



BUILDING SAFETY INTO PAVING EQUIPMENT

ROADS MUST BE BUILT. WORLDS MUST BE CONNECTED.

About Me

- Sakai America Inc. – November 2020
 - Regional Sales Manger Southeastern US
- Live in Cartersville GA (45 minutes outside Atlanta)
- Hobbies –
 - Golf – Lacrosse – Football - Food

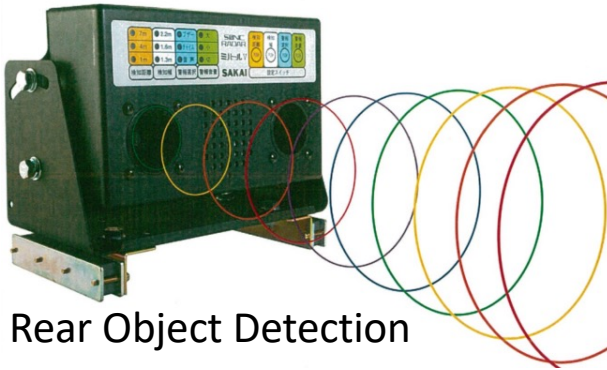
Contact info:

Nick.Zessack@sakaiamerica.com

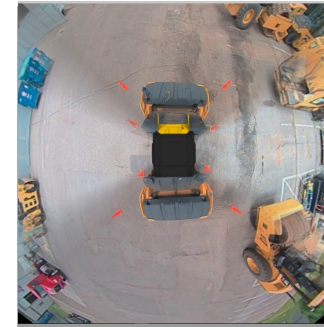


- Building Safety into Paving Equipment = Building Paving into Safety Equipment
- Adapting technology to the paving jobsite for better adoption.
- Never forget that safety is everyone's responsibility.
- Equipment safety is an enhancement, but not a replacement for the safety protocols already in place.





Rear Object Detection

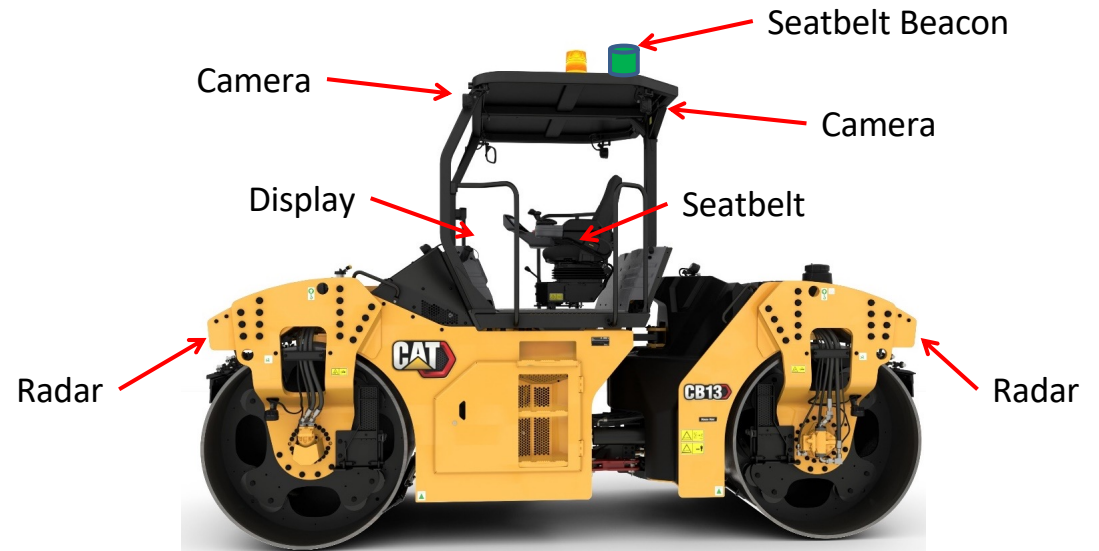


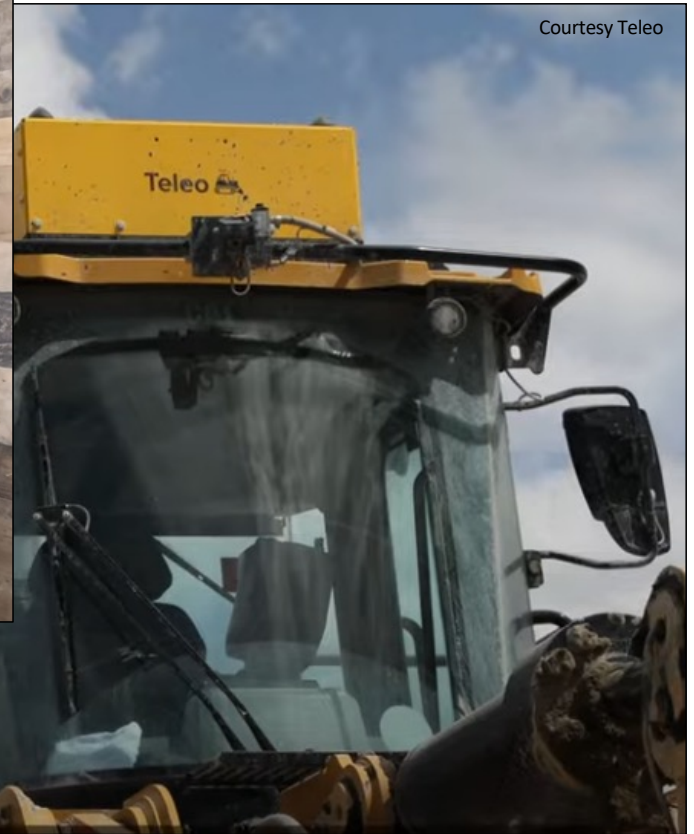
Courtesy Caterpillar

Backup Camera
w/Integrated
Rear Proximity
Detection



Backup Camera





Courtesy Teleo

Autonomous Plant Operation
Currently in use at Ajax in Florida

Courtesy SSI



Source:
<https://www.smoothroad.com/company/news/how-inertial-profiling-systems-work-to-measure-and-specify-pavement-smoothness/>



Spotlight on Pavement Density



Use of Dielectric Profiling Systems for Asphalt Density

FHWA-HIF-21-107

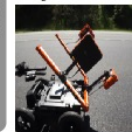
Background

Highway agencies seeking a more viable way to check the quality of asphalt construction than through sample cores are considering dielectric profiling systems (DPS) as a solution.

DPS use a ground-penetrating radar (GPR) to collect dielectric values from the underlying surface that help measure air voids or nonuniformity of newly laid hot-mix asphalt. In this way, a DPS unit rolled along a road segment can collect continuous data on asphalt density. Asphalt density is a key indicator for long-term performance of new pavement or resurfacing construction jobs. Improving pavement performance can extend maintenance cycles and save millions of dollars in transportation budgets.

State Departments of Transportation (DOTs) have been field-testing DPS units in their pavement testing programs as a result of the second Strategic Highway Research Program (SHRP2) Initiative (R06C), which advanced the DPS technology as a nondestructive method for checking asphalt density. Says Stephen Cooper, Pavement Engineer in the Federal Highway Administration (FHWA) Resource Center: "Several DOTs expressed a strong interest in this technology after completing SHRP2 R06C. FHWA and the Mobile Asphalt Technology Center are working with DOTs to serve as a bridge between research and implementation."

Some DOTs—such as Alaska, Maine, Minnesota, and Ohio—observe that DPS data produces a more uniform and immediate picture of a new pavement layer than obtaining sample cores at random spots along a new section.



How DPS Work

DPS units come in various models from multiple commercial vendors, costing about \$70,000 per unit. Also known as density profiling systems, DPS often are in the form of lightweight carts that one person easily pushes along a test path. A three-channel GPR mounted near the wheels continuously collects data that transmits to the unit's computer system.

The unit determines the dielectric readings of the materials that make up the asphalt layer by measuring the velocity of reflected waves to about 2.5 inches. All material has a dielectric constant, ranging from 1 for air to 81 for water. HMA dielectric constants typically range from 3 to 6, depending on the aggregate type, asphalt content, and percentage of air voids.

The paving crew can view the data immediately on the unit's trackpad and then export the data to other software for further analysis. The dielectric constants along the test path display as statistical data, histograms, box plots with outliers identified, or heat maps of the production lot.

Considering DPS? Technical assistance is available from the FHWA through the MATC or FHWA division offices.

Benefits

- Ability to detect and identify areas of concern. The contractor can adjust or remediate while the work zone is intact.
- More uniform results than with sample cores, which may miss variations in the new mat.
- Increased efficiency through quick non-destructive testing of the entire pavement surface while potentially reducing cores per project. Reducing cores avoids risks of new defects from removal and backfilling of cores. It also can save on contract costs.
- Data applies to other uses, such as simulating changes to construction specifications, mapping locations and data, and other quick visualizations.

For more information on DPS and related technology, contact Monica Jurado Pavements & Materials Engineer FHWA Resource Center

This equipment and more are available on loan at the MATC. www.fhwa.dot.gov/pavement/asphalt/trailer/testing.cfm

The dielectric profiling system series shares information on pavement testing programs.

To access the full series, visit www.fhwa.dot.gov/pavement/asphalt/trailer/initiatives.cfm

Source:
<https://www.fhwa.dot.gov/pavement/pubs/hif21027.pdf>

- Autonomous Rollers
 - Fully Autonomous
 - Remote Control
 - Programmable

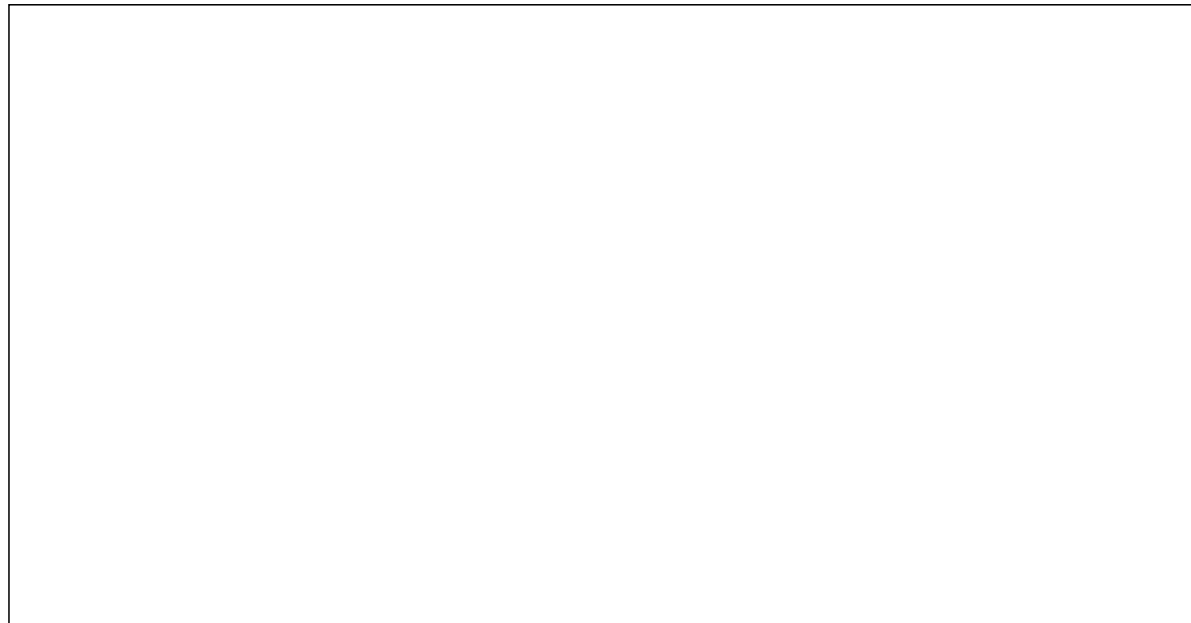


Guardman

Auto Brake Assist System “ABAS”

- ✓ **Roller with Safety and Workability**
- ✓ **Sustainable business**
- ✓ **Protect workers life**
- ✓ **Increase safety standard**
- ✓ **Achieve higher CSR**
- ✓ **Save Expense & Time**

SAKAI
MASTERS OF COMPACTION

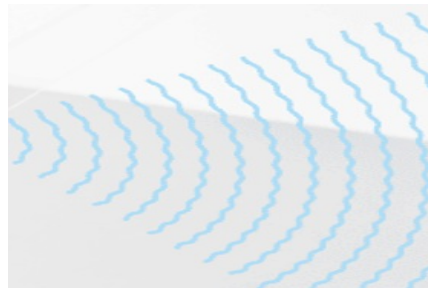


SAKAI Auto Brake Assist System “Guardman” (DEMO)
<https://youtu.be/1PpHmIViwyl?si=r-kjk7XOjH8awuyi>

79GHz Millimeter Radar



354/504 Series
(2.5t, 47" / 4t, 51")



SW884/994
(15t, 79"/84")

Control Screen
(W:5"xH:4.5")



3D LiDAR



R2H-4 (15t, 83")



GW754 (10t, 77")

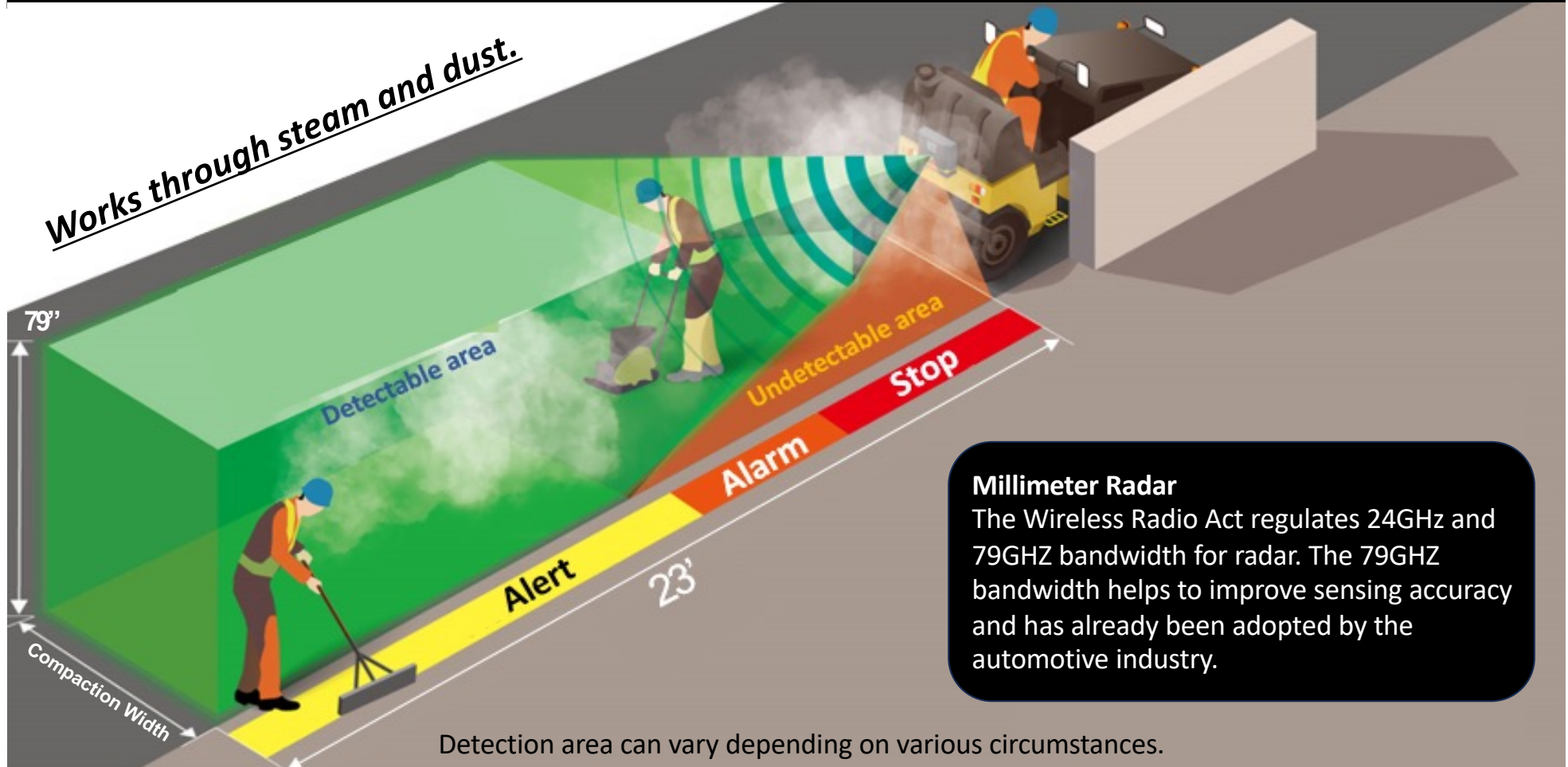


Control Screen
w/ Rear Cam
(W:9"xH:6.4")



*Specifications are subject to change.

Works through steam and dust.



Millimeter Radar

The Wireless Radio Act regulates 24GHz and 79GHZ bandwidth for radar. The 79GHZ bandwidth helps to improve sensing accuracy and has already been adopted by the automotive industry.

Detection area can vary depending on various circumstances.

- ✓ NOT affected by steam nor earth dust particles, but only larger objects.
- ✓ Automatically adjusts braking by speed to achieve minimum stopping distance & works day or night.
- ✓ Automatically brakes where visibility is limited.
- ✓ SW/TW354, SW/TW504 – Reverse operation only
- ✓ SW884/994 – Forward AND reverse operation
- ✓ Wall mode allows versatility in tight paving jobsites with many obstacles and walls
- ✓ Redundancy: if motor fails to brake, SAHR e-brake is applied



SW354/TW354

SW504/TW504

SW884/994/ND

**Constant Uninterrupted
Alarm Tone**



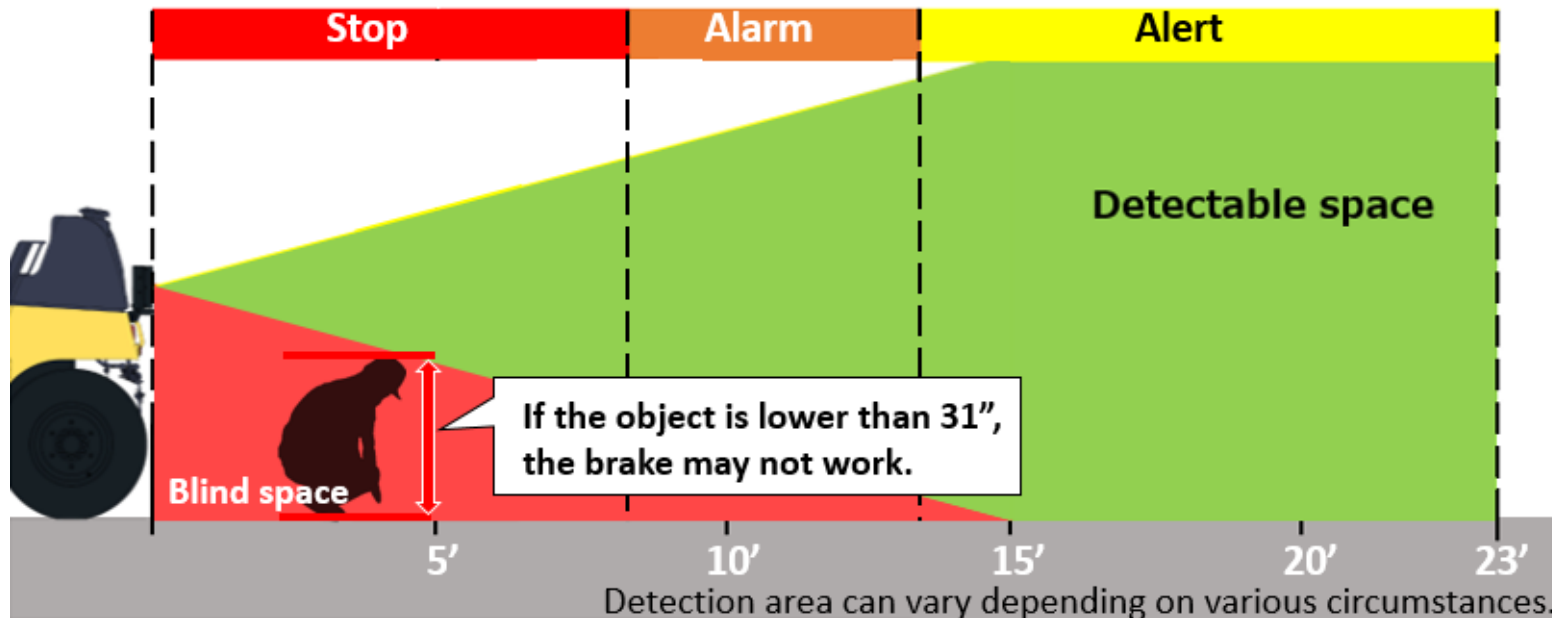
**Fast Repeating
Alarm Tone**



**Slow Repeating
Alarm Tone**



STAGES





At the left is the screen shown when Guardman has fully activated braking.

The engine is NOT cut off.

To reset and continue job, simply move FNR lever to Neutral & Push Parking Brake switch.

Not affected by steam or dust particles, but only larger objects.

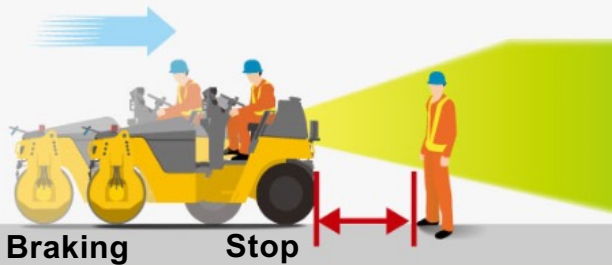
Steam &
Earth Dust



Brake timing auto adjusts based on machine speed.

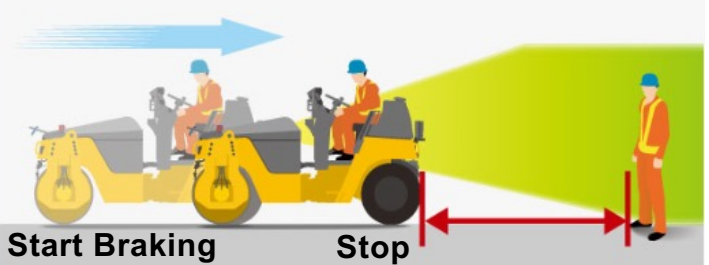
At Slow
Speed

Braking & Stop



At Faster
Speed

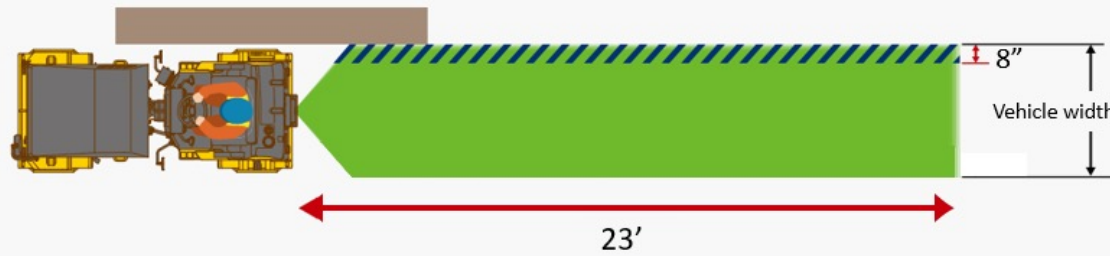
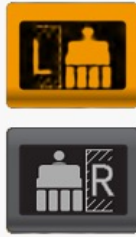
Braking engages sooner to stop



Detection area can vary depending on various circumstances.

Wall Mode

Applications:
Compaction near walls.



Low Volume Mode

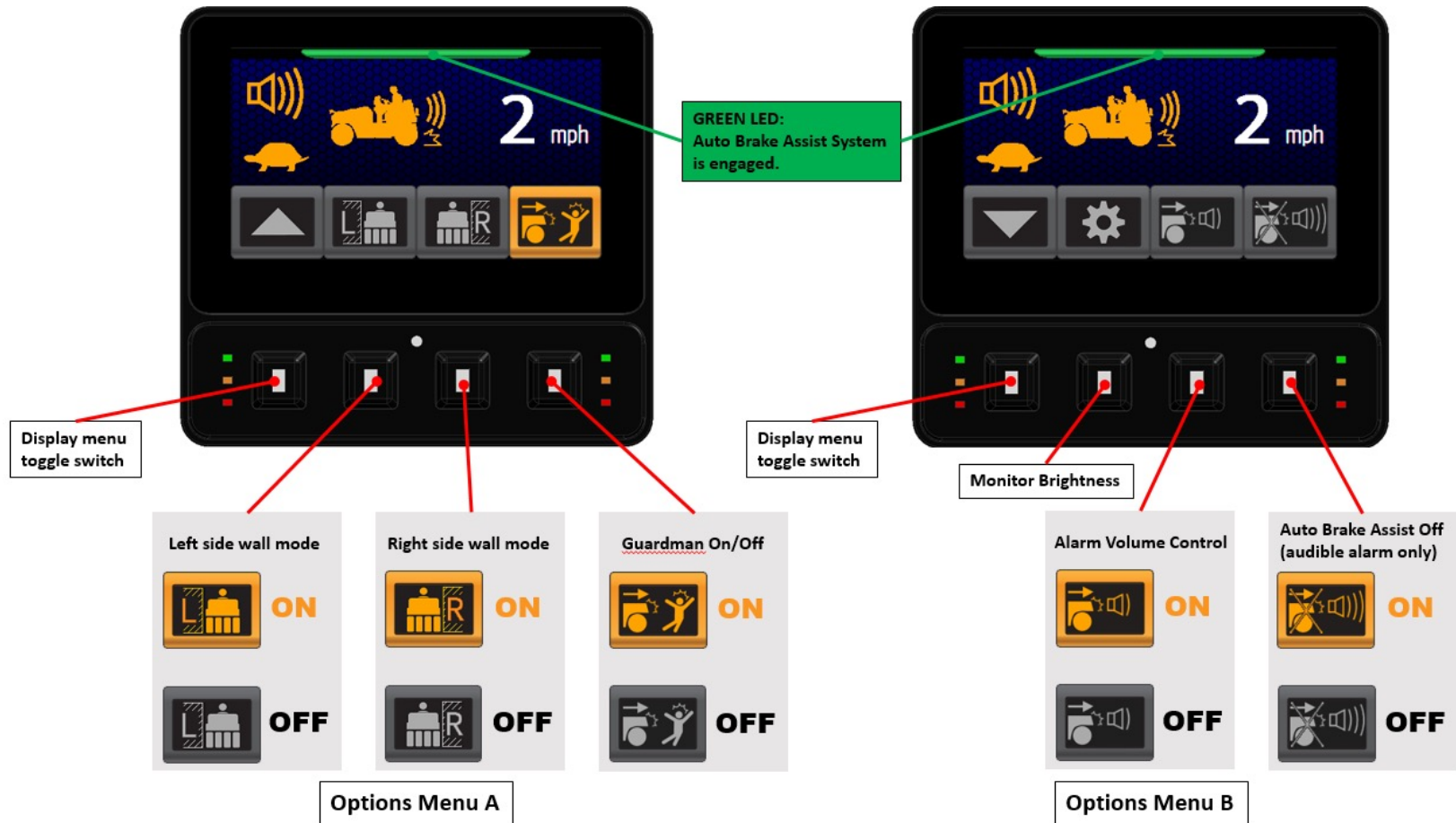
Applications:
Operation at night, in residential areas and near schools or hospitals.



ABAS Off
(audible alarm On)

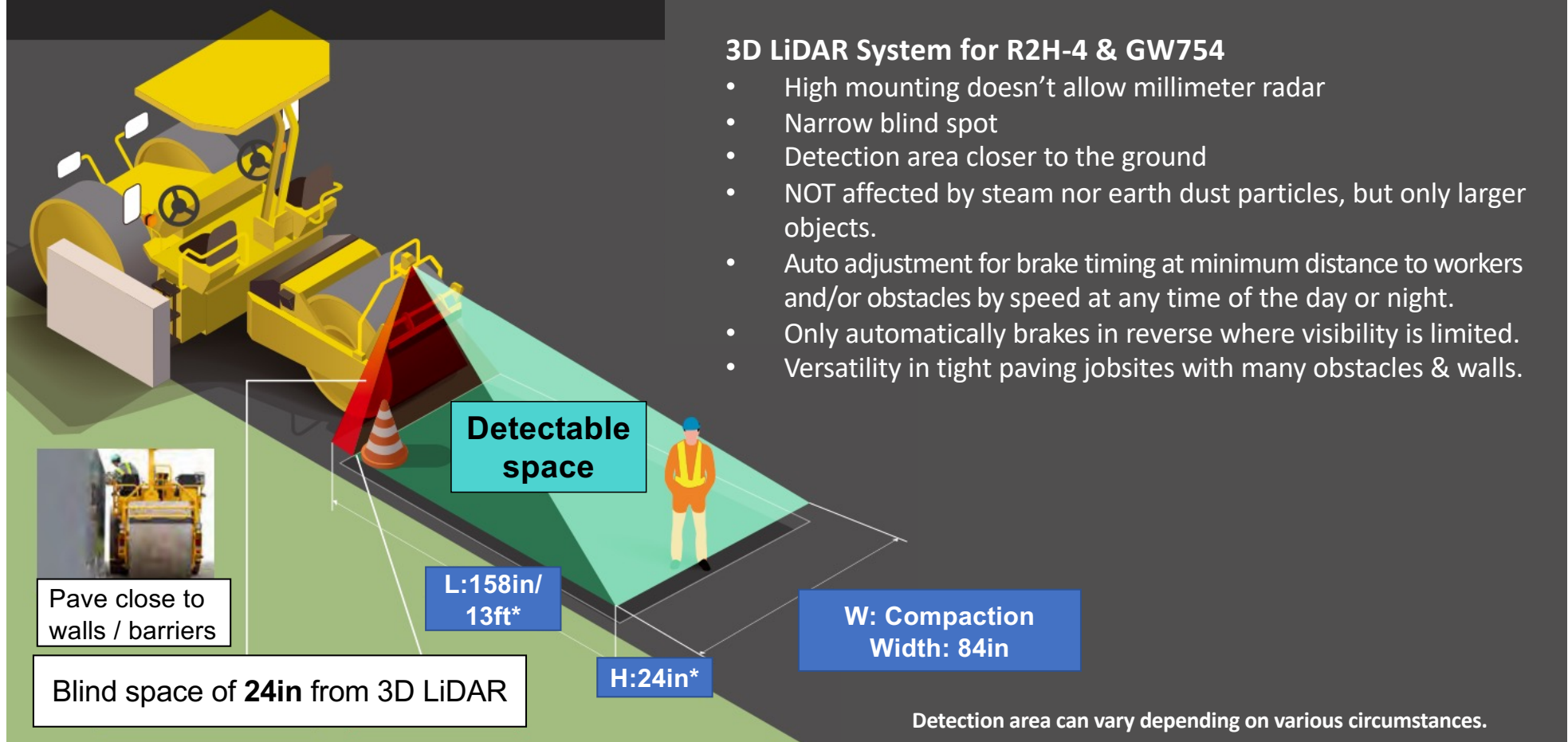
Applications:
Bridges, tunnels or tight work environments.

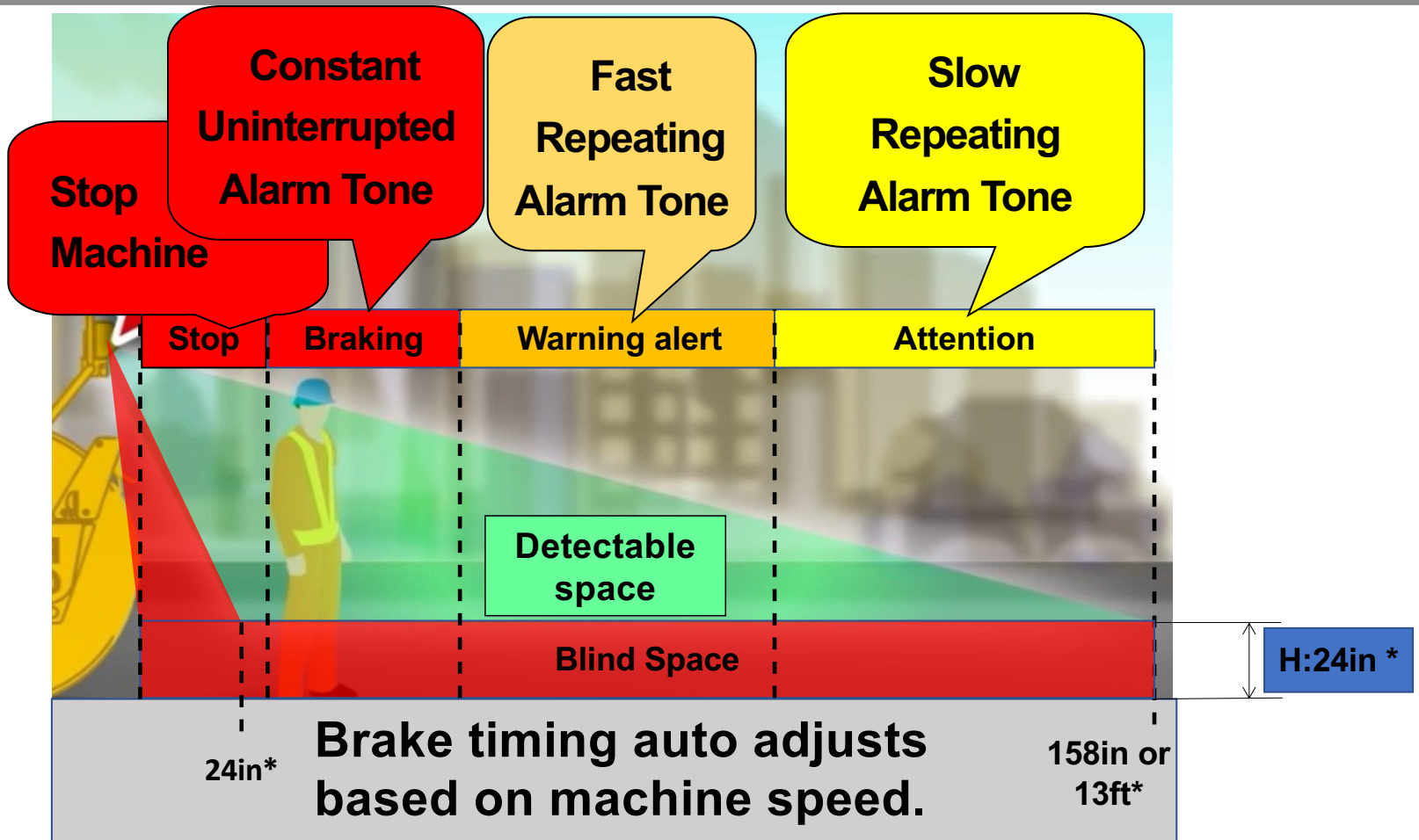




3D LiDAR System for R2H-4 & GW754

- High mounting doesn't allow millimeter radar
- Narrow blind spot
- Detection area closer to the ground
- NOT affected by steam nor earth dust particles, but only larger objects.
- Auto adjustment for brake timing at minimum distance to workers and/or obstacles by speed at any time of the day or night.
- Only automatically brakes in reverse where visibility is limited.
- Versatility in tight paving jobsites with many obstacles & walls.





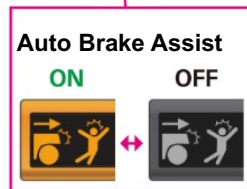
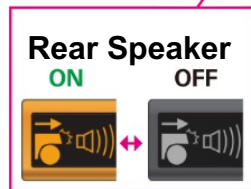
Detection area can vary depending on various circumstances.

Display Functions: Rear Monitoring View, Rear Speaker ON/OFF, and Auto Brake Assist: ON/OFF (audible alert only)

Green LED: Auto Brake Assist Sys. is engaged.



Monitor rear view (range cone) behind roller



Display when ABAS is applied.
For release, move FNR lever to Neutral & Push Parking Brake switch.

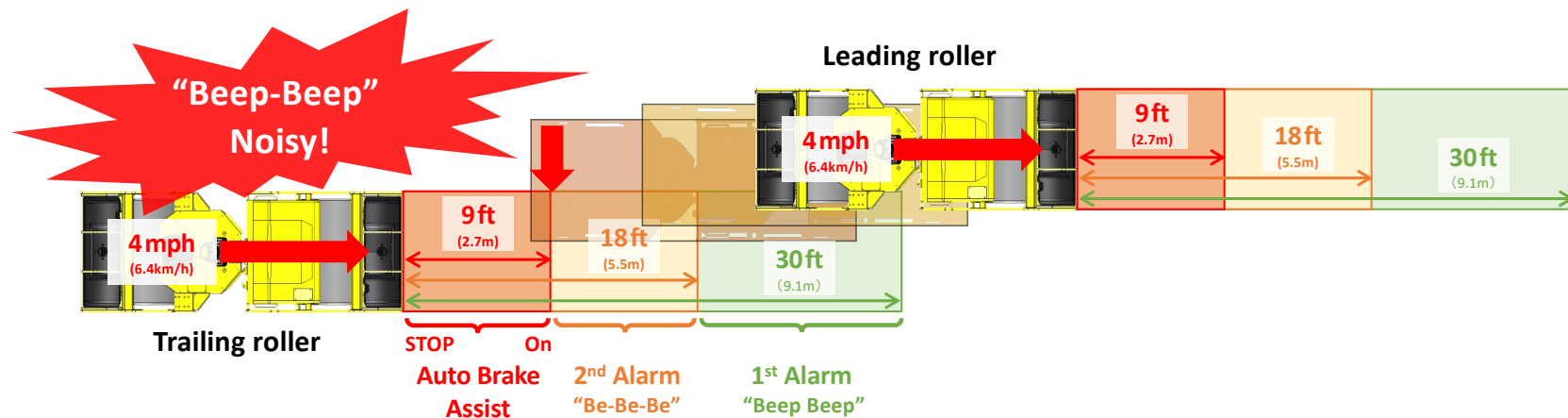
*Specifications are subject to change.

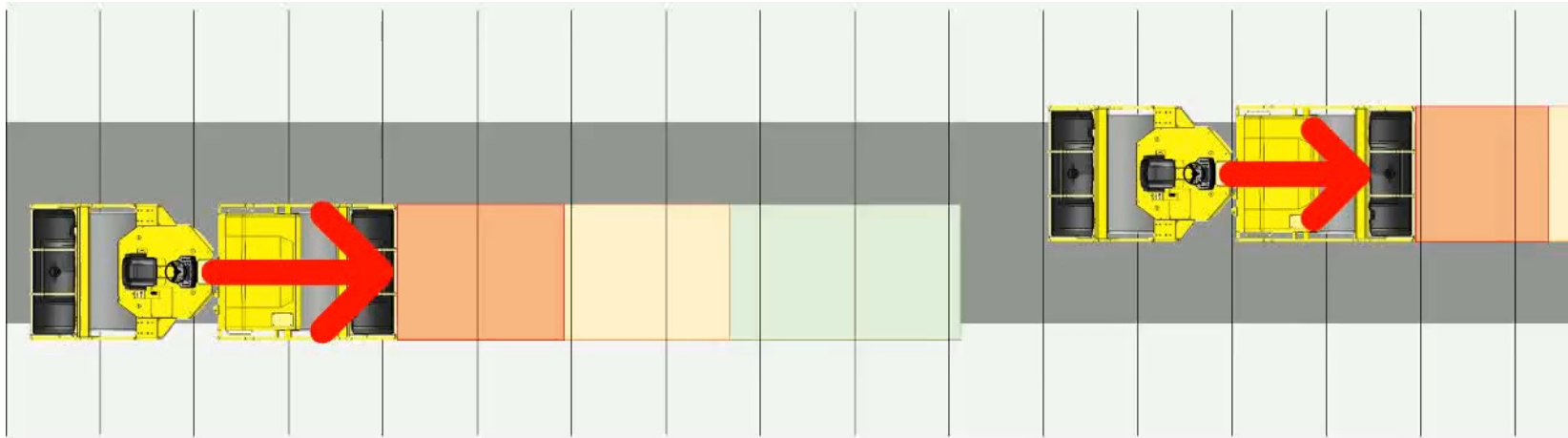


New Guardman Echelon Mode - Automatic Emergency Braking for Asphalt Rollers
<https://youtu.be/QTI1xtQuPNE?si=xHkh2b0KR40qoDtp>

- 1st Alarm “Beep-Beep” of the trailing roller at 4mph as an example.
 1. When the distance between both rollers is shorter than 30ft(9.1m), it starts.
 2. To shut off the 1st Alarm, slow down and keep the distance to 30ft or more.
- 2nd Alarm “Be-Be-Be” (more frequent and noisy) of the trailing roller:
 1. When the distance is shorter than 18ft(5.5m), it begins.
 2. To stop the 2nd Alarm, slow down the trailing roller and widen the distance to 18ft or more.
 3. But 1st Alarm still continues, if the leading roller is running within 30ft.
- If the distance becomes shorter than 9ft(2.7m), the Auto Brake Assist on the trailing roller is applied to stop.

Echelon Trial with Guardman STD Spec





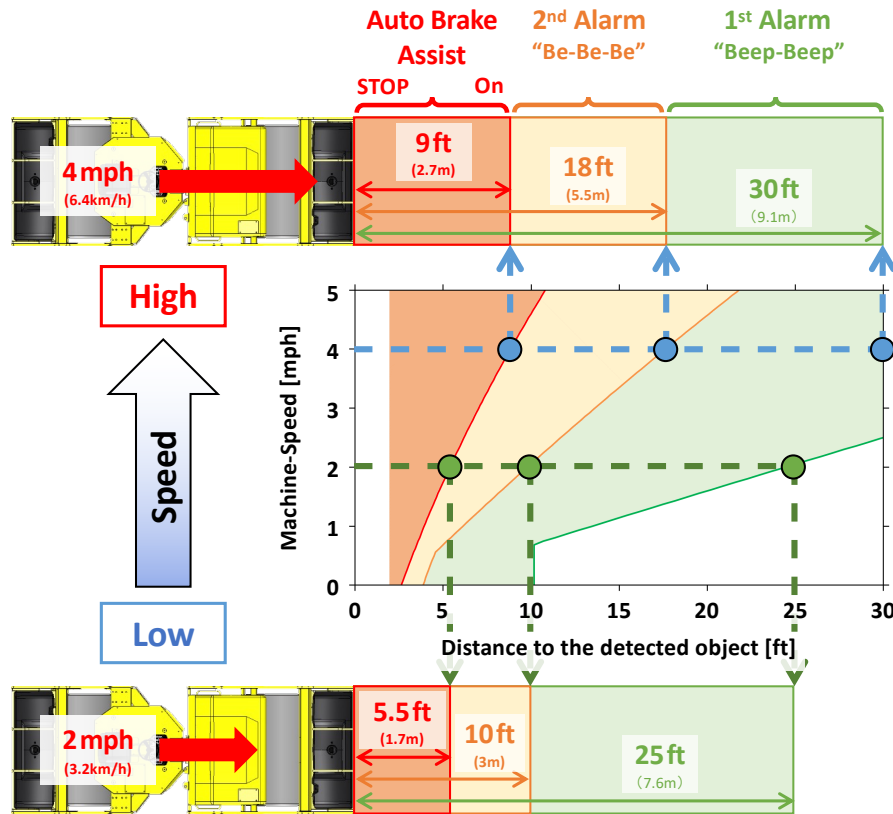
Trailing-Roller

Speed: 4.0 mph (6.4 km/h)

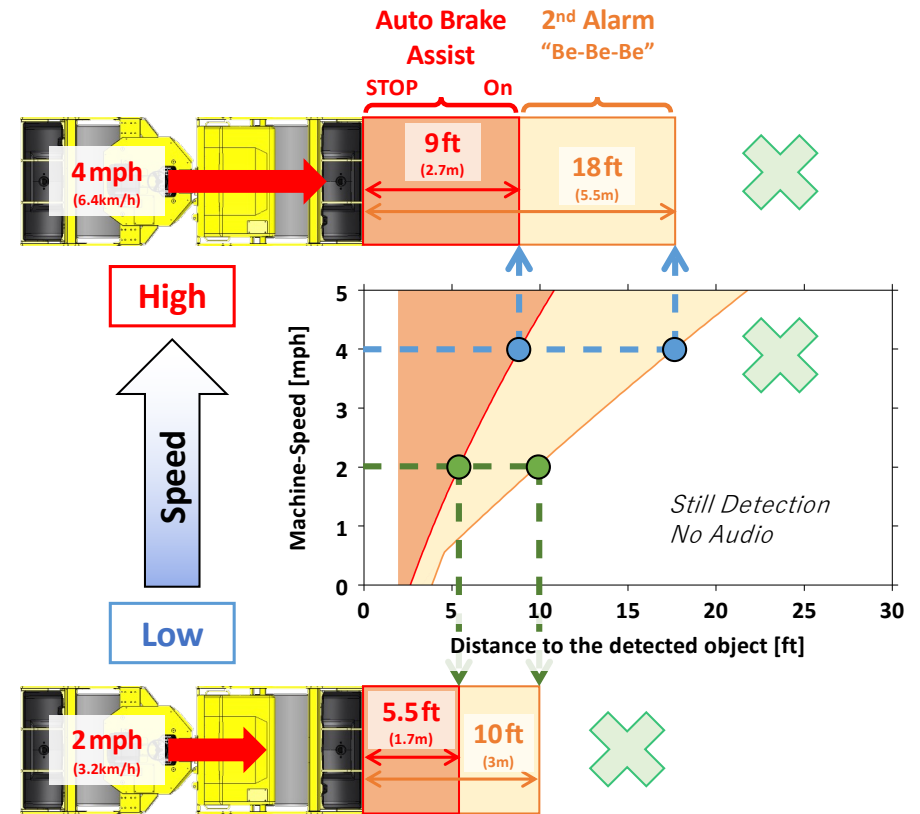
Leading-Roller

Speed: 3.0 mph (4.8 km/h)

- Step 1 turn off the 1st Alarm as set in Guardman Standard Spec.



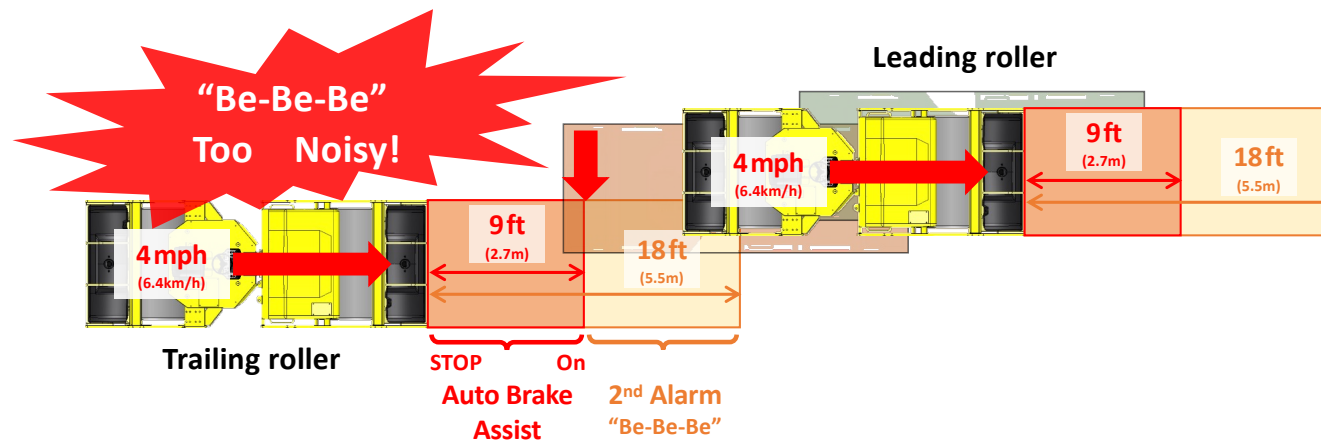
Standard Guardman Spec.

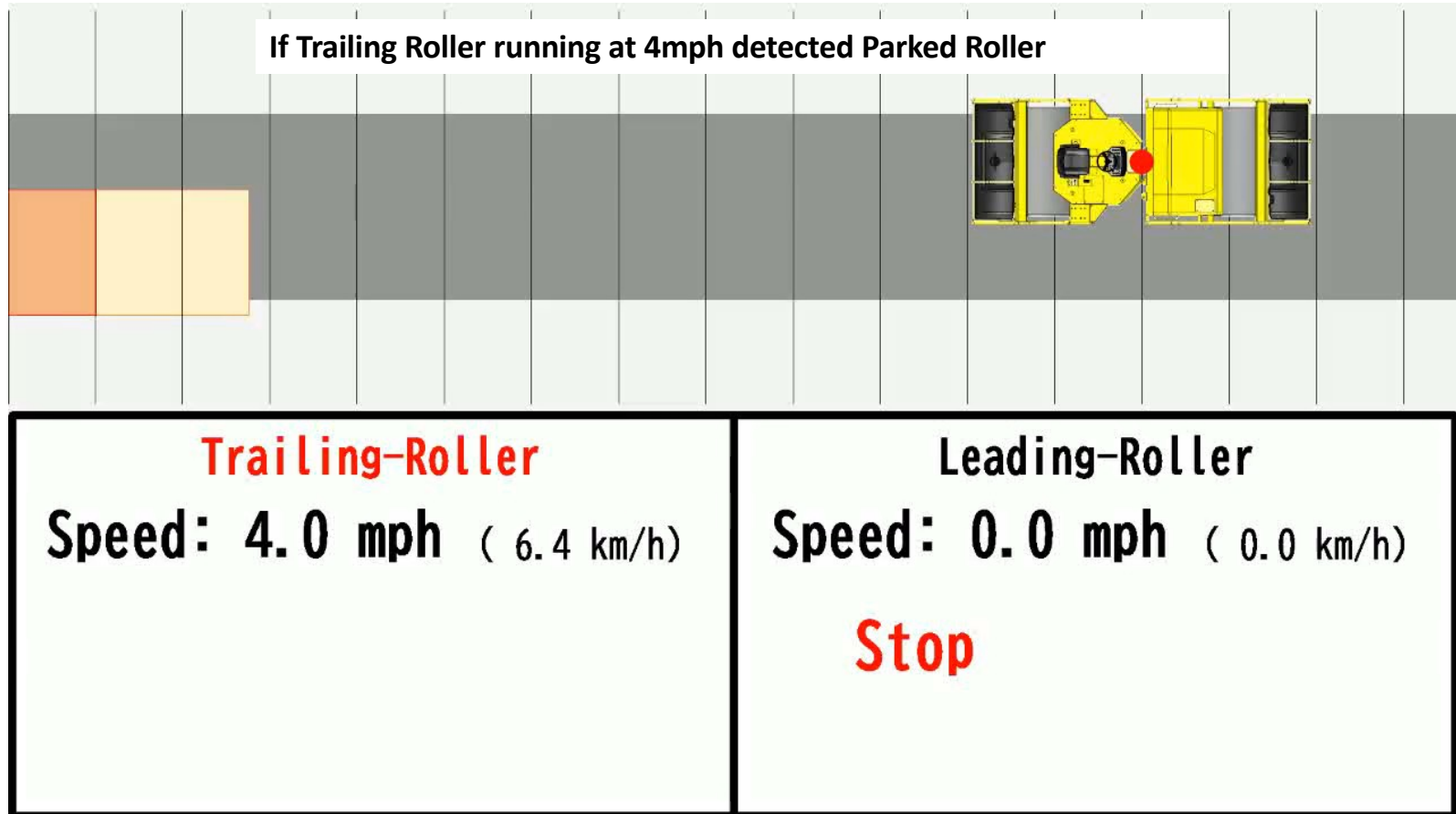


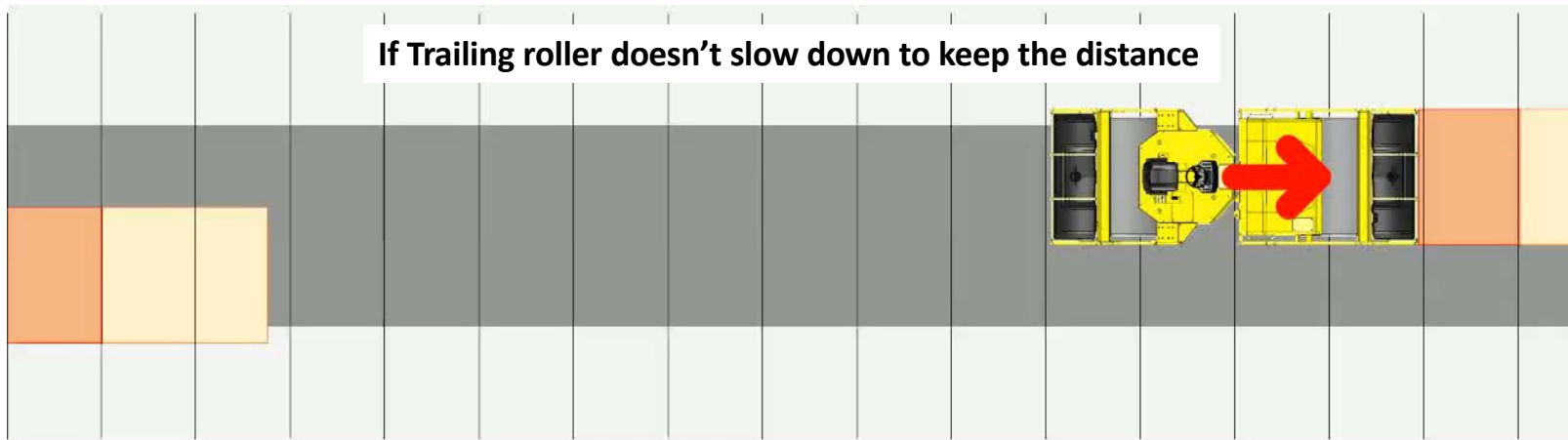
Guardman in Echelon Rolling mode

- “Echelon Rolling” mode allows the trailing roller to approach the leading one to a minimum distance of 18ft(5.5m) without being disturbed by the 1st Alarm at maximum speed.
- When the trailing roller approaches the leading one below 18ft(5.5m) and the 2nd Alarm begins, the trailing roller will slow down and widen the distance between the rollers and allow to continue working without activating the Auto Brake Assist on the trailing roller.
- If the distance becomes shorter than 9ft(2.7m), the Auto Brake Assist on the trailing roller is applied. Trailing roller will stop.
- It is strongly recommended that two rollers with Echelon Rolling mode be used in one set. This is because the same functionality as above is required for going backward.

New Echelon Rolling Mode







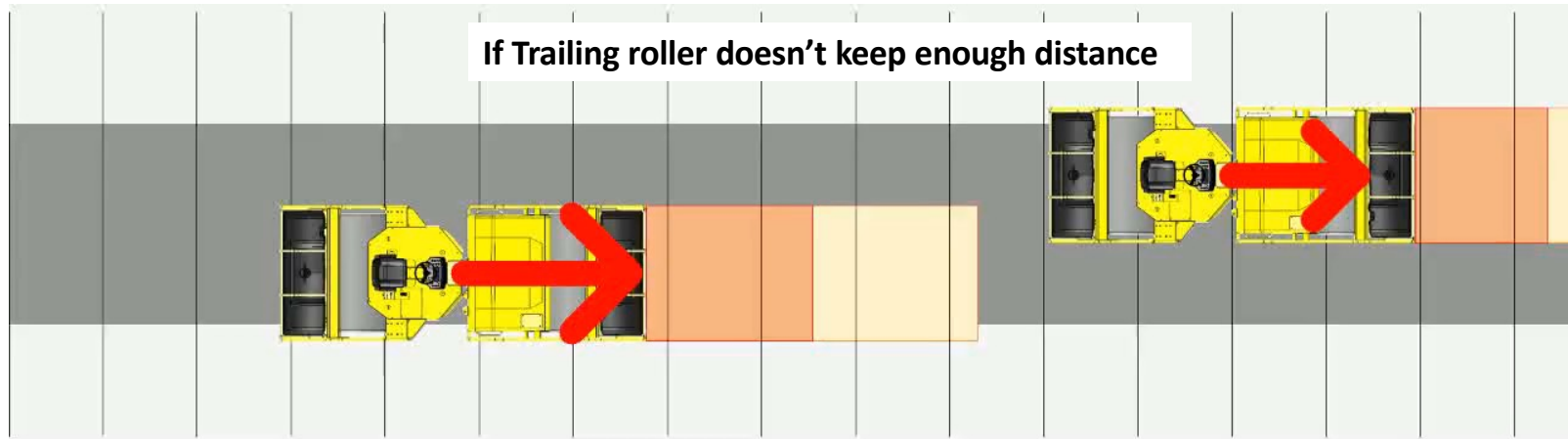
If Trailing roller doesn't slow down to keep the distance

Trailing-Roller

Speed: 4.0 mph (6.4 km/h)

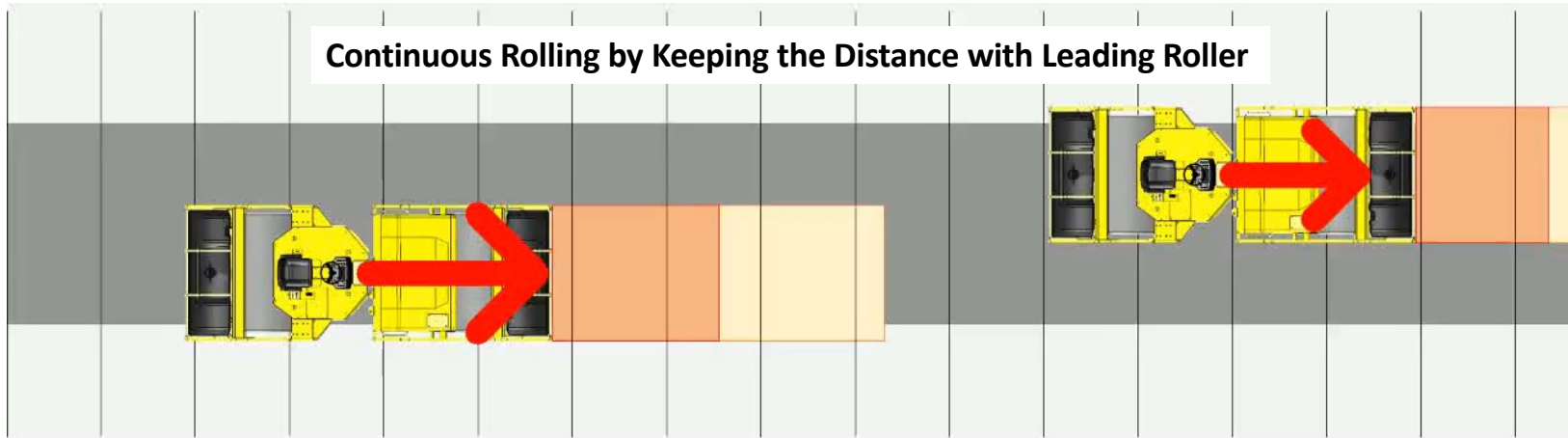
Leading-Roller

Speed: 2.0 mph (3.2 km/h)



| | |
|---|--|
| <p>Trailing-Roller Speed: 4.0 mph (6.4 km/h)</p> | <p>Leading-Roller Speed: 3.0 mph (4.8 km/h)</p> |
|---|--|

Continuous Rolling by Keeping the Distance with Leading Roller



Trailing-Roller

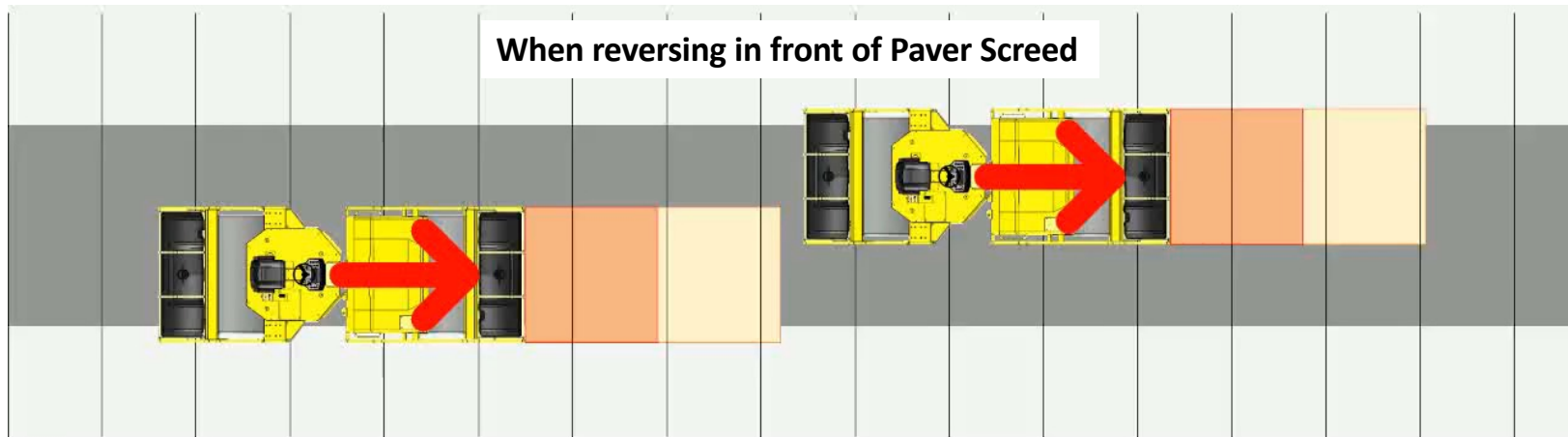
Speed: 4.0 mph (6.4 km/h)

Leading-Roller

Speed: 3.0 mph (4.8 km/h)



| | |
|--|---|
| <p>Trailing-Roller Speed: 4.0 mph (6.4 km/h)</p> | <p>Leading-Roller Speed: 4.0 mph (6.4 km/h)</p> |
|--|---|



Trailing-Roller

Speed: 3.0 mph (4.8 km/h)

Leading-Roller

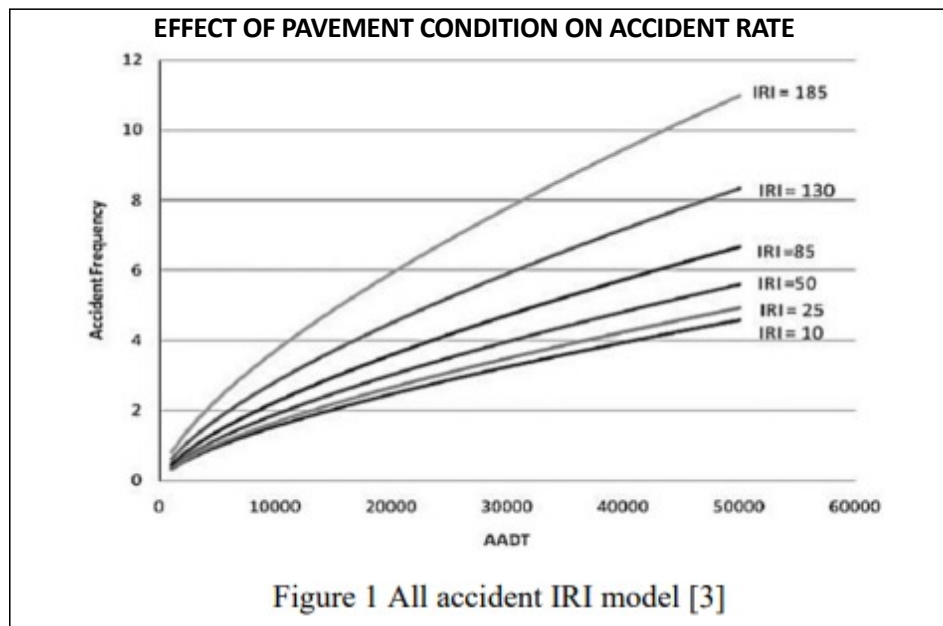
Speed: 3.0 mph (4.8 km/h)


Display Operation STD vs ECH Mode

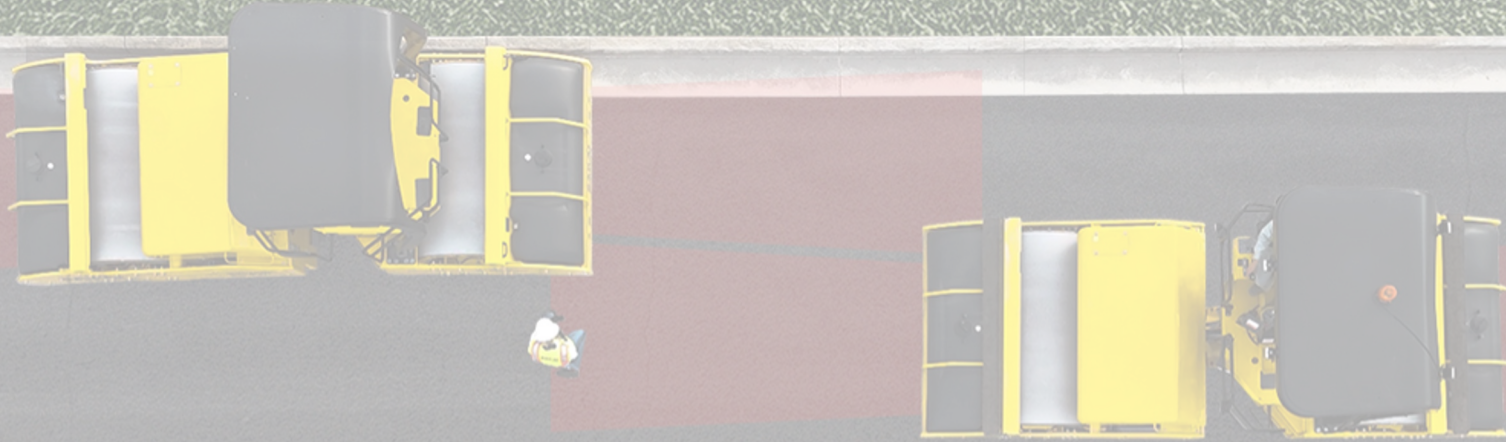


* Video is for illustration purposes.

Building safely = Building better roads = Building safer roads




UNIVERSITY OF MARYLAND
National Transportation Center
 Project ID: NTC2016-SU-R-2
EFFECT OF PAVEMENT CONDITION ON ACCIDENT RATE
Final Report
 by
Mounica Vinayakamurthy
Michael Mamlouk, Ph.D., P.E.
Shane Underwood, Ph.D.
Kamil Kaloush, Ph.D., P.E.
Arizona State University
 for
 National Transportation Center at Maryland (NTC@Maryland)
 1124 Glenn Martin Hall
 University of Maryland
 College Park, MD 20742
June 2017



Thank you. Questions?

SakaiAmerica.com

Follow us:

