



Mat Quality

Charles Butler

Product Training Manager

Constructing Smooth Pavement

Whether new construction or rehabilitation,

- a. Good planning
- b. Communication
- c. Proper mix production
- d. Delivery
- e. Correct placement techniques

These Key Steps are necessary to ensure a smooth HMA pavement.



Understanding the Asphalt Paver

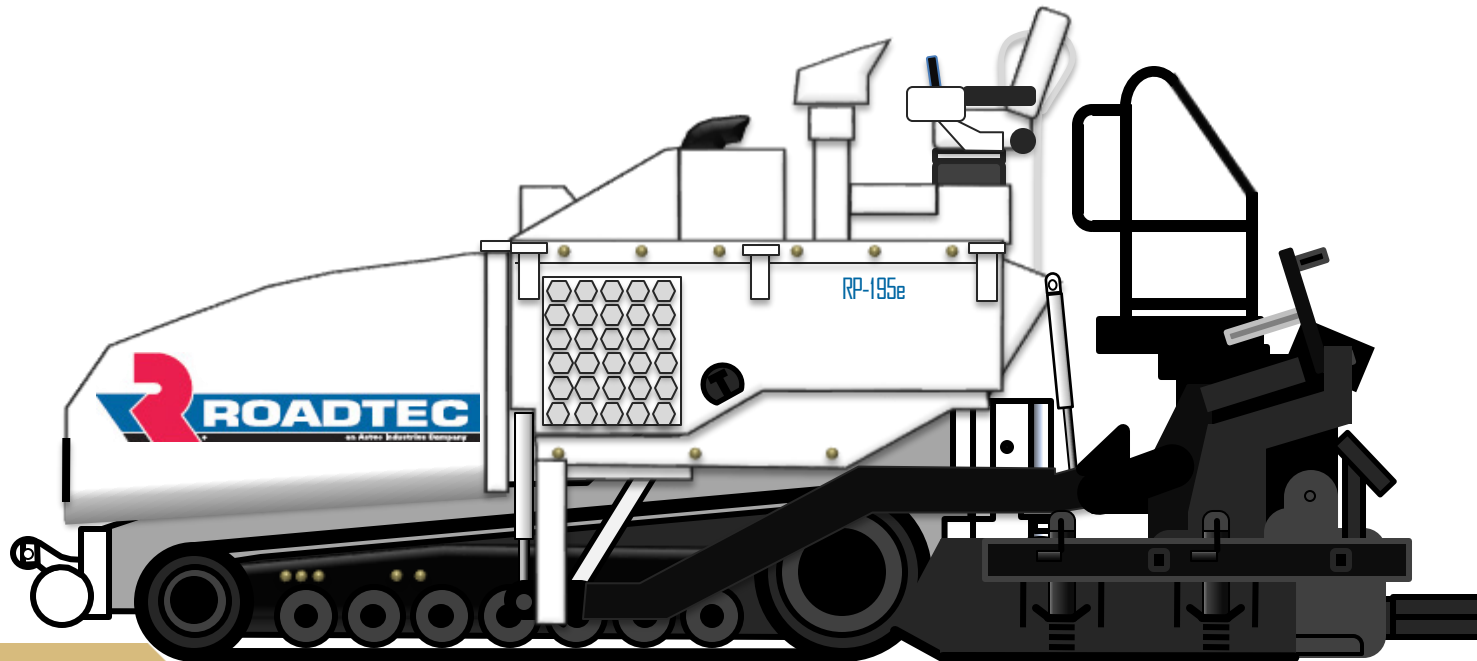
The two components are:

The Tractor

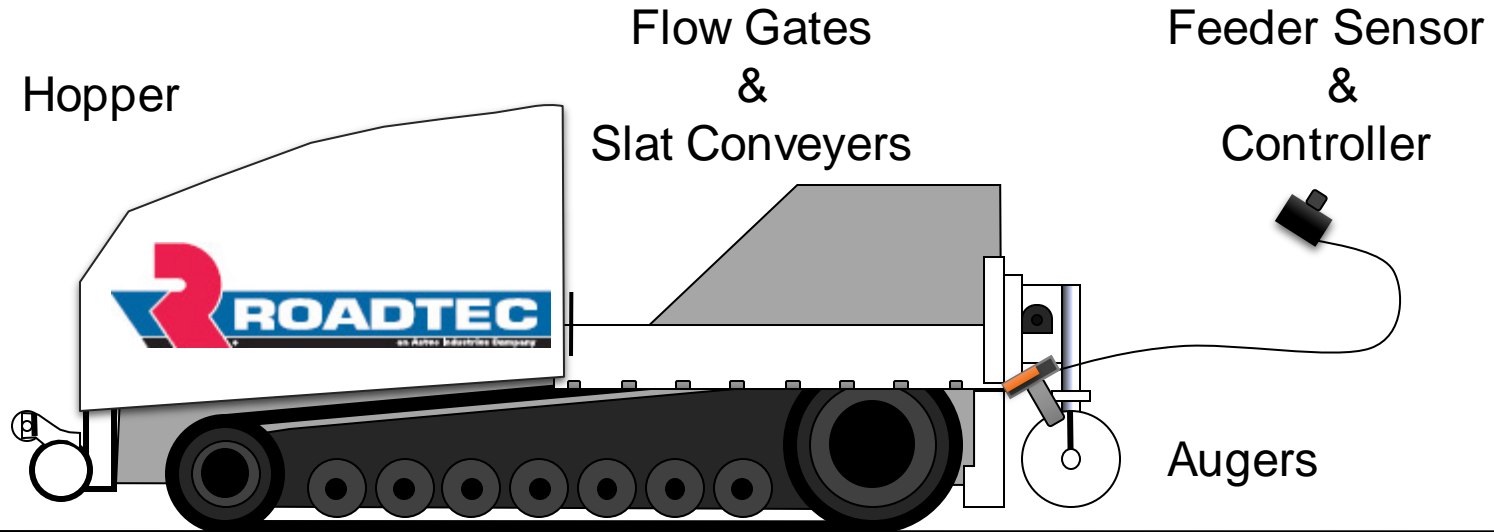
The tractor pushes trucks and tows the screed.

The Screed

The screed slopes and lays the desired depth needed per job spec.



Feed System Components



The Hopper is to receive the mix.

Slate conveyors carry it through the paver tunnel.

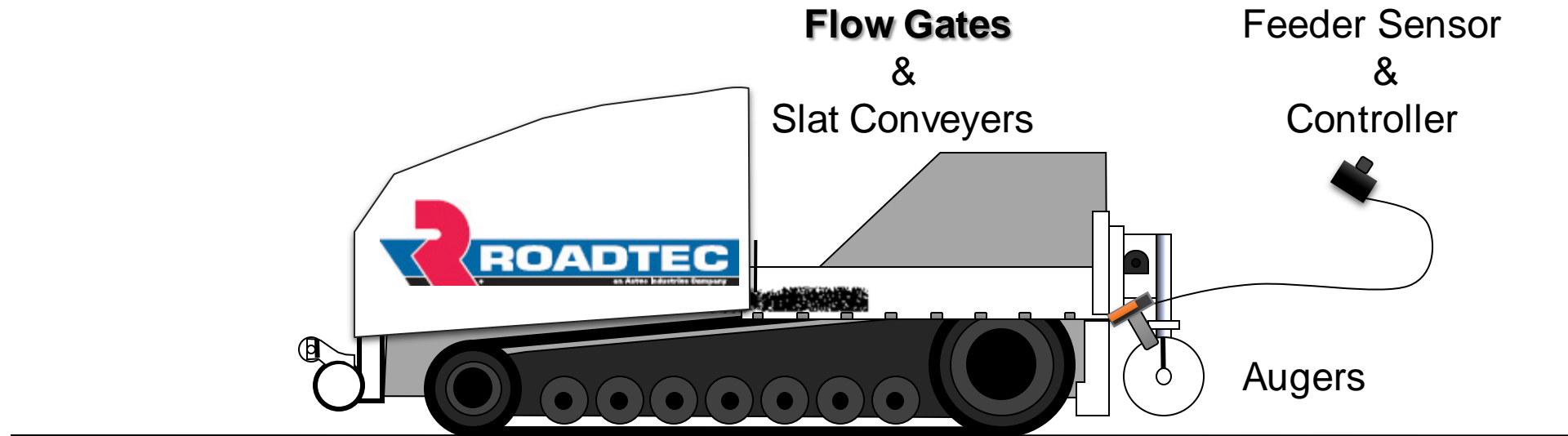
Flow gates to strike off the mix.

Augers to distribute the mix in front of the screed.

Sensors to control the material level at the outboard edge of the screed.



Feed System Components



Flow gates to strike off the mix.

Augers to distribute the mix in front of the screed.

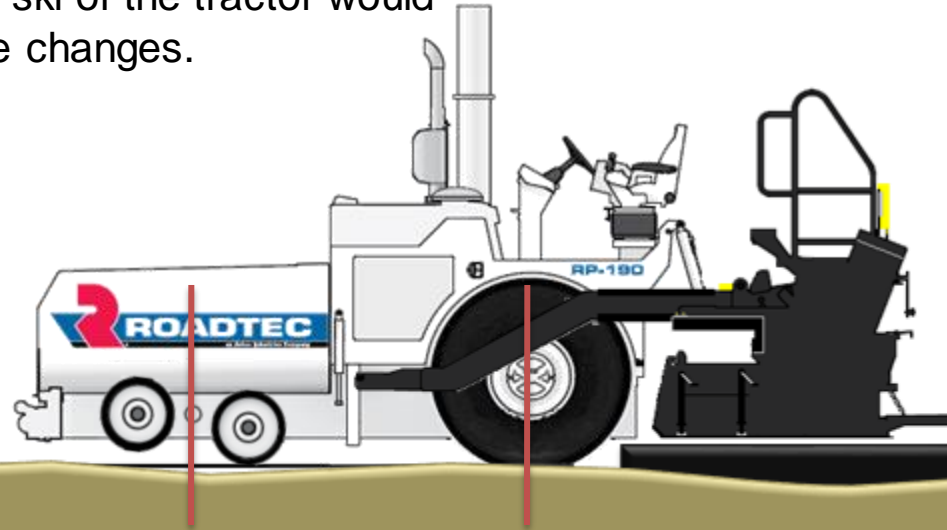


Rubber Tire

The tractor's self leveling action is the wheel base of the paver.

From the center line of the gearbox to the centerline of the shaft between the bogies is the internal ski with the paver.

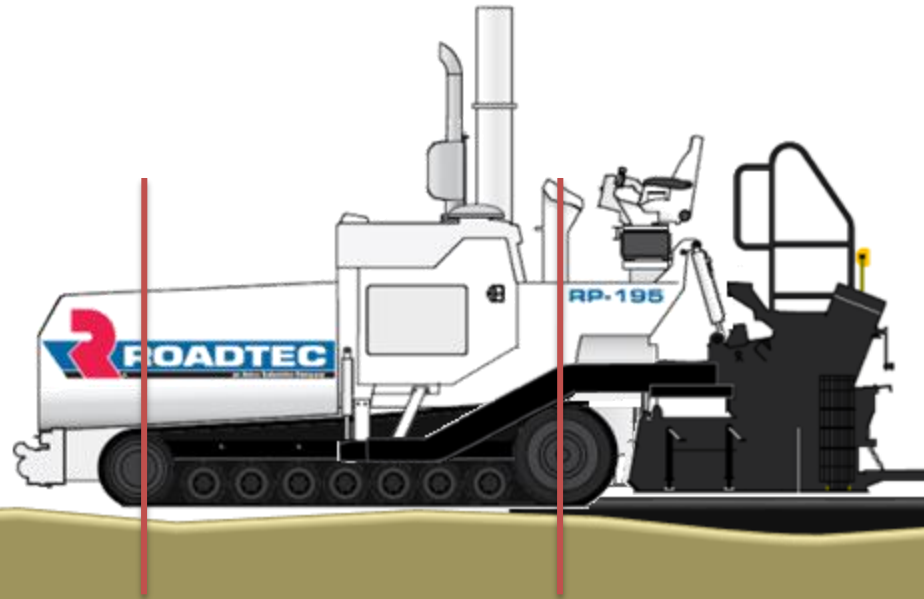
If nobody was on the screed and we paved over an uneven grade, the internal ski of the tractor would try to smooth out the grade changes.



Track Paver

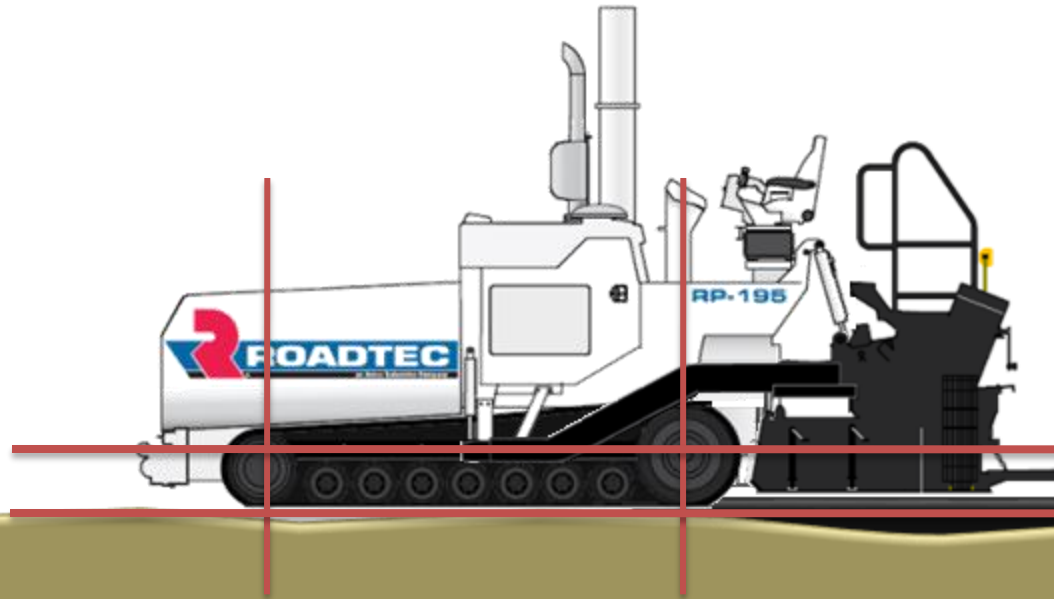
Here, the internal ski is the gear box center line to the idler wheel center line.

Traditionally, the track paver has a longer wheel base than the rubber tire paver.



Line of Pull

Although the tractor is averaging the ride, what's important is to keep a proper Line of Pull between the surface and the screed.

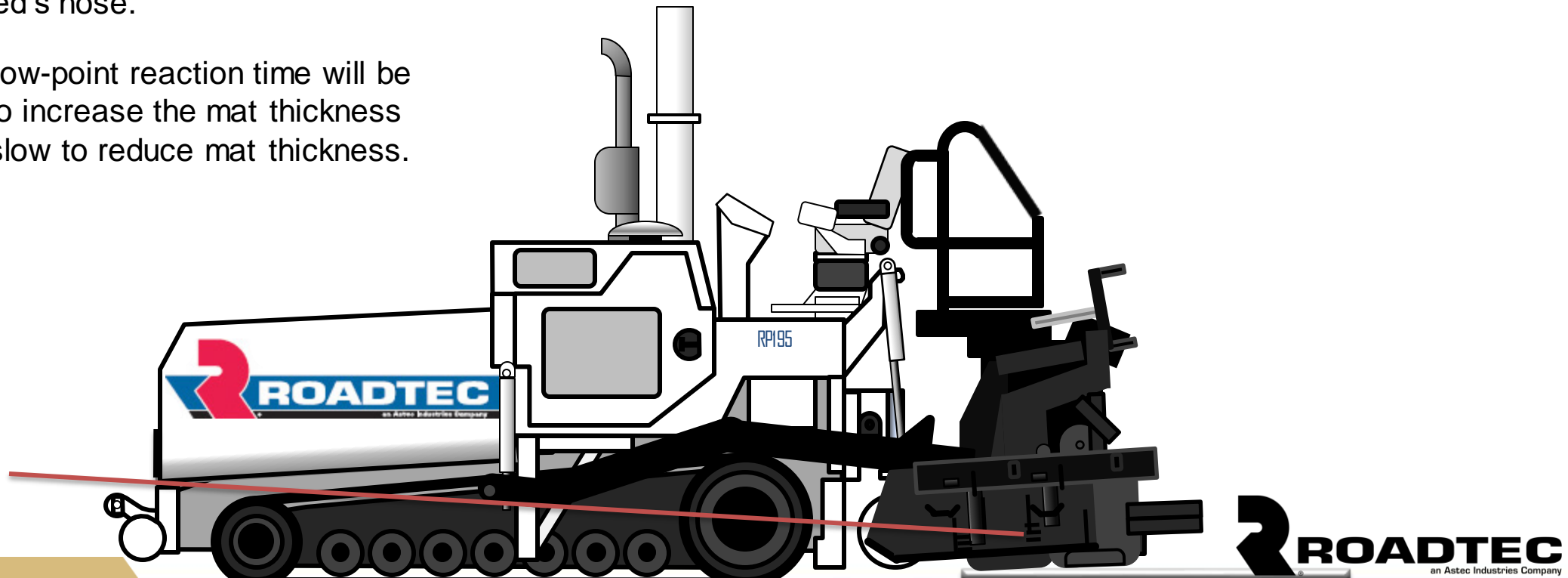


Line of Pull

With a high tow-point and a thin lift you would have a line of pull that is always pulling upward.

This upward pull would have an effect that would want to put pressure on the Screed's nose.

The tow-point reaction time will be fast to increase the mat thickness and slow to reduce mat thickness.



Line of Pull

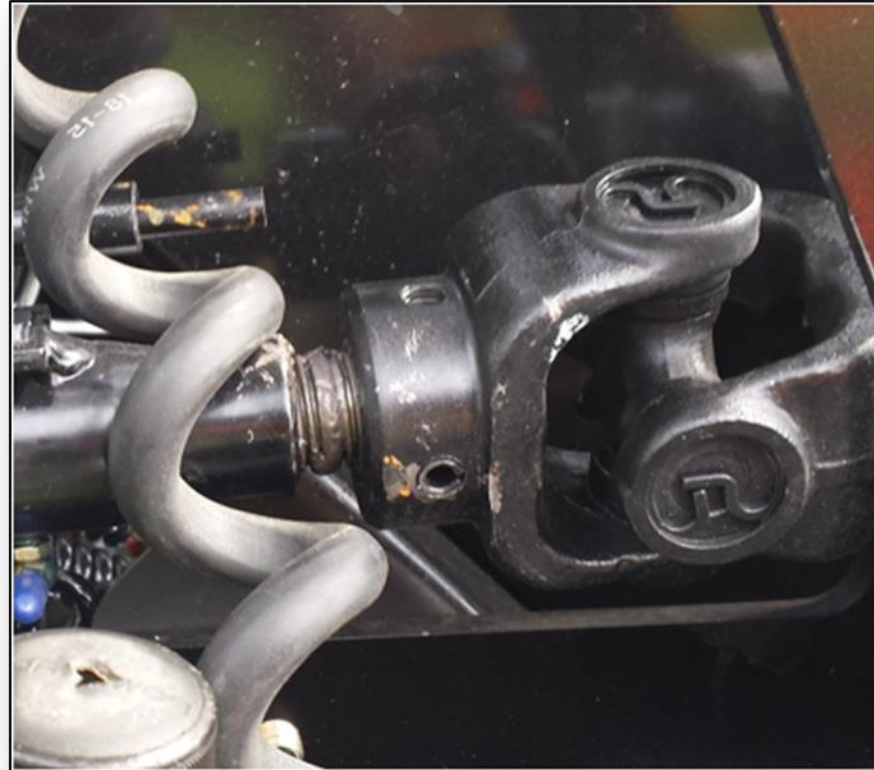
With a low tow-point and a thick lift you would have a line of pull that is always pulling downward.

This downward pull would have an effect that would want to put pressure on the screed's tail.

The tow-point reaction time will be slow to increase the mat thickness and fast to reduce mat thickness.



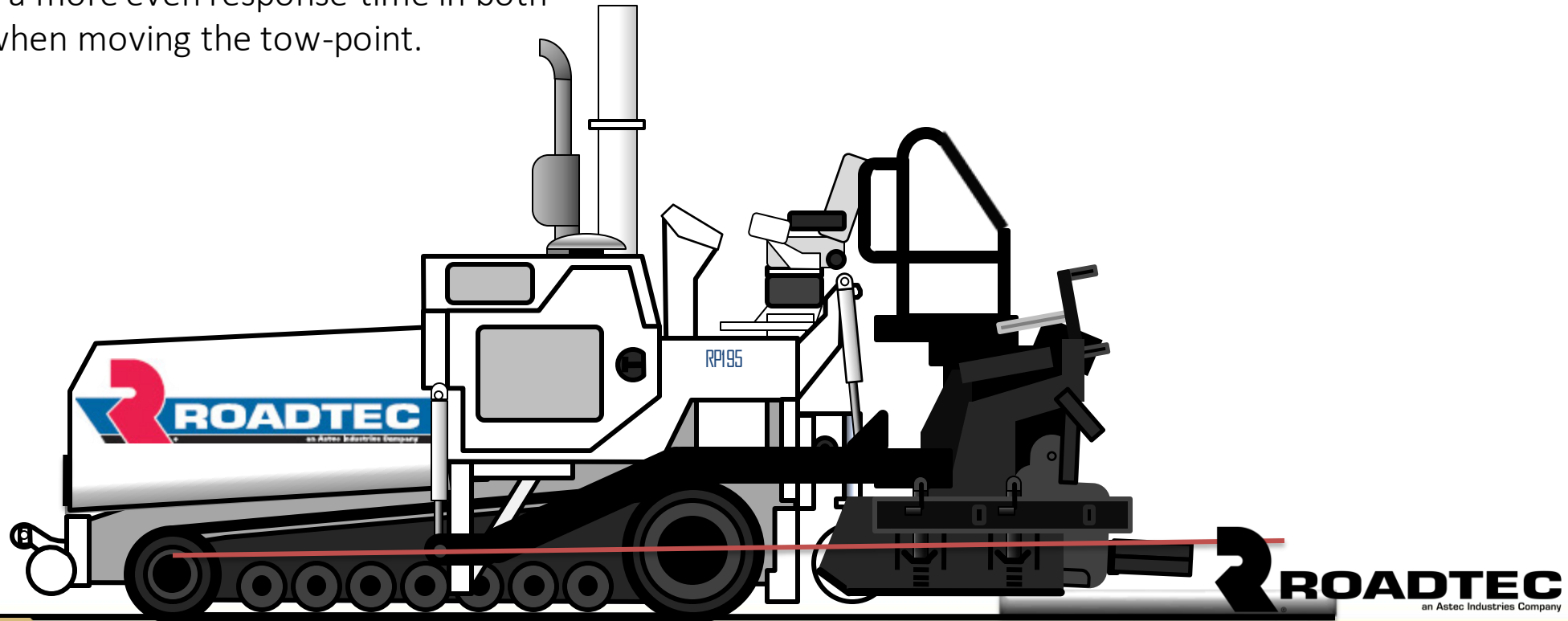
Line of Pull



Line of Pull

Place the tow-point **1 inch** higher than the loose mat thickness you are laying.

This will give you a slight angle of attack in the screed, and a more even response time in both directions when moving the tow-point.



It's All Balance

To build quality, smooth riding roads, the paving speed **MUST** be at a constant rate. **Consistency wins every time!**

Quality Paving Techniques

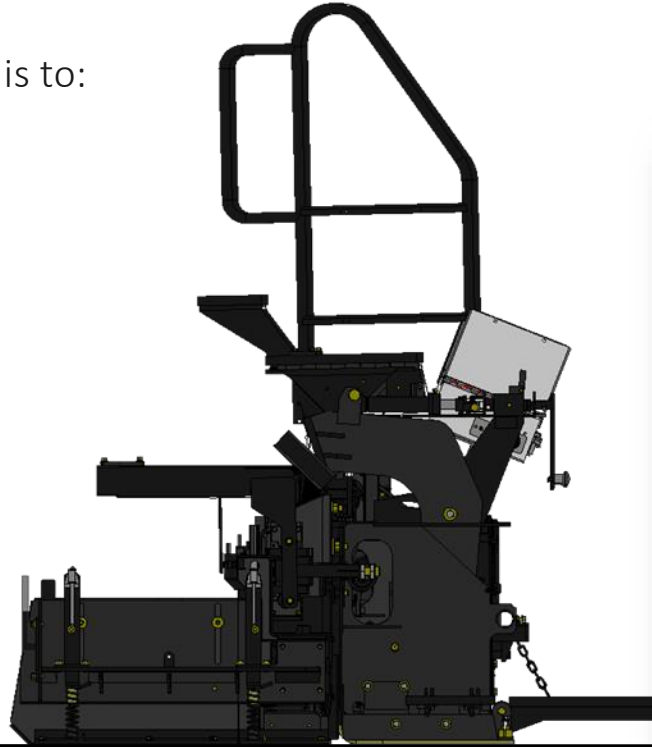
1. Uniformed “Head of Material”
2. Proper Angle of Attack
3. Constant Speed of Paver



Paving Principles

The main purpose of the screed is to:

1. Spread the paving material
2. Provide initial compaction
3. Contour the road surface



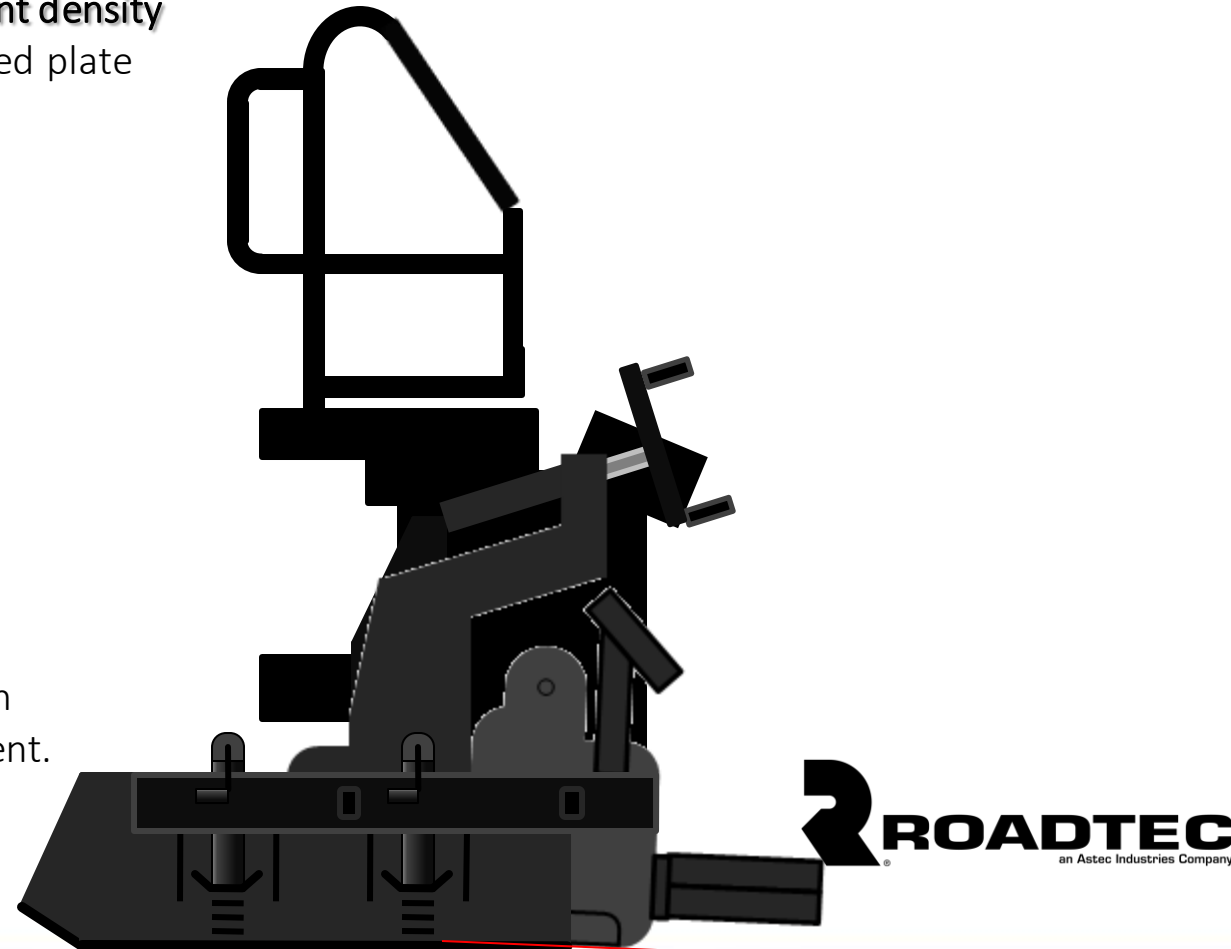
Angle of Attack

In order for a screed to produce a mat that has **consistent density and texture**, the **pressure exerted** by the rear of the screed plate must be equal along the entire plate.

A normal angle of attack is set on the rear extension to 3/16 (4.5mm).

As the angle of attack is changed on the main screed then it will effect the vertical on the rear extension.

Adjusting the angle of attack on some screeds is done on the screed plate itself and not through a single adjustment.



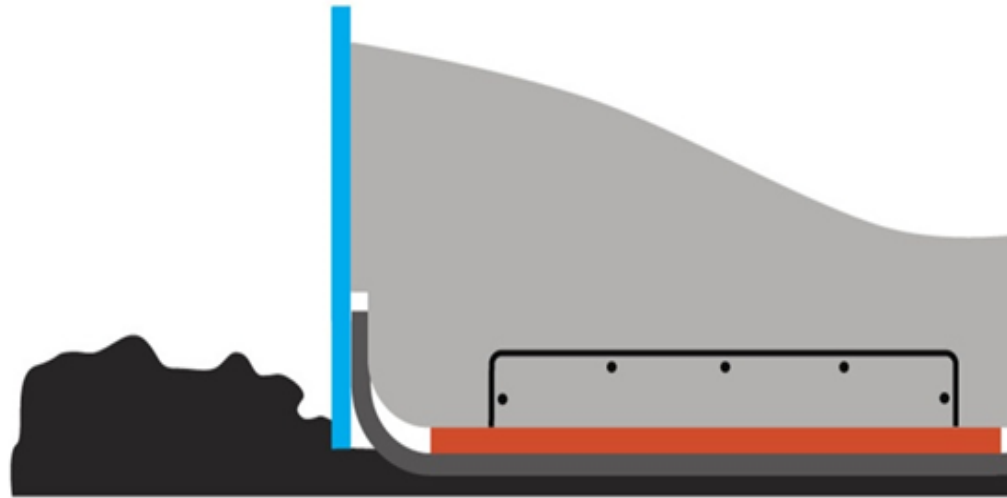
Pre Strike-off

The Main Strike Off meters the flow of material under the screed.

Its adjustment directly affects the balance angle of attack.

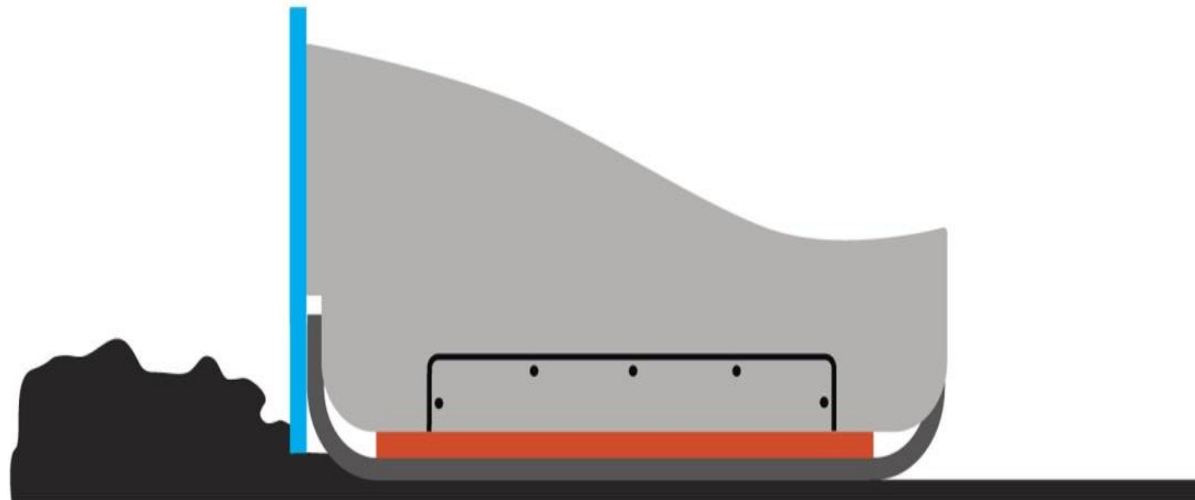
The bottom of the strike off is set $\frac{1}{2}$ in. above the screed bottom and is adjustable from the top of the screed.(12.5mm)

The screed must maintain the correct attitude for the screed plate to keep full contact with the mix.



Pre Strike-off

Due to the number of mix designs, it may be necessary to adjust the pre strike-off plates to force the screed to ride correctly over the mat being laid.



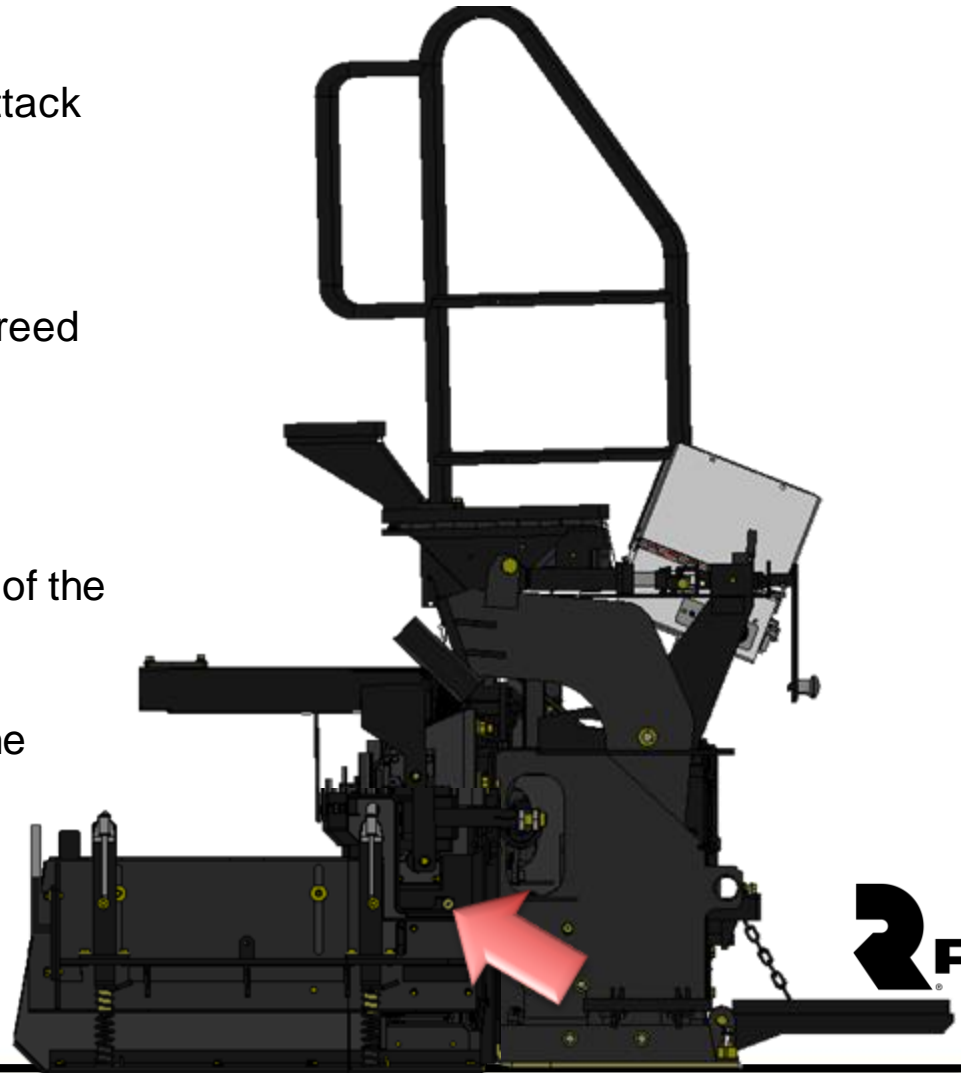
Angle of Attack

On a screed with front extensions, the angle of attack on the extensions is adjustable.

As the angle of attack is changed on the main screed you have to watch the vertical adjustment of the extension.

A level should be flat along the main, and the tail of the extension should touch the level.

You should then see a 3/16 (4.5mm) air-gap at the front of the extension.



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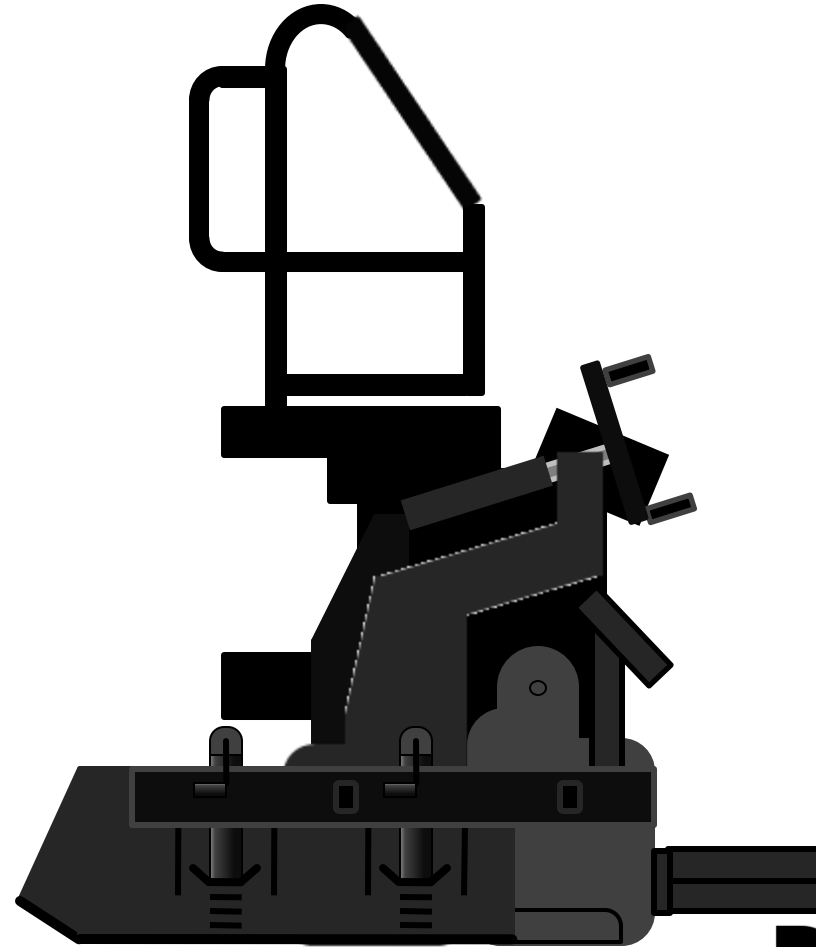
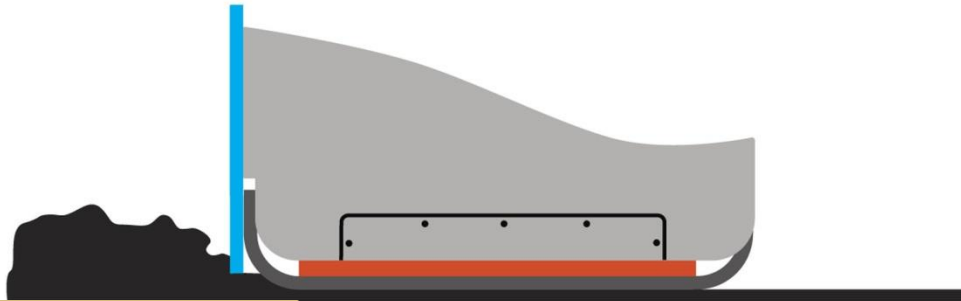
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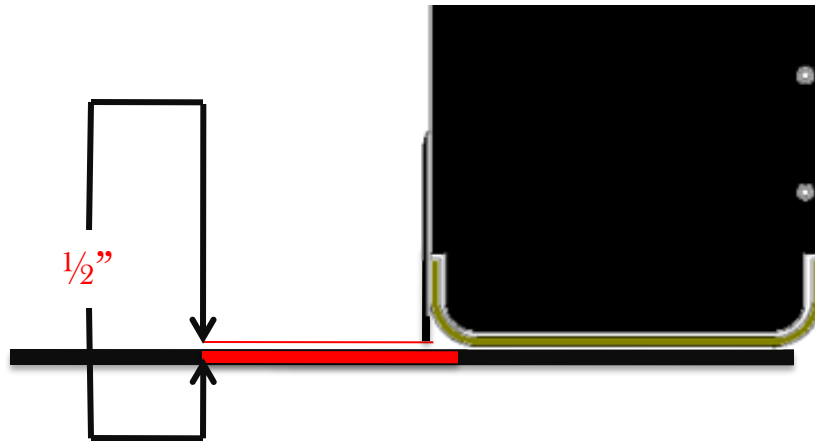


Pre Strike-off

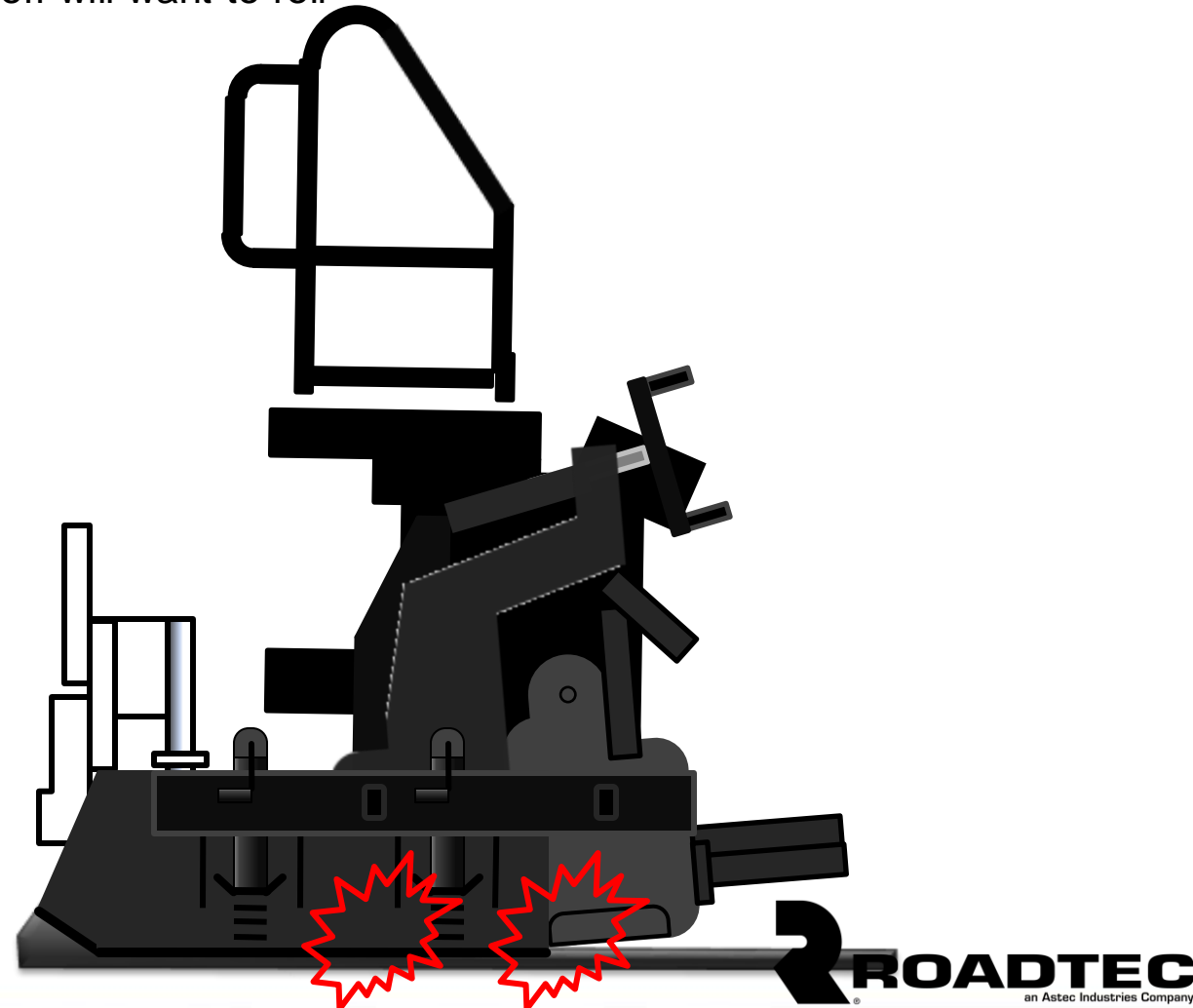
The force of the head of material against the strike-off will want to roll the screed in a particular direction.

With a Strike-off that is adjusted too low, you will have a screed that will want to ride on the nose of the screed.

You will see premature wearing of the front of the screed plate or (Bull Nose).

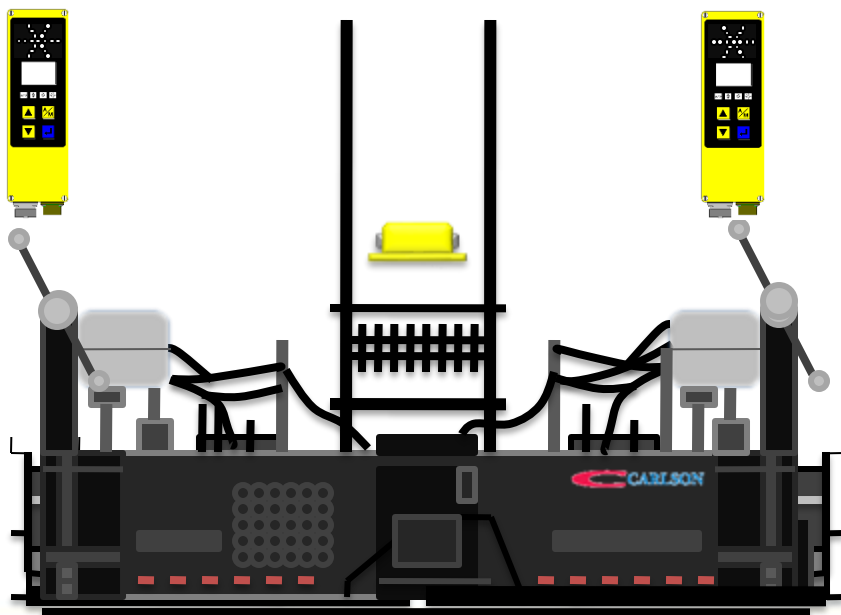


The bottom of the strike off is set 1/2" above the screed bottom and is adjustable from the top of the screed.(12.5mm)



4 Ways to Control the Screed

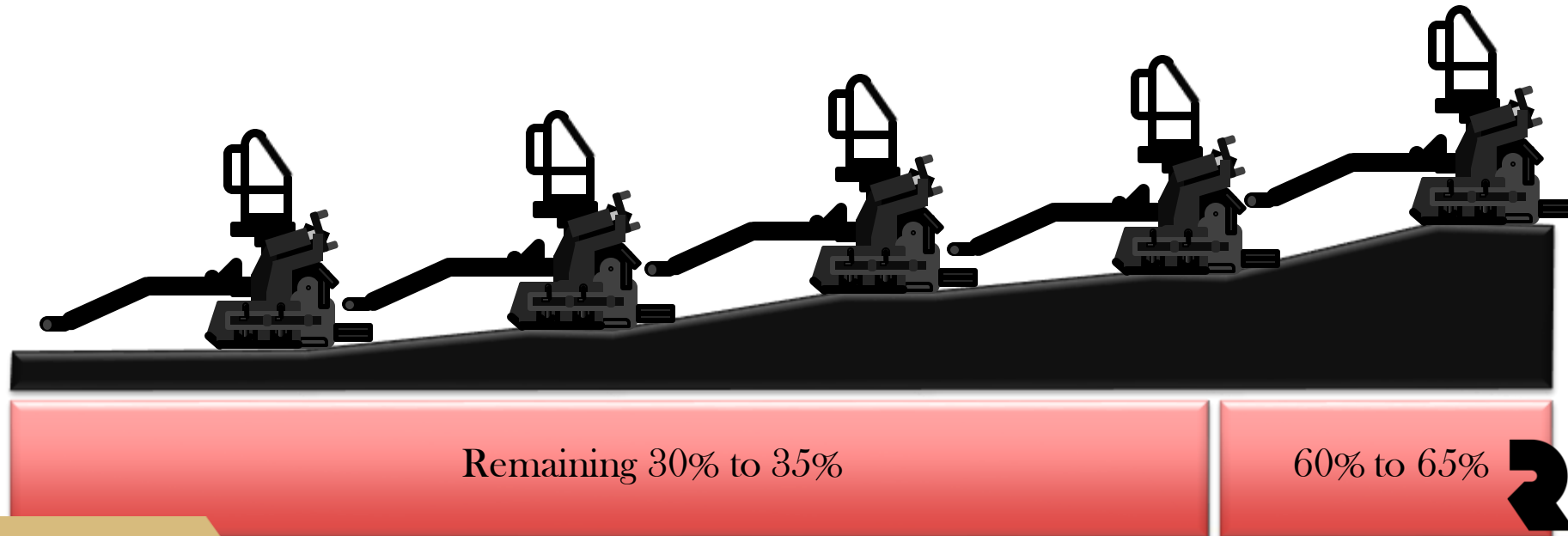
1. Manual with the depth screw
2. Grade Control & Manual
3. Dual Grade Control
4. Grade & Slope Control



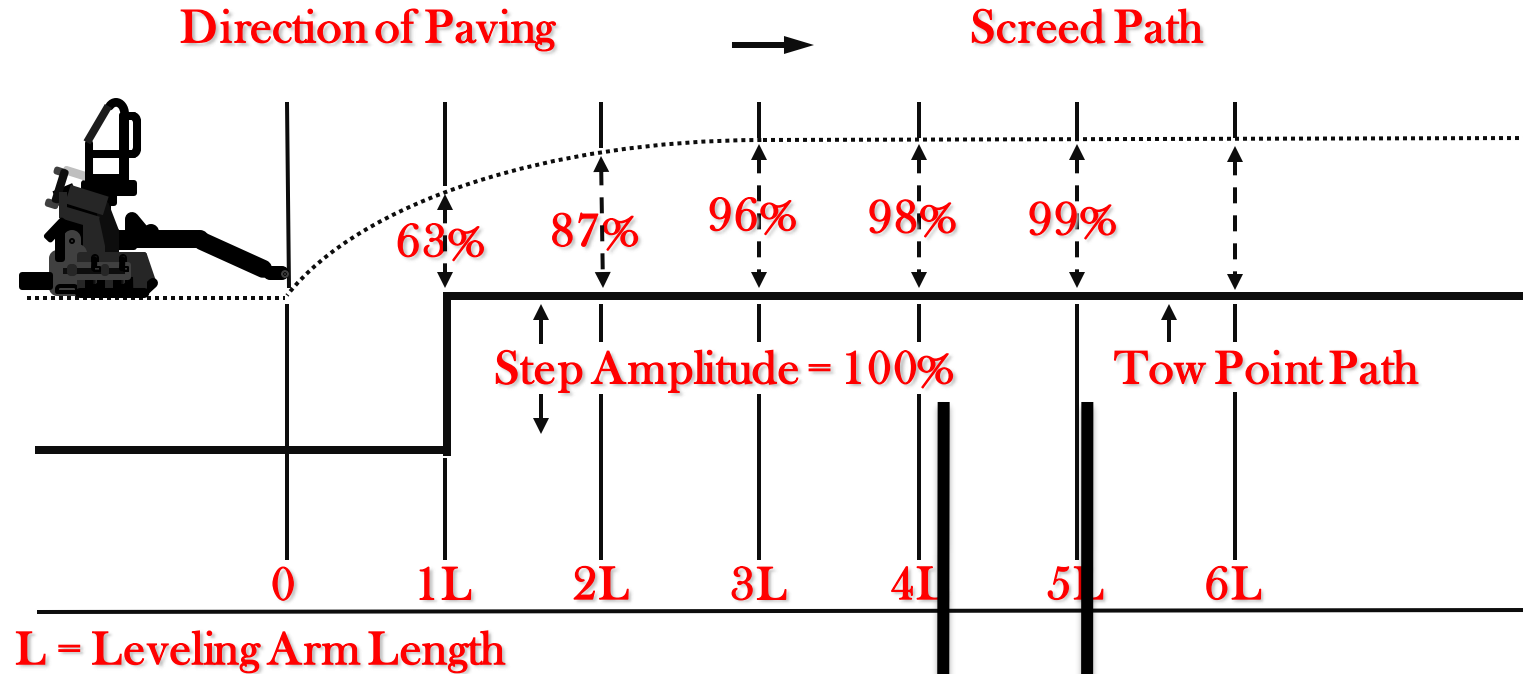
Screed Reaction Time

For a screed to rebalance, it takes 5 tow arm lengths for the screed to rebalance the forces working against it.

This distance for these forces to balance is 50-60 feet (15-18M) or 1 ½ paver lengths. WE must be patient for the full reaction to take place.

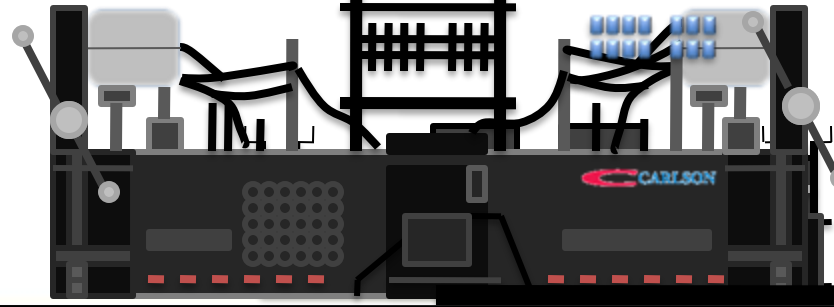


Correction Time of the Screed

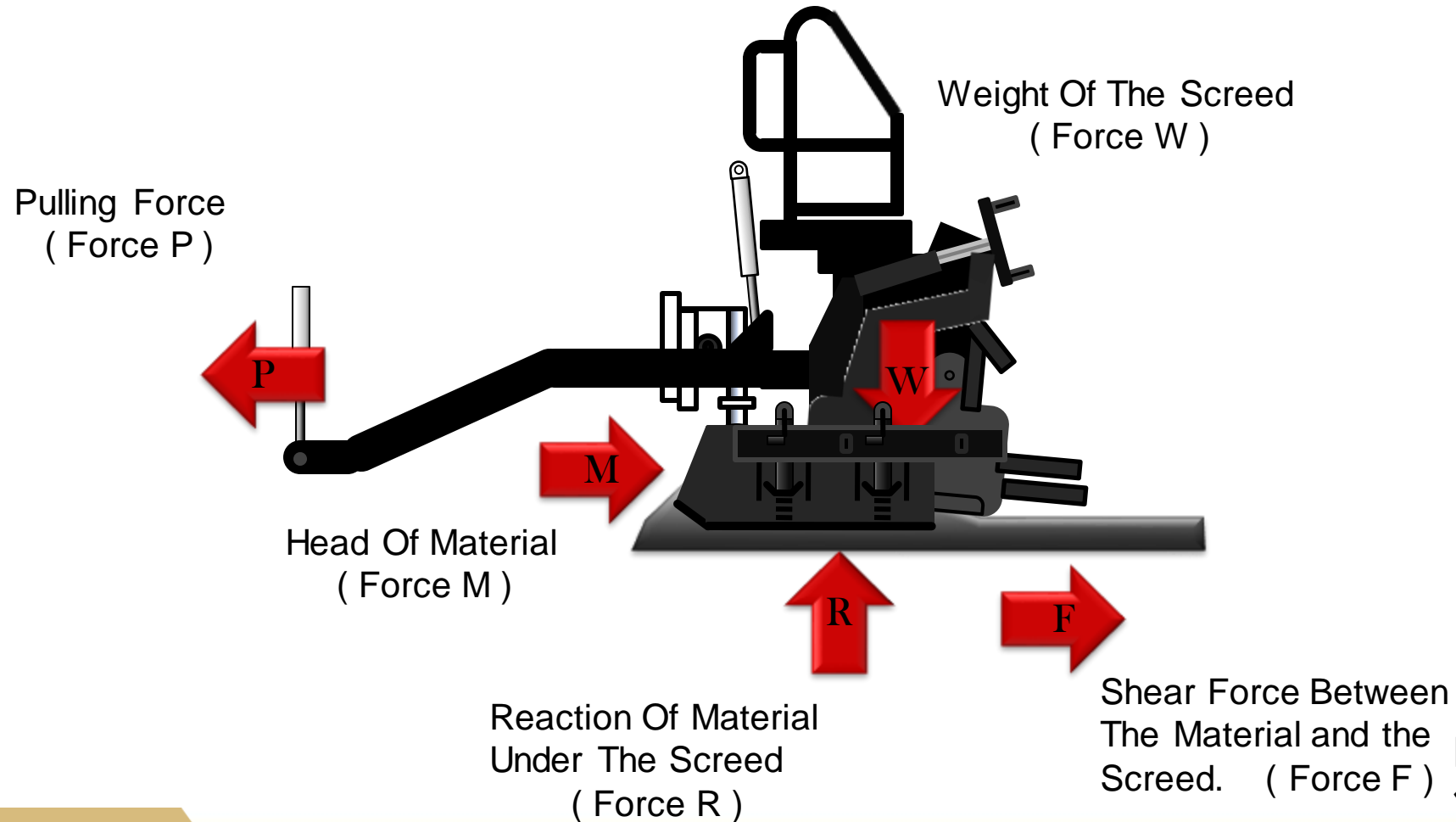


This theory only applies to running the screed manually.

In automatic, you don't see these effects?



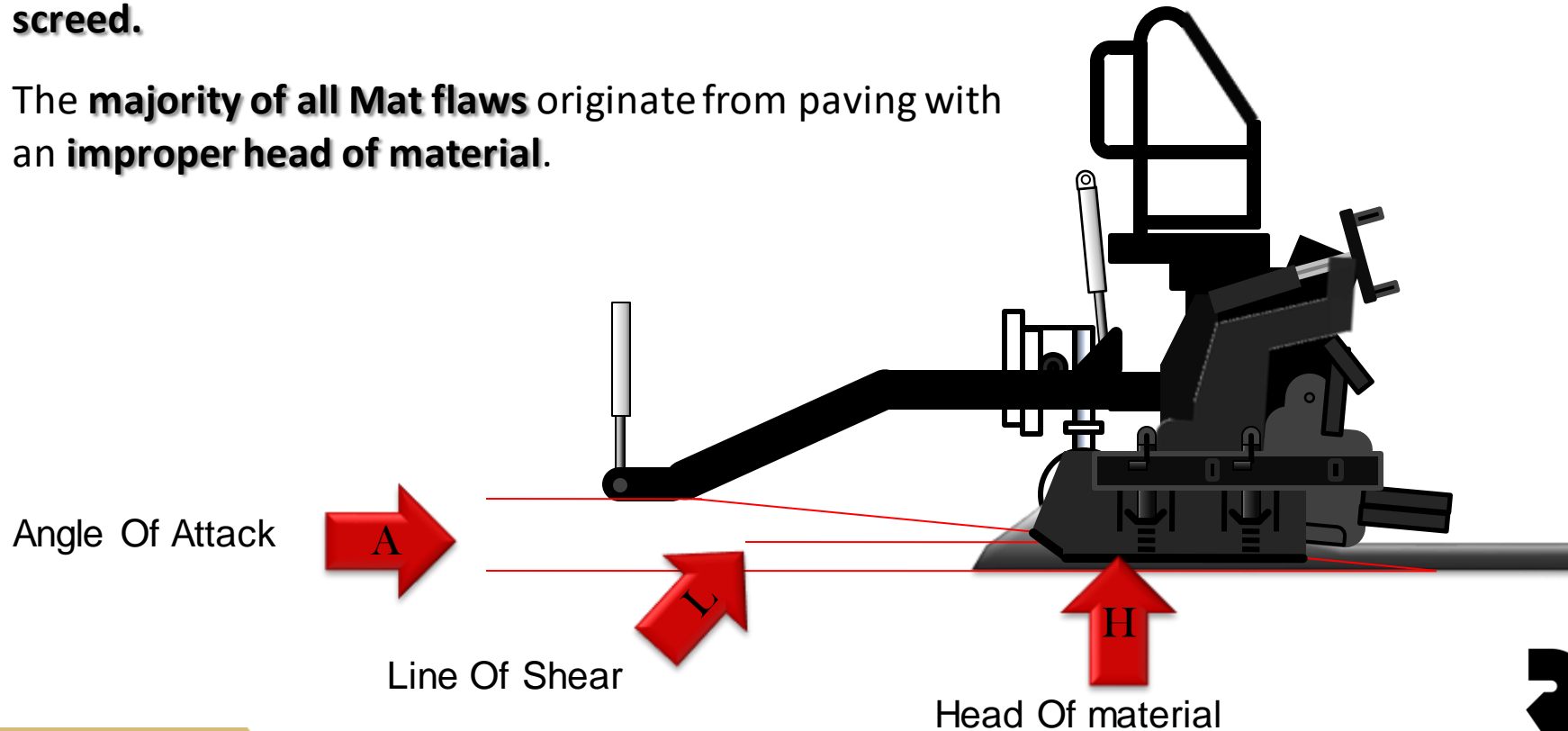
Forces Acting on the Screed



Screed Shear Point

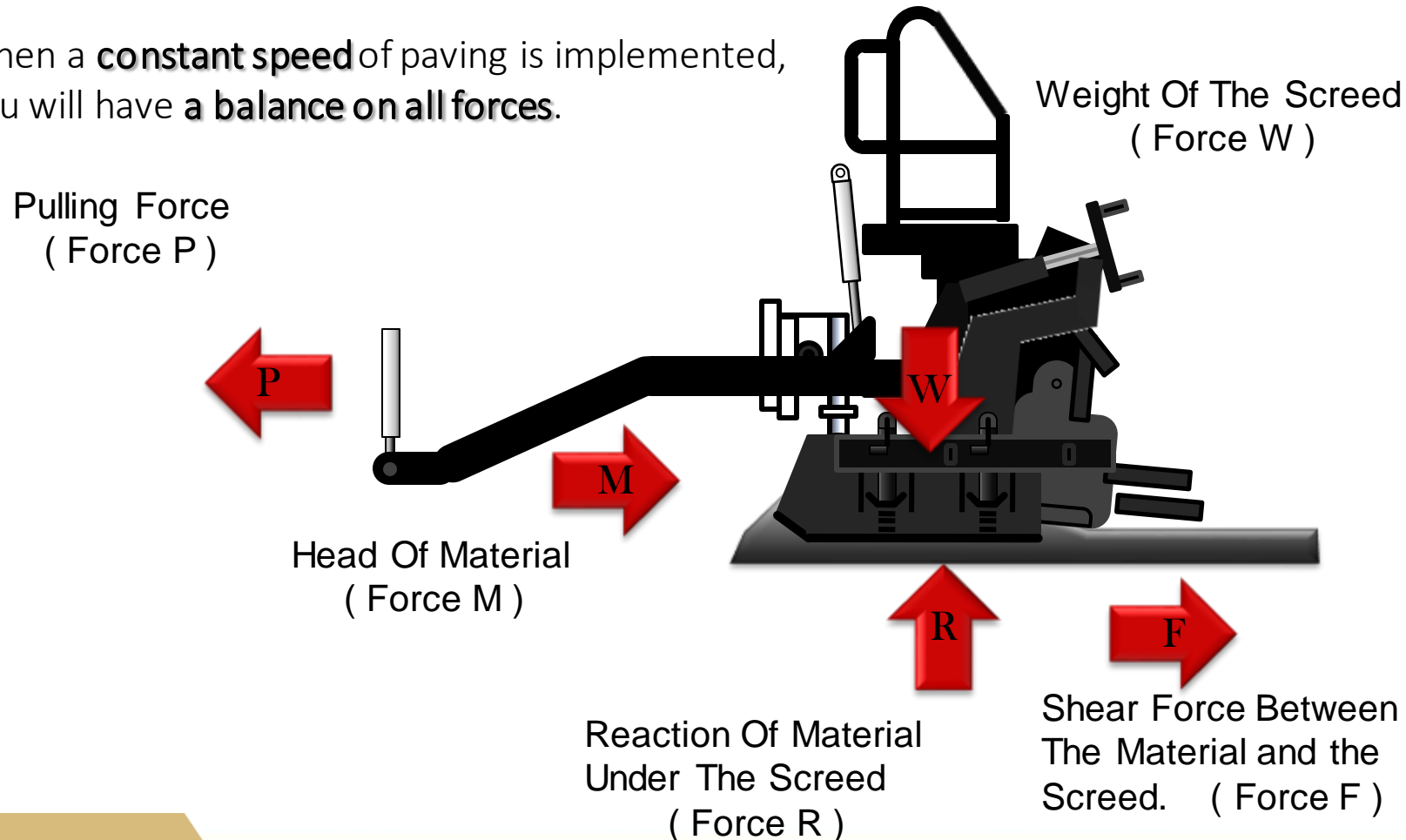
The **Head of Material** is the mass of material that lies directly in front of, and **spans the entire width of the screed**.

The **majority of all Mat flaws** originate from paving with an **improper head of material**.

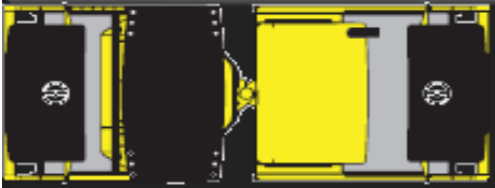


Forces Acting on the Screed

When a **constant speed** of paving is implemented, you will have a **balance on all forces**.

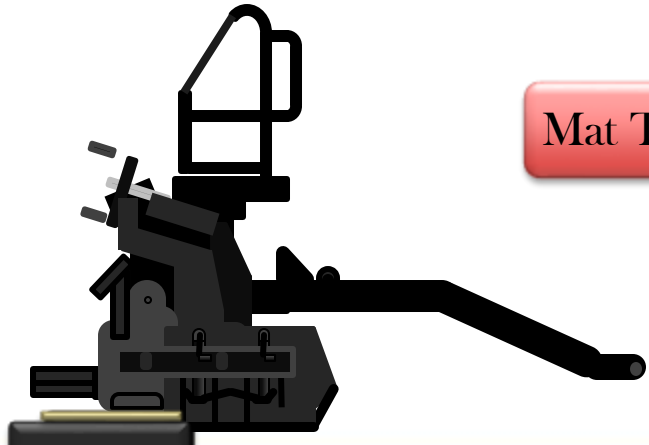


Mat Thickness Chart



To achieve the proper Mat thickness, you should always allow for roll down.

Roll down is the differential between the non-compacted and compacted material.



Mat Thickness Chart

To Achieve Final
Mat Thickness:

1" or 25.4 mm
2" or 50.8 mm
3" or 76.2 mm
4" or 101.6 mm

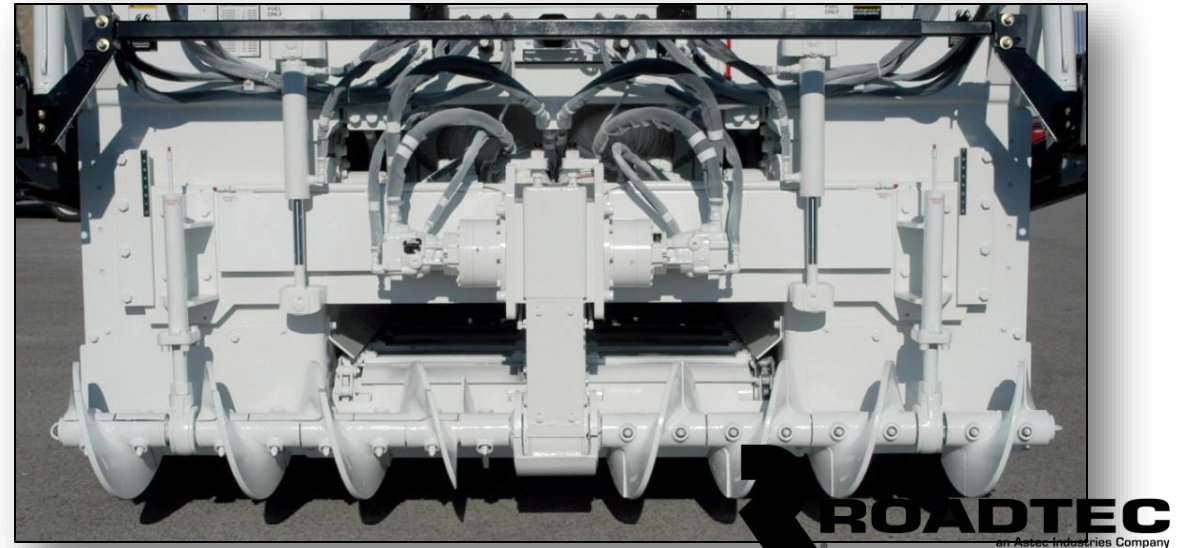
Requires an Initial
Thickness Of:

1.26" or 32.0 mm
2.53" or 64.3 mm
3.79" or 96.3 mm
5.05" or 128.3 mm

Material Management

Key Points in Prevention of Segregation:

- Keep Material **Contained**
- Prevent Excessive Rolling of **Materials**
- Move Material in a **Smooth Uniform Uninterrupted Manner**



Say When!!

What's happening to this screed ?

And what if we were going to bring our end-gate in? What would happen?



What Can We Change?



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Auger Adjustments

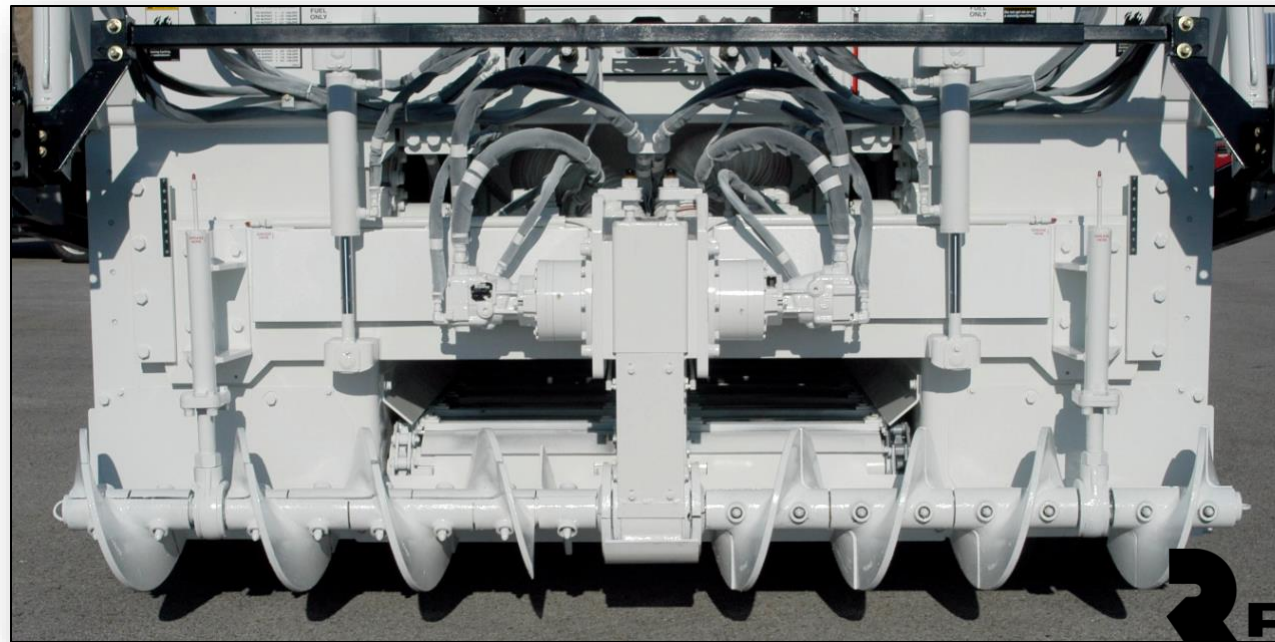
The head of material is the asphalt that is carried in front of the screed

There is no need to carry any more material in front of the screed than is required to feed the entire length of the screed.

Augers break.

Augers get worn out.

Augers can be changed.

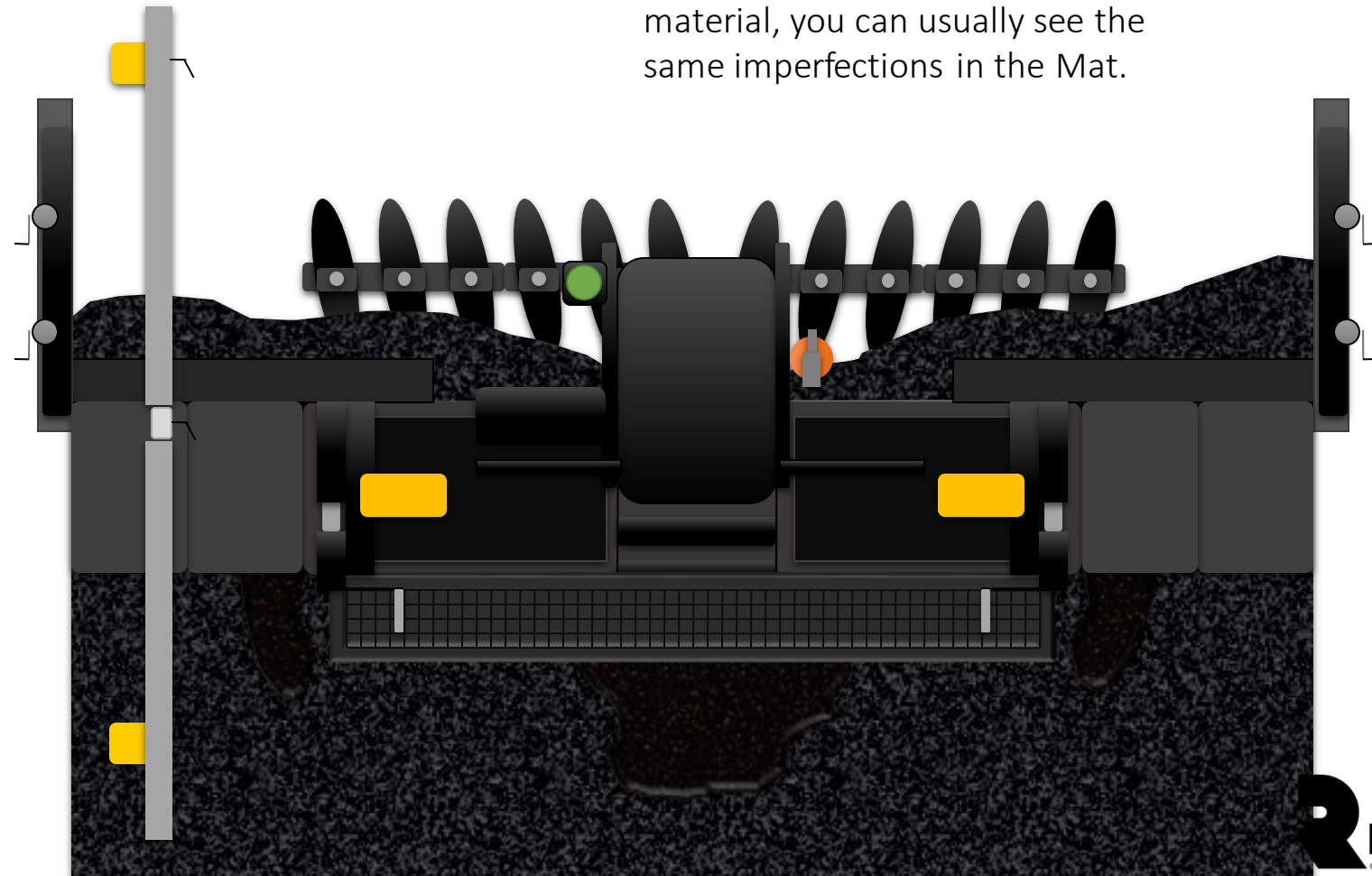


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Irregular Head of Material

Gradation changes in the mix design will affect how a screed reacts.

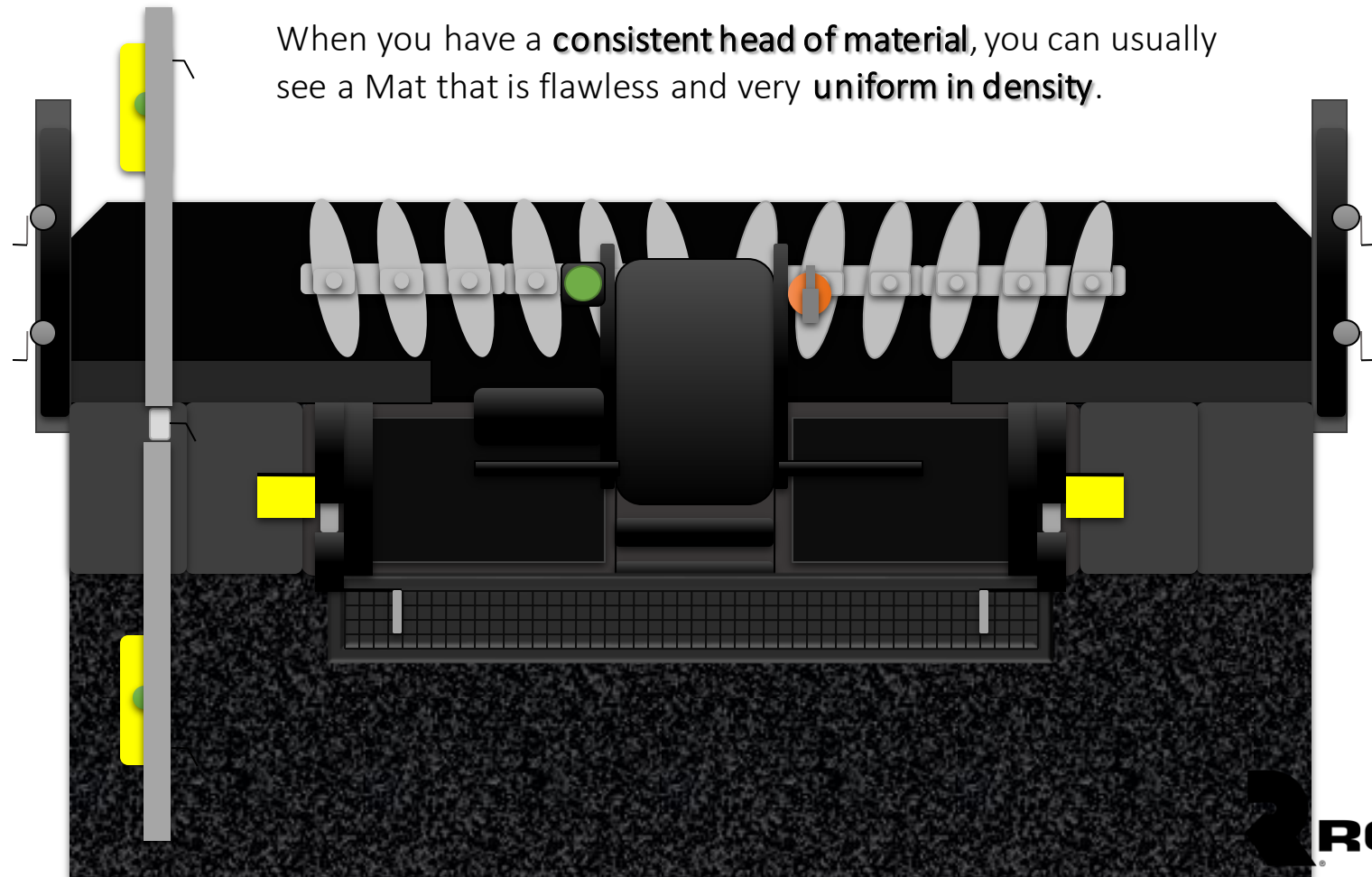
When you have an irregular head of material, you can usually see the same imperfections in the Mat.



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Consistent Head of Material

When you have a **consistent head of material**, you can usually see a Mat that is flawless and very **uniform in density**.

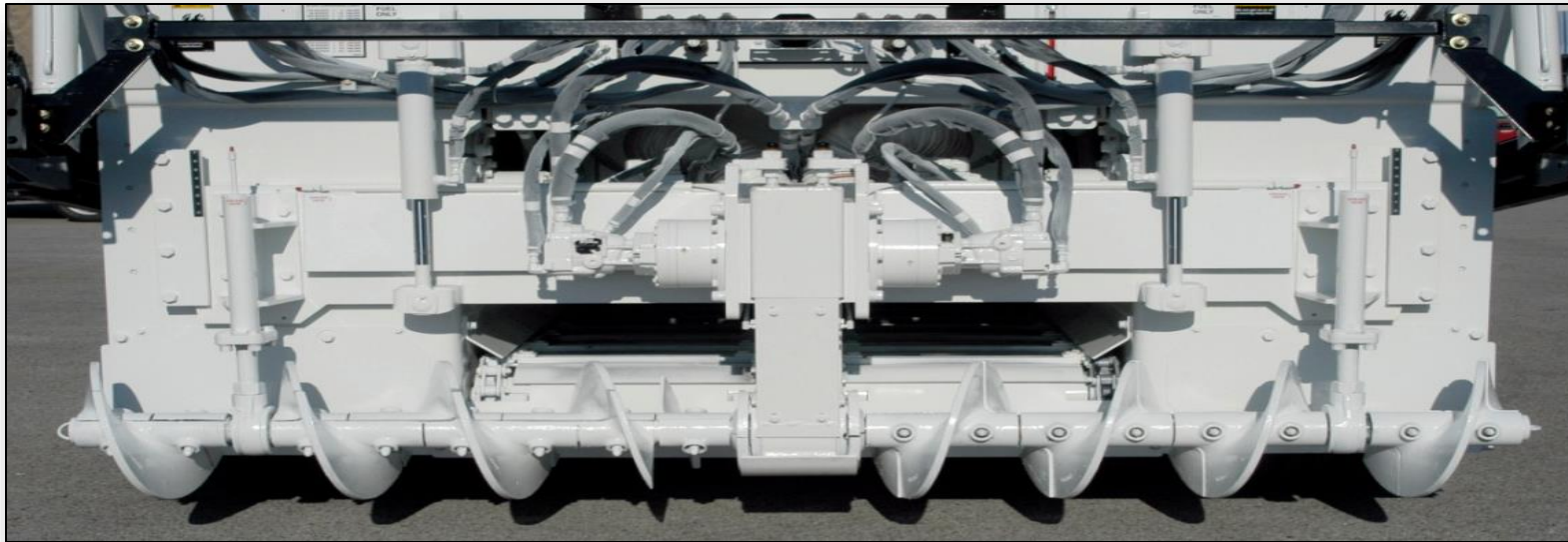


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Auger Height

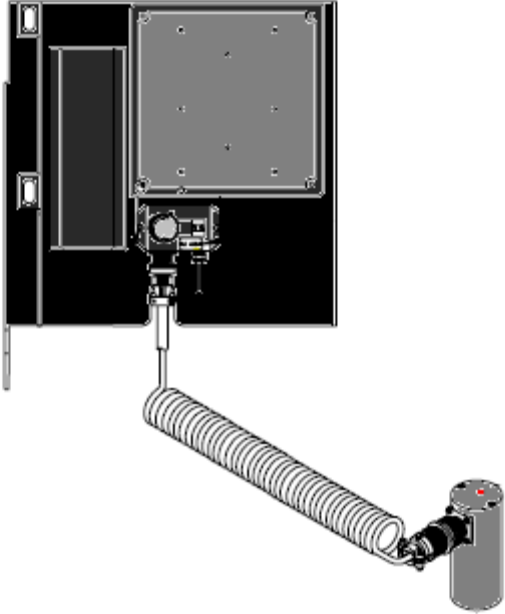
Auger height controls the head of material and is determined by mat thickness.

Add 2 inches or 50 mm to loosen the thickness you are laying. Use more for larger aggregates.



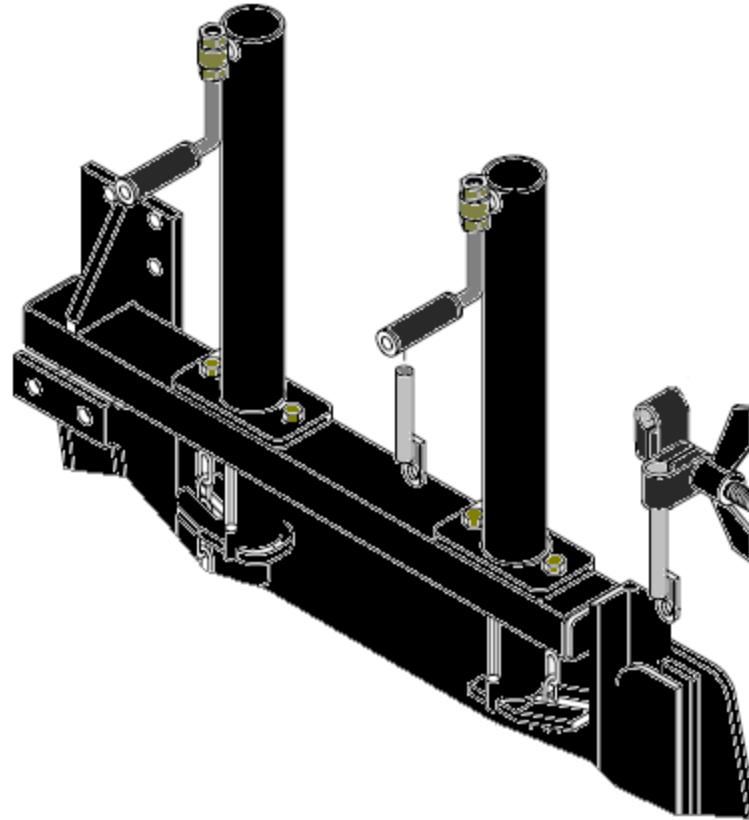
Feeder Placement

This is one of the major problems in the field hands down!



When should I change my Feeder position?

What benefit will I see from a different position?

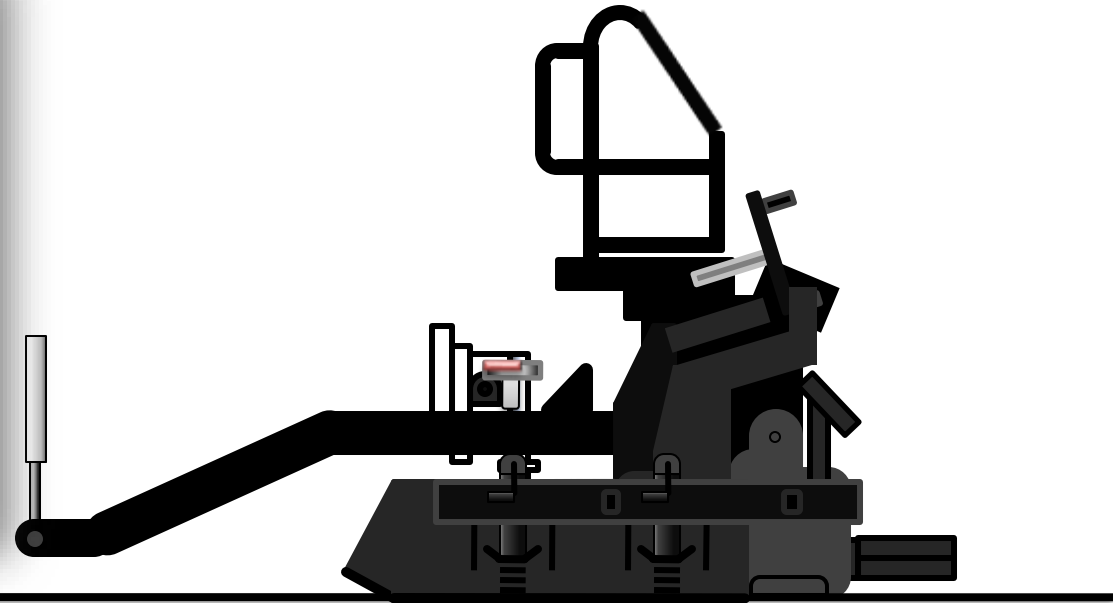


Managing the Feed System



Managing the Feed System

This is an example of a Feeder that is not positioned properly.

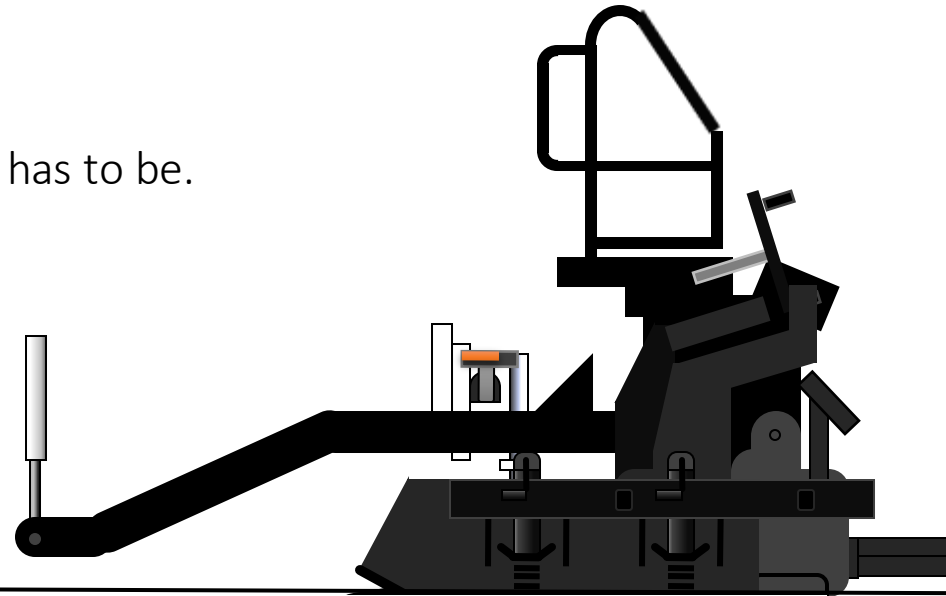


Managing the Feed System

The correct position, as illustrated here, will cure many problems with your paving operation.

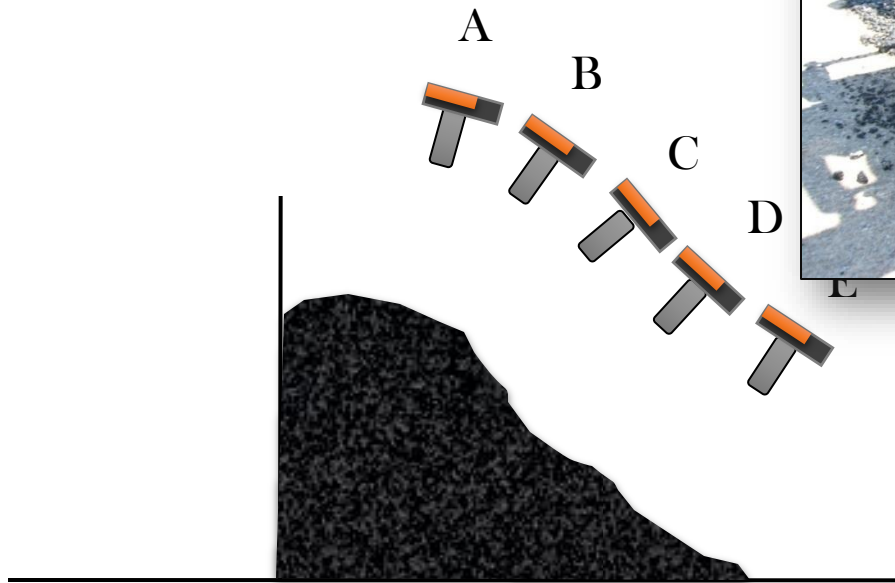
Material that is not manageable will make a mat that is unmanageable.

This is easy. Don't make it harder than it has to be.



Managing the Feed System

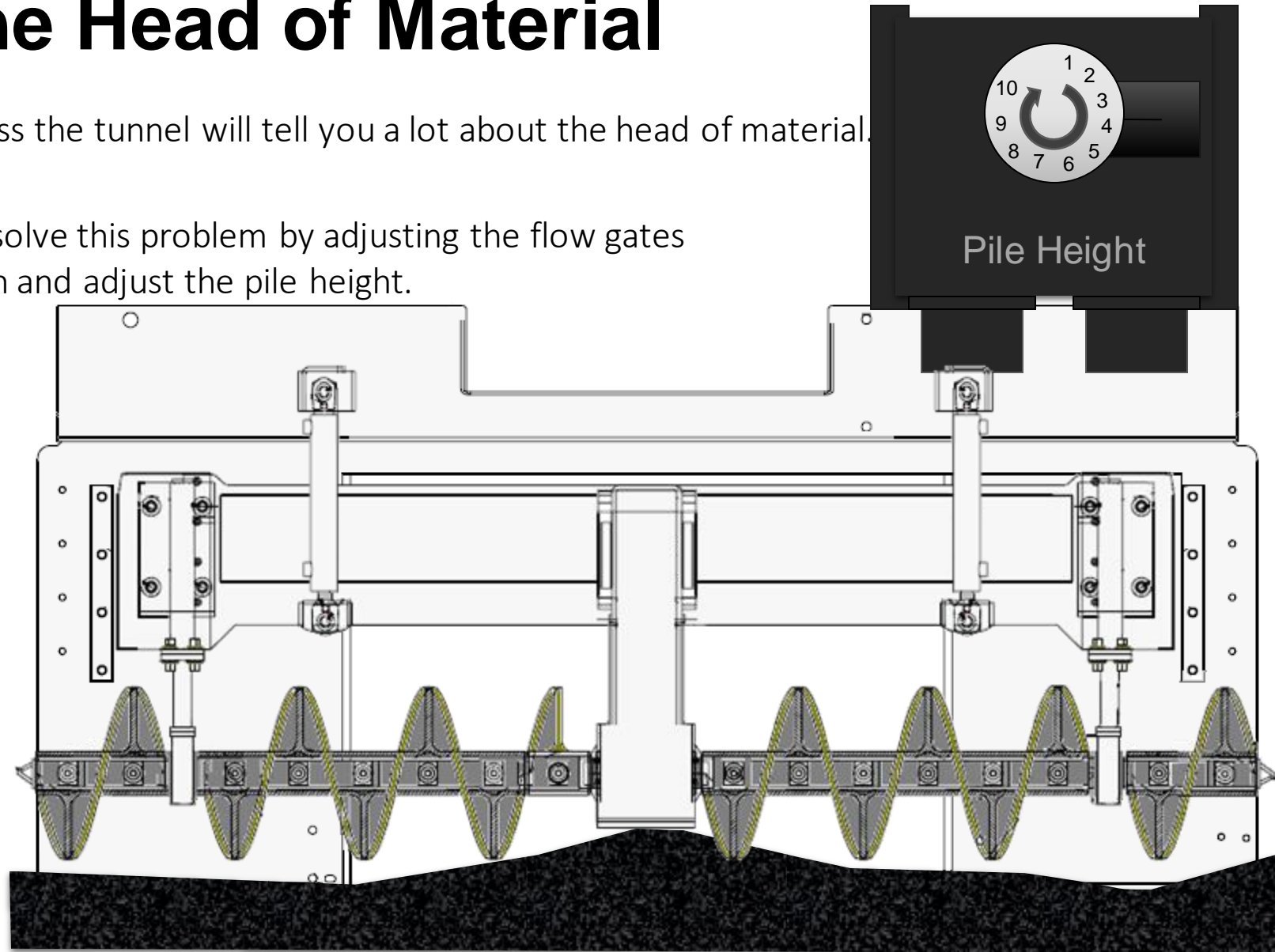
What is the best position to manage this head of material?



Adjusting the Head of Material

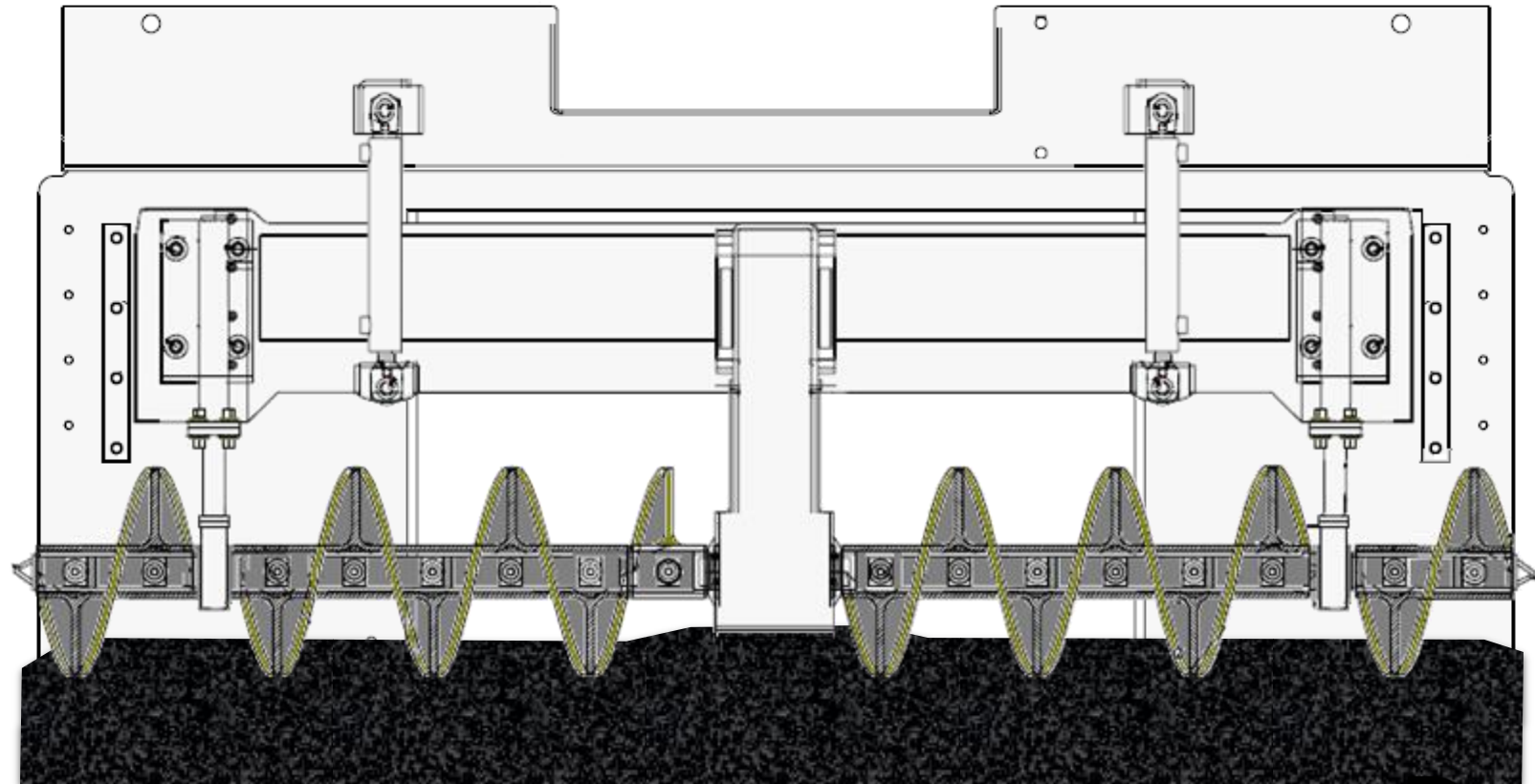
Looking across the tunnel will tell you a lot about the head of material.

You could resolve this problem by adjusting the flow gates or slow down and adjust the pile height.

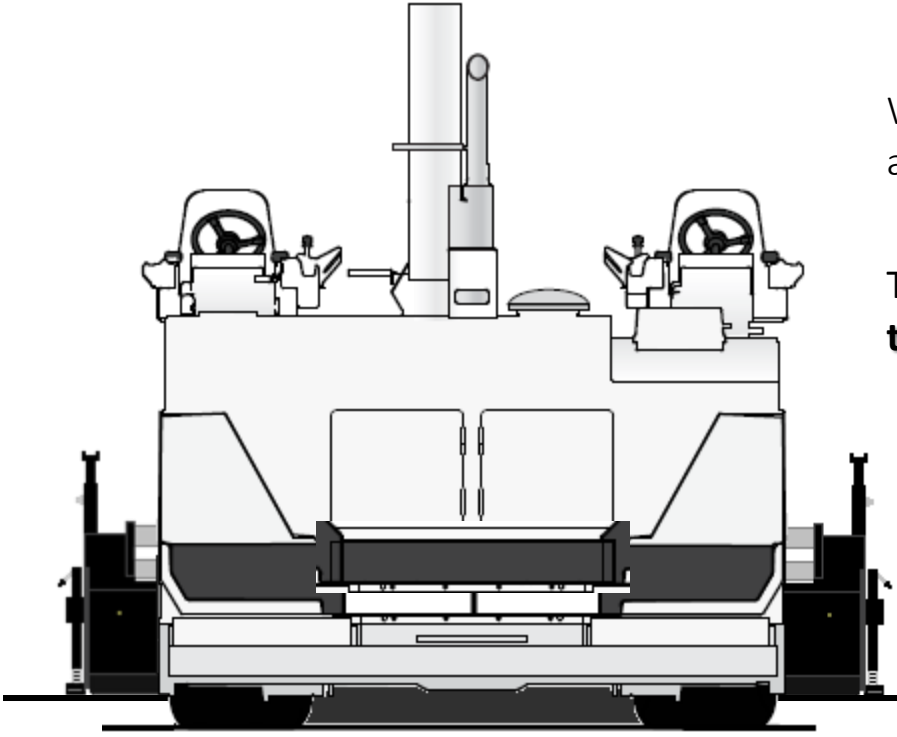


Adjusting the Proper Head of Material

You should have an **even** amount of material across the auger chamber, and your **augers** should be running 100 % of the time.

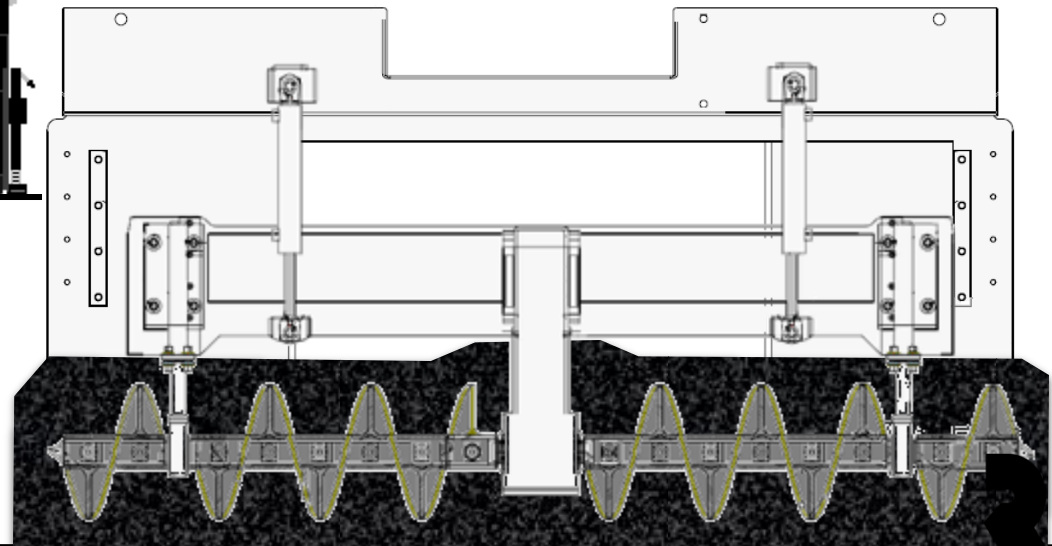


Improper Pile Height



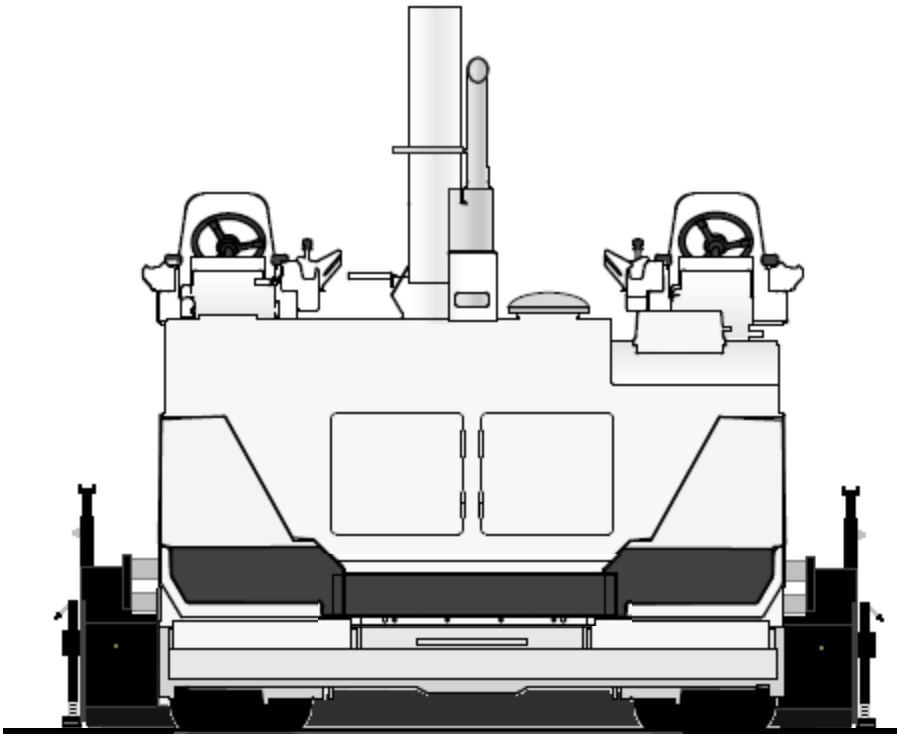
What we see is a flood of material across the auger chamber.

This is a **common problem at the most critical time of the process**, The take off..



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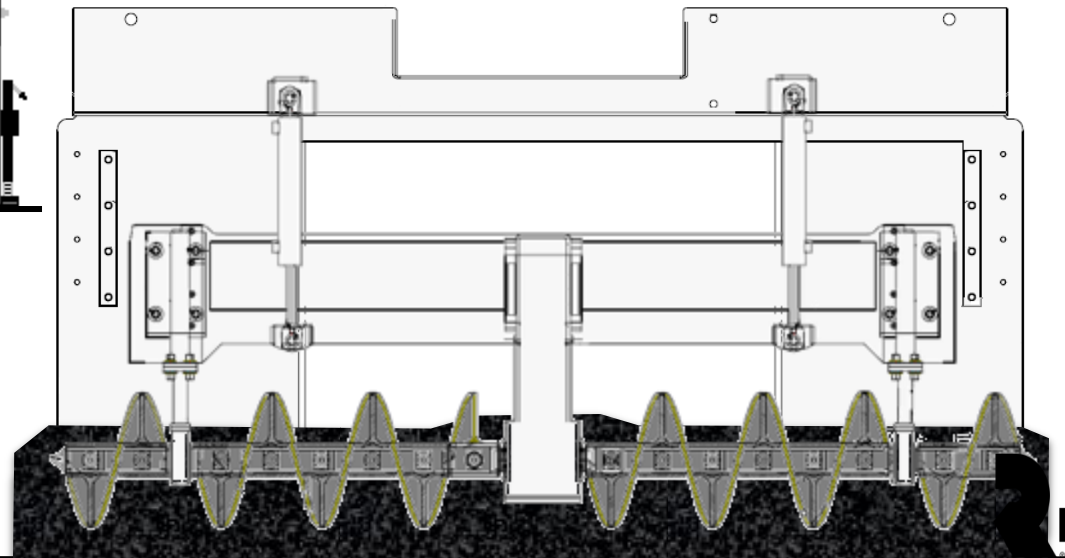
Proper Pile Height



If it needs to be shoveled to make it to the end, **then do it!**

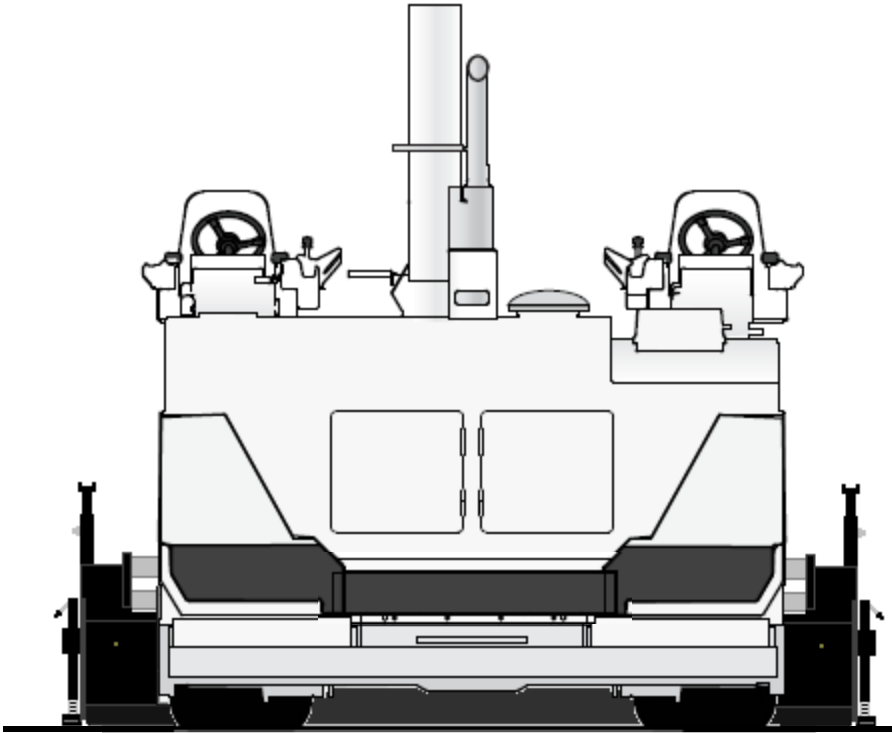
What we see is the correct head of material and an even flow of material across the auger chamber.

Augers need to **run all the time...** not one faster than the other....**Equal amount flowing in and equal amount flowing out..**



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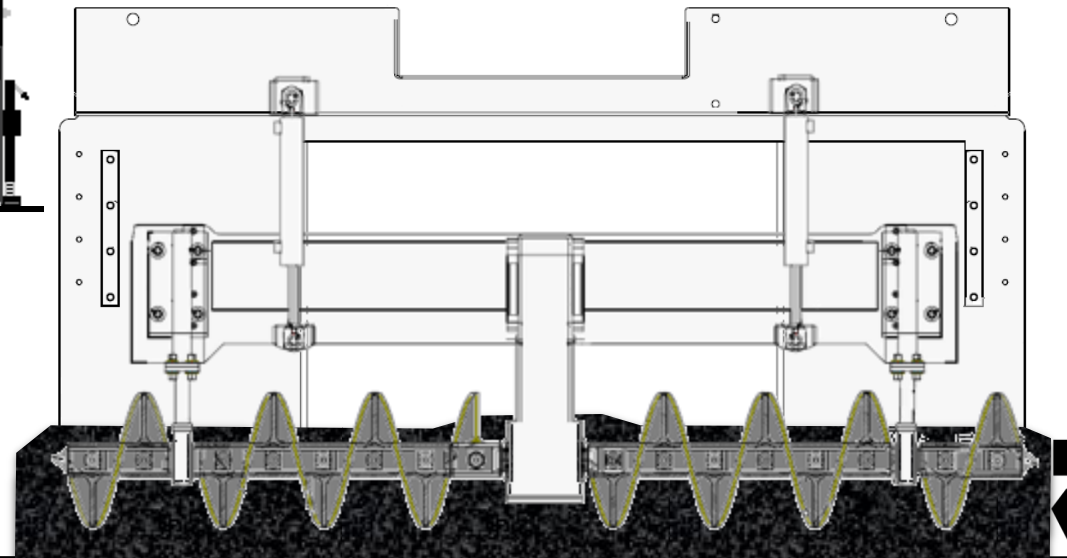
Proper Pile Height



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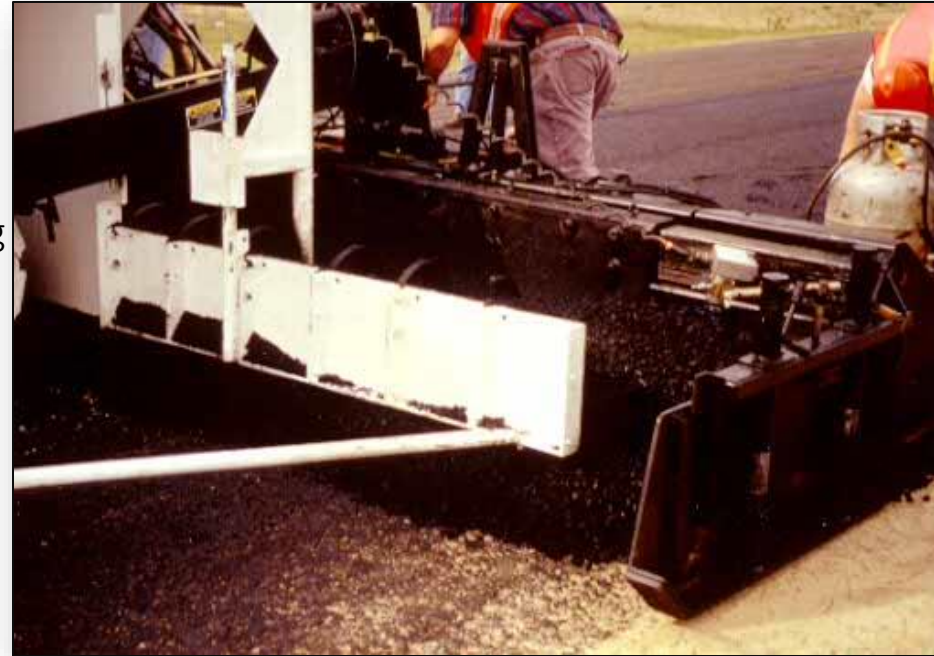
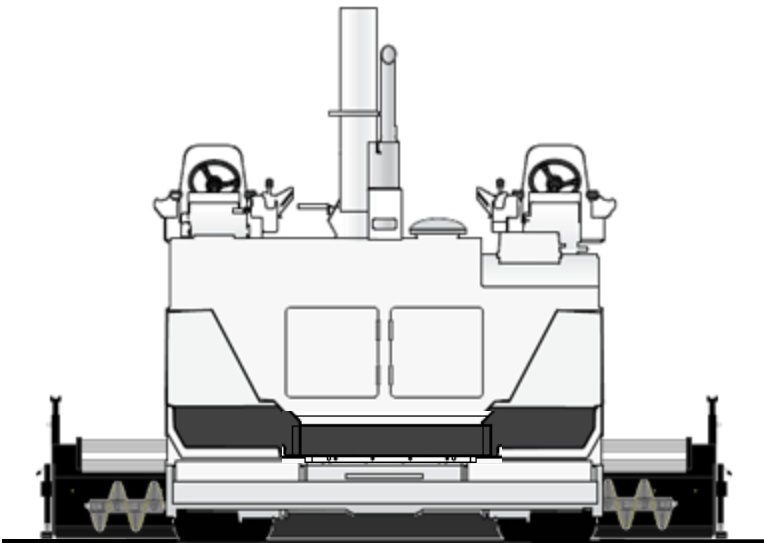
If it needs to be shoveled to make it to the end, **then do it!**



Augers Extension

Auger extensions should always be used when wider paving is done.

Some material designs may require additional auger extensions that would not be required when working with traditional material designs.

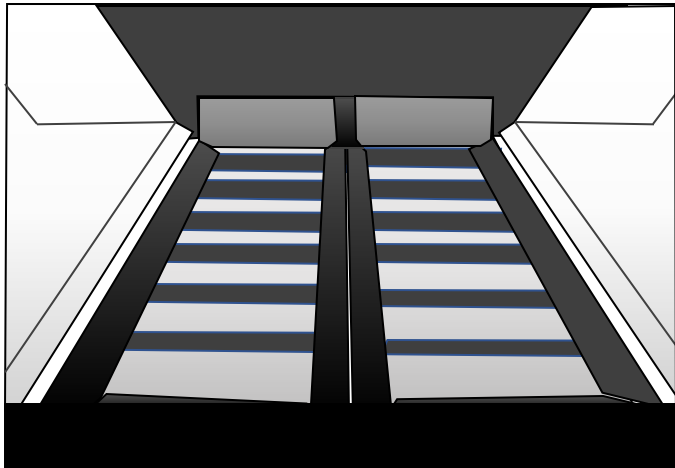


How will material stay **contained, uniform and continuously** move without them?



Flow Gates

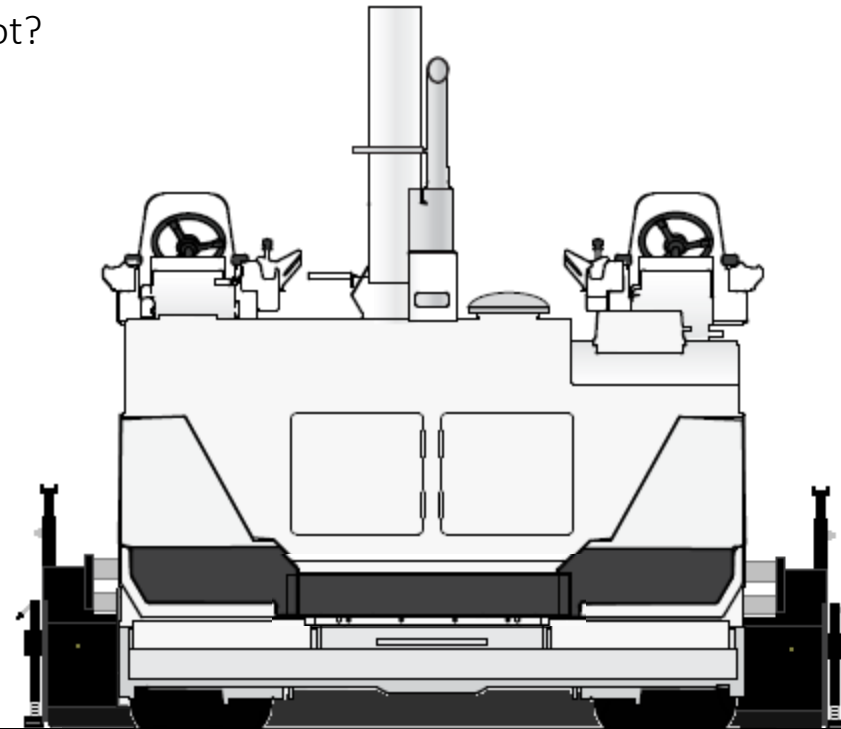
Remember flow gates are designed to meter the amount of material that is delivered to the Auger Chamber.



With this width, what should we do with the Flow-Gates?

So in this width, we will just move the gates down a little, or a lot?

What else could we do to help manage the Material in this application?



What is the Customer's Demand?

Long Life Pavement

Proper Sub-grade

Substantial Structural life

Pavement Smoothness

No Material Segregation

No Temperature Segregation

Uniformity of Density

Speed of Construction

Minimizing Traffic Delays

Low Price

That's It..... Easy Enough!



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Preparing for the Job

What does the job consist of ?

If crews are informed of the job and every person involved is on the same page, the crew will be more productive.

A crew that is frustrated will:

- a. Not produce
- b. Unravel itself
- c. Won't care what the job looks like or rides like.

Be aware of Existing Grade Conditions:

Slope

Low Spots

High Spots

HMA Design



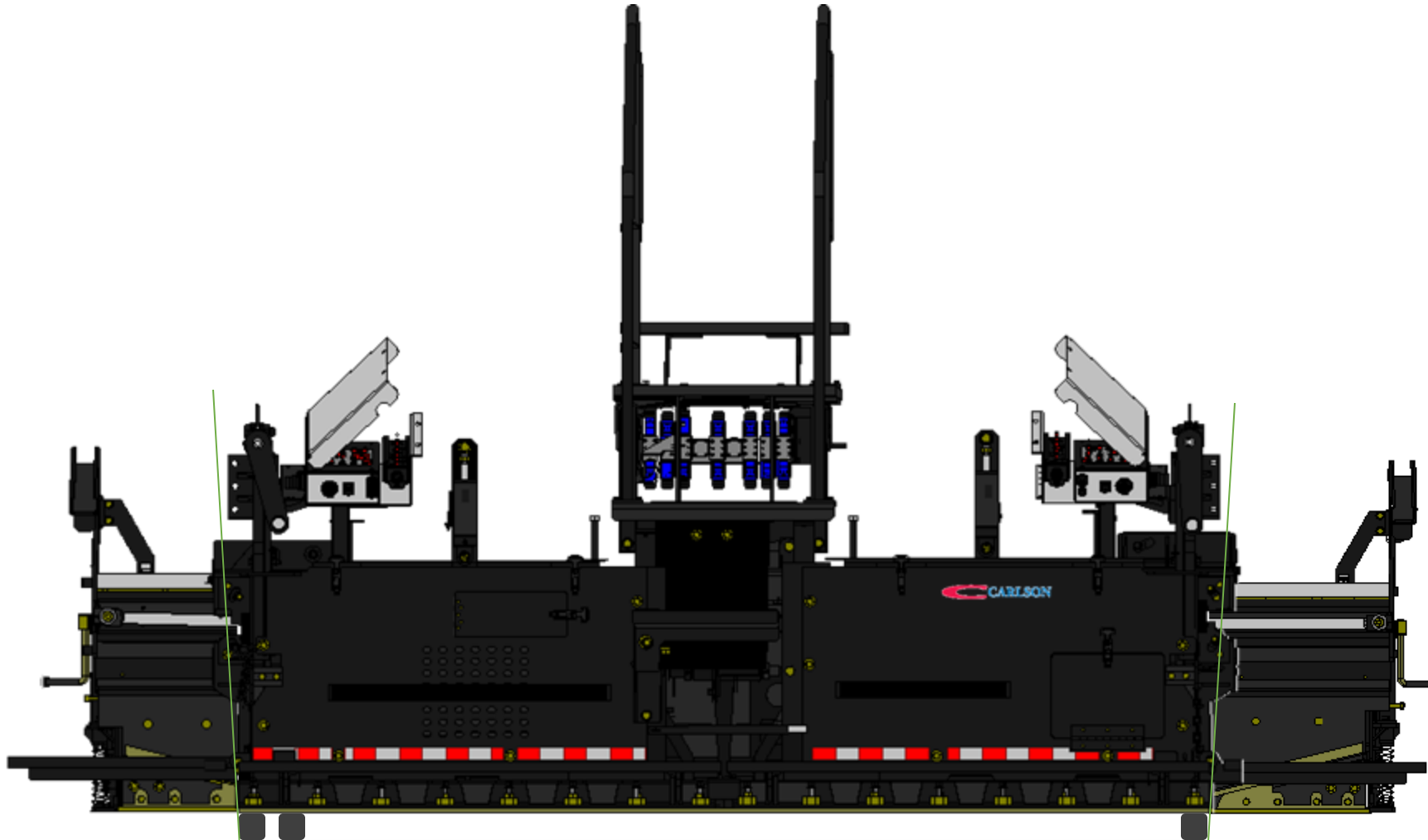
It's OK, It Will Cover



Cover it, is not the answer here. Not all jobs are perfect but the customer needs to know **what happens when jobs are rushed.**



String Lining the Screed



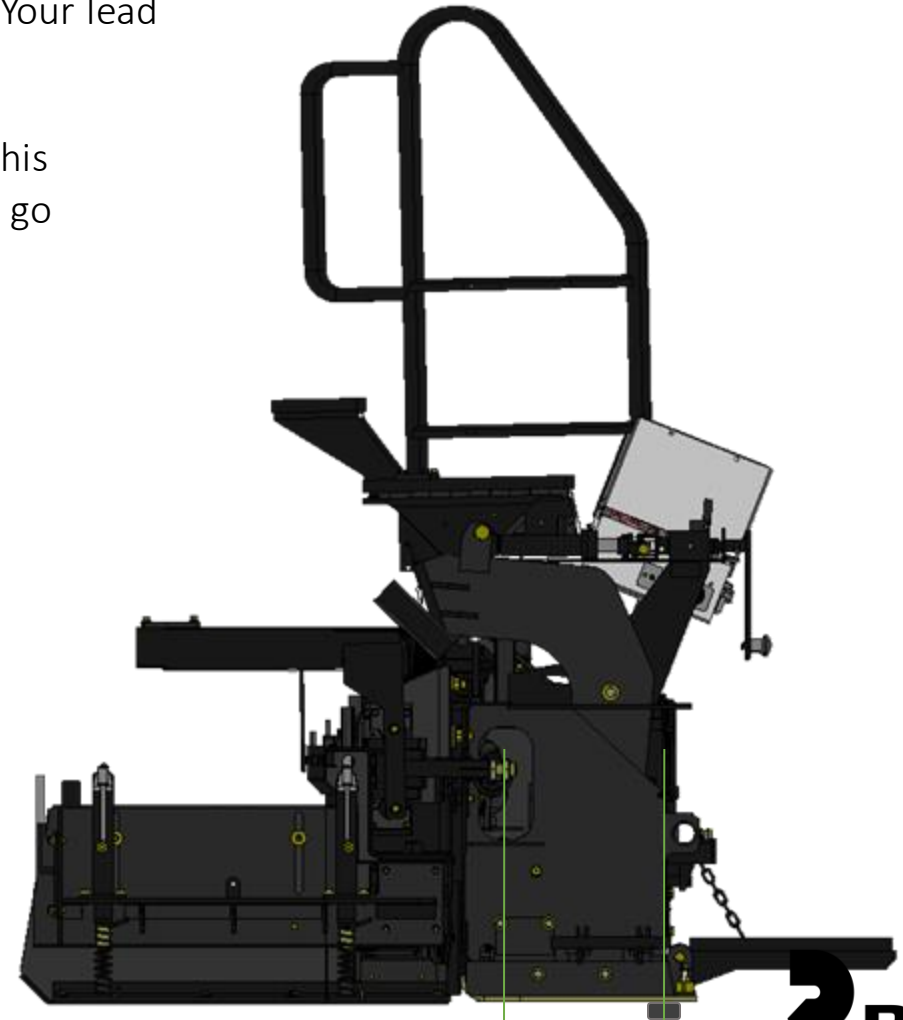
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Setting up the Screed

There is more to checking the Screed than just at the tail. Your lead crown is very important.

By always checking the back and putting it flat first, then this becomes something that is easily controlled. You can now go to the front and set your lead and recheck your work.

After you have checked the rear of the screed you should check lead crown and set to $\frac{1}{8}$ th of an inch.

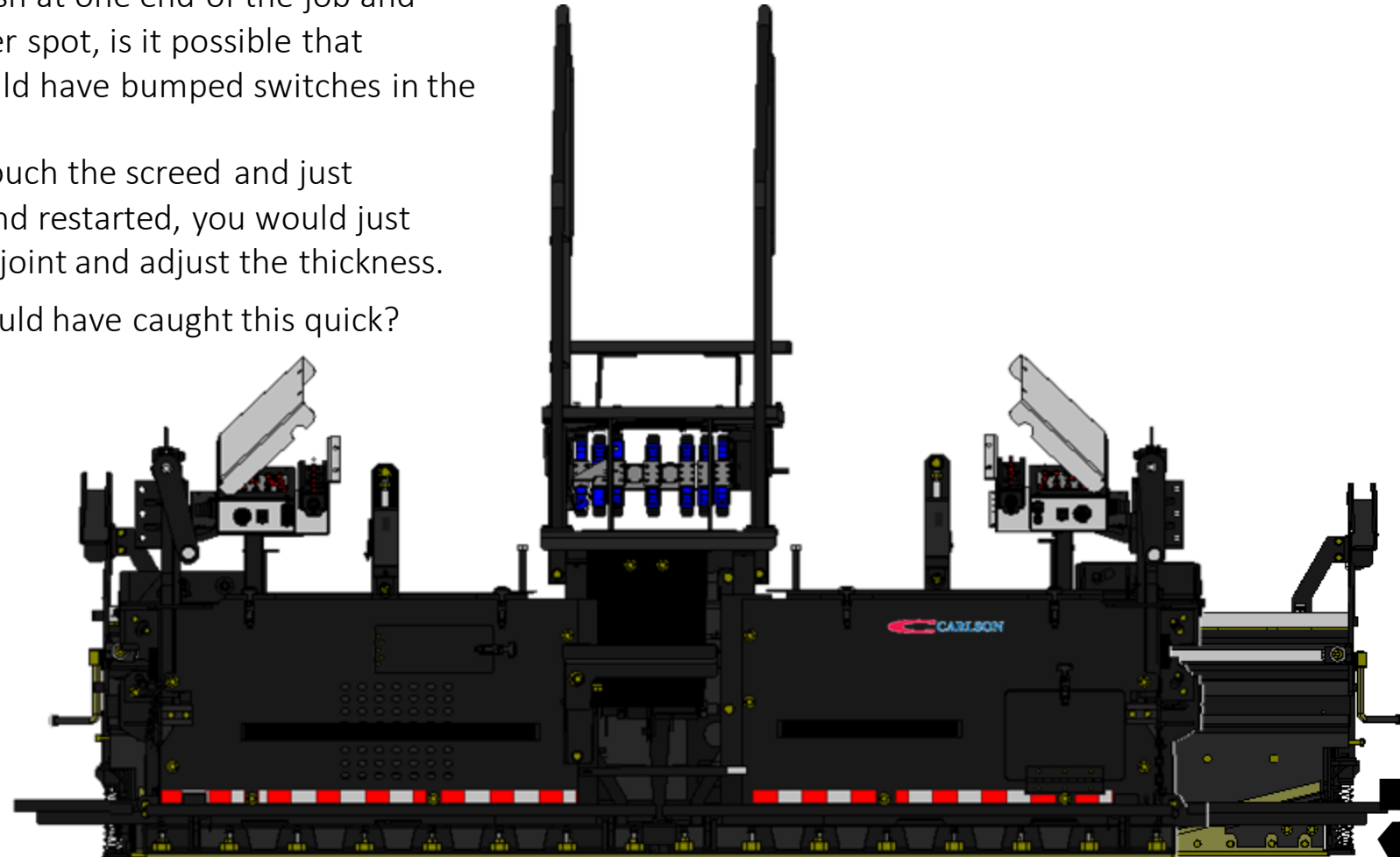


Check for Slope in Your Extension

When you finish at one end of the job and start at another spot, is it possible that somebody could have bumped switches in the move?

If you didn't touch the screed and just moved back and restarted, you would just be low on the joint and adjust the thickness.

How many would have caught this quick?



Checking the Crown

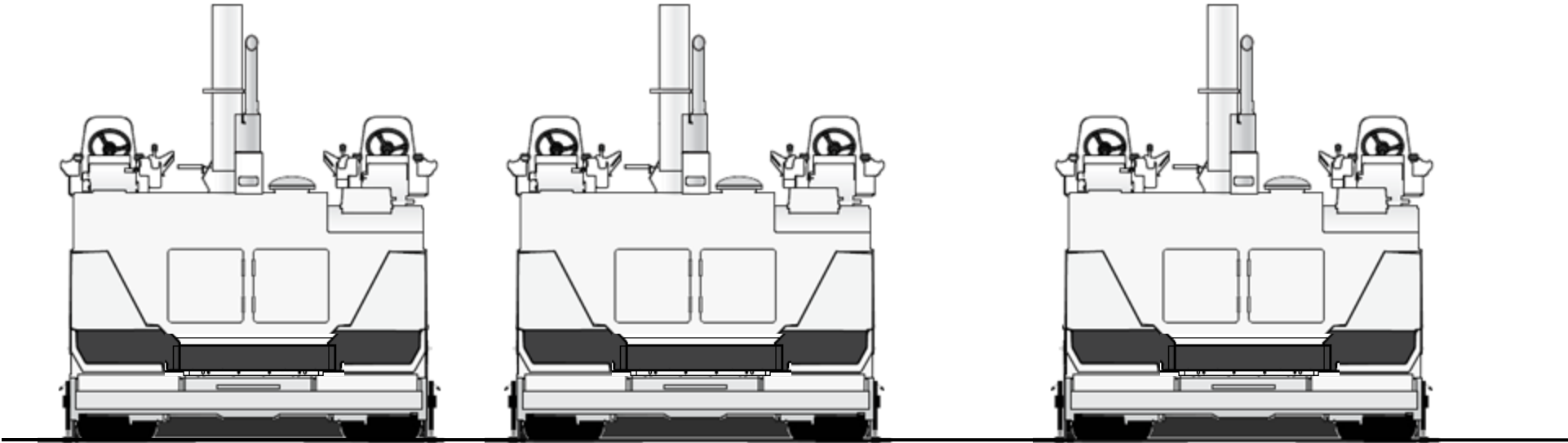
Think of how much material you would use with $\frac{1}{8}^{\text{th}}$ of an inch over 12' multiplied by 3000'.

3000 Feet
 $\frac{1}{8}^{\text{th}}$ Inch average
12 Feet wide
\$85.00 per ton

\$2390.00



Paving Width Setup



An 8 foot paver that is pulling 12 feet. Which of these would be best suited for the pull? (3.65m)

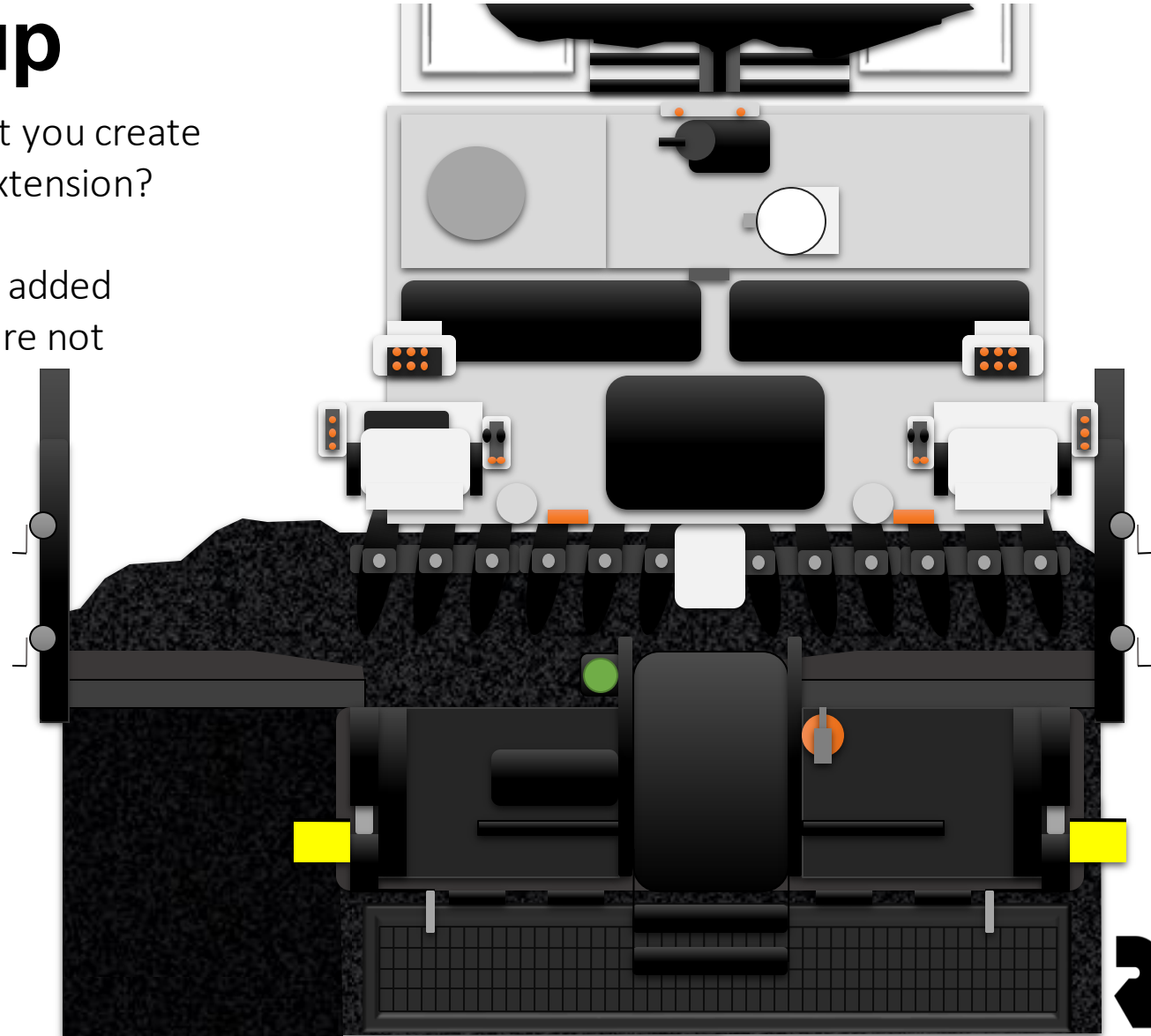
What would be the big deal? 12 foot is 12 foot.



Paving Width Setup

What typically happens is that you create pressure that builds on the extension?

As we said earlier, if you have added pressure on the screed, you are not balanced.



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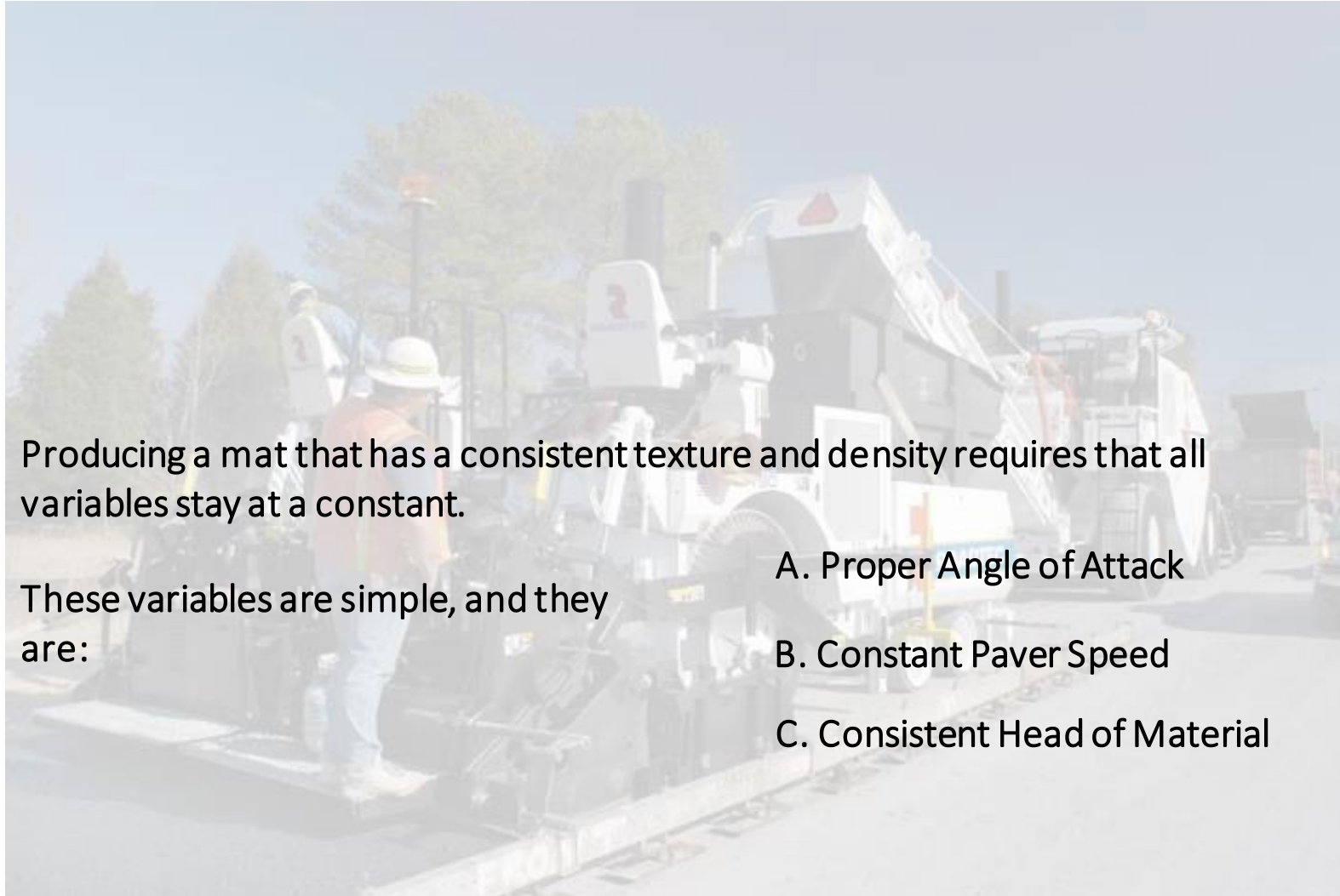
Paving Width Setup

As you can see here, it does happen.

If you were to pave at this width you would see problems with the surface.



Pulling Off and Paving



Producing a mat that has a consistent texture and density requires that all variables stay at a constant.

These variables are simple, and they are:

- A. Proper Angle of Attack
- B. Constant Paver Speed
- C. Consistent Head of Material



Clean Up and Joint Prep

If we just set down and pull off without any prep then we will go down.

Setting down and getting the following in order will give us a successful takeoff.

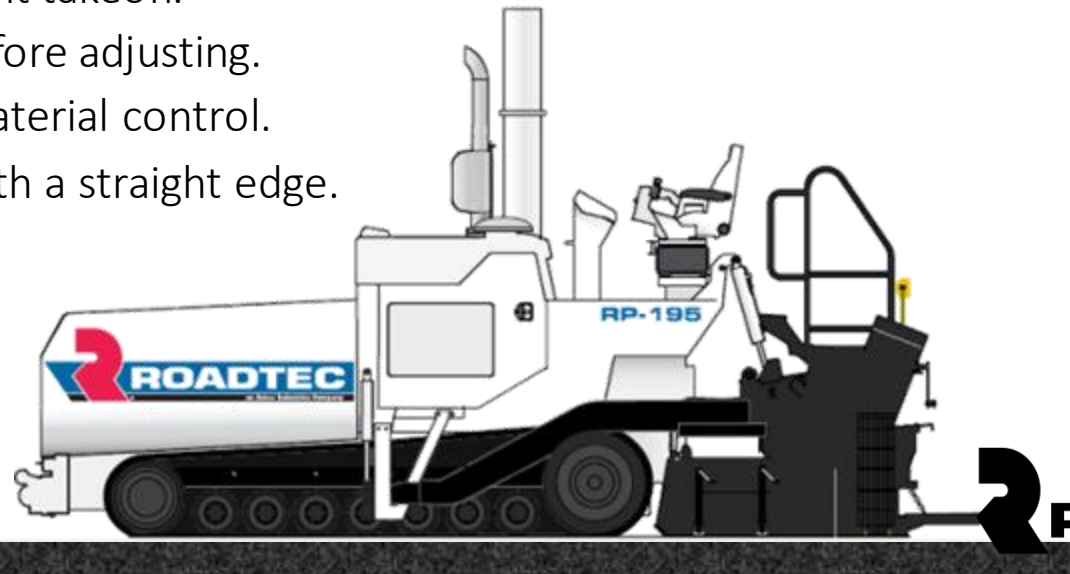
Allow for roll down.

Slow and consistent takeoff.

Take your time before adjusting.

Execute proper material control.

Check the joint with a straight edge.

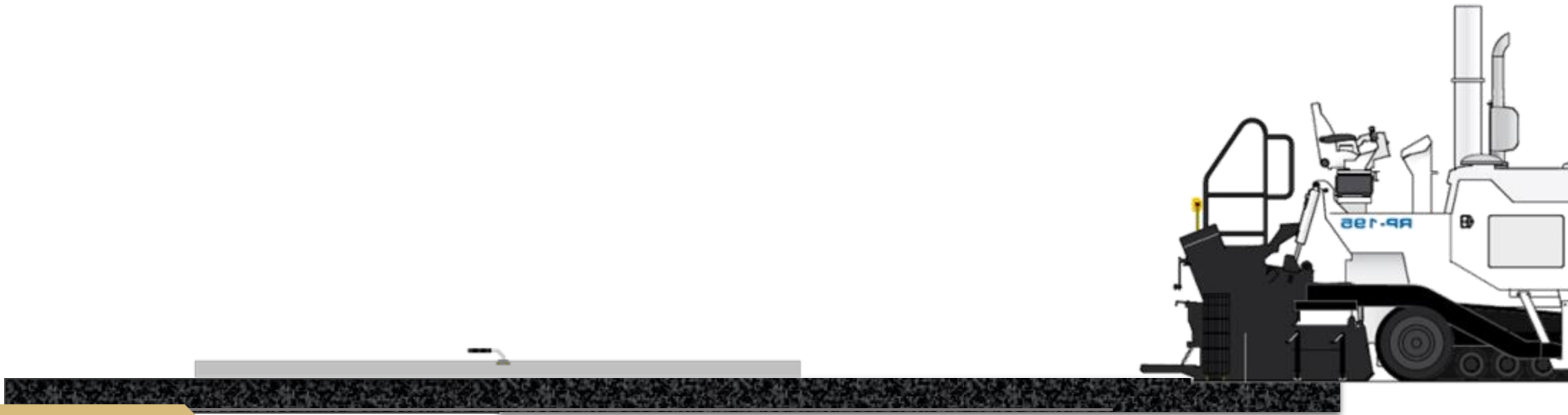


Use a Straight-Edge

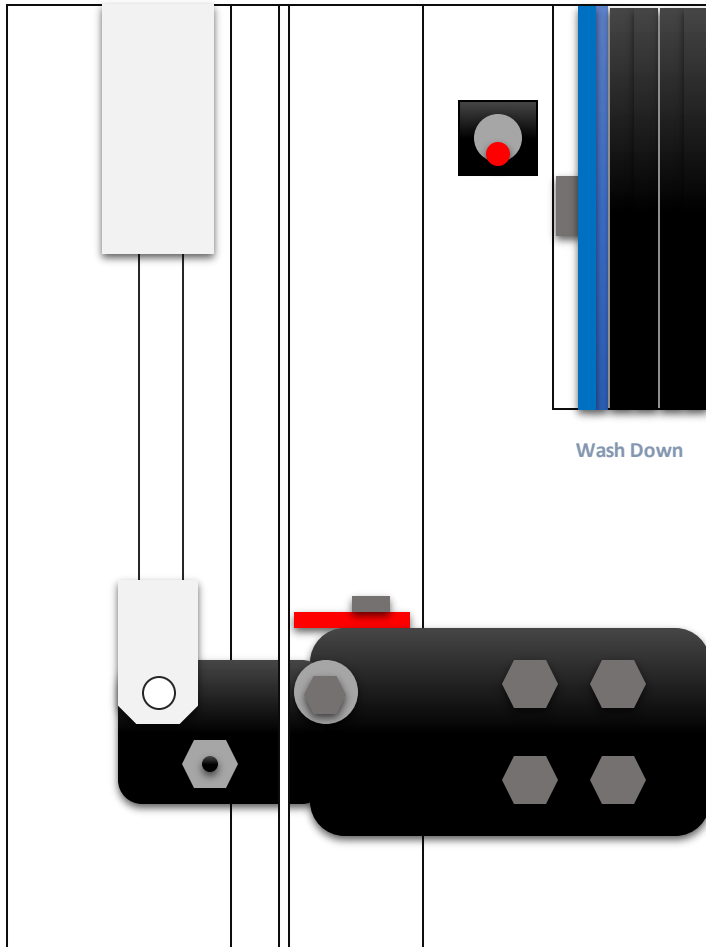
Most foreman have a straight-edge on a service truck, but for the most part they seldom get used.

This is a very important tool in the joint construction process.

Using a straight-edge will help increase the quality of the joints, as well as crown adjusting, sloped extensions and vertical.



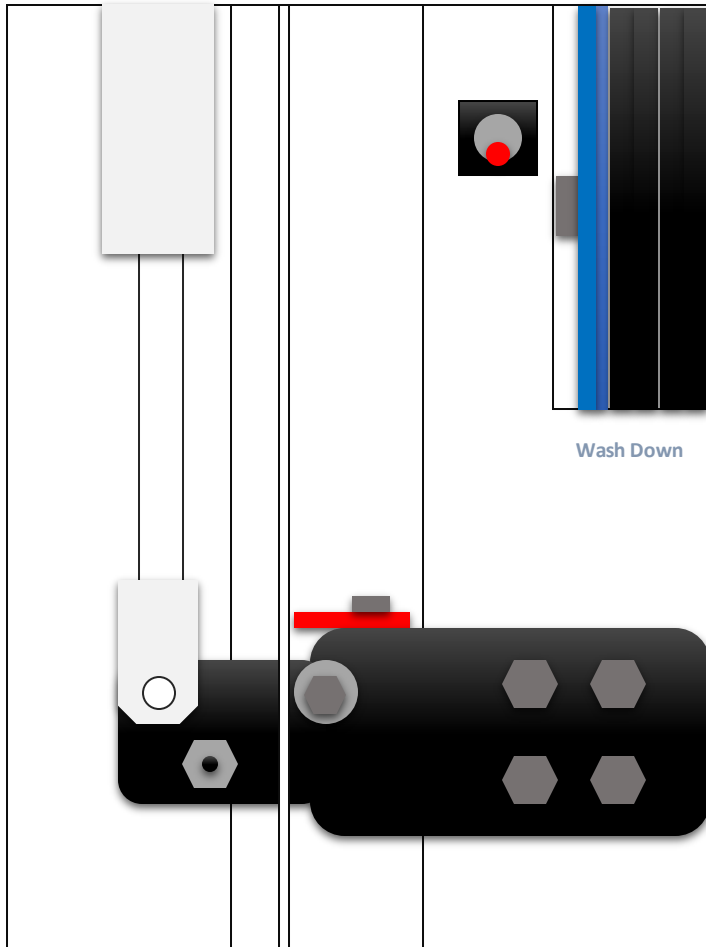
Set the Tow-Point



Where should this Tow-Point be set?

There are times that this will depend on the thickness of the mat, but a good rule to follow is **1 inch** above the loose mat thickness

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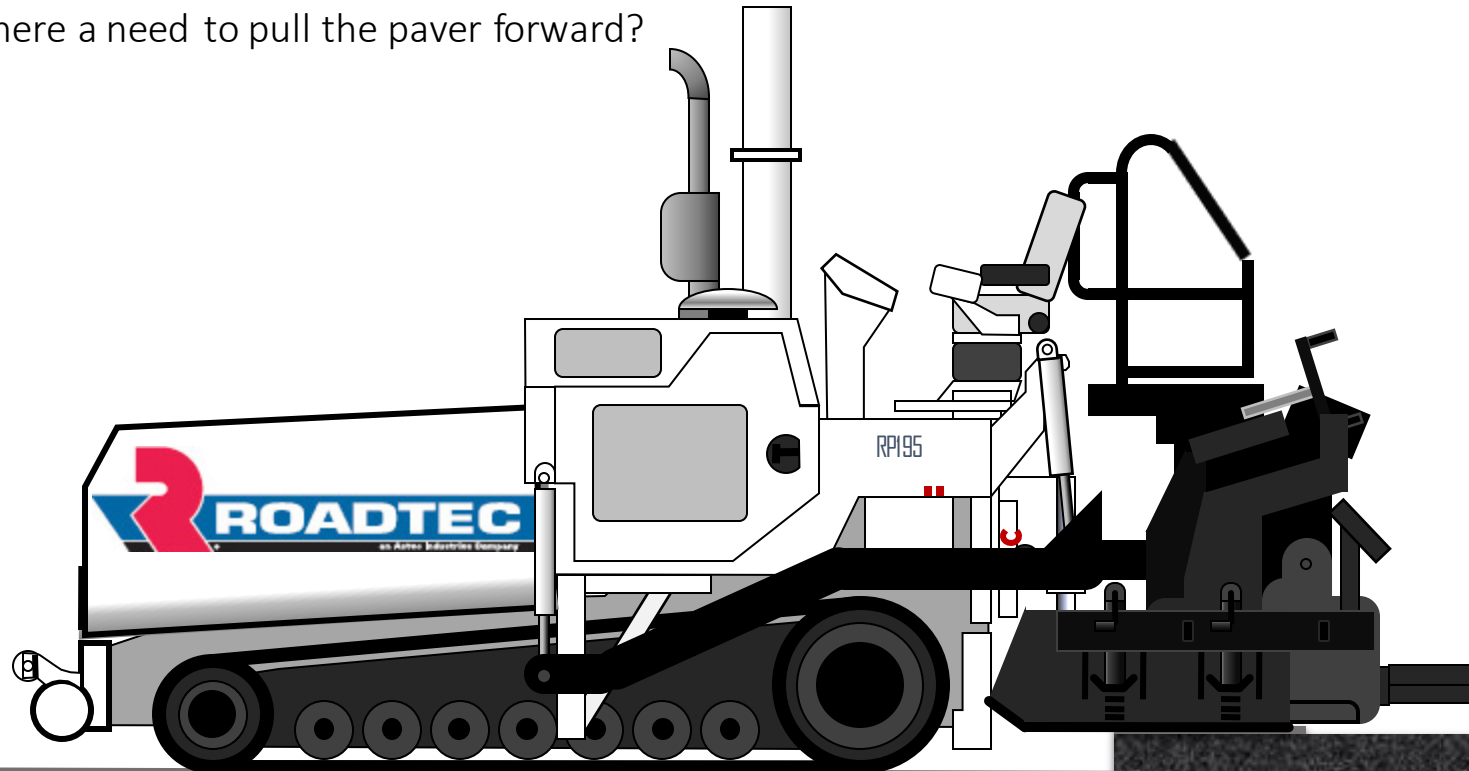


Pulling Off

Allow for your roll down.

Set the screed down and pull the slack out of the tow arm.

Why is there a need to pull the paver forward?



Pulling Off



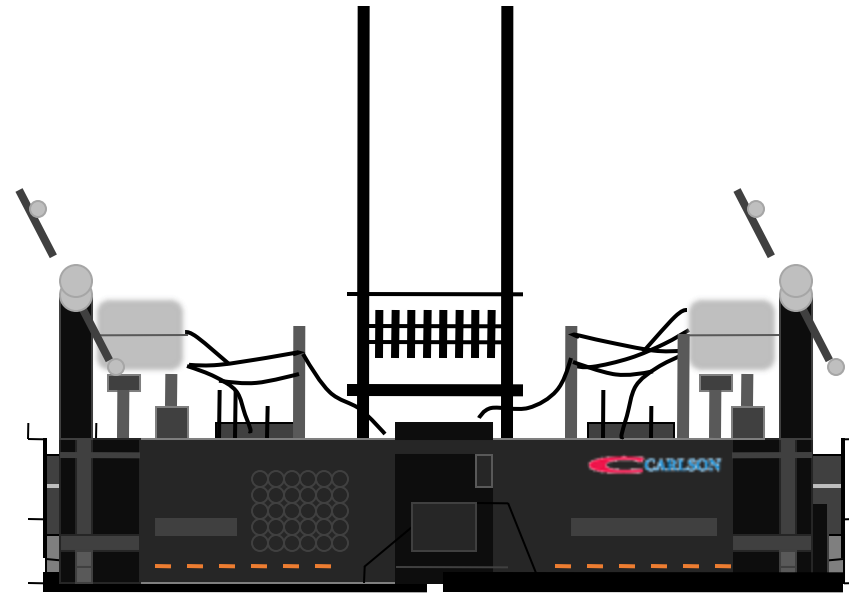
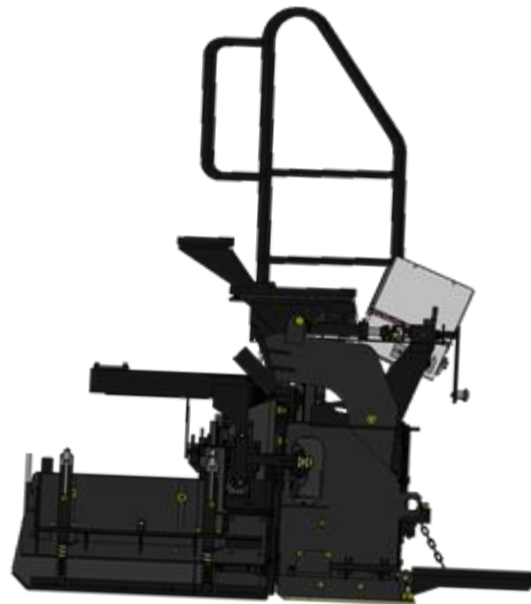
Load your auger chamber with material.

Here is a great example of containing your material as you take off.

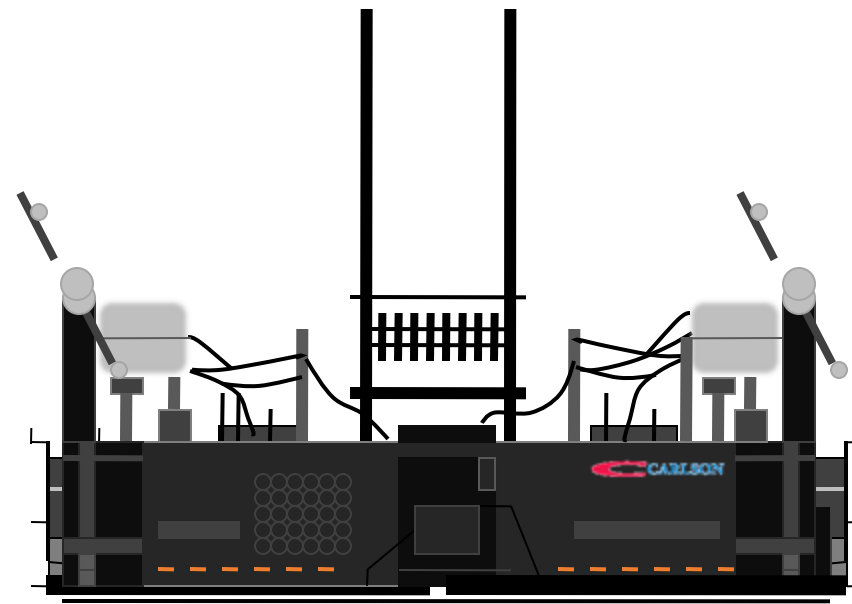
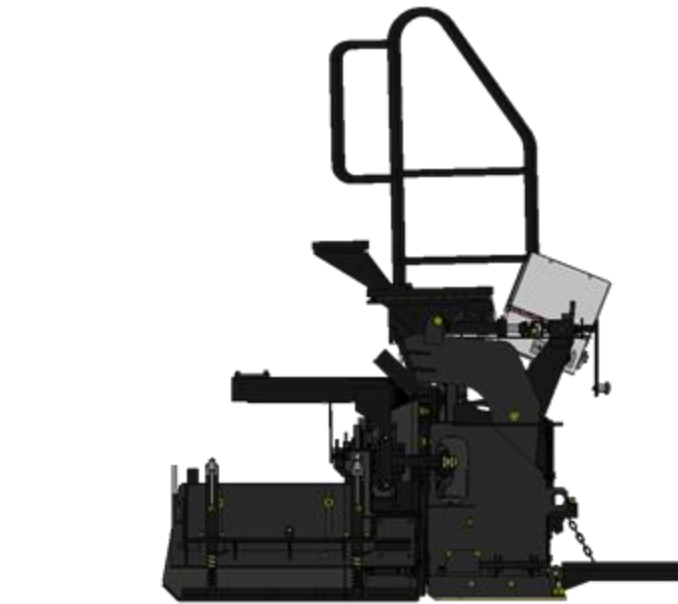
Make sure that you don't fill the auger chamber until it builds a mountain of material.



Null Out the Screed, Using Both Screws Together



Add Angle of Attack



Joint Prep

Good example of taking off on the header, except too much material was brushed up on the mat.

The result is segregation and will change the thickness of the mat. The solution is to remove the larger rock.



Joint Prep



Joint Prep

Very little has to be done to this joint after pulling off because the setups were done properly.

If you have a joint that is too thick, you have problems. The spreading or broadcasting of material is what will more than likely cause a failed joint.



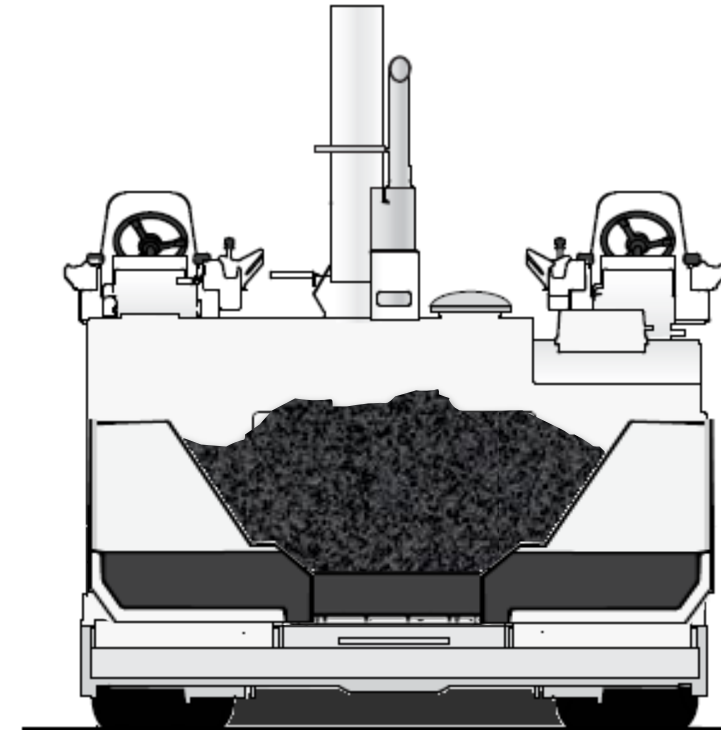
Poor Joint
Prep. Take your
time to get it
CORRECT, it will
make your day
go much
smoother.



When Should I Empty the Hopper?

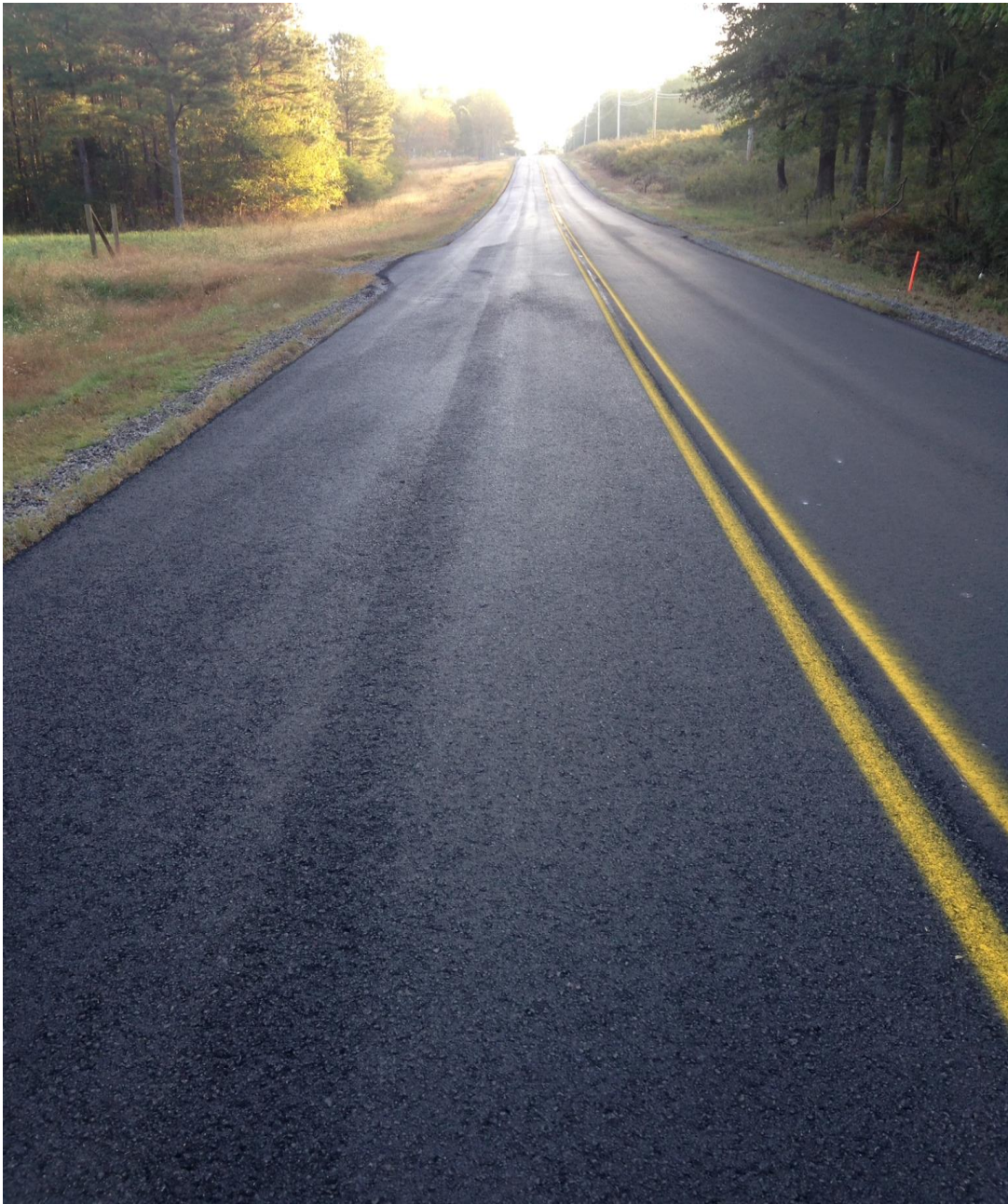
When working with segregating materials, the hopper wings should only be cycled with the hopper relatively full.

This bunches the segregated materials that collect in the hopper wings instead of flipping them into an empty center area.



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A Great Start for a Strong Joint







Paving By The Numbers

1. Heat your screed
2. Adjust tow point cylinders
3. Set paving width
4. Set main screed crown
5. Set extension height
6. Set extension slope
7. Lower the screed
8. Move the machine forward
9. Null screed
10. Set the angle of attack
11. Set auger height
12. Set the endgates
13. Position feeder sensors
14. Fill the auger chamber
15. Set feeder controls
16. Put the machine in motion



Any Questions?



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Title of Slide Here, If Needed



SLIDE OPTION #1

The graphic elements on this slide will appear on **every** slide unless using a full-framed photo. In the case of a full-framed photo please refer to slides 5 and 6 as examples.

Copy and paste elements to each slide.



OPTION #1

For full-framed photos using no Company logo. The black and gold AI bar remains below.



OPTION #2

Full-framed photos with the
company logo used in reverse.

The black and gold AI bar remains below





Title of Presentation

Presenter's Name

Presenter's Title

Presenter's Company