TRIMBLE PAVING SOLUTIONS

Trimble®

better from the ground up

Today's road projects require contractors to work faster, with better accuracy, and with tighter control on costs. For the paving contractor, that means no unplanned downtime, minimal material usage, and zero re-work.

Trimble® paving solutions are designed for today's competitive environment. Whether you are building a new road or resurfacing an old one, Trimble solutions will help you build a better surface, reduce material use, and significantly improve your productivity. The more you use Trimble paving solutions, the more productive and profitable your paving operation will be.

Resurfacing an Old Road:

Topo

Site Positioning Systems

Design & Take-off

Business Center – HCE

Mill

GCS900 Grade Control System

Building a New Road:

Topo

Site Positioning Systems

Design & Take-off

Business Center – HCE

Grade & Compact

GCS900 Grade Control System

Trimble offers road building solutions from concept to completion; from the initial design to the last pass of the asphalt compactor. Using Business Center – Heavy Construction Edition and Trimble 3D technology, you can create a better foundation for the asphalt, whether it is on soil or existing asphalt layers.

The best built roads begin with a quality subsurface before the paver ever starts. For new roads, start by creating a quality 3D design using Business Center – HCE software powered by Trimble. Then Trimble 3D grade control systems on your motor grader and soil compactor will help you achieve a more uniformly compacted surface that's right on grade.

For resurfacing an old road, use Trimble 3D grade control on your milling machine to smooth out undulations and imperfections in the original surface.

Supervise & Check

Site Positioning Systems

Pave

PCS400 Paving Control System

Compact

CCSFlex

OR

OR

Supervise & Check

Site Positioning Systems

Pave

PCS900 Paving Control System

Compact

CCS900 Compaction Control System

better milling for better paving

3D Milling with Trimble GCS900

Milling to a fixed depth often satisfies the specification for a resurfacing project, but it leaves any improvements to road smoothness to the paver. With Trimble GCS900 Grade Control System on your milling machine you can mill at variable depth and slope, eliminating undulations and preparing a smoother sub-surface for new asphalt. When used in conjunction with a paver equipped with PCS400 or PCS900, the end result is a significantly smoother road surface using less material and finished in less time.

MILL SMARTER

Using GCS900 on your milling machine provides several benefits:

- Smoother base—mill out the existing undulations, creating a smoother surface for paving
- Shorter lane shutdowns—trucks can run more efficiently unhindered by stringline and stakes
- Reduced machine wear—by only milling to the depth required, the machine will burn less fuel and experience less teeth wear
- Less material to remove—fewer trucks and cost required to remove waste material
- Less asphalt usage—mill off the minimum depth and use less asphalt for the final surface

Prism:
Patented Trimble active tracking technology guarantees total station lock to the on-machine target and ensures millimeter control of the milling machine drum.

CB460 Control Box:
The Trimble CB460 Control Box indicates the position of the drum versus the 3D design or pre-defined vertical offset.

Result after fixed depth milling of a road with longitudinal waves

Result after paving:
lower smoothness bonus
+ higher asphalt usage
= less profit, worse road

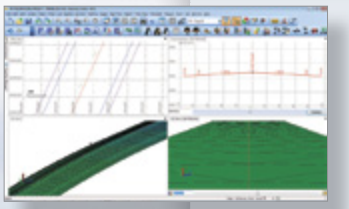
Result after 3D milling of a road with longitudinal waves

Result after paving:
maximized smoothness bonus
+ minimized asphalt usage
= more profit, better road

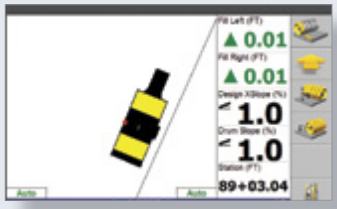
ACCURATE MILLING. NO STRINGLINES

Accurate milling begins with a quality 3D design model created in Business Center – HCE. The 3D design is loaded onto the control box and displayed to the machine operator showing areas that are on, above, or below ideal grade. Comparing the actual drum position and slope with the digital design, the system automatically guides the milling drum to cut the ideal depth and slope without stringlines or manual adjustments.

With GCS900 on your mill, you easily handle transitions, super-elevated curves, variable drainage slopes and longitudinal waves. And you can do it all without re-work.



3D Design Model created in Business Center - HCE



Guidance to grade shown to the operator in plan, profile, and cross section view

TRIMBLE SPS930 UNIVERSAL TOTAL STATION:

The industry-leading Trimble SPS930 Universal Total Station locks onto and tracks the MT900 active target mounted on the milling machine. Trimble active tracking technology guarantees lock to the target, ignoring passing vehicles, strobes, and other reflective objects. By measuring the angle and distance to the target, the SPS930 can very accurately drive the mill drum to cut to the digital 3D design within 0.01-0.02 feet. (3-6 millimeters).

THE SPS930 IS IDEAL FOR MILLING BECAUSE:

- **It offers the best accuracy on the market—** every millimeter saved reduces your milling and paving costs substantially.
- **It is flexible and reliable—**you can work on sites where there is an obstructed view of the sky (overpasses, trees, tunnels).
- **It has a 45 degree tracking angle—**you can set it up very close to the mill in narrow corridors or at a lower elevation than the mill in the drainage area between divided highways.
- **It maximizes your return on investment—** other survey and machine control work can be done with the same instrument.

a more **uniform** surface

2D Paving with Trimble PCS400

The Trimble PCS400 system is ideal for projects that require meeting a thickness specification. When milling is done to design using Trimble 3D technology, Trimble 2D paving technology can easily handle the task of paving a fixed thickness.

The Trimble PCS400 Paving Control System uses sonic tracers, a 30-foot averaging beam, and averaging technology to ensure highly accurate referencing off a surface, stringline or cross-slope. This makes the PCS400 an excellent, lower cost option for roads that have been graded or milled using Trimble Grade Control Systems.

MANY BENEFITS FROM ONE SYSTEM

Using the Trimble PCS400 system can help you:

- Lay the finished surface with accuracy to 0.01 feet (3 millimeters)
- Minimize use of expensive material... pave within a tighter tolerance and get closer to the minimal asphalt thickness specification
- Reduce labor costs by controlling the screed with one operator
- Eliminate operator mistakes with the easy-to-use display interface
- Achieve maximum smoothness and rideabiity
- Finish on time

CB440 Control Box:
The CB440 Control Box displays the measured and target values of the cross slope and mat thickness simultaneously.

ST200 Sonic Tracer:
The PCS400 Averaging Beam uses three evenly spaced ST200 Sonic Tracers to average out uneven reference surfaces.

REFERENCING OFF A SURFACE

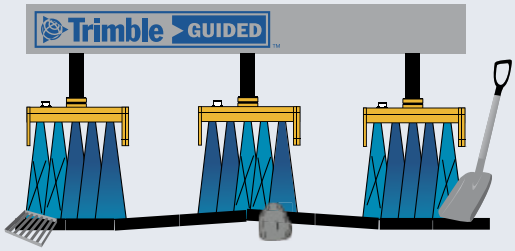
Each side of the paver is typically equipped with one sonic tracer or with three sonic tracers mounted on an averaging beam. These sonic tracers send multiple sonic signals to reference off the existing surface and calculate an average elevation for paving a smooth surface.

REFERENCING OFF STRINGLINE

The ST200 sonic tracer can be configured to use stringline as a reference line to control the paver. In this mode the sonic tracer will measure any lateral movement of the machine relative to the stringline. When the sonic tracer's center is moving away from the stringline, the control box warns you and provides correction guidance.

REFERENCING OFF THE SLOPE SENSOR

The PCS400 system can also use the Trimble AS200 Angle Sensor to reference the desired cross-slope of the road. Designed specifically for asphalt pavers, the sensor rarely needs recalibration and paves cross slopes of up to 0.5% accurately and consistently.



PCS400 AVERAGING BEAM AND SONIC TRACERS

Three ST200 Sonic Tracers mounted on the averaging beam ignore irregularities such as grates, and stones that could otherwise decrease accuracy. The beam measures a full 30 feet (9.1 meters) in length as required by some governmental agencies and swings back behind the paver to reference both the adjoining surface and freshly laid mat.

TRIMBLE CB440 CONTROL BOX

The PCS400 system features a large display and an easy-to-understand layout for controlling cross slope and material thickness. The optional split screen view on the CB440 Control Box allows you to control and monitor the left and right side of the screed with just one operator. You can even view the measured and target values of the cross slope and mat thickness simultaneously.

3D precision paving without stringlines

3D Paving with Trimble PCS900

The Trimble PCS900 Paving Control System adds the accuracy and flexibility of 3D technology to your paving operations, giving you the flexibility of operating in either 2D or 3D mode, depending on project needs. In addition to PCS400, which paves at a fixed depth and slope, the PCS900 allows you to also pave with variable depth and slope based on the 3D design.

The PCS900 upgrade consists of a Trimble SPS930 Universal Total Station, an MT900 active target, and a CB460 display running the PCS900 on-board software. If you already have a Trimble GCS900 Grade Control System on your grading or milling machine, you can leverage your investment by simply re-deploying the same display, machine target, and total station for your paver.

AVOID THE PROBLEMS OF STRINGLINE

Stringless 3D technology resolves the problems inherent to stringline because:

- It eliminates time consuming and costly manual setup and possible human errors
- It eliminates the possibility that stringlines can be moved or damaged
- It improves truck productivity with less travelling and maneuvering around the stringlines

Prism:
Patented Trimble active tracking technology guarantees total station lock to the on-machine target and millimeter control of the screed.

CB460 Control Box:
The CB460 3D Control Box offers a 7 inch (18 centimeter) graphical display and adjustable light settings for day or night paving.

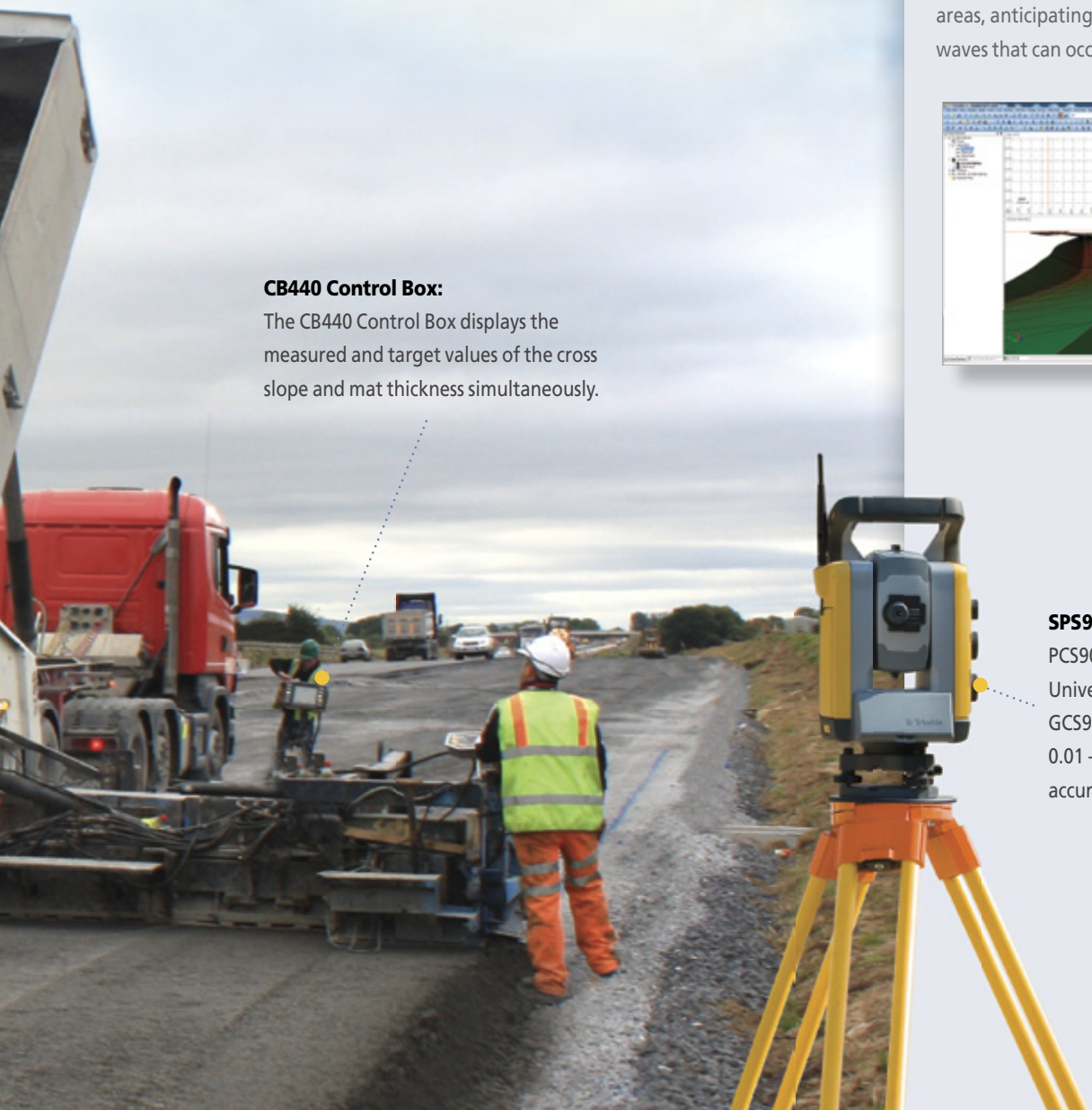
PRECISION PAVING WITH LESS MATERIAL

The PCS900 system regularly achieves asphalt mat accuracies of 0.01-0.02 feet (3-6 millimeters), making it ideal for projects such as airports, large commercial surfaces and highways.

Accurate 3D control of the screed allows you to:

- Take out high and low areas early in the process with the less expensive first layer materials
- Increase road smoothness using less asphalt than with traditional paving methods
- Lay complex designs such as transitions, super-elevated curves and frequently changing cross slopes
- Achieve accuracy and smoothness specifications, which can mean bonus income

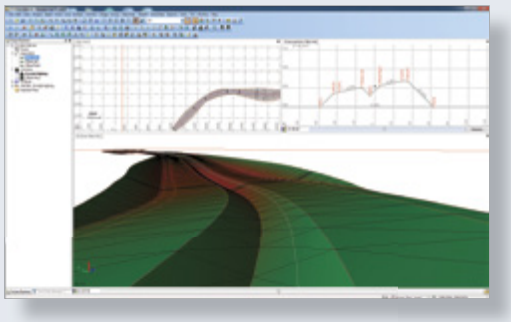
CB440 Control Box:
The CB440 Control Box displays the measured and target values of the cross slope and mat thickness simultaneously.



GOOD DESIGNS MAKE GOOD SURFACES

Good digital designs are the foundation to starting your paving project, but you need not be an advanced CAD professional to get the job done. Data preparation and management for asphalt paving projects is easy with Business Center – HCE.

Using Business Center – HCE, you can create 3D design models and automatically generate uncompacted surface designs for the Trimble PCS900 3D paving system. The uncompacted surface designs guide the paver to automatically lay more material above low areas and less material in high areas, anticipating and eliminating longitudinal waves that can occur after asphalt compaction.



SPS930 Universal Total Station:
PCS900 leverages the same Trimble Universal Total Station as the GCS900 milling system to provide 0.01 - 0.02 feet (3-6 millimeter) accuracy for laying asphalt.

target compaction in fewer passes

3D Compaction with Trimble CCS900

The asphalt compactor is the last machine to pass over your paving project, and mistakes during this phase can be very costly to fix. You can significantly reduce the need for re-work by installing the Trimble CCS900 Compaction Control System on your asphalt compactors.

The CCS900 system eliminates much of the guess work from asphalt compaction and helps achieve more consistent compaction to target design density. You will also be able to roll a more efficient pattern, increase productivity, and save fuel.

MAP IT AND GET IT RIGHT

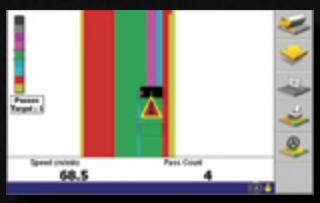
Pass count mapping in the CCS900 system allows you to monitor the number of passes over an area and adjust your effort to avoid over or under-compaction.

Using the roof-mounted GNSS receiver or machine target, the system calculates the exact position of the machine and displays a color map indicating the current number of passes and where you have overlaps or gaps. When installed with two optional IS310 Infrared Sensors, CCS900 maps the surface temperature of the mat and pinpoints exactly where you need to be for ideal compaction timing.

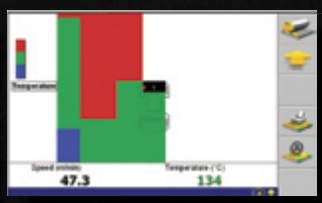
CB460 or CB450 Control Box:
The Control Box graphically maps pass counts and surface temperature readings with high and low temperature warnings to indicate potential issues in real-time.

REPORTING AND DOCUMENTATION

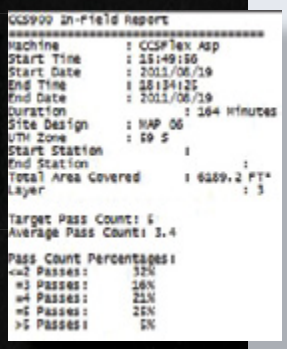
In-field reporting and an in-cab printer allow on-site supervisors and quality managers to monitor compaction operations and correct possible issues immediately. Compaction data logs can be wirelessly transferred from the machine to the office for analysis using the web-based VisionLink™ fleet, asset and productivity management solution from Trimble.



Operator view of pass count mapping



Operator view of temperature mapping



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CCS900 In-Field Report
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Machine          : CCSFlex Asp
Start Time       : 15:49:56
Start Date       : 2011/08/19
End Time         : 18:34:25
End Date         : 2011/08/19
Duration         : 164 Minutes
Site Design      : MAP 06
UTM Zone         : 59 S
Start Station    :
End Station      :
Total Area Covered : 6289.2 FT²
Layer            : 3

Target Pass Count: 5
Average Pass Count: 3.4

Pass Count Percentages:
<=2 Passes:   32%
=3 Passes:    16%
=4 Passes:    21%
=5 Passes:    26%
>5 Passes:     5%
```

A printed in-field report showing pass count coverage

MS972 GNSS Smart Antenna:

The Trimble MS972 Smart GNSS Antenna measures the position of the compactor using a base station or satellite delivered correction sources such as SBAS.

IS310 Infrared Temperature Sensors:

IS310 Infrared Temperature Sensors are installed on the front and rear drum to measure surface temperature of the mat in the direction of operation.

UPGRADEABLE AND PORTABLE ACROSS MACHINES

The Trimble CCS900 Compaction Control System is fully upgradeable and can be installed on any asphalt compactor. The wiring harness and brackets are permanently installed for optimal fit and integration with the machine body, while the more costly positioning sensor, control box, and radio from the CCS900 system can be ported between compactors to maximize utilization of the investment. These components can also be used on a wide range of paving and earthmoving machines to increase utilization even more. You can use a common platform and components across your entire fleet, while at the same time knowing you chose the right solution for your asphalt compactor.

TRIMBLE CB450 AND CB460 CONTROL BOX

The 7 inch (18 cm) CB460 Control Box is the premium display for the CCS900 system. The CB450 Control Box offers a smaller 4.3 inch (10 cm) display and is priced for maximum return on investment.

affordable. easy to use

Pass count mapping with CCSFlex

The Trimble CCSFlex™ Compaction Control System is an easy-to-use and affordable compaction control system to help you increase your compaction efficiency in the most economical way.

Unlike CCS900 which requires a more permanent installation on the machine, the CCSFlex system is completely portable between compactors and requires no welding or drilling onto the machine. Designed specifically for compactors, CCSFlex cannot be installed on other earthmoving and paving machines.

GET STARTED QUICKLY

Straight out of the case, you can run the CCSFlex system without a GPS base station and without creating 3D designs. The highly intuitive CCSFlex software guides you to the exact number of passes required for the job and provides instant feedback on pass count and compaction quality. You simply can't go wrong.

CB450 Control Box:
The in-cab control box provides visual guidance regarding pass count and compaction by "painting" a map in real time, showing on a color scale the number of passes over each spot.

PORTABLE SYSTEM IN A CASE

The CCSFlex "in a case" system is easy to install by the contractor in a couple of hours. This easy portability makes the system an ideal solution if you employ rented compactors or you want to move the system between compactors in your fleet. It can be installed on any asphalt compactor with open or enclosed cab.

The Trimble CCSFlex system comes standard as a pass count system with an MS972 GNSS Smart Antenna, CB450 Control Box, moveable mounting brackets, and system cables.

MS972 GNSS Smart Antenna:
The MS972 provides sub meter accurate positioning of the compactor. Position information is used to display a pass count coverage map in real time on the in-cab control box.

System Cables and Mounts:
The system cables are used to connect the GPS receiver to the in-cab control box. Installation is easy, requiring no drilling or welding.

ADD-ON OPTIONS

Add-on options allow you to increase the functionality and accuracy of the system, as the need arises. System accuracy can be increased to 1 cm (0.03 foot) by adding options to the GNSS receiver.

IS310 Infrared Sensor:
Two IS310 Infrared Sensors can be added to the CCSFlex system to enable temperature mapping.

TRIMBLE CB450 CONTROL BOX

The CCSFlex system uses the same CB450 Control Box as the CCS900 Compaction Control System.

dependability when you need it

DEPENDABLE TECHNOLOGY. DEPENDABLE SUPPORT.

Reliability is especially important in paving systems, because you lose money any time the process stops. Trimble components are built to withstand the heat, steam, tamping and vibration that are the norm on milling machines, pavers, and compactors. And while system durability prevents downtime, Trimble's extensive SITECH® dealer network ensures that training and support are always close at hand.

SITECH is the leading distribution network for the most reliable, rugged and complete portfolio of construction technology systems available to the heavy and highway contractor. The experienced construction professionals at your SITECH dealership will advise you on the right technology for your job and provide you with local customer service, personalized training and technical support.

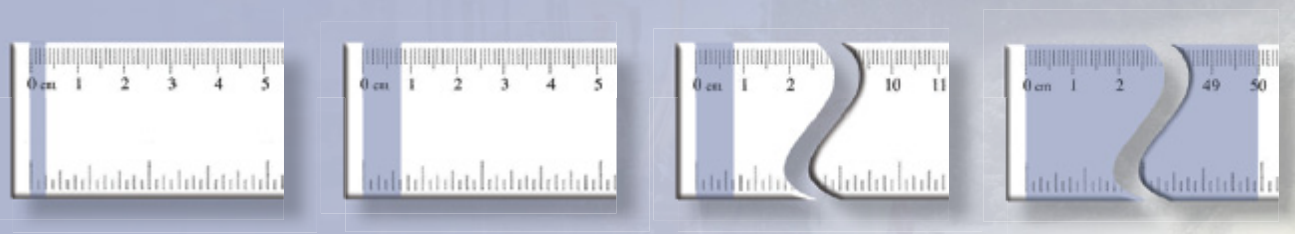
With the addition of Trimble site-wide solutions to your heavy and highway projects, you're in a stronger, more competitive position. You'll experience new levels of productivity that will help you win the bid and be profitable, project after project.

Recommended Technology for Your Application

		Milling	Asphalt Paving			Asphalt Compaction	
		3D	Grade & Slope	Grade & Slope	3D	Passcount / Temperature Mapping	As-Built Cut-Fill Mapping
Application Description	**Examples**	**GCS900**	**PCS400**	**PCS400 with averaging beam**	**PCS900**	**CCSFlex / CCS900 with GNSS**	**CCS900 with Universal Total Station**
Road jobs with an accurate reference surface or curb	Roads, parking lots	Optional	Recommended			Recommended	
Road jobs with an accurate reference surface or curb and a stringent smoothness spec	Highways, airports	Optional		Recommended		Recommended	
Asphalt paving without stringlines or accurate reference surface but with stringent elevation, cross slope and/or smoothness specs	Airports, roller compacted concrete paving, base material paving, asphaltic base for concrete roads	Recommended			Recommended	Recommended	Optional
Asphalt paving with frequent cross slope changes	Highway exits and curves, parking lots, sports surfaces	Recommended			Recommended	Recommended	

SYSTEM ACCURACIES FOR EACH TECHNOLOGY EMPLOYED

Horizontal Accuracy



Vertical Accuracy

Trimble Total Station Accuracy at 100 m is 3mm (0.01 ft) Horizontal and 1mm (0.003 ft) Vertical

Trimble Precision GNSS Accuracy is 8mm (0.03 ft) Horizontal and 15 mm (0.05 ft) Vertical

Trimble Location RTK Accuracy is 8 mm (0.03 ft) Horizontal and 100mm (0.33 ft) Vertical

Satellite Based Augmentation System (SBAS) Accuracy is approximately 0.5m (1.7 ft) in both the Vertical and Horizontal

TRIMBLE: THE CONSTRUCTION TECHNOLOGY STANDARD

Trimble provides the tools and support to let you integrate planning, design, site positioning, machine control and asset management information throughout the construction life cycle for more efficient operations and higher profits. Visit your SITECH® technology dealer today to learn how easy it is to utilize technology that makes significant improvements in project workflow, dramatically increases your production, improves your accuracy and lowers your operating costs.

YOUR TRIMBLE HEAVY CIVIL CONSTRUCTION PROVIDER

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