Trainers can measure key student performance metrics such as:

- ✓ Tasks completed and time
- ✓ Pendulums and load or hook collisions
- ✓ Rough load handling
- ✓ CCO test violations
- ✓ Instructor comments and bookmarks

The optional student management system allows instructors to generate reports from excavator training sessions, and review current and past performance.

Motor Grader Training Pack

Simulated Equipment Specs

Operating weight:
20,303 kg (44,760 lbs)
275 variable horsepower
8-speed power shift transmission

6-wheel drive
On-demand locking differential
Blade pull: 17,913 kg (39,491 lbs)

Overview /

CM Labs' Motor Grader Training Pack is the most advanced grader simulation available today. From controls familiarization, grader positioning, windrow management, material spreading, and V-ditch creation, to using Trimble® Earthworks Grade Control Platform for grading; operators who train on CM Labs simulators develop the aptitude and skills they need to master efficient motor grader operations.

Key features & benefits /

CM Labs' Motor Grader Training Pack is a complete learning solution for grader operations. It gives trainees the distinctive feeling of pushing soil, essential for an immersive motor grader training experience. It is also the only training solution on the market that allows trainees to learn how to operate a high-precision blade and manage real-life advanced effects such as side-draft, which require specific skills. The training pack also incorporates self-guided learning features, including previews of each training exercise, and best-practice hints.

A progressive learning program covering skills ranging from controls familiarization to windrow management, material spreading, V-ditch operations, side-draft, and more.

Performance metrics and reporting that provide trainers with objective feedback on operator habits and skills, along with an overall score.

Best-of-class tower crane simulation that ensures trainees understand how a grader works and learn by feel, as on the real equipment.

Motor grader simulation

The Motor Grader Training Pack provides a complete engineering-grade simulation that has been rigorously field-tested by experienced operators and instructors from equipment manufacturers and top training schools. The complete grader is simulated, from powertrain to blade — the blade can be manipulated and positioned in the same way as on the real machine, including a functional saddle-locking bar and automated cross-slope control.

The operator touchscreen displays key operating indications for cross slope, saddle locking bar, differential lock, hydraulic lock, and more. It also includes indicators for transmission, coolant, and hydraulic temperature, as well as a fuel gauge and articulation and slope indicators updated in real time.

The training packs' advanced learning tools include Trimble Earthworks Grade Control Platform which runs off a tablet that users can connect to the simulator. Visual aids are overlaid onto the existing ground along with cut/fill information, slope data, and other customizable reference points to provide the user with a better understanding of the work that needs to be done.

CM Labs' Motor Grader Training Pack is unique in its simulation of a completely open training environment — you'll never be locked into fake game-like scenarios with easy wins. All challenges have multiple possible solutions, leaving it to the operator to exercise skills, creativity, and good judgment — just as in the real world.

Supported CM Labs Hardware Platforms

The Motor Grader Training Pack can be installed on any CM Labs simulator hardware platform, with different configurations to meet your budget, space, and training requirements. CM Labs' simulators are built to last, designed for years of 24/7 operator training.

Vortex Edge laptop-based instructional platform

Vortex Edge Plus portable single display trainer

Vortex Advantage with one, three, or five immersive displays

Learning program

The Motor Grader Training Pack features progressive learning exercises—from beginner to advanced—designed to gradually build skill and confidence:

✓ Control familiarization

✓ Loading & unloading from lowboy trailer

✓ Stuck in mud

✓ Windrow management

✓ Material spreading

✓ Leveling with obstacles

✓ V-ditch operations

✓ Trimble Earthworks for precise grading techniques

Trainees learn the fundamentals of motor grader work, including working with the machine interface panel, accurate maneuvering and operation and materials management.

Performance measurement

Motor Grader Training Pack exercises can be played back for after-action performance review. The software also records objective performance metrics such as:

✓ Blade efficiency

✓ Blade contacts with wheels or obstacles

✓ Grade quality

✓ Idle time and cycle time

✓ Fuel consumption

... and more

With the optional instructor operating station, instructors can generate reports from training sessions, and review current and past performance.
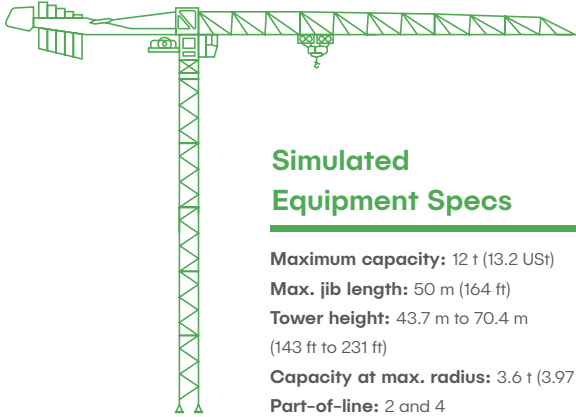
Tower Crane Training Pack

Simulated Equipment Specs

Maximum capacity: 12 t (13.2 USt)
Max. jib length: 50 m (164 ft)
Tower height: 43.7 m to 70.4 m (143 ft to 231 ft)
Capacity at max. radius: 3.6 t (3.97 USt)
Part-of-line: 2 and 4

Overview /

The Vortex® Tower Crane Training Pack is part of the Vortex Training suite for construction cranes and heavy equipment. From hook and load management to complex blind lifts, operators who train with Vortex simulators develop the skills, coordination, and worksite awareness they need to master safe lift operations.

Key features & benefits /

With the Tower Crane Training Pack, operators gain valuable experience in safe lifting operations, with no wear and tear to the crane, and no risk to themselves or others. Operators build real skills faster than traditional training alone and learning organizations save instructor time and reduce equipment costs.
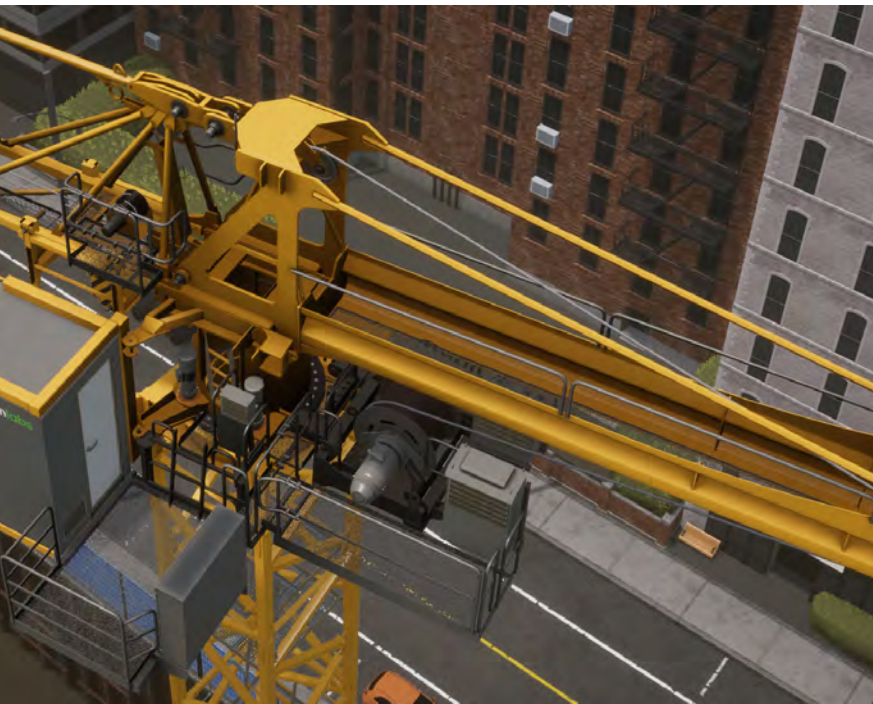
A progressive learning program covering basic craning skills such as hook and load control to working at height with various load types and more advanced lifts.

Performance metrics and reporting that provides students with the feedback on their operating and lifting skills.

Best-of-class tower crane simulation that ensures real skills development and behaves like the real crane.

Crane simulation

The Tower Crane Training Pack provides the most realistic simulation-based training on the market. This ensures that students can transfer their skills directly from the simulator to the real world. There is no risk of negative training as with other game-based simulators.

Simulation of the crane is built on the proven Vortex Studio engine. As in real life, the simulated mast and jib bend and torque according to the weight of the load, dynamic movements, and actual crane characteristics.

All rigging and hoisting cables are simulated from the load to the drum using actual engineering properties, so that they behave appropriately as lines are placed under tension or the load is released. This means that all loads pendulum, snag, and collide just as they would in the real world, providing valuable experience to students without endangering them or others. Cables will collide with worksite obstructions and the crane boom.

Vortex simulators provide leading worksite visuals; the view from the cab accurately matches the view inside a real crane. An in-cab LMI is displayed on a touch screen mounted to the right of the operator chair, and displays key operational information as well as additional controls. Operators configure and learn LMI operation just like the real crane.

Supported Vortex Hardware Platforms

The Vortex Tower Crane Training Pack can be installed on any Vortex simulator hardware platform, with different configurations to meet your budget, space, and training requirements. Vortex simulators are built to last, designed for years of 24/7 operator training.

Vortex Edge laptop-based instructional platform

Vortex Trainer portable single display trainer

Vortex Advantage with one, three, or five immersive displays

Learning program

The Tower Crane Training Pack features progressive learning exercises—from beginner to advanced—designed to gradually build student skill and confidence:

- ✓ Understand the controls, start up and shutdown
- ✓ LMI configuration and alarms
- ✓ Hook and load management and pendulum control
- ✓ Work in adverse wind and weather
- ✓ Unload materials on the worksite
- ✓ Move loads within the building site
- ✓ Erect steel structures and concrete panels
- ✓ Change part of line with pulley block
- ✓ Work at different heights and longer hook lines
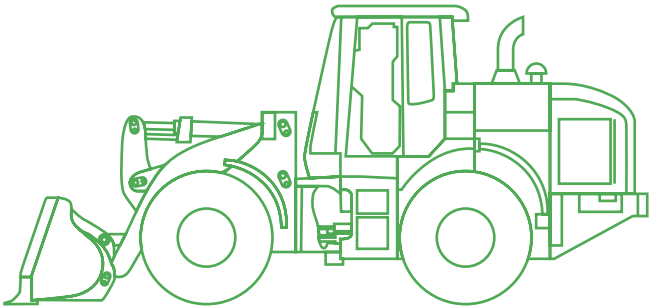- ✓ Practice CCO zigzag corridor and barrel test courses

Performance measurement

The Tower Crane Training Pack gives trainers objective insight into student performance and abilities. Student exercises can be recorded and played back for after-action lift team performance review. Trainers can measure key student performance metrics such as:

- ✓ Tasks completed and time
- ✓ Pendulums and load or hook collisions
- ✓ Rough load handling
- ✓ CCO test violations
- ✓ Instructor comments and bookmarks

The optional student management system allows instructors to generate reports from Towe Crane training sessions, and review current and past performance.

Wheel Loader Training Pack

Simulated Equipment Specs

Rated net power: 105 kW (140 HP)	**Bucket capacity:** 2.3 m^3 (3.0 yd^3)
Operating weight: 13,200 kg (29,101 lbs)	**Transmission:** 4-speed, all-wheel drive

Overview /

The Vortex® Wheel Loader Training Pack is part of the Vortex construction equipment training product suite. From earth moving and stockpile management to truck loading, operators who train with Vortex simulators develop the skills, coordination, and worksite awareness they need to master safe, efficient operations.

Key features & benefits /

With the Wheel Loader Training Pack, operators gain valuable experience in safe operations, with no wear and tear to the loader, and no risk to themselves or others. Operators build real skills faster than traditional training alone, and learning organizations save instructor time and reduce equipment costs.

A progressive learning program covering basic operating skills ranging from maneuvering, controls handling and excavating, to working with stockpiles and truck loading.

Performance metrics and reporting that provides students with the feedback on their operating and earth moving skills.

Best-of-class loader and earthmoving simulation that ensures real skills development and behaves like the real machine.

Wheel loader and earth-moving simulation

The Wheel Loader Training Pack provides the most realistic simulation-based training on the market. This ensures that students can transfer their skills directly from the simulator to the real world. There is no risk of negative training as with other game-based simulators. The Vortex Wheel Loader is a composite 13-ton loader based on actual OEM machines, and includes bucket, forks, and truss boom tools.

Precise simulation of the loader's hydraulics system and transmission ensure that trainees feel like they are driving the real thing, with realistic machine feedback at all times.

Simulation of soil digging and dumping is powered by decades of research into earth-moving simulation, and hundreds of peer-reviewed academic research papers. Trainees will experience changes in hydraulic pressure, engine RPM, and terrain surface, familiarising them with equipment performance over a full range of real-life conditions.

The result is realistic simulation of soil flow, erosion, and compaction — operators will feel resistance as they "dig in," just like in real life.

Supported Vortex Hardware Platforms

The Vortex Wheel Loader Training Pack can be installed on any Vortex simulator hardware platform, with different configurations to meet your budget, space, and training requirements. Vortex simulators are built to last, designed for years of 24/7 operator training.

Vortex Edge laptop-based instructional platform

Vortex Trainer portable single display trainer

Vortex Advantage with one, three, or five immersive displays

Learning program

The Wheel Loader Training Pack features progressive learning exercises—from beginner to advanced—designed to gradually build student skill and confidence:

- ✓ Understanding the controls and vehicle positioning
- ✓ Bucket positioning
- ✓ Earth moving and transport
- ✓ Stockpile management
- ✓ Excavation
- ✓ Truck loading
- ✓ Using the quick coupler
- ✓ Safe load handling

Performance measurement

The Wheel Loader Training Pack gives trainers objective insight into student performance and abilities. Student exercises can be recorded and played back for after-action performance review. Trainers can measure key student performance metrics such as:

- ✓ Tasks completed and time
- ✓ Collisions
- ✓ Fuel consumption, cycle time, and Idle time
- ✓ Instructor's comments

The optional student management system allows instructors to generate reports from excavator training sessions, and review current and past performance.

Instructor Operating Station

Monitor, assess, and engage construction equipment operator trainees from a single workstation

Presenting the IOS /

CM Labs' Instructor Operating Station (IOS) gives instructors complete control of operator training sessions. You can initiate exercise sessions, monitor operations from your seat, and challenge trainees by exposing them to a wide range of tasks and job site conditions. It is the only solution on the market that provides instructors with a real-time 3D view of learning progress, from any vantage point on the virtual work site.

Benefits /

Challenge trainees for maximum learning effectiveness

With the IOS, you can expose operators to the variable kinds of situations they will experience in real life. Set time of day, as well as weather conditions including rain, fog, snow, wind speed, and direction. At any time, the instructor can inject machine faults including engine stalls, hydraulic failures, and line breaks.

Benchmark trainees easily with smart assessment tools

The IOS offers a host of automated monitoring tools, including recording and reporting of machine and performance data, rolled up into a single score that updates in real time. At any point during the training session, you can use the IOS to add bookmarks and notes to the training session for later review.

Enable full team-based training in a single classroom

The IOS is the central hub for collaborative learning. You can enable tandem lift exercises, put another trainee at the helm of the IOS so they can provide peer-to-peer evaluation, or launch a Signalperson Training Station (purchased separately) that allows another trainee to work cooperatively with the operators.

IOS Features /

Scales up with your training

With the IOS, you can add any solution from CM Labs' suite of training tools, at any time. This includes the Signalperson Station, as well as simulator training packs for lifting equipment (boom truck, crawler crane, mobile crane, overhead crane, flat-top tower crane, luffing tower crane, forklift) and earthmoving equipment (backhoe, excavator, motor grader, wheel loader, dozer).

Customisable scoring

The IOS tracks all operating metrics during training exercises, and rolls them up into a single score that updates in real time. It is the only simulator training solution that gives trainers and managers the ability to customise this scoring system and establish their own benchmarks, if desired, according to the operator attributes they want to target.

Smart reporting

After each training session, the IOS can generate reports that highlight scoring, selected instructor bookmarks, notes, and charts. This allows you to objectively document trainee readiness, provide an indication of areas for improvement, and ultimately train a safer, more effective operator.

360–degree monitoring

Along with a real-time 3D view from any vantage point on the virtual work site, the IOS allows trainers to control virtual characters within the training environment for an "on the ground" perspective, or use the built-in signaler functionality to provide virtual hand signals to the operator.

vortex®
advantage

Vortex Advantage

The scalable, full-immersion, all-in-one operator training simulator

Introducing the Vortex Advantage /

The Vortex Advantage is a full-immersion training simulator that develops transferable operator skills. It's designed for extended training, including mastering advanced skills. With OEM hot-swappable controls sets and pedals, and options for different screen configurations, the Vortex Advantage delivers high-quality training and flexibility.

Benefits /

1. Grows with your needs

With options to add displays, motion, and more, the Vortex Advantage is designed to grow with you, whether you're providing individual instruction or group training. The optional instructor station and classroom manager provide tools to record and manage trainee progress.

2. All-in-one training platform

The Vortex Advantage is ready for training on all types of lifting and earth-moving equipment — it features equipment-specific hot-swappable control sets and pedals. The 3-screen option also rotates to replicate crane and earth-moving equipment sightlines.

3. Built to last

With a robust steel frame, commercial-grade displays, professional-grade controls and industrial shock-mounted computers, the Vortex Advantage is built to last. It is designed to service classrooms and mobile trailer usage with 24-7 operations for years of learning.

Vortex simulators bridge the learning gap between the classroom and the worksite

Meet the Vortex Advantage

1. IMMERSIVE DISPLAYS

With leading worksite visuals, the view from the cab matches the view from the seat of the actual equipment. Select from a single-display option, 3 displays, or 5 for maximum trainee engagement.

2. BUILT TOUGH

With rugged high-quality steel frame and parts, the Vortex Advantage is built tough for the demands of a busy classroom.

3. PROFESSIONAL-GRADE CONTROLS

Train many equipment types on a single simulator — with no need to shut down the simulator to change control sets or pedals.

4. FEEL THE MOTION

For full trainee immersion, the motion platform replicates the motion and vibration experienced while traveling, digging, and lifting.

5. OPERATOR TOUCHSCREEN

The touchscreen makes it easy for the student to log in and switch between training exercises, and also acts as the equipment computer interface, including safe load indicator (LMI/SLI), auxiliary controls, and operator's dashboard.
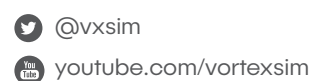
6. TRAIN AS A CREW

The Vortex Edge Advantage can connect to other simulators for tandem operations and crew training.

Vortex Edge Max

A new solution for bridging the skills gap

Introducing the Vortex Edge Max /

Not every organisation has the time, manpower, or equipment available for training when needed. That all changes with the Vortex Edge Max.

Part of CM Labs' Edge series of award-winning training products, the Vortex Edge Max is an entry-level tool that develops transferable operator skills. The Vortex Edge Max replicates the motion and feel of real construction equipment, and comes embedded with CM Labs' Smart Training Technology™—assuring a solution that delivers the most transferable operator skills anywhere, outside the real equipment.

Benefits /

1. Maximum safety

Trainees can learn to operate equipment and practice challenging real-world scenarios, with no risk to equipment or themselves.

2. Maximum cost effectiveness

With a rugged, stripped down design that minimises simulator costs, the Vortex Edge Max is built to the same uncompromising standard that has made CM Labs the largest construction simulator vendor in the world.

3. Maximum learning effectiveness

The Vortex Edge Max logs key performance metrics, so operators learn productive machine use. Self-guided learning paths — from beginner to advanced — mean operators can train even when equipment or trainers are unavailable.

Vortex Edge Max Features

1. COMPLETE HEO TRAINING

The Vortex Edge Max comes bundled with a full fleet of cranes, our complete earthmoving catalogue — or both, for a total of 10 machines on one simulator. Its heavy-duty controls are designed to run any machine, and the screen rotates to provide an optimal field of view for every piece of equipment.

2. ECO-FRIENDLY TRAINING

Incorporating the Vortex Edge Max into your training reduces fuel emissions compared to training on the real equipment, while teaching operators how to operate machines efficiently and with minimal idle time.

3. REAL-WORLD LEARNING

With a motion platform that replicates the feel of the real equipment, best-in-class visuals, and exercises that replicate work site conditions, the Vortex Edge Max prepares trainees for the real world.

4. READY TO GO

Easy to transport, set up, and use: Wheel the Vortex Edge Max out of the shipping crate and get up and running in under 10 minutes.

5. TRAIN AS A CREW

The Vortex Edge Max can connect to other simulators for tandem operations and crew training.

6. YOUR PARTNER IN SUCCESS

The Vortex Edge Max is backed by complete customer service from CM Labs, so your investment is always protected.

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Vortex Edge Plus

Professional simulator training on the desktop

Introducing the Vortex Edge Plus /

Designed for maximum portability and simple set up, the desktop Vortex Edge Plus makes it easy and affordable for organizations to run CM Labs' full catalogue of construction and forestry equipment training modules anytime, anywhere.

Benefits /

1. Ease of transport and set up

The Vortex Edge Plus is so compact that it can be easily transported and installed on classroom desktops or job fair/tradeshow booths in minutes. It is the ideal training solution for the classroom or on the go, and a great way to quickly assess the skill level of new operators on- or off-site. All components, from the pedals to the operator controls, monitor, steering wheel and workstation-class laptop, can be transported in optional carrying cases and ergonomically positioned for optimal trainee comfort.

2. Complete training

The Vortex Edge Plus simulator is a complete training solution that runs CM Labs' full fleet of earthmoving, lifting and forestry equipment training packs. It can also be paired with an optional Instructor Operating Station (IOS) for instructor-led training. With the IOS, instructors can control the training right from their seat and do everything from launching exercises and manipulating the weather,

to injecting machine faults, providing virtual hand signals and customizing the scoring system as well as generating reports. The simulator can also connect to other Vortex simulators as well as CM Labs' Signalperson Station, for collaborative crew training.

3. Optimized operator training

The Vortex Edge Plus runs on the same engineering-grade software that powers CM Labs' fully immersive Vortex Advantage. This means that all simulated machine components behave as they do in the real world, whether operators are digging a trench, delimbing a tree or catching a swing. The Vortex Edge Plus complements the entry level motion-enabled Vortex Edge Max and the full-immersion Vortex Advantage. It allows organizations to engage novices, and then complement training with more immersive seat time.

Meet the Vortex Edge Plus

Lightweight, rugged and easy to use

1. Laptop

The laptop makes it simple for a user to log in and switch between training exercises. It also acts as the equipment computer interface, including safe load indicator (LMI/SLI), auxiliary controls, and operator's dashboard.

2. Pedals

Industrial grade pedals used in real cranes, earthmoving, and forestry equipment provide operators with quality and flexibility. The configuration allows users to operate all construction and forestry equipment without having to change the pedals.
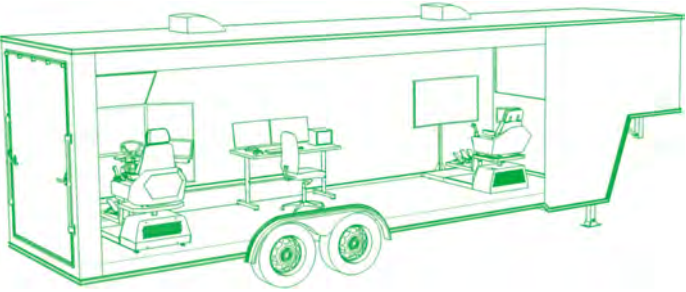
3. Your partner in success

The Vortex Edge Plus is backed by complete customer service from CM Labs, as well as a best-in-class maintenance and support plan, so your investment is always protected.

4. Joysticks and steering wheel

The Vortex Edge Plus joysticks and steering wheel are produced by the same manufacturer that provides controls for actual equipment and feel and operate just like the real thing. The controls are compatible with cranes, earthmoving, and forestry training packs while the steering wheel supports specific earthmoving training packs. Controls attach quickly to any standard desk for ease of setup.

Mobile Training Center

Operator training and assessment, whenever and wherever needed

CM Labs' Mobile Training Center provides companies and training institutions the flexibility to offer training and assessment where needed most.

Whether on the road or at remote locations, the Mobile Training Center was designed for all-season versatility and use.

Multiply your training capabilities

Bring training directly to your customers, multiply training locations, and access markets that were previously inaccessible.

Bring training to the job site

The Mobile Training Center offers an on-location presence, reducing team displacement and job site disruption.

Memorable branding

Make a statement about your organization's commitment to training with high-impact trailer exterior graphics.

All-season availability

Built for comfort, the all weather training environment is equipped with a generator and insulated HVAC cooling and heating. Included is a breaker panel with a manual power switch to connect to a diesel generator or local grid for Ethernet, Wi-Fi, and LED lighting with 3 switch zones.

Optimized for training

The gooseneck trailer comes in 24 and 34" lengths and accommodates 1 or 2 Vortex simulators, as well as CM Labs' Instructor Operator Station, from which trainers can monitor, assess, and report on training progress. The trailer can be hitched to a vehicle for transport or set up as a standalone station.

Additional options

Add-on options include interior storage, bench, awning, and 12kW liquid-cooled diesel generator. Options for trailer graphics include a fully customized vinyl wrapping, or your logo included on a CM Labs-branded trailer.

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