8.80 USE OF SPECIAL EQUIPMENT

Material Transfer Vehicles

Material transfer vehicles (MTVs) provide mix surge capacity, which allows more constant paver speed and more efficient paving operation. These vehicles operate in front of or beside the paver and receive loads of hot HMA from delivery trucks. They perform as a mobile 20 - 30 Mg (22 – 33 tons) HMA surge bin that re-mixes HMA and continually feeds the paver hopper. Use of these vehicles results in smoother pavement by minimizing paver stops and eliminating trucks bumping into the paver. More uniform surface texture and pavement density is also achieved, as mixture and temperature segregation are virtually eliminated by remixing capabilities of common MTV models.

Use of MTVs is restricted to closed construction work zones. Applicable permits must be obtained for moving the vehicles to and from the project on the open highway for compliance with Code of Iowa weight laws. Do not allow the contractor to operate this equipment on the open road.

There is currently one model of MTV approved for use in Iowa. The equipment and limitations are as follows:

BARBER-GREENE MTV-3500
This vehicle weighs 34 500 kg (76,600 pounds) empty with a maximum additional 31 500 kg (35 tons) mix storage capacity. It has four axles with large flotation tires. The front two axles have 17.5R x 25 flotation tires and rear two axles have 20.5R x 25 flotation tires. Tire pressure is 345 - 450 kpa (50 - 65 psi) inflation.

An empty MTV-3500 can safely cross all bridges that are not load-restricted, subject to the following conditions:

- Vehicle cannot be centered in its own lane.
- Gross weight cannot exceed listed empty weight of 34 500 kg (76,600 pounds).
- Vehicle speed cannot exceed 8 kph (5 mph).

A partially loaded MTV-3500 can safely cross all bridges that are not load-restricted, subject to the following conditions:

- Vehicle must be centered on bridge with no other vehicles on the bridge.
- Gross weight cannot exceed 45 000 kg (100,000 pounds) - approximately one-third hopper.
  NOTE: This situation should be avoided. We prefer the contractors anticipate the need to cross a bridge and have the MTV empty by the time they reach the bridge.
- Speed of the vehicle on the bridge cannot exceed 8 kph (5 mph).
- An MTV-3500 shall not cross any load-restricted bridge without prior approval from the Office of Construction.
- Pavement on which the MTV-3500 operates must be at least 200 mm (8 inches) in thickness. It shall not be operated on shoulders, subbases, or lower lifts of HMA pavement without prior approval from the project engineer.

Other Material Transfer Vehicles

Due to the possibly excessive high axle loads and tire contact pressure, material transfer vehicles other than the Barber Greene MTV-3500 must be approved by the Office of Design and Office of Bridges and Structures prior to use on a particular project. Approval for use can be requested through the Office of Construction.

Pavements
Conditions and restrictions for use of other MTVs on primary and interstate pavements are similar to those for the MTV-3500 as described in the previous section. An analysis of the existing pavement structural numbers by the Office of Design is required prior to MTV approval. This analysis is requested by the contractor through the project engineer.

Bridges
An analysis by the Office of Bridges and Structures of each bridge to be crossed is required if the vehicle exceeds the allowable weight formula for bridges. This evaluation is based on the MTV in an unloaded condition and must be performed prior to crossing any bridges. The analysis is also requested by the contractor through the project engineer.

Following are the procedures to be followed in regards to obtaining MTV approval:

1. Contractor requests permission from project engineer to use MTV on a specific project, preferably no later than at the preconstruction meeting. The contractor must provide the make and model of MTV, and any additional information needed for analysis.

2. Project engineer forwards the request to Central Construction, who will arrange for reviews, as needed, by the Office of Bridges & Structures and Office of Design.

3. The Office of Bridges & Structures will perform an analysis of existing bridge structures within the project limits and provide specific requirements regarding MTV operation across the structures. Please note that unless specifically stated otherwise, the MTV must be near empty when crossing all bridge structures.

4. The Office of Design (Pavement section) will analyze the existing pavement and provide recommended hopper loads and suitability of MTV use for placing underlying base and intermediate HMA courses. Similar analysis will be made for surface course of single-lift resurfacing projects.

5. Central Construction will report results of above analyses to project engineer, who informs the contractor.

The DOT intends to take a “permissive” approach in regards to allowing MTV use on the surface course of multiple lift HMA resurfacing projects. This will provide increased potential for continuous MTV use in the area of the pavement where the MTV’s improvements to mat quality are most beneficial. However, the MTV hopper load may be limited, based on results of the pavement analysis.

MTV use in conjunction with HMA placement must be closely monitored, and discontinued if evidence of detrimental distresses in the base or underlying pavement result. Such distresses would typically show up as deformation or rutting of base in full depth paving, or cracking and joint movement in existing pavement during an overlay. The contractor is responsible for repairing any damage to existing pavement or base caused by MTV operation.

Mat Smoothness Machine

Several contractors have used Cedarapids CR MS-3 or MS-4 Mat Smoothness Machines on paving and resurfacing projects. This is an HMA material receiving hopper and elevator that deposits hot HMA into the paver hopper. Use of this equipment allows for a more consistent paver operation by providing some surge capacity for paver, only on a much smaller scale than MTVs. In some cases, it can also help re-mix material and minimize segregation.

It weighs approximately 8 500 kg (18,800 pounds) empty and has a hopper capacity of 1.7 cu m (2.22 cubic yards). Weight restrictions are not a concern with this piece of equipment.

When using Mat Smoothness Machines (or MTVs), the paver hopper should be kept relatively full at all times. If the hopper is allowed to draw down too far, coarse aggregate collected in the sides and corners of the paver hopper might be drawn down and create streaks of segregation in the mat surface.

Windrow Pick-Up Equipment

Many Iowa contractors are equipped to construct HMA resurfacing and paving projects using windrow pick-up equipment. This process is allowed by specification.

With this process, hot HMA is deposited in a windrow onto the pavement surface using bottom dump trailers. A windrow pick-up elevator deposits the material into the paver hopper. Again, the primary advantages are contractor efficiency, uniform speed of operation, and elimination of delivery trucks bumping into the paver.

Segregation has occurred on several projects on which this equipment was used. Truckload and longitudinal strip type segregation are potential problems. The contractor should balance their HMA delivery with the mat placement rate to keep the paver hopper at a nearly uniform level, which helps avoid segregation. Balancing delivery and placement also minimizes the need to either feed the hopper additional mix or remove excess windrow material with a mini-loader. The windrow should be placed to feed the center of the windrow pick-up machine. A windrow that is improperly located can place an eccentric force on the pick-up machine, which can force the paver to lose proper centerline alignment. It is also important for the contractor to pick up all windrow material from the pavement surface, and not allow the windrow to extend more than two truckloads in front of the paver to avoid excessive cooling of the mix.

Normal HMA laydown temperature limitations apply to this process.

It has been shown that this process can be used successfully for the lower lift of a full depth pavement; however, it is important to make sure the pick-up machine does not disturb (pick up) the subgrade or subbase material.

If streak type segregation is suspected, a trench can be sawed transversely across the lane and the profile viewed for voids and/or a non-uniform aggregate matrix. Cores can also be cut to ascertain if segregation is present. If segregation is determined to exist, costs of the coring or sawing will be at the contractor's expense.