Train noise – notes – April 15, 2017 – Bob Kingsnorth – rckingsnorth@aol.com

Summary

Moving model locomotives and cars create vibrations, creating noise. Our locomotives create low pitched vibrations/noise from imbalanced motors, flywheels, gears. Gear teeth "clash". The rolling wheels on rail of our cars produce a higher pitched vibration/noise. (Like studded tires?) Although these vibrations/noises are transmitted through the air to our ears, the major culprit of the noise is the vibration transmitted through the roadbed to the base plywood, which acts as a sound board to amplify these noises. Perfectly tuned locos and perfectly smooth car wheels can reduce the vibrations. But more effective are various roadbed materials and combinations that reduce the transmission of vibrations to the plywood. A roadbed of cork on camper tape on plywood is a very effective combination to reduce the transmission of vibrations to the plywood.

Model train noise factors:

Vibrating locomotives and rough car wheels create vibration/noise.

A wide sheet of plywood is a significant sound board that amplifies the vibrations/noises. A 2" wide "cookie cutter" strip of plywood supporting your track is a much smaller sound board, and will reduce the sound board effect. Likewise, narrow "spline" roadbed has the same positive effect. My observations suggest that a base of home insulation foam board transmits the most vibration and creates the most noise.

High speeds create much more noise. A long train at 60 MPH can be very noisy. A slow speed switching layout is much less noisy. Likewise, a 60 MPH N scale train moves at half the speed of HO, and therefore should make less noise.

My tests and experience are based on HO. I expect similar (perhaps reduced) effectiveness for N, S, and O.

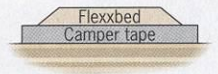
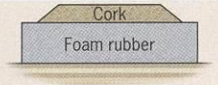
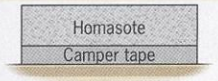
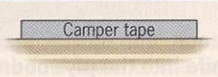
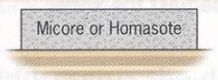
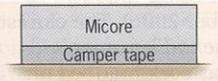
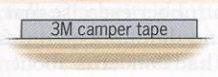
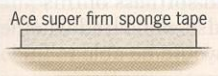
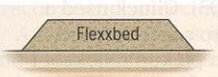
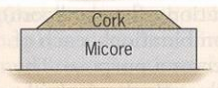
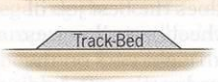
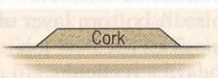
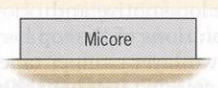
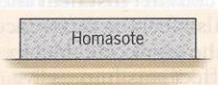
Your evaluation of noise depends upon your hearing, and upon your expectation of what is "acceptable". A noisy club room reduces the value of attempts to reduce model train noises – but even in the noisy environment, noise reduction will improve the operator's enjoyment of on board sound systems. The value of noise reduction is most apparent in the quiet of a home layout with one or two operators.

My techniques for installing cork on camper tape roadbed

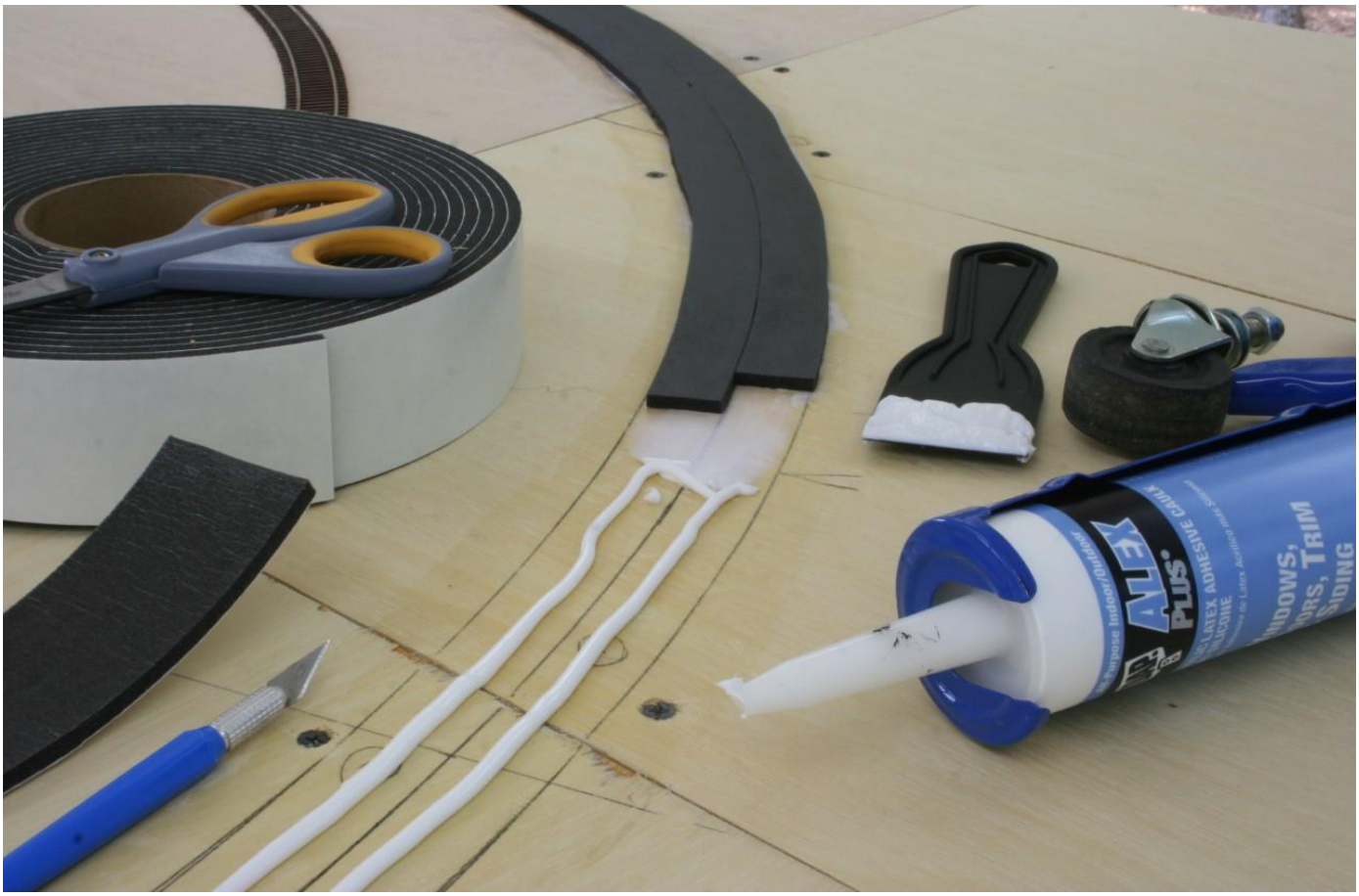
I use DAP Alex Plus latex caulk (clear) for gluing camper tape to plywood, cork to camper tape, and track to cork. Although "clear" caulk is milky white from the tube, pencil lines and centerline cork joints are very visible with a thin application of caulk. Although the camper tape has an adhesive, it is very tacky and is "one touch grab". Applying the caulk to the plywood allows reasonable adjustment of the camper tape. If I pre-paint the track, I can use the wet caulk to glue the track AND ballast to the cork. The long term flexibility of the caulk helps to reduce any negative effect of adding ballast later with white glue, matte medium, Wood Scenic cements, etc. Using the wet caulk for the ballast is quick and easy. When ballasting with caulk, apply a thick (1/16") layer of caulk. Press the track into the caulk. Then liberally spread the ballast and compress it gently into the wet caulk. When dry, vacuum or sweep away the excess ballast. (How does that compare to the time it takes to later apply loose ballast and carefully add dilute glue?) Camper tape is soft and easy to compress and stretch, changing its thickness. Installing straight sections with the paper backing still attached helps significantly. The paper backing must be removed before laying a curve, so the tape must be laid

carefully without stretching or compressing. For curves, I find a strip 24”-30” long a comfortable working length. I split the 2” wide camper tape down the middle for curves, even on my 32” radius curves. I think that 24” curves could be laid with full width tape (perhaps creating a very minor “negative super elevation”). Tighter curves deserve the split tape. I recommend laying the curve inside strip first, providing a “firm centerline shoulder” when laying the outside strip. (The same technique applies to laying cork.) Even on sharp curves, the camper tape does not need pins to hold it in place while the caulk dries. Cork needed pins even on my 32” curves. I allow the caulk to dry overnight before adding the next layer. Camper tape (2” for HO) should be available from any shop that installs canopies or camper shells on pickups. For N scale, try “Ace” or “Do-It” camper tape (gray), 1-1/4” wide. In desperation, Google “gaska tape” for their V710 tape 3/16” thick. To split the camper tape in half, lay a straight length of duct tape on a surface (plywood?) and lay the camper tape on the duct tape. Using a straight edge and a sharp knife, split the camper tape. The camper tape can be removed carefully from the duct tape. Keep the paper backing attached to the camper tape until you are ready to lay your curves.

Sound Evaluation of Roadbed Configurations

Configuration		Overall effectiveness (1 is best)	High pitched noise (wheel-to-rail)	Low-pitched noises (locomotive)	Comments:
	Cork on camper tape	1	1	2	Very good control of noises. Thick caulk provides a further, but small, improvement in high-pitched noises.
	Homabed on camper tape	1	1	2	Very good control of noises. Thick caulk provides a further, but small, improvement in high-pitched noises.
	Flexxbed on camper tape	1	1	2	Not as quiet as other top performing combinations, but lower pitch. Ballast slightly increases high-pitched noise.
	Cork on 3/8" foam rubber mat	2	1	1	Very good noise control. Very thick and soft roadbed. Availability of foam rubber mat may be a problem.
	Homasote on camper tape	2	1	3	Produces higher-pitched noise than others, but at a lower volume. Low-pitch damping is not as good.
	Camper tape	2	2	1	Material by itself is soft, but acceptable. Good damping of low-pitch noise, but high-pitch noise is noticeable.
	"Floating" track on Micore or Homasote	3	2	3	Loosely attached track with minimum spikes or nails. Noise damping qualities are lost when ballast is glued.
	Micore on camper tape	3	2	3	Results similar to Homasote/camper tape, but high-pitched noises more noticeable.
	3M camper tape	4	3	2	Top surface is a tough plastic film that must be removed if the tape is to be formed around curves.
	ACE Hardware super firm sponge tape #57632	4	4	3	Available in one size - 3/16" x 1 1/4".
	Cork on Track-Bed	4	4	4	The cork seems to reduce high pitch noises and the Track-Bed reduces low pitch vibrations.
	Flexxbed	4	4	4	Provides some damping of high and low pitched noises.
	Track-Bed on camper tape	4	5	2	Moderate damping of low pitched noise. Seems to emphasize high pitched noise.
	Cork on Micore	4	4	5	A reasonable blend of high and low pitch noises, but somewhat louder than other combinations.
	Track-Bed	4	6	3	Good damping of low pitched noise. Seems to emphasize high pitched noise.
	Cork	5	6	6	Traditional configuration.
	Micore	5	6	6	Traditional configuration.
	Homasote	5	7	6	Traditional configuration.

Note: I established the overall effectiveness by ranking the sum of the low-pitch damping plus double the high-pitch damping plus any demerits for concerns of availability or awkward installation. I found the high-pitch noise to be more intrusive, therefore gave it a double weight.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