

Paving By The Numbers

AP1000F and AP1055F Pavers with the SE60 V XW Screed



Important Safety Information

Most accidents involving product operation, maintenance and repair are caused by failure to observe basic safety rules and precautions. An accident can often be avoided by recognizing potentially hazardous situations before an accident occurs. A person must be alert to potential hazards. This person should also have the necessary training, skills and tools to perform these functions properly.

Improper operation, lubrication, maintenance or repair of this product can be dangerous and could result in injury or death.

Do not operate or perform any lubrication, maintenance or repair on this product, until you have read and understood the operation, lubrication, maintenance and repair information.

The hazards are identified by the “Safety Alert Symbol” and followed by a “Signal Word” such as “WARNING” as shown below.



The meaning of this safety alert symbol is as follows:

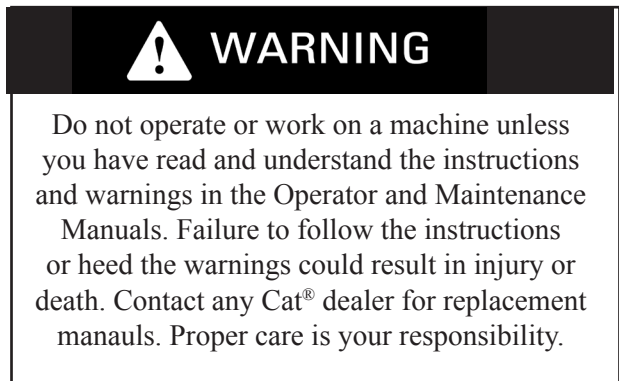
Attention! Become Alert! Your Safety is Involved.

The message that appears under the warning, explaining the hazard, can be either written or pictorially presented.

Operation that may cause product damage are identified by NOTICE labels on the product and in this presentation.

Caterpillar cannot anticipate every possible circumstance that might involve a potential hazard. The warnings in this presentation and on the product are therefore not all inclusive. If a tool, procedure, work method or operating technique not specifically recommended by Caterpillar is used, you must satisfy yourself that it is safe for you and others. You should also ensure that the product will not be damaged or made unsafe by the operation, lubrication, maintenance or repair procedures you choose.

The information, specifications, and illustrations in this presentation are on the basis of information available at the time it was written. The specifications, illustrations and other items can change at any time. These changes can effect the service given to the product. obtain the complete and most current information available.





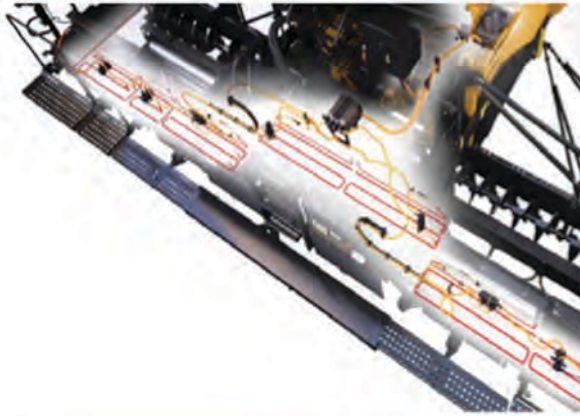
Producing a smooth asphalt surface with a uniform finish is not as simple as saying “one—two—three.” But a well-trained paver crew, which follows a set of established fundamental practices, will avoid many of the problems that affect mat quality.

The purpose of this presentation is to review the steps you should follow each time you get ready to pull off the joint and start paving.

Note: This presentation should be used for the 3 m (10 foot) F-series paver with a SE60 V XW. This does not take the place of the Operation & Maintenance manual. Please refer to this manual for further explanation about the proper use, safety warnings and control of the machine.

Paving by the Numbers

Step 1



Heat the screed

- ✓ Electric element

BUILT FOR IT.



CAT

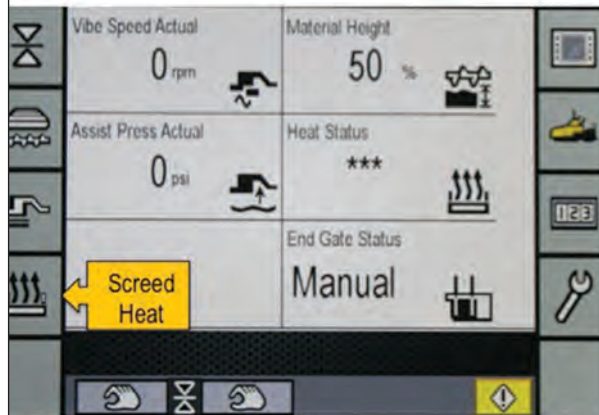
STEP 1:

Step 1 is heating the screed plates. If the screed is cold, you have to heat it before beginning to pave to prevent asphalt sticking to the screed plates. There are several types of screed heaters on Cat® screeds, diesel fired, liquid propane and electric element. In this presentation, we will talk about the electric screed heat only. If you need information on the Diesel or Liquid Propane screed heat, please refer to the Operation & Maintenance Manual (O&MM) for that screed.

On Cat extendable-type screeds, each screed frame section is equipped with a heater. One on each screed extender and two on the main screed.

Paving by the Numbers

Step 1



Heat control icon

✓ Select Screed heat

BUILT FOR IT.

CAT

STEP 1 (Continued):

The F-series asphalt paver has two spots to activate the heating system. This can be achieved on the left or the right tractor operator station or on the left or right screed operator station. Choose the screed heat icon. (Screed operators station screen shown)

Start with the screed approximately 25-75 mm (1-3") off of the ground. If the screed is at maximum height, wind can effect the performance of the heaters. Also if the screed is on the ground, the ground acts as a heat sink and it will take longer for the screed to come up to temperature.

Paving by the Numbers

Step 1



- ✓ Activate Generator
- ✓ Choose Heating Options

BUILT FOR IT.

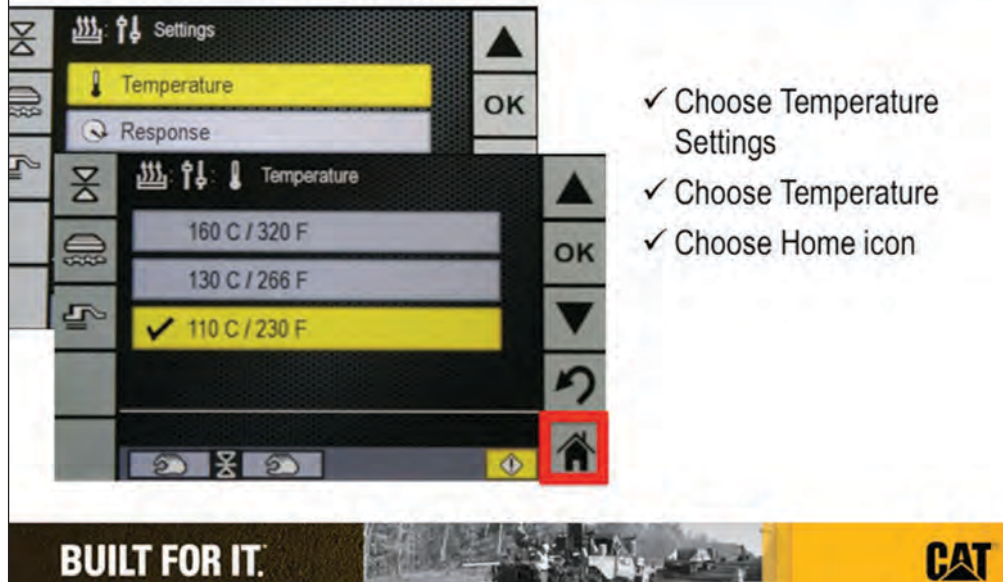
CAT

STEP 1 (Continued):

The generator icon is located on the left side of the screed heat screen. Touch the screen symbol and slide to the right. When activated the icon will turn green and the engine rpm will raise to 1300 rpm and the generator will be activated. The temperature set point can be chosen by selecting the heating option icon on the right hand side.

Paving by the Numbers

Step 1

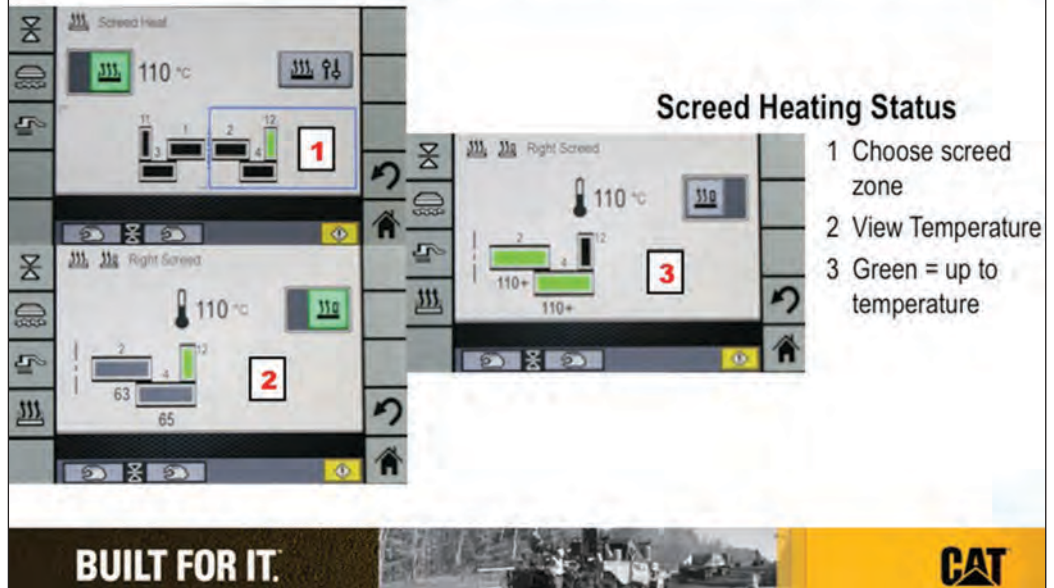


STEP 1 (Continued):

In the heating options menu, the operator can choose the Temperature title. Under this screen, three temperature set points can be chosen. These set points are 110°C (230°F), 130°C (266°F), or 160°C (320°F). Once the temperature choice has been made, touch the Home icon and continue with the setup of “Paving by the Numbers” instruction.

Paving by the Numbers

Step 1



STEP 1 (Continued):

Once the generator has been turned on and the temperature has been chosen the screed will heat up. The operator can view the status of the screed heat by touching the zone section (1). The color of the viewed zone will be black, grey (2) or green (3) (see color explanation below). Once all the zones have turned green paving can begin.

Note: Picture (2) shows the optional end-gate heater turned on and both the heater and the on/off button is shown in green. In picture (3), it is shown turned off and is black.

Temperatures of color changes:

Heat Setting / Black / Grey / Green

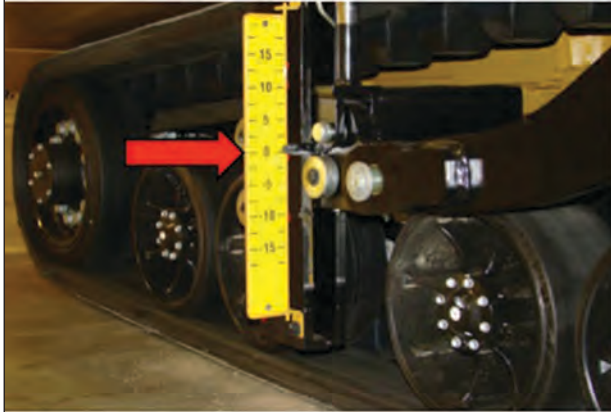
110° C (230°F) = 0° - 59° C (32°-138°F) / 60° - 109° C (140°-228°F) / 110° C+ (230°F+)

130° C (266°F) = 0° - 79° C (32°-174°F) / 80° - 129° C (176°-264°F) / 130° C+ (266°F+)

160° C (320°F) = 0° - 109° C (32°-228°F) / 110° - 159° C (230°-318°F) / 160° C+(320°F+)

Paving by the Numbers

Step 2



✓ Position Tow Arm Cylinders (shallow paving)

- 0-7.5 cm (0-3 inches) = "0" on scale
- When paving > 7.5 cm (3 inches) increase tow arm position 2.5 cm (1 inch) per 2.5 cm (1 inch) mat depth increase

BUILT FOR IT.



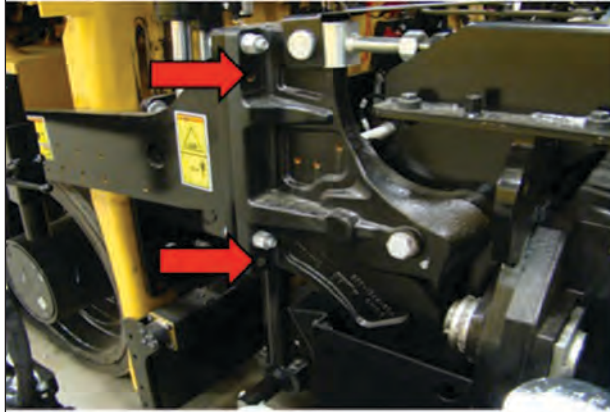
STEP 2:

Step 2 is positioning the tow arm cylinder for the correct "line on pull" for the depth that is being paved. On the F-series paver, the position of the screed attachment point can be placed in a position for shallow paving 0-18 cm (0-7 inches) or deep depth paving for 18 cm – 30 cm (7-12 inches). For shallow paving setup, the operator should adjust the position of the tow arm pointer at "0" if paving 7.5 cm (3 inches) or less. When paving at depths more than 7.5 cm (3 inches), the operator should adjust the cylinder at the rate of 2.5 cm (1 inch) per 2.5 cm (1 inch) depth increase.

| | Loose Mat | Tow Point Position |
|--|-----------------|--------------------|
| Shallow Paving 0-18 cm (0-7 inches) | 0-7.5 cm (0-3") | 0 |
| | 10 cm (4") | 2.5 cm (1") |
| | 12.5 cm (5") | 5 cm (2") |
| | 15 cm (6") | 7.5 cm (3") |
| | 17.5 cm (7") | 10 cm (4") |

Paving by the Numbers

Step 2



Deep Depth Paving

✓ 18 cm – 30 cm (7 – 12 ")

- Change tow arm position per depth being paved and mix design

BUILT FOR IT.



STEP 2 (Continued):

Deep Depth Tow Arm Position: The F-series can be setup to pave deep depth. To do this, reposition the tow arm attachment on the drop arm to the bottom set of holes.

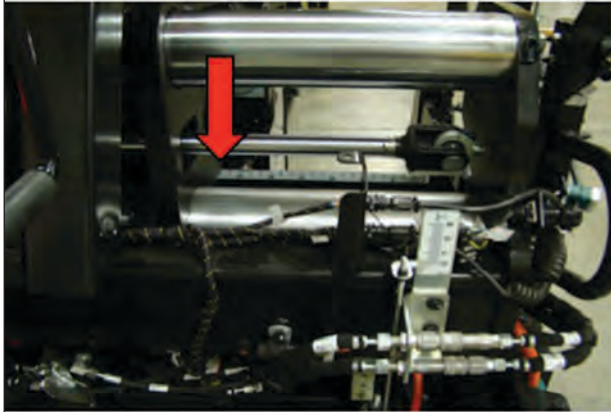
This will give the depth range of 18 cm (7 inches) – 30 cm (12 inches).

When paving at this depth the tow arm will need to be positioned in the proper location.

| | Loose Mat | Tow Point Position |
|---------------------------|--------------------------|---------------------------|
| Deep Depth Paving | 18 - 23 cm (7-9 inches) | 0-2.5 cm (0-1 inch) |
| 18-30 cm (7-12 inches) | 23 - 30 cm (9-12 inches) | 2.5 - 7.5 cm (1-3 inches) |

Paving by the Numbers

Step 3



✓ Set Paving width

- Based on the main screed width, set extender width per job specs
- Use scales on extenders
- Equal extender width on both sides whenever possible

BUILT FOR IT.



STEP 3:

Step 3 is setting the desired paving width.

With the screed still raised, move the extenders out to the proper paving width. When setting this up you will want to keep in mind the main screed width then add the additional width to meet the job specification.

Each extender has a scale which shows how far the extender is moved out from the main screed.

It is good paving practice to set equal extender width on each side whenever possible so the forces against each extender are equal.

For example, if the job specifications are a total width of 12 ft. (3.66 m), on the SE60 V / SE60 V XW the main screed measures 9 ft. 10 inches or 3 meters, to achieve the proper width move the left and right extenders out an equal amount of 13 inches (0.33 m) on each side. This will achieve the proper width required.

Paving by the Numbers

Step 4



- ✓ Set Main Screed Crown per job specs

BUILT FOR IT.



CAT

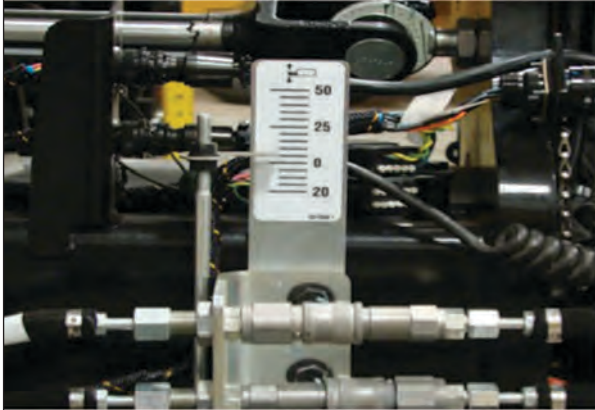
STEP 4:

Step 4 is setting the main screed crown to the specifications of the job.

Use the crown indicator scale located on the right side of the screed to set the crown. Before using the indicator scale, be sure that it is properly calibrated to the screed.

Paving by the Numbers

Step 5



✓ Set Extender height

- 5mm (3/16") above

BUILT FOR IT.

CAT

STEP 5:

Step 5 is setting the height of the extenders.

Set the height of the extenders so they match the height of the main screed. When the extender height is right, there are no transition marks in the mat.

Extender height is adjusted with a push button in each screed control box on vibratory screeds.

The SE series of screeds normally run with a 5 mm (3/16 inch) nose-up angle of attack. Therefore, on a screed with rear mounted extenders, set the extender height 5 mm (3/16 inch) above the zero point on the scale. Do this for both left and right extenders.

Again, make sure that the height indicators have been calibrated to the extenders.

Paving by the Numbers

Step 6



✓ Set Extender Slope per job specs

BUILT FOR IT.



CAT

STEP 6:

Step 6 is setting the slope of the extenders to the specifications of the job.

If there is no requirement for extender slope, set the indicator at zero on both sides.

Again, make sure that the slope indicators have been calibrated to the extenders.



Prepare Screed

- ✓ Raise the end gates
- ✓ Select starting reference that is the proper thickness and length 0.9 – 1.2 m (3 – 4 ft.) and position under extender pivot
- ✓ Support main screed and extender screed

BUILT FOR IT.



STEP 7:

In this step we first want to raise the end gates to the proper position to ensure that the screed rests on the starting reference and not the end gates.

Then select a starting reference whose thickness matches the uncompacted mat depth that will be placed by the screed. Normally, the mat will compact about 6 mm (1/4 inch per inch) per 25 mm (1 inch) of mat depth. For example, to get a 50 mm (2 inch) compacted mat, use a starting reference which is 64 mm (2-1/2 inches) thick. Use two references. Position them so they are under the pivot of the extender and completely supporting both the main screed and the screed extender from front to back. The normal length of the starting references are between 0.9 - 1.2 m (3-4 ft.).

NOTE: With the extenders beyond the halfway point, an additional starting reference for the extender may be required.

Paving by the Numbers

Step 7



Screed in float

- ✓ Make sure that the green light is illuminated next to the screed float button on the active console.

BUILT FOR IT.



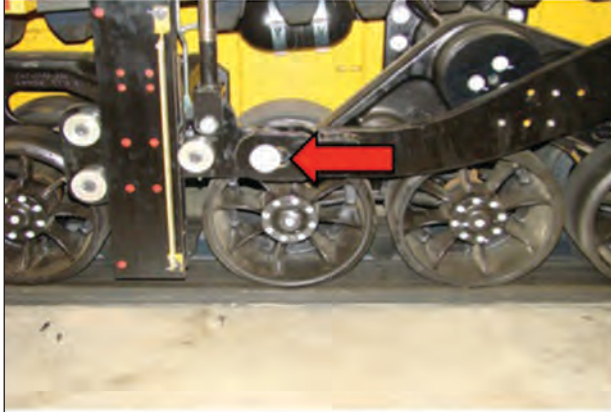
CAT

STEP 7 (Continued):

After placing your starting references, lower the screed by pressing the screed float button, making sure that the green light is illuminated next to the button. The screed is now in float and should lower to the references.

Paving by the Numbers

Step 7



Lower the Screed

- ✓ Move the machine forward to remove the slack from the tow point

BUILT FOR IT.

CAT

STEP 7 (Continued):

Step 7 also includes removing the slack from the tow arm. Move the machine forward until the tow arm roller contacts the tow point frame and both sides of the screed begin to move forward.



Null the Screed

- ✓ Null one side at a time
- ✓ Turn one depth control crank until no resistance is felt
- ✓ Repeat for the other depth control crank
- ✓ Check the first side again

BUILT FOR IT.

CAT

STEP 8:

Step 8 is nulling the screed.

Use the manual depth control cranks to null the screed. Nulling the screed should be done on one side of the screed at a time. Turn the crank in either direction until no resistance is felt. This ensures that the full weight of the screed is supported by the starting reference. Move to the other side and follow the same nulling procedure. Be sure the crank turns freely. Then, go back to the other side. Make sure the crank still turns freely.

NOTE: Repeat this until both sides have no resistance.

Paving by the Numbers

Step 8



Null the Screed

- ✓ Turn depth control crank in direction of increase until tension is felt
- ✓ Set other depth control crank the same way

BUILT FOR IT.

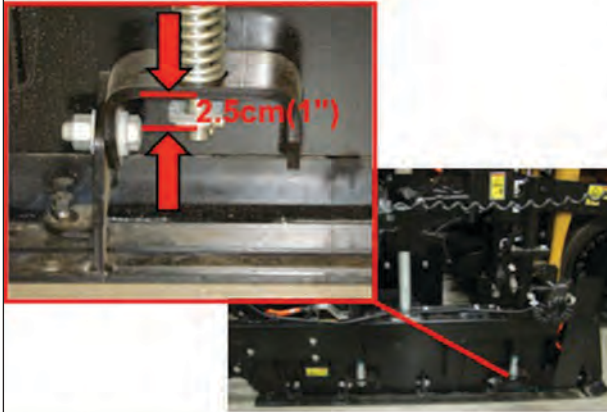


STEP 8 (Continued):

Then, turn the depth control crank in the direction that increases mat thickness until resistance is felt.

On the other side, turn the crank until you feel resistance.

On other types of screeds, you may have to turn the depth control cranks one or more revolutions to set the angle of attack. Follow the manufacturer's guidelines for the screed you are setting up.



Position End Gates per job requirements

- ✓ Manual End Gates - lower to contact grade, apply 2.5 cm (1 inch) spring tension
- ✓ Hydraulic Powered End Gates – lower to grade, Press Auto

BUILT FOR IT.



STEP 9:

Step 9 is positioning the end gates.

End gates on both ends of the screed retain material at the proper width. They float on the grade. First, lower the end gate until it touches the grade. On manual gates, raise or lower the spring tension to create 2.54 cm (1 inch) space between washer and bracket to allow for the end gates to move up and down over any grade irregularities. On the hydraulic power end gates lower them to the grade and press the “auto” button or raise even with bottom of the extender plate depending on the requirements.



Set Auger Height

- ✓ Auger height affects mat texture
- ✓ Auger height of 5 cm (2 in) above the mat is right for most mixes
- ✓ Fine tune according to mix

BUILT FOR IT.



CAT

STEP 10:

Step 10 is setting the auger height.

The height of the augers in relation to the depth of the uncompacted mat has an effect on the texture and finish of the mat.

If the augers are too low, you will probably see an open texture and maybe material segregation. If the augers are too high, the head of material will likely be too high which will cause the screed to climb. Different mixes react differently to auger height adjustment, but as a rule, set the auger height at least 5 cm (2 in) above the height of the uncompacted mat.

From the bottom of the auger to the center of the auger shaft is 20 cm (8 in). Now add 5 cm (2 in) to that. Then add the thickness of mat to be paved. The total is the distance from the centerline of the auger shaft to the grade. Adjust the auger up or down until the dimension is reached.

Fine tune the auger height after paving starts if the mix is very coarse or very tender.



Position Feeder Sensors

- Paddle Sensor
- ✓ Raise paddle arm to 45 degree angle
- ✓ Position paddle arm on mounting hardware 46 cm (18") outboard of the last auger segment

BUILT FOR IT.



CAT

STEP 11:

Step 11 is setting the position of the feeder sensors.

Position the paddle type feeder sensors so they are sensing the active pile of material about 46 cm (18 in) away from the last auger segment. With the paddle-type sensor, the paddle arm should be at a 45 degree angle at the 46 cm (18 in) distance.



Position Feeder Sensors

- Sonic feed sensors
- ✓ Perpendicular to the live material flow.
- ✓ 46 cm (18 in) away from the material
- ✓ Target moving material

BUILT FOR IT.



STEP 11 (Continued):

Sonic feeder sensors should be set perpendicular to the material flow 46 cm (18 in) away from the material. Always target the moving material.

Paving by the Numbers

Step 12



Set Feeder Controls

- ✓ Select material feed icon on the touch screen

BUILT FOR IT.



STEP 12:

In step 12 set up the feeder controls. On the left side of the tractor control panel touch screen, select the material feed adjustment icon.

Paving by the Numbers

Step 12



Set Feeder Controls

- ✓ Adjust Conveyor Control Dials to 40%
- ✓ Adjust mix height to 60% using arrows
- ✓ Select OK after adjusting

BUILT FOR IT.



STEP 12 (Continued):

Set the conveyor control dials to 40% for each conveyor. Using the arrows on the touchscreen, adjust the mix height to 60%. After adjustments are made to the mix height push the OK icon on the touchpad to accept the setting. This is a starting point for the system. The operator or screed operator can fine tune these when paving begins.

Paving by the Numbers

Step 13



Manually Fill Auger Chamber

- ✓ Machine low idle
- ✓ Manually convey material out until material just touches auger shaft

BUILT FOR IT.

CAT

STEP 13:

Now fill the auger chamber in front of the screed until the material is covering one half the auger.

Fill the chamber with the engine at low idle, one side at a time, alternating between the conveyor and auger. This helps prevent material from being pulled under the machine and overfilling the chambers.

NOTE: Do not fill the chamber using the conveyor and auger switches together or by using the feeder override switches located on the screed. This will overflow the chamber and cause a bump on take off.

Using the manual override switches, alternately convey and auger material to the auger chamber and out to the ends of the augers.

The goal is to fill the auger chamber evenly on both sides.

Use one conveyor switch at a time to move material out until it just touches the auger shaft.

Paving by the Numbers

Step 13



Manually Fill Auger Chamber

- ✓ Machine low idle
- ✓ Manually auger material across screed face
- ✓ Auger material out to establish $\frac{1}{2}$ level
- ✓ Do not overfill

BUILT FOR IT.

CAT

STEP 13 (Continued):

Then, use the manual auger switch to move material out to the end of the screed. The correct head of material covers one half of the augers.

Always fill the auger chamber using the manual mode at low idle and be careful not to overfill.

Overfilling the auger chamber will result in a bump when starting off the transverse joint.



Manually Fill Auger Chamber

- ✓ Using a shovel, hand fill area between last auger and end gate
- ❖ NOTE: Do not fill in area in front of screed extender on rear-mounted extender screeds

BUILT FOR IT.

CAT

STEP 13 (Continued):

Do not force material out to the end gate. You will overfill the chamber. Instead, move some material with a shovel to the end gate even with the face of the main screed.

NOTE: Do not fill in the area directly in front of the extender on rear-mounted extender screeds. This area will be filled by material automatically as the paver pulls forward off the starting reference.

Paving by the Numbers

Step 13



Feeder system Auto

- ✓ Press the Conveyor/Auger Auto button or individual Auto buttons.
- ✓ Verify all material feed system indicators are illuminated

BUILT FOR IT.

CAT

STEP 13 (Continued):

When you have filled the auger chamber half full—no more, no less—put the conveyor and auger mode switches on the operator's console to Auto. Either push the automatic conveyor and auger button or press individual automatic buttons for both the conveyor and auger. Verify that all four automatic system indicators are illuminated.



Set Accessory Functions

- Determine what accessories will be used

BUILT FOR IT.



CAT

STEP 14:

Step 14 is setting the accessory functions of the machine. At this point it needs to be determined what accessory functions are going to be used on the machine.



Set Accessory Functions

- Set grade controls to specifications
- Set slope control to specifications

BUILT FOR IT.



CAT

STEP 14 (Continued):

Automatic grade and slope controls are considered accessory controls. Set them according to to the job specifications. Install any averaging devices and controls as required.



Set Accessory Functions

- Refer to O&MM for all accessory functions

BUILT FOR IT.



STEP 14 (Continued):

Step 14 is setting the accessory functions of the machine.

Refer to the machine Operation and Maintenance Manual for all the functions on the machine. Here are just a few:

- Automatic Engine Speed Control
- Friction Steer
- Vibrator System On/Off and Speed
- Screed Assist System
- Timers
- Propel Hill Hold

Paving by the Numbers

Step 15



Pull Off Starting Reference

- ✓ Pave mode (1), Screed in Float (2), throttle (3)
- ✓ Turn speed dial (4) to desired target speed (5) brake released (6)
- ✓ Move propel lever full forward (7)

BUILT FOR IT.

CAT

STEP 15:

Now we're ready for step 15—pulling off the starting reference.

Make sure the gear selector is in the PAVE mode (1), the screed is in float (2), and the engine throttle is set at the chosen idle speed (ECO or high idle) (3). Then, turn the speed control dial (4) clockwise until the calculated paving speed is displayed in the target speed area of the display (5), release brake (6). Propel the machine by squeezing the trigger and stroking the propel lever (7) full forward in one quick, smooth motion.

NOTE: When calculated target speed is reached, use the propel lever to stop and start the machine using the same quick, smooth motion as before. Slowly stroking the propel lever will result in a more uneven head of material and have an adverse effect on mat smoothness.



Pull Off Starting Reference

- As paving begins
- ✓ Screed persons check material level at outboard end of augers
- ✓ Adjust mix height controls if needed to maintain material level at 1/2 auger

BUILT FOR IT.

CAT

STEP 15 (Continued):

Screed personnel observe the level of material at the outboard ends of the auger shafts to see if the auger shafts are one half covered.

There are individual material height dials on the screed control boxes which are adjusted to control the height of material at the outboard ends.



Pull Off Starting Reference

- As paving begins
- ✓ Operator checks center area of auger chamber.
- ✓ Adjust conveyor ratio controls if necessary to maintain material level at 1/2 auger

BUILT FOR IT.



STEP 15 (Continued):

As the paver comes up to speed, the operator should look down at the auger chamber. The goal is to maintain the mix level and maintain an auger speed of 20 to 40 rpm.

Use the independent left and right conveyor ratio controls to adjust the auger speed.

Paving by the Numbers

Step 15



Pull Off Starting Reference

- As paving stabilizes
- ✓ Check auger speed
- ✓ Keep auger speed in 20 – 40 RPM range
- ✓ Avoid ON / OFF operation

BUILT FOR IT.

CAT

STEP 15 (Continued):

As the paving operation stabilizes, the operator should check the speed of auger rotation. The augers should be turning uniformly in the range of 20-40 rpm.

To slow down the augers, the operator turns the ratio control dials clockwise. This action sends more mix to the auger chamber. To increase auger speed, turn the conveyor ratio control dials counterclockwise.

By all means, avoid erratic or ON/OFF operation of the augers. These conditions tend to create material segregation stripes in the mat and loss of smoothness.

Paving by the Numbers

Step 15

No Separation Marks In Mat
(Rear Mounted Extenders)



Pull Off Starting Reference

- Screed personnel
- ✓ Check for transition marks
- ✓ Mat should be uniform

BUILT FOR IT.



CAT

STEP 15 (Continued):

As paving speed and feeder system operation are stabilized, screed personnel should look for transition marks between the main screed and screed extenders.

If screed height, angle of attack and slope are correct, the mat should have a uniform texture across the full width of the mat and there should be no longitudinal lines present.

Paving by the Numbers

Step 15

Extender Screeds Too Low
(Rear Mounted Extenders)



Pull Off Starting Reference

- Extender too low, mark in line with inner edge of extension
- ✓ Raise extender until line disappears

BUILT FOR IT.



CAT

STEP 15 (Continued):

If an extender is set too low, there will be a longitudinal transition mark in line with the inner edge of the screed extender. The mat will be thinner behind the screed extender.

Use the extender height switch to raise the extender until no transition mark is present.

Paving by the Numbers

Step 15

Extender Screeds Too High
(Rear Mounted Extenders)



Pull Off Starting Reference

- Extender too high, mark in line with outer edge of main screed
- ✓ Lower extender until transition line disappears

BUILT FOR IT.



CAT

STEP 15 (Continued):

If an extender is set too high, there will be a longitudinal transition mark in line with the outer edge of the main screed. The mat will be thicker behind the screed extender.

Use the power height switch to lower the extender until no transition mark is present.

Paving by the Numbers

Step 15



- ✓ Keep speed constant
- ✓ Speed changes cause bumps or dips
- ✓ Adjust feeder system if speed must be changed

BUILT FOR IT.

CAT

The most important fundamental of smooth paving is maintaining a consistent paving speed and constant head of material.

Normally, you can set up the paver to pave smoothly at any speed that matches the delivery of mix to the job site. **The important thing is to keep the speed constant on all systems.**

If the paving speed is changed drastically, the screed will either rise or fall and mat smoothness will suffer.

Also, if paving speed changes, the demands on the feeder system change. So the feeder system controls will have to be adjusted to match the new material demands.

For quality paving results, always follow the basic fundamentals of paver set-up and keep the operation consistent.

QEDQ1843-01 (12/2014)
© 2014 Caterpillar
All Rights Reserved.

Materials and specifications are subject to change without notice.
Featured machines in photography may include additional equipment for special applications. CAT, CATERPILLAR, their respective logos, "Caterpillar Yellow" and the POWER EDGE trade dress, as well as corporate and product identity used herein, are trademarks of Caterpillar and may not be used without permission.

