

**Illinois Department of Transportation
Bureau of Materials**

**LIST OF "M" SPECIFICATIONS
Effective April 19, 2019**

Serial Number	Effective Date	Specification for	Contact Person	Contact Person Phone Number
M4-87	03/01/87	Wood Lath Snow Fence	Dan Tobias	217-782-2912
M17-08	03/01/08	Bituminous Mixtures for Maintenance Use, Emulsified Asphalt Type	Clay Snyder	217-782-7217
M19-07	01/15/07	Bituminous Mixture for Maintenance Use, Liquid Asphalt Type	Clay Snyder	217-782-7217
M20-07	01/15/07	Bituminous-Sand Mixture for Maintenance Use	Clay Snyder	217-782-7217
M37-07	02/01/07	Cutting Edges for Grader Blades	Dan Tobias	217-782-2912
M48-02	02/01/02	Bituminous Premix for Maintenance Use, Inverted Emulsified Asphalt GBAE-2 RESCINDED 04/16/19		
M50-07	02/01/07	Cutting Edges for Snow Plows	Dan Tobias	217-782-2912
M119-02	02/01/02	Fast-Dry Black Pavement Marking Paint RESCINDED 04/01/11		
M120-16	11/04/16	Bituminous Premix for Maintenance Use - Proprietary Mixes	Clay Snyder	217-782-7217
M124-81	02/01/81	Tarpaulins	Dan Tobias	217-782-2912
M126-07	02/01/07	Bituminous Mixes for Maintenance Use, Reinforced Fiber Mixture	Clay Snyder	217-782-7217
M128-02	02/01/02	Rubber Cutting Edges for Snow Plows	Dan Tobias	217-782-2912
M131-92	11/01/92	Polyethylene Plastic Mesh Snow Fence	Dan Tobias	217-782-2912
M133-96	02/02/96	Bituminous Premix for Maintenance Use, Instant Road Repair - Proprietary	Clay Snyder	217-782-7217
M135-05	09/12/05	Fast-Dry Pavement Marking Paint – Black (Lead Free Waterborne Type)	Tony Wagner	217-782-7218

State of Illinois
Department of Transportation
Division of Highways
Springfield

SPECIFICATIONS
FOR
WOOD LATH SNOW FENCE

Serial Number: M4-87

1. GENERAL. This specification covers wood lath snow fence used for snow drift prevention. It shall consist of wood lath woven between wire cables in the manner specified herein.
2. MATERIALS. The materials used shall meet the requirements of these specifications.

(a) Lath

The lath shall be made from sound, live, Southern yellow pine, Western red cedar, Douglas fir, cypress, hemlock, spruce, aspen or red wood. They shall be 3/8 inch in thickness, 1-1/2 inches in width, and 48 inches in length. They shall be straight, square-sawed, free from cross grain, worm holes or other defects which would impair their strength, and shall be as much as 1/2 inch short of the length specified. Wane, not to exceed 1/8 inch in depth, 1/4 inch wide on the face, and 6 inches in length, will be permitted on not more than 20% of the pieces. Knots shall be firm and sound and shall be limited to pin knots, 1/2 inch and less in diameter. Not more than three pin knots so scattered that no two will be closer than 6 inches apart will be permitted in any one piece. Pin worm holes, very small pitch pockets, and small surface checks and stains will not be considered objectionable.

(b) Preservative Coating

The lath shall be immersed in a solution of red oxide of iron preservative for a sufficient length of time to fill the pores of the wood. The wood shall be dry at the time of immersion. The solution shall contain not less than 1-1/2 pounds per gallon of red oxide of iron of approved quality and fineness. The pigment shall be held in suspension by agitating or otherwise when in use. After treatment, the material shall be protected from the weather until the preservative coating has become dry to touch.

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(c) Wire

The wire shall be galvanized steel wire. The tensile strength of the wire shall not be less than 50,000 nor more than 72,000 pounds per square inch. The wire shall be No. 13 standard gauge.

(d) Protective Coating on Wire

The wire shall have a continuous coating of zinc of uniform thickness. The weight of the zinc coating shall be not less than 0.30 ounce per square foot of surface. The adherence of the coating shall be such that it will not crack nor flake during the fabrication of the fence.

3. FABRICATION. The lath shall be woven between five wire cables in such a manner that they will be securely held in place. Each cable shall consist of two strands of wire, and shall have two complete twists between the lath. The lath shall be spaced 2 - 2-1/4 inches apart. The fence shall be stretched after weaving and before being placed in rolls. The fence shall be fabricated in such a manner that neither the tensile strength of the wires nor the zinc coating will be injured.
4. TESTS. Tests will be made by the Department. All fence shall be tested and inspected for compliance with these specifications, and acceptance or rejection will be based on the results of such tests and inspection. At the option of the Department, inspection may be carried on at the manufacturer's plant during fabrication, or it may be inspected at the plant after fabrication, or after delivered, or it may be inspected both during fabrication and after delivery.

(a) Samples

All samples shall be furnished free of charge to the Department. If inspection is to be carried on at the plant during fabrication, samples of the wire shall be submitted sufficiently in advance of fabrication to permit complete tests. The lath may be inspected before being treated with preservative and also during fabrication.

The number of samples taken shall be optional with the Department.

(b) Rejection

Material not meeting the requirements of these specifications will be rejected. Peeling, scaling, or flaking of the zinc coating during fabrication; irregular spacing of the lath; or broken lath or wires will be sufficient cause for rejection.

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(b) Certification

The fabricator shall certify with test data that the product meets these specifications, the laths were immersed for a sufficient length of time, and the solution contained the specified amount of red oxide of iron.

5. SHIPPING. The fence shall be shipped in 50-foot rolls. Care shall be taken to prevent damage in handling.

Effective March 1, 1987

This specification supersedes Serial Number M4-81.

M4-87

State of Illinois
Department of Transportation
Division of Highways
Springfield

SPECIFICATIONS
FOR
BITUMINOUS MIXTURES FOR MAINTENANCE USE
EMULSIFIED ASPHALT TYPE

Serial Number: M17-08

1. DESCRIPTION. These specifications cover coarse-graded and fine-graded bituminous mixtures for use in maintaining small areas on flexible and rigid type pavements. The bituminous premix shall be composed of mineral aggregate uniformly coated with emulsified asphalt HFE-300, or SS-1, or Penetrating Emulsified Asphalt and prepared cold as further described below. The mixtures shall be capable of being loaded into trucks by either hand shovels or power loading equipment, shall be sufficiently workable for placing with shovels, rakes or other hand tools, and shall readily compact by hand tamping, hand or power rolling, or under the action of traffic at the mixing temperature or at temperatures as low as 4 °C (40 °F), immediately after preparation or over a period of several months in a stockpile. The mixtures shall remain in place when used to patch wet or dry pavements and shall be stable under normal traffic conditions.

2. MATERIALS. Control of the materials shall be according to the general requirements of Section 106 of the current *Standard Specifications for Road and Bridge Construction*. At the discretion of the Engineer, a twenty-five pound sample of the aggregate(s), a one-quart sample of the bituminous material, and a one-pint sample of the additive shall be submitted to the Bureau of Materials and Physical Research, 126 East Ash Street, Springfield, Illinois, for checking the dosage rate and compatibility of the additive with the other ingredient materials.

(a) Aggregate

1. Coarse Aggregate shall consist of crushed stone, crushed gravel, or gravel of Class C quality or better, as defined in Article 1004.01 of the *Standard Specifications for Road and Bridge Construction*.
2. Fine Aggregate shall consist of sand, stone sand, or stone screenings* of Class B quality or better, as defined in Article 1003.01 of the *Standard Specifications for Road and Bridge Construction*.

*The use of stone sand or stone screenings will increase in place stability, but reduce stockpile workability.

(b) Bituminous Material

The bituminous materials used shall be either emulsified asphalt HFE-300, SS-1, or Penetrating Emulsified Asphalt.

1. Emulsified asphalt HFE-300 shall conform to the requirements given in Article 1032.06(c) of the Standard Specifications. Emulsified asphalt HFE-300 shall be formulated to possess the characteristics required to produce a mixture conforming to the requirements of this specification.
2. Emulsified asphalt SS-1 shall conform to the requirements given in Article 1032.06(a), of the Standard Specifications.
3. Penetrating Emulsified Asphalt shall be prepared as specified in Article 403.05, except that the spraying (maximum-minimum) application temperature shall be between 60-88 °C (140-190 °F). The penetrating emulsified asphalt shall meet the following requirements when tested according to AASHTO T 59:

Viscosity, Saybolt Furol @ 25°C (77°F)	SFS:	20-500
Sieve Test, retained on 850µm (No. 20) sieve	%:	0.10 max.
Storage Stability Test, 24 hours	%:	1 max.
Stone Coating Test, 3 minutes	:	stone coated thoroughly
Particle Charge	:	negative
pH	:	7.3 min.
Distillation Test:		
Distillation to 260°C (500°F) Residue	%:	65 min.
Oil Distillation by Volume	%:	3 max.
Test on residue from distillation:		
Penetration @ 25°C (77°F), 100 g, 5 sec.	dmm:	300 min.
Float Test @ 60°C (140°F)	sec:	150 min.

3. INSPECTION. The Engineer or his authorized representative shall have access at any time to all parts of the plant in order to verify weights or proportions and character of materials used in the preparation of the mixture. The manufacturer shall afford such facilities as may be required for making inspection at the plant and for collecting and forwarding samples of the bituminous mixture to the Department.

4. PLANT AND EQUIPMENT. Storage facilities and all equipment used in the preparation of the mixture shall be approved by the Department. An approved drier shall be available for surface drying the aggregate when needed. The materials for individual batches shall be measured accurately either by volume or weight, by approved methods and equipment. A batch type mixture of approved design and capacity shall be used in mixing the ingredient materials. However, approval for the use of a continuous mixer may be given if it can be shown that satisfactory results will be obtained.

5. PREPARATION OF MIXTURE. At the time of mixing, the aggregate shall not contain enough moisture to cause drifting of the emulsion from the aggregates. The aggregates and bituminous material shall be measured separately and accurately by weight or volume. When a batch type mixer is used, the aggregates shall be added to the mixer and mixed thoroughly. The bituminous material shall then be added and mixing continued for a period of at least 30 seconds or longer if necessary to produce a homogeneous mixture in which all particles of the aggregate are coated uniformly.

6. COMPOSITION OF MIXTURE. The ingredients shall be combined in such a manner as to produce a mixture which when discharged shall be workable. The mixture shall conform to the following composition limits by weight:

Crushed Stone or Crushed Gravel			Gravel	
Graduation of Extracted Aggregate: (100%)	Binder Mixture		Coarse	Fine
	Binder Mixture	Surface Mixture	Surface Mixture	Surface Mixture
Percent Passing Sieves				
3/4 inch	100	----	----	----
1/2 inch	75-94	100	95-100	----
3/8 inch	64-78	90-100	----	95-100
No. 4	32-45	65-86	50-75	50-85
No. 8	25-38	31-54	34-65	38-70
No. 200	0-5.0	0-5.0	0-5.0	0-5.0
Residual Bitumen (Includes Additive)	4.0-5.0	5.0-6.0	4.0-5.0	5.0-6.0

Effective March 1, 2008

This specification supersedes Serial Number M17-07, effective January 15, 2007

VJP/M17-08

State of Illinois
Department of Transportation
Division of Highways
Springfield

SPECIFICATIONS
FOR
BITUMINOUS MIXTURE FOR MAINTENANCE USE
LIQUID ASPHALT TYPE

Serial Number: M19-07

1. DESCRIPTION. These specifications cover coarse-graded and fine-graded bituminous mixtures for use in maintaining small areas on flexible and rigid type pavements. The bituminous premix shall be composed of mineral aggregate uniformly coated with liquid asphalt plus additive and prepared cold as further described below. The mixtures shall be capable of being loaded into trucks by either hand shovels or power loading equipment, shall be sufficiently workable for placing with shovels, rakes or other hand tools, and shall readily compact by hand tamping, hand or power rolling, or under the action of traffic at the mixing temperature or at temperatures as low as 4 °C (40 °F), immediately after preparation or over a period of several months in a stockpile. The mixtures shall remain in place when used to patch wet or dry pavements and shall be stable under normal traffic conditions.

2. MATERIALS. Control of the materials shall be according to the general requirements of Section 106 of the current *Standard Specifications for Road and Bridge Construction*. At the discretion of the Engineer, a twenty-five pound sample of the aggregate (s), a one-quart sample of the bituminous material and a one-pint sample of the additive shall be submitted to the Bureau of Materials and Physical Research, 126 East Ash Street, Springfield, Illinois, for checking the dosage rate and compatibility of the additive with the other ingredient materials.

(a) Aggregate

1. Coarse Aggregate shall consist of crushed stone, crushed gravel, or gravel of Class C quality or better, as defined in Article 1004.01 of the *Standard Specifications for Road and Bridge Construction*.

2. Fine Aggregate shall consist of sand, stone sand, or stone screenings* of Class B quality or better, as defined in Article 1003.01 of the *Standard Specifications for Road and Bridge Construction*.

*The use of stone sand or stone screenings will increase in place stability, but reduce stockpile workability.

(b) Additive

The additive shall be an anti-stripping additive approved by the Department. The additive shall be added to the bituminous material at the dosage rate (0.8 to 1.5 percent by weight of total liquid) recommended by the Engineer and shall be thoroughly mixed for at least four (4) hours prior to being incorporated into the mix. A list of approved additives is available on request.

(c) Bituminous Materials

The bituminous material used shall be either liquid asphalt MC-250, MC-800, SC-250, or SC-800 conforming to the requirements of Section 1032 of the *Standard Specifications for Road and Bridge Construction*. The Engineer reserves the right to specify the grade and type to be used.

3. INSPECTION. The Engineer or his authorized representative shall have access at any time to all parts of the plant in order to verify weights or proportions and character of materials used in the preparation of the mixture. The manufacturer shall afford such facilities as may be required for making inspection at the plant and for collecting and forwarding samples of the bituminous mixtures to the Department

4. PLANT AND EQUIPMENT. Storage facilities and all equipment used in preparation of the mixture shall be approved by the Department. An approved drier shall be available for surface drying the aggregated when needed. The materials for individual batches shall be measured accurately either by volume or weight, by approved methods and equipment. A batch type mixer of approved design and capacity shall be used in mixing the ingredient materials. However, approval for the use of a continuous mixer may be given if it can be shown that satisfactory results will be obtained.

5. PREPARATION OF MIXTURE. The aggregate shall be surfaced dry at the time of mixing and shall contain not more than 1.5 percent moisture by weight. Aggregates which do not conform to this requirement shall be dried by natural or artificial means before being used in the mixture. The mixture at the time of mixing shall have a temperature adequate for good mixing and below the flash point of the bituminous material. The bituminous material shall be heated to such a temperature that it will be workable when used in preparation of the mixture.

6. COMPOSITION OF MIXTURES. The Department shall specify the type (gradation) of the mixture to be used. The ingredients shall be combined in such a manner as to produce a mixture which when discharged shall be workable. The mixture shall conform to the following composition limits by weight.

Gradation of Extracted Aggregate (100%)

Percent Passing Sieve	Nominal Size			
	<u>1/2" to No. 4</u>	<u>1/2" to No. 8</u>	<u>3/8" to No. 8</u>	<u>3/8" to No. 200</u>
1/2"	100	100	---	---
3/8"	60-90	---	100	100
No. 4	0-25	30-55	20-50	25-45
No. 8	0-17	23-54	0-17	17-35
No. 30	---	10-25	---	10-20
No. 200	0-6.0	0-5.0	0-6.0	0-6.0
Residual Bitumen, (Includes Additive)%	3.0-5.0	4.0-7.0	3.0-5.0	3.5-7.0

Gradation of Extracted Aggregate (100%)

Percent Passing Sieve	Nominal Size		
	<u>Alternate 1/2" to No. 200</u>	<u>Alternate 3/8" to No. 8</u>	<u>Alternate 3/8" to No. 200</u>
1/2"	95-100	---	---
3/8"	---	100	100
No. 4	50-75	20-65	25-65
No. 8	38-54	0-17	17-35
No. 30	10-30	---	10-20
No. 200	0-5.0	0-6.0	0-5.0
Residual Bitumen, (Includes Additive)%	4.0-6.0	3.0-5.5	3.5-7.5

The percentage of bituminous material shall be determined by the Engineer. The right is reserved to make, at any time during the progress of the work, such changes in the proportions of bitumen and aggregate as the Engineer may consider necessary or desirable within the limits of the specifications. After the proportions of the ingredient materials have been set there shall be no variation from the same without the Engineer's approval.

It is the responsibility of the producer to produce a mixture conforming to the requirements of these specifications and satisfactory to the Department.

Effective January 15, 2007

This specification supersedes Serial Number M19-02a, effective October 15, 2002.

RWH/M19-07

State of Illinois
Department of Transportation
Division of Highways
Springfield

SPECIFICATIONS
FOR
BITUMINOUS-SAND MIXTURE FOR MAINTENANCE USE

Serial Number: M20-07

1. DESCRIPTION. The bituminous mixture shall be mineral aggregate uniformly coated with liquid asphalt plus additive as further described herein. The mixture shall be prepared hot and sufficiently workable for placing with shovels and power equipment.

2. MATERIALS. Control of the materials shall be in accordance with the general requirements of Section 106 of the current *Standard Specifications for Road and Bridge Construction*. At the discretion of the Engineer, a twenty-five pound sample of the aggregate (s), a one-quart sample of the bituminous material and a one-pint sample of the additive shall be submitted to the Bureau of Materials and Physical research, 126 East Ash Street, Springfield, Illinois, for checking the dosage rate and compatibility of the additive with the other ingredient materials.

(a) Aggregate

Fine Aggregate shall consist of sand, stone sand, or stone screenings of Class B quality or better, as defined in Article 1003.01 of the *Standard Specifications for Road and Bridge Construction*.

(b) Additive

The additive shall be an anti-stripping additive approved by the Department. The additive shall be added to the bituminous material at the dosage rate (0.8 to 1.5 percent by weight of total liquid) recommended by the Engineer and shall be thoroughly mixed for at least four (4) hours prior to being incorporated into the mix. A list of approved additives is available on request.

(c) Bituminous Materials

The bituminous material used shall be liquid asphalt MC 800 conforming to the requirements of Article 1032.08, Medium Curing Liquid Asphalt, or SC800 conforming to requirements of Article 1032.09, Slow Curing Liquid Asphalt, of the *Standard Specification for Road and Bridge Construction*.

3. INSPECTION. The Engineer or his authorized representative shall have access at any time to all parts of the plant in order to verify weights or proportions and character of materials used in the preparation of the mixture. The manufacturer shall afford such facilities as may be required for making inspection at the plant and for collecting and forwarding samples of the bituminous mixture to the Department.

4. PLANT AND EQUIPMENT. Storage facilities and all equipment used in the preparation of the mixture shall be approved by the Department. An approved drier shall be available for surface drying the aggregate when needed. The materials for individual batches shall be measured accurately either by volume or weight, by approved methods and equipment. A batch type mixer of approved design and capacity shall be used in mixing the ingredient materials. However, approval for the use of a continuous mixer may be given if it can be shown that satisfactory results will be obtained.

5. PREPARATION OF MIXTURE. The aggregate shall be surface dry at the time of mixing and shall contain not more than 1.5 percent moisture by weight. Aggregates which do not conform to this requirement shall be dried by natural or artificial means before being used in the mixture. The mixture at the time of mixing shall have a temperature above 66 °C (150 °F). and below the flash point of the bituminous material. The bituminous material shall be heated to such a temperature that it will be workable when used in preparation of the mixture.

6. COMPOSITION OF MIXTURE. The ingredients shall be combined in such a manner as to produce a mixture which when discharged shall be workable. The mixture shall conform to the following composition limits by weight:

Gradation of Extracted Aggregate:

Passing No. 4 sieve	94 -100%
Passing No. 8	60 - 95%
Passing No. 16	35 - 80%
Passing No. 50	8 - 30%
Passing No. 100	5 - 15%
Passing No. 200 sieve.....	0 - 5.0%

Residual Bitumen (Includes Additive)..... 5.0-9.0%

The percentage of bituminous material shall be determined by the Engineer. The right is reserved to make, at any time during the progress of work, such changes in the proportions of bitumen and aggregate as the Engineer may consider necessary or desirable within the limits of the specifications. After the proportions of the ingredient materials have been set, there shall be no variation from the same without the Engineer's approval.

It is the responsibility of the producer to produce a mixture conforming to the requirements of these specifications and satisfactory to the Department.

Effective January 15, 2007

This specification supersedes Serial Number M 20-02, effective February 1, 2002

RWH/M20-07

State of Illinois
 Department of Transportation
 Division of Highways
 Springfield

SPECIFICATIONS
 FOR
 CUTTING EDGES FOR GRADER BLADES

Serial Number: M37-07

1. *Material.* The cutting edges shall be alloy steels meeting the approval of the Department. The steels shall be melted by the electric-furnace, basic-oxygen or other similar commercially accepted steel making process, and may be either ingot cast or strand cast. The manufacturer shall have the option to fabricate and machine the blades in the as-rolled or annealed condition, and then subsequently quench and temper the steel to meet the requirements of this specification.
2. *Chemical Composition.* The cutting edges shall be made of one or more of the following approved alloy steels, listed in numerical order. Their respective chemical compositions shall conform to the following requirements*:

Alloy Name	%C	%Mn	%P	%S	%Si	%Cr	%Ni	%Mo
SAE 1330 ^D	0.28-0.33	1.60-1.90	0.035 max	0.040 max	0.15-0.35	^A	^B	^C
SAE 15B30 modified ^E	0.28-0.34	1.00-1.30	0.025 Max	0.050 Max	0.15-0.30	0.35-0.55	0.40 max	0.15 max
SAE 4130	0.28-0.33	0.40-0.60	0.035 max	0.040 max	0.15-0.35	0.80-1.10	^B	0.15-0.25
SAE 8620	0.18-0.23	0.70-0.90	0.035 max	0.040 max	0.15-0.35	0.40-0.60	0.40-0.70	0.15-0.25
T-1 Type A (ASTM A514 Grade B)	0.12-0.21	0.70-1.00	0.035 max	0.035 max	0.20-0.35	0.40-0.65	^B	0.15-0.25

*All alloys in the above table must be quenched and tempered in their final finished condition, and have a min CVN impact toughness of 25 ft-lbs at 32°F in the plate's rolling (longitudinal) direction. For the alloys listed in the above table, except for SAE 15B30, up to 0.35% copper is permitted in the heat analysis as scrap residual.

^A Up to 0.20% chromium is permitted in the heat analysis as scrap residual.

^B Up to 0.25% nickel is permitted in the heat analysis as scrap residual.

^C Up to 0.06% molybdenum is permitted in the heat analysis as scrap residual.

^D 0.04-0.08% vanadium is permitted.

^E Boron, 0.00050-0.0020%; copper, 0.50% max; titanium, 0.007-0.030%; aluminum, 0.010-0.060%, nitrogen, 0.015% max; vanadium, 0.01% max.

If a special alloy steel is proposed, its composition shall be approved in writing by the Department prior to its use.

3. *Chemical Analysis.* A certified analysis of each heat of steel shall be furnished to the Department to verify the weight percentages of the elements specified in Paragraph 2. A product analysis of the cutting edge from an independent laboratory, in lieu of a heat analysis, can be furnished to the Department. The chemical composition shall be within the ranges for the elements specified in Paragraph 2, but can deviate within the permitted variations for the same elements as listed in Table B of ASTM Standard A 6, *General Requirements for Rolled Structural Steel Bars, Plates, Shapes and Sheet Piling*.
4. *Hardness.* The finished cutting edges shall have a Rockwell C Scale (R_c) hardness of not less than 25, nor more than 35. The corresponding Brinell hardness (BHN) range for a 3000 kg-f load and a 10 mm ball is 266 to 327 BHN. The Rockwell C or Brinell hardness shall be determined on a finished cutting edge in accordance with ASTM A 370, *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*.
5. *Impact Toughness.* All cutting edges shall have a minimum average Charpy V-notch impact toughness of 25 ft-lbs at 32°F, based on a minimum of three test specimens. No single test value out of three or more specimens shall be less than 17 ft-lbs. Testing shall be in conformance with ASTM A 370.
6. *Dimensions.* The length, width, thickness, curvature and bevel of the finished cutting edges shall be as shown on the plans or specified on the order. All grader blades to be double-bevel curved unless otherwise specified.
7. *Spacing and Size of Holes.* The spacing and size of the holes for the finished cutting edges shall comply with the sketches. For sketches, contact the Bureau of Materials and Physical Research, Engineer of Tests, at (217) 782-7200.
8. *Finish.* The finished cutting edges shall be straight, free from observable flaws, voids, seams, large non-metallic inclusions, or other injurious defects. All finished or machined surfaces shall have a surface roughness of 125 microinches or less. All surfaces shall be painted with a metal primer and an acrylic top coat meeting the approval of the Department.
9. *Inspection.* All cutting edges shall be inspected by the Department for specification compliance. Inspection may be performed upon delivery, or if the Department elects, at the place of manufacture, whereby the inspector representing the Department shall have free entry to all parts of the plant related to that specific order of cutting edges.
10. *Holes.* Holes cuts to accept countersunk head, square neck plow bolts shall be plasma or laser cut or punched. If the square holes exhibit any cutting protrusions or deformation lips, these raised hole edges shall be ground smooth to conform with the adjacent undeformed surfaces of the cutting edge. Holes may be punched in as-rolled or annealed alloy steels, and then subsequently heat treated to their final condition in order to meet this specification.

Effective February 1, 2007

This specification supersedes Serial Number M37-02, effective February 1, 2002.

State of Illinois
 Department of Transportation
 Division of Highways
 Springfield

SPECIFICATIONS
 FOR
 CUTTING EDGES FOR SNOWPLOWS

Serial Number: M50-07

1. *Material.* The cutting edges shall be alloy steels meeting the approval of the Department. The steels shall be melted by the electric-furnace, basic-oxygen or other similar commercially accepted steel making process, and may be either ingot cast or strand cast. The manufacturer shall have the option to fabricate and machine the blades in the as-rolled or annealed condition, and then subsequently quench and temper the steel to meet the requirements of this specification.
2. *Chemical Composition.* The cutting edges shall be made of one or more of the following approved alloy steels, listed in numerical order. Their respective chemical compositions shall conform to the following requirements*:

Alloy Name	%C	%Mn	%P	%S	%Si	%Cr	%Ni	%Mo
SAE 1330 ^D	0.28-0.33	1.60-1.90	0.035 max	0.040 max	0.15-0.35	A	B	C
SAE 15B30 modified ^E	0.28-0.34	1.00-1.30	0.025 max	0.050 max	0.15-0.30	0.35-0.55	0.40 max	0.15 max
SAE 4130	0.28-0.33	0.40-0.60	0.035 max	0.040 max	0.15-0.35	0.80-1.10	B	0.15-0.25
SAE 8620	0.18-0.23	0.70-0.90	0.035 max	0.040 max	0.15-0.35	0.40-0.60	0.40-0.70	0.15-0.25
T-1 Type A (ASTM A514 Grade B)	0.12-0.21	0.70-1.00	0.035 max	0.035 max	0.20-0.35	0.40-0.65	B	0.15-0.25

*All alloys in the above table must be quenched and tempered in their final finished condition, and have a min CVN impact toughness of 25 ft-lbs at 32°F in the plate's rolling (longitudinal) direction. For the alloys listed in the above table, except for SAE 15B30, up to 0.35% copper is permitted in the heat analysis as scrap residual.

^A Up to 0.20% chromium is permitted in the heat analysis as scrap residual.

^B Up to 0.25% nickel is permitted in the heat analysis as scrap residual.

^C Up to 0.06% molybdenum is permitted in the heat analysis as scrap residual.

^D 0.04-0.08% vanadium is permitted.

^E Boron, 0.00050-0.0020%; copper, 0.50% max; titanium, 0.007-0.030%; aluminum, 0.010-0.060%, nitrogen, 0.015% max; vanadium, 0.01% max.

If a special alloy steel is proposed, its composition shall be approved in writing by the Department prior to its use.

3. *Chemical Analysis.* A certified analysis of each heat of steel shall be furnished to the Department to verify the weight percentages of the elements specified in Paragraph 2. A product analysis of the cutting edge from an independent laboratory, in lieu of a heat analysis, can be furnished to the Department. The chemical composition shall be within the ranges for the elements specified in Paragraph 2, but can deviate within the permitted variations for the same elements as listed in Table B of ASTM Standard A 6, *General Requirements for Rolled Structural Steel Bars, Plates, Shapes and Sheet Piling*.
4. *Hardness.* The finished cutting edges shall have a Rockwell C Scale (R_c) hardness of not less than 25, nor more than 35. The corresponding Brinell hardness (BHN) range for a 3000 kg-f load and a 10 mm ball is 266 to 327 BHN. The Rockwell C or Brinell hardness shall be determined on a finished cutting edge in accordance with ASTM A 370 *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*.
5. *Impact Toughness.* All cutting edges shall have a minimum average Charpy V-notch impact toughness of 25 ft-lbs at 32°F, based on a minimum of three test specimens. No single test value out of three or more specimens shall be less than 17 ft-lbs. Testing shall be in conformance with ASTM A 370.
6. *Dimensions.* The cutting edges shall conform to the Department's Code Numbers as shown on the drawings, or they shall fit the plow as identified by the manufacturer's name and model if the Code Number is not shown. For Code Number drawings, contact the Bureau of Materials & Physical Research, Engineer of Tests at 217 782-7200. Allowable tolerances for dimensions and holes shall in accordance with standard commercial practice. All snowplow blades shall be square edge flat unless otherwise specified.
7. *Finish.* The finished cutting edges shall be straight, free from observable flaws, voids, seams, large non-metallic inclusions, or other injurious defects. All finished or machined surfaces shall have a surface roughness not exceeding 125 microinches.
8. *Inspection.* All cutting edges shall be inspected by the Department for specification compliance. Inspection may be performed upon delivery, or if the Department elects, at the place of manufacture, whereby the inspector representing the Department shall have free entry to all parts of the plant related to that specific order of cutting edges.
9. *Marking.* The model of the plow on which the cutting edge is to be used, or the Code Number, shall be painted or labeled with 3-inch high letters or numbers on the front and back of each cutting edge.
10. *Holes.* All cutting edges shall be plasma or laser cut or punched to accept #3 countersunk head, square neck plow bolts. If the square holes exhibit any cutting protrusions or deformation lips, these raised hole edges shall be ground smooth to conform with the adjacent undeformed surfaces of the cutting edge. Holes may be punched in as-rolled or annealed alloy steels, and then subsequently heat treated to their final condition in order to meet this specification.

Effective February 1, 2007

This specification supersedes Serial Number M50-02, effective February 1, 2002.

CH/M50-07

State of Illinois
Department of Transportation
Division of Highways
Springfield

SPECIFICATIONS
FOR
BITUMINOUS PREMIX FOR MAINTENANCE USE

PROPRIETARY MIXES

Serial Number: M 120-16

1. DESCRIPTION. These specifications cover coarse-graded and fine-graded bituminous mixtures for use in maintaining small areas on flexible and rigid type pavements. The bituminous premix shall be composed of mineral aggregate uniformly coated with liquid asphalt binder plus additive and prepared cold as further described below. The mixtures shall be capable of being loaded into trucks by either hand shovels or power loading equipment and shall be sufficiently workable for placing with shovels, rakes or other hand tools. The mixtures shall also be readily compact by hand tamping, hand or power rolling, or under the action of traffic at the mixing temperature or at temperatures as low as 4 °C (40 °F), immediately after preparation and over a period of several months in a stockpile. The mixtures shall remain in place when used to patch wet or dry pavements and shall be stable under normal traffic conditions.

2. MATERIALS. Control of the materials shall be according to the general requirements of Section 106 of the current Standard Specifications for Road and Bridge Construction. At the discretion of the Engineer, a twenty-five pound sample of the aggregate (s), a one-quart sample of the asphalt binder and a one-pint sample of the additive shall be submitted to the Bureau of Materials and Physical Research, 126 East Ash Street, Springfield, Illinois, for checking the dosage rate and compatibility of the additive with the other ingredient materials.

(a) Aggregate

All Coarse Aggregate used in the proprietary mixtures shall consist of crushed stone of Class B quality or better as defined in Article 1004.01(a) & (b) of the above cited Standard Specifications.

(b) Bituminous Materials

The bituminous material shall be a formulation of the liquid asphalt binder and additive blend prepared under the supervision of the proprietary mix supplier. It shall meet the requirements of ASTM D 2026 or ASTM 2027, whichever applies, modified as follows:

ASTM D 92 Flash point (COC)°C (°F) - minimum	94 (200)
ASTM D 2170 Kinematic Viscosity 60 °C (140 °F) mm ² /s (cSt)	280 – 4000
ASTM D 95 Water % - maximum	0.2
ASTM D 402 Distillate% by Volume of Original Sample <u>Temperature</u>	
Distillate to 225 °C (437 °F)	0
Distillate to 260 °C (500 °F)	0-5
Distillate to 315 °C (600 °F)	0-55
Residue from distillation to 360 °C (680 °F)% Volume by Difference	70 min
Residue Tests:	
ASTM D 2171 Absolute Viscosity 60 °C(140 °F)Pascal Seconds (Poises)	11.5-44.0 (115-440)
ASTM D 5 Penetration25 °C (77 °F)100 g, 5s – minimum	200
ASTM D 5 Penetration, modified with cone, 25 °C (77 °F)150 g, 5s – minimum	180
ASTM D 113 Ductility 21 °C (70 °F)1cm/min.cm – minimum	100
ASTM D 113 Ductility 4 °C (39 °F) 1cm/min, cm – minimum	85
ASTM D 2042 Solubility in Trichloroethylene % - minimum	99.0

(c) Stripping Tests

(1) Place 50 grams of cold mix into a beaker containing 400 ml of boiling distilled water. Bring back to boiling and boil for 3 minutes with constant stirring at 1 revolution per second. At the end of 3 minutes, remove the beaker from the heat source and immediately decant the water. Empty the wet mix onto a paper towel and examine. The retained coating shall not be less than 95 percent.

(2) AASHTO T 182-06 Coating and Stripping of Bitumen-Aggregate Mixtures.

3. INSPECTION. The Engineer or his authorized representative shall have access at any time to all parts of the plant in order to verify weights or proportions and quality of materials used in the preparation of the mixture. The manufacturer shall afford such facilities as may be required for making inspection at the plant and for collecting and forwarding samples of the ingredient materials and bituminous mixture to the Department.

4. PREPARATION OF MIXTURE. The aggregate and liquid asphalt shall be proportioned into the mixer and mixed until a uniformly coated mixture is obtained.

Effective November 4, 2016

This specification supersedes Serial Number M 120-10, effective June 1, 2010.

State of Illinois
Department of Transportation
Division of Highways
Springfield

SPECIFICATIONS
FOR
TARPAULINS

Serial Number: M124-81

I. DESCRIPTION

This material will be used to cover equipment, tools, and supplies in truck beds or other locations.

II. GENERAL

All tarpaulin material furnished will be fire, water, weather, and mildew resistant. The fire resistance shall meet or exceed the California State Fire Marshall Code, Paragraph 1273-3. A copy of the test results shall be furnished. Each tarpaulin shall have No. 4 or No. 5 spur grommets. The grommets shall be rolled rim, brass, or zinc coated, placed in each corner and evenly spaced approximately 3 - 4 feet apart along each side and the ends, depending on the size of the tarpaulin. Each tarpaulin shall be identified by stamping or stenciling the words, "Illinois Department of Transportation", with not less than 2-inch high letters. Tarpaulin sizes as shown on the proposal shall be the minimum size acceptable; oversizing shall not exceed 4%.

III. HEMMING

The hemming and stitching shall be as follows: All hems shall be triple thickness (including the fold) of material and 1-1/2 - 2 inches wide. The stitching shall consist of a lock stitch, 5 - 7 stitches to the inch, using Size 12 polyester thread.

IV. TIE DOWNS

The tie down ropes may be either 3/8-inch manila or 5/16-inch polypropylene monofilament. The rope shall be 3-strand twisted type in 10-foot lengths secured to the corner grommets with an eye splice having a 2-3/4-inch eye and an eye splice with not less than 3 tucks. The splice shall be individual strand tucks to form a smooth splice. Manila rope shall have the free ends of the tie rope secured by whipping with 2-strand, 5-ply waxed cotton twine with not less than 7 turns or they may be machine-stitched using a zigzag stitch. The polypropylene rope shall have the free ends heat-sealed (rather than whipped). The heat seal shall be no less than 1/4 inch nor more than 3/4 inch long. The whipping or seal shall prevent the unwrapping of the 3-strand twist rope.

V. MATERIAL

A. Canvas.

Tarpaulin from this material shall be made of No. 10 (standard weight per square yard minimum 12.75 ounces, maximum 14.73 ounces), hard textured, olive drab duck, treated, and shall meet the requirements of AASHTO M 166.

B. Synthetic.

This material shall be 10 x 10 - 1000 denier woven scrim polyester. The color shall be red or yellow. The base fabric shall be PVC coated or laminated and shall be 13 ounces \pm 1/2 ounce, finished. This material shall meet Federal Standard 191, Sub-article 5134, tear minimum 100 x 100 pounds, and Substandard 5100, grad tensile of 240 x 220 pounds. The cold crack low shall be -30°F minimum. The heat resistance shall be a minimum of 180°F sustained.

C. Neoprene

This material shall be 16 ounces \pm 1/2 ounce, finished. The color shall be black/black or black/aluminum, and shall be grease resistant. This material shall meet a grab tensile strength of 450 x 400 pounds, a minimum tear of 70 x 60 pounds, and the cold crack low shall be -40F on a 1/8-inch mandrell.

VI. INSPECTION AND TESTS

All vendors are required to furnish a representative sample of the product they propose to furnish by the date of the bid opening. The sample must be clearly tagged for the Illinois Department of Transportation with vendor's name, requisition number, and date of bid opening. This sample shall be sent to the State of Illinois Purchasing Agent. The sample (approximately 12" x 12") shall include stitching, grommet, rope, eye splice, and whipping or seal method. The successful bidder shall contact the Engineer of Materials and Physical Research, 126 East Ash Street, Springfield, Illinois 62706, before starting manufacture or making shipment. The Department reserves the right to make inspections and tests either at the origin of shipment or at the destination.

VII. PACKAGING

All finished tarpaulins are to be bulk packaged for shipment suitable for transport and handling by commercial carrier.

VIII. LABELING

In addition to any and all stenciling and markings required under "General" (II.), a label identifying the manufacturer shall be affixed.

Effective February 1, 1981

M124-81

State of Illinois
Department of Transportation
Division of Highways
Springfield

SPECIFICATIONS
FOR
BITUMINOUS MIXES FOR MAINTENANCE USE

Reinforced Fiber Mixture

Serial Number: M126-07

1. DESCRIPTION. These specifications cover the manufacture of bituminous mixtures, reinforced with short-cut synthetic fibers, either polypropylene or polyester, for use in highway maintenance. Each mixture shall meet the individual requirements of one of the following specifications except for the addition and mixing of the synthetic fibers: M17-07, Specification for Bituminous Mixtures for Maintenance Use, Emulsified Asphalt Type; M19-07, Specification for Bituminous Mixtures for Maintenance Use, Liquid Asphalt Type; or M48-02, Specification for Bituminous Premix for Maintenance Use, Inverted Emulsified Asphalt CBAE-2.

2. MATERIAL. In addition to the individual MATERIAL requirements for each mixture, add the following:

(d) Fibers

1. The fibers shall be either polypropylene or polyester with the following physical properties:

Polypropylene Fibers (Hercules FiberPave 3010 or equal)

Length:	10 ⁺² mm
Denier:	4 ⁺¹
Crimp:	None
Tensile Strength:	40,000 psi, minimum
Specific Gravity:	0.91 (typical)
Moisture Regain @ 70° F. and 65% RH:	0.1% (typical)

Polyester Fibers (Kapejo BoniFibers B, GFC Materials Company Petroflex, or equal)

Length:	6 mm
Diameter:	6 x 10 ⁻⁴ ± 2 x 10 ⁻⁴ inch
Tensile Strength:	70,000 psi minimum
Melt Temperature:	480° F., minimum
Elongation at Break:	33% minimum

3. PREPARATION OF MIXES. In addition to the individual PREPARATION OF MIXTURES requirements for each mixture, add the following:

Polypropylene fiber mix preparation shall be as follows. The fibers shall be added to the mix at the rate of 0.3% by total weight of mixture (6 pounds per ton of mix). The fiber shall be proportioned by weight to the pugmill, dry mixed for 10 seconds, minimum, followed by a minimum wet mixing with the asphalt of 30 seconds. The asphalt content of the mix shall be increased by 0.3% by weight of mix over the normal percent of asphalt required in each individual mixture. In no case shall the temperature of the asphalt exceed 300 °F or the aggregate temperature exceed 250 °F.

Polyester fiber mix preparation shall be as follows. For each ton of mix, 6 pounds of polyester fibers shall be added and dry mixed for 45 seconds, minimum, followed by a minimum wet mixing with the asphalt of 30 seconds. The fibers should be emptied from the bag into the pugmill. The asphalt content shall be increased by 0.4% by weight over the normal percent of asphalt required in each individual mix.

Effective January 15, 2007

This specification supersedes Serial Number M126-95, effective September 1, 1995.

RWH/M126-07

State of Illinois
Department of Transportation
Division of Highways
Springfield

SPECIFICATIONS
FOR
RUBBER CUTTING EDGES FOR SNOW PLOWS

Serial Number: M128-02

1. MATERIAL: The cutting edges shall be formed from resilient rubber compounds or other compounds meeting the approval of the Department.
2. COMPOSITION: Black SBR, conforming to ASTM D 2000 M4AA614, A13, B13, F17, Z1 where Z1=Die C Tear @ 26 kN/m minimum, conforming to ASTM D 624.
3. DIMENSIONS: The cutting edges shall conform to the Illinois Department of Transportation code numbers as shown on the drawings, or they shall fit the plow as identified by the manufacturer's name and model where the code number is not shown. For code number drawings, contact the Bureau of Materials and Physical Research, Engineer of Tests, at (217) 782-7200. Allowable tolerances for dimensions and punched holes shall be in accordance with standard commercial practice.
4. INSPECTION: All cutting edges shall be inspected by the Department for compliance with the specifications. The inspection may be performed upon the finished cutting edges subsequent to delivery, or if the Department elects, the inspection may be undertaken at the place of manufacture in which case the inspector representing the Department shall have free entry to all parts of the manufacturer's plant which concern the production of the cutting edges ordered.
5. MARKING: The model of the plow on which the cutting edge is to be used or the code number shall be painted or stamped with 3-inch letters or numbers on the front and back of each cutting edge.
6. HOLE PUNCHING: All cutting edges shall be punched/slotted to conform with the Illinois Department of Transportation code numbers as shown on the attached drawings.

Effective February 1, 2002

This specification supersedes Serial Number M128-88, effective March 1, 1988.

RH/dg/M128-02

State of Illinois
Department of Transportation
Division of Highways
Springfield

SPECIFICATIONS
FOR
POLYETHYLENE PLASTIC MESH SNOW FENCE

Serial Number: M131-92

I. GENERAL

This specification covers polyethylene plastic mesh snow fence used for snow drift prevention.

II. MATERIALS

The following physical properties shall be met.

<u>PROPERTIES</u>	<u>TEST METHOD</u>	<u>UNITS</u>	<u>VALUE</u>
<u>Ribs</u> Tensile Strength ¹	GRI-GG1-87 ²	lb./ft. of fence width	1850 (min)
<u>Junctions</u> Tensile Strength	GRI-GG2-87 ³	lb./ft. of fence width	1480 (min)
<u>Aperture Size</u> Open Area	COE Method ⁴	%	50 (nom)
<u>Material</u> High Density Polyethylene	ASTM D1248 Type III/Class B/ Grade E5 or Grade P24	%	97.5 (min)
<u>Ultraviolet Resistance</u> 2% (min) Carbon Black or fully stabilized	ASTM D4218		
<u>Color</u> Black or Orange as Specified			
<u>Temperature Range</u> Minimum Strengths Maintained		°F	-60 to 150

Dimensions

Roll Length	ft.	50/100
Roll Width	ft.	4
Roll Weight	lb.	20/39 (min)

Notes:

1. Measured along roll length.
2. Peak tensile strength measured by Geosynthetic Research Institute test method GG1-87 "Geogrid Tensile Strength".
3. Geogrid junction strength and junction efficiency measured by Geosynthetic Research Institute test method GG2-87 "Geogrid Junction Strength".
4. Percent open area measured without magnification by Corps of Engineers method as specified in CW 02215 Civil Works Construction Guide, November 1977.

III. FABRICATION

The geogrid shall be a regular grid structure formed by uniaxially drawing a continuous sheet of select high density polyethylene material and shall have aperture geometry and rib and junction cross-section sufficient for optimum snow trapping efficiency. The geogrid shall have high continuity of tensile strength through all ribs and junctions of the grid structure. The geogrid shall also be resistant to ultraviolet degradation deterioration.

IV. TESTS

The supplier shall furnish the manufacturer's certification that the resin used in the manufacture of polyethylene plastic mesh snow fence meets the physical tests set forth in paragraph II, Materials. The Department at its option may perform any of the tests necessary to establish conformance with this specification. When required by the engineer, a 36-inch long, full height sample shall be furnished for each 2,500 feet of fence or fraction thereof for each manufacturing lot. Additional samples may be required at the Department's option.

V. SHIPPING

Polyethylene plastic mesh snow fence shall be shipped in 50- or 100-foot rolls.

Effective November 1, 1992

State of Illinois
Department of Transportation
Division of Highways
Springfield

SPECIFICATION
FOR
BITUMINOUS PREMIX FOR MAINTENANCE USE,
INSTANT ROAD REPAIR - PROPRIETARY

Serial Number: M133-96

1. **DESCRIPTION**. This specification covers the properties of a rapid-curing asphaltic concrete mixture for the repair of small areas of flexible and rigid type pavements.

2. **MATERIAL**. The mixture shall be designed so that it will have a good workability and can be placed at temperatures of 20° to 140°F without addition of heat. The mixture shall have good adhesion to wet surfaces and be resistant to water damage. It shall consist primarily of crushed stone, rapid-curing cutback asphalt and additives. The mixture must be uniform and not require any remixing of the contents of a given container prior to use.

3. **PROPERTIES**. When tested according to standard Illinois Department of Transportation test methods and ASTM procedures indicated, the mixture shall comply with the following requirements. The department may waive any portion of the testing procedures when it determines such waiving will not affect the acceptance decision.

ASPHALT CONTENT, EXCLUSIVE OF VOLATILES:

PERCENT BY WEIGHT	4.0 Minimum
	6.5 Maximum

AGGREGATE GRADATION:

<u>SIEVE</u>	<u>PERCENT BY WEIGHT</u>
Passing 1/2"	100
Passing 3/8"	95 to 100
Passing 1/4"	75 to 100
Passing 1/4" Retained on No. 10.....	40 to 75
Passing No. 10, Retained on No. 40	8 to 30
Passing No. 40, Retained on No. 80	3 to 15
Passing No. 80, Retained on No. 200	2 to 10
Passing No. 200	0 to 6

HYDROCARBON VOLATILE CONTENT OF MIX:

PERCENT BY WEIGHT 0.4 MINIMUM
1.0 MAXIMUM

MOISTURE CONTENT OF THE MIX:

PERCENT BY WEIGHT 0.2 MAXIMUM

DISTILLATION RANGE OF VOLATILES RECOVERED FROM MIX:

Distillate, expressed as percent by volume of total volatiles recovered from mix when tested by ASTM D 86.

			<u>MINIMUM</u>	<u>MAXIMUM</u>
Off	at	300°F	-	15
Off	at	350°F	25	90
Off	at	400°F	65	-
Off	at	450°F	75	-

PROPERTIES OF ASPHALT EXTRACTED FROM THE MIX:

Penetration, 77 F, 100 g, 5 sec. 60 MINIMUM
120 MAXIMUM

Ductility at 77 F, 5 cm/min, cms 100 MINIMUM

STABILITY AND DENSITY PROPERTIES:

Stability of As-received Mix (no curing) at 77 plus or minus 2 F, percent, minimum (molded at 77 plus or minus 2 F) 35

Stability of Cured Mix at 140 F, percent minimum (cured and molded at 140 F) 40

Density, Percent 90 MINIMUM
96 MAXIMUM

(Mix cured and molded at 140 F, percent density shall be the ratio of the compacted specific gravity to the theoretical maximum specific gravity.

Resistance to water damage. The as-received mix may be evaluated by ASTM D3625. It must not show evidence of more than 10 percent stripping of the aggregate surfaces.

4. **PACKAGING**: The material shall be packaged in plastic resealable airtight buckets with a maximum weight of 50 pounds of premix per bucket. The plastic buckets must be sufficiently sturdy to withstand the normal handling received in use and shipment.
5. **SAMPLING**: The department reserves the right to test samples for requirements of these specifications.
6. **CONSTRUCTION METHODS**: The area to receive the material shall be clean and free of standing water at the time of placement of the repair material. Repair material shall be placed in lifts not to exceed 3 inches. Each lift shall be compacted by rolling, tamping or as directed by the Engineer.

M133-96.doc

State of Illinois
Department of Transportation
Division of Highways
Springfield

SPECIFICATION FOR
FAST-DRY PAVEMENT MARKING PAINT
BLACK
(Lead Free Waterborne Type)

Serial Number M135-05

I. SCOPE

This specification covers black pavement marking paint intended for application on portland cement and bituminous surfaced roadways using conventional waterborne pavement marking equipment capable of atomizing and applying the materials at temperatures up to 65 °C (149 °F). The specification governs the types and quantities of ingredient materials, the required characteristics of the finished paint, inspection procedures, and packaging requirements.

Any material delivered that fails to meet these specifications shall be disposed of by the vendor and immediately replaced with acceptable material entirely at the vendor's expense, including handling and transportation charges.

II. QUALITY REQUIREMENTS

The finished paint shall be formulated and manufactured from first-grade materials. It shall be free from defects and imperfections that might adversely affect the serviceability of the finished product. It shall be completely free from dirt and other foreign material and shall dry within the time specified to a good, tough, serviceable film. The paint shall show no evidence of excessive settling, gelling, skinning, spoilage or livering upon storage in the sealed shipping containers under normal above freezing temperatures within twelve (12) months of delivery. Any settled portion shall be easily brought back into suspension by hand mixing. When the settled portion is brought back into suspension in the vehicle, the paint shall be homogeneous and shall not show a viscosity change of more than 5 KU from the original viscosity. Any paint that has settled within the period of 12 months after delivery to the degree that the settled portion cannot be easily brought into suspension by hand mixing shall be disposed of by the vendor and immediately replaced with acceptable material entirely at the vendor's expense, including handling and transportation charges. The paint, when applied by spraying methods to a bituminous pavement, shall not be discolored due to the solvent action of the paint on the bituminous surface.

III. INGREDIENT MATERIALS

A. Carbon Black

This material shall be a carbon black pigment either powdered or pre dispersed form.

B. Calcium Carbonate.

This material shall comply with the latest revision of the Specification for Calcium Carbonate Pigments, ASTM D 1199, Type GC, Grade I, with a minimum of 95% Calcium Carbonate or Type PC, minimum 98% Calcium Carbonate.

C. Acrylic Emulsion Polymer

This material shall be Rohm and Haas 2706 or Dow Chemical DT-211.

D. Methyl Alcohol

This material shall comply with the latest revision of the Specification for Methyl Alcohol, ASTM D 1152.

E. Miscellaneous Materials

1. Water: Potable.
2. Dispersant: Tamol 850 (Rohm and Haas) or equivalent
3. Surfactant: Triton CF-10 (Union Carbide) or equivalent
4. Defoamer: Colloids 654 (Rhone-Poulenc) or equivalent
5. Rheology Modifier: Natrasol 250 HBR (Aqualon Company) or equivalent
6. Coalescent: Texanol (Eastman Chemical).
7. Preservative: Troy 192 (Troy Chemical) or equivalent

IV. MANUFACTURE

All ingredient materials shall be delivered in the original containers and shall be used without adulteration.

The manufacturer shall furnish to the Department the batch formula which will be used in manufacturing the paint.

No change shall be made in this formula without prior approval by the Department and no change will be approved that adversely affects the quality or serviceability of the paint.

Serial Number M135-05

The following Standard Formula shall be the basis for the paint. The finished product shall conform on a weight basis to the composition requirements of this formula. No variations will be permitted except for the replacement of volatile lost in processing. Amounts are shown in kilograms (pounds) of material.

Carbon Black	9.53(21)**
Calcium Carbonate	362.87(800)
Rheology Modifier	0.23(0.5)*
Acrylic Emulsion, 50% Solids	196.77(434)
Coalescent	9.53(21)
Preservative	0.68(1.5)
Defoamer	2.27(5.0)
Dispersant	3.18(7.0)
Surfactant	1.13(2.50)
Methyl Alcohol	13.61(30)
Aqua Ammonia	0.23(0.50)
Water	<u>26.79(59)**</u>
Total Kilograms (Pounds)	626.82(1382)

*Rheology Modifier amount may be varied by up to 0.05 kg (0.1 pound) to adjust viscosity to desired range.

**Carbon black and water content may vary depending upon the pigment form used. Both must be adjusted to meet the following paint properties.

V. PAINT PROPERTIES

The finished paint shall meet the following requirements:

A. Pigment

Analysis of the extracted pigment shall conform to the following requirements:

Carbon Black (%)	1.5 Min.
Calcium Carbonate (%)	58 Min.

The percent pigment by weight of the finished product shall not be less than 57.5% nor more than 61.5%.

- B. Vehicle
The non-volatile portion of the vehicle shall be composed of a 100% acrylic polymer and shall not be less than 38% by weight.
- C. Organic Volatiles
The finished paint shall contain less than 150 grams of volatile organic matter per liter of total paint (ASTM D3960).
- D. Total Solids
The finished paint shall not be less than 75% total non-volatile by weight (ASTM D2369).
- E. Unit Weight
The unit weight at 25 °C (77 °F) of the production batches shall not vary more than plus or minus 0.024 kg/l (0.2 pounds per gallon) from the weight of the qualification samples.
- F. Viscosity
The consistency of the paint shall not be less than 78 nor more than 88 Krebs Units at 25 °C (77 °F).
- G. Dry Opacity
The minimum contrast ratio shall be 0.97 when tested in accordance with Federal Specification Method 141a, No. 4121, Procedure B, when applied at a wet film thickness of 0.38 mm (15 mils).
- H. Water Resistance
The paint shall conform to Federal Specification TT-P-1952D, Section 3.2.5.
- I. Freeze-Thaw Stability
The paint shall show no coagulation or change in consistency greater than 10 Krebs Units, when tested in accordance with Federal Specification TT-P-1952D, Section 4.3.8.
- J. Accelerated Package Stability
The paint shall show no coagulation, discoloration, or change in consistency greater than 10 Krebs Units when tested in accordance with Federal Specification TT-P-1952D, Section 4.3.4.
- K. Dilution Test
The paint shall be capable of dilution with water at all levels without curdling or precipitation such that the wet paint can be readily cleaned up with water only.
- L. Storage Stability
After 30 days storage in a three-quarters filled, closed container, the paint shall show no caking that cannot be readily remixed to a smooth, homogenous state, no skinning, livering, curdling, or hard settling. The viscosity shall not change more than 5 Krebs units from the viscosity of the original sample.

- M. No-Pick-Up Time
The no-pick-up time shall be less than 10 minutes. The test shall follow the requirements of ASTM D711 with a wet film thickness of 0.38 mm (15 mils).
- N. Grind
The paint shall have a grind of not less than 3 on a Hegman Grind Gauge.
- O. Flexibility
The paint shall show no cracking or flaking when tested in accordance with Federal Specification TT-P-1952D, Section 4.3.5.
- P. Dry Through Time
The paint, when applied to a non-absorbent substrate at a wet film thickness of 0.38 mm (15 mils) and placed in a humidity chamber controlled at $90 \pm 5\%$ R.H. and $22.5 \pm 1.4^{\circ}\text{C}$ ($72.5 \pm 2.5^{\circ}\text{F}$), shall have a "dry through time" not greater than 15 minutes of the IDOT standard formula. The dry through time shall be determined according to ASTM D1640, except that the pressure exerted shall be the minimum needed to maintain contact with the thumb and film.
- Q. No-Tracking Time Field Test
The paint shall dry to a no-tracking condition under traffic in three minutes maximum when applied at 0.38 ± 0.03 mm (15 ± 1 mil) wet film thickness at $54.4^{\circ}\text{-}65.6^{\circ}\text{C}$ ($130^{\circ}\text{-}150^{\circ}\text{F}$), and from three to ten minutes when applied at ambient temperatures. "No-tracking" shall be the time in minutes required for the line to withstand the running of a standard automobile over the line at a speed of approximately 64 km/hour (40 mph), simulating a passing procedure without tracking of the line when viewed from a distance of 15 m (50 feet).

VI. SAMPLING AND INSPECTION

- A. Sample
The manufacturer shall forward to the Engineer of Materials and Physical Research, 126 East Ash Street, Springfield, Illinois 62704, for test purposes, three ½-liter (pint) qualification samples of material representative of that which he/she proposes to produce.

Along with the samples, the paint manufacturer shall furnish a copy of his/her batching formula and a list of the trade names and manufacturers of the ingredient materials proposed for use. Product data sheets shall be provided as verification of the ingredient materials conformity with the specification requirements. No changes shall be made without prior approval by the Department.
- B. Sampling and Testing
Unless otherwise provided, all materials shall be sampled and tested in accordance with the latest published standard methods of the American Society for Testing and Materials, and revisions thereof, in effect on the date of the invitation for bids, where such standard methods exist. In case there are no ASTM Standards which apply, applicable standard methods of the American Association of State Highway and Transportation Officials, or of the Federal Government, or of other recognized standardizing agencies shall be used.
- C. Inspection

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The right is reserved to inspect the paint either at the place of manufacture or after its arrival at destination. If inspected at the place of manufacture, the manufacturer shall furnish such facilities as may be required for collecting and forwarding samples of ingredient materials and finished paint and for performing the inspection of the paint during the process of manufacture. Before manufacture of the paint is started, the ingredient materials shall be set aside at the manufacturer's plant and shall be sampled by an authorized representative of the Department. All materials represented by these samples shall be held until tests have been made and the materials found to comply with the requirements of the specifications. Approximately 30 days are required to test the ingredient materials. The Department has the option to waive inspection of ingredient materials. During the manufacturing operations, the Department's representative shall have free entry at all times to such parts of the plant as concern the manufacture of the paint. All tests will be made by and at the expense of the Department unless otherwise specified.

All material samples for acceptance tests shall be taken or witnessed by a representative of the Department and will be submitted to the Engineer of Materials and Physical Research, 126 East Ash Street, Springfield, Illinois 62704.

VII. PACKAGING

Unless otherwise directed, the paint shall be packaged and shipped in new 55-gallon removable head, steel drums meeting the latest regulations of the United States Department of Transportation for shipping containers for this type of material. The drums shall be lined with a non-corrosive lining compatible with the waterborne paint. The opening in the drum shall be circular, and the diameter of the opening shall be substantially the diameter of the inside of the end of the drum. The drum shall be provided with gaskets of one-piece tubular neoprene construction and shall be completely airtight. The closure shall be securely attached to the drum by a bolt-action-type ring that shall enclose the edge of the lid and the chime of the drum. The closure bolt shall be tightened to a minimum of 54 N•m (40-ft. lbs.) torque, and a lock nut shall be securely tightened against the threaded end of the anchor. The paint shall be packaged in white drums with gray lids.

Fifty-five gallons of paint shall be placed in each drum, leaving approximately 5 cm (2 inches) of air space. The paint shall be measured by volume, the unit of measure being a gallon of 231 cubic inches at 25 °C (77 °F).

Each drum shall be stenciled on the removable head and on the side to show the kind of paint contained therein, the manufacturer's name, the lot number, and the month and year the paint is packaged.

This specification is effective September 12, 2005, and supersedes Serial Number M 135-00, effective May 1, 2000.

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