

SUPPLEMENTAL SPECIFICATIONS
INDIANA DEPARTMENT OF TRANSPORTATION
1999 STANDARD SPECIFICATIONS

REVISION TO 1999 STANDARD SPECIFICATIONS

SECTION 901, BEGIN LINE 174, DELETE AS FOLLOWS:

On days when fly ash is being accumulated for use as a pozzolan, the supplier shall obtain a minimum of one sample per day and furnish test results for moisture content, loss on ignition, ~~sulfur trioxide~~ and 45 : m (No. 325) sieve residue for each sample. ~~A specific gravity determination shall be performed on at least one sample per week.~~

SECTION 901, BEGIN LINE 328, DELETE AND INSERT AS FOLLOWS:

901.04 Microsilica Silica Fume Used As a Pozzolanic Mineral Admixture.

(a) General. Microsilica *Silica fume* will be accepted from one of the suppliers on the Department's list of approved pozzolanic suppliers. ~~Microsilica Silica fume~~ from more than one of these suppliers shall not be mixed or used alternately in the same construction unless authorized in writing. ~~Microsilica Silica fume~~ will be subject to random assurance sampling and testing by the Department. Failure of the random samples to meet the specified requirements will be cause for suspension of the ~~microsilica silica fume~~ supplier's approval.

(b) Acceptance Criteria. Acceptance of ~~microsilica silica fume~~ will be based on the manufacturer's documented ability to consistently furnish material in accordance with the specified requirements.

1. Requirements. The ~~microsilica silica fume~~ shall be in accordance with AASHTO M 307 with the following exceptions:

- ~~a. Loss on ignition, maximum 6.0%~~
- ~~b. Fineness, percent retained on the 45 : m (No. 325) sieve, maximum 10%.~~
- a. *Reactivity with cement alkalies shall not be required.*
- b. *The oversize, amount retained on the 45 Fm (No. 325) sieve, in accordance with ASTM C 1240, shall be conducted.*
- c. *The oversize, amount retained on the 45 Fm (No. 325) sieve, shall not be more than 10%.*
- d. *Accelerated pozzolanic activity index, in accordance with ASTM C 1240, shall be conducted in lieu of strength activity index.*

- e. *The accelerated pozzolanic activity index shall be a minimum of 85% at seven days.*
- f. *The increase of drying shrinkage of mortar bars at 28 days shall be conducted in accordance with ASTM C 1240.*
- g. *The increase of drying shrinkage of mortar bars at 28 days shall not be more than 0.10%*

2. Frequency of Testing.

- a. The manufacturer shall obtain a minimum of one sample ~~per day or one sample~~ for each 400 Mg (400 \pm \bar{t}) of material produced, ~~whichever is most frequent.~~ Test results for ~~fineness, moisture content, specific gravity, and loss on ignition, and soundness~~ shall be furnished for each sample.
- b. For each 2000 Mg (2000 \pm \bar{t}) produced, a complete AASHTO M 307 analysis shall be performed on a sample composed randomly from daily samples. The method of randomization shall be subject to approval by the Department. The optional chemical ~~and physical~~ requirements identified in AASHTO M 307 shall be reported in addition to *the increase of drying shrinkage of mortar bars as well as* the standard chemical and physical requirements.

3. Test and Calibration Procedure. The minimum frequencies for calibration of test equipment shall be as follows:

- ~~a. The 45 : m (No. 325) sieve shall be calibrated every 100 determinations or every six months, whichever comes first.~~
- b a. The analytical balances and scales shall be calibrated annually.
- e b. The concrete compression machine shall be calibrated annually.
- d c. The Blaine apparatus shall be calibrated annually.
- e d. All instrumentation used for rapid chemical analysis shall be in accordance with AASHTO T 105.

4. Documentation. Microsilica Silica fume suppliers requesting approval shall supply the following to the Materials and Tests Division:

- a. For initial approval, a current Material Safety Data Sheet and a summary of results for all specified tests for six consecutive months shall be submitted. No test results shall be more than one year old at the time of the request.
- b. To maintain approval, a summary of results for all specified tests shall be submitted monthly. ~~The results of daily tests shall be available by telephone during normal working hours.~~
- c. A quality control program which ensures the Department a continuous supply of ~~microsilica~~ *silica fume* complying with the material requirements and calibration procedures shall be submitted. This program will be reviewed by the Materials and Tests Division to determine its adequacy.
- d. Certification:
 - (1) For approval, the supplier shall furnish a certification indicating the name, location, and type of manufacturing facility, which includes the metallurgical process and furnace. It shall state that the ~~microsilica~~ *silica fume* shipped for use on Department projects will be produced under appropriate quality control and shall be in accordance with the specified requirements. A sample certification is set out in ITM 804.
 - (2) For certification of test reports, the results generated in accordance with 901.04(b) shall be summarized and submitted monthly. The reports shall state the name and location of the testing facility, and shall be signed by the chemist or technical manager. This certification shall also identify the concrete plants receiving ~~microsilica~~ *silica fume* represented by these results.

901.05 Chemical Anchor Systems. *Chemical anchor systems shall be furnished from the Department's Approved List of Chemical Anchor Systems. Chemical anchor systems may be added to the approved list by completing the requirements in ITM 806, Procedure F and passing required laboratory testing.*

(a) Requirements. *Chemical anchor systems shall be in accordance with the following:*

1. *Chemical anchor systems shall be two part systems which are capable of anchoring deformed steel reinforcing bar and grouting load transfer dowels.*
2. *Chemically anchored steel reinforcing bar shall be capable of withstanding a tensile load equal to the yield strength of a #22 (#7), grade 400 (60), epoxy coated, deformed steel reinforcing bar.*

3. *Chemical anchor systems shall be capable of filling the entire annular space between the concrete and the steel reinforcing bar or dowel and remain in place until the chemical anchor is completely cured.*

(b) Laboratory Testing. *The Department will test chemical anchor systems in accordance with ITM 807.*

901.06 PCC Sealer/Healers. *PCC sealer/healers shall be furnished from the Department's Approved List of PCC Sealer/Healers. PCC sealer/healers may be added to the approved list by completing the requirements in ITM 806, Procedure F and passing required laboratory testing.*

(a) Requirements. *PCC sealer/healers shall be in accordance with the following:*

1. *PCC sealer/healers shall be two part systems, capable of sealing and healing cracks in PC pavement.*
2. *PCC sealer/healers shall be capable of restoring the original integrity of a PCC beam broken in flexure.*
3. *All four beams used for testing sealer/healers shall break at a location different from the original break or with a flexural strength greater than or equal to 3800 kPa (550 psi).*
4. *The viscosity of PCC sealer/healers shall be sufficient to penetrate a crack 0.8 mm (1/32 in.) wide and 150 mm (6 in.) in depth.*

(b) Laboratory Testing. *The Department will test PCC sealer/healers in accordance with ITM 808.*

SECTION 902, BEGIN LINE 7, INSERT AS FOLLOWS:

(a) Performance Graded Asphalt Binders. *Effective January 1, 2001, all performance graded asphalt binders shall be supplied in accordance with ITM 581. Performance graded, PG, asphalt*

SECTION 904, BEGIN LINE 52, INSERT AS FOLLOWS:

minimum acid insoluble content shall be 25%. Fine aggregates shall be in accordance with 904.01(a) for soundness. If soundness testing cannot be conducted, the aggregate shall come from a Category I source in accordance with ITM 203. The mass (weight) adjustment in accordance with 904.02(a) will be applied to fine aggregate only when manufactured from SF slag.

The fine aggregate angularity value of the total blended aggregate material from the fine and coarse aggregates, and recycled materials shall meet or exceed the minimum values for the appropriate ESAL category shown on the title sheet and position within the pavement structure as follows:

SECTION 904, DELETE LINES 60a THROUGH 60k.

SECTION 904, AFTER LINE 61, DELETE AND INSERT AS FOLLOWS:

<i>FINE AGGREGATE ANGULARITY</i>		
<i>TRAFFIC, ESAL</i>	<i>DEPTH FROM SURFACE</i>	
	<i>< 100 mm</i>	<i>> 100 mm</i>
<i>< 300,000</i>		
<i>300,000 to < 3,000,000</i>	<i>40</i>	<i>40</i>
<i>3,000,000 to < 10,000,000</i>	<i>45</i>	<i>40</i>
<i>10,000,000 to < 30,000,000</i>	<i>45</i>	<i>40</i>
<i>> 30,000,000</i>	<i>45</i>	<i>45</i>

Fine Aggregate Angularity, Method A..... AASHTO TP 33 304

SECTION 904, DELETE LINES 67a THROUGH 67j.

SECTION 904, AFTER LINE 68, INSERT AS FOLLOWS:

<i>CLAY CONTENT</i>	
<i>TRAFFIC, ESAL</i>	<i>SAND EQUIVALENT, MINIMUM</i>
<i>< 300,000</i>	<i>40</i>
<i>300,000 to < 3,000,000</i>	<i>40</i>
<i>3,000,000 to < 10,000,000</i>	<i>45</i>
<i>10,000,000 to < 30,000,000</i>	<i>45</i>
<i>> 30,000,000</i>	<i>50</i>

SECTION 904, BEGIN LINE 83, INSERT AS FOLLOWS:

(c) Mineral Filler. Mineral filler shall consist of dust produced by crushing stone, portland cement, fly ash, or other inert mineral matter having similar characteristics for use in HMA. It shall be in accordance with the gradation requirements of 904.01(g) for size No. 16. *Mineral filler for use in HMA shall be produced from a Category I source in accordance with ITM 203 or be from an ABF slag source.* Fly ash shall have been collected by means

SECTION 904, AFTER LINE 121, INSERT AS FOLLOWS:

Specific Gravity and Absorption, Fine Aggregate.....AASHTO T 84

SECTION 904, DELETE LINES 273a THROUGH 273j.

SECTION 904, AFTER LINE 274, INSERT AS FOLLOWS:

<i>FLAT AND ELONGATED PARTICLES</i>	
<i>TRAFFIC, ESAL</i>	<i>PERCENT, MAXIMUM</i>
<i>< 300,000</i>	
<i>300,000 to < 3,000,000</i>	<i>10</i>
<i>3,000,000 to < 10,000,000</i>	<i>10</i>
<i>10,000,000 to < 30,000,000</i>	<i>10</i>
<i>≥ 30,000,000</i>	<i>10</i>

SECTION 904, DELETE LINES 280a THROUGH 281.

SECTION 904, AFTER LINE 282, INSERT AS FOLLOWS:

<i>COARSE AGGREGATE ANGULARITY</i>		
<i>TRAFFIC, ESAL</i>	<i>DEPTH FROM SURFACE</i>	
	<i>< 100 mm</i>	<i>> 100 mm</i>
<i>< 300,000</i>	<i>55</i>	
<i>300,000 to < 3,000,000</i>	<i>75</i>	<i>50</i>
<i>3,000,000 to < 10,000,000</i>	<i>85/80*</i>	<i>60</i>
<i>10,000,000 to < 30,000,000</i>	<i>95/90*</i>	<i>80/75*</i>
<i>> 30,000,000</i>	<i>100/100*</i>	<i>100/100*</i>

* Denotes two faced crush requirements

Coarse Aggregate Angularity..... ASTM D 5821

(d) Surface Aggregate Requirements. The surface aggregate selection shall be based on the ESAL loadings for the project as following:

COARSE AGGREGATE TYPES FOR HMA SURFACE MIXTURES			
<i>(Note 1)</i>			
Coarse Aggregate Type	Traffic ESAL		
	< 1,000,000	< 3,000,000	≥ 3,000,000
Air-Cooled Blast Furnace Slag	Yes	Yes	Yes
Steel Furnace Slag	Yes	Yes	Yes
Sandstone	Yes	Yes	Yes
Crushed Dolomite	Yes	Yes	Note 1 2
Crushed Stone	Yes	No	No
Gravel	Yes	No	No

Note 1. Coarse aggregate for HMA shoulder surface mixtures may be any of the coarse aggregate types.

Note: 12. ~~Dolomite may only be used when blended equally with slag or sandstone. A maximum of 50% of coarse aggregate may be dolomite.~~

SECTION 904, BEGIN LINE 290p DELETE AND INSERT AS FOLLOWS:

75 : m (No. 200)(2)								5.0-10.0	5.0-10.0 12.0	
Decant Conc ⁽³⁾			0-1.5	0-1.5	0-1.5	0-1.5				0-1.5
Other	0-1.0	0-2.5	0-2.5	0-3.0	0-2.5	0-2.5	0-2.0			0-2.5

- NOTES: 1. The fraction passing the 75 Fm (No. 200) sieve shall not exceed 2/3 the fraction passing the 600 Fm (No. 30) sieve. The liquid limit shall not exceed 25 (35 if slag) and the plasticity index shall not exceed 5. The liquid limit shall be determined in accordance with AASHTO T 89 and the plasticity index in accordance with AASHTO T 90. ~~Unless otherwise specified, when these materials are not to be surfaced or sealed under the contract, the amount passing the 75 Fm (No. 200) sieve shall be 5% to 12% and the plasticity index shall not exceed 7.~~
2. Includes the total amount passing the 75 Fm (No. 200) sieve as determined by AASHTO T 11 and T 27.
3. When the material is stone or slag, the decant may be 0 to 2.5.

SECTION 904, LINE 337, DELETE AS FOLLOWS:

- 1- The size of test samples for coarse aggregate shall be as follows:

SECTION 904, DELETE LINES 351 THROUGH 355.

SECTION 906, BEGIN LINE 40, DELETE AND INSERT AS FOLLOWS:

- 40 ~~**d. Certification.** The manufacturer of the joint sealant shall furnish a type A certification in accordance with 916 for each lot of the joint sealant material furnished to the contract. Each lot of the~~ The sealant shall be delivered in containers plainly marked with manufacturer's name or trade mark, lot number, and date of manufacture. The basis of use will be the manufacturer's certification.

SECTION 906, BEGIN LINE 107, DELETE AND INSERT AS FOLLOWS:

(b) Detail Requirements.

- 110 1. When applied in a layer 1 mm (1/16 in.) to 3 mm (1/8 in.) thick on a
tinned metal panel and cured at room temperature for 24 h, the
bituminous mastic pipe joint sealer shall set to a tough plastic
coating free from blisters.
- | | Min. | Max. |
|--|------------|------|
| 2. Grease cone penetration unworked, 150 g,
25EC, 5 s-, ASTM D 217, mm/10 | 125 | 225 |
| 3. Non-Volatile, 10 g, 105EC-110EC, 24 h, % | 75 | |
| 4. Ash, by ignition, %..... | 15 | 45 |
| 5. Flash Point (ASTM D 92), EC (EF) | {38} (100) | |
| 6. Fire Point (ASTM D 92), EC (EF)..... | {66} (150) | |

SECTION 909, BEGIN LINE 681, DELETE AND INSERT AS FOLLOWS:

909.07 Miscellaneous Paints and Ingredients *Blank*.

SECTION 909, DELETE LINES 682 THROUGH 688.

SECTION 909, DELETE LINES 794 THROUGH 823.

SECTION 909, AFTER LINE 824, INSERT AS FOLLOWS:

909.10 Proprietary PCC Sealers. *Proprietary PCC sealers shall be selected from the Department's Approved List of Other Concrete Sealers. A proprietary PCC sealer may be added to the approved list by completing the requirements in accordance with ITM 806, Approved List Procedure C.*

(a) Properties. *The proprietary PCC sealer shall be in accordance with NCHRP 244, Series IV, Southern Climate Weathering Test and possess the following properties.*

Property

Requirement

Reduction of Chloride Ion Content

90% of the Control

Active Ingredients, Minimum

Silane Based

20%

Siloxane Based

15%

Others

10%

(b) Test Report. Testing shall be performed by a recognized laboratory in accordance with ITM 806.

The proprietary PCC sealers shall be delivered to the jobsite in unopened containers with the manufacturer's numbered seal intact.

SECTION 910, BEGIN LINE 633, DELETE AND INSERT AS FOLLOWS:

910.12 Samples and Certification of Guardrail, Posts, Accessories, Fittings, and Hardware Suppliers. All samples required for testing purposes shall be furnished free of charge. General requirements for sampling are as follows:

~~(a) Control Procedure for Furnishing Steel Beam Guardrail and Accessories.~~

~~All steel beam guardrail and accessories shall be subject to one of the two control procedures as follows:~~

~~1. installers on a certification basis with random in-place testing of guardrail;~~

~~2. installers not qualifying or not desiring certification basis with job control sampling~~

Installers Suppliers desiring to be on certification status will be approved upon request and added to the Department's List of Approved Certified Guardrail Suppliers. The

written request need not be in writing, but it shall be requested through the Division of shall be submitted to the Materials and Tests Division. A 6-digit An approval number will be assigned to each installer supplier to be used for identification acceptability of material.

The installer supplier shall perform testing or shall obtain documentation to ensure the quality of the material incorporated into the work.

The installer shall prepare and attach to each monthly material record a certification in accordance with ~~916.02(d)~~ 916.02(e). Such certification shall contain the contract number; installer's supplier's name; installer's supplier's approval number; month of installation; rail

manufacturer; bolt manufacturer; quantities of rail, channel, posts, block, and paddle posts incorporated into the work; quantities of sawed timber posts and blocks for thrie-beam and W-beam guardrail incorporated into the work; and a notarized statement sworn by a person having legal authority to bind the company preparing the certification that the materials furnished are in accordance with 910.09 through 910.12.

The Department will inspect the steel beam guardrail on a randomly selected contract for compliance with specifications for a minimum of one time per year per installer *supplier*. ~~The inspections will be performed before the contract is certified by the Division of Materials and Tests. Various dimensional checks, various coating thickness determinations, proper identification checks for rail and bolts, bore cores for determination of preservative retention, and penetration for sawed timber posts and blocks for end sections will be performed.~~

~~Randomly selected~~ *Selected* contracts with failing results will be issued a Failed Materials Report. ~~Failed materials will be subject to action by the Failed Materials Committee adjudicated as a failed material in accordance with normal Department practice.~~

If the ~~installer~~ *supplier* shows negligence or the inability to ensure the delivery of specified materials, the ~~installer's~~ *supplier's* immediate usage status may be removed.

~~Suppliers not desiring to retain their certification or who lose status will have their material sampled at the project site after delivery. No material may be used until it has been tested and approved.~~

~~Samples will be obtained from materials after delivery to the jobsite or while being held in inventory at the Contractor's yard, if it is located in an area normally serviced by the Department.~~

~~**(b) Aluminum Guardrail.** Rails, posts, accessories, fittings, and hardware will be accepted based on a visual inspection confirming the physical dimensions conform to the requirements as shown on the plans and a type C certification in accordance with 916.~~

SECTION 910, BEGIN LINE 840, DELETE AND INSERT AS FOLLOWS:

250 (ASTM A 709 grade 36). Fuse plates shall be in accordance with the requirements of ASTM A 441 and ASTM A 709M grade 345W (ASTM A 709 grade 50W) 36M (ASTM A 36) and shall be galvanized in accordance with ASTM A 123. All bolts, nuts, and washers shall be high

SECTION 910, BEGIN LINE 859, DELETE AND INSERT AS FOLLOWS:

~~**(c) Square Steel Posts.** Square steel sign post shall be covered by the type of certification specified in the Frequency Manual and A-type C certification shall be required in accordance with 916.~~

SECTION 910, AFTER LINE 874, DELETE AND INSERT AS FOLLOWS:

- c. *ASTM A 653, cold rolled high strength steel, 1.90 mm (0.75 in.) with minimum yield strength of 414 MPa (60,000 psi). The ultimate tensile strength shall not exceed 550 MPa (79,800 psi) or have an elongation measured over 50 mm (2 in.) greater than 20%. This requirement shall apply to the 50 mm x 50 mm (2 in. x 2 in.) size posts only.*

Yield strengths and chemical composition shall be determined from the three latest test results performed by the steel manufacturer. These test results may not be determined on materials from which the delivered posts were made. However, the tests shall have been performed within 90 days of shipment. The certification shall include the range of test results and the section modulus value in accordance with 910.14(a)3.

2. Fabrication. *The posts shall be corner welded and scarfed as necessary to allow sections to telescope within each other. The finished posts shall be machine straightened and have a smooth uniform finish free from cracks, flaws, injurious seams, laps, blisters, and edges which are ragged, sharp, and imperfect, or other defects affecting their strength, durability, or appearance. The maximum variation in straightness shall be no more than 6.3 mm (1/4 in.) in any 1.52 m (5 ft.) of length. Cut holes or knockout holes of 11 mm*

(7/16 in.) diameter shall be spaced on 25 mm (1 in.) centers, on the centerlines of all four sides in true alignment, and opposite to each other for back to back applications. All holes and sheared ends shall be free from burrs.

3. Protective Coating. *The protective coating shall be applied using one of the following:*

- a. ~~Both inside and outside surfaces shall be galvanized or coated in accordance with ASTM A 525. Before fabrication, both sides of the rolled sheet steel shall be galvanized in accordance with ASTM A 653M, coating designation Z 275 (ASTM A 653, coating designation G 90).~~
- b. *After fabrication, a triple coating system with a zinc coating on the outside of the posts consisting of galvanizing with zinc which is in accordance with AASHTO M 120, weighing 190 mL/m^2 $183 \pm 46 \text{ g/m}^2$ ($0.60 \pm 0.15 \text{ oz/ft}^2$) shall be applied to the outside of the post, followed by a chromate conversion coating of 0.02 Fg/mm^2 weighing $0.02 \pm 0.006 \text{ g/m}^2$ (15 ± 5 micrograms per Fg/in.^2) and a clear organic exterior coating of $5 \text{ }\mu\text{m}$ ($0.2 \pm 0.1 \text{ mil}$). The interior surface of the posts shall receive a double in-line application of a full zinc based rich organic coating of $30 \text{ }\mu\text{m}$ with a total dry film thickness of $30 \pm 15 \text{ }\mu\text{m}$*

(1.2 ± 0.6 mil). ~~Such interior coating shall be tested in accordance with ASTM B 117.~~ The dried zinc rich organic coating film shall contain a minimum of 77% total zinc. Samples from the posts which use these protective coatings shall be exposed to salt fog testing in accordance with ASTM B 117 for a total of 500 h. The samples shall be examined at both 100 and 500 h of salt fog testing and rated for corrosion. At 100 h the corrosion rating shall be a minimum of 9 and at 500 h the corrosion rating shall be a minimum of 6 when determined in accordance with ASTM D 1654.

(f) Portable Construction Sign Trailer. The portable construction sign trailer, not including the signs and lights, shall weigh no more than 140 kg (300 lb) and shall not be fabricated with heavier than 75 x 75 mm (3 x 3 in.) angles, 63 mm (2 ½ in.) pipe, or 75 x 50 mm (3 x 2 in.) rectangular tubing. The rim size of the wheels shall not exceed 300 mm (12 in.). Axle assemblies with differential housings shall not be used.

SECTION 910, BEGIN LINE 919, DELETE AND INSERT AS FOLLOWS:

920 tolerances. ~~It~~ The sample shall withstand being bent cold through an angle of 180 degrees flat upon itself, without failure of the outside of the bent portion. The type of certification for copper flashing will be covered by the Frequency Manual and shall be in accordance with 916.

SECTION 910, LINE 1225, DELETE AND INSERT AS FOLLOWS:

910.20 Blank Steel Bridge Railing Components. Materials for steel bridge railing components shall be in accordance with the following.

- (a) Railing tubing shall be in accordance with ASTM A 500, Grade B.
- (b) Posts, connection plates, splice bars, base plates, and anchor channel bars shall be in accordance with ASTM A 36M (ASTM A 36).
- (c) Steel bolts, nuts, and cap screws shall be in accordance with ASTM A 307.
- (d) Railing end caps shall be steel castings in accordance with ASTM A 27M, grade 485-250 (ASTM A 27, grade 70-36).
- (e) Threaded rods, nuts, and washers shall be in accordance with AASHTO M 164.
- (f) Steel washers shall be standard round cut or lock washers, as shown on the plans.
- (g) Cap screws shall be stainless steel in accordance with ASTM A 276, type 304, 305, or 430.

- (h) *Anchor bolts shall be stainless steel in accordance with ASTM A 276, type 305 or 430. However, they shall have a minimum ultimate strength of 690 MPa (100 ksi). Threads may be cut or rolled.*
- (i) *Railing tubing, posts, connection plates, splice bars, base plates, anchor channel bars, and railing end caps shall be galvanized after fabrication in accordance with AASHTO M 111.*

Bolts, nuts, cap screws, washers, and lock washers shall be galvanized after fabrication in accordance with AASHTO M 232.

- (j) *Anchor bolts furnished under this specification shall be covered by a type A certification in accordance with 916. All other components furnished under this specification shall be covered by a type C certification in accordance with 916.*

SECTION 912, AFTER LINE 24, INSERT AS FOLLOWS:

(f) Polyethylene Film *The sheeting shall be in accordance with AASHTO M 171.*

SECTION 912, BEGIN LINE 62, DELETE AND INSERT AS FOLLOWS:

912.03 Admixtures for Use in Concrete. *Admixtures for use in PCC shall be selected from the Department's Approved List of Admixtures for PCC. An admixture may be added to the approved list by completing the requirements in ITM 806, Procedure D. Admixtures containing chloride added as an ingredient of manufacture are unacceptable.*

(a) Air Entraining Admixtures. *Air entraining admixtures are materials to be added to ~~portland cement concrete~~ PCC mixtures at the mixer for the purpose of entraining air. ~~These admixtures shall be in accordance with AASHTO M 154.~~*

(b) Chemical Admixtures for Concrete. *Chemical admixtures are materials to be added to ~~portland cement concrete~~ PCC mixtures at the mixer for the purpose or purposes indicated below. The admixtures shall be in accordance with AASHTO M 194 for their respective types.*

1. Type A. *Type A is a water reducing admixture that reduces the quantity of mixing water required to produce concrete of a given consistency.*

2. Type B. *Type B is a retarding admixture that retards the setting of concrete.*

3. Type C. *Type C is an accelerating admixture that accelerates the setting and early strength development of concrete.*

4. Type D. *Type D is a water reducing and retarding admixture that reduces the quantity of mixing water required to produce concrete of a given consistency and retards the setting of concrete.*

5. Type E. Type E is a water reducing and accelerating admixture that reduces the quantity of mixing water required to produce concrete of a given consistency and accelerates the setting and early strength development of concrete.

6. Type F. Type F is a high range water reducing admixture, HRWR, that reduces the quantity of mixing water required to produce concrete of a given consistency by 12% or greater.

7. Type G. Type G is a high range water reducing and retarding admixture, HRWRR, that reduces the quantity of mixing water required to produce concrete of a given consistency by 12% or greater and retards the setting of concrete.

8. High Range Water Reducing and High Range Water Reducing and Retarding Admixture Systems. HRWR and HRWRR admixture systems typically utilize an air entraining agent; a type A or type D chemical admixture; and a type F chemical admixture, for HRWR, or a type G chemical admixture, for HRWRR.

SECTION 912, DELETE LINES 103 THROUGH 170.

SECTION 912, AFTER LINE 171, DELETE AND INSERT AS FOLLOWS:

(c) Test Report. *Testing shall be performed by a recognized laboratory in accordance with ITM 806 for their respective types.*

1. *Air entraining admixtures shall be in accordance with AASHTO M 154.*
2. *Chemical admixtures shall be in accordance with AASHTO M 194 for their respective types except that the test report for HRWR and HRWRR admixture systems shall be in accordance with the following additional requirements:*
 - a. ~~(1)~~ The HRWR or HRWRR admixture system shall be used in the test concrete.
 - ~~(2) The control concrete shall contain the same air entraining agent used in the HRWR or HRWRR admixture system.~~
 - b. ~~(3)~~ The six month and one year compressive strength testing will be waived and flexural strength testing will not be required.
 - c. ~~(4)~~ Uniformity and equivalence testing will not be required.
 - d. ~~(5)~~ Testing for length change ~~shall~~ *will* not be required.

- e. (6) A sample of the test concrete containing the HRWR or HRWRR admixture system shall be tested for hardened concrete air void system analysis in accordance with ASTM C 457. The sample for hardened concrete air void system analysis shall indicate an air content of at least 4.5% for class C, and 5.2% for class A; a voids per millimeter (inch) parameter of at least 0.0492 (1.25) times the air content; a spacing factor of 0.254 mm (0.010 in.) or less; and a specific surface of 19.685 mm²/mm³ (500 in.²/in.³).

SECTION 912, DELETE LINES 194 THROUGH 230.

SECTION 912, BEGIN LINE 232, DELETE AND INSERT AS FOLLOWS:

5 3. ~~The tests shall be performed by a recognized laboratory which is a state highway agency testing laboratory, or a cement or concrete laboratory regularly inspected by the CCRL. Proof of such inspection shall be furnished on request. The test report shall be dated to establish when the testing was started. Test reports shall not be more than five years old on January 1 of the approval year will be unacceptable. New submittals of AASHTO M 194 test reports more than five years old will be accepted if all subsequent 5 year limited retest reports are submitted. Subsequent limited retest results shall comply with the dating and age requirements specified above and shall include the following AASHTO M 194 tests as a minimum requirement for compliance:~~

- a. *infrared analysis, residue by oven drying, and specific gravity;*
- b. *water content and time of setting as referenced in AASHTO M 194;*
- c. *flexural strength at three, seven, and 28 days;*
- d. *relative durability.*

SECTION 912, DELETE LINES 238 THROUGH 264.

SECTION 912, DELETE LINES 274 THROUGH 276.

SECTION 913, BEGIN LINE 31, DELETE AND INSERT AS FOLLOWS:

913.04 Hydrated Lime. Hydrated Lime shall be ~~in accordance with ASTM C 207, Type N~~ a hydrated lime when used in masonry or a hydrated lime, quicklime or lime by-product when used for soil modification.

(a) Hydrated Lime for Masonry Hydrated lime used in masonry shall be in accordance with ASTM C 207, Type N.

(b) Lime for Soil Modification

1. Hydrated Lime and Quicklime. Hydrated lime and quicklime shall be in accordance with AASHTO M 216.

2. Lime By-Products. Lime by-products shall be hydrated lime or quicklime by-products in accordance with ASTM C 25 having the following requirements:

- a. The lime by-products shall contain a minimum of 60% total available calcium and magnesium oxides (non-volatile basis).
- b. Available calcium hydroxide plus magnesium oxide calculated as calcium hydroxide shall be a minimum of 30%.
- c. Sieve analysis shall be performed in accordance with ASTM C 110. The lime by-products gradation shall be as follows:

Sieve	% Passing
4.75 mm (No. 4)	95-100
600 μ m (No. 30)	90-95
150 μ m (No. 100)	70-80

SECTION 913, BEGIN LINE 73, DELETE AND INSERT AS FOLLOWS:

913.07.1 Flexible Channelizer and Flexible Tubular Marker. The vertically placed portion of each this device shall consist of high density polyethylene plastic in accordance with ASTM D 5203. The base material shall be butyl rubber in accordance with ASTM D 5900. Epoxy material used to attach the base to the roadway surface shall be in accordance with the manufacturer's recommendations. The tubular portion of the flexible tubular marker shall be covered with high intensity reflective sheeting in accordance with 913.10(d).

SECTION 913, DELETE LINES 150 THROUGH 159.

SECTION 913, AFTER LINE 151, INSERT AS FOLLOWS:

913.09 Glass Beads. Glass beads shall be in accordance with AASHTO M 247, Type I except sampling shall be in accordance with the frequency manual. The beads shall have a maximum of 25% defects such as, but not limited to, miliness, scratches, pits, air bubbles, fused beads, irregularities, and angularity. The beads shall have a moisture resistant coating.

SECTION 913, BEGIN LINE 1574, DELETE AND INSERT AS FOLLOWS:

913.12 Construction Warning Lights. Construction warning lights shall be self-illuminated by means of an electric lamp behind the lens. Types A and C shall also be externally illuminated by reflex-reflective elements built into the lens to enable it to be seen by the light from the headlights of oncoming traffic.

The batteries shall be entirely enclosed in a case. The case shall be secured by a locking device which can be opened with a special tool.

~~(a) Types of Warning Lights.~~

~~1. Type A.~~ Type A shall be a low intensity flashing barricade warning light.

~~2. Type B.~~ Type B shall be a high intensity flashing barricade warning light.

~~3. Type C.~~ Type C shall be a steady burn barricade warning light.

~~(b) General Requirements.~~ The light shall be self-illuminated by means of an electric lamp behind the lens. Types A and C also shall be externally illuminated by reflex-reflective elements built into the lens to enable it to be seen by reflex-reflection of the light from the headlights of oncoming traffic.

~~When the unit is to be operated by batteries, the batteries shall be entirely enclosed in a case. The case shall be secured by a locking device which can be opened by a special wrench or tool.~~

~~When the unit is to be operated by a 120 volt, 60 cycle power supply, the unit shall be supplied with a separate ground wire and be protected with suitable fuses. The connections and equipment used shall be in accordance with the pertinent current standards of the Institute of Electrical and Electronic Engineers, the ASTM, and the National Board of Fire Underwriters. In those areas where there are pertinent local ordinances and requirements, the wiring, materials, and installation procedures shall be in accordance with them.~~

~~(c) (a) Flash Requirements.~~

~~1. Flash Rate.~~ The light from types A and B shall have a flash rate of 65 " 10 pulsations per minute from -29EC (-20EF) to + 66EC (150EF) ~~regardless of power source.~~

~~2. On-Time.~~ *On-time is defined as the period of the flash when instantaneous intensity is equal to or greater than the effective intensity as specified in 913.12(b)1.*

~~a. Definition.~~ ~~On time is defined as the period of the flash when instantaneous intensity is equal to or greater than the effective intensity as specified in 913.12(d)1.~~

~~b a. Type A.~~ The light shall have an on-time of no less than 10% of the flash cycle.

~~c b. Type B.~~ The light shall have an on-time of no less than 8% of the flash cycle.

~~(d)(b) Optical Requirements.~~

1. Effective Intensity. The light beam projected upon a surface perpendicular to the axis of the light beam shall produce a lighted area within the solid angle bounded by the two vertical planes nine degrees from the vertical plane through the axis of the optical system and two planes five degrees above and below the horizontal plane through the optical axis of the system.

For type A, the effective intensity shall not drop below *4.0 cd* (4.0 candles) within the area specified herein during the first 336 h of continuous flashing.

For type B, the effective intensity shall not drop below *35 cd* (35 candles) within the area specified herein during the first 168 h of continuous flashing.

For type C, the ~~beam-candle-power~~ *effective intensity* shall not drop below *2.0 cd* (2.0 candles) within the area specified herein during the first 168 h of continuous burning.

2. Lens Illumination. The illuminated lens shall be uniformly bright in appearance over its entire illuminated surface when viewed from any point within the angle defined in ~~912.12(d)~~ *913.12(b)*.

3. Reflex-Reflective Performance. For types A and C the specific intensity of the lens when acting as a reflex-reflector at an observation angle of 0.2 of a degree shall be no less than the following:

Entrance Angle (degrees)	Specific Intensity Candelas per lux (Candles per Footcandle)
0	1.67 (18)
10	1.40 (14)
20	0.65 (7)

4. Testing Procedure. The effective intensity of types A and B lights shall be calculated using the Guide for Calculating the Effective Intensity of flashing Signal Lights as approved by the Illuminating Engineering Society, June, 1961. The intensity of the type C light shall be tested in accordance with SAE Standard J 575d, Lighting Equipment and Photometric Tests. Reflex-reflection shall be tested in accordance with SAE Standard J 594d.

~~(e)(c)~~ Lens Requirements.

1. Size of Lens. The lens shall be no less than 175 mm (7 in.) in diameter including for ~~types A and C~~ a reflex-reflector ring of 13 mm (1/2 in.) minimum width around the periphery *for types A and C*.

2. Number of Directional Lenses. Unless otherwise directed, types A, B, and C shall have uni-directional lenses.

3. Lens Chromaticity. If the light uses an incandescent lamp, the chromaticity of the lens color shall be defined by the tri-stimulus coordinates of the Commission International d'Eclairage Standards. When tested with illuminants from 2856 K to 2366 K, the lens color shall fall within the area of the chromaticity diagram in accordance with the 1931 Commission International d'Eclairage Standard Observer as defined by the following coordinates:

X	Y	Z
0.543	0.452	0.005
0.548	0.452	0.000
0.584	0.411	0.005
0.589	0.411	0.000

If the light uses other than an incandescent lamp, the light output shall be in the same range as the light obtained with the incandescent lamp and the specific lens.

4. Lens Luminous Transmittance. The minimum relative luminous transmittance of the lens with illuminant at 2856 K shall be 0.440.

5. Lens Material. The lens shall be plastic of one piece construction. ~~The lens material~~ and shall meet the test requirements in accordance with SAE J 576b, except that the exposure time and condition, paragraph 3.4.3, for the purposes of this standard shall be one year.

~~(f)(d)~~ Head and Housing Case.

1. Swivel Head. If swivel capabilities as described herein are not incorporated in the device used to mount a type A or C light on a barricade or sign, the head shall be mounted on the housing in a manner permitting it to be swiveled through a minimum 90 degrees arc in a horizontal plane. If swiveling is accomplished by rotation of the head, construction shall be such that the head rotation ~~will~~ *shall* not damage the wiring.

2. Housing. ~~Housing shall be the case containing the batteries and circuitry. The housing shall be constructed of No. 1.2 mm (18 gage) steel or other approved material.~~

3. Weatherproofing 2. Case. The case shall be so constructed and closed as to exclude moisture that would affect the specified operation of the light. The case shall have a weep hole to allow the escape of moisture from condensation.

~~(g)(e) Photoelectric Controls.~~ Photoelectric controls, if provided on types A or C lights, shall keep the light operating whenever the ambient light falls below 215 lux (20 footcandles).

~~(h) Basis For Use.~~ ~~A type C certification in accordance with 916 shall be provided for construction warning lights, except it shall be prepared by the Contractor, and not a manufacturer.~~

SECTION 913, DELETE LINES 1724 THROUGH 1729.

SECTION 913, AFTER LINE 1730, INSERT AS FOLLOWS:

An indicator light shall be provided on the back of the sign to provide confirmation that the flashing arrow sign is operating. The indicator light shall be visible for 150 m (500 ft).

~~(a) Solar Powered.~~ *Solar power assisted units shall incorporate a target sight device and leveling mechanism to aid the user for positioning of the unit prior to use. The device shall be attached to the elevated portion of the flashing arrow sign and not to the fixed support frame.*

The lamps shall be electronically operated by means of a solid state controller. An automatic lamp intensity regulator shall hold the lamp output constant with varying battery voltage. The control system shall incorporate a full time tracking system designed to track ambient light for 24 h a day. The control system shall adjust lamp intensity to provide maximum system efficiency. The controller shall be in a weatherproof, ventilated, lockable enclosure.

The lamps shall provide amber beams with a minimum of a 20E horizontal and 6E vertical field of view. The minimum effective luminance within the required beam shall not be less than one half the effective luminance at the beam center.

The battery bank shall consist of 12 v, deep cycle, batteries. The battery bank shall be of sufficient capacity to power the unit for 15 days with no assistance from the sun. A battery condition indicator and a test switch shall be provided to monitor the system's battery charge. The batteries shall be secured in a well-ventilated, weatherproof lockable housing. A low battery charge indicator which shall be visible to maintenance personnel driving past the sign shall be provided to indicate the need to recharge the batteries. The battery bank shall be at full charge when delivered to the project site.

The unit shall be equipped with a sign/solar panel lifting mechanism. The lifting mechanism shall be designed to safely carry the capacity of the sign's load. The lifting mechanism shall incorporate a positive locking device to secure the panel in a raised or lowered position.

Solar power assisted flashing arrow signs to be used shall be selected from the Department's list of Approved Solar Power Traffic Control Devices.

(b) Diesel Powered. *Flashing arrow sign shall be fueled by diesel fuel only.*

(c) AC Powered. *When connected to an AC electrical power source, provisions shall be made to prevent electrocution.*

FLASHING ARROW SIGN GENERAL SPECIFICATIONS

	TYPE A	TYPE B	TYPE C	SOLAR POWER ASSISTED
Minimum Board Size	0.6 m (2 ft) high x 1.2 m (4 ft) wide**	See Note Below	1.2 m (4 ft) high x 2.4 m (8 ft) wide	1.2 m (4 ft) high x 2.4 m (8 ft) wide
Minimum No. of Lamps Flashing Arrow Flashing Double Arrow Sequential Chevron (3 Heads Minimum)	5 in head, 5 in shaft* 5 in head, 4 in shaft* 5 in head		Same as Type A	5 in head, 5 in shaft* 5 in head, 3 in shaft* 7 in shaft
Lamp Type	Sealed Beam - 12.8 V, not to exceed 3 A Ave. rated life - 300 h. Min. Candlepower - 1000 cd (1000 candles) Min. 9700 cd (9700 candles) Max.		Same as Type A	Sealed beam - 12.8 V, not to exceed 3 A Average rated life - 300 h Min. Candlepower - 600 cd (600 candles) at normal voltage and \$ 250 cd (250 candles) at low voltage
Lens Color	Amber		Amber	Amber
Board Color	Flat Black		Flat Black	Flat Black
Flashing Rate	30-50 F.P.M. (50% on time)		30-50 F.P.M. (50 % on time)	25-40 F.P.M. (50% on time)
Message (Left or Right)	Flashing Arrow, Flashing Double Arrow, or Sequential Chevron		Flashing Arrow, Flashing Double Arrow	Flashing Arrow, Flashing Double Arrow, or Warning Bar
Minimum mounting height (to bottom of board)	2.1 m (7 ft)		2.1 m (7 ft)	2.1 m (7 ft)
Where Permitted	Where normal speed limit is less than 40 mph		All rural & urban locations	Stationary Operations Tangent Sections (See 801.13(a))
Required Minimum Visibility	0.8 km (0.5 mi)		1.6 km (1 mi)	1.6 km (1 mi)

* When flashing a single or double arrow(s), the lamp(s) nearest the arrow points shall not be illuminated.

** Either rectangular or arrow shaped black background sign will be permitted.

Note: General specifications for a type B flashing arrow sign are shown in the Federal MUTCD.

913.13.1 Temporary Worksite Speed Limit Sign Assembly. The temporary worksite speed limit sign assembly shall be an all-weather, self-contained unit designed to display speed limit signs in accordance with the MUTCD and as shown on the plans. The signs shall be installed on frangible posts or mounted on movable stands or trailers in accordance with 910.14(f). The power source shall be capable of operating the strobe lights, without service, for the period which the sign is in effect. An on/off switch will be required.

SECTION 913, DELETE LINES 1737 THROUGH 1831.

SECTION 913, AFTER LINE 1832, INSERT AS FOLLOWS:

1. Thermoplastic. This material shall be in accordance with AASHTO M 249.

SECTION 913, BEGIN LINE 2022, DELETE AND INSERT AS FOLLOWS:

Type I tape shall be prequalified for use. ~~and each~~ Each manufacturer shall provide the ~~Procurement and Distribution~~ Operations Support Division with samples for field evaluation. The Department will maintain a list of approved type I tape.

SECTION 913, BEGIN LINE 2073, DELETE AS FOLLOWS:

A steel wool abrasion test shall be performed by forming a 25 mm (1 in.) diameter flat pad using No. 3 coarse steel wool ~~in accordance with Federal Specification FF W-1825~~. The steel wool pad shall be placed on the reflector lens, a load of 22.7 kg (50 lbs) shall be applied, and the entire lens surface shall be rubbed 100 times.

SECTION 913, LINE 2081F, DELETE AND INSERT AS FOLLOWS:

HORIZONTAL INCIDENT ANGLE	MINIMUM REFLECTIVE INTENSITY
0E	0.279 cd/lx (3.0 Candlepower/footcandle)
20E	0.1115 cd/lx (1/2 1.2 Candlepower/footcandle)

SECTION 913, BEGIN LINE 4144, DELETE AS FOLLOWS:

~~The geotextile to be used shall be selected from the list of approved Geotextiles for Use with Underdrains.~~ A manufacturer, requesting that a geotextile be added to the approved list, shall provide a certification documenting compliance with the above requirements and a sample to the Materials and Tests Division. The certification shall be