BEST PRACTICE ROLLING PROCEDURES FOR HMA

Breakdown Rolling:

1. Primary Roller is 1 or 2 Double Drum Vibratory Rollers
2. Set up rollers with proper amplitude and frequency settings. Amplitude is set according to lift thickness; 1 1/2 inch to 3 inches low amplitude 3 inches or greater high amplitude. My recommendation for amplitude and frequency settings for a wide range of lift thickness and mix designs is: run at low or lower amplitude range and the highest frequency designed into the roller.
3. Check the following before starting production: engine oil and water; hydraulic sight gauge; any daily lube points; water spray system-check to see all nozzles are spraying equally and covering the entire drum to the drum edges. My recommendation is to carry extra nozzles and welding wire to clean out nozzles.
4. Set travel speed of vibratory roller at 2-4 mph depending on frequency. My recommendation is to maintain a minimum of 10 Impacts Per Foot (IPF); and maximum 1.2 inch spacing between impacts. The maximum IPF is 14. IPF is directly related to Frequency, Travel Speed, and number of passes. A pass is any single movement of the roller from one point on the HMA mat to another.
5. Set the roller in the automatic or manual mode; auto mode: the vibration automatically comes on and off at a given travel speed- manual mode: the operator shuts the vibration on and off manually. My recommendation is to operate vibe on and off manually; except at night, the roller operator might try auto mode due to fatigue of operator and forgetting to shut off vibration behind the paver.
6. The BREAKDOWN zone is a time, distance and temperature zone. Depending on the mix design, mix temperature, base temperature, ambient temperature, wind, and sun direction: the breakdown roller should operate in a distance no more than 200 foot from the screed of the paver; depending on the conditions listed above. This distance will be shorter on cooler base, ambient, and mix temperatures. My recommendation: keep the breakdown roller in a temperature range of the mat to obtain density in not more than 2-3 passes in any marked spot on the mat. With warm mix asphalt WMA: since we have lower mix temperatures; we should stay closer to the screed on the paver to maximize density in the fewest passes. We have seen with warm mix that we sometimes can reduce the number of rollers in the INTERMEDIATE rolling stage. This is dependent on the warm mix process and the mix design.

7. On the start up joint or transverse joint; My recommendation: use a smaller double drum vibratory roller than we use as main line roller to cross roll the transverse joint in the static mode, or if the area does not give us space to cross roll joint; roll joint on the 45 degree bias this is two passes in and out; move to the other side of joint and make two passes in and out on the 45 degree angle. DO NOT make the first passes straight into the transverse joint, in the direction of paving. This will result in a low density area at the joint and a possible dip or depression in the mat.

8. Start the rolling process from the low side to the high side of the mat except when we are matching the joint roll the longitudinal joint first; except when we are matching a notch-wedged non supported edge: start the first rolling passes from the outside edge and rollup to the longitudinal joint-this allows time for high temperature to
transfer heat to the notch and wedge, and gain density and stability on the longitudinal joint.

9. Start checking pass density pattern in the first passes with the breakdown vibratory roller with QC technician. My recommendation: mark a spot on the mat make a pass vibrating at production travel speed over the spot, check density and temperature; make a second pass, check temperature and density; third pass, check temperature and density. My recommendation: if a large percentage of passing or bonus density is achieved in two passes set up a rolling pattern based on two passes in any travel lane. Than cut a core where we took density tests with densometer; to correlate densometer with cored density.

10. My recommendation for a pass pattern on the first pull with two non supported edges with 12 foot- 14 foot paving width with 66 inch wide vibratory roller- make first pass staying 3-6 inches from nonsupported edge from low side of mat with roller vibrating, within 10 foot of paver shut off vibration and make a slow gradual angle turn into paver screed- second return pass, overhang 3-6 inches of vibrating drum on non supported edge; move roller on compacted material to high side of mat and repeat the first and second passes made on low side of mat. Make the 5th return pass up the middle of the mat- than move back into rolling patter from low side. DO NOT overhang more than 6 inches on non supported edge. DO check temperature behind paver screed before starting passes with breakdown roller. DO have QC technician check density behind paver screed and behind each pass with vibratory roller in BREAKDOWN zone. With a 78 inch or 84 inch drum width on a vibratory roller; you might not need to make 5th pass vibrating; but static; with an 84 inch drum width you could be over rolling the middle of the mat considering overlap with
pass 1 and 3. The other method of setting a rolling pattern in the BREAKDOWN zone; is utilizing two double drum vibratory roller in an echelon pattern- one roller on low side of mat the second roller on high side of mat, right off the rear of roller on low side. Both these rollers should be matched models to assure we are putting equal centrifugal force into the mat, and getting uniform density full width of the mat. The pattern follows the 5 pass pattern described above- with the roller on the low side making pass one and two; the roller on the high side making passes three and four. The roller on the low side starts the rolling- the roller on the high side follows and stays within 1 foot of roller on low side- on the return, 2nd pass the roller on the high side moves first, with the roller on the low side following-staying within 1 foot of roller leading. The 5th pass- the roller line up in tandem and make pass up the middle of the mat; follow procedure for 5th pass for 66inch, 78inch, or 84inch roller widths as described above.

11. The INTERMEDIATE rolling zone is a time, distance, and temperature zone that can be rolled with a second or third double drum vibratory roller; or a pneumatic roller. My Recommendation: if you encounter a temperature rolling zone in the INTERMEDIATE zone that the mix goes tender and moves and cuts under the double drum vibratory roller- get the double drum vibratory roller out of this zone. This is the TENDER ZONE; this zone is related to super pave high stability mixes, with high gyration at design, and absorptive aggregate. The only roller we have used in this zone is a pneumatic tired roller. This zone is a temperature related zone that begins at 260degrees – 220degrees mat surface temperature, and ends at 150degrees-170degrees mat surface temperature. When using a double drum vibratory roller in the INTERMEDIATE zone; follow the
same rolling patterns and procedures outlined for the breakdown rolling zone.

12. My Recommendation in the INTERMEDIATE rolling zone is the use of the Pneumatic Tired Roller. 1. The roller should be checked for engine oil and water, hydraulic sight gauge, any daily grease points, and water tank and spray system. Check the pneumatic tires to see they are aired up to the same uniform tire pressure; so we will get uniform pounds per square inch(PSI) compactive effort and uniform density. With a 11:00x 20 18 ply tire; I recommend you inflate this tire to 90lbs. of inflation pressure, this gives you approximately 80 PSI on the mat; with a roller ballasted to 20 tons. Beyond this recommendation, check the manufacturer’s tire chart. My recommendation:

2. use an approved release agent in the water tank of roller; and sprayed on tires with the water spray system on both modified and non-modified mixes. I also recommend the use of heat retention shields that hold heat in around the tires, to help eliminates pick up; and keep the wind from cooling the outside pair of tires and getting asphalt pick up. 3. Start the rolling process from the low side of the mat; making 4 passes in any one spot on the mat. My recommendation:

4. with the new squared profile tires on the pneumatic tired rollers; that give us a very smooth surface; the QC technician should be checking the density behind each pass with the pneumatic roller. The density behind the first pass with a pneumatic tired roller will sometimes show lower than what we had with the breakdown roller or rollers; do not be alarmed, with the confined manipulation with the pneumatic tired roller, we sometimes see lower density in the first pass- the density will increase in succeeding passes. Do not expect any density increase with pneumatic tired roller if applied in Tender Zone, described above. My recommendation:

5. make these four passes at a travel
speed of 21/2- 3 mph; you have to have “dwell time” on
the mat to impart the forces of PSI pressure and confined
manipulation. Keep the roller in a mat surface
temperature of 180 degrees F - 205 degrees F; to obtain
density and keep the asphalt from adhering to the tires.
DO NOT make a turn out at the end of each pass. Let the
roller coast to a stop, don’t use the foot break. DO NOT
stop the roller during the day’s production.
13. The FINISH rolling zone is a time, distance, and
temperature rolling zone. We use a static steel wheel
roller; or double drum vibratory roller utilized in the
static mode to FINISH the mat and achieve final
smoothness. My recommendation: 1. if you use a tandem
static steel wheel roller, not vibratory, turn the driven,
larger diameter drum toward the direction of paving, to
eliminate any possibility of pushing the mat and causing a
transverse crack. If you are rolling behind a Tender
Zone; the mat surface temperature to start the FINISH
roller is 150 degreesF. 2. If you use a double drum
vibratory roller as a FINISH roller; DO NOT vibrate the
roller, run the roller in the static mode. 3. There has been
some application of larger, 20-30 ton ballasted weight
pneumatic tired rollers with the squared profile tires, as
finish rollers. 4. The rollers applied in the FINISH rolling
zone should be run at a temperature range to take out the
marks without leaving additional marks. 5. The QC
technician should check final density and smoothness
behind the FINISH rolling zone.

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