

ASPHALT COMPACTION

LONGITUDINAL JOINT COMPACTION

Longitudinal joint construction and compaction involve another multi-step process that requires doing many fundamentals correctly. How the compaction team approaches the work on longitudinal joints depends on the objectives of the project.

If appearance is the main objective, then the compaction process should focus on making the joint as invisible as possible. Joint appearance is normally most important for parking lots and city streets.

If joint density is the main objective, then the compaction process should focus on achieving high density at and around the longitudinal joint. Joint density is normally most important on high-volume roads and airports. The process of creating the highest density at the longitudinal joint is the first topic to be addressed.



Having a straight edge for joint matching is a key part of building a quality longitudinal joint.

User Tip: A useful option for some applications is an edge cutter. The edge cutter installs on Cat Asphalt Compactors in order to trim unconfined edges. The trimmed edges provide an improved vertical face and a better line for matching.

HIGH-DENSITY LONGITUDINAL JOINTS

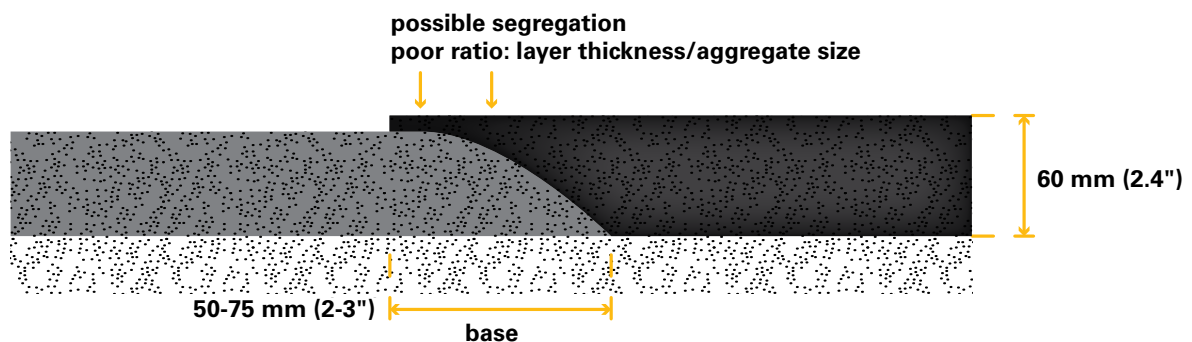
The first step in creating a quality, high-density longitudinal joint is building it correctly during the paving process. The paver operator should have a steering guide, paint stripe or string to follow. The joint edge should be as straight as possible in order to make the joint matching as easy as possible.

Next, the paving crew should have the end gate ski in contact with the grade being paved. The end gate ski should float on the grade and create a uniform vertical edge that will provide a good bonding surface for joint matching.



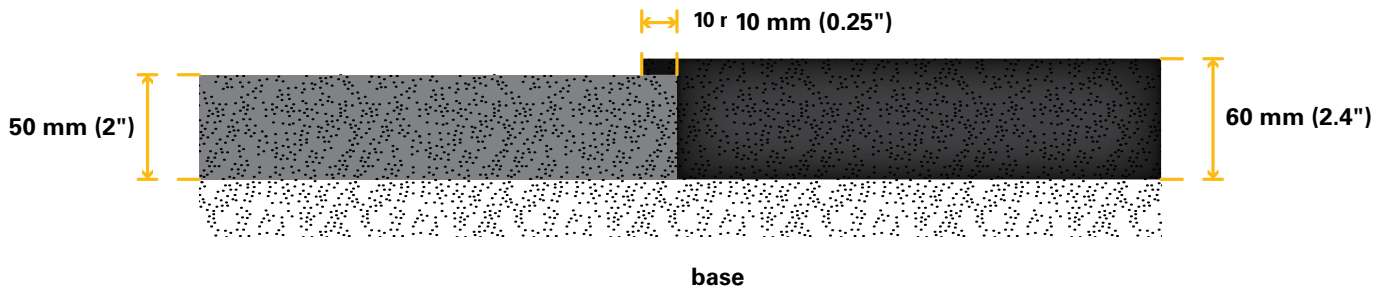
Create a vertical unconfined edge by running the screed end gate in the float position on the grade being paved.

INCORRECT SQUARE JOINT – END GATE UP



When the paving crew operates the screed with the end gates in the raised position, the unconfined edge rolls over, especially when being compacted. The sloped edge causes larger aggregate to drag under the screed when the joint is being matched by the next paving operation. You are likely to see broken aggregate along the longitudinal joint when the joint is compacted. Caterpillar recommends always running the end gates down in the float position when creating an unconfined edge that will be matched by the next lane.

CORRECT SQUARE JOINT – END GATE DOWN

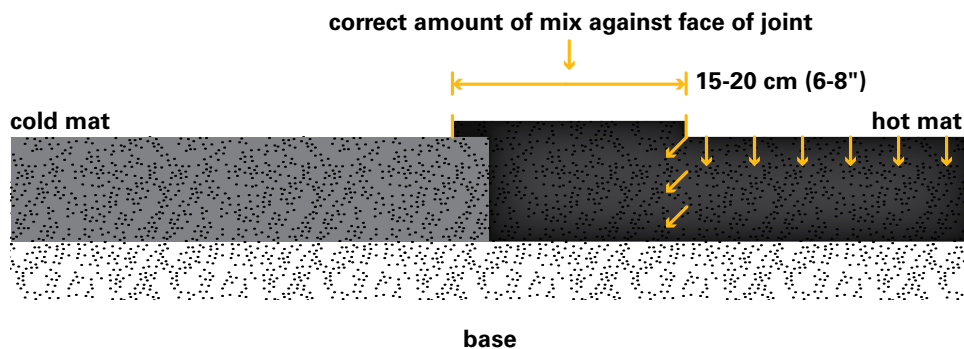


Finally, when the paving crew matches the unconfined edge to create the longitudinal joint, they should overlap the cold asphalt layer about 10 mm (0.25"). The overlap is necessary to make sure there is enough material at the joint to provide a good seal in order to prevent moisture penetration. The height of the hot asphalt layer should be enough to allow for its compaction rate. In the example above, the cold compacted layer is 50 mm (2") thick. The hot asphalt layer is laid 60 mm (2.4"). After compaction, the hot asphalt layer will match the height of the cold mat, assuming that the crew has correctly calculated the compaction rate. Remember, the compaction rate, as a general rule, is about 6 mm (1/4") per 25 mm (1") of screed laid thickness when a vibratory screed is used and about 5 mm (1/5") per 25 mm (1") when a tamping and vibrating screed is used. Always verify the compaction rate of the fresh layer when building a longitudinal joint.

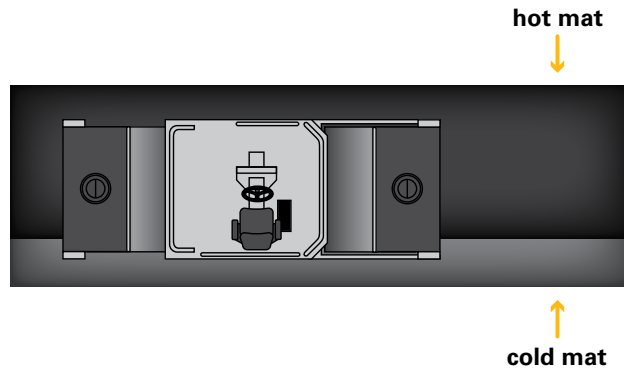
Longitudinal joint raking should be avoided. If the joint overlap and the height of the hot layer are correct, the joint will not need to be raked. Light bumping or minor handwork is permissible. The

paving crew should immediately correct the paving technique if excessive raking is needed prior to compaction.

FIRST PASS FOR HIGHER JOINT DENSITY



When joint density is the main objective of the compaction process, the first pass made by the initial phase compactor should be made with both drums on the hot mat about 15-20 cm (6-8") away from the joint. By keeping the drums slightly away from the hot / cold joint, asphalt mix is pushed toward the vertical joint face. Pushing mix toward the joint helps ensure that there will be fewer air voids in the mat after compaction is completed.



During the return pass along the longitudinal joint, the drums should slightly overlap onto the cold mat. The slight overlap will begin the process of creating joint density, sealing the joint and knocking down the hot mat so its height will be the same as the cold mat.



Pneumatic compactor sealing a hot / cold longitudinal joint.

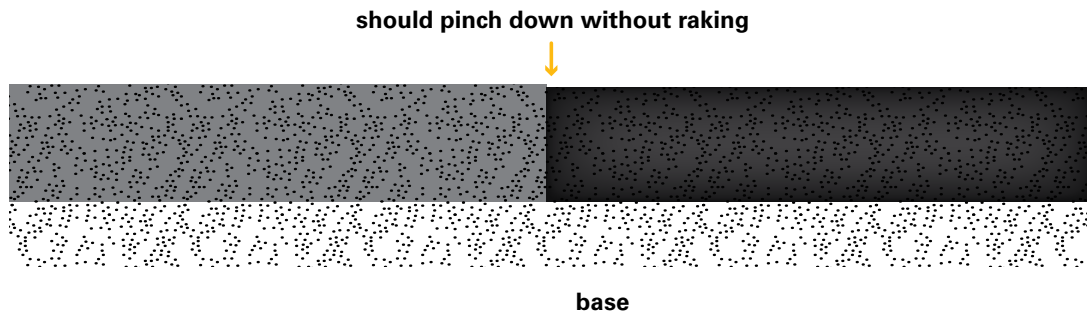
During all phases of compaction and with all types of compaction equipment, the longitudinal joint can be overlapped once the initial pass has been made.

Pneumatic compactors are especially good at knocking down the hot layer in order to equalize the height of the two asphalt layers.

User Tip: If a vibratory compactor is used to overlap the joint, be careful not to overlap more than about 16 cm (6"). If too much of the vibratory drum is on the cold, compacted mat, drum bouncing is likely to occur. You may see ripples in the fresh mat and fractured aggregates showing on the cold side of the joint.

User Tip: If there is a slope difference between the cold mat and the hot mat, be careful not to straddle the joint. Two different slopes create a crown along the joint. The crown is specified for drainage. Straddling the joint will knock down the crown and interfere with moisture drainage.

CORRECT SQUARE JOINT – END GATE DOWN



The compacted longitudinal joint should result in height match between the two layers and a high degree of density. The joint should be sealed and tight to resist moisture penetration. Remember, there are three keys to achieving good longitudinal joint density.

- Joint faces are vertical with the correct pre-compaction height
- No raking—light bumping permitted
- First pass 15-20 cm (6 -8") away from the joint

JOINT COMPACTION FOR APPEARANCE

On some projects, the main goal is to make the longitudinal joint disappear as much as possible. The task is made easier if the longitudinal joint is between hot mats being laid down simultaneously

by multiple pavers working in echelon. Creating better appearance is also easier if the joint is between a hot mat and a warm mat that is still somewhat pliable at the surface.



Sealing the longitudinal joint during the first pass improves the appearance of the joint.

To create a longitudinal joint with the best final appearance, make the first pass along the joint with most of the drums on the cold side of the joint and a slight overlap on the hot side. The compactor must be operated in the static mode during this pass to avoid bouncing on the cold side.

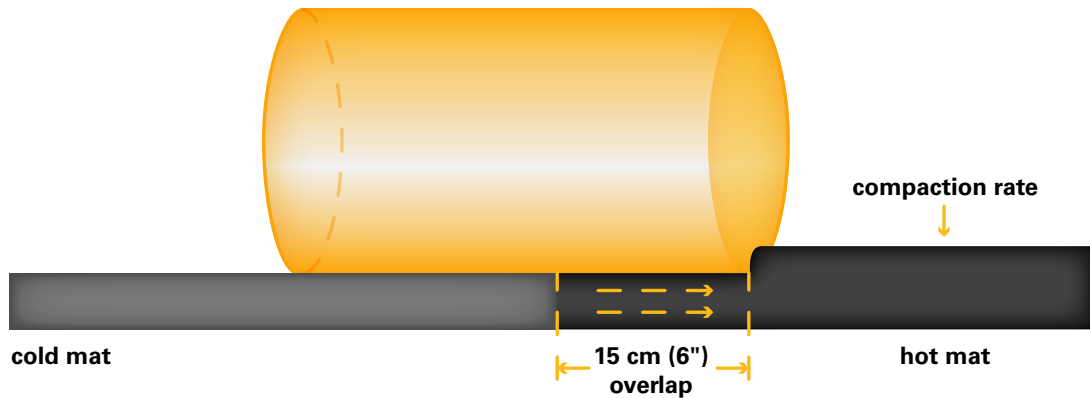
Before setting up a pattern to include a first pass to seal the joint, be sure you have considered the following factors:

- Is there enough time to include this pass in the pattern? Since you make this pass in the static mode with the drums mostly on the cold mat, there will be no density increase in the hot mat. You may have to increase compactor working speed in order to keep up with the paver. Use the Cat Interactive Production Calculator to verify that the extra pass is possible.
- How much mat temperature will be lost by adding the extra pass? The temperature of the asphalt layer is critical to achieving target density. When the ambient temperature is low and the mat is thin, heat loss occurs quickly. It may not be possible to use the initial phase compactor for the pass that seals the joint. Perhaps you'll need to add another compactor to complete this extra pass.
- Is there enough space on the cold side of the joint to accommodate the width of the compactor? If you are working on a road or street project, there may be traffic cones or some sort of barrier close to the longitudinal joint that would prevent you from working on the cold side. You may have to use a narrow drum compactor more suitable for operating in a confined space.

If you're paving and compacting a parking lot or working in a new residential area, you probably will not have to worry about traffic or space. However,

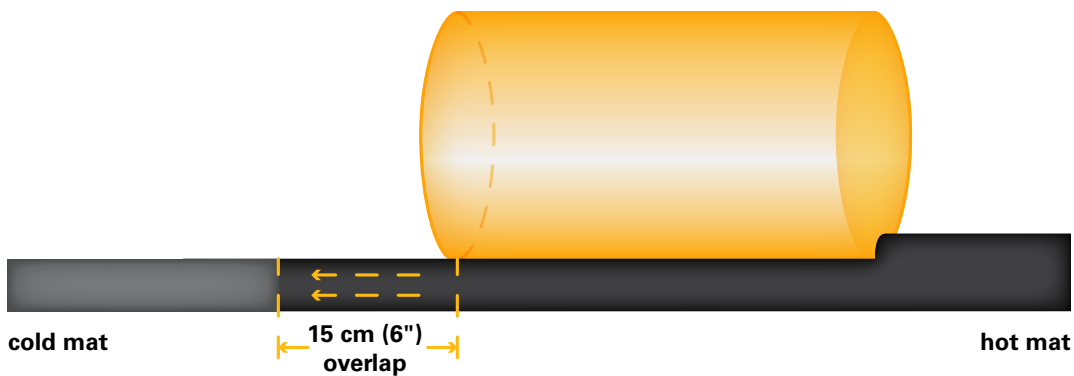
you should always confirm production requirements and mat temperatures when planning to include a joint-sealing pass.

LONGITUDINAL JOINT – FIRST PASS



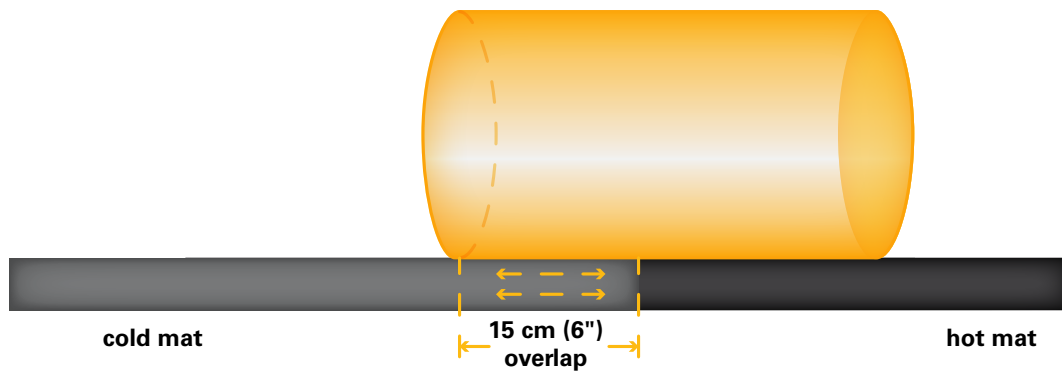
During Pass One, the drums slightly overlap onto the hot side. From an appearance standpoint, the drums effectively push the hot mix down to make the joint height equal on both sides. From a density standpoint, some mix is pushed away from the joint as there is no confinement near the drum edge.

LONGITUDINAL JOINT – SECOND PASS



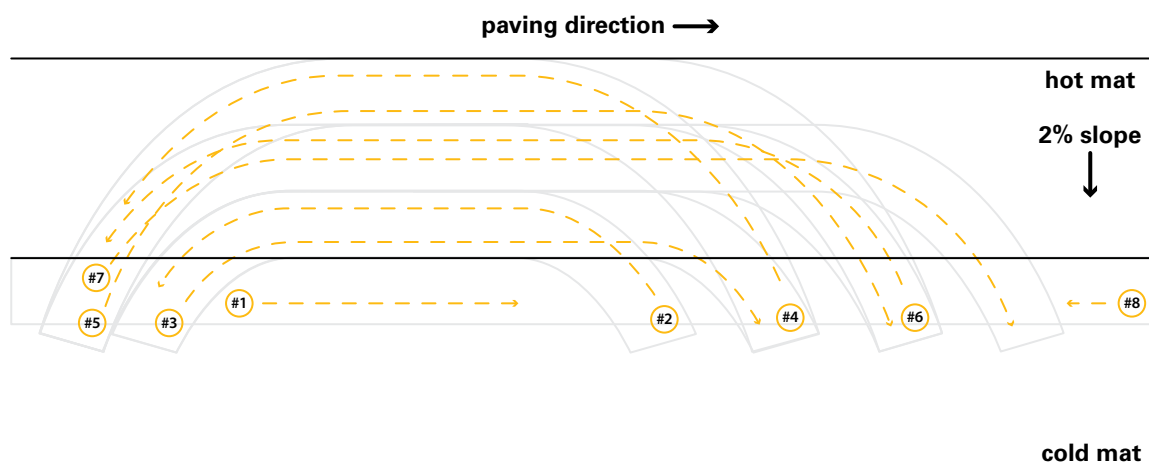
During Pass Two, position the compactor with both vibratory drums completely on the hot mat with the drum edge about 15 cm (6") away from the joint face. This vibratory pass starts to create the required density and tends to push a little mix back toward the longitudinal joint.

LONGITUDINAL JOINT – THIRD PASS



During Pass Three, position the compactor so the drums slightly overlap the longitudinal joint with most of the drums on the hot mat. Since the overlap onto the cold mat is small, you can operate with the drums vibrating. All other passes, if any, with all other compactors can overlap the joint during passes adjacent to the longitudinal joint.

COMPLETE ROLLING PATTERN



Assuming that two passes achieve target density, the rolling pattern looks a little different because of the first pass to seal the joint. In this pattern, you also can take advantage of the cold mat to stop and reverse the compactor. Notice that during Passes Four and Five the operator has moved to the unconfined edge. The unconfined edge should be compacted after the joint when the mat slopes down from the joint toward the unconfined edge. Passes Six and Seven complete the mat coverage by compacting the center of the mat.

At the end of Pass Seven, the compactor operator has stopped to reverse on the cold mat and is located some distance ahead of the point where the joint has already been sealed. Therefore, Pass Eight is a return static pass with most of the drums on the cold mat. After Pass Eight, the operator can position the compactor to begin a new pattern. Because of the joint-sealing pass, the rolling patterns end with the initial compactor in different locations.

If you use a rolling pattern like the one shown, the pass counting map is a good option to help the operator develop consistency.