



HOT-MIX ASPHALT

FOR SILAGE FLOORS AND FEEDING BUNKERS

The goal of a successful stock or dairy farm is to obtain the most sanitary conditions at the least cost. Paving cattle pens, feed lots, silage platforms, and bunker and stack silos with hot-mix asphalt (HMA) has proven to be a good way to achieve this goal — because HMA pavements are economical, durable and easily constructed.

Livestock need a hard surface around silos and feeding bunkers to help keep them clean. Surfaces paved with hot-mix asphalt keep livestock out of the mud and muck, keeping the animals cleaner, reducing disease and providing improved hygiene. Farmers, as well, benefit from improved working conditions around silage bunkers with paved surfaces. Cleaner equipment equates to less wear and tear and potential maintenance.

The two most common floors for silage bunkers and feeding areas are concrete and hot-mix asphalt. Silage goes through a fermentation process, which creates acid and alcohol, and when placed on concrete, these fluids attack the concrete and cause it to deteriorate. Deteriorated concrete flakes can cause digestion problems for livestock, as well as silage waste and clean-up problems for farmers.

Unlike concrete, HMA is resistant to silage acids and animal wastes and does not readily deteriorate. The HMA surface stays smooth and structurally sound. And asphalt pavements are easy to clean, offering a practical solution to mud, dust, and concrete deterioration.



HOT-MIX ASPHALT

FOR SILAGE FLOORS AND FEEDING BUNKERS

HMA VERSATILITY AND DURABILITY

HMA is a versatile product used for many farm applications. Cattle that feed on a clean, dry paved yard stay cleaner than those fed on an unsurfaced, muddy yard. Trench silos for production of silage feed are also more efficient when the bottom is paved with HMA. The HMA pavement prevents contamination of the silage and facilitates proper drainage of the site.

Additionally, HMA can be used for farm equipment yards, farm driveways, and equipment staging areas. Farm equipment is easier to maintain when the mud and muck of unpaved surfaces is minimized.

HMA silage floors can be constructed in stages, with the final surface course being constructed a year or more after the base course. The materials used and the thickness of each layer of HMA depend on the amount of heavy vehicle traffic, ground conditions and climate.

High quality and properly placed HMA is the ideal paving material. But all HMA is not the same. For barnyard pavement, what is needed is a quality aggregate blend and a liquid asphalt binder that is appropriate for the local climate.

If the contractor uses good materials, and follows recommended specifications, a properly paved barnyard or feeding area should last for many years. Some HMA floors that have been installed for agricultural uses, both in hot and cold climates, are still in excellent condition after more than 20 years of service.

Everett Thomas, Vice President of Agricultural Programs for the W.H. Miner Institute in Chazy, New York, says the Miner Institute Dairy Farm, which is ranked in the top one percent of U.S. dairy farms, uses asphalt on all its bunker silos. The Miner Dairy Farm operations have used both concrete and asphalt bunker floors in the past. The farm now has six bunker silos, all with asphalt floors.

“Concrete floors where silage is stacked deteriorate quickly because silage is extremely acidic,” says Thomas. “It produces fluids that react with concrete. The damage to concrete bunker floors where silage is placed is visibly evident after three years.”

THICKNESS AND LAYERS

The pavement structure of a paved barnyard or feeding area typically consists of a prepared subgrade, an aggregate base, an HMA base, and an HMA surface. The aggregate base may be comprised of either bank-run gravel or crushed stone. The thickness of the aggregate base and HMA base depend on the strength of the subgrade and the anticipated vehicle use. When the aggregate subbase is placed over a heavy clay or plastic soil, a 3-inch insulation blanket of sand or fine gravel may be placed between the subgrade and the aggregate base as a construction platform.

GOOD - TO - FAIR SOILS
2 inches HMA surface
2 inches HMA base
4 inches aggregate base
Subgrade

POOR SOILS
2 inches HMA surface
2 to 4 inches HMA base
4 to 8 inches aggregate base
Subgrade

VERY POOR SOILS
2 inches HMA surface
4 inches HMA base
6 to 8 inches aggregate base
Subgrade

The Asphalt Pavement Alliance recommends the following thicknesses:

- For good soils—well drained gravelly or sandy soils—use a 2-inch HMA base course and a 2-inch HMA surface course. An aggregate base is not needed.
- For fair to poor soils—average clay loams, plastic (swelling) base—use a 2-inch HMA base and a 2-inch HMA surface course. Also, use a 4-inch aggregate base.
- For very poor soils—heavy clay, plastic when wet—use a 4-inch HMA base course and 2-inch HMA surface course. Also, use a 6- to 8-inch aggregate base.

MATERIALS

Quality local mixes, suited for the soil conditions at the paving site, should be selected. For assistance in your geographic area, consult a local highway engineer, paving contractor or paving consultant. Local asphalt material suppliers may also be able to provide guidance.

The Asphalt Pavement Alliance recommends paving the floor or feeding area with a relative non-porous (low voids) mix. The Superpave method of materials selection can be applied to silos, bunkers and livestock feeding areas. The use of well-graded crushed aggregates and proper asphalt binder content will yield long-lasting structures that will provide improved value to the farm.

Crushed stone, gravel or slag is needed for the aggregate base course. These materials should be well-graded from coarse to fine with not more than 8 percent passing through the No. 200 sieve. Aggregates for the HMA surface course



should be acid resistant. Siliceous aggregates such as granite, trap-rock and some gravels perform well.

Unlike concrete, HMA cannot be mixed at the farm. It must be purchased from a local HMA supplier. The best practice for getting a high quality HMA mix is to specify that it meet state highway department requirements for the area of installation.

PAVING AND COMPACTION

Before beginning the work, choose a contractor who has experience paving barnyards, bunkers and feed areas so the quality of the work can be observed. If a specialty contractor is not available, then choose a road or street contractor with a reputation for doing quality work—because a feeding area is like a parking lot, and a floor is like a road inside a barn.

The equipment for barnyard paving is usually the same as that used for road construction, and most asphalt contractors will be able to do this type of work.

The aggregate base should be compacted until it is stable. Then the HMA base and surface courses are placed. If the surface course is not placed immediately after constructing the HMA base, the existing course must be cleaned and tacked. Each layer should be no more than 4 inches thick after compaction. An 8-ton or heavier roller should be used to compact the HMA layers.

To prevent tracking after compaction, a sand cover of two to five pounds per square yard may be applied.





DRAINAGE

It is a good practice to provide surface water drainage on all paved areas. A slope of at least 1.5 to 2 inches in every 10 feet is recommended for surface drainage. The contractor can obtain proper drainage by sloping the pavement toward the center or placing a crown in the center with the pavement sloping to the outer edges. For poor to very poor soils, underdrains may be desirable.

RESURFACING CONCRETE SILO FLOORS WITH HMA

Resurfacing a concrete floor with HMA is slightly different from building a new floor. As with a new floor, preparation is important. The old surface must be swept or power-brushed and be completely free of silage debris and old aggregate. Then, spray a tack coat onto the old concrete floor to improve the HMA's adhesion to the concrete.

Before paving begins, clean the surface of the area to be paved with a high pressure wash or steam-cleaning equipment to remove all dirt. If the surface of the feeding area is excessively cracked, the entire floor must be removed or proof-rolled to identify any failed base areas. If the floor has subsided in a few local areas, break out and replace the concrete. Cut out any shrinkage cracks in the existing silo floor and repair them.

All joints and cracks in the existing floor must be cleaned, enlarged where necessary, and filled with hot asphalt binder or suitable asphalt sealer.

Three inches is a common thickness for resurfacing a badly worn concrete silo floor. Typically, the HMA is placed in two lifts—using both HMA base and surface. Concrete and

HMA expand and contract at different rates, so any resurfacing job must be a complete *edge-to-edge* job, and not just patchwork.

SUCCESSFUL APPLICATIONS

Many Michigan farmers are using HMA for paved areas on their farms. On Charles Pinkerton's Chamabi Ranch, located near Prescott, Michigan, the floors of the bunk feed stalls and cattle barn are paved with HMA. A 4-inch HMA base was placed the first year, then a 1.5-inch surface course the next.

Another example of a farm successfully using HMA is the C. V. Wilder ranch in Bellington, Washington. On his 980-acre stock ranch, HMA was used to pave a large feed lot and loading area. Wilder also used HMA floors for a large barn, a calf feeding shed, a horse barn, and an equipment shed. The thickness of the HMA pavement on the Wilder ranch is 2 inches on a 6-inch gravel base.

For Wilder's ranch, paving the floors of the calf shed, barn and equipment shed before the buildings were erected made the construction of each easier. Without walls or posts to interfere, the floors were paved with a minimum of cost and time.

Paved floors allow both efficiency and economy. Using a tractor with a front-end loader attachment on HMA floors, one farmer was able to feed silage to 200 head of stock in approximately 20 minutes. At another site, using an 8-foot scraper mounted on a tractor, the farmer was able to collect 1500 loads of manure during the winter feeding season.

By selecting appropriate materials and following recommended construction practices, HMA farm installations will provide many years of service.

