INDIANA DEPARTMENT OF TRANSPORTATION
Driving Indiana's Economic Growth

100 North Senate Avenue
Room N925
Indianapolis, Indiana 46204

PHONE: (317) 232-5456
FAX: (317) 232-5551

Michael R. Pence, Governor
Karl B. Browning, Commissioner

AGENDA

February 19, 2015 Standards Committee Meeting

MEMORANDUM

February 5, 2015

TO: Standards Committee

FROM: Scott Trammell, Secretary

RE: Agenda for the February 19, 2015 Standards Committee Meeting

A Standards Committee meeting is scheduled for 09:00 a.m. on February 19, 2015 in the N955 Bay Window Conference Room. Please enter meeting through the double doors directly in front of the conference room.

The following items are listed for consideration:

A. GENERAL BUSINESS ITEMS

OLD BUSINESS

(No items on this agenda)

NEW BUSINESS

1. Approval of the Minutes from the January 15, 2015 meeting

B. CONCEPTUAL PROPOSAL ITEMS

OLD BUSINESS

(No items on this agenda)

NEW BUSINESS

(No items on this agenda)

C. STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS PROPOSED ITEMS

OLD BUSINESS

(No items on this agenda)

NEW BUSINESS

Item No. 01	(2014 SS)	Mr. Pankow	pg 04
109.05(b)6		Subcontracting	
Item No. 02	(2014 SS)	Mr. Pankow	pg 08
107.23		Waiver of Legal Rights	
108.10		Default and Termination of Contract	
Item No. 03	(2014 SS)	Mr. Walker	pg 14
715.02(j)		Grated Box End Sections	
910.22		*Grating for Grated Box End Sections*	
Item No. 04	(2014 SS)	Mr. Walker	pg 20
715.02(h)		End Bent Drain Pipe	
715.02(j)		Underdrain Outlet Pipe	
907.24(b)		Schedule 40 PVC Pipe	
Item No. 05	(2014 SS)	Mr. Walker	pg 25
715.09		Backfilling	
907.16		Thermoplastic Pipe Requirements	
907.17		Corrugated Polyethylene Drainage Tubing *and Pipe*	
907.19		Corrugated P~~olyethylene~~*Polypropylene* Pipe	
Item No. 06	(2014 SS)	Mr. Walker	pg 30
910.01(b)5		Deformed and Smooth Steel WWR	
Item No. 07	(2014 SS)	Mr. Boruff	pg 35
803.03(c)		Weld Quality	
803.04		Qualification Of Procedures, Welders, and Welding Operators	
910.19(a)		Aluminum Trusses for Overhead Sign Structures, Box Truss and Dynamic Message Sign Structure Truss	
925.01		General Requirements	
Item No. 08	(2014 SS)	Mr. Pankow	pg 38
201.01		Description	
202.02		General Requirements	
203.08		Borrow or Disposal	
203.10		Disposal of Excavated Material Except Waterway and Peat Excavation	
203.11		Disposal of Waterway Excavation	
203.12		Disposal of Peat	

Item No. 09 (2014 SS)	Mr. Boruff	pg 53
Standard Drawings:		
808-MKPM-01	*PAVEMENT MARKINGS ROUNDABOUT TRAFFIC ARROWS*	
808-MKPM-02	TRANSVERSE MARKINGS *TURN ARROWS*	
808-MKPM-03	TRANSVERSE MARKINGS *WORD MESSAGES*	
808-MKPM-04	TRANSVERSE MARKINGS *WORD MESSAGE*	
808-MKPM-05	TRANSVERSE MARKINGS *YIELD LINES*	
808-MKPM-06	TRANSVERSE MARKINGS *RAILROAD CROSSINGS*	
~~808-MKPM-07~~	~~PAVEMENT MARKING FOR RAILROAD CROSSINGS~~ *(see MKPM-06)*	

Item No. 10 (2014 SS)	Mr. Boruff	pg 68
805.05	Placing Signal Heads	
Standard Drawing:		
805-SGSC-04	~~SIGNAL POLES~~ SPAN, CATENARY & TETHER DETAIL	

Item No. 11 (2014 SS)	Mr. Boruff	pg 75
Recurring Special Provision:		
807-T-193	LUMINAIRES	

Item No. 12 (2014 SS)	Mr. Walker	pg 108
203.09	General Requirements	
203.16(a)	Treatment of Existing Fills	
203.20(a)	Rock Embankment	
203.20(b)	Shale, Shale and Soft Rock Mixtures, Or Soft Rock	
203.20(c)	Shale And Thinly Layered Limestone	
203.23	Embankment Other Than Rock and Shale, With Density Control	
203.04	Method of Making Density Tests	
203.25	Embankment without Density Control	
203.27	Method of Measurement	
207.03	General Requirements	

cc: Committee Members
FHWA
ICA

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Contractors are allowed to markup various components of work that is done under force account. This markup accounts for the administration costs of the components of the work. In the current standard specification 109.05(b)5, the markup allowed for subcontracted work is 10% on the first $3000 and 7% thereafter. This can result in excessive markups on subcontracted work beyond the cost associated with administrating the subcontracts.

PROPOSED SOLUTION: This proposal will allow for a slightly higher initial markup of subcontracted work and limit the total amount of markup on the subcontracted component.

APPLICABLE STANDARD SPECIFICATIONS: 109.05(b)5

APPLICABLE STANDARD DRAWINGS: None

APPLICABLE DESIGN MANUAL SECTION: None

APPLICABLE SECTION OF GIFE: None

APPLICABLE RECURRING SPECIAL PROVISIONS: None

PAY ITEMS AFFECTED: None

APPLICABLE SUB-COMMITTEE ENDORSEMENT: N/A

IMPACT ANALYSIS (attach report): See Attached.

Submitted By: Greg Pankow

Title: State Construction Engineer

Organization: INDOT

Phone Number: 232-5502

Date: January 22, 2015

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

IMPACT ANALYSIS REPORT CHECKLIST

Explain the business case as to why this item should be presented to the Standards Committee for approval. Answer the following questions with Yes, No or N/A.

Does this item appear in any other specification sections? Yes, In addition to force account work, numerous specification sections refer to change orders in accordance with 109.05.

Will approval of this item affect the Approved Materials List? No

Will this proposal improve:

Construction costs? Yes

Construction time? No

Customer satisfaction? No

Congestion/travel time? No

Ride quality? No

Will this proposal reduce operational costs or maintenance effort? No

Will this item improve safety:

For motorists? No

Will this proposal improve quality for:

Construction procedures/processes? No

Asset preservation? No

Design process? No

Will this change provide the contractor more flexibility? No

Will this proposal provide clarification for the Contractor and field personnel? No

Can this item improve/reduce the number of potential change orders? No

Is this proposal needed for compliance with:

Federal or State regulations? No

AASHTO or other design code? No

Is this item editorial? No

Provide any further information as to why this proposal should be placed on the Standards Committee meeting Agenda: This section is used as a basis for cost analysis of submitted change order cost summaries as well as force account work.

REVISION TO STANDARD SPECIFICATIONS

SECTION 100 - GENERAL PROVISIONS
109.05(b)6 SUBCONTRACTING

The Standard Specifications are revised as follows:

SECTION 109, BEGIN LINE 727, DELETE AND INSERT AS FOLLOWS:

6. Subcontracting

For administration costs in connection with approved subcontract work, the Contractor shall receive an amount equal to 10% of the first ~~$3,000~~*10,000* and ~~7~~5% thereafter, of the total cost of such work computed as set forth above. *The maximum amount compensated for subcontracting administration costs will be $50,000 per subcontract.*

COMMENTS AND ACTION

109.05(b)6 SUBCONTRACTING

DISCUSSION:

Motion: Second: Ayes: Nays: FHWA Approval:	Action: _____ Passed as Submitted _____ Passed as Revised __ __ Withdrawn
Standard Specifications Sections referenced and/or affected: 109.05 pg 108. Recurring Special Provision affected: NONE Standard Drawing affected: NONE Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	_____ 2016 Standard Specifications _____ Revise Pay Items List _____ Create RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Revise RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Standard Drawing Effective _____ Create RPD (No. _____) Effective _____ Letting _____ GIFE Update

Mr. Pankow
Date: 2/19/15

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: INDOT incurs substantial attorney fees from outside counsel due to a contractor's breach of contract for failure to perform in an acceptable fashion. Nearly all well written commercial contracts contain a provision to allow a party to recover its attorney fees. Indiana law does not permit the state or INDOT to pay someone else's attorney fees.

PROPOSED SOLUTION: Include a provision in the Standard Specifications to allow for recovery of attorney fees and litigation expenses. Change 108.10 and 107.23 to the following:

[See attached].

APPLICABLE STANDARD SPECIFICATIONS: 108.10 and 107.23

APPLICABLE STANDARD DRAWINGS: N/A

APPLICABLE DESIGN MANUAL SECTION: N/A

APPLICABLE SECTION OF GIFE: N/A

APPLICABLE RECURRING SPECIAL PROVISIONS: N/A

PAY ITEMS AFFECTED: N/A

APPLICABLE SUB-COMMITTEE ENDORSEMENT:

IMPACT ANALYSIS (attach report):

Submitted By: Lori Torres

Title: Chief Legal Counsel

Organization: INDOT

Phone Number: 317-232-5012

Date: 1-23-15

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

IMPACT ANALYSIS REPORT CHECKLIST

Explain the business case as to why this item should be presented to the Standards Committee for approval. Answer the following questions with Yes, No or N/A.

Does this item appear in any other specification sections? No

Will approval of this item affect the Approved Materials List? No

Will this proposal improve:

- Construction costs? Yes
- Construction time? No
- Customer satisfaction? No
- Congestion/travel time? No
- Ride quality? No

Will this proposal reduce operational costs or maintenance effort? Yes

Will this item improve safety:

- For motorists? No
- For construction workers? No

Will this proposal improve quality for:

- Construction procedures/processes? Yes
- Asset preservation? No
- Design process? No

Will this change provide the contractor more flexibility? No

Will this proposal provide clarification for the Contractor and field personnel? No

Can this item improve/reduce the number of potential change orders? No

Is this proposal needed for compliance with:

- Federal or State regulations? No
- AASHTO or other design code? No

Is this item editorial? No

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

Provide any further information as to why this proposal should be placed on the Standards Committee meeting Agenda: It would allow INDOT to recover taxpayer dollars from contractors that cause the need to expend the money to obtain acceptable performance. Recent out of pocket expenses on a breach of contract claim demonstrate that INDOT needs this provision. Indiana law does not allow a prevailing party to recover attorney fees unless a contract or statute allows such recovery. Otherwise, each party bears their own expenses.

REVISION TO STANDARD SPECIFICATIONS

SECTION 107 - LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC
107.23 WAIVER OF LEGAL RIGHTS
SECTION 108 - PROSECUTION AND PROGRESS
108.10 DEFAULT AND TERMINATION OF CONTRACT

(Note: Proposed changes shown highlighted gray)

The Standard Specifications are revised as follows:

SECTION 107, BEGIN LINE 746, INSERT AS FOLLOWS:

107.23 Waiver of Legal Rights

Upon completion of the work, the Department will expeditiously make final inspection and notification of acceptance. Such final acceptance, however, shall not preclude or estop the Department from correcting any measurement, estimate, or certificate made before or after completion of the work, nor shall the Department be precluded or estopped from recovering from the Contractor or its surety, or both, such overpayment as it may sustain by failure on the part of the Contractor to fulfill its obligations under the contract. A waiver on the part of the Department of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

The Contractor, without prejudice to the terms of the contract, shall be liable to the Department for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the rights of the Department under any warranty or guaranty. *All costs and charges incurred by the Department, including, but not limited to, attorneys' fees and/or litigation expenses incurred by the Department with regard to the Contractor's and/or Surety's performance under the contract or performance bond, or related to the work to be provided under the contract, together with the cost of remedying the work under the contract to the extent and in the manner decided by the Department, will be deducted from any monies due or which may become due. If there are no monies or insufficient monies still due from the Department to the Contractor, the Contractor and/or Surety shall be liable to the Department for any such costs and charges.*

SECTION 108, BEGIN LINE 650, INSERT AS FOLLOWS:

108.10 Default and Termination of Contract

Notice in writing will be given to the Contractor and its surety of delay, neglect, or default if the Contractor:

(a) fails to begin work under the contract within the time specified;

(b) fails to perform the work with sufficient workmen and equipment or with sufficient materials to ensure the prompt completion of said work;

(c) performs the work unsuitably, neglects or refuses to remove materials or performs anew such work as may be rejected as unacceptable and unsuitable;

(d) discontinues the prosecution of the work;

REVISION TO STANDARD SPECIFICATIONS

SECTION 107 - LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC
107.23 WAIVER OF LEGAL RIGHTS
SECTION 108 - PROSECUTION AND PROGRESS
108.10 DEFAULT AND TERMINATION OF CONTRACT

(e) fails to resume work which has been discontinued within a reasonable time after notice to do so;

(f) becomes insolvent or is declared bankrupt, or commits an act of bankruptcy or insolvency;

(g) allows final judgment to stand against it unsatisfied for a period of 10 days;

(h) makes an assignment for the benefit of creditors;

(i) for other causes whatsoever, fails to carry on the work in an acceptable manner; or

(j) fails to implement the employee drug testing plan as submitted with the bid; or fails to provide information regarding the implementation of the employee drug testing plan when requested by the Department; or provides false information regarding implementation of the employee drug testing plan.

If the Contractor or surety does not proceed in accordance therewith within a period of 10 days after such notice, then the Department will, upon written notification from the Engineer of the fact of delay, neglect, default, or the failure of the Contractor to comply with such notice, have full power and authority, without violating the contract, to take the prosecution of the work away from the Contractor. The Department may appropriate or use materials and equipment on the ground as may be suitable and acceptable and may enter into an agreement for the completion of said contract according to the terms and provisions thereof. Other methods required for the completion of the contract in an acceptable manner may be used.

All costs and charges incurred by the Department, *including, but not limited to, attorneys' fees and litigation expenses incurred by the Department with regard to the Contractor's and/or Surety's performance under the contract or performance bond, or related to the work to be provided under the contract,* together with the cost of completing the work under the contract, will be deducted from any monies due or which may become due. If such expense exceeds the sum which would have been payable under the contract, the Contractor and the surety shall be liable and shall pay to the Department the amount of such excess.

COMMENTS AND ACTION

107.23 WAIVER OF LEGAL RIGHTS
108.10 DEFAULT AND TERMINATION OF CONTRACT

DISCUSSION:

Motion: Second: Ayes: Nays: FHWA Approval:	Action: _____ Passed as Submitted _____ Passed as Revised __ __ Withdrawn
Standard Specifications Sections referenced and/or affected: 107.23 pg 76; 108.10 pg. 90. Recurring Special Provision affected: NONE Standard Drawing affected: NONE Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	_____ 2016 Standard Specifications _____ Revise Pay Items List _____ Create RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Revise RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Standard Drawing Effective _____ Create RPD (No. _____) Effective _____ Letting _____ GIFE Update

Mr. Walker
Date: 2/19/15

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: In preparing the Type B Certification Manual, the Office of Materials Management determined that material specifications were included in the construction specifications for grated box end sections.

PROPOSED SOLUTION: Create a new section for the grating for grated box end section in 910 (metal materials) and include a table for Type B Certification requirements.

APPLICABLE STANDARD SPECIFICATIONS: 715.02 and *910.22* (proposed new)

APPLICABLE STANDARD DRAWINGS: N/A; the change reflects information already included on standard drawings. No change to the standard drawings is necessary.

APPLICABLE DESIGN MANUAL SECTION: N/A

APPLICABLE SECTION OF GIFE: N/A

APPLICABLE RECURRING SPECIAL PROVISIONS: N/A

PAY ITEMS AFFECTED: N/A

APPLICABLE SUB-COMMITTEE ENDORSEMENT: An ad hoc committee of Kenny Anderson and Crystal Weaver reviewed the specifications and concurred with the changes.

IMPACT ANALYSIS (attach report):

Submitted By: Kenny Anderson through Ron Walker

Title: Materials Services Engineer through State Materials Engineer

Organization: Office of Materials Management

Phone Number: (317)610-7251 x203/x204

Date: January 23, 2015

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

IMPACT ANALYSIS REPORT CHECKLIST

Explain the business case as to why this item should be presented to the Standards Committee for approval. Answer the following questions with Yes, No or N/A.

Does this item appear in any other specification sections? No

Will approval of this item affect the Approved Materials List? No

Will this proposal improve:

Construction costs? N/A

Construction time? N/A

Customer satisfaction? N/A

Congestion/travel time? N/A

Ride quality? N/A

Will this proposal reduce operational costs or maintenance effort? N/A

Will this item improve safety:

For motorists? N/A

For construction workers? N/A

Will this proposal improve quality for:

Construction procedures/processes? N/A

Asset preservation? N/A

Design process? N/A

Will this change provide the contractor more flexibility? No; there will be no change.

Will this proposal provide clarification for the Contractor and field personnel? Yes; in conjunction with the Type B Certification Manual, this change provides more clarity on the requirements for the certification. The change also places the materials specification in the 900 section, which provides clarity to the specifications.

Can this item improve/reduce the number of potential change orders? N/A

Is this proposal needed for compliance with:

Federal or State regulations? No

AASHTO or other design code? No

Mr. Walker
Date: 2/19/15

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

Is this item editorial? Yes; however, due the addition of the Type B Certification Table and the movement of significant portions of the specification from one location to a new section, it must be reviewed by the Standards Committee.

Provide any further information as to why this proposal should be placed on the Standards Committee meeting Agenda: There is no change to the material requirements. They are just being moved to a more appropriate location in the Standard Specifications.

REVISION TO STANDARD SPECIFICATIONS

SECTION 715 - PIPE CULVERTS, AND STORM AND SANITARY SEWERS
715.02(j) GRATED BOX END SECTIONS
SECTION 910 - METAL MATERIALS
PROPOSED NEW 910.22 GRATING FOR GRATED BOX END SECTIONS

The Standard Specifications are revised as follows:

SECTION 715, BEGIN LINE 137, DELETE AND INSERT AS FOLLOWS:

(j) Grated Box End Sections

~~Steel pipe and steel tubing for grating shall be in accordance with ASTM A 53, type E or S, grade B or ASTM A 501, electric resistance welded or seamless. Such pipe and tubing shall be galvanized in accordance with ASTM A 123. All other related hardware shall be galvanized in accordance with ASTM A 153. Structural steel grates shall be ASTM A 36 for end sections having widths less than or equal to 3 ft and shall be ASTM A 572, grade 50 for widths greater than 3 ft.~~ *Grating for box end sections shall be in accordance with 910.22.* Threaded inserts *for type II grated box end sections* shall have a minimum pull-out capacity of 6,000 lbs. The 1/2 in. round bolts shall have hex heads, cut washers, and where necessary, shall be furnished with the grating. The aggregate leveling bed required for precast units shall be coarse aggregate No. 8 in accordance with 904.03. The hardware cloth used to cover the weep holes, may be plastic with 1/4 in. mesh or galvanized steel wire No. 4 mesh with a minimum wire diameter of 1/32 in. It shall be firmly anchored to the outside of the structure and shall be centered on the holes.

~~Pipe with a 4 in. outside diameter and in accordance with ASTM A 513, type 5, may be used as an alternate to the 4 in. outside diameter pipe specified. The pipe used as an alternate shall have a minimum wall thickness of 5/16 in. and a minimum yield strength of 50,000 psi. Steel tube of 4 in. by 4 in. by 3/8 in., and in accordance with ASTM A 500, Grade B, will also be allowed as an alternate to the 4 in. outside diameter pipe specified.~~

~~Pipe furnished as an alternate as described herein shall be covered by a type B certification in accordance with 916. The results of the wall thickness measurement, outside diameter measurement, and the yield strength test shall be provided on the type B certification.~~

Unless otherwise specified, materials furnished as described herein shall be covered by a type C certification in accordance with 916.

SECTION 910, AFTER LINE 1465, INSERT AS FOLLOWS:

910.22 Grating for Grated Box End Sections

(a) Type I Grated Box End Sections

Steel pipe and steel tubing for grating shall be in accordance with ASTM A 53, type E or S, grade B or ASTM A 501, electric-resistance welded or seamless. Such pipe and tubing shall be galvanized in accordance with ASTM A 123. All other related hardware shall be galvanized in accordance with ASTM A 153.

REVISION TO STANDARD SPECIFICATIONS

SECTION 715 - PIPE CULVERTS, AND STORM AND SANITARY SEWERS
715.02(j) GRATED BOX END SECTIONS
SECTION 910 - METAL MATERIALS
PROPOSED NEW 910.22 GRATING FOR GRATED BOX END SECTIONS

Pipe with a 4 in. outside diameter and in accordance with ASTM A 513, type 5, may be used as an alternate to the 4 in. outside diameter pipe specified. The pipe used as an alternate shall have a minimum wall thickness of 5/16 in. and a minimum yield strength of 50,000 psi. Steel tube of 4 in. by 4 in. by 3/8 in., and in accordance with ASTM A 500, grade B, will also be allowed as an alternate to the 4 in. outside diameter pipe specified.

(b) Type II Grated Box End Sections

Structural steel grates shall be ASTM A 36 for end sections having widths less than or equal to 3 ft and shall be ASTM A 572, grade 50 for widths greater than 3 ft.

Pipe, tubing, tube, and grates furnished as described herein shall be covered by a type B certification in accordance with 916. The typical values of the tests listed below shall be provided on the type B certification.

TEST	*ASTM*
Tensile Strength, Yield Strength, Outside Diameter, Wall Thickness, Galvanization Coating Thickness	*A 53, Type E or S, grade B*
Tensile Strength, Yield Strength, Wall Thickness, Outside Diameter (Round) or Unit Weight (Square/Rectangular), Galvanization Coating Thickness	*A 501*
Tensile Strength, Yield Strength, Bar Dimensions	*A 36*
Tensile Strength, Yield Strength, Bar Dimensions	*A 572, grade 50*
Wall Thickness, Outside Diameter, Yield Strength	*A 513, type 5*
Tensile Strength, Yield Strength, Tube Dimensions, Wall Thickness	*A 500, grade B*

COMMENTS AND ACTION

715.02(j) GRATED BOX END SECTIONS
910.22 GRATING FOR GRATED BOX END SECTIONS

DISCUSSION:

Motion: Second: Ayes: Nays: FHWA Approval:	Action: _____ Passed as Submitted _____ Passed as Revised __ __ Withdrawn
Standard Specifications Sections referenced and/or affected: 715.02(j) pg 620; 910 pg 932. Recurring Special Provision affected: NONE Standard Drawing affected: NONE Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	_____ 2016 Standard Specifications _____ Revise Pay Items List _____ Create RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Revise RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Standard Drawing Effective _____ Create RPD (No. _____) Effective _____ Letting _____ GIFE Update

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: The Pipe Committee was asked by industry to review the materials allowed for End Bent Drain Pipe and Underdrain Outlet Pipe. In the course of that review, the Committee determined that "dual wall" HDPE pipe (Type S, which has a smooth inner liner and corrugated exterior) could be used for End Bent Drain Pipe along with those materials already specified. Additionally, the review of Underdrain Outlet Pipe exposed that a material of lesser strength had previously been allow. Since the most significant maintenance problem with underdrain outlets is crushing, the Committee decided to eliminate the material of lesser strength. The definition of the allowable material was also reviewed. It was determined that two standards were available describing the material.

PROPOSED SOLUTION: Revise 715.02(h) to allow "corrugated polyethylene drainage tubing, Type SP. Revise 715.02(i) to disallow profile wall PVC pipe. Revise 907.24 to acknowledge ASTM D2665 (PVC Pipe DSW) as acceptable and equivalent to ASTM D1785 Schedule 40 PVC Pipe.

APPLICABLE STANDARD SPECIFICATIONS: 715.02, 907.24

APPLICABLE STANDARD DRAWINGS: N/A

APPLICABLE DESIGN MANUAL SECTION: N/A

APPLICABLE SECTION OF GIFE: N/A

APPLICABLE RECURRING SPECIAL PROVISIONS: N/A

PAY ITEMS AFFECTED: N/A

APPLICABLE SUB-COMMITTEE ENDORSEMENT: The Pipe Committee has reviewed and accepted the changes.

IMPACT ANALYSIS (attach report):

Submitted By: Kenny Anderson through Ron Walker

Title: Materials Services Engineer through State Materials Engineer

Organization: Office of Materials Management

Phone Number: (317)610-7251 x203/x204

Date: January 23, 2015

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

IMPACT ANALYSIS REPORT CHECKLIST

Explain the business case as to why this item should be presented to the Standards Committee for approval. Answer the following questions with Yes, No or N/A.

Does this item appear in any other specification sections? No

Will approval of this item affect the Approved Materials List? No

Will this proposal improve:

Construction costs? Yes/No; the end bent drain pipe change provides more options and more competition which could result in lower cost/the change to underdrain outlet pipe disallows a generally more expensive material.

Construction time? No.

Customer satisfaction? N/A

Congestion/travel time? N/A

Ride quality? N/A

Will this proposal reduce operational costs or maintenance effort? No/Yes; changes to end bent drain pipe will neither increase nor reduce costs and effort/by disallowing a material of lesser strength, it is anticipated that repair/replacement of underdrain outlet pipe will be reduced.

Will this item improve safety:

For motorists? N/A

For construction workers? N/A

Will this proposal improve quality for:

Construction procedures/processes? No/Yes; the change to end bent drain pipe is not expected to alter procedures or processes/the change to underdrain outlet pipe provides clarity to contractors and project personnel.

Asset preservation? Yes; see operation costs/maintenance effort above.

Design process? N/A

Will this change provide the contractor more flexibility? Yes/No; the end bent drain pipe change allows additional material options/while the change reduces the

options available to the contractor, the material removed is generally more expensive and the material allowed is widely available.

Will this proposal provide clarification for the Contractor and field personnel? No/Yes; the change to end bent drain pipe will have no impact on clarity/the addition of a standard reference for underdrain outlet pipe provides clarity on material allowed.

Can this item improve/reduce the number of potential change orders? No; it is anticipated that no change in the potential for change orders will occur.

Is this proposal needed for compliance with:

Federal or State regulations? No

AASHTO or other design code? No

Is this item editorial? No.

Provide any further information as to why this proposal should be placed on the Standards Committee meeting Agenda: While the initial request from industry was anticipated to provide more options, the review of this request resulted in changes to both increase and reduce options. The change to end bent drain pipe was based on fairly similar product performance and strength. The review of underdrain outlet pipe revealed that not only should the proposed material be denied, but that some material already allowed was deficient in comparison to other material allowed and was not originally included in the specification—most likely for that very reason.

REVISION TO STANDARD SPECIFICATIONS

SECTION 715 - PIPE CULVERTS, AND STORM AND SANITARY SEWERS
715.02(h) END BENT DRAIN PIPE
715.02(j) UNDERDRAIN OUTLET PIPE
SECTION 907 - CONCRETE, CLAY, AND PLASTIC DRAINAGE COMPONENTS
907.24(b) SCHEDULE 40 PVC PIPE

The Standard Specifications are revised as follows:

SECTION 715, BEGIN LINE 127, DELETE AND INSERT AS FOLLOWS:

(h) End Bent Drain Pipe

End bent drain pipe shall be perforated profile wall PVC pipe, ~~or~~ perforated smooth wall PVC pipe, *or corrugated polyethylene drainage tubing Type SP* from the Department's list of approved thermoplastic liner pipe in accordance with 907.16.

(i) Underdrain Outlet Pipe

Pipe shall be ~~profile wall PVC pipe or~~ smooth wall pipe for outlets ~~from the Department's list of approved thermoplastic pipe and liner pipe~~ in accordance with ~~907.16~~*907.24(a)*.

SECTION 907, BEGIN LINE 300, INSERT AS FOLLOWS:

(b) Schedule 40 PVC Pipe

Pipe shall be in accordance with ASTM D 1785 *or D 2665* and shall have a minimum pipe stiffness of 150 psi at 5% deflection when determined in accordance with ASTM D 2412. Material furnished under this specification shall be covered by a type C certification in accordance with 916 and shall reference ASTM D 1785 *or D 2665* in the product print line.

COMMENTS AND ACTION

715.02(h) END BENT DRAIN PIPE
715.02(j) UNDERDRAIN OUTLET PIPE
907.24(b) SCHEDULE 40 PVC PIPE

DISCUSSION:

Motion: Second: Ayes: Nays: FHWA Approval:	Action: _____ Passed as Submitted _____ Passed as Revised __ __ Withdrawn
Standard Specifications Sections referenced and/or affected: 715.02 pg 620; 907.24(b) pg 875. Recurring Special Provision affected: NONE Standard Drawing affected: NONE Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	_____ 2016 Standard Specifications _____ Revise Pay Items List _____ Create RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Revise RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Standard Drawing Effective _____ Create RPD (No. _____) Effective _____ Letting _____ GIFE Update

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: The Pipe Committee has approved the use of polypropylene pipe in storm drainage applications. The 907.16 section and subsequent sections must be modified to include this material. Note that other changes will be necessary, including modification of the pipe selection software and Pipe Materials Table. However, these items are being pursued and, being on a different schedule than the standard specifications, will be completed at a future date. It is expected these changes will be made prior to or shortly after the 2016 Standard Specifications go into effect. In addition, the Pipe Committee wishes to included these changes to provide material requirements in the event of a CRI or other change.

PROPOSED SOLUTION: Revise and reorganize sections 907.16 through 907.19 to include materials requirements for polypropylene pipe.

APPLICABLE STANDARD SPECIFICATIONS: 715.09 and 907.16

APPLICABLE STANDARD DRAWINGS: N/A

APPLICABLE DESIGN MANUAL SECTION: N/A

APPLICABLE SECTION OF GIFE: N/A

APPLICABLE RECURRING SPECIAL PROVISIONS: N/A

PAY ITEMS AFFECTED: N/A

APPLICABLE SUB-COMMITTEE ENDORSEMENT: The Pipe Committee has reviewed and accepted the changes.

IMPACT ANALYSIS (attach report):

Submitted By: Kenny Anderson through Ron Walker

Title: Materials Services Engineer through State Materials Engineer

Organization: Office of Materials Management

Phone Number: (317)610-7251 x203/x204

Date: January 23, 2015

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

IMPACT ANALYSIS REPORT CHECKLIST

Explain the business case as to why this item should be presented to the Standards Committee for approval. Answer the following questions with Yes, No or N/A.

Does this item appear in any other specification sections? No

Will approval of this item affect the Approved Materials List? Yes

Will this proposal improve:

Construction costs? Yes; the change increases competition among pipe materials and could lead to lower costs.

Construction time? Yes; the change provides additional options to the contractor who can select materials based on availability.

Customer satisfaction? N/A

Congestion/travel time? N/A

Ride quality? N/A

Will this proposal reduce operational costs or maintenance effort? N/A

Will this item improve safety:

For motorists? N/A

For construction workers? N/A

Will this proposal improve quality for:

Construction procedures/processes? Yes; see construction costs/time above.

Asset preservation? N/A

Design process? N/A

Will this change provide the contractor more flexibility? Yes

Will this proposal provide clarification for the Contractor and field personnel? N/A

Can this item improve/reduce the number of potential change orders? No; in the short term, the Contactor may implement a CRI. However, no change orders are expected from either the status quo or the result of this change.

Is this proposal needed for compliance with:

Federal or State regulations? No

AASHTO or other design code? No

Is this item editorial? No.

Provide any further information as to why this proposal should be placed on the Standards Committee meeting Agenda: Rationale and explanation has been provided under “Problems Encountered”.

REVISION TO STANDARD SPECIFICATIONS

SECTION 715 - PIPE CULVERTS, AND STORM AND SANITARY SEWERS
715.09 BACKFILLING
SECTION 907 - CONCRETE, CLAY, AND PLASTIC DRAINAGE COMPONENTS
907.16 THERMOPLASTIC PIPE REQUIREMENTS
907.17 CORRUGATED POLYETHYLENE DRAINAGE TUBING
907.19 CORRUGATED POLYETHYLENE PIPE

The Standard Specifications are revised as follows:

SECTION 715, BEGIN LINE 368, DELETE AND INSERT AS FOLLOWS:

PIPES REQUIRED TO BE MANDREL TESTED			
Pipe Material	Standard Specifications	AASHTO	ASTM
Corrugated Polyethylene Pipe	907.19~~7~~*7(b)*	M 294	
Ribbed Polyethylene Pipe	907.20		F 894
Smooth Wall Polyethylene Pipe	907.21		F 714
Profile Wall PVC Pipe*	907.22	M 304	
Smooth Wall PVC Pipe	907.23	M 278	F 679

* Mandrel testing will not be required for profile wall PVC pipe in accordance with 907.22 that also is in accordance with ASTM F 949.

SECTION 907, BEGIN LINE 232, DELETE AND INSERT AS FOLLOWS:

907.16 Thermoplastic Pipe Requirements

A list of approved thermoplastic pipe and liner pipe will be maintained by the Department. The list will specify the manufacturer and thermoplastic pipe designation. All of these materials shall comply with the applicable AASHTO or ASTM requirements listed in the following table and will only be accepted from qualified manufacturers. The manufacturer is defined as the plant which produces the thermoplastic pipe. The manufacturer shall become qualified by establishing a history of satisfactory quality control of these materials as evidenced by the test results performed by the manufacturer's testing laboratory.

SUMMARY OF THERMOPLASTIC PIPE SPECIFICATION REQUIREMENTS				
Pipe Material	Standard Specifications	AASHTO	ASTM	Manufacturer Requirements
Corrugated Polyethylene Drainage Tubing	907.17*(a)*	M 252		ITM 806, Procedure O
Corrugated Polyethylene Pipe	*907.17(b)*	*M 294*		*ITM 806, Procedure O*
Perforated PVC Semicircular Pipe	907.18		D 3034	ITM 806, Procedure A
Corrugated ~~Polyethylene~~ *Polypropylene* Pipe	907.19	M ~~294~~*330*		ITM 806, Procedure O
Ribbed Polyethylene Pipe	907.20		F 894	ITM 806, Procedure A

REVISION TO STANDARD SPECIFICATIONS

SECTION 715 - PIPE CULVERTS, AND STORM AND SANITARY SEWERS
715.09 BACKFILLING
SECTION 907 - CONCRETE, CLAY, AND PLASTIC DRAINAGE COMPONENTS
907.16 THERMOPLASTIC PIPE REQUIREMENTS
907.17 CORRUGATED POLYETHYLENE DRAINAGE TUBING
907.19 CORRUGATED POLYETHYLENE PIPE

Smooth Wall Polyethylene Pipe	907.21		F 714	ITM 806, Procedure A
Profile Wall PVC Pipe	907.22	M 304	F 949	ITM 806, Procedure O
Smooth Wall PVC Pipe	907.23	M 278	F 679	ITM 806, Procedure A
Type PSM PVC Pipe and Fittings	907.24(a)		D 3034	ITM 806, Procedure A
Schedule 40 PVC Pipe	907.24(b)		D 1785 *or D 2665*	916, Type C Cert.

907.17 Corrugated Polyethylene Drainage Tubing *and Pipe*

(a) Corrugated Polyethylene Tubing

Tubing and fittings shall be in accordance with AASHTO M 252. Perforations shall be required for tubing used as a longitudinal underdrain. Qualification requirements for the manufacturers shall be in accordance with ITM 806, Procedure O.

(b) Corrugated Polyethylene Pipe

Pipe and fittings shall be in accordance with AASHTO M 294. Qualification requirements for the manufacturers shall be in accordance with ITM 806, Procedure O.

SECTION 907, BEGIN LINE 261, DELETE AND INSERT AS FOLLOWS:

907.19 Corrugated ~~Polyethylene~~*Polypropylene* Pipe

Pipe and fittings shall be in accordance with AASHTO M ~~294~~*330*. Qualification requirements for the manufacturers shall be in accordance with ITM 806, Procedure O.

COMMENTS AND ACTION

715.09 BACKFILLING
907.16 THERMOPLASTIC PIPE REQUIREMENTS
907.17 CORRUGATED POLYETHYLENE DRAINAGE TUBING
907.19 CORRUGATED POLYETHYLENE PIPE

DISCUSSION:

Motion: Second: Ayes: Nays: FHWA Approval:	Action: _____ Passed as Submitted _____ Passed as Revised __ __ Withdrawn
Standard Specifications Sections referenced and/or affected: 715.09 pg 625; 907.16 pg 873; 907.17 pg 874 and 907.19 pg 875. Recurring Special Provision affected: NONE Standard Drawing affected: NONE Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	_____ 2016 Standard Specifications _____ Revise Pay Items List _____ Create RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Revise RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Standard Drawing Effective _____ Create RPD (No. _____) Effective _____ Letting _____ GIFE Update

Mr. Walker
Date: 02/19/15

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: The referenced standard in 910.01(b)5 allows the manufacturer to oversize material unless precluded by the purchaser. When oversized material is provided, the standard indicates that the ordered size be identified rather than the actual size. This requirement could lead to material failures when test results are compared to the ordered size rather than the size provided.

PROPOSED SOLUTION: As ASTM A1064 allows the purchaser to preclude the ordering requirements stated therein, an exception to this standard should be included in 910.01(b)5 stating that oversizing must be allowed by the Engineer and that the size provided should be identified rather than the size ordered.

APPLICABLE STANDARD SPECIFICATIONS: 910.01(b)5

APPLICABLE STANDARD DRAWINGS: N/A

APPLICABLE DESIGN MANUAL SECTION: N/A

APPLICABLE SECTION OF GIFE: N/A

APPLICABLE RECURRING SPECIAL PROVISIONS: N/A

PAY ITEMS AFFECTED: N/A

APPLICABLE SUB-COMMITTEE ENDORSEMENT: This issue was addressed by an ad hoc committee including Elizabeth Phillips, Naveed Burki and Kenny Anderson with format assistance from Jim Reilman.

IMPACT ANALYSIS (attach report):

Submitted By: Kenny Anderson through Ron Walker

Title: Materials Services Engineer through State Materials Engineer

Organization: Office of Materials Management

Phone Number: (317)610-7251 x203, x204

Date: January 15, 2015

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

IMPACT ANALYSIS REPORT CHECKLIST

Explain the business case as to why this item should be presented to the Standards Committee for approval. Answer the following questions with Yes, No or N/A.

Does this item appear in any other specification sections? Yes, but these sections are unaffected by the change.

Will approval of this item affect the Approved Materials List? No. While the material is covered by an approved list, the sources on the list will be unaffected.

Will this proposal improve:

Construction costs? N/A

Construction time? N/A

Customer satisfaction? N/A

Congestion/travel time? N/A

Ride quality? N/A

Will this proposal reduce operational costs or maintenance effort? N/A

Will this item improve safety:

For motorists? N/A

For construction workers? N/A

Will this proposal improve quality for:

Construction procedures/processes? Yes. The change could prevent undue failures on the testing side.

Asset preservation? N/A

Design process? Yes. The change avoids any redesign that could be required as a result of the status quo. It also maintains the ability to provide greater quality to the project with no additional cost to the Department.

Will this change provide the contractor more flexibility? No. The change does not impact the flexibility, but does require additional steps to maintain flexibility.

Will this proposal provide clarification for the Contractor and field personnel? Yes. The change provides clarity as to the material provided and could avoid testing failures.

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

Can this item improve/reduce the number of potential change orders? N/A. The change incorporates a mechanism for approval which avoids additional change orders, but does not reduce the potential compared to the status quo.

Is this proposal needed for compliance with:

Federal or State regulations? No.

AASHTO or other design code? No.

Is this item editorial? No.

Provide any further information as to why this proposal should be placed on the Standards Committee meeting Agenda: The change provides clarity to field personnel and testing personnel in order to avoid conflict and potential failing test results. Although it constitutes an exception to the standard (ASTM A1064), it is not in conflict with the standard as there is a provision to allow the purchaser to deviate from the standard.

REVISION TO STANDARD SPECIFICATIONS

SECTION 910 - METAL MATERIALS
910.01(b)5 DEFORMED AND SMOOTH STEEL WWR

The Standard Specifications are revised as follows:

SECTION 910, BEGIN LINE 46, INSERT AS FOLLOWS:

5. Deformed and Smooth Steel WWR

Deformed and smooth steel WWR shall be in accordance with ASTM A 1064, except as follows:

a. The wire used in manufacturing the WWR shall be drawn, not galvanized, unless otherwise specified.

b. WWR shall be furnished in flat sheets.

c. When epoxy-coated WWR is specified, it shall receive a type 1 coating in accordance with ASTM A 884. Repairing or patching of the coating shall be in accordance with ASTM A 884 with the patching material in accordance with ASTM A 775, Annex A2. The average coating thickness shall be 9 to 14 mils after cure. Epoxy coated WWR shall be furnished by selecting WWR coated from an applicator's plant on the list of Certified Reinforcing Bar and WWR Epoxy Coaters and in accordance with ITM 301.

d. When galvanized WWR is specified, it shall be in accordance with ASTM A 1060, including repair or renovation of the coating. It shall be coated after fabrication.

e. The size and spacing of the WWR shall be provided as specified. If over-sized wire is proposed for substitution, the Contractor shall obtain written approval from the Engineer prior to delivery. The WWR shall be identified as the size provided, not the size originally ordered.

COMMENTS AND ACTION

910.01(b)5 DEFORMED AND SMOOTH STEEL WWR

DISCUSSION:

Motion: Second: Ayes: Nays: FHWA Approval:	Action: _____ Passed as Submitted _____ Passed as Revised __ __ Withdrawn
Standard Specifications Sections referenced and/or affected: 616 pg 426; 703 pg 538; 708 pg 561; 714 pg 609; 723 pg 670; 731 pg 697; 734 pg 708; 735 pg 711 and 910.01 pg 899. Recurring Special Provision affected: NONE Standard Drawing affected: NONE Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	_____ 2016 Standard Specifications _____ Revise Pay Items List _____ Create RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Revise RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Standard Drawing Effective _____ Create RPD (No. _____) Effective _____ Letting _____ GIFE Update

Mr. Boruff
Date: 2/19/15

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Industry has noted that the Standard Specifications reference outdated or incorrect codes for aluminum alloy weld quality, and for qualification of procedures, welders, and welding operations.

PROPOSED SOLUTION: Update the specifications with the current, correct references.

APPLICABLE STANDARD SPECIFICATIONS: 803.03 (c), 803.04, and 925.01

APPLICABLE STANDARD DRAWINGS: N/A

APPLICABLE DESIGN MANUAL SECTION: N/A

APPLICABLE SECTION OF GIFE: N/A

APPLICABLE RECURRING SPECIAL PROVISIONS: N/A

PAY ITEMS AFFECTED: N/A

APPLICABLE SUB-COMMITTEE ENDORSEMENT: Industry and the American Welding Society

IMPACT ANALYSIS (attach report): N/A

Submitted By: David Boruff

Title: Manager, Office of the Traffic Administration

Organization: INDOT

Phone Number: 317-234-7975

Date: 1/21/15

REVISION TO STANDARD SPECIFICATIONS

SECTION 803 - WELDING ALUMINUM ALLOYS
803.03(c) WELD QUALITY
803.04 QUALIFICATION OF PROCEDURES, WELDERS, AND WELDING OPERATORS
910.19(a) ALUMINUM TRUSSES FOR OVERHEAD SIGN STRUCTURES, BOX TRUSS AND DYNAMIC MESSAGE SIGN STRUCTURE TRUSS
925.01 GENERAL REQUIREMENTS

The Standard Specifications are revised as follows:

SECTION 803, BEGIN LINE 101, DELETE AND INSERT AS FOLLOWS:

(c) Weld Quality

Welds will not be accepted if they contain cracks in the welds or in the adjacent base metal, copper inclusions, or porosity in excess of that allowed by ~~Appendix IV, Section VIII, of the ASME Boiler and Pressure Vessel~~*AWS D1.2 Structural Welding* Code.

SECTION 803, BEGIN LINE 157, DELETE AND INSERT AS FOLLOWS:

803.04 Qualification of Procedures, Welders, and Welding Operators

Joint welding procedures shall be qualified previously by tests prescribed in ~~Part B, Section IX, of the ASME Boiler and Pressure Vessel~~*AWS D1.2 Structural Welding* Code. Evidence of previous qualification of the joint welding procedures to be employed may be accepted.

All welders and welding operators shall be previously qualified by tests in accordance with ~~Part B, Section IX, of the ASME Boiler and Pressure Vessel~~*AWS D1.2 Structural Welding* Code. Evidence of previous qualification of the welders and welding operators to be employed may be accepted. The same process and type of equipment that is required for execution of the contract work shall be used in qualifying welders and welding operators.

SECTION 910, BEGIN LINE 1285, DELETE AND INSERT AS FOLLOWS:

Certified proof of the qualifications for a minimum of two welders shall be presented after the contract is awarded and before fabrication is started. This certification shall be from a commercial or public testing laboratory and qualifications shall be based on welding of aluminum alloy, 6061-T6 with consumable electrode type welding using aluminum alloy ER5356 filler material. Welders shall qualify by passing the requirements ~~of "Procedure and Performance Tests of Qualification Standard for Welding Procedures, Welders, and Welding Operations", latest edition, formulated by the Boiler and Pressure Vessel Committee of the American Society of Mechanical Engineers~~*set out in 803.04*.

SECTION 925, BEGIN LINE 22, DELETE AND INSERT AS FOLLOWS:

Procedures, welders, and welding operators for welding on aluminum shall be qualified in accordance with the requirements of AWS B~~3.0~~2.1 "*Specification for* Welding Procedure and Performance Qualification"~~, and to the practices in accordance with AWS C5.6.~~*or AWS D9.1M/D9.1 Sheet Metal Welding Code.*

COMMENTS AND ACTION

803.03(c) WELD QUALITY
803.04 QUALIFICATION OF PROCEDURES, WELDERS, AND WELDING OPERATORS
910.19(a) ALUMINUM TRUSSES FOR OVERHEAD SIGN STRUCTURES, BOX TRUSS AND DYNAMIC MESSAGE SIGN STRUCTURE TRUSS
925.01 GENERAL REQUIREMENTS

DISCUSSION:

Motion: Second: Ayes: Nays: FHWA Approval:	Action: _____ Passed as Submitted _____ Passed as Revised __ __ Withdrawn
Standard Specifications Sections referenced and/or affected: 803 pg 754; 925 pg 1049. Recurring Special Provision affected: NONE Standard Drawing affected: NONE Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	_____ 2016 Standard Specifications _____ Revise Pay Items List _____ Create RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Revise RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Standard Drawing Effective _____ Create RPD (No. _____) Effective _____ Letting _____ GIFE Update

Mr. Pankow
Date: 02/19/15

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: RSP 203-R-550 was adopted by the Standards Committee on March 20, 2008 (latest revision was 5-23-13) to establish the requirements for borrow and disposal sites. These requirements have been in place as an RSP for several years and should now be included into the Standard Specifications.

PROPOSED SOLUTION: To incorporate RSP 203-R-550 into the 2016 Standard Specifications

APPLICABLE STANDARD SPECIFICATIONS: 201.01; 202.02; 203.08; 203.10; 203.11 and 203.12.

APPLICABLE STANDARD DRAWINGS: N/A

APPLICABLE DESIGN MANUAL SECTION: None

APPLICABLE SECTION OF GIFE: 3.2

APPLICABLE RECURRING SPECIAL PROVISIONS: 203-R-550 APPROVAL OF BORROW AND DISPOSAL SITES

PAY ITEMS AFFECTED: N/A

APPLICABLE SUB-COMMITTEE ENDORSEMENT: N/A

IMPACT ANALYSIS (attach report): yes

Submitted By: Greg Pankow

Title: State Construction Engineer

Organization: INDOT

Phone Number: (317) 232-5502

Date: February 2, 2015

Mr. Pankow
Date: 02/19/15

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

IMPACT ANALYSIS REPORT CHECKLIST

Explain the business case as to why this item should be presented to the Standards Committee for approval. Answer the following questions with Yes, No or N/A.

Does this item appear in any other specification sections? No

Will approval of this item affect the Approved Materials List? No

Will this proposal improve:

Construction costs? No

Construction time? No

Customer satisfaction? No

Congestion/travel time? No

Ride quality? No

Will this proposal reduce operational costs or maintenance effort? No

Will this item improve safety:

For motorists? No

For construction workers? No

Will this proposal improve quality for:

Construction procedures/processes? No

Asset preservation? No

Design process? No

Will this change provide the contractor more flexibility? No

Will this proposal provide clarification for the Contractor and field personnel? Yes

Can this item improve/reduce the number of potential change orders? No

Is this proposal needed for compliance with:

Federal or State regulations? No

AASHTO or other design code? No

Is this item editorial? No

Provide any further information as to why this proposal should be placed on the Standards Committee meeting Agenda:

REVISION TO STANDARD SPECIFICATIONS

SECTION 201 - CLEARING AND GRUBBING
201.01 DESCRIPTION
SECTION 202 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS
202.02 GENERAL REQUIREMENTS
SECTION 203 - EXCAVATION AND EMBANKMENT
203.08 BORROW OR DISPOSAL
203.10 DISPOSAL OF EXCAVATED MATERIAL EXCEPT WATERWAY AND PEAT EXCAVATION
203.11 DISPOSAL OF WATERWAY EXCAVATION
203.12 DISPOSAL OF PEAT

(Note: Currently active RSP.
Basis for Use: Required for all contracts with 201, 202 or 203 pay items.
Final draft of the 203.08 shown beginning on pg 48.)

203-R-550 APPROVAL OF BORROW AND DISPOSAL SITES

(Revised 05-23-13)

The Standard Specifications are revised as follows:

SECTION 201, BEGIN LINE 3, INSERT AS FOLLOWS:

201.01 Description

This work shall consist of clearing, grubbing, removing, and disposing of all vegetation and debris, except such objects as are designated to remain or are to be removed in accordance with other sections of these specifications, within the construction limits shown on the plans. If no construction limits are shown, the right-of-way and easement areas will be the construction limits. This work shall include the preservation from injury or defacement of all vegetation and objects designated to remain. *Disposal of material shall be in accordance with 203.08.*

SECTION 201, BEGIN LINE 43, DELETE AND INSERT AS FOLLOWS:

Unless burned in accordance with the requirements herein, perishable materials and debris shall be removed from the right-of-way and disposed of ~~at locations off the construction site and outside the limits of view from the traveled roadway~~ *in accordance with 203.08. If permitted, sod.* ~~Sod~~ may be disposed of within the right-of-way, but outside the construction limits~~, if allowed. Written permission shall be obtained from the property owner on whose property the materials and debris are to be placed. All necessary arrangements shall be made with the owner for obtaining suitable disposal locations. The cost involved shall be included in the contract price of pay items.~~

SECTION 202, BEGIN LINE 13, DELETE AND INSERT AS FOLLOWS:

202.02 General Requirements

All buildings and foundations in accordance with 202.06, structures, fences, tanks, and other obstructions, any portions of which are on the right-of-way shall be razed, removed, and disposed of, except utilities and those features for which other provisions have been made for removal. Designated salvageable material shall be removed without unnecessary damage in sections or pieces which may be transported readily and shall be stored at specified places within the project limits or as otherwise designated. ~~Unless otherwise specified and e~~*E*xcept for regulated materials, which ~~are~~

REVISION TO STANDARD SPECIFICATIONS

SECTION 201 - CLEARING AND GRUBBING
201.01 DESCRIPTION
SECTION 202 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS
202.02 GENERAL REQUIREMENTS
SECTION 203 - EXCAVATION AND EMBANKMENT
203.08 BORROW OR DISPOSAL
203.10 DISPOSAL OF EXCAVATED MATERIAL EXCEPT WATERWAY AND PEAT EXCAVATION
203.11 DISPOSAL OF WATERWAY EXCAVATION
203.12 DISPOSAL OF PEAT

~~defined in~~ *shall be disposed of in accordance with* 104.06, and bridge painting debris which is subject to 619, non-salvageable material shall be disposed of in accordance with ~~State, Federal, and local regulations~~*203.08*~~. Unregulated material that may be disposed of on private property, other than approved landfill sites, shall only be done with written approval of the Engineer and the property owner with appropriate permits and shall be outside the limits of view from the traveled roadway. Copies of all agreements with property owners shall be furnished~~. Unsuitable material shall be removed from cisterns, septic tanks, other tanks, basements, and cavities. The disposition of this material shall be in accordance with all applicable and current State, Federal, and Local Regulations.

SECTION 203, BEGIN LINE 51, DELETE AND INSERT AS FOLLOWS:

203.08 Borrow or Disposal

Borrow shall consist of approved material required for the construction of embankments or for other portions of the work and shall be obtained from approved locations and sources outside the right-of-way. Borrow material shall be free of substances that will form deleterious deposits, or produce toxic concentrations or combinations that may be harmful to human, animal, plant or aquatic life, or otherwise impair the designated uses of ~~the~~ *a* stream or area. Unless otherwise designated in the contract, arrangements shall be made for obtaining borrow. Borrow, as designated herein, shall not include material excavated beyond the right-of-way limits at intersecting public roads, private and commercial drive approaches~~, or~~ *and* material furnished as B borrow.

Disposal of waste material, other than regulated material, from within the right-of-way shall only be allowed at approved locations either within or outside the right-of-way. Disposal of regulated material shall be in accordance with 104.06.

~~Proposed borrow sites and proposed disposal sites for excavated material shall be identified before such material is excavated or disposed of within or outside the right-of-way.~~

Except where a ~~permitted or~~ licensed commercial site *or a permitted site* is utilized *for borrow or disposal, the Contractor shall obtain all permits required by local, State and Federal laws prior to the start of any operations at the site.*

Licensed commercial sites and permitted sites are defined as follows:

(a) A licensed commercial site is a solid waste facility with a current IDEM operation number.

REVISION TO STANDARD SPECIFICATIONS

SECTION 201 - CLEARING AND GRUBBING
201.01 DESCRIPTION
SECTION 202 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS
202.02 GENERAL REQUIREMENTS
SECTION 203 - EXCAVATION AND EMBANKMENT
203.08 BORROW OR DISPOSAL
203.10 DISPOSAL OF EXCAVATED MATERIAL EXCEPT WATERWAY AND PEAT EXCAVATION
203.11 DISPOSAL OF WATERWAY EXCAVATION
203.12 DISPOSAL OF PEAT

(b) A permitted site is a location that is operated under permits required by local, state and federal laws for the activities proposed by the Contractor. A permitted site shall also have documentation that a wetlands delineation and an archaeological survey have been performed by qualified professionals.

For proposed borrow or disposal sites other than licensed commercial or permitted sites, an inspection of areas outside the construction limits shall be conducted by a qualified wetland professional *approved by the Department* to determine if wetlands are present on the site. *An approved wetland professional shall be prequalified with the Department to perform environmental services work type 5.4 Ecological Surveys or shall be certified by the Society of Wetland Scientists as a wetland professional-in-training or professional wetland scientist. A list of approved wetland professionals is maintained on the Department's website*. ~~This~~ *The wetlands* inspection shall be in accordance with the Federal Manual for Identifying and Delineating Jurisdictional Wetlands. The inspection shall also determine if isolated wetlands as defined by ~~the~~ IDEM are present. ~~The Contractor shall submit a document, signed by the wetland professional, verifying that the site has been inspected for the presence of wetlands in accordance with the federal manual and for isolated wetlands and, if any are present, specifying the area to be demarcated as jurisdictional waters and/or wetland.~~ *The Contractor shall demarcate in a method approved by the Engineer the boundary of all wetlands identified within the proposed borrow or disposal site*. ~~Once the area to be used for borrow or for disposal of excavated material has been shown not to contain jurisdictional or isolated wetlands, the boundary of the area cleared shall be demarcated. The methods of demarcation shall be as approved by the Engineer.~~

For proposed borrow or disposal sites other than licensed commercial or permitted sites, a qualified archaeologist shall perform a record check and field survey to determine if any significant archaeological sites exist within the proposed site. The Indiana Department of Natural Resources Division of Historic Preservation and Archeology maintains a roster of qualified archeological consultants. If any archaeological sites are identified, the archaeologist shall establish the limits of the site along with a reasonable border. The Contractor shall demarcate in a method approved by the Engineer the border of all archeological sites identified within the proposed borrow or disposal site.

REVISION TO STANDARD SPECIFICATIONS

SECTION 201 - CLEARING AND GRUBBING
201.01 DESCRIPTION
SECTION 202 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS
202.02 GENERAL REQUIREMENTS
SECTION 203 - EXCAVATION AND EMBANKMENT
203.08 BORROW OR DISPOSAL
203.10 DISPOSAL OF EXCAVATED MATERIAL EXCEPT WATERWAY AND PEAT EXCAVATION
203.11 DISPOSAL OF WATERWAY EXCAVATION
203.12 DISPOSAL OF PEAT

Identified archeological sites shall not be disturbed unless the site is cleared by established procedures and written authorization to enter the site has been obtained by the Contractor.

~~The Department maintains a list of professional consultants who are prequalified to perform various types of work. A qualified wetland professional shall be a professional consultant who is prequalified with the Department to perform Environmental Services work type 5.4 Ecological Surveys, or is certified by the Society of Wetland Scientists, SWS, as a wetland professional in training or professional wetland scientist.~~

~~Previously approved sites may be utilized for borrow or disposal operations if the Contractor furnishes a valid permit or document signed by a wetland professional prior to utilizing the site.~~

Borrow and disposal sites shall be approved by the Engineer prior to the start of any earth disturbing operations at the site. A request for approval of a borrow or disposal site shall be submitted to the Engineer a minimum of 14 days prior to the Contractor's planned start of operations at the site. All requests for approval of a borrow or disposal site shall include a description of the Contractor's planned operations at the site. In the case of disposal sites, the description shall include a listing of the types of material to be disposed of at the site.

A request for approval of a licensed commercial site shall include the following:

(a) The name and address of the facility.
(b) The IDEM operating number.
(c) The expiration date of the IDEM operating permit.

A request for approval of a permitted site shall include the following:

(a) Name of the site owner.
(b) Address of the site.
(c) A list of the permits, permit numbers and permit expiration dates for all permits under which the site operates.
(d) Documentation that a wetlands delineation and an archaeological survey have been performed by qualified professionals.

REVISION TO STANDARD SPECIFICATIONS

SECTION 201 - CLEARING AND GRUBBING
201.01 DESCRIPTION
SECTION 202 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS
202.02 GENERAL REQUIREMENTS
SECTION 203 - EXCAVATION AND EMBANKMENT
203.08 BORROW OR DISPOSAL
203.10 DISPOSAL OF EXCAVATED MATERIAL EXCEPT WATERWAY AND PEAT EXCAVATION
203.11 DISPOSAL OF WATERWAY EXCAVATION
203.12 DISPOSAL OF PEAT

A request for approval of a site, other than a licensed commercial or permitted site, shall include the following:

(a) Name of the property owner.
(b) Address or location of the site.
(c) A copy of a right-of-entry obtained from the property owner. Rights-of-entry shall include rights for access by Department personnel to the site for the purposes of monitoring, measurement and sampling.
(d) A site plan showing the site location, site dimensions, adjacent property and right-of-way lines, all demarcated jurisdictional wetlands or isolated wetlands, all demarcated archeological sites, existing and proposed finished contours and proposed finished slope grades.
(e) A site operations plan detailing the operations proposed for the site, what equipment will be utilized, how the site will be accessed and any other information relevant to the operation of the site.
(f) A copy of the Rule 5 Notice of Intent, if required under 327 IAC 15-5.
(g) An erosion control plan for the site including the types of erosion control measures to be incorporated and the sequencing of the measures in respect to the operations plan for the site.
(h) Documentation signed by a wetlands professional verifying that the site has been inspected for the presence of both wetlands and isolated wetlands and, if any are present, specifying the area to be demarcated as jurisdictional or isolated wetlands.
(i) Documentation of the archeological record check and field survey signed by a qualified archeologist including the limits and border of any archeological site discovered.
(j) Copies of all other permits obtained by the Contractor to perform operations at the site.

The Contractor shall provide the Engineer a minimum of 14 days notice prior to opening borrow areas for the purpose of obtaining original cross section elevations and measurements and to sample the borrow material prior to use.

The Contractor shall install temporary erosion and sediment control measures at borrow or disposal sites other than licensed commercial and permitted sites prior to the start of any earth disturbing activity. ~~If the Contractor elects to use the site, all required permits shall be obtained.~~ The Contractor shall develop and construct all mitigation measures *necessary to* ~~and~~ fulfill ~~all~~ *the* requirements ~~detailed by such~~ *of all* permits

REVISION TO STANDARD SPECIFICATIONS

SECTION 201 - CLEARING AND GRUBBING
201.01 DESCRIPTION
SECTION 202 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS
202.02 GENERAL REQUIREMENTS
SECTION 203 - EXCAVATION AND EMBANKMENT
203.08 BORROW OR DISPOSAL
203.10 DISPOSAL OF EXCAVATED MATERIAL EXCEPT WATERWAY AND PEAT EXCAVATION
203.11 DISPOSAL OF WATERWAY EXCAVATION
203.12 DISPOSAL OF PEAT

obtained by the Contractor for operation of a borrow or disposal site. ~~The Contractor shall also obtain written permission from the land owner for Department personnel to access the site for monitoring.~~

No excavation shall occur or no material shall be disposed of ~~beyond~~ *within* the boundaries of the demarcated *wetlands and archeological* area*s unless the operations are in compliance with all required permits and these specifications.*

No extension of completion time will be granted due to any delays by the Contractor in securing approval of borrow or disposal sites.

~~Before borrow or disposal operations are begun, the Contractor shall submit operation plans for approval. Such plans shall include the following:~~

~~(a) a detailed sketch showing the limits relative to property and right-of-way lines;~~

~~(b) the grade of all slopes;~~

~~(c) an erosion control plan in accordance with the requirements of 327 IAC 15-5;~~

~~(d) the encasement, finished grading, and seeding procedures; and~~

~~(e) archaeological clearance.~~

~~Notice shall be given in advance of opening borrow areas so that cross section elevations and measurements of the ground surface after stripping may be taken and the borrow material may be tested before being used.~~

~~Except when a commercial source is utilized, a qualified archaeologist shall perform a record check and field survey of borrow or disposal limits to determine if any significant archaeological sites are within the limits. Results of the record check and survey shall be furnished in writing prior to the excavation of any material. If any archaeological sites are identified, the archaeologist shall establish the limits of the site along with a reasonable border. The site shall not be disturbed unless the archaeological site is cleared by established procedures and written authorization to enter the site has~~

REVISION TO STANDARD SPECIFICATIONS

SECTION 201 - CLEARING AND GRUBBING
201.01 DESCRIPTION
SECTION 202 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS
202.02 GENERAL REQUIREMENTS
SECTION 203 - EXCAVATION AND EMBANKMENT
203.08 BORROW OR DISPOSAL
203.10 DISPOSAL OF EXCAVATED MATERIAL EXCEPT WATERWAY AND PEAT EXCAVATION
203.11 DISPOSAL OF WATERWAY EXCAVATION
203.12 DISPOSAL OF PEAT

~~been issued. No extension of completion time will be granted due to any delays in securing approval of a borrow or disposal site.~~

Approval of a proposed borrow or disposal site by the Engineer, whether the proposed site is commercial, permitted, or otherwise, shall not relieve the Contractor of its responsibility to utilize an appropriate site and to comply with all Local, State and Federal laws and regulations.

SECTION 203, BEGIN LINE 294, DELETE AND INSERT AS FOLLOWS:

203.10 Disposal of Excavated Material Except Waterway and Peat Excavation

Excavation material shall be used for the construction of embankments, shoulders, special fill, or other places as may be specified or directed, depending on the nature of the material. Excavated material that is suitable for embankment construction, that is not required for maintenance of traffic, shall be placed in the embankment before placing any borrow material, unless otherwise authorized in writing.

If more material is excavated from within required cut slopelines than is needed to construct embankments or special fills, the excess may be used to widen embankments, flatten fill slopes, or be used otherwise as directed. All excess excavated material that cannot be used constructively within the project limits shall be disposed of off the right-of-way in accordance with ~~201.03 and~~ 203.08.

Excavation obtained from the right-of-way and planned to be used in fills may be wasted and replaced with borrow with no additional payment only after written permission is obtained. All required samples of the borrow or the excavation materials involved shall be furnished with no additional payment.

203.11 Disposal of Waterway Excavation

Unless otherwise provided, material resulting from waterway excavation shall be used ~~to fill old channels and~~, if suitable, in embankment, special fill, and approach embankments, or any combination of these, as specified or directed.

~~A~~ *Any* portion of waterway excavation *material* which is unsuitable for the above uses, ~~a~~ *any* portion which is suitable but is in excess of that required for such uses, or ~~if~~ *when* locations for such ~~disposal~~ *uses* are not available, the ~~disposal~~ *material* shall be *disposed of* in accordance with ~~201.03~~ *203.08*.

REVISION TO STANDARD SPECIFICATIONS

SECTION 201 - CLEARING AND GRUBBING
201.01 DESCRIPTION
SECTION 202 - REMOVAL OF STRUCTURES AND OBSTRUCTIONS
202.02 GENERAL REQUIREMENTS
SECTION 203 - EXCAVATION AND EMBANKMENT
203.08 BORROW OR DISPOSAL
203.10 DISPOSAL OF EXCAVATED MATERIAL EXCEPT WATERWAY AND PEAT EXCAVATION
203.11 DISPOSAL OF WATERWAY EXCAVATION
203.12 DISPOSAL OF PEAT

203.12 Disposal of Peat

All material removed as peat excavation, removed or displaced by machine operation, or displaced by the advancing backfilling material shall be ~~uniformly spread between the toes of fill slopes and the swamp ditches or beyond, or otherwise~~ disposed of in accordance with 203.08.

BACKUP 01. 203.08 SHOWN FOR EASE OF READING AS A FINAL DRAFT (2016SS)

203.08 BORROW OR DISPOSAL

(Note: New statements shown *blue* and italics font.)

203.08 Borrow or Disposal

Borrow shall consist of approved material required for the construction of embankments or for other portions of the work and shall be obtained from approved locations and sources outside the right-of-way. Borrow material shall be free of substances that will form deleterious deposits, or produce toxic concentrations or combinations that may be harmful to human, animal, plant or aquatic life, or otherwise impair the designated uses of *a* stream or area. Unless otherwise designated in the contract, arrangements shall be made for obtaining borrow. Borrow, as designated herein, shall not include material excavated beyond the right-of-way limits at intersecting public roads, private and commercial drive approaches *and* material furnished as B borrow.

Disposal of waste material*, other than regulated* material*, from within the right-of-way shall only be allowed at approved locations either* within or outside the right-of-way. *Disposal of regulated material shall be in accordance with 104.06.*

Except where a *licensed commercial site or a* permitted *site is utilized for borrow* or *disposal, the Contractor shall obtain all permits required by local, State and Federal laws prior to the start of any operations at the site.*

Licensed commercial sites and permitted sites are defined as follows:

(a) A licensed commercial site is *a solid waste facility with a current IDEM operation number.*

(b) A permitted site is a location that is operated under permits required by local, state and federal laws for the activities proposed by the Contractor. A permitted site shall also have documentation that a wetlands delineation and an archaeological survey have been performed by qualified professionals.

For proposed borrow or disposal sites other than licensed commercial or permitted sites, an inspection of areas outside the construction limits shall be conducted by a qualified wetland professional *approved by the Department to determine if wetlands are present on the site. An approved wetland professional shall be prequalified with the Department to perform environmental services work type 5.4 Ecological Surveys or shall be certified by the Society of Wetland Scientists as a wetland professional-in-training or professional wetland scientist. A list of approved wetland professionals is maintained on the Department's website. The wetlands* inspection shall be in accordance with the Federal Manual for Identifying and Delineating Jurisdictional Wetlands. The inspection shall also determine if isolated wetlands as defined by *IDEM are present. The Contractor shall demarcate in a method approved by the Engineer the boundary of all wetlands identified within the proposed borrow or disposal site*.

BACKUP 01. 203.08 SHOWN FOR EASE OF READING AS A FINAL DRAFT (2016SS)

203.08 BORROW OR DISPOSAL

For proposed borrow or disposal *sites other than licensed* commercial *or permitted sites*, a qualified archaeologist shall perform a record check and field survey to determine if any significant archaeological sites *exist* within the *proposed site. The Indiana Department of Natural Resources Division of Historic Preservation and Archeology maintains a roster of qualified archeological consultants*. If any archaeological sites are identified, the archaeologist shall establish the limits of the site along with a reasonable border. *The Contractor shall demarcate in a method approved by the Engineer the border of all archeological sites identified within the proposed* borrow or disposal site.

Identified archeological sites shall not be disturbed unless the *site is cleared by established procedures and written authorization to enter the site* has been obtained *by the Contractor.*

Borrow and disposal sites shall be approved by the Engineer prior to the start of any earth disturbing operations at the site. A request for approval of a borrow or disposal site shall be submitted to the Engineer a minimum of 14 days prior to the Contractor's planned start of operations at the site. All requests for approval of a borrow or disposal site shall include a description of the Contractor's planned operations at the site. In the case of disposal sites, the description shall include a listing of the types of material to be disposed of at the site.

A request for approval of a licensed commercial site shall include the following:

(a) The name and address of the facility.
(b) The IDEM operating number.
(c) The expiration date of the IDEM operating permit.

A request for approval of a permitted site shall include the following:

(a) Name of the site owner.
(b) Address of the site.
(c) A list of the permits, permit numbers and permit expiration dates for all permits under which the site operates.
(d) Documentation that a wetlands delineation and an archaeological survey have been performed by qualified professionals.

A request for approval of a site, other than a licensed commercial or permitted site, shall include the following:

(a) Name of the property owner.
(b) Address or location of the site.
(c) A copy of a right-of-entry obtained from the property owner. Rights-of-entry shall include rights for access by Department personnel to the site for the purposes of monitoring, measurement and sampling.

(d) A site plan showing the site location, site dimensions, adjacent property and right-of-way lines, all demarcated jurisdictional wetlands or isolated wetlands, all demarcated archeological sites, existing and proposed finished contours and proposed finished slope grades.

(e) A site operations plan detailing the operations proposed for the site, what equipment will be utilized, how the site will be accessed and any other information relevant to the operation of the site.

(f) A copy of the Rule 5 Notice of Intent, if required under 327 IAC 15-5.

(g) An erosion control plan for the site including the types of erosion control measures to be incorporated and the sequencing of the measures in respect to the operations plan for the site.

(h) Documentation signed by a wetlands professional verifying that the site has been inspected for the presence of both wetlands and isolated wetlands and, if any are present, specifying the area to be demarcated as jurisdictional or isolated wetlands.

(i) Documentation of the archeological record check and field survey signed by a qualified archeologist including the limits and border of any archeological site discovered.

(j) Copies of all other permits obtained by the Contractor to perform operations at the site.

The Contractor shall provide the Engineer a minimum of 14 days notice prior to opening borrow areas for the purpose of obtaining original cross section elevations and measurements and to sample the borrow material prior to use.

The Contractor shall install temporary erosion and sediment control measures at borrow or disposal sites other than licensed commercial and permitted sites prior to the start of any earth disturbing activity. The Contractor shall develop and construct all mitigation measures necessary to fulfill the requirements of all permits obtained by the Contractor for operation of a borrow or disposal site.

No excavation shall occur or no material shall be disposed of within the boundaries of the demarcated wetlands and archeological areas unless the operations are in compliance with all required permits and these specifications.

No extension of completion time will be granted due to any delays by the Contractor in securing approval of borrow or disposal sites.

Approval of a proposed borrow or disposal site by the Engineer, whether the proposed site is commercial, permitted, or otherwise, shall not relieve the Contractor of its responsibility to utilize an appropriate site and to comply with all Local, State and Federal laws and regulations.

Archaeological artifacts encountered during operations shall be addressed in accordance with 107.10.

BACKUP 01. 203.08 SHOWN FOR EASE OF READING AS A FINAL DRAFT (2016SS)

203.08 BORROW OR DISPOSAL

Unless written permission is granted, there shall be no excavation in a borrow area below the elevation of the adjacent properties within 150 ft of the nearest right-of-way line of an existing highway, county road, or city street; the nearest right-of-way line of a proposed highway, county road, or city street; or adjacent property lines. If the properties adjacent to the borrow area are privately owned, the setback limit of 150 ft may be lessened if written approval or permission is granted by the owner of the adjacent property, the excavation is in accordance with local zoning laws and requirements, and if lessening the limit is in the best interest of the State. Such minimum distance shall not be closer than 50 ft to an adjacent property line. All excavated slopes of a borrow area shall not be steeper than 3:1 down to 2 ft below the ground water elevation. All excavated slopes 2 ft below the ground water elevation shall not be steeper than 2:1.

Top soil from the borrow or disposal area shall be stockpiled for use in restoring the disturbed area. A minimum encasement of 6 in. shall be placed on the 3:1 or flatter slopes. Final restoration of borrow or waste disposal areas shall include grading, seeding, or other necessary treatments that will blend the area into the surrounding landscape. Restored areas within 150 ft of the nearest right-of-way line shall be well drained. Areas beyond 150 ft shall be drained unless the landowner desires other treatment of the borrow area. Construction of borrow or disposal areas shall be in accordance with existing laws, regulations, and ordinances. Under no conditions shall borrow sites detract from the appearance of the natural topographical features or increase the potential hazard to a vehicle that has inadvertently left the highway.

If granulated slag, dunes sand, or other granular material which is not suitable for the growth of vegetation is used, such material shall not be placed within 1 ft of the required finished surfaces of shoulders and fill slopes. Additional material required to complete the embankment, such as sandy loam, sandy clay loam, clay loam, clay, or other materials suitable for the growth of vegetation and free from clods, debris, and stones, shall be furnished at the contract price for borrow.

Additional fill material may be secured from within the permanent or temporary right-of-way in lieu of borrow or B borrow either from vertical or horizontal extensions, or both, beyond the lines and elevations of roadway and drainage excavation as shown on the contract plans when authorized in writing. If additional material has been obtained without written approval, the material will be classified either as to source or use, to the best advantage of the Department.

COMMENTS AND ACTION

201.01 DESCRIPTION
202.02 GENERAL REQUIREMENTS
203.08 BORROW OR DISPOSAL
203.10 DISPOSAL OF EXCAVATED MATERIAL EXCEPT WATERWAY AND PEAT EXCAVATION
203.11 DISPOSAL OF WATERWAY EXCAVATION
203.12 DISPOSAL OF PEAT

DISCUSSION:

Motion: Second: Ayes: Nays: FHWA Approval:	Action: _____ Passed as Submitted _____ Passed as Revised __ __ Withdrawn
Standard Specifications Sections referenced and/or affected: 201.01 pg 120; 202.02 pg 124; 203.08 pg 141; 203.10 pg 146; 203.11 and 203.12 pg 147. Recurring Special Provision affected: 203-R-550 APPROVAL OF BORROW AND DISPOSAL SITES Standard Drawing affected: NONE Design Manual Sections affected: NONE GIFE Sections cross-references: Section 3.2	_____ 2016 Standard Specifications _____ Revise Pay Items List _____ Create RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Revise RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Standard Drawing Effective _____ Create RPD (No. _____) Effective _____ Letting _____ GIFE Update

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD DRAWINGS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: The standard drawings series on pavement marking messages (808-MKPM) has not been updated since 2000 and does not have yield lines or roundabout "fish-hook" type arrows. The FHWA Standard Highway Signs & Markings Book also does not have a standard layout for fish-hook arrows.

PROPOSED SOLUTION: Create a standard drawing sheet for fish-hook arrows and yield lines and update the remaining drawings in the series.

APPLICABLE STANDARD SPECIFICATIONS: 808.05

APPLICABLE STANDARD DRAWINGS: 808-MKPM-02, 03, 04, 05, and 07

APPLICABLE DESIGN MANUAL SECTION: 502-2.02(16), (17), and (21)

APPLICABLE SECTION OF GIFE: N/A

APPLICABLE RECURRING SPECIAL PROVISIONS: N/A

PAY ITEMS AFFECTED:

Retain:
808-10097 Transverse Markings, Multi-Component, Yield, White, 27 in.....(LFT)
808-11698 Transverse Markings, Thermoplastic Yield, White, 27 in.....(LFT)

Mark as Obsolete:
808-10118 Transverse Markings, Thermoplastic, Yield, White, 24 in.....(LFT)
808-11776 Transverse Markings, Multi-Component, Yield, White, 24 in...(LFT)

Submitted By: Dave Boruff

Title: Manager, Office of Traffic Administration

Organization: INDOT

Phone Number: (317) 234-7975

Date: 1/29/2015

APPLICABLE SUB-COMMITTEE ENDORSEMENT: Yes, Traffic Standards Subcommittee.

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD DRAWINGS

(CONTINUED)

IMPACT ANALYSIS REPORT CHECKLIST

Please explain the business case as to why this item should be presented to the Standards Committee for approval.

Please answer the following questions with Yes, No or N/A.

Does this item appear in any other specification sections? No

Will approval of this item affect the Approved Materials List? No

Will this proposal improve:

Construction costs? No
Construction time? Yes
Customer satisfaction? Yes
Congestion/travel time? No
Ride Quality? No

Will this item improve safety:

For motorists? Yes
For construction workers? No

Will this proposal improve quality for:

Construction procedures/processes? Yes
Asset preservation? No
Design process? Yes

Will this proposal provide clarification for the Contractor and field personnel? Yes

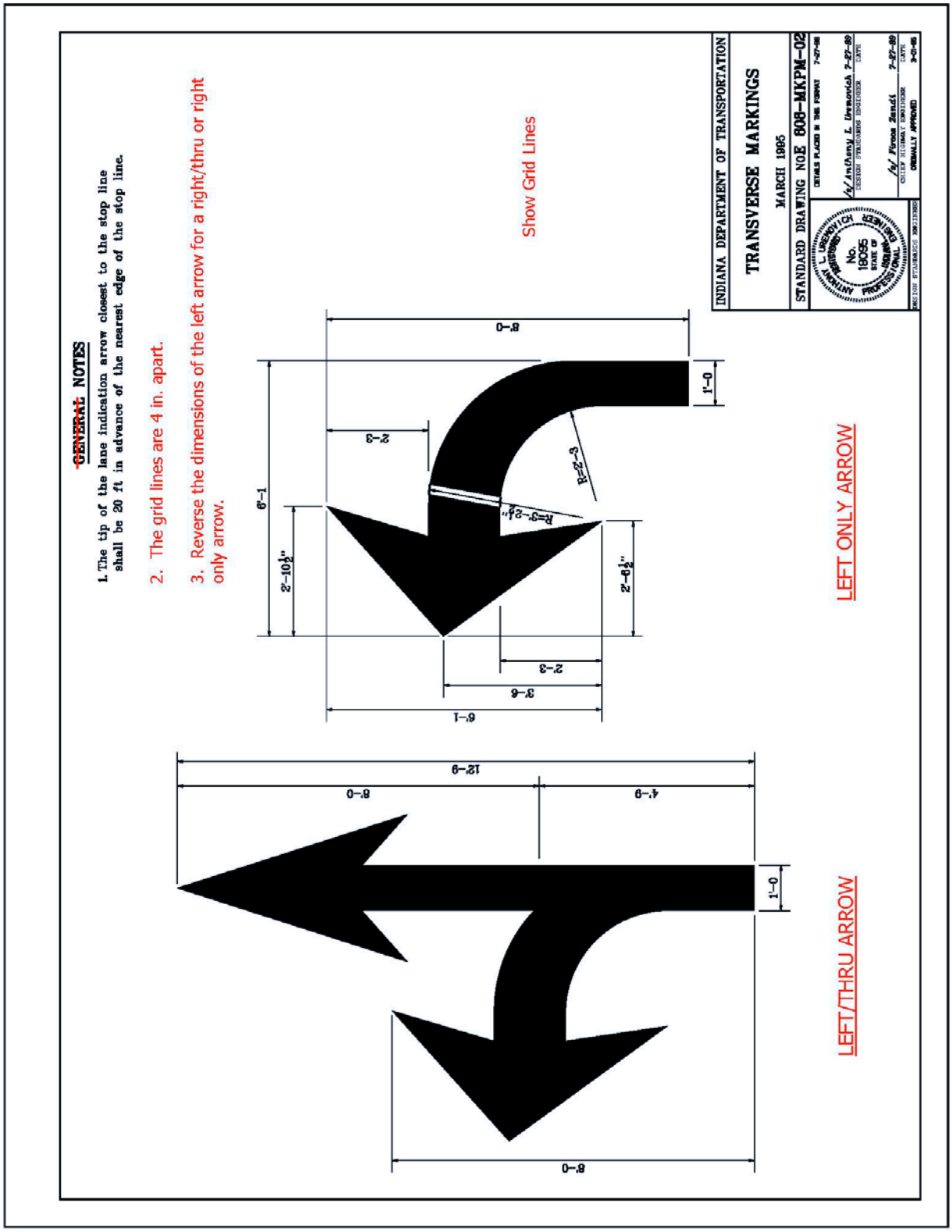
Can this item improve/reduce the number of potential change orders? Yes

Is this item editorial? No

Please provide any further information as to why this proposal should be placed on the Standards Committee meeting Agenda: N/A

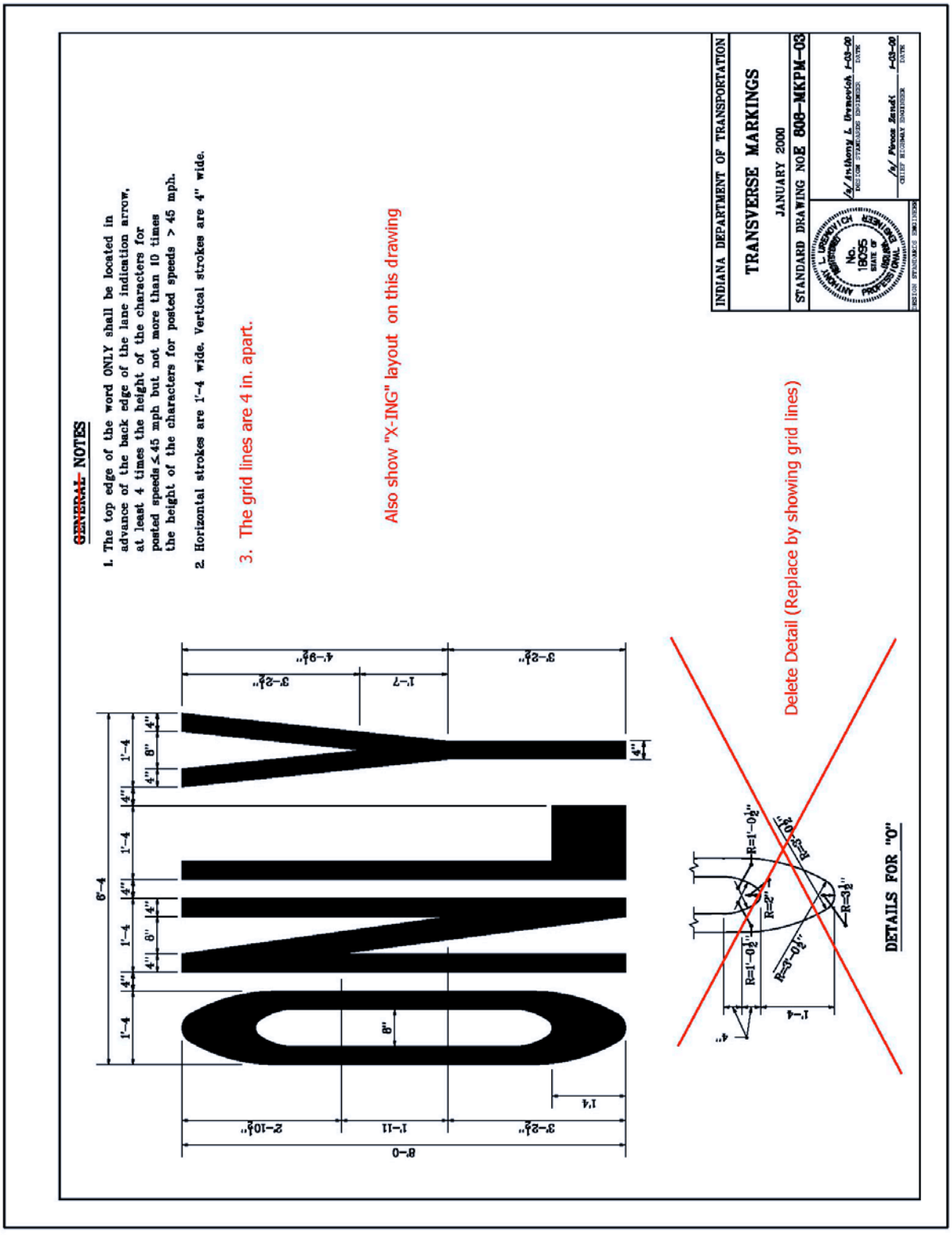
REVISION TO STANDARD DRAWINGS

808-MKPM-02 TRANSVERSE MARKINGS (WITH MARKUPS)



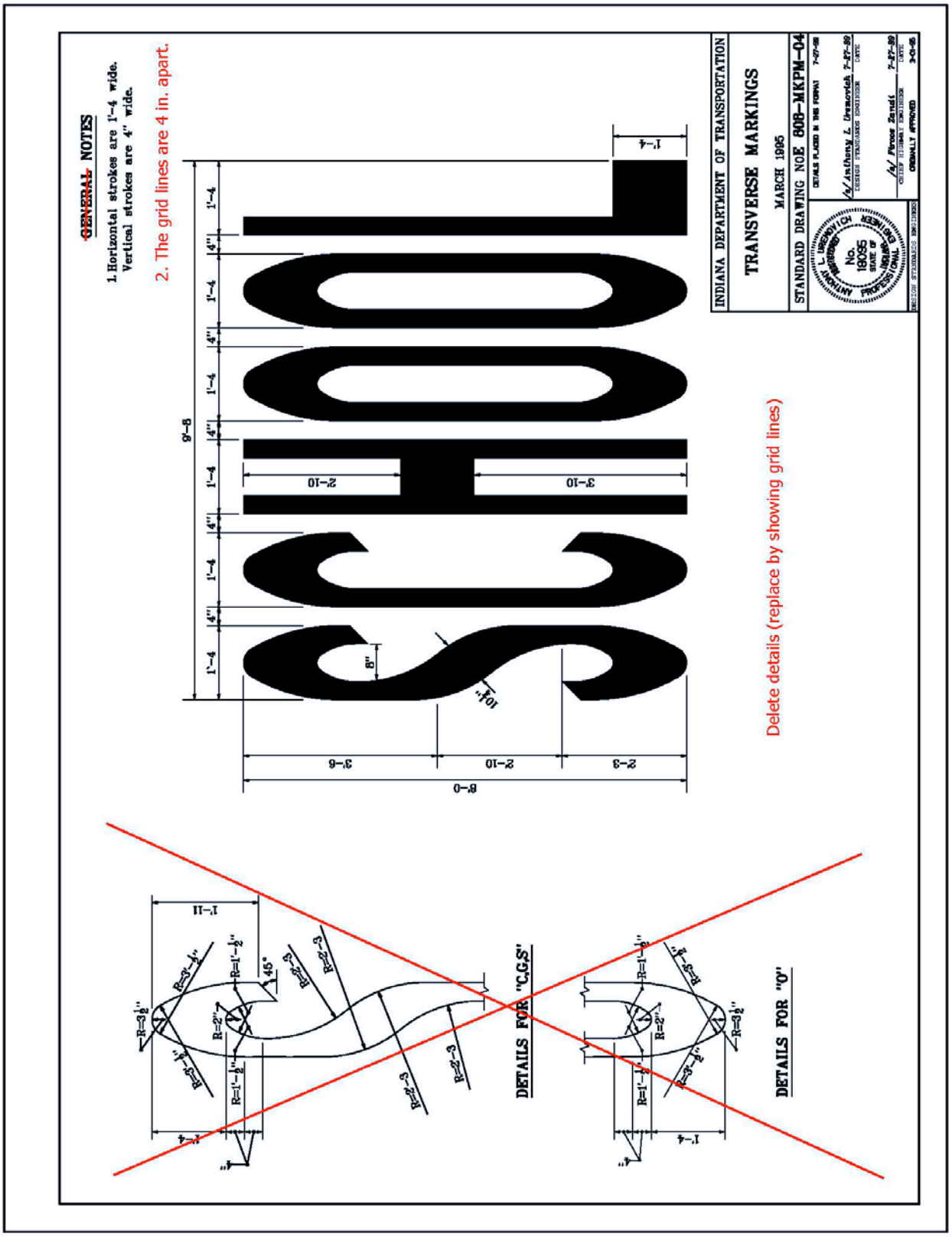
REVISION TO STANDARD DRAWINGS

808-MKPM-03 TRANSVERSE MARKINGS (WITH MARKUPS)



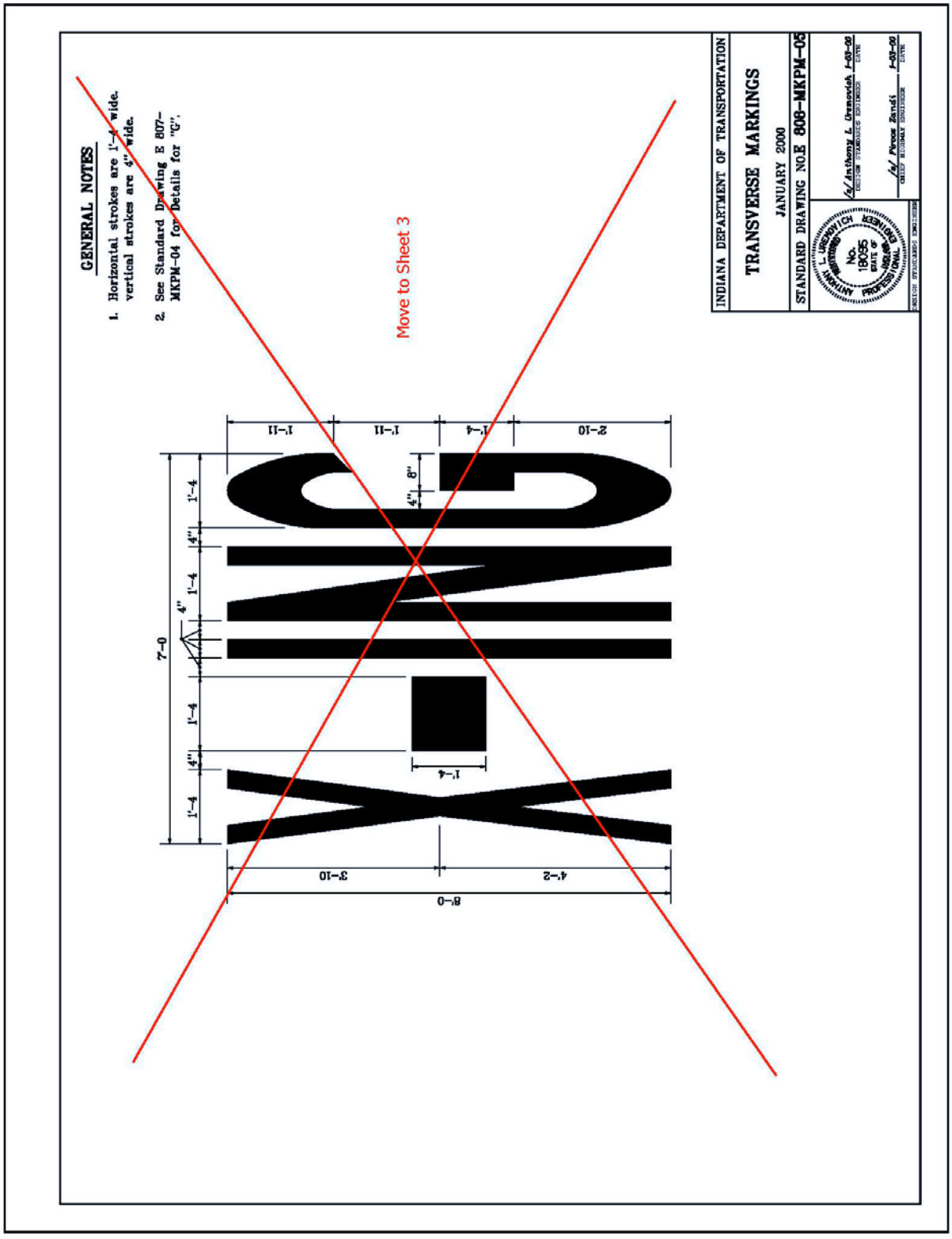
REVISION TO STANDARD DRAWINGS

808-MKPM-04 TRANSVERSE MARKINGS (WITH MARKUPS)



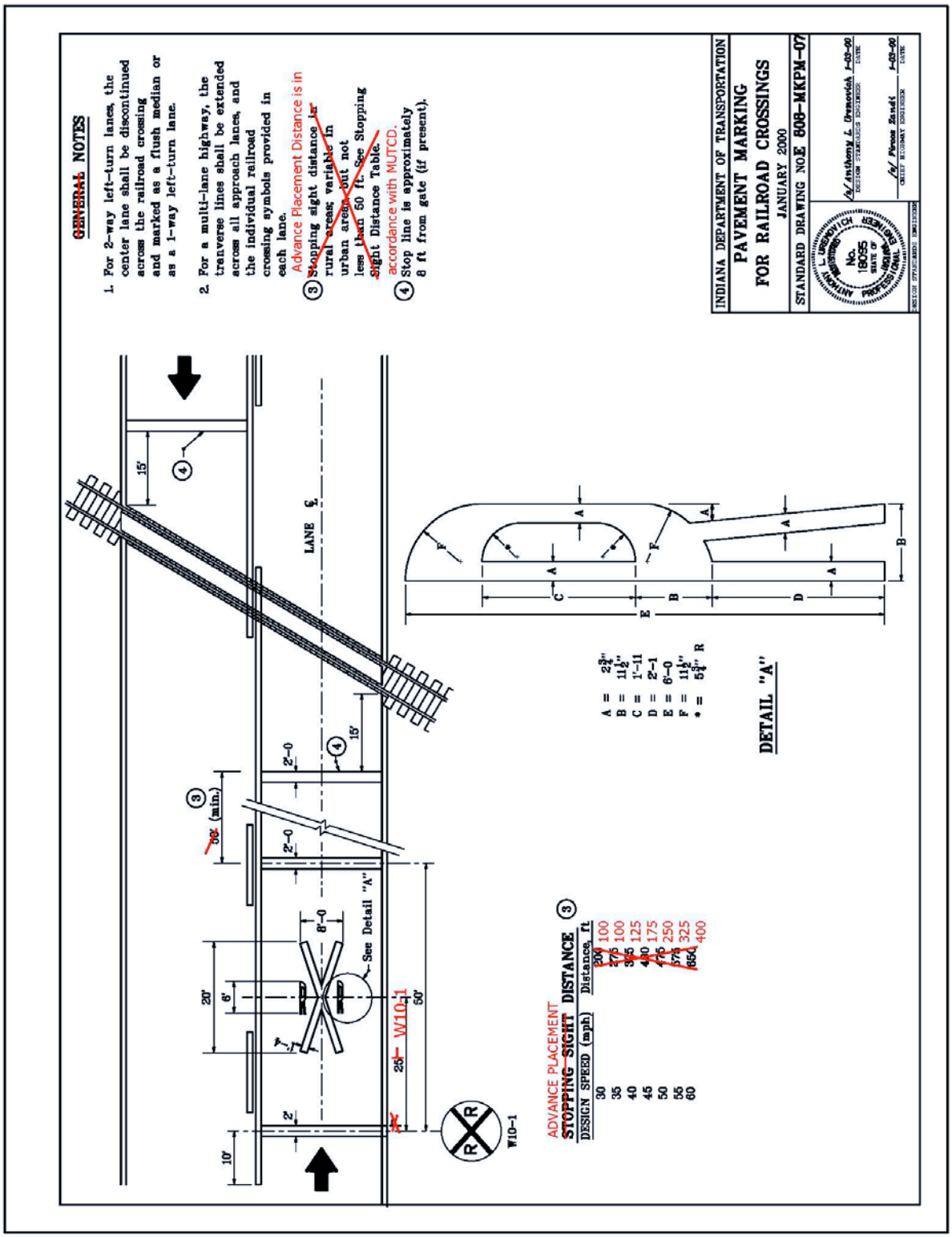
REVISION TO STANDARD DRAWINGS

808-MKPM-05 TRANSVERSE MARKINGS (WITH MARKUPS)



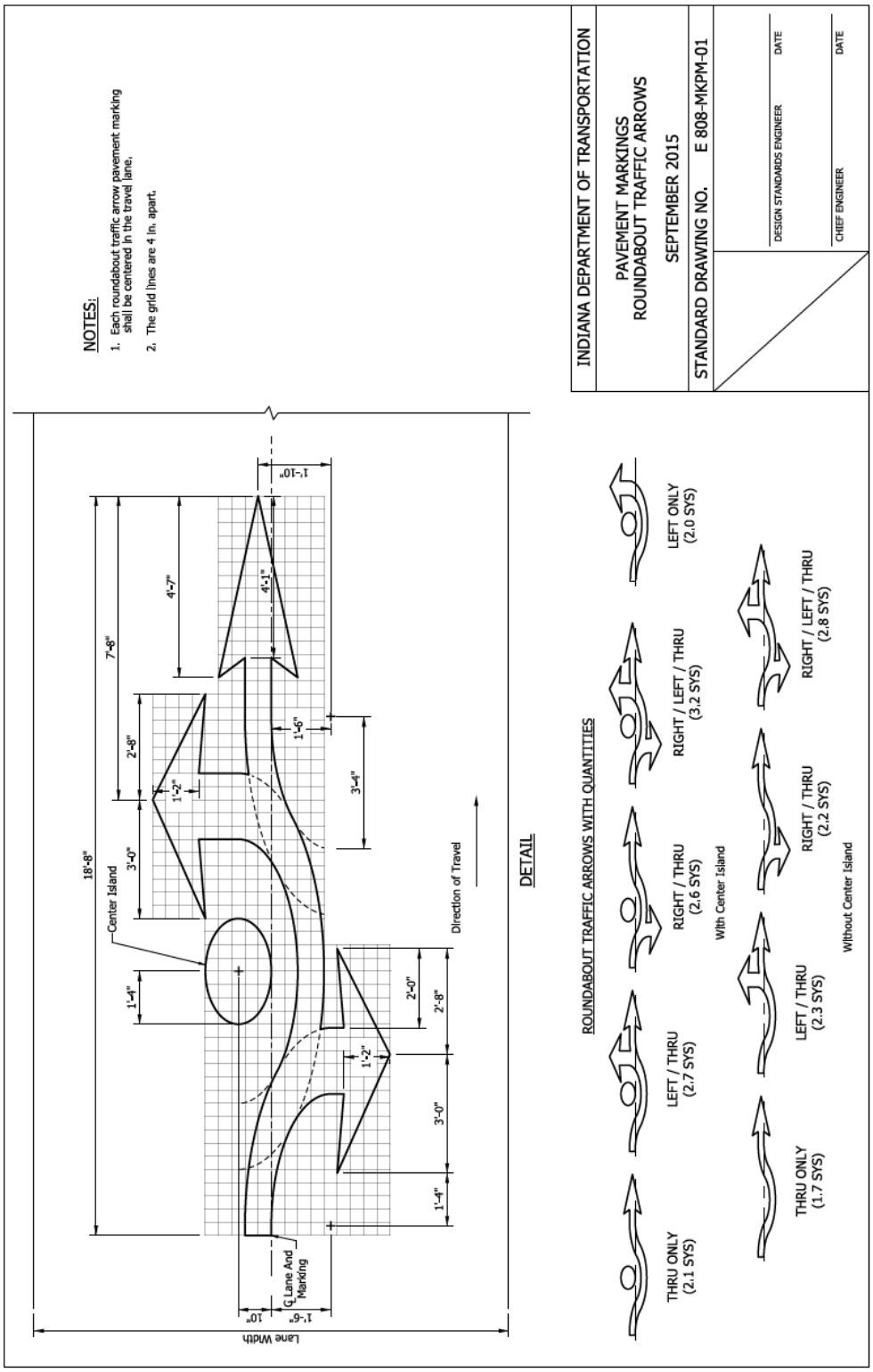
REVISION TO STANDARD DRAWINGS

808-MKPM-07 PAVEMENT MARKING FOR RAILROAD CROSSINGS (WITH MARKUPS)



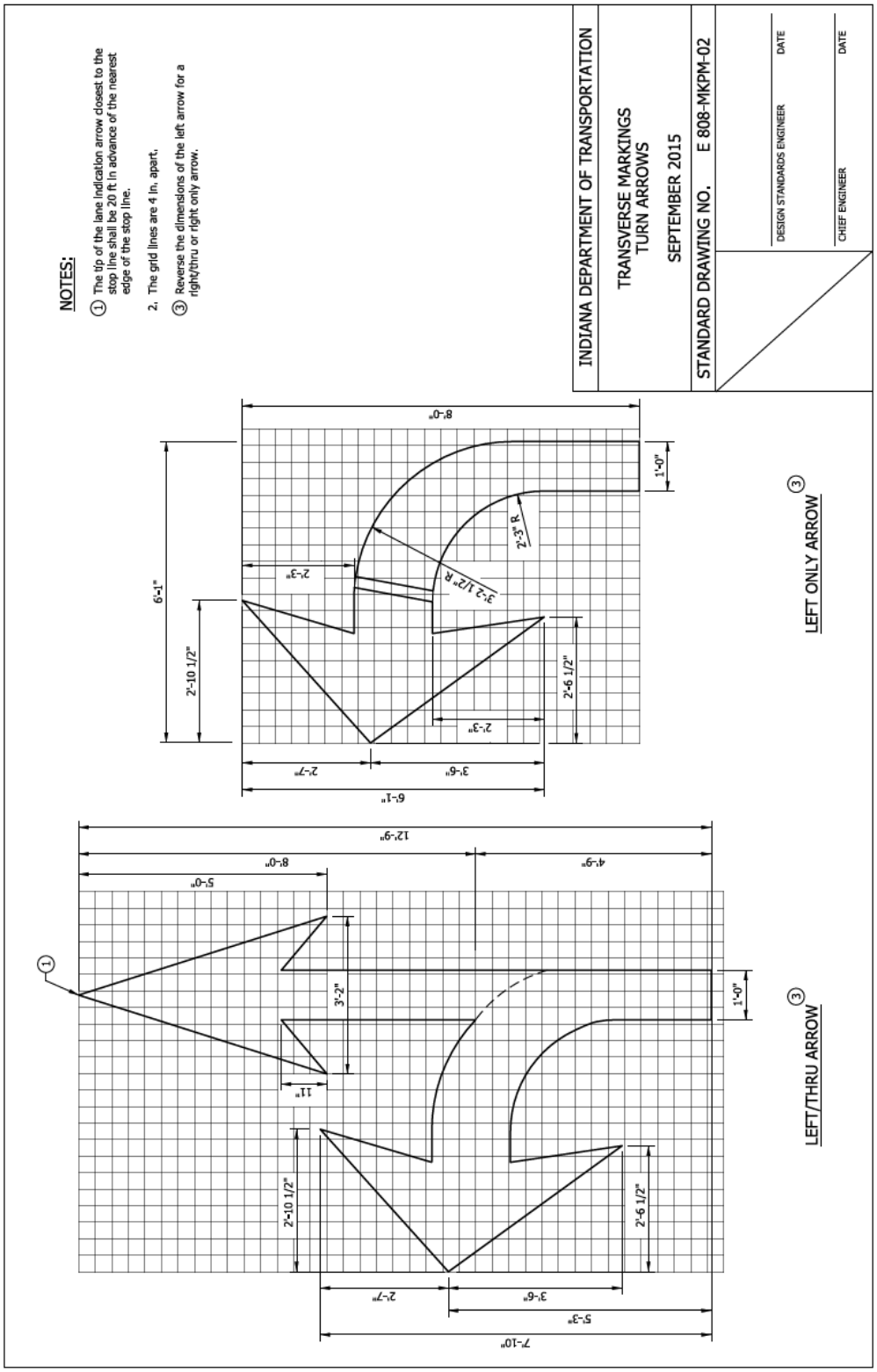
REVISION TO STANDARD DRAWINGS

808-MKPM-01 PAVEMENT MARKINGS ROUND ABOUT TRAFFIC ARROWS (PROPOSED DRAFT)



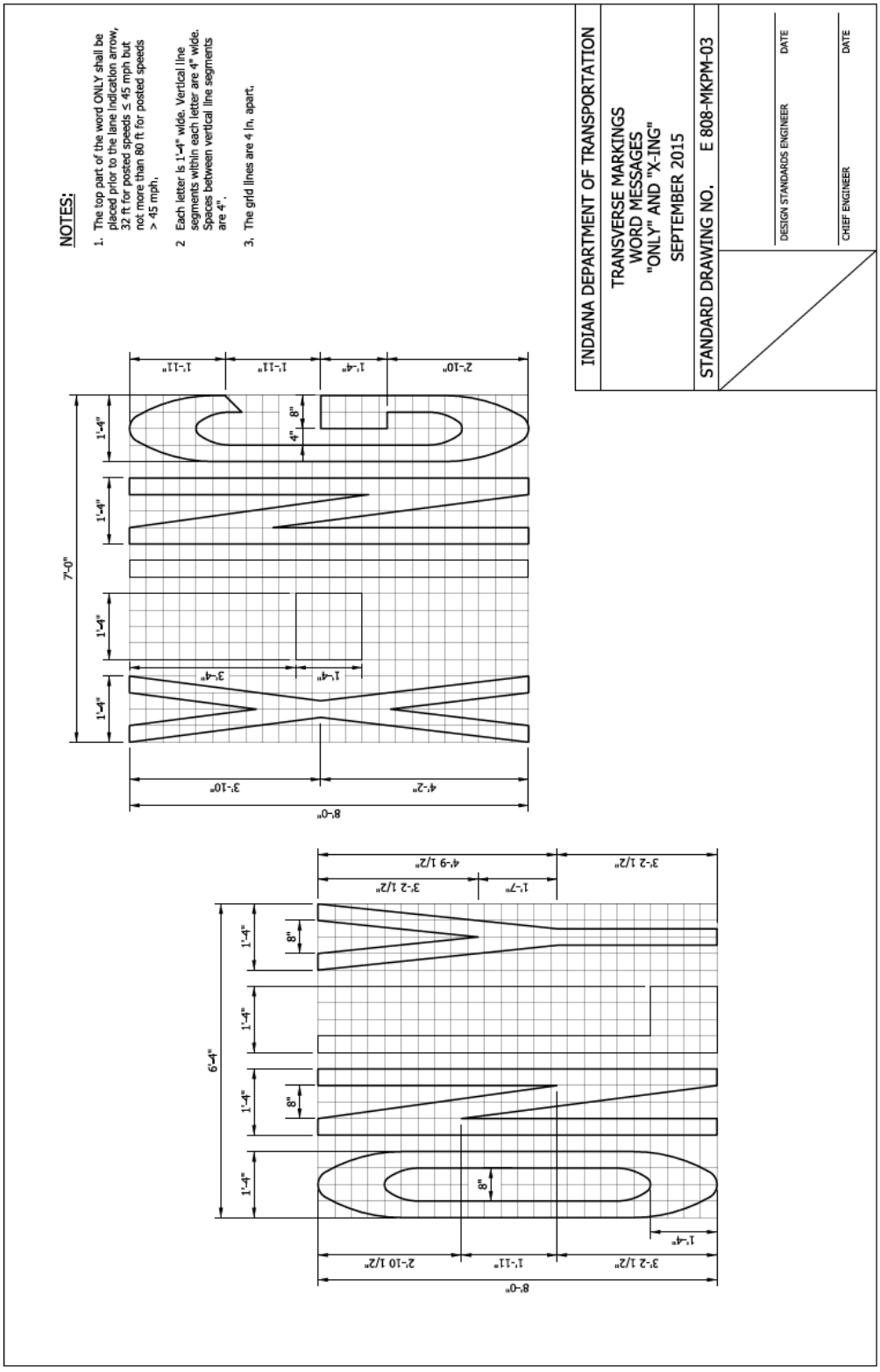
REVISION TO STANDARD DRAWINGS

808-MKPM-02 TRANSVERSE MARKINGS TURN ARROWS (PROPOSED DRAFT)



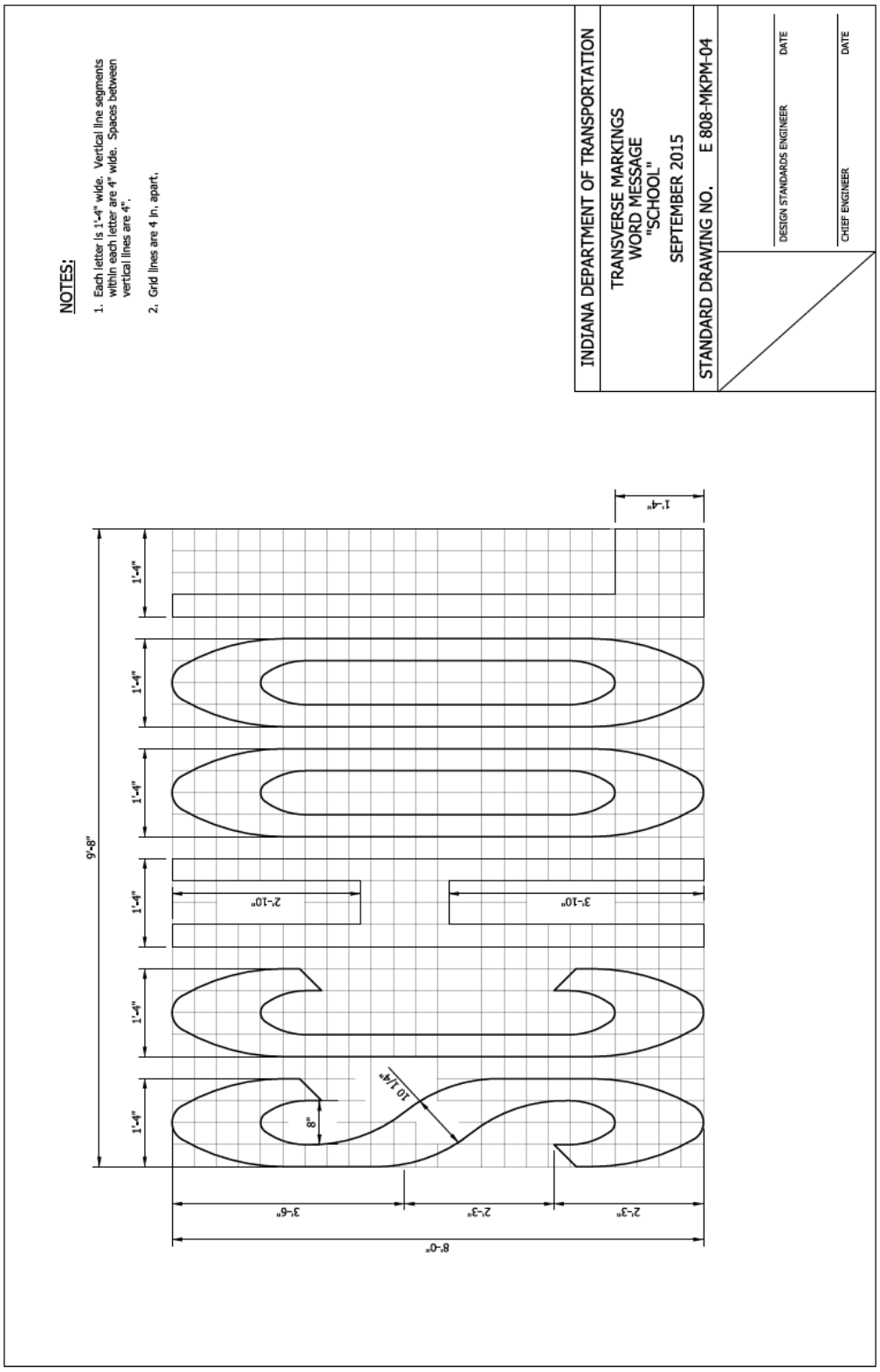
REVISION TO STANDARD DRAWINGS

808-MKPM-03 TRANSVERSE MARKINGS WORD MESSAGES (PROPOSED DRAFT)



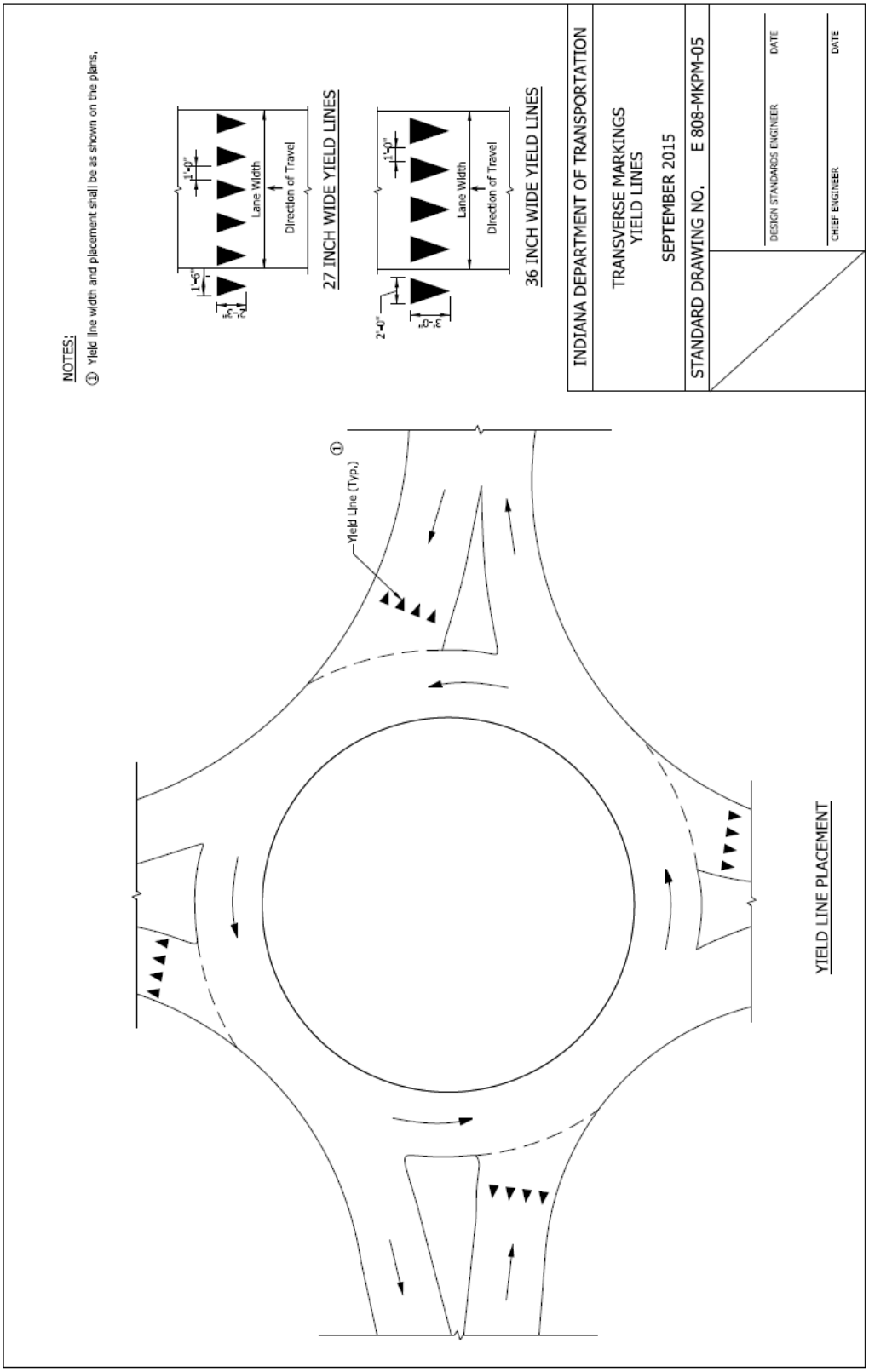
REVISION TO STANDARD DRAWINGS

808-MKPM-04 TRANSVERSE MARKINGS WORD MESSAGES (PROPOSED DRAFT)



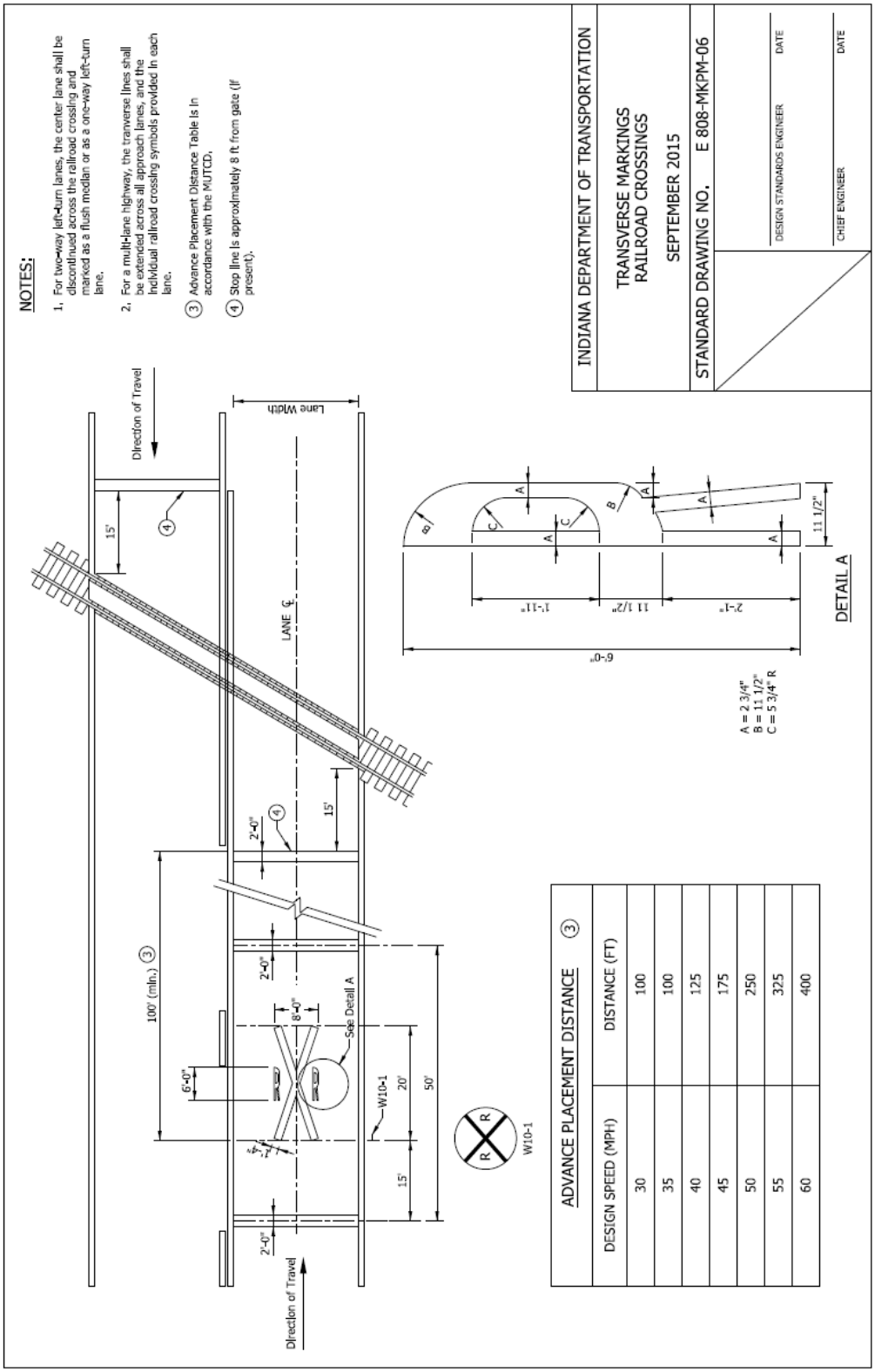
REVISION TO STANDARD DRAWINGS

808-MKPM-05 TRANSVERSE MARKINGS YIELD LINES (PROPOSED DRAFT)



REVISION TO STANDARD SPECIFICATIONS

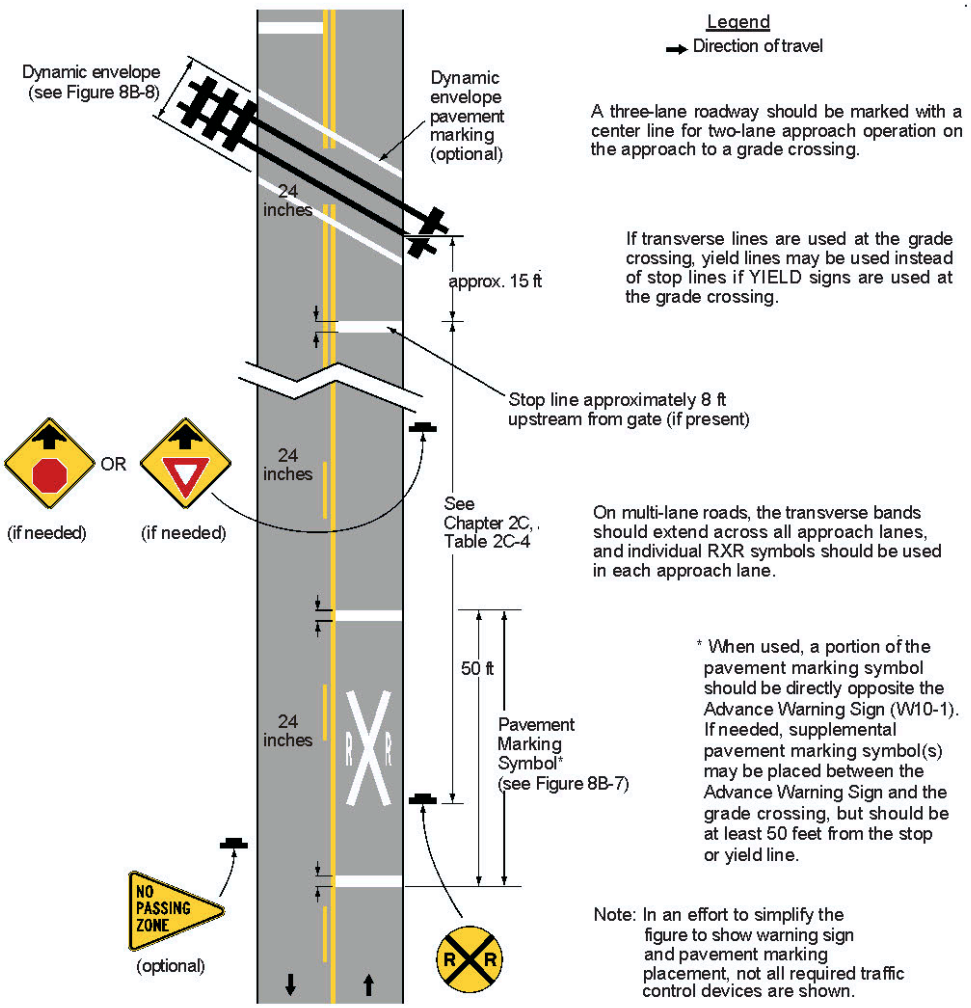
808-MKPM-06 TRANSVERSE MARKINGS RAILROAD CROSSINGS (PROPOSED DRAFT)



BACKUP 01.

FIGURE 8B-6. EXAMPLE OF PLACEMENT OF WARNING SIGNS AND PAVEMENT MARKINGS AT GRADE CROSSINGS

Figure 8B-6. Example of Placement of Warning Signs and Pavement Markings at Grade Crossings



COMMENTS AND ACTION

808-MKPM Series PAVEMENT MARKINGS

DISCUSSION:

Motion: Second: Ayes: Nays: FHWA Approval:	Action: _____ Passed as Submitted _____ Passed as Revised _____ Withdrawn
Standard Specifications Sections referenced and/or affected: 808.05 pg 796; 808.12 pg 807. Recurring Special Provision affected: NONE Standard Drawing affected: 808-MKPM series Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	_____ 2016 Standard Specifications _____ Revise Pay Items List _____ Create RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Revise RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Standard Drawing Effective _____ Create RPD (No. _____) Effective _____ Letting _____ GIFE Update

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: A signal backplate improves the conspicuity of a traffic signal head during daytime hours, especially at dawn and dusk for intersection approaches facing east or west. The 2 in. yellow retroreflective strip on a signal backplate also improves the visibility of a traffic signal head at night. However, the current specification only requires signal backplates on signal heads for the thru lanes. On most contracts with signal work, this provision is now being overridden to require backplates on all signal heads mounted overhead.

PROPOSED SOLUTION: Revise the construction requirements for signal heads to specify backplates on all traffic signal heads that are mounted overhead and attached to new structures.

APPLICABLE STANDARD SPECIFICATIONS: 805.05

APPLICABLE STANDARD DRAWINGS: 805-SGSC-04

APPLICABLE DESIGN MANUAL SECTION: 502-3.03(06)

APPLICABLE SECTION OF GIFE: N/A

APPLICABLE RECURRING SPECIAL PROVISIONS: N/A

PAY ITEMS AFFECTED: N/A

Submitted By: Dave Boruff

Title: Manager, Office of Traffic Administration

Organization: INDOT

Phone Number: (317) 234-7975

Date: 12/23/2014

APPLICABLE SUB-COMMITTEE ENDORSEMENT: Ad hoc review by district traffic engineers and INDOT Office of Traffic Safety.

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS AND STANDARD DRAWINGS

(CONTINUED)

IMPACT ANALYSIS REPORT CHECKLIST

Please explain the business case as to why this item should be presented to the Standards Committee for approval.

Please answer the following questions with Yes, No or N/A.

Does this item appear in any other specification sections? No

Will approval of this item affect the Approved Materials List? No

Will this proposal improve:

- Construction costs? No
- Construction time? No
- Customer satisfaction? Yes
- Congestion/travel time? No
- Ride Quality? No

Will this item improve safety:

- For motorists? Yes
- For construction workers? No

Will this proposal improve quality for:

- Construction procedures/processes? No
- Asset preservation? No
- Design process? Yes

Will this proposal provide clarification for the Contractor and field personnel? Yes

Can this item improve/reduce the number of potential change orders? Yes

Is this item editorial? No

Please provide any further information as to why this proposal should be placed on the Standards Committee meeting Agenda: N/A

REVISION TO STANDARD SPECIFICATIONS

SECTION 805 - TRAFFIC SIGNALS
805.05 PLACING SIGNAL HEADS

The Standard Specifications are revised as follows:

SECTION 805, BEGIN LINE 204, DELETE AND INSERT AS FOLLOWS:

~~Overhead three section~~*Except for signal heads installed on existing traffic signal cantilever structures, all overhead* signal heads ~~for through lanes~~ shall have backplates, *unless otherwise indicated on the plans* ~~with the exception of signal heads installed on existing traffic signal cantilever structures~~. Backplates shall not be cut or altered upon installation.

502-3.03(06) Traffic Signal-Head Components

8. Backplate. A signal indication loses some of its contrast value if viewed against a bright sky or other intensive background lighting, e.g., advertising lighting. A backplate placed around a signal assembly enhances the signal's visibility and has been shown to provide a benefit in reducing crashes. However, a backplate also adds weight to the signal head and can increase the effect of wind loading on the signal. Normally backplates should be used on all signal heads unless directed otherwise by the district traffic engineer. ~~A backplate is required by the INDOT *Standard Specifications* on all overhead 3-section signal heads for through lanes. Backplates to be installed with heads other than 3-section through movement should be identified on the plans.~~

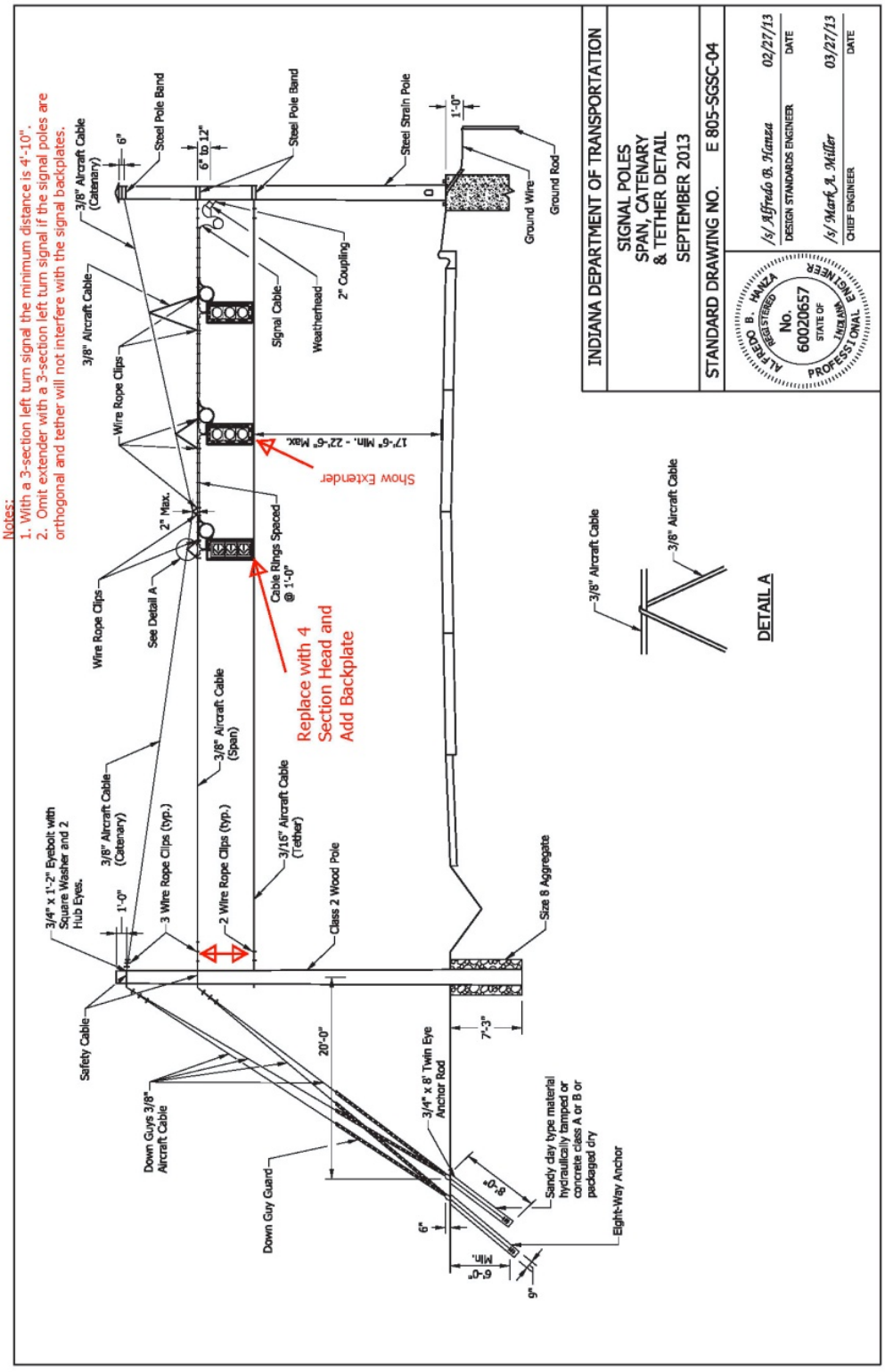
   Backplates for heads installed on existing cantilever structures should be specified to have louvers (slotted openings) to reduce wind load. Louvers should comprise no more than 40% of the backplate area.

   The INDOT *Standard Specifications* require backplates to include a 2-in. yellow retroreflective strip around the perimeter of the backplate to enhance the conspicuity of the signal head at night. For non-INDOT projects where the reflectorized surface is not desired, the plans or special provisions should so indicate.

   Backplates may be retrofitted onto existing traffic signal heads when the existing LEDs have some service life remaining and should be reused but backplates are needed. Currently LED indicators have a service life of about 6 years. The INDOT *Standard Specifications* require a retrofit to include a new signal housing along with the backplate. Retrofits should be indicated on the plans and are paid for under the Traffic Signal Head Retrofit pay item.

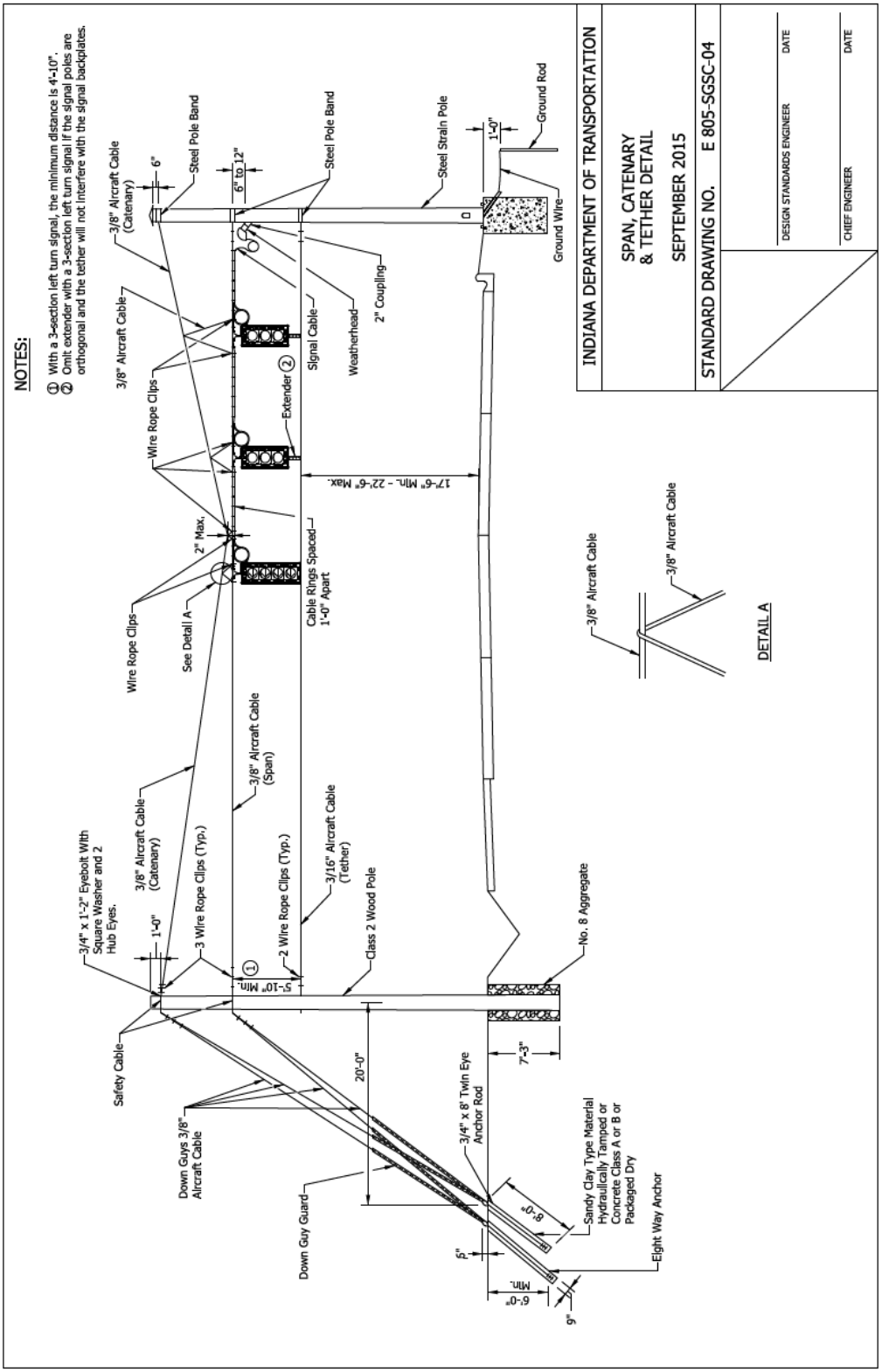
REVISION TO STANDARD DRAWINGS

805-SGSC-04 SIGNAL POLES SPAN, CATENARY & TETHER DETAIL (WITH MARKUPS)



REVISION TO STANDARD DRAWINGS

805-SGSC-04 SIGNAL POLES SPAN, CATENARY & TETHER DETAIL (DRAFT)



COMMENTS AND ACTION

805-SGSC-04 SIGNAL POLES SPAN, CATENARY & TETHER DETAIL

DISCUSSION:

Motion: Second: Ayes: Nays: FHWA Approval:	Action: _____ Passed as Submitted _____ Passed as Revised __ __ Withdrawn
Standard Specifications Sections referenced and/or affected: 805 pg 762. Recurring Special Provision affected: NONE Standard Drawing affected: 805-SGSC-04 SIGNAL POLES SPAN, CATENARY & TETHER DETAIL Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	_____ 2016 Standard Specifications _____ Revise Pay Items List _____ Create RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Revise RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Standard Drawing Effective _____ Create RPD (No. _____) Effective _____ Letting _____ GIFE Update

Mr. Boruff
Date: 2/19/15

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO SPECIAL PROVISIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: As luminaires that utilize solid state technology become more prevalent and cost effective our current specification does not adequately address several issues including power driver reliability, warranty requirements, and the color of the emitted light. Additionally our design procedure needs to recognize service life to get a more accurate estimate of annualized costs and does not currently account for several concepts such as glare and adaptive lighting that are significant to certain types of lighting projects, e.g. downtown streetscape.

PROPOSED SOLUTION: Revise the recurring special provision for luminaires and the Indiana Design Manual.

APPLICABLE STANDARD SPECIFICATIONS: 807.13 and 920.01(d)

APPLICABLE STANDARD DRAWINGS: n/a

APPLICABLE DESIGN MANUAL SECTION: 502-4

APPLICABLE SECTION OF GIFE: n/a

APPLICABLE RECURRING SPECIAL PROVISIONS: 807-T-193

PAY ITEMS AFFECTED: n/a

APPLICABLE SUB-COMMITTEE ENDORSEMENT: Traffic Standards Subcommittee, district Traffic Engineers, Luminaire Manufacturers, Purdue University

IMPACT ANALYSIS (attach report): Yes

Submitted By: David Boruff

Title: Manager, Office of Traffic Administration

Organization: INDOT

Phone Number: 317-234-7975

Date: 1/23/15

[

Mr. Boruff
Date: 2/19/15

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO SPECIAL PROVISIONS

IMPACT ANALYSIS REPORT CHECKLIST

Explain the business case as to why this item should be presented to the Standards Committee for approval. Answer the following questions with Yes, No or N/A.

Does this item appear in any other specification sections? No

Will approval of this item affect the Approved Materials List? No

Will this proposal improve:

Construction costs?

Construction time?

Customer satisfaction?

Congestion/travel time?

Ride quality?

Will this proposal reduce operational costs or maintenance effort?

Will this item improve safety:

For motorists?

For construction workers? Yes

Will this proposal improve quality for:

Construction procedures/processes?

Asset preservation?

Design process?

Will this change provide the contractor more flexibility?

Will this proposal provide clarification for the Contractor and field personnel? N/A

Can this item improve/reduce the number of potential change orders?

Is this proposal needed for compliance with:

Federal or State regulations?

AASHTO or other design code?

Is this item editorial?

Provide any further information as to why this proposal should be placed on the Standards Committee meeting Agenda:

REVISION TO SPECIAL PROVISIONS
807-T-193 LUMINAIRES

(Note: Proposed changes shown highlighted gray)

807-T-193 LUMINAIRES

(Adopted 05-16-13)

The Standard Specifications are revised as follows:

SECTION 807, BEGIN LINE 41, INSERT AS FOLLOWS:

807.03 Working Drawings

Working drawings shall be submitted in accordance with 105.02 for lighting-standard assemblies, luminaires, and external drive assemblies.

Working drawings for each luminaire model submitted shall include:

(a) Luminaire specifications and data sheets.
(b) Test report verifying UL 1598 compliance.
(~~a~~c) Test report indicating compliance with ANSI C136.31, 2G or 3G requirements.
(~~b~~d) Test reports indicating ~~that IP 66 requirements are met~~the IP rating specified in 920.01(d)2 are met in accordance with ANSI/IEC, International Electrotechnical Committee, standard 60529.
(e) Report of testing performed in accordance with ANSI C82.77 for electronic power drivers, or ANSI C82.6 for mechanical ballast indicating that the Total Harmonic Distortion does not exceed the limit specified in 920.01(d)2 and the Power Factor meets or exceeds the minimum specified in 920.01(d)1.

For luminaires utilizing solid state ~~and plasma luminaires~~ power drivers, the working drawings shall also include:

(a) IESNA LM - 79 test report.
~~(b) IESNA LM - 80 test report, for solid state luminaires only.~~
(~~c~~b) Test report ~~verifying~~indicating surge protection device survival in accordance with ANSI/IEEE C62.41.2 ~~compliance~~.
(~~d~~c) UL 1449 certification.
(~~e~~d) Test report indicating Title 47 CFR Part 15, Class A compliance.
(e) Mean Time to Failure prediction for the power driver in accordance with Telcordia SR 332, issue 3 or MIL-HDBK-217F
(f) Power Driver Lifetime Report.

For luminaires utilizing an LED light source the IESNA LM - 80 test shall also be submitted. For plasma luminaires the emitter manufacturer's life test report indicating lumen maintenance at 50,000 hrs shall also be submitted. For post top mounted and underpass luminaires, the working drawings shall also include a report for a salt spray test in accordance with ASTM B117, 2,000 housr time horizon.

REVISION TO SPECIAL PROVISIONS

807-T-193 LUMINAIRES

Certifications and test reports shall be issued by ~~an independent~~ a laboratory that is either listed as a National Recognized Testing Laboratory on the U.S. Department of Labor's website: https://www.osha.gov/dts/otpca/nrtl/nrtllist.html or is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP): http://ts.nist.gov/standards/scopes/programs.htm. Additionally, LM-79 and LM-80 testing shall be performed by a laboratory that is accredited by the U.S. Department of Energy's CALIPER program: http://www1.eere.energy.gov/buildings/ssl/caliper.html.

Working drawings for luminaires shall also include the Illumination Engineering Society of North America, IESNA, photometric distribution file if the file number varies from what is indicated on the plans. The IESNA photometric distribution file shall be in either ~~ILLUMS, developed by General Electric, or~~ Visual, developed by Acuity Brands Lighting, or AGi32 from Lighting Analysis, Inc.

SECTION 807, BEGIN LINE 525, DELETE AND INSERT AS FOLLOWS:

807.13 Luminaire ~~Installation~~

(a) Installation

Luminaire installation shall consist of the physical placing of the luminaire. Each installation shall include the furnishing and placing of the ~~lamp~~ *light source* as designated. *Luminaires shall be compatible with other lighting materials as specified in 920.01.* ~~*All luminaires on a contract shall be of the same technology and be provided by one manufacturer*~~.

~~(a)~~*1*. Roadway Luminaires

Each luminaire shall be leveled in both directions in the horizontal plane after the light standard has been erected and adjusted. Rotary adjustment of the mast arm and vertical adjustment of roadway luminaires to obtain an installed level position in both directions shall be accomplished by means of the bolted saddle arrangement used to attach the luminaires to the mast arm. Lamp socket positions may be shown on the plans by type of Illuminating Engineering Society of North American, IES, light pattern. The specified lamp socket position, *or comparable arrangement of LEDs* shall be used to obtain the desired light pattern delivery. Proper connections shall be made to provide ~~ballast~~ operation at the voltage being supplied. Replacements needed because of faulty or incorrect voltage connections shall be made with no additional payment. *All roadway luminaires provided for an intersection, interchange, or contiguous highway segment shall be the same model.*

~~(b)~~ *2*. Sign Luminaires

Connections in which plain and galvanized steel are in contact shall be protected such that aluminum surfaces shall receive one coat of zinc chromate primer. Steel surfaces shall be prepared in accordance with 619.08(a), 619.08(b) and 619.08(d) and painted with a structural steel system in accordance with 619.09(a). All paint shall be allowed to cure before assembly. Conduit fittings, if required, shall be watertight.

Required conduit shall be either rigid or flexible as necessary. Conduit shall not be clamped to a sign panel.

Sign luminaires shall be mounted on overhead sign structures on two metal channels located at the extremity of the sign walkway support brackets. The distance between lighting unit support channels shall be 7 in. These channels shall be located in such a manner that they readily receive the mounting bolts from the rear of the sign luminaire. The installation of the sign luminaire shall consist of the physical placement of the luminaire on the channels.

Sign luminaires shall be connected to a phase conductor and a neutral conductor. The luminaires shall be alternately connected to opposite phase conductors to balance the load. The connections in the base of the sign structure shall be in accordance with 807.06. Conductor splicing shall be in junction boxes, in-ground handholes, inside handholes of sign structures, and circuit breaker enclosures. *All sign luminaires provided for an interchange or contiguous highway segment shall be the same model.*

~~(c)~~*3.* Underpass Luminaires

Underpass luminaires shall be mounted on the vertical side surfaces of bridge bent structures or suspended by means of pendants supported by angle-iron struts or clips fastened to the structural beam members of the bridge. All parts of the pendent pipe assembly shall be hot-dipped galvanized after threads are cut. Silicone caulking compound shall be applied to the threads during assembly of the pendent. Underpass luminaires may require separately mounted ballasts which shall be installed in close proximity to the luminaires.

Underpass luminaires shall be connected to a phase conductor and a neutral conductor. The luminaires shall be alternately connected to opposite phase conductors to balance the load. Conductor splicing will only be allowed in junction boxes, in-ground handholes, and circuit breaker enclosures. *All underpass luminaires provided for an interchange shall be the same model.*

~~(d)~~ *4.* High Mast Luminaires

The aiming of the luminaires shall be as shown on the plans. When the aiming process is being done the luminaire shall be oriented to conform to its raised position and the ring properly tethered to prevent rotation during the aiming adjustment. The long axis of the luminaire shall be parallel to the aiming direction indicated on the plans. *All high mast luminaires provided for the for an interchange shall be the same make and model.*

(b) Warranty

~~The~~A non-prorated manufacturer's written warranty ~~covering all components, except lamps, of the luminaire against defects in materials and workmanship for a minimum period of five years after installation shall be provided~~against loss of performance and defects in materials and workmanship for a period of five years after installation shall be provided. The warranty shall cover all components of the luminaire,

including ballast, driver, and light source. Loss of performance is defined as the luminaire or any of its components falling out of compliance with this specification and the following: there is no light output from 10% or more of the LEDs, the luminaire is operating below the lumen maintenance curve, the color temperature shifts more than 500K outside of the specified color temperature range. The warranty shall stipulate that replacement luminaires will be ~~*provided*~~*shipped to the appropriate INDOT District Office within* ~~*seven*~~*30 days after receipt of failed luminaires at no* ~~*additional*~~ *cost to the Department. Warranty documents shall give the manufacturer's name, contact person, and contact person telephone number and e-mail and shall be submitted to the Engineer with the Type C Certification. Warranty documents shall provide the estimated life cycle of the lamp, LEDs, or plasma emitter, and power driver.*

807.14 Sign, Underpass, Roadway, ~~**and**~~ **High Mast Lighting Location** ***and Luminaire*** **Identification**

All high mast towers, roadway light standards, underpass lighting installations, and sign lighting installations shall have an identification code number as shown on the plans. In addition, each luminaire at a sign or underpass installation shall be individually identified with a single capital letter.

The code number shall be displayed on the light standard, sign structure column, and high mast tower as shown on the plans. The underpass code number shall be displayed near the breaker box at a location as directed.

The code number for the lighting standard and sign structure column shall be applied to the pole, as specified by the manufacturer, by using individual, pressure sensitive, adhesive backed tags. The code number for the high mast tower shall be applied to an aluminum plate which is mounted with spacers away from the structure as shown on the plans.

A luminaire identification sticker shall be provided on each luminaire and on the light pole or tower that supports the luminaire. The sticker shall be titled "LUMINAIRE" and contain the following information: light source type, manufacturer, model, wattage, ~~*and*~~ *date of installation, and warranty period. The pole/tower sticker shall be attached underneath the light pole ID tag, shall face the roadway, and shall have 3/4 in. lettering, and be no greater than 8 in. by 8 in.*

SECTION 807, BEGIN LINE 808, INSERT AS FOLLOWS:

Luminaire, High Mast, _____, _____Watt .....EACH
light source type

Luminaire, Roadway, _____, _____ Watt .....EACH
light source type

Luminaire, Sign, _____, _____ Watt .....EACH
light source type

Luminaire, Underpass, _____, _____ Watt .....EACH
light source type

REVISION TO SPECIAL PROVISIONS

807-T-193 LUMINAIRES

SECTION 807, BEGIN LINE 821, INSERT AS FOLLOWS:

The cost of lamps, *LED arrays, plasma emitters,* ballast, *drivers,* optical systems, weatherproof housings, *surge protection devices,* and electrical connections shall be included in the cost of luminaire.

SECTION 920, BEGIN LINE 499, DELETE AND INSERT AS FOLLOWS:

(d) Luminaires

1. General Requirements

~~Lamps~~*Light sources* supplied for luminaires shall be electrically compatible with the luminaires. Luminaires ~~*that are not solid state*~~ shall include the lamp ballast *or power driver*. The ballast *or power driver* shall be integrally built in. ~~and~~*Ballasts shall* of the constant wattage regulator type of sufficient size to operate the designated lamp at the required voltage. ~~The ballast shall provide satisfactory lamp performance to 20°F~~ *The luminaire shall operate satisfactorily in temperatures from - 40°F to 122°F* with an input voltage variation of ± 10% of the rated operating voltage specified. *Luminaires shall be a single, self contained device, not requiring on-site assembly for installation. Power consumption, wattage, shall not exceed that which is indicated on the plans. The luminaire power factor shall be 0.9 or greater.*

Underpass and post top mounted luminaires shall be protected against salt spray and conform to ASTM B117, 2,000 hours time horison.

Luminaires shall include vandal shields when installed on an underpass or signs on bridge brackets and when otherwise specified. The vandal shield shall be made of a tough durable plastic, such as Lexan, mounted in a rugged galvanized steel or aluminum frame, and shall withstand severe impact without being damaged or allowing the refractor to be damaged. It shall be fastened securely to the luminaire so it cannot be removed from the outside and shall not interfere with the light distribution pattern. It shall protect the face of the refractor and if ventilation is necessary, the ventilating apertures shall be arranged so that they do not admit a probe of a diameter greater than 1/4 in.

2. Roadway Lighting Luminaires

Roadway lighting luminaires shall have a precision-cast aluminum housing ~~and refractor holder~~ with weatherproof finish. They shall have a strong, easily operated, positive latch on the street side of the ~~refractor holder~~ *housing with* ~~and~~ a hinge ~~with~~ a safety catch that prevents accidental unhinging on the house side of the refractor *or lens* holder. They shall include a *four bolt* slipfitter capable of adapting to a 2 in. mounting bracket~~; that is adjustable ± 5° for levelin. an easily detachable highly specular aluminum reflector; and an easily adjustable socket in both horizontal and vertical directions capable of producing lighting patterns to meet all the requirements of the American Standard Practice for Roadway Lighting as sponsored by the Illumination Engineering Society and as shown on the plans. They shall have a high impact, heat resistant, glass, prismatic refractor; and~~

REVISION TO SPECIAL PROVISIONS
807-T-193 LUMINAIRES

~~They~~*Luminaires shall* include gasketing that will completely seal out dust, moisture, and insects from the interior of the optical assembly ~~*in accordance with IP 66*~~ and retard the formation of an undesirable film from gaseous vapors on the interior of the optical assembly. *The optical assembly shall be rated at IP 66 or better in accordance with ANSI/IEC 60529 while ballasts, power drivers and surge protection devices shall be rated at IP 65 or better.*

All ~~*I*~~*internal components shall be adequately supported to withstand mechanical shock and vibration.* ~~*and*~~*Luminaires shall be tested in accordance with ANSI C136.31, 2G loading or ANSI C136.31, 3G loading for luminaires on bridges. Testing about all axes shall be accomplished with a single luminaire.*

Total Harmonic Distortion (THD) of the ballast or power driver shall not exceed 20% as verified by ANSI C82.6 for mechanical ballasts or ANSI C82.77 for power drivers.

Luminaire weight shall not exceed 53 lbs and its projected area shall not exceed 2.4 sq ft. Luminaires shall be either High Pressure Sodium, HPS, or utilize another light source in accordance with 920.01(d)2b.

a. High Pressure Sodium Luminaires

HPS luminaires shall have a high impact, heat-resistant, glass, prismatic refractor; a precision-cast, aluminum refractor holder with weatherproof finish, a detachable highly specular aluminum reflector; and an adjustable socket in both horizontal and vertical directions capable of producing lighting patterns to meet all the requirements of the American Standard Practice for Roadway Lighting as sponsored by the IESNA and as shown on the plans.

b. Other Light Source Types

Luminaires that utilize technologies other than HPS shall be compatible with the lighting materials specified in this section and in the plans. Luminaires, including primary fuse protection, surge protection devices, power drivers, and other major components, shall be rated for a minimum operational life of 50,000 hours at 77°F. Power drivers shall maintain constant current and have a minimum Mean Time to Failure of 2,000,000 hours as determined by Telcordia SR 332, issue 3 or MIL-HDBK-217F methodology Luminaires shall be adjustable in the horizontal and vertical directions to meet the specified IESNA light distribution pattern. Refractors or lenses shall be scratch resistant and made from high impact, heat-resistant, glass or UV inhibited, high impact plastic. If utilized, reflectors shall be detachable and made of highly specular aluminum. Power supply drivers, surge protection devices, LED arrays, and plasma emitters shall be replaceable without replacing the entire luminaire. Luminaires shall have five or seven wire photocontrol receptacle in accordance with ANSI C136.41 with shorting cap for adaptive lighting control.

REVISION TO SPECIAL PROVISIONS

807-T-193 LUMINAIRES

LEDs shall be connected so that the loss of one LED will not result in the loss of the entire luminaire. LED circuitry shall prevent flickering to the unaided eye at the voltage specified on the plans and the range indicated herein. LED junction temperature shall not exceed 158°F.

Metal halide luminaires shall utilize a power driver; external capacitors or igniters shall not be used.

Solid state and plasma luminaires shall meet these additional requirements:

(1) Wattage. The wattage shall be verified by the IESNA LM-79 test.

(2) Lumen Output. The total lumen output shall meet or exceed the amount specified on the plans and shall be verified by the IESNA LM-79 test. ~~The~~ LEDs shall deliver a minimum of ~~70~~85% of the initial rated lumens after 50,000 hours of operation at 130°F ambient temperature as indicated by LM-80 lumen maintenance test of the light source as calculated by IESNA TM-21 (L~~70~~85 > 50,000 hrs). Plasma emitters shall deliver a minimum of 70% of the initial lumens after 50,000 hours of operation.

(3) Chromaticity. Luminaires shall exhibit a color temperature in the range ~~4100K to 6,500K~~ of 4000K to 5000K per ANSI C78.377 and a minimum Color Rendering Index of 70 as verified by the IESNA LM-79 test

(4) Surge Protection. Solid State luminaires shall include a Surge Protection Device, SPD, to protect the luminaire from damage and failure for transient voltage and currents. The SPD shall conform to UL 1449 and shall be tested ~~per~~ in accordance with, and survive, the procedure in ANSI/IEEE C62.41.2 definitions for standard and optional waveform for location category C-High. Once the surge current has subsided, the SPD shall automatically restore normal operation and reset to a state ready to receive the next surge.

(5) Electromagnetic Interference. Luminaires shall comply with Title 47 CFR Part 15, Class A on unlicensed transmissions in a business, ~~industrial,~~ commercial, or industrial environment.

(6) Heat Dissipation. A passive thermal management system to dissipate the heat generated by operation shall be provided. ~~F~~fans or other mechanical cooling systems shall not be used.

REVISION TO SPECIAL PROVISIONS

807-T-193 LUMINAIRES

3. Sign Luminaires

Luminaires shall be 250W metal halide unless otherwise specified. Sign luminaires shall have the same requirements as roadway luminaires plus a shield that blocks the view of the refractor from an approaching motorist. This shall be accomplished by the design of the housing or by a shield fabricated from sheet aluminum, approximately 0.05 in. thick, and of sufficient size to be fastened onto the horizontal edge of the refractor holder with self tapping screws and placed between the refractor and approaching traffic.

Aluminum and steel structural members for luminaire supports shall include aluminum conduit, conduit clamps, fittings, and stainless steel screws.

4. Underpass Luminaires

Underpass luminaires shall have the same requirements as roadway luminaires except they shall have vandal shields and the ballast shall meet the same requirements except it may be mounted separately near the luminaire as shown on the plans.

5. High Mast Luminaires

The luminaires shall be in accordance with the American Standard Practice for Roadway Lighting by the Illumination Engineering Society and shall produce lighting patterns as shown on the plans. The ~~lamp in the~~ high mast luminaire *lamp or light source* shall be supported at both ends with mechanical spring grips or other means to hold the lamp secure against vibration. The sockets shall be mogul sized and porcelain enclosed. The luminaire housing shall be an enclosed aluminum unit with a ~~reflector and~~ borosilicate glass refractor *or lens*. It shall include gasketing that will completely seal out dust, moisture, and insects from the interior of the optical assembly and retard the formation of an undesirable film from gaseous vapors on the optical assembly. *High pressure sodium luminaires shall have an aluminum reflector. High mast luminaires utilizing light sources other than HPS shall meet the requirements of 920.01(d)1 and 920.01(d)2.*

BACKUP 01. IDM CHAPTER 502 TRAFFIC DESIGN

VARIOUS AFFECTED SECTIONS OF CHAPTER 502 TRAFFIC DESIGN (DRAFT)

TABLE OF CONTENTS *(added)*

502-4.02 Warrants

Providing lighting along every highway is not practical or cost effective. The District Traffic Team will be responsible for determining if the lighting system is economically justified along a state-maintained highway. An editable version of the Highway Lighting Accident Warrant Analysis Worksheet is available for download from the Department's website at http://www.in.gov/dot/div/contracts/design/dmforms/index.html. It is the Department's practice to provide lighting only if the warrants described herein are satisfied. A location which satisfies these warrants does not obligate INDOT to provide funding for the requested highway lighting project. INDOT's objective is to identify each roadway which should be considered in the process of setting priorities for the allocation of available funding to a roadway-lighting project.

502-4.02(03) Warrant Criteria for Non-Freeways

Non-freeway lighting should be considered where the night-to-day ratio of crashes is greater than 0.5 and the lighting is expected to be cost effective.

In addition, lighting should be considered for locations with a relatively high potential for crashes, such as a section with numerous driveways, channelized islands, significant commercial or residential development, a high percentage of trucks, *nighttime pedestrian volumes*, or geometric deficiencies *such as substandard safe stopping sight distance*.

502-4.02(08) Criteria for Tunnel or Underpass

The lighting of a tunnel or underpass should be in accordance with the AASHTO *Roadway Lighting Design Guide*. *Lighting of underpasses that are less than 75 ft in length is not normally needed. Daytime lighting should be considered for tunnels or underpasses with a length to height ratio that exceeds 10:1. ANSI/IESNA RP-22-11 publication on American National Standard Practice for Tunnel Lighting contains additional information.*

502-4.02(09) Criteria for Roundabout

The lighting of a roundabout should be in accordance with the AASHTO *Roadway Lighting Design Guide* and NCHRP *Report 672*.

Lighting at the roundabout should include the central circulatory roadway and extend at least 400 ft from the circulatory roadway along all approaches. Lighting on the approaches should also extend through any pedestrian crosswalks and/or splitter islands. The remaining limits of the intersection can be delineated with RPM's or by other methods.

502-4.02(10) Criteria for Other Facilities

Lighting should be considered at the following locations:

1. commuter park-and-ride lot;
2. bikeway;
3. walkway; or
4. other pedestrian facility.

The need for lighting at one of these locations will be determined as required for each situation. *See the AASHTO Roadway Lighting Design Guide for information on the lighting of walkways/bikeways separated from the roadway.*

502-4.02(11) Reduction or Removal of Lighting

Where an existing highway lighting system is no longer warranted, feasible, or cost effective, it should be considered for reduction in the lighting level or for removal. Where light levels are reduced, they should not be reduced below the criteria described in Figure 502-4G. Prior to reducing lighting or removing the system, an engineering investigation will be required. Concurrence by the Highway Design and Technical Support Division and approval by the Commissioner will be required. If federal-aid funds were used for the original installation and the project is on the National Highway System and is not exempt from FHWA oversight, a copy of the report should be submitted to the FHWA.

If determining whether an existing lighting system should be removed or the lighting reduced, the following should be considered.

1. Freeway Lighting. Continuous freeway lighting should be removed or reduced where a cost analysis shows that such action will be cost effective. The cost analysis will be similar to the one prepared for the installation of a new lighting system. However, this study must consider the increase in accidents and cost to remove the system. A 50% increase in nighttime accidents should be assumed over a period of three years for analysis purposes.

2. Interchange Lighting. Complete interchange lighting should be reduced to partial interchange lighting where the average traffic volume falls b*elow the levels given in the AASHTO Lighting Design Guide, table 3-3, both cases CIL-1 and CIL-2* ~~that shown in Section 502-4.02(02) item 1.b.~~, but satisfies that shown in ~~item 2.b. or item 2.c~~ *table 3-4, case PIL-1*. An engineering analysis will be required to determine the extent of lighting reduction. Removal of complete or partial lighting will require a cost analysis to determine the cost effectiveness of removing the lighting system. A 50% increase in nighttime accidents should be assumed for analysis purposes.

502-4.03(12) Alternative criteria for urban streets

Local agencies may refer to NCHRP Report 152, Highway Lighting Warrants for a thorough methodology to determine need for lighting on existing facilities,

502-4.02(13) Transition Lighting

Where light levels are significant consideration should be given to providing a gradual transition to segments that are not lighted. See ANSI/IESNA RP-8.

502-4.02(14) Adaptive Lighting

The fundamental concept of adaptive lighting is to provide lighting only when and where it is needed, essentially managing the roadway light level as an asset. Refer to "Publication No. FHWA-HRT-14-050 dated June 2014 for more information. Adaptive lighting may involve lighting curfews, or reduction of lighting during periods of low demand, e.g. from 1 a.m. to 4 a.m.

Adaptive lighting can be considered when lighting is installed/warranted based on the pedestrian counts but is not applicable for INDOT lighting systems which are installed based on other considerations. Lighting curfews can be implemented only with the use of solid state luminaire technology.

502-4.03(04) Luminaire

A luminaire is defined as a complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute light. The INDOT *Standard Specifications*, along with the following, provide the Department's criteria for luminaire hardware. Section 502-4.06(03) item 1 discusses the light distributions for a luminaire. For additional information, the designer should contact the Traffic Administration Manager, Traffic Engineering Division for the latest products and specifications.

1. Light Source. ~~Only a high-intensity discharge light source should be used.~~ The following provides information on the light sources that may be used.

   a. High-Pressure Sodium (HPS). The HPS lamp produces a soft, pinkish-yellow light by passing an electric current through a sodium-and-mercury vapor.

   b. Low-Pressure Sodium (LPS). Its disadvantage is that it requires long tubes and has poor color quality. INDOT does not allow the use of LPS on a state facility. However, a local agency can consider the use of an LPS lighting source. The LPS lamp produces a yellow light by passing an electrical current through a sodium vapor.

   c. Metal Halide (MH). A metal-halide lamp produces color at higher efficiency than a mercury vapor (MV) lamp. However, life expectancy for ~~an~~ *a traditional* MH lamp is shorter than that for an HPS or MV. An MH lamp is also more sensitive to lamp orientation than other light sources.

The *traditional* MH ~~lamp~~ *luminaire* is used for lighting a sports arena or major sports stadium, for high-mast lighting, or for lighting a downtown area or park. *Metal Halide luminaires utilizing solid state ballasts are viable options for general roadway applications.* Metal halide produces good color rendition. Light is produced by passing a current through a combination of metallic vapors.

d. Light Emitting Diode (LED). LEDs are arranged in clusters which are attached to a panel. Various designs utilize different LED types Heat sinks are built into the housing to facilitate heat dissipation and maximize luminaire service life. Light is directly emitted from the lens, so reflectors are not required, resulting in the light being delivered more efficiently than the HPS type and also resulting in less light pollution. LEDs are energy efficient, have a long life, and generate a full color spectrum resulting in good color rendition. Due to the manner in which light is emitted the arrays must be carefully arranged to provide sufficient light distribution and yet be energy efficient. Properly arranged LEDs can provide energy efficient, effective light distribution.

   LED retrofits are available for existing high mast luminaires. LED modules are attached to a threaded rod which is fit into the existing housing. Luminaire dimensions should be verified as housing diameters less than 16 inches may require an attachment plate as well as the threaded rod, pending the retrofit manufacturer's specific design.

e. *Light Emitting* Plasma. Plasma lamps generate light by exciting gas with radio frequency power. They produce visible light without phosphor conversion which results in a higher luminaire efficiency and which eliminates color shift. The point-source light they generate results in an even distribution of light through highly efficient optics. Plasma luminaires have no electrodes which reduces maintenance requirements. They are highly efficient, have a long life, and generate a full color spectrum resulting in good color rendition. Heat sinks are built into the housing to facilitate heat dissipation and maximize luminaire service life.

f. Induction Lighting. Magnetic induction lamps also contain no electrodes resulting in an extended service life. The power used to generate light is transferred from outside the lamp to inside via electromagnetic fields. Induction lamps are also efficient light generators compared to HPS lamps.

2. Optical System. The optical system consists of a light source, a reflector (except for LED), and also a refractor (or lens for LED).

a. Light Source. Item 1 above discusses light sources that should be considered.

b. Reflector. The reflector is used in optical control to change the direction of the light rays. Its purpose is to take that portion of light emitted by the lamp that otherwise will be lost or poorly utilized, and to redirect it to a more desirable distribution pattern. A reflector is designed to work either alone or with a refractor. Reflectors are specular or diffuse. A specular reflector is made from a glossy material that provides a mirror-like surface. A diffuse reflector is used where the intent is to spread the light over a wider area.

c. Refractor. The refractor is another means in optical control to change the direction of the light. A refractor is made of transparent high-strength glass or plastic. Plastic is used in a high-vandalism area. However, plastic can yellow over time due to heat and ultraviolet exposure. The refractor, through its prismatic construction, controls and redirects both the light emitted by the lamp and the light reflected off the reflector. It can also be used to control the brightness of the lamp source.

3. Ballast/*Power Driver*. Each luminaire must operate with an input voltage variation of ±10% of the rated operating voltage specified, with non-solid state technologies this is accomplished through a built-in ballast. A ballast is used to regulate the voltage to the lamp to ensure that the lamp is operating within its design parameters. It also provides the proper open-circuit voltage to start the lamp. The ballast should be an auto-regulator type. Figure 502-4E, Lamp Data, provides the approximate expected operating wattage for a ballast based on the lamp wattage.

For solid state technology luminaires the input voltage is controlled by a power driver. Power drivers are completely electronic and are considered to be the controlling component in the performance and service life of the luminaire. Electronic power drivers allow for the light source to be dimmed so they provide an opportunity to reduce energy consumption through adaptive lighting (reduced light levels after a certain time at night).

4. Housing Unit. Luminaire housing requirements are dependent upon the application type. In selecting a luminaire housing, the following should be considered.

a. Roadway-Lighting Luminaire. The housing unit should allow access from the street side and allow for adjustments to the light. The luminaire should also have a high-impact, heat-resistant, glass, or plastic prismatic refractor.

Since LEDs generate a substantial amount of heat and since they are sensitive to heat build up, their housings are provided with apparatus known as heat sinks to dissipate heat in an effective manner. The typical heat sink is a shape or plate placed in contact with the LED panel. The shape or plate is usually made of a conductive metal such as aluminum.

b. Sign Luminaire. A sign luminaire requires the same housing as a roadway-lighting luminaire, except that it should also provide a durable, plastic, vandal-resistant shield that blocks the view of the refractor from an approaching motorist. The unit is attached to the sign walkway as shown on the INDOT *Standard Drawings.* The mounting attachment is adjustable to allow for directing the light onto the sign.

c. Underpass Luminaire. An underpass luminaire requires the same housing as a roadway-lighting luminaire, except that it should also provide a durable, plastic, vandal-resistant shield. The ballast should be placed as shown on the INDOT *Standard Drawings*. An underpass luminaire may be attached to the vertical-side surface of a bridge bent structure, or may be suspended by the use of a pendant.

d. High-Mast Luminaire. A high-mast luminaire is an enclosed unit with a reflector and a borosilicate glass refractor. The luminaire is attached to the mast ring. The mounting attachment is adjustable to allow for directing the light.

5. *<u>Backlight, Uplight, and Glare (BUG) Rating</u>. I.E.S.N.A. has recently adopted a system of classifying the amount of light that is generated in three distinct directions from the luminaire. The BUG rating system is an alternative to the conventional "cut-off" system as a means of classifying light distribution.*

Backlight is defined as the light distributed away from the street (towards sidewalk, shoulder, etc.) and below the luminaire. Uplight is the amount of light that is directed above the luminaire either to the front or back. Glare, or offensive light, results from light distributed to the street side below the luminaire and towards the driver at an acute angle from the luminaire (less than 30 degrees from horizontal).

BUG ratings can be specified to limit or control the amount of glare, sky glow and light trespass effecting the environment of the lighting system. For example for locations adjacent to observatories and planetariums it may be desirable to keep the amount of uplight to a minimum thereby reducing sky glow and interference with astronomical observations. In urban settings a certain amount of backlight on sidewalk and parking lot areas may be desirable for added security. For luminaires mounted at lower heights (less than 30 ft) the designer should consider models with a glare rating no greater than 3.

Each of the three ratings is on a scale of 0 to 6, higher the number the greater the affect.

For additional information on the BUG rating system refer to the following I.E.S.N.A. publication: https://www.ies.org/pdf/education/ies-fol-addenda-1-%20bug-ratings.pdf.

502-4.05 Design Procedure

For additional design information, see the references listed in Section 502-4.01(01).

Lighting-system design should consider various light sources and may require several iterations for each type of light source to produce an acceptable design. After the first run, if the design criteria are not satisfied, the initial parameters should be changed, e.g., pole spacing, mounting height, light source, luminaire wattage, and lamp lumen output. The design should be rechecked to determine if it then satisfies the criteria. This process is repeated until the design is optimized and all criteria are satisfied.

As part of the scope of work on a project the designer may be given specific parameters for the lighting system, e.g., tower or conventional, pole height, and luminaire type, to supplement or supersede the guidance provided in this section.

Lighting in the interchange area should be maintained at the same level or better as on the crossroad approaches. Partial interchange lighting should include the merge and diverge areas- see Figure 502-4M.

Conflict points, protected turn lanes, and approaches to divided areas and traffic islands should be illuminated when intersection lighting is provided.

502-4.05(01) Computerized Design

To determine an acceptable lighting system requires iterations using variables. The chance for error in manually solving its equations is high. Therefore, one of the commercial computer software packages that are available should be used.

Each software package requires the same input and performs the same calculations. However, the method of input can vary. The user should first determine which programs are currently acceptable to INDOT. The PC-based program VISUAL®, developed by *Acuity Brands* ~~Holophane~~, *or AGi32, by Lighting Analysts* should be used for its lighting calculations. ~~VISUAL is~~ *These programs are* used to generate templates for design and to check lighting levels and uniformity.

The design *model files* ~~data inputs and reports~~ for a lighting design prepared by a consultant, should be provided to the Traffic Design and Review Team, Traffic Engineering Division.

502-4.05(02) Design Process

2. Luminaire Replacement or Partial Modernizations. This type of project involves the replacement of luminaires on existing poles. Other equipment may also be replaced.

The design should be developed as follows:

a. Assembly of Information. Obtain a plan of the existing lighting system.

b. Verification of Plan. Verify that the geometrics and lighting system are accurately detailed on the existing plan sheet.

c. Confirmation of Scope. Confirm which elements in the system are to be modernized. This should be coordinated with the district Traffic Office.

d. Selection of Design Criteria. Select the appropriate AASHTO design criteria based on the type of roadway. See 502-4.06(02) for more information.

e. Selection of Light Source Type. Select the optimal light source type and wattage to satisfy the design criteria in a cost effective manner. Because calculations by computer are relatively quick and easy, the designer should try a number of alternative light source types even if the first design satisfies the criteria since more than one alternative may be satisfactory. Systems with 40-ft height poles will typically utilize a luminaire that provides approximately 28,000 or 50,000 lumens of initial light output in a M-S-Type II, III or Type IV IES distribution classification. *See Figure 502-4C for more information on lumen output and* Figure 502-4 I for information on the IES classification system.

At a minimum the alternatives should include one HPS, one LED, one plasma, *and one metal halide model*. ~~and~~ *Other light source types may also be considered. For systems utilizing a shorter mounting height (e.g. with streetscape projects utilizing pedestal poles)* ~~one~~ induction *lighting* ~~model~~ *may be viable* ~~considered~~, ~~although~~ ~~Other light source types may also be considered~~. Only luminaire types and models that have an accessible IES light distribution file can be used. For a list of manufacturers that have approached INDOT about use of their luminaires go to Y:\TrafficManagement\Luminaire Manufacturers. Consultants and local agencies may contact their Project Manager or the Office of Traffic Administration to obtain this information.

Design optimization should include an analysis for the purpose of minimizing service costs. The lowest service cost per year alternative should be selected. The service cost is defined to be:

Service Cost per Year =

Annual Energy Cost + Annual Routine Luminaire Maintenance Costs + Installation Cost/~~Warranty Period~~ *Service Life*

Where:

Annual Energy Cost = (Total Luminaire Wattage of the System) x (Hours Operated per Year) x (Cost of Electricity)

Hours Operated per Year = 4380 h

Cost of Electricity (estimated) = ~~$0.08~~ *$0.10* per kWh *(as of Oct. 2014)*
The average cost of electricity for the transportation sector in the state of Indiana is available from the U.S. Energy Information Administration's Electric Monthly Report, table 5.6.b, at http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_06_b. The electric provider or district may have a more location specific unit cost.

Maintenance Cost for HPS should be based on re-lamping the entire system every 3 years as well as other miscellaneous work. Currently this cost is estimated at $60 per year for each 250-watt or 400-watt luminaire and $105 per year for each 1000-watt high-mast luminaire. The cost for non-HPS light sources may be estimated at $25 per year for roadway luminaires and $50 per year for high-mast luminaires plus any additional maintenance costs that are specific to the type and model. The designer should confer with the manufacturer for these specific maintenance costs; however, *typically plasma emitters will need to be replaced after 50,000 (11 years). LED arrays and power drivers may also need to be replaced within the expected service life- these additional maintenance costs should be included. If manufacturer specific information is not available additional annual maintenance costs of $15 per LED or plasma roadway luminaire and $20 per LED or plasma high mast luminaire may be used; bringing the total estimated annual maintenance costs for the lighting system to $40 per roadway luminaire and $70 per year for high mast.*

Recent bid history as obtained on the INDOT website should be used to estimate the cost of HPS luminaires. Cost of luminaires utilizing alternative light sources should be obtained from the manufacturer along with an estimate of the cost to install for about 1 hour of labor per luminaire. A $75 estimate can be used for labor cost.

Service life may be estimated at 20 years, including the luminaire regardless of light source type..

~~Warranty Period is defined to be 5 years or the manufacturer's specific warranty period if greater than 5 years. The designer should verify the warranty period as some manufacturers provide longer coverage periods.~~

A Service Costs Analysis for Luminaire Modernization worksheet should be completed for each alternative considered and placed in the project file. An editable version of this worksheet is available for download from the Design Manual Editable Documents web page, http://www.in.gov/dot/div/contracts/design/dmforms/. If the service cost analysis does not yield a clear choice, other factors such as the light color or district preferences should be weighed into the decision regarding the type of light source.

f. Electric Design. Once the luminaire model has been selected, the designer will need to determine the voltage drop for the system. Section 502-4.06(07) provides information on how to determine the voltage drop for the lighting system. If the most cost effective model results in too much voltage drop the designer may either check the voltage drop of the second most cost effective design for use or may try additional luminaire models.

g. Preparation of Plans. The plan sheet should indicate the average illumination level and uniformity ratio and should show the location of the existing equipment being reused with an indication of what items are being replaced or added. Equipment includes the service point indicating voltage being supplied, pole(s), the orientation of the luminaire(s), underground wiring, conduit, handholes, and cable duct markers. The light source type, luminaire wattage, total initial lumen output, *estimated light loss factor*, and the IES file type used will be given on the plans with a note that the distribution pattern of the actual luminaire to be supplied will be equivalent, e.g., "Luminaire shall provide a light distribution equivalent to IES distribution type GE 452918.IES." This distribution pattern is based on how a specific luminaire model distributes light, i.e., how it is designed, and also corresponds to the lumen output and power draw of the fixture. *If a particular backlight/uplight/glare rating is needed this information should also be specified on the plans.* The luminaire table, service point amp table, and the lighting ID numbers should also be included on the plans.

h. Utility Notification. If there is a change in service location or an increase in the power required the designer must coordinate with the electric provider. Reimbursement costs to the utility company should be identified in a special provision and the cost incorporated into the bid estimate.

i. Working (Shop) Drawing Check. As part of the working drawing approval the contractor will submit the IES photometric distribution file for each model when the

IES file number is different from that indicated on the plans, i.e., when the contractor is submitting a different model than that on which the design is based. In these cases, the IES files will be provided to the design engineer of record for his/her review and concurrence that the design light level criteria will be satisfied.

3. New Lighting System or Full Modernizations. This procedure should be followed when designing a new system or when modernizing and the existing poles and foundations will not be reused.

a. Assembly of Information. Necessary information to be assembled includes the following.

a. Contact the Traffic Review Team for the current design policies and procedures applicable to the project, sample plans, schedules, pay quantities, and example calculations.
b. Gather roadway and bridge plans including plan and profile sheets and details sheets, e.g., those for overhead signs.
c. Determine existing and expected utility locations.
d. Discuss special considerations with the road or bridge designer.
e. Conduct field reviews. *Note areas of high ambient lighting and facilities that are sensitive to light trespass or sky glow (e.g. farms, observatories).*
f. If this project is a local-agency project, hold discussions with local officials.

b. Determination of Classifications. The roadway classification and environmental conditions should be determined. If not already included in the project report, this information can be obtained from the Environmental Policy Team. The roadway classifications, for lighting purposes, are defined in Section 502-4.06(01).

c. Selection of Design Criteria. The pertinent design methodology described in Section 502-4.04 should be selected, along with the appropriate criteria based on the classification selected in Step 2. See Section 502-4.06(02) for information. For an INDOT-route lighting project**,** only the illuminance design methodology should be used.

d. Selection of Optimum Design and Light Source Type. Because recalculations by computer are relatively quick and easy, the designer should try several alternatives even if one design satisfies the criteria. There is often more than one satisfactory alternative.

At a minimum, the alternatives should include one HPS, one LED, one plasma, and one ~~induction~~ *metal halide* model, although other light source

types may also be considered. *For systems utilizing shorter mounting height (e.g. with streetscape projects utilizing pedestal poles) ~~one~~ induction lighting ~~model~~ may ~~also~~ be viable ~~considered~~,* Only luminaire types and models that have a published IES light distribution can be used. For a list of manufacturers that have approached INDOT about use of their luminaires go to Y:\TrafficManagement\Luminaire Manufacturers-list. Consultants and local agencies may contact their Project Manager or the Office of Traffic Administration to obtain this information.

Design Optimization should include an analysis for the purpose of minimizing service costs. The lowest service cost per year alternative should be selected. The service cost is defined to be:

Service Cost per Year =

Annual Energy Cost + Annual Routine Luminaire Maintenance Costs + Installation Costs/~~Warranty Period~~ *Service life*

Where:

Annual Energy Cost = (Total Luminaire Wattage of the System) x (Hours Operated per Year) x (Cost of Electricity)

Hours Operated per Year = 4380 h

Cost of Electricity (estimated) = ~~$0.08~~ *$0.10* per kWh *(as of Oct. 2014)*

The average cost of electricity for the transportation sector in the state of Indiana is available from the U.S. Energy Information Administration's Electric Monthly Report, table 5.6.b, at http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_06_b. The electric provider or district may have a more location specific unit cost. The electric provider or district may have a more location specific unit cost.

Maintenance Cost for HPS should be based on re-lamping the entire system every 3 years as well as other miscellaneous work. Currently this cost is estimated at $60 per year for each 250-watt or 400-watt luminaire and $105 per year for each 1000-watt high-mast luminaire. The cost for non-HPS light sources may be estimated at $25 per year for roadway luminaires and $50 per year for high-mast luminaires plus any additional maintenance costs that are specific to the type and model. The designer should confer with the manufacturer for these specific maintenance costs; however, *typically plasma emitters will need to be replaced after 50,000 (11 years). LED arrays and power drivers may also need to be replaced within the expected service life- these additional*

maintenance costs should be included. If manufacturer specific information is not available additional annual maintenance costs of $15 per LED or plasma roadway luminaire and $20 per LED or plasma high mast luminaire may be used; bringing the total estimated annual maintenance costs for the lighting system to $40 per roadway luminaire and $70 per year for high mast.

Installation Cost should include poles and foundations as well as the luminaires. Recent bid history as obtained on INDOT website should be used. Cost of luminaires utilizing other light sources should be obtained from the manufacturer along with an estimate of the cost to install for about 1 hour of labor per luminaire. A $75 estimate can be used for labor cost.

Service life may be estimated at 20 years, including the luminaire regardless of light source type.

~~Warranty Period is defined to be 5 years or the manufacturer's specific warranty period if greater than 5 years. The designer should verify the warranty period as some manufacturers provide longer coverage periods.~~

A Service Costs Analysis for New or Fully Modernized Lighting worksheet should be completed for each alternative considered and placed in the project file. An editable version of this worksheet is available for download from the Design Manual Editable Documents web page, http://www.in.gov/dot/div/ contracts/design/dmforms/. If the service cost analysis does not yield a clear choice, other factors such as the light color or district preferences should be weighed into the decision regarding the type of light source.

i. Selection of Equipment and Light Output Characteristics. In the preliminary design, initial assumptions should be made regarding the equipment composition and light output. This includes mounting height, pole setback distance, light source, mast-arm length, light source type, lamp wattage, etc. A 40-ft height pole should be used with a luminaire that provides approximately 28,000 or 50,000 lumens of initial light output in an M-S-Type II, III or Type IV IES distribution classification. See Figure 502-4 I for information on the IES classification system. Figure 502-4E, Lamp Data, provides the information on lighting levels for lighting sources. See Sections 502-4.03 and 502-4.06(03) for additional information on equipment selection. After selecting the luminaire equipment, the photometric data sheet should be obtained from the manufacturer for the luminaire selected.

Normally mounting heights and mast arm lengths will be uniform through the project limits. If the project ties into adjacent lighting systems consideration should be given to matching these considerations.

ii. Selection of Layout Arrangement. Section 502-4.06(04) provides information on the commonly used lighting arrangements. The selection of the appropriate layout design depends upon local site conditions and engineering judgment. Section 502-4.06(05) provides the roadside-safety considerations in selecting the lighting arrangements. Section 502-4.06 (06) provides other layout considerations.

iii. Luminaire Spacing. For an INDOT-route lighting project, the illuminance methodology should be used to determine the appropriate luminaire spacing. This step is conducted by the computer.

iv. Check for Uniformity. Once the spacing has been determined, the uniformity of light distribution should be checked and compared to the criteria selected in Item c. Use the following equation to determine the uniformity ratio:

$$\textit{Uniformity Ratio} = \frac{\textit{Average Maintained Illumination Value}}{\textit{Minimum Maintained Illumination Value}}$$ (Equation 502-4.05)

When comparing alternative designs that yield approximately equivalent annual service costs the designer should also consider the number of poles- from a safety consideration the fewer the better.

e. Electric Design. Once the type, number, size, and location of the luminaires are determined, the electric voltage drop should be determined for the system. Section 502-4.06(07) provides this information.

f. INDOT Pre-Design Approval. For a consultant-designed project, the consultant should submit the service cost analysis worksheets and discuss the optimum alternatives with the Traffic Review Team prior to preparing the plans to expedite project development. Upon approval from INDOT, FHWA if necessary, and the local utility company, the final development of the plans may proceed.

g. Preparation of Plans. Once the final design has been selected, the plan sheets, quantities, cost estimate, voltage drop calculations, circuit schematic layouts, and special provisions, should be submitted to the

Traffic Review Team for review. The light source type, luminaire wattage, total initial lumen output, *estimated light loss factor*, luminaire table, service point amp table, and the lighting ID numbers should be included on the plans. Additionally the IES file type used in the design will be given on the plans with a note that the distribution pattern of the actual luminaire to be supplied will be equivalent, e.g., "Luminaire shall provide a light distribution equivalent to IES distribution type GE 452918.IES." *If a particular backlight/uplight/glare rating is needed this information should also be specified on the plans*

h. Working (Shop) Drawing Check. As part of the working (shop) drawing approval the contractor will submit the IES photometric distribution file for each model when the IES file number is different from that which is indicated on the plans, i.e., when the contractor is submitting a different model than that on which the design is based. In these cases, the IES files will be provided to the design engineer of record for review and concurrence that the design light level criteria will be satisfied.

4. Design-Build Projects. The following provides the procedural steps in designing a lighting system as part of a roadway design-build project. The design-build team will complete the following:

a. Assembly of Information. Necessary information to be assembled includes the following.

i. Contact the Traffic Review Team for the current design policies and procedures applicable to the project, sample plans, schedules, pay quantities, and example calculations.

ii. Gather roadway and bridge plans including plan and profile sheets and details sheets, e.g., those for overhead signs.

iii. Determine existing and expected utility locations.

iv. Discuss special considerations with the road or bridge designer.

v. conduct field reviews. *Note areas of high ambient lighting and facilities that are sensitive to light trespass or sky glow (e.g. farms, observatories).*

vi. If this project is a local-agency project, hold discussions with local officials.

b. Determination of Classifications. Determine the roadway classification and environmental conditions. If not already included in the project report, this information can be obtained from the Environmental Policy

Team. The roadway classifications, for lighting purposes, are defined in Section 502-4.06(01).

c. Selection of Design Criteria. Based on the above information, the designer will select the pertinent design methodology and the appropriate criteria based on the classification selected in item b. See Section 502-4.04 for design methodologies. For an INDOT-route lighting project, only the illuminance design methodology should be used.

d. Selection of Equipment. In the preliminary design, the designer will need to make some initial assumptions regarding the equipment composition. This includes mounting height, pole setback distance, mast arm length, light source type, luminaire wattage, photometric distribution pattern (INDOT typically uses M-S-Type II, III, or IV), and initial lumen output (typically 28,000 or 50,000). See Sections 502-4.03 and 502-4.06(03) for additional details on equipment selection.

Normally mounting heights and mast arm lengths will be uniform through the project limits. If the project ties into adjacent lighting systems consideration should be given to matching these considerations.

At a minimum the alternatives should include one HPS, one LED, one plasma, and one ~~induction~~ *metal halide* model, although other light source types may also be considered. *For systems utilizing shorter mounting height (e.g. with streetscape projects utilizing pedestal poles)* ~~an~~ *induction lighting* ~~model~~ *may* ~~also~~ *be viable* ~~considered~~ Only luminaire types and models that have an accessible IES light distribution file can be used. For a list of manufacturers that have approached INDOT about the use of their luminaires go to Y:\TrafficManagement\Luminaire Manufacturers. Consultants and local agencies may contact their Project Manager or the Office of Traffic Administration to obtain this information.

e. Selection of Layout Arrangement. Section 502-4.06(04) provides information on commonly used lighting arrangements. The selection of an appropriate layout design depends upon local site conditions and the engineer's judgment. Section 502-4.06(05) provides the roadside safety considerations in selecting the lighting arrangements. Section 502-4.06(06) provides other layout considerations.

f. Luminaire Spacing. For an INDOT-route lighting project, use the illuminance
methodology to determine the appropriate luminaire spacing. This step is conducted by the computer.

Normally for a tangent alignment where roadway width is constant, spacing will be uniform through the project limits. If the project ties into adjacent lighting systems consideration should be given to matching the spacing.

g. Check for Uniformity. Once the spacing has been determined, the designer should check the uniformity of light distribution and compare this to the criteria selected in Item c. ~~Use Equation 502-4.05 to determine the uniformity ratio~~ *Use the following equation to determine the uniformity ratio:*

$$\text{Uniformity Ratio} = \frac{\text{Average Maintained Illumination Value}}{\text{Minimum Maintained Illumination Value}} \quad \text{(Equation 502-4.05)}$$

h. Selection of Optimum Design. Because recalculations by computer are relatively quick and easy, the designer should try several alternatives even if the first design satisfies the criteria. There is often more than one satisfactory alternative. Design Optimization should include an analysis for the purpose of minimizing service costs. The service cost is defined to be:

Service Cost per Year =
Annual Energy Cost + Annual Routine Luminaire Maintenance Costs
+ Installation Cost/~~Warranty Period~~ *Service Life*

Where:

Annual Energy Cost = (Total Luminaire Wattage of the System) x (Hours Operated per Year) x (Cost of Electricity)

Hours Operated per Year = 4380 h

Cost of Electricity (estimated) = ~~$0.08~~ *$0.10* per kWh *(as of Oct. 2014)*
The average cost of electricity for the transportation sector in the state of Indiana is available from the U.S. Energy Information Administration's Electric Monthly Report, table 5.6.b, at http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_06_b. The electric provider or district may have a more location specific unit cost.

The electric provider or district may have a more location specific unit cost.

Maintenance Cost for HPS should be based on re-lamping the entire system every 3 years as well as other miscellaneous work. Currently this cost is estimated at $60 per year for each 250-watt or 400-watt luminaire and $105 per year for each 1000-watt high-mast luminaire. The cost for non-HPS light sources may be estimated at $25 per year for roadway luminaires and $50 per year for high-mast luminaires plus any additional maintenance costs that are specific to the type and model. The designer should confer with the manufacturer for these specific maintenance costs; however, *typically plasma emitters will need to be replaced after 50,000 (11 years). LED arrays and power drivers may also need to be replaced within the expected service life- these additional maintenance costs should be included. If manufacturer specific information is not available additional annual maintenance costs of $15 per LED or plasma roadway luminaire and $20 per LED or plasma high mast luminaire may be used; bringing the total estimated annual maintenance costs for the lighting system to $40 per roadway luminaire and $70 per year for high mast.*

Estimated cost of the system should include poles, foundations, wiring, conduit, handholes, service points as well as the luminaires. Recent bid history as obtained on INDOT website should be used. Cost of alternative technology luminaires should be obtained from the manufacturer along with an estimate of the cost to install for about 1 hour of labor per luminaire. A $75 estimate can be used for labor cost.

Service life may be estimated at 20 years, including the luminaire regardless of light source type.

~~Warranty Period is defined to be 5 years or the manufacturer's specifc warranty period if greater than 5 years. The designer should verify the warranty period as some manufacturers provide longer coverage periods.~~

A Service Costs Analysis for New or Fully Modernized Lighting worksheet should be completed for each alternative considered and placed in the project file. An editable version of this worksheet is available for download from the Design Manual Editable Documents web page, http://www.in.gov/dot/div/ contracts/design/dmforms/. If the service cost analysis does not yield a clear choice, other factors such as the light color or district preferences should be weighed into the decision regarding the type of light source.

When comparing alternative designs that yield approximately equivalent annual service costs the designer should also consider the number of poles- from a safety consideration the fewer the better.

i. Electric Design. Once the type, number, size, and location of the luminaires are determined, the designer will need to determine the appropriate electric voltage drop for the system. Section 502-4.06(07) provides information on how to determine the voltage drop for the lighting system. For light source types other than HPS, the design current (amperage) requirement should be obtained from the manufacturer.

j. Preparation of Plans. Once the final design has been selected, the lighting designer will prepare and submit to the Traffic Review Team the plan sheets, design criteria, initial lumen output, *estimated light loss factor*, photometric files, service cost analysis worksheets, luminaire shop drawing, quantities, cost estimate, voltage drop calculations, circuit schematic layouts for review. The plan sheet shall indicate the IES photometric distribution file number used in the design, the luminaire type and initial lumen output, and should include the luminaire table, service point amp table, and the lighting ID numbers. *If a particular backlight/uplight/glare rating is needed this information should also be specified on the plans.*

502-4.06(02) Design Criteria

The lighting criteria vary according to the design methodology, highway classification, area classification, and pavement type. The following provide AASHTO and INDOT lighting design criteria.

1. Figure 502-4G provides the roadway-illuminance-design criteria.

2. NCHRP *Report 672, Roundabouts: An Informational Guide,* provides the recommended illuminance-design criteria for roundabout lighting.

The Uniformity Ratios given in Figure 502-4G should be regarded as target values. A driver's visual ability may be adversely affected by lighting that varies significantly from the recommended uniformity value, i.e. it is possible for lighting to be too uniform or too non-uniform.

502-4.06(03) Equipment Considerations

---

d. Veiling Luminance. The designer should select lighting system equipment that minimizes veiling luminance, or glare. Glare hinders visibility.

Optical devices such as shields, reflectors, refractors may be utilized to reduce the possibility of disabling glare and the mounting height selected

should take into account the probability that glare will be created. The higher the luminaire is mounted, the further it is above normal line of vision and the less glare it creates. Mounting heights less than 20 feet cannot be considered a good practice for typical roadway lighting.

e. Light trespass. Light trespass is commonly understood to mean light that falls beyond its intended target, and across a property line so as to create a perceived nuisance. Spill light of this kind, if it emanates at a high angle from the luminaire, can be a public nuisance and contribute to light pollution. Light trespass is somewhat subjective because it is difficult to define when, where, and how much light is unwanted.

A common cause of light trespass is the inappropriate selection, tilting, or aiming of luminaires. To minimize the likelihood of light trespass the designer should:

- *consider the surrounding area during the design, and select luminaires, locations, and orientation that minimize spill light into adjacent properties.*
- *specify luminaires with an appropriate light distribution type- luminaires are available with either asymmetric or symmetric distributions and can be equipped with shields to control light at the desired lines.*
- *indicate aiming of luminaires so that the entire light output falls within the area intended to be lit.*
- *Consider light trespass when selecting pole heights.*

Refer to I.E.S.N.A. RP 33-99 for additional information on Light Trespass.

2. Mounting Height. *There are two criteria for determining a preferred luminaire mounting height: the desirability of minimizing direct glare from the luminaire and the need for a reasonably uniform distribution of illumination on the street surface*. A higher-wattage bulb allows the use of a higher mounting height, fewer luminaires, and fewer support poles, and still ~~maintains~~ *provides* the lighting quality. A higher mounting height tends to produce the most efficient design. For practical and aesthetic reasons, the mounting height should remain constant throughout the system. The manufacturer's photometric testing results are required to determine the appropriate adjustments for mounting height. The mounting height *for INDOT projects* should be at least 30 ft but no more than 50 ft, using an even 5-ft increment.

---

4. Light-Loss Factor, or Maintenance Factor. The efficiency of a luminaire is reduced over time. This reduction must be determined to properly estimate the light available at the end of the lamp or LED service life. The maintenance factor for HPS lighting can range from 0.50 to 0.90 *and from 0.5 to 0.70 for LED lighting* Figure 502-4F, Lighting Design Parameters, provides the factors used for designing a lighting system. The maintenance factor is the product of the following.

   a. Lamp/LED Lumen Depreciation Factor (LLD). As the light source progresses through its service life, the lumen output of the lamp or LEDs decreases. The initial lumen value is adjusted by means of a lumen depreciation factor to compensate for the anticipated lumen reduction by the end of the light source's service life. This ensures that a minimum level of illumination will be available at the end of the assumed *service* life *of 20 years*, even though lumen depreciation has occurred. This information should be provided by the manufacturer. For HPS, a typical LLD factor of 0.90 may be used. ~~For LED~~ *Since LED depreciation may vary greatly from one manufacturer to another a test verified lumen depreciation factor specific to the model should be used. The factor should estimate the lumen depreciation at ~~50,000~~ 85,000 hrs., In lieu of manufacturer specific information* a default value of 0.70 ~~should~~ may be used. ~~since INDOT *Standard Specifications* require a service life of 50,000 hours for LED arrays with the *that* LED arrays providing at least 70% of their initial lumen output. LED depreciation may vary greatly from one manufacturer to another.~~ *Lumen depreciation for plasma emitters and other light source types should be confirmed with the manufacturer.*

   b. Luminaire Dirt Depreciation Factor (LDD). Dirt on the exterior and interior of the luminaire, and to an extent on the lamp, reduces the amount of light reaching the roadway. Various degrees of dirt accumulation can be anticipated depending upon the area in which the luminaire is located. Industry, exhaust of vehicles, especially large diesel trucks, dust, etc., all combine to produce dirt accumulation on the luminaire. A higher mounting height, however, tends to reduce vehicle-related dirt accumulation. Information on the relationship between the area and the expected dirt accumulation is shown in Figure 502-4K. An LDD factor of 0.87 should be used. This is based on a moderately-dirty environment and three years exposure time. If deemed necessary, another value may only be used with approval from the Office of Traffic Administration.

   c. *Equipment Factor (EF). Accounts for inefficiencies inherent in the manufacture and operation of the equipment. A factor of 0.95 may be used.*

~~*e.*~~*d.* LED Survival Factor (LSF) The LSF applies only to LED luminaires and takes into account any failures early in the expected service life (at least 50,000 hrs). This factor may be conservatively estimated at 0.98 but can be adjusted per the manufacturer.

502-4.06(06) Other Considerations

1. Sign. A pole should be placed to minimize interference with the motorist's view of a highway sign. The luminaire brightness should not detract from the legibility of the sign at night. *Conversely to avoid adversely impacting the light distribution light poles should be located at a minimum separation of 60 ft (for 40 ft E.M.H poles) and 40 ft (for 30 ft E.M.H. poles).*

502-4.07 High-Mast Lighting Design

The design of a high-mast lighting system consists of the same procedures as discussed in Section 502-4.05(02). The following should also be considered.

1. Lighting Source. For HPS designs a 130,000 lumen (1000 watt) light source should be used. For LED and plasma design the lumen and wattage requirements may vary. The number of required luminaires should be determined based on the area to be lighted and target design criteria as shown in Figure 502-4U. At a minimum the designer should consider one HPS, one LED, and one plasma model when determining the optimal design.

2. ~~Estimated~~ *Effective* Mounting Height (EMH). *Based on INDOTs Standard Specifications* this can range from 100 to 200 ft. Once determined, it should be specified to the higher 5-ft increment. An EMH of 100 to 160 ft is the most practical. An EMH of 165 ft or greater requires more luminaires to maintain the illumination level. However, such an EMH allows for fewer towers and provides more uniformity. Use of such an EMH should be confirmed with the district traffic engineer.

---

4. Information To Be Shown on Plans. This includes the tower location, foundation details if not standard, estimated mounting height, retaining-wall height if applicable, and number of luminaires. The IES file type used in the design will be given on the plans with a note that the distribution pattern of the actual luminaire to be supplied will be equivalent, e.g., "Luminaire shall provide a light distribution equivalent to IES distribution type GE 452918.IES." The plans should *indicate the light source type* and also include *luminaire wattage, total initial lumen output*, luminaire table, service point amp table, and the lighting ID numbers.

COMMENTS AND ACTION

807-T-193 LUMINAIRES

DISCUSSION:

Motion: Second: Ayes: Nays: FHWA Approval:	Action: _____ Passed as Submitted _____ Passed as Revised __ __ Withdrawn
Standard Specifications Sections referenced and/or affected: 807.03 pg 776; 807.13 pg 787; 807.14 pg 788; 807.19 pg 792; 920.01 pg 1002. Recurring Special Provision affected: 807-T-193 LUMINAIRES Standard Drawing affected: Design Manual Sections affected: CHAPTER 502 GIFE Sections cross-references: NONE	_____ 2016 Standard Specifications _____ Revise Pay Items List _____ Create RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Revise RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Standard Drawing Effective _____ Create RPD (No. _____) Effective _____ Letting _____ GIFE Update

Mr. Walker
Date: 2/19/15

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

PROPOSAL TO STANDARDS COMMITTEE

PROBLEM(S) ENCOUNTERED: Acceptance tests for soil compaction are being done by the Dynamic Cone Penetrometer, DCP, and as such a table listing the DCP requirements for all soil types needs to be included in the specification. Additional revisions are also being recommended to several other 200 Sections to reflect this revision. Also, revisions for geotextiles, chemical modifiers, eliminating the use of nuclear gauges for density, and revisions for clarification are being proposed.

PROPOSED SOLUTION: Revise appropriate 200 Sections as follows:

1. 203.09 – eliminate calcium/magnesium carbonate requirements and just list organic material for soils
2. 203.09 – require geotextiles for soils that cannot be compacted to the requirements
3. 203.23 – include a chart that lists all of the DCP requirements for all soil types
4. 203.23 – include the frequency of testing for the DCP
5. 203.23 – include a chart that lists all of the moisture compaction ranges for all soil types
6. 203.24 – require the DCP for strength of soils and the LWD for stiffness of aggregates
7. 203.24 – eliminate the nuclear gauge for determining the density and allow the sand cone for this purpose

APPLICABLE STANDARD SPECIFICATIONS: 203.09, 203.20, 203.23, 203.24, 203.25, 203.27, 203.28, and 207.03

APPLICABLE STANDARD DRAWINGS: N/A

APPLICABLE DESIGN MANUAL SECTION: N/A

APPLICABLE SECTION OF GIFE: Several sections related to density by nuclear gauge

APPLICABLE RECURRING SPECIAL PROVISIONS: N/A

PAY ITEMS AFFECTED: N/A

IMPACT ANALYSIS (attach report):

Submitted By: Ron Walker for Geotechnical Services
Title: State Materials Engineer
Organization: Office of Materials Management

Mr. Walker
Date: 2/19/15

STANDARD SPECIFICATIONS, SPECIAL PROVISIONS AND STANDARD DRAWINGS

REVISION TO STANDARD SPECIFICATIONS

Phone Number: 317-610-7251 x 204
Date: February 2, 2015
APPLICABLE SUB-COMMITTEE ENDORSEMENT: INDO/ICA Soils Technical Committee

IMPACT ANALYSIS REPORT CHECKLIST

Please explain the business case as to why this item should be presented to the Standards Committee for approval.

Please answer the following questions with Yes, No or N/A.

Does this item appear in any other specification sections? No

Will approval of this item affect the Approved Materials List? No

Will this proposal improve:

- Construction costs? Yes
- Construction time? Yes
- Customer satisfaction? Yes
- Congestion/travel time? N/A
- Ride quality? N/A

Will this item improve safety:

- For motorists? N/A
- For construction workers? N/A

Will this proposal improve quality for:

- Construction procedures/processes? Yes
- Asset preservation? N/A
- Design process? N/A

Will this proposal provide clarification for the Contractor and field personnel? Yes

Can this item improve/reduce the number of potential change orders? Yes

Is this item editorial? There are some editorial revisions

Please provide any further information as to why this proposal should be placed on the Standards Committee meeting Agenda:

REVISION TO STANDARD SPECIFICATIONS

SECTION 203 - EXCAVATION AND EMBANKMENT
203.09 GENERAL REQUIREMENTS
203.16(a) TREATMENT OF EXISTING FILLS
203.20(a) ROCK EMBANKMENT
203.20(b) SHALE, SHALE AND SOFT ROCK MIXTURES, OR SOFT ROCK
203.20(c) SHALE AND THINLY LAYERED LIMESTONE
203.23 EMBANKMENT OTHER THAN ROCK AND SHALE, WITH DENSITY CONTROL
203.04 METHOD OF MAKING DENSITY TESTS
203.25 EMBANKMENT WITHOUT DENSITY CONTROL
203.27 METHOD OF MEASUREMENT
207.03 GENERAL REQUIREMENTS

(Note: Proposed changes shown highlighted gray.)

The Standard Specifications are revised as follows:

SECTION 203, BEGIN LINE 211, DELETE AND INSERT AS FOLLOWS:

Soils containing greater than 7% *by* dry weight ~~calcium, magnesium carbonate or~~ organic material, or soils with a maximum dry density of less than 90 pcf shall not be incorporated in the embankment. ~~Calcium and magnesium carbonate shall be determined in accordance with ITM 507,~~ *L*~~l~~oss ~~of~~ *on* ignition ~~shall~~*will* be determined in accordance with AASHTO T 267, and density ~~shall~~*will* be determined in accordance with AASHTO T 99.

SECTION 203, BEGIN LINE 225, DELETE AND INSERT AS FOLLOWS:

If the original ground cannot be compacted to the required density because of unstable soils, high water table, or other conditions, the use of stabilizing materials consisting of B borrow in accordance with 211.02, or ~~modifications~~*soils drying with a chemical modifier* in accordance with ~~215~~*217* may be used. The materials shall be 1 to 2 ft thick, and shall be extended so as to daylight at the toe of slope. B borrow, when exposed, shall be capped with *a geotextile and* 6 in. of coarse aggregate No. 2 *or riprap.*

~~When~~*Prior to the use of* B borrow, *granular materials,* or ~~modification will not satisfactorily stabilize an area~~*soils drying with a chemical modifier*, *a* written approval is required ~~prior to the use of alternate methods~~. When preliminary exploration indicates the need to remove more than 4 ft or 250 cu yd of unsuitable material, approval is needed.

SECTION 203, BEGIN LINE 528, INSERT AS FOLLOWS:

5. excavating and constructing with lightweight fills.

SECTION 203, BEGIN LINE 674, INSERT AS FOLLOWS:

Where the depth of an embankment exceeds 5 ft and is to consist entirely of rock, the rock shall be deposited in lifts not to exceed the top size of the material being placed, but in no event exceeding 4 ft. The rock for any particular lift shall be deposited on and pushed over the end of the lift being constructed by means of bulldozers or other approved equipment. Depositing of rock over the end of any lift from hauling equipment will not be allowed. If the voids of the last lift are not closed sufficiently, they shall be choked with small broken stone or other suitable material and compacted as directed. *A geotextile in accordance with 918.02 shall be placed between the rock and soil.*

REVISION TO STANDARD SPECIFICATIONS

SECTION 203 - EXCAVATION AND EMBANKMENT
203.09 GENERAL REQUIREMENTS
203.16(a) TREATMENT OF EXISTING FILLS
203.20(a) ROCK EMBANKMENT
203.20(b) SHALE, SHALE AND SOFT ROCK MIXTURES, OR SOFT ROCK
203.20(c) SHALE AND THINLY LAYERED LIMESTONE
203.23 EMBANKMENT OTHER THAN ROCK AND SHALE, WITH DENSITY CONTROL
203.04 METHOD OF MAKING DENSITY TESTS
203.25 EMBANKMENT WITHOUT DENSITY CONTROL
203.27 METHOD OF MEASUREMENT
207.03 GENERAL REQUIREMENTS

Where the depth of embankment is 5 ft or less, or where the material being placed does not consist entirely of rock, the material shall be placed in lifts not to exceed the top size of the rock being placed but not exceeding 2 ft. Each layer shall be choked thoroughly with broken stone or other suitable material and be compacted to the required density or as directed. *A geotextile in accordance with 918.02 shall be placed between the rock and soil.*

SECTION 203, BEGIN LINE 703, DELETE AND INSERT AS FOLLOWS:

Shale, shale and soft rock mixtures, or soft rock shall be placed in 8 in. maximum loose lifts. ~~and~~ *Strength and moisture control for compacted soils shall be in accordance with 203.23 or the density* shall be ~~compacted to~~ at least 95% of maximum dry density *with moisture control in accordance with 203.23.* ~~The moisture content shall be controlled within -2 and +1 percentage points of optimum moisture content. The density will be measured with a calibrated nuclear gauge using the direct transmission mode.~~ Excavation and blasting procedures shall accommodate the selective placement of these materials and avoid intermixing rock. Rock shall be placed in accordance with 203.20(a).

SECTION 203, BEGIN LINE 717, DELETE AND INSERT AS FOLLOWS:

Unless otherwise approved in writing, each embankment lift shall receive a minimum of three passes with the static roller and a minimum of two passes with the vibratory roller. The material shall be bladed before using the vibratory tamping-foot roller. A pass shall be in accordance with 402.15. The rollers shall not exceed 3 mph during these passes. The number of passes will be adjusted upward if necessary to ~~obtain 95% of maximum dry density, in accordance with AASHTO T 99~~ *meet the requirements of 203.23.* No additional compensation will be allowed for additional passes as specified herein, the cost of which shall be included in the cost of the pay items.

SECTION 203, BEGIN LINE 747 INSERT AS FOLLOWS:

If the material is found to be too intermixed with limestone fragments to enable field density tests as required in this section, this requirement may be waived by written permission. *As an alternate to this requirement, proof rolling shall be performed after every four lifts, and the moisture content will be controlled on clayey soils in accordance with 203.23.*

SECTION 203, BEGIN LINE 825 DELETE AND NSERT AS FOLLOWS:

203.23 Embankment Other Than Rock ~~and Shale,~~ With *Strength or* Density Control

REVISION TO STANDARD SPECIFICATIONS

SECTION 203 - EXCAVATION AND EMBANKMENT
203.09 GENERAL REQUIREMENTS
203.16(a) TREATMENT OF EXISTING FILLS
203.20(a) ROCK EMBANKMENT
203.20(b) SHALE, SHALE AND SOFT ROCK MIXTURES, OR SOFT ROCK
203.20(c) SHALE AND THINLY LAYERED LIMESTONE
203.23 EMBANKMENT OTHER THAN ROCK AND SHALE, WITH DENSITY CONTROL
203.04 METHOD OF MAKING DENSITY TESTS
203.25 EMBANKMENT WITHOUT DENSITY CONTROL
203.27 METHOD OF MEASUREMENT
207.03 GENERAL REQUIREMENTS

The compaction will be determined by dynamic cone penetrometer, DCP, testing in accordance with ITM 509 and the moisture content in accordance with ITM 506. Soil classification will be performed in accordance with the ITM 512 and the following DCP blow counts will be used for compaction control:

Textural Classification	*Maximum Dry Density (pcf)*	*Optimum Moisture Content Range (%)*	*Acceptable Minimum DCP value for 6 in. lift*	*Acceptable Minimum DCP value for 12 in. (2 lifts of 6 in)*
CLAY SOILS				
Clay	*<105*	*19 to 24*	*6*	
Clay	*105 - 110*	*16-18*	*7*	
Clay	*111 - 114*	*14-15*	*8*	
SILTY SOILS				
Silty	*115 - 116*			*8*
Silty	*117 - 120*	*13 to 14*		*10*
SANDY SOILS				
Sandy	*121-125*	*8 to 12*		*11*
Sandy	*>125*			*14*
GRANULAR SOILS - STRUCTURE BACKFILL AND A-1, A-2, AND A-3 SOILS				
No. 30				*6*
No. 4				*7*
1/2 in.				*10*
1 in.				*15*

Three random test locations will be determined in accordance with ITM 802 for each 2000 cyd of compacted soil for each two-lane pavement section.

~~Unless otherwise specified,~~*As an alternate,* all embankments shall be compacted to at least 95% of their maximum dry density *determined in accordance with AASHTO T 191 and the moisture content as specified*. ~~The moisture content shall be controlled within -2 and +1 percentage points of optimum moisture content. Maximum density and optimum moisture content shall be determined in accordance with AASHTO T 99 using method A for soil and method C for granular materials.~~

REVISION TO STANDARD SPECIFICATIONS

SECTION 203 - EXCAVATION AND EMBANKMENT
203.09 GENERAL REQUIREMENTS
203.16(a) TREATMENT OF EXISTING FILLS
203.20(a) ROCK EMBANKMENT
203.20(b) SHALE, SHALE AND SOFT ROCK MIXTURES, OR SOFT ROCK
203.20(c) SHALE AND THINLY LAYERED LIMESTONE
203.23 EMBANKMENT OTHER THAN ROCK AND SHALE, WITH DENSITY CONTROL
203.04 METHOD OF MAKING DENSITY TESTS
203.25 EMBANKMENT WITHOUT DENSITY CONTROL
203.27 METHOD OF MEASUREMENT
207.03 GENERAL REQUIREMENTS

~~When silts or loessial type soils are encountered and used in embankment construction, the moisture content shall be controlled within -3 percentage points of optimum moisture content and optimum moisture content. In no case shall these soils be placed at moisture content in excess of optimum moisture content.~~

~~The moisture content for sand soil or a sand and gravel soil, having at least 80% sand and gravel size particles, shall be such that the soils may be compacted to the specified density at a moisture content which is normally several percentage points below optimum or as directed.~~ *The moisture compaction range for all soils types shall be as follows:*

Soil Type	*Moisture Compaction Range*
Clay (< 105 lb/cu ft)	*-2 to +2% of optimum moisture content*
Clay (105-114 lb/cu ft)	*-2 to +1% of optimum moisture content)*
Silty and Sandy (>114 lb/cu ft)	*-3% of optimum moisture content)*
Granular	*5 to 8%*

Moisture tests will be performed every four hours for clayey soils.

SECTION 203, LINE 862, DELETE AND INSERT AS FOLLOWS:

203.24 Method of Making *Strength, Stiffness and* Density Tests

The strength of compacted soils will be determined by the DCP in accordance with ITM 509 and the stiffness of aggregates will be determined by the Light Weight Deflectometer in accordance with ITM 508. The percent of compaction shall be based on *the* maximum dry densities unless otherwise specified or directed. Field compaction tests will be ~~run~~*performed* on each lift and the required compaction obtained on each lift before the next is placed.

(a) Laboratory

~~The procedure for determining maximum densities for compaction control shall be in accordance with AASHTO T 99~~ *DCP criteria will be established on representative soils by performing ASTM D 1140, AASHTO T 90, and AASHTO T 99 using Method A for soils and Method C for granular materials.*

(b) Field

The soil strength will be determined by the DCP in accordance with ITM 509 and the moisture content will be determined in accordance with ITM 506.

REVISION TO STANDARD SPECIFICATIONS

SECTION 203 - EXCAVATION AND EMBANKMENT
203.09 GENERAL REQUIREMENTS
203.16(a) TREATMENT OF EXISTING FILLS
203.20(a) ROCK EMBANKMENT
203.20(b) SHALE, SHALE AND SOFT ROCK MIXTURES, OR SOFT ROCK
203.20(c) SHALE AND THINLY LAYERED LIMESTONE
203.23 EMBANKMENT OTHER THAN ROCK AND SHALE, WITH DENSITY CONTROL
203.04 METHOD OF MAKING DENSITY TESTS
203.25 EMBANKMENT WITHOUT DENSITY CONTROL
203.27 METHOD OF MEASUREMENT
207.03 GENERAL REQUIREMENTS

The field density determination shall be made in accordance with AASHTO T 191, ~~T 310~~, or ~~T 272~~*ITM 512* except as follows:

SECTION 203, BEGIN LINE 903 INSERT AS FOLLOWS:

When aggregate is used for embankment construction and has such a large top size as to make it impractical to perform density tests, and if approved, such material may be compacted with crawler-tread equipment or with approved vibratory equipment, or both. The materials shall be placed in lifts not to exceed 6 in.~~,~~ loose measurements, *or as directed*, and each lift compacted thoroughly by successive trips back and forth with the tread areas overlapping enough on each trip so that all portions will be compacted uniformly.

SECTION 203, BEGIN LINE 1015, DELETE AS FOLLOWS:

~~If the Contractor chooses the option of coarse aggregate No. 53 as subgrade treatment in accordance with 207.04, the borrow material including the aggregate will be measured in accordance with 203.27(b). The aggregate will also be measured as subgrade treatment in accordance with 207.05.~~

SECTION 203, BEGIN LINE 1047, DELETE AND INSERT AS FOLLOWS:

~~If the Contractor chooses the option of coarse aggregate No. 53 as subgrade treatment in accordance with 207.04, the borrow material including the aggregate will be measured in accordance with 203.27(b). The aggregate will also be measured as subgrade treatment in accordance with 207.05~~

(g) Measurement of Embankment Foundation Soils Treatment

Mechanical treatment of embankment foundation soils will be measured by the square yard. Chemical treatment of embankment foundation soils will be measured in accordance with ~~215.10~~*217*.

SECTION 203, AFTER LINE 1239, INSERT AS FOLLOWS:

The cost of geotextiles shall be included in the cost of other pay items.

SECTION 207, BEGIN LINE 43, DELETE AND INSERT THE FOLLOWING:

(Note: this statement was amended on February 20, 2014 SC meeting)

Soils containing greater than 3% by dry weight ~~calcium,/magnesium carbonate or~~ organic material, or with a maximum dry density of less than 100 ~~lb/cu ft~~*pcf*, or with liquid limit of greater than 50, *or with a soluble sulfate content greater than 1000 ppm*, will not be allowed within the specified thickness of the subgrade treatment in cut

REVISION TO STANDARD SPECIFICATIONS

SECTION 203 - EXCAVATION AND EMBANKMENT
203.09 GENERAL REQUIREMENTS
203.16(a) TREATMENT OF EXISTING FILLS
203.20(a) ROCK EMBANKMENT
203.20(b) SHALE, SHALE AND SOFT ROCK MIXTURES, OR SOFT ROCK
203.20(c) SHALE AND THINLY LAYERED LIMESTONE
203.23 EMBANKMENT OTHER THAN ROCK AND SHALE, WITH DENSITY CONTROL
203.04 METHOD OF MAKING DENSITY TESTS
203.25 EMBANKMENT WITHOUT DENSITY CONTROL
203.27 METHOD OF MEASUREMENT
207.03 GENERAL REQUIREMENTS

sections and will not be allowed within 24 in. of the finished subgrade elevation in fill sections. Density ~~shall~~*will* be determined in accordance with AASHTO T 99 *or* ~~*AASHTO T 272*~~ *ITM 512* and loss ~~of~~*on* ignition ~~shall~~*will* be determined in accordance with AASHTO T 267. Liquid limits ~~shall~~*will* be determined in accordance with AASHTO T 89. ~~*Calcium/magnesium carbonate will be determined in accordance with ITM 507.*~~*Sulfate content will be determined in accordance with ITM 510.*

COMMENTS AND ACTION

203.09 GENERAL REQUIREMENTS
203.16(a) TREATMENT OF EXISTING FILLS
203.20(a) ROCK EMBANKMENT
203.20(b) SHALE, SHALE AND SOFT ROCK MIXTURES, OR SOFT ROCK
203.20(c) SHALE AND THINLY LAYERED LIMESTONE
203.23 EMBANKMENT OTHER THAN ROCK AND SHALE, WITH DENSITY CONTROL
203.04 METHOD OF MAKING DENSITY TESTS
203.25 EMBANKMENT WITHOUT DENSITY CONTROL
203.27 METHOD OF MEASUREMENT
207.03 GENERAL REQUIREMENTS

DISCUSSION:

Motion: Second: Ayes: Nays: FHWA Approval:	Action: _____ Passed as Submitted _____ Passed as Revised _____ Withdrawn
Standard Specifications Sections referenced and/or affected: SECTION 203 pg 140 thru 167; 207.03 pg 194. Recurring Special Provision affected: NONE Standard Drawing affected: NONE Design Manual Sections affected: NONE GIFE Sections cross-references: NONE	_____ 2016 Standard Specifications _____ Revise Pay Items List _____ Create RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Revise RSP (No._____) Effective _____ Letting RSP Sunset Date: _____ Standard Drawing Effective _____ Create RPD (No. _____) Effective _____ Letting _____ GIFE Update