INDIANA DEPARTMENT OF TRANSPORTATION

STANDARDS COMMITTEE MEETING AGENDA

Driving Indiana's Economic Growth

October 12, 2005

MEMORANDUM

TO: Standards Committee

FROM: Dannie L. Smith, Secretary

RE: Agenda for the October 20, 2005 Standards Committee Meeting

A Standards Committee meeting is scheduled for 9:00 a.m. on October 20, 2005 in the N755 Bay Window Conference Room. Please enter the meeting through the double doors directly in front of the conference room. The following agenda items are listed for consideration.

New Business

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cc: Committee Members (7)
Districts (28)
FHWA (3)
ICI Representative (1)
IMAA Representative (1)
APAI Representative (1)
ACEC Representative (1)
ADS Representative (1)
Mirich Representative
ACPA Representative (1)
Contech Representative (1)
IKO Representative (1)
Bridgetek Representative (1)
INDOT Toll Road (3)
Traffic Design (3)
Estimators (3)
Specification Writers (4)

Item No. 8-1
Mr. Cales
Date: 10/20/05

REVISION TO 2006 STANDARD SPECIFICATIONS

SECTION 101, BEGIN LINE 206, DELETE AND INSERT AS FOLLOWS:

(c) ~~Procurement and Distribution Division~~ *Logistical Support Center*

A ~~division~~ *unit* within the Department which has a mailing address of 6400 East 30th Street, Indianapolis, IN 46219-1082.

Other sections containing specific cross references:

None

General Instructions to Field Employees
Update Required? Y ☐ N ☐
By - Addition ☐ Revision ☐

Frequency Manual
Update Required? Y ☐ N ☐
By - Addition ☐ Revision ☐

Recurring Special Provisions potentially affected:

805-T-036

Standard Sheets potentially affected:

None

Motion: Mr.
Second: Mr.
Ayes:
Nays:

Action: Passed as submitted ☐ revised ☐
Effective - _____ Letting
_____ Supplementals

Withdrawn ☐ Resubmit ☐

Received FHWA Approval? Y ☐ N ☐

Item No. 8-2
Mr. Cales
Date: 10/20/05

REVISION TO 2006 STANDARD SPECIFICATIONS

SECTION 108, BEGIN LINE 399, DELETE AS FOLLOWS:

~~Adjustments to the contract payment with respect to liquidated damages will be included in a liquidated damages pay item. The unit price for this pay item will be $1.00 and the quantity will be in units of dollars. The quantity is the total calculated in accordance with the above schedule.~~

SECTION 108, AFTER LINE 455, INSERT AS FOLLOWS:

Adjustments to the contract payment with respect to liquidated damages will be included in a liquidated damages pay item. The unit price for this pay item will be $1.00 and the quantity will be in units of dollars. The quantity is the total calculated in accordance with the above schedule.

This item is necessary due to the inclusion of the above paragraph in the incorrect section of the 2006 Standard Specifications Book.

Other sections containing specific cross references:

108.08
108.03 Pg 100-71
108.09 Pg 100-79

108.09
106.09 Pg 100-55

General Instructions to Field Employees
Update Required? Y ☐ N ☐
By - Addition ☐ Revision ☐

Frequency Manual
Update Required? Y ☐ N ☐
By - Addition ☐ Revision ☐

Recurring Special Provisions potentially affected:

None

Standard Sheets potentially affected:

None

Motion: Mr.
Second: Mr.
Ayes:
Nays:

Action: Passed as submitted ☐ revised ☐
Effective - _____ Letting
_____ Supplementals

Withdrawn ☐ Resubmit ☐

Received FHWA Approval? Y ☐ N ☐

Item No. 8-3
Mr. Cales
Date: 10/20/05

PROPOSED NEW STANDARD DRAWINGS

706-BRRW-01, Railing and Moment Slab Aside MSE Wall - PCCP
706-BRRW-02, Railing and Moment Slab Aside MSE Wall - HMA Pavement
706-BRRW-03, Railing and Moment Slab on MSE Wall - PCCP
706-BRRW-04, Railing and Moment Slab on MSE Wall - HMA Pavement
706-BRRW-05, Moment Slab Joints

731-BRRW-01, MSE Wall Precast Concrete Coping Details
731-BRRW-02, MSE Wall C-I-P Coping and Pedestrian Fence Details

Other sections containing specific cross references:

None

General Instructions to Field Employees
Update Required? Y ☐ N ☐
By - Addition ☐ Revision ☐

Frequency Manual
Update Required? Y ☐ N ☐
By - Addition ☐ Revision ☐

Recurring Special Provisions potentially affected:

None

Standard Sheets potentially affected:

See Above

Motion: Mr.
Second: Mr.
Ayes:
Nays:

Action: Passed as submitted ☐ revised ☐
Effective - _____ Letting
_____ Supplementals

Withdrawn ☐ Resubmit ☐

Received FHWA Approval? Y ☐ N ☐

INDIANA DEPARTMENT OF TRANSPORTATION

INTER-DEPARTMENT COMMUNICATION

Standards Section-Room N642

Writer's Direct Line

233-2273

September 29, 2005 DRAFT

DESIGN MEMORANDUM No. 05-__
TECHNICAL ADVISORY

TO: **All Design, Operations, District Personnel, and Consultants**

FROM: **_____**
Anthony L. Uremovich
Design Policy Engineer
Contracts and Construction Division

SUBJECT: **Concrete Railings and Moment Slabs at Mechanically Stabilized Earth (MSE) Wall Systems**

EFFECTIVE: **_____, 2005, Letting**

I. Use of Moment Slab with Concrete Railing

Details for placement of cast-in-place reinforced-concrete railing and a cast-in-place reinforced-concrete moment slab aside the top or on the top of an MSE wall have been standardized.

Such a railing is placed atop an MSE wall or aside it, 200 mm (8 in.) from the near face of the wall. The 200-mm (8-in.) offset permits sufficient space for the concrete formwork and facilitates construction of the railing which may be in close proximity to the concrete coping on top of the MSE wall.

The placement of the railing and moment slab aside an MSE wall is the preferred design. The placement of the railing and moment slab atop an MSE wall should be used where the minimum acceptable shoulder width is provided in conjunction with transverse space or right-of-way limitations.

The minimum thickness of the moment slab should be 300 mm (12 in.) for either PCCP or HMA pavement. The moment-slab thickness should match that of the adjoining PCCP, but should not be less than 300 mm (12 in.).

The standard minimum width of the moment slab should be 2.4 m (8 ft) as measured from the bottom face of the railing. If a narrower width is used, it must be designed, and the details must be shown on the plans. If the shoulder width is greater than 2.4 m (8 ft), the reinforced moment-slab width must equal the shoulder width, and the same reinforcement scheme should be used.

Coarse aggregate No. 8 should be placed underneath the moment slab within the limits of MSE wall usage. For an HMA roadway where the moment-slab thickness interferes with QC/QA-HMA Intermediate open-graded (OG) mixtures, the Materials and Tests Division's pavement design engineer should be contacted for drainage requirements underneath the moment slab.

Each exposed end of concrete railing should be provided with an appropriate railing transition to guardrail, or end treatment in accordance with *Indiana Design Manual* Section 49-5.04, or an impact attenuator in accordance with *Indiana Design Manual* Section 49-6.0, and the INDOT *Standard Drawings*.

II. Standard Documents

New INDOT *Standard Drawings* have been developed showing details for a concrete railing and moment slab where required for a roadway at an MSE wall system. The drawing numbers with their corresponding subject matters are listed below, and are attached hereto.

706-BRRW-01	Railing and Moment Slab Aside MSE Wall – PCCP
706-BRRW-02	Railing and Moment Slab Aside MSE Wall – HMA Pavement
706-BRRW-03	Railing and Moment Slab On MSE Wall – PCCP
706-BRRW-04	Railing and Moment Slab On MSE Wall –HMA Pavement
706-BRRW-05	Moment Slab Joints
731-BRRW-01	MSE Wall Precast Concrete Coping Details
731-BRRW-02	MSE Wall Cast-in-Place Coping and Pedestrian Fence Details

The locations of the transverse joints in the moment slab and the railing should match the locations provided in the PCCP. For an HMA pavement, the location of the transverse

joints in the railing should be the same as those in the moment slab. The maximum transverse joint spacing should be 5.5 m (18 ft).

INDOT *Standard Drawing* 706-BRRW-05 shows the plan view of the moment slab and the joint details. This drawing also shows the plan view of the railing with the required additional vertical reinforcing steel at the railing joint.

INDOT *Standard Drawing* 731-BRRW-01 shows details of precast concrete coping without a pedestrian fence. INDOT *Standard Drawing* 731-BRRW-02 shows details of cast-in-place concrete coping with or without a pedestrian fence. Cast-in-place coping is recommended where the MSE wall follows a horizontal or vertical curve determined to be significant. However, the contractor will usually have an option to use either type of coping. If a pedestrian fence is warranted atop the MSE wall, the cast-in-place coping should be specified.

New Recurring Special Provision 706-R-504 has been developed to complement this work and is also attached hereto. It includes a new pay item, Reinforced Concrete Moment Slab, with pay unit square meter (square yard). The pay width should be taken from the vertical front face of the concrete railing to the PCCP or HMA pavement. The concrete railing remains a separate pay item, as does the reinforcing steel in the slab and the railing. The pay item code numbers and names for the moment slab are as follows:

706-____	Reinforced Concrete Moment Slab, 300 mm	(or 12 in.)
706-____	Reinforced Concrete Moment Slab, 313 mm	(or 12½ in.)
706-____	Reinforced Concrete Moment Slab, 325 mm	(or 13 in.)
706-____	Reinforced Concrete Moment Slab, 338 mm	(or 13½ in.)
706-____	Reinforced Concrete Moment Slab, 350 mm	(or 14 in.)
706-____	Reinforced Concrete Moment Slab, 363 mm	(or 14½ in.)
706-____	Reinforced Concrete Moment Slab, 375 mm	(or 15 in.)
706-____	Reinforced Concrete Moment Slab, 388 mm	(or 15½ in.)
706-____	Reinforced Concrete Moment Slab, 400 mm	(or 16 in.)
706-____	Reinforced Concrete Moment Slab, 450 mm	(or 18 in.)

There are insufficient details and crash-test data currently available to validate the use of a precast-reinforced-concrete railing and a cast-in-place reinforced-concrete moment slab aside or atop an MSE wall. Therefore, precast-reinforced-concrete railing is not currently permitted aside or atop an MSE wall. The use of only cast-in-place railing with a moment slab aside or atop an MSE wall is recommended. INDOT *Standard Drawings* may be developed for a precast railing and cast-in-place moment slab in the future.

III. Design Considerations and Assumptions for Qualifying Calculations

The following design parameters and assumptions were used in developing the INDOT *Standard Drawings* listed above. The same assumptions should be used for analysis for a moment slab narrower than the standard 2.4-m (8-ft) width.

Railing loading should be applied in accordance with the AASHTO *Standard Specifications for Highway Bridges*, Article 2.7, with P = 10 kips at the top of the railing.

The effective length, E, of moment slab resisting concrete railing loading should be in accordance with *SSHB* Article 3.24.5.2, with E = 0.8X + 1.5 (E = 0.8X + 5.0), where X is width of the moment slab in meters (feet). The calculations for the standard moment slab are based on the minimum moment slab width of 2.4 m (8 ft), and minimum slab thickness of 300 mm (12 in.).

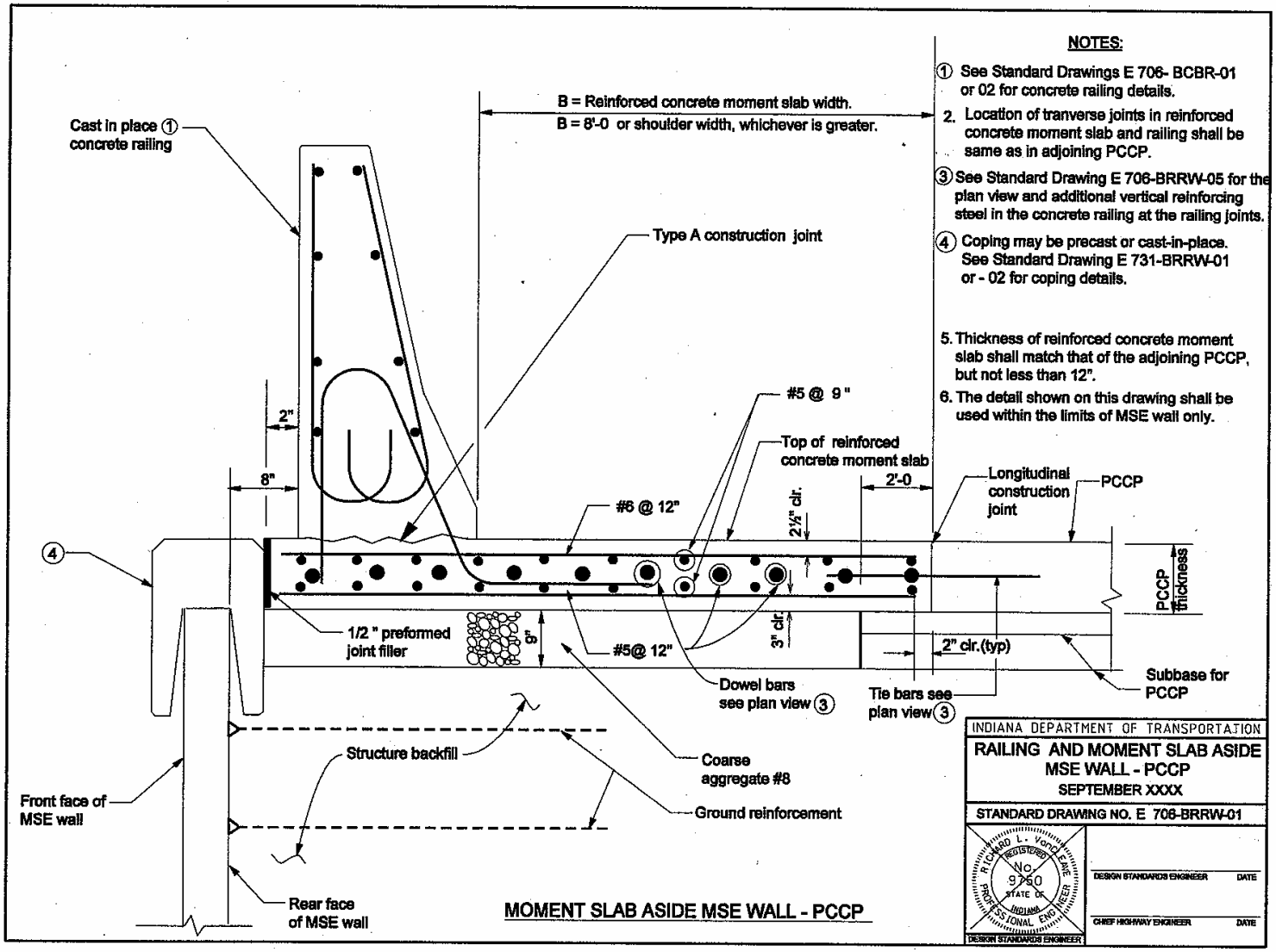
Concrete compressive strength f'_c = 27,500 kPa (4000 psi)
Steel yield stress f_y = 413,000 kPa (60,000 psi)
Factor of safety for overturning = 1.50
Factor of safety for sliding = 1.50
Coefficient of friction for sliding = 0.55

The factor of safety for overturning of 1.50 is considered adequate. This is because the moment slab is continuously supported by the compacted backfill in the MSE wall, compared to a normal cantilevered bridge deck overhang where a factor of safety for overturning of 2.0 would be used. Also, the concrete railing and moment slab are a more rigid system than a posts-and-metal-element railing and beam which may actually provide a longer effective length E than that required by Article 3.24.5.2, adding some stability to the overturning of the concrete railing.

The factor of safety for sliding should be taken as 1.50. The entire length of the moment slab between the joints, 5.5 m (18 ft), may be considered as resisting sliding due to the rigidity of the concrete railing and moment slab.

yps:alu
Attachments

[F:\Des\05BRRW-ta]



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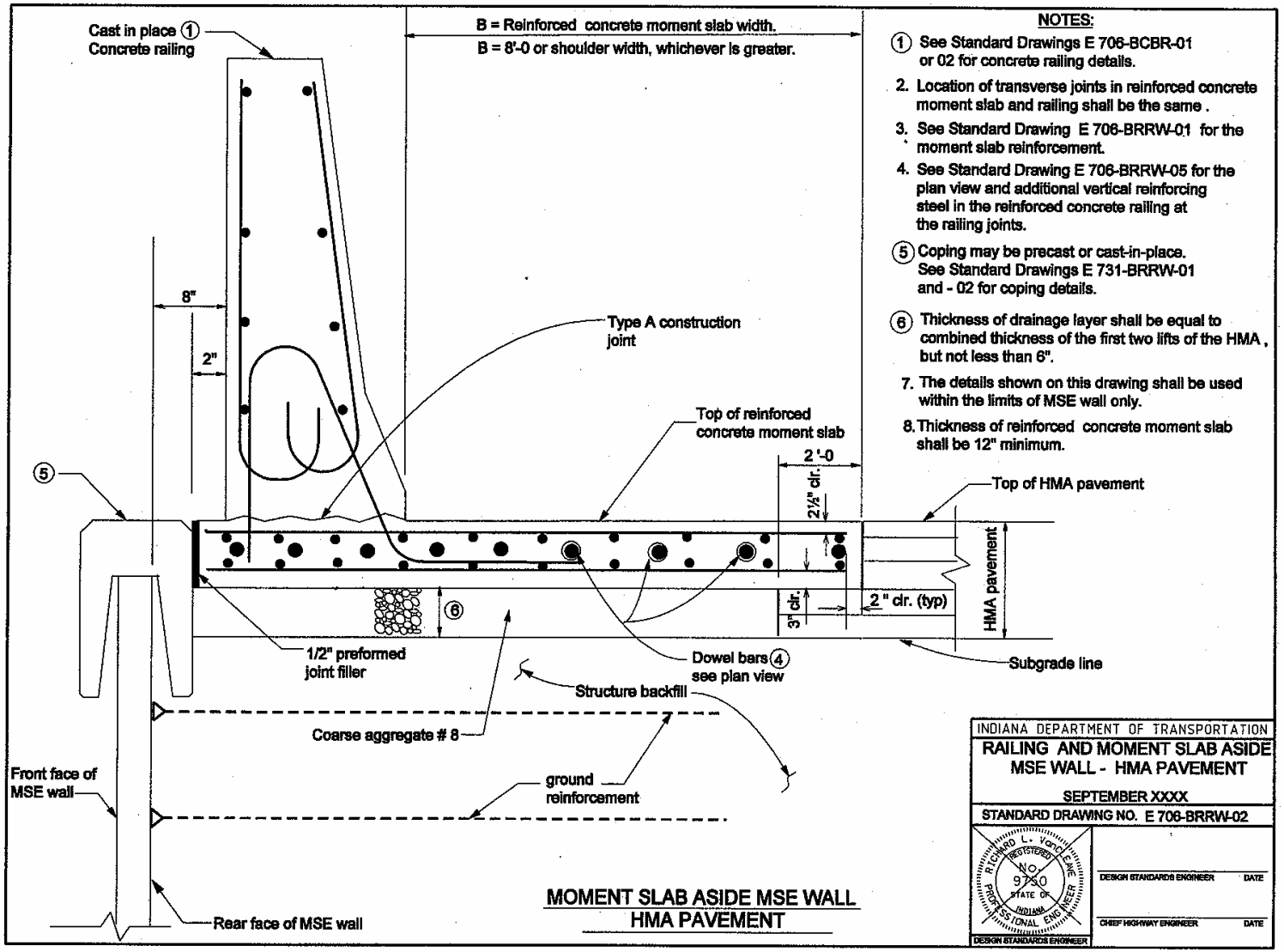

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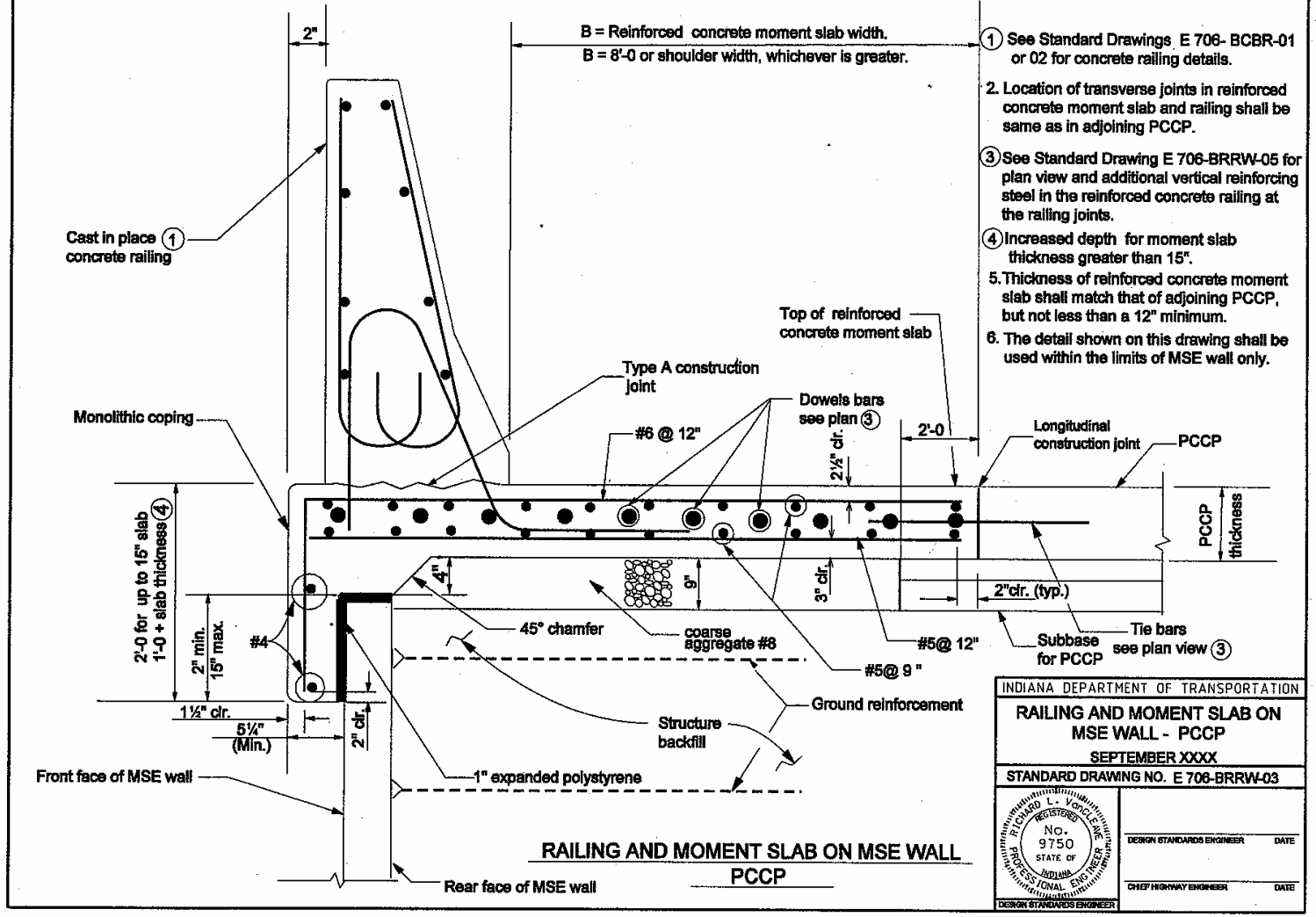

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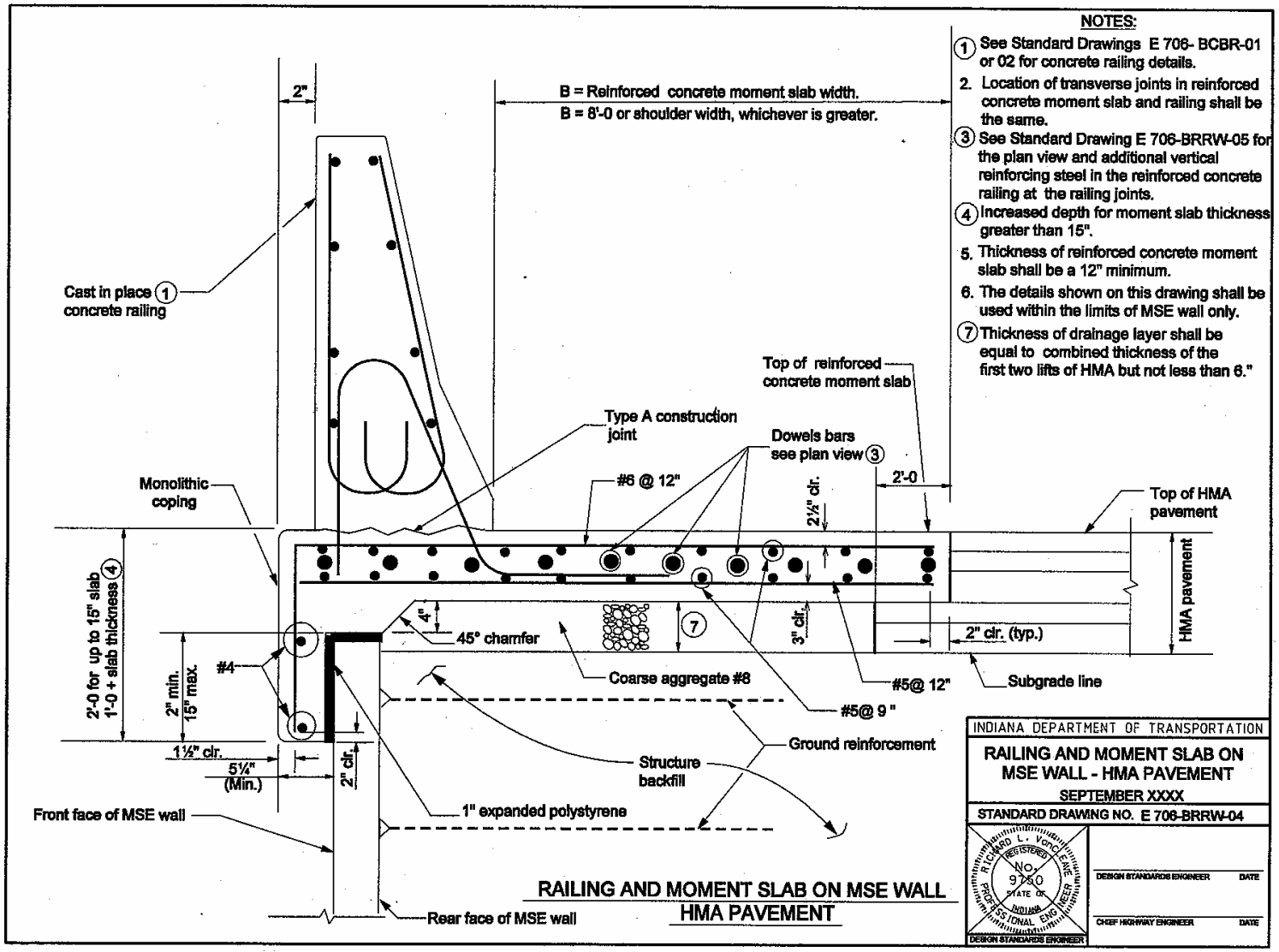

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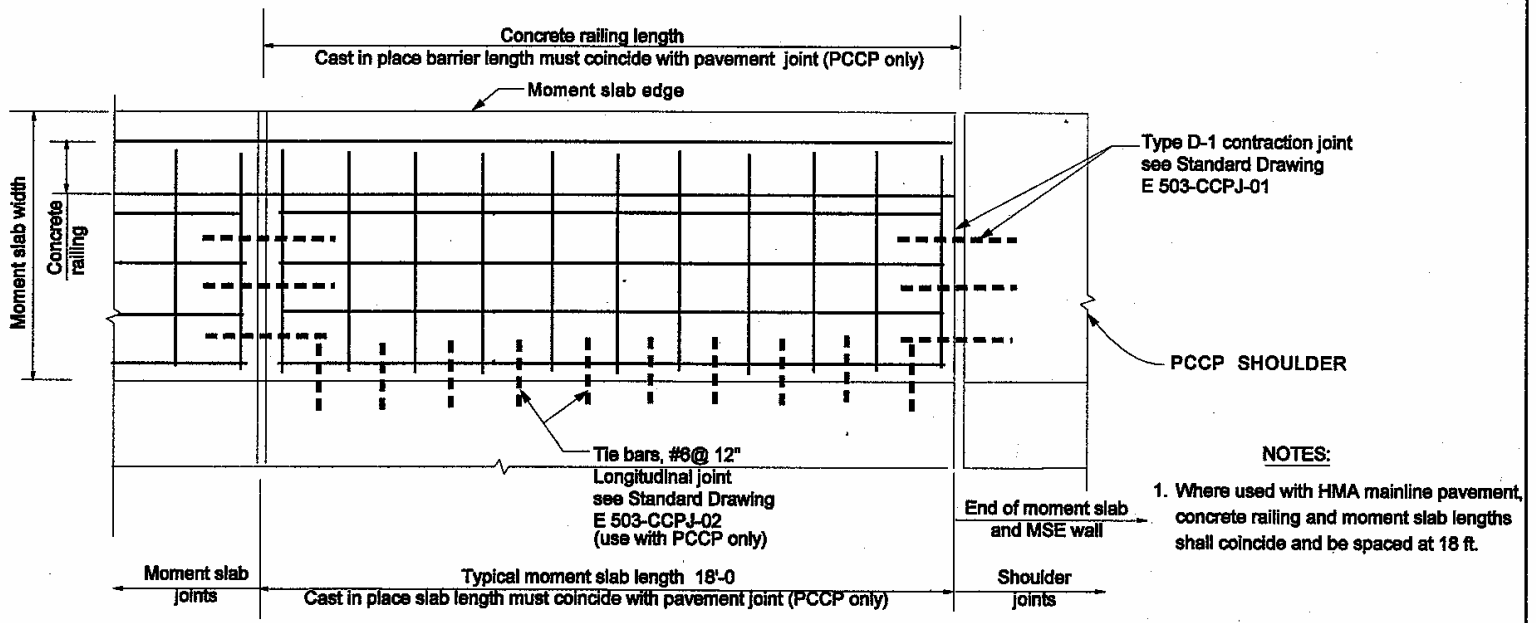
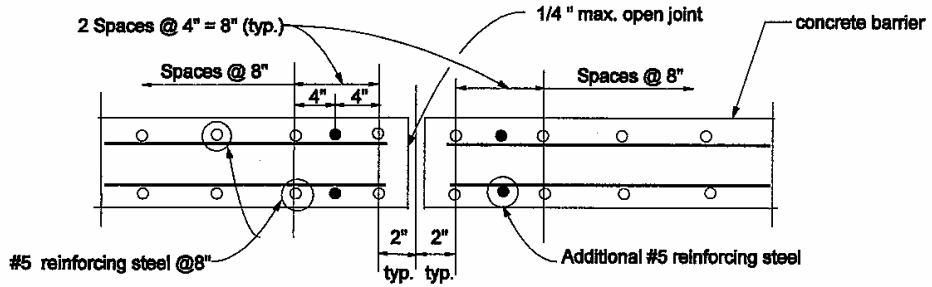


NOTES:

1. Where used with HMA mainline pavement, concrete railing and moment slab lengths shall coincide and be spaced at 18 ft.

PLAN - REINFORCED CONCRETE MOMENT SLAB JOINTS



PLAN - CONCRETE RAILING ADDITIONAL VERTICAL STEEL

INDIANA DEPARTMENT OF TRANSPORTATION

MOMENT SLAB JOINTS

SEPTEMBER XXXX

STANDARD DRAWING NO. E 706-BRRW-05

RICHARD L. VanDeLinde REGISTERED NO. 9780 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DESIGN STANDARDS ENGINEER DATE

CHIEF HIGHWAY ENGINEER DATE

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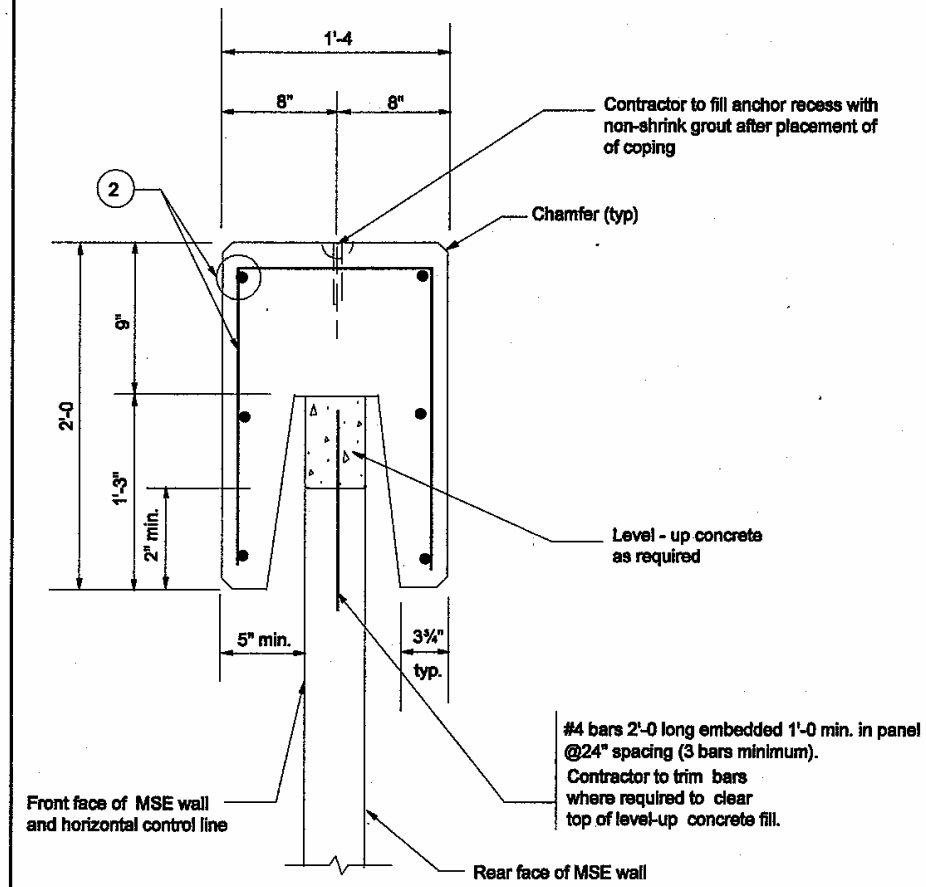

NOTES:

1. Standard precast coping unit shall be 10'-0 long .
2. Reinforcing steel in precast coping shall be determined by the manufacurer.

PRECAST CONCRETE COPING DETAIL

INDIANA DEPARTMENT OF TRANSPORTATION

MSE WALL PRECAST CONCRETE COPING DETAILS

SEPTEMBER XXXX

STANDARD DRAWING NO. E 731-BRRW-01

RICHARD L. VanDeLinde REGISTERED NO. 9780 STATE OF INDIANA PROFESSIONAL ENGINEER

DESIGN STANDARDS ENGINEER

DESIGN STANDARDS ENGINEER DATE

CHIEF HIGHWAY ENGINEER DATE

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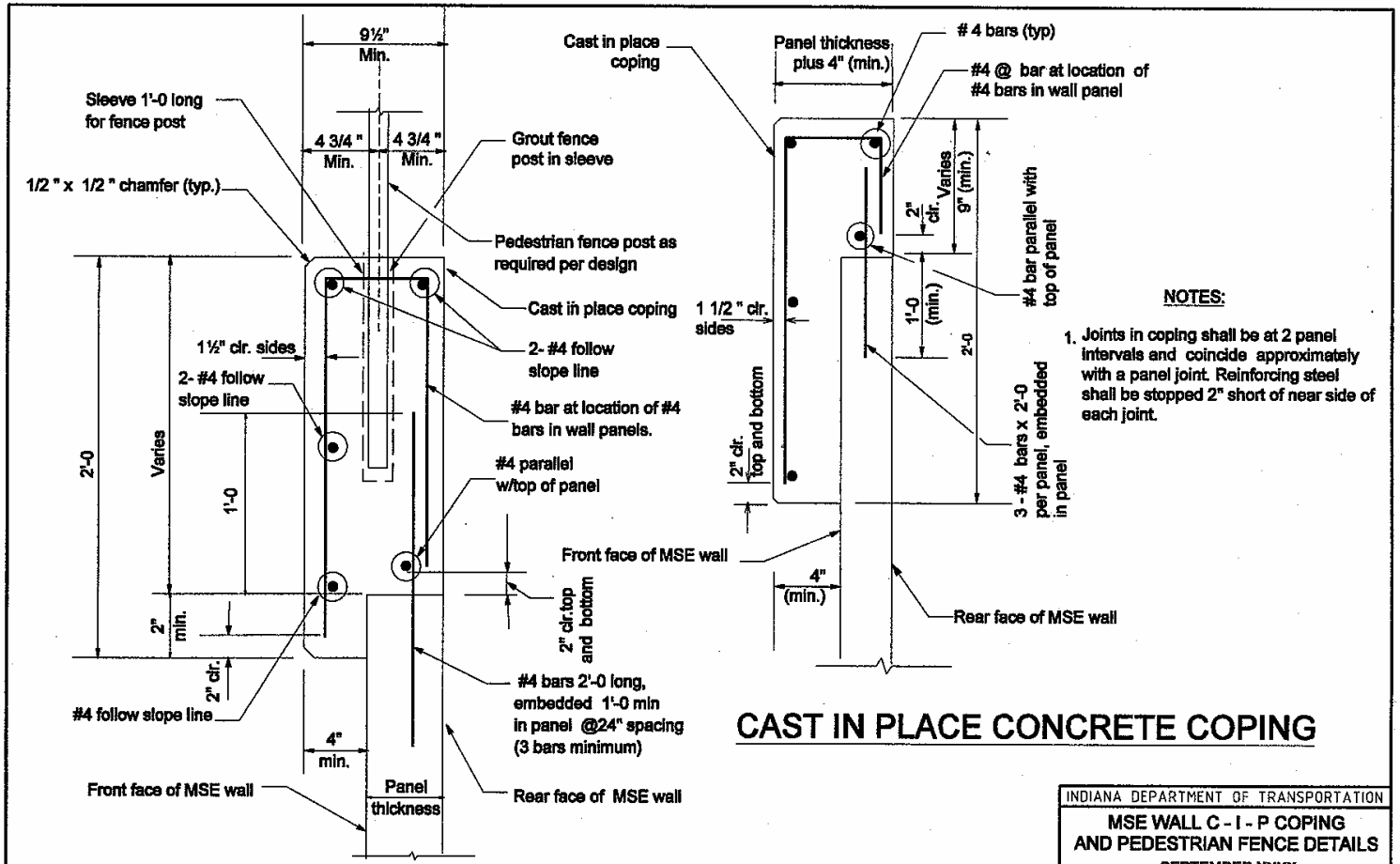

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SECTION 706, BEGIN LINE 3, DELETE AND INSERT AS FOLLOWS:

706.01 Description

This work shall consist of the furnishing and placing of concrete or steel railings on bridges and on top of *or aside* wingwalls and retaining walls *and reinforced concrete moment slabs* in accordance with *105.03.*

MATERIALS

706.02 Materials

Materials shall be in accordance with the following:

Barrier Delineators	926.02(c)
Coarse Aggregate, Class B or Higher, Size No. 8	*904*
Concrete, Class C	702
Dowel Bars	*910.01(b)10*
Joint Materials	*906*
Organic Zinc Primer	909.02(a)2
Polyurethane Finish Coat	909.02(c)
Reinforcing ~~Bars~~ *Steel*, Epoxy Coated	910.01
Steel Bridge Railing Components	910.20

Concrete for reinforced concrete moment slabs shall be QC/QA PCCP in accordance with 501 or PCCP in accordance with 502.

Thrie-beam railing and guardrail elements for retrofit bridge railing shall be steel and shall be in accordance with the applicable requirements *of 910.09, 910.11, and 910.12* for steel beam guardrail ~~shown in 910.09, 910.11, and 910.12~~.

SECTION 706, AFTER LINE 66, INSERT AS FOLLOWS:

706.03.1 *Concrete Railing With Reinforced Concrete Moment Slab*

The railing portion shall be constructed in accordance with 602.03 except it shall be cast in place. Type D-1 contraction joints in the moment slab shall match the locations of the joints in the abutting PCC pavement. If the abutting pavement is HMA, the D-1 contraction joints shall be spaced at 18 ft (5.5 m).

Moment slabs shall be formed with either steel or wood forms in accordance with 508.04(c)1 or 508.04(c)2. Vibration of the concrete shall be in accordance with 702.20(c).

The aggregate drainage layer shall be compacted in accordance with 302.06(b).

Type D-1 contraction joints and dowel bar assemblies shall be in accordance with 503.

Finishing and curing the moment slab shall be in accordance with 504. Finishing and curing the railing shall be in accordance with 702.

Job control testing for acceptance shall be in accordance with 502.05.

SECTION 706, BEGIN LINE 75, DELETE AND INSERT AS FOLLOWS:

706.05 Method of Measurement

Concrete railing, including all concrete work above the top of curb, will be measured by the linear foot (meter) or by the cubic yard (cubic meter) in accordance with the dimensions shown on the plans. No deductions will be made for reinforcing bars or joints. Concrete bridge railing transition will be measured per each for the type specified.

Reinforced concrete moment slabs will be measured by the square yard (square meter) for the thickness specified. Coarse aggregate placed under moment slabs will be measured by cubic yard (cubic meter) in accordance with 109.01(f). Type D-1 contraction joints will be measured in accordance with 503.07.

Reinforcing ~~bars~~ *steel in the railing* will be measured in accordance with 703.07.

Barrier delineators will be measured in accordance with 602.05.

Steel railing will be measured by the linear foot (meter) in accordance with the dimensions shown on the plans or as directed.

Linear measurements will be made from end to end of the railing along the centerline.

706.06 Basis of Payment

The accepted quantities of concrete railing will be paid for at the contract price per linear foot (meter) or cubic yard (cubic meter), for railing, concrete, of the ~~class~~ *type* specified. Steel railing will be paid for at the contract unit price per linear foot (meter) of the type specified. Concrete bridge railing transitions will be paid for at the contract unit price per each for the type specified. *Reinforced concrete moment slabs will be paid for at the contract unit price per square yard (square meter) for the thickness specified, complete in place. Coarse aggregate placed under moment slabs will be paid for at the contract unit price per cubic yard (cubic meter). Type D-1 contraction joints will be paid for in accordance with 503.08.* Reinforcing ~~bars~~ *steel* for concrete railings and concrete bridge railing transitions will be paid for in accordance with 703.08. Barrier delineator will be paid for in accordance with 602.06.

Payment will be made under:

Pay Item	**Pay Unit Symbol**
Coarse Aggregate, Size No. 8	CYS (m3)
Concrete Bridge Railing Transition, ____ type	EACH
Railing, *Steel,* ____ type	LFT (m)
Railing, Concrete ____ type	LFT (m) CYS (m3)
Reinforced Concrete Moment Slab, _____ thickness	*SYD (m2)*

REVISION TO 2006 STANDARD SPECIFICATIONS

SECTION 706, CONTINUED.

The cost of painting, washers, rivets, welding, anchor bolts, and necessary incidentals shall be included in the cost of the pay items in this section.

Concrete railing which the Engineer has ordered removed and replaced in accordance with 706.03 shall be with no additional payment.

The cost of the epoxy coated reinforcing steel in the moment slab shall be included in the cost of the reinforced concrete moment slab.

The cost of all labor and materials required to provide for the concrete coping with moment slabs shall be included in the cost of the moment slab.

The cost of furnishing and placing all materials not specified as pay items shall be included in the cost of the pay items in this section.

Other sections containing specific cross references:

706.05
702.27 Pg 700-44
707.11 Pg 700-64

706.06
702.28 Pg 700-44
707.12 Pg 700-64

General Instructions to Field Employees
Update Required? Y ☐ N ☐
By - Addition ☐ Revision ☐
Frequency Manual
Update Required? Y ☐ N ☐
By - Addition ☐ Revision ☐

Recurring Special Provisions potentially affected:

None

Standard Sheets potentially affected:

See Item 8-3

Motion: Mr.
Second: Mr.
Ayes:
Nays:

Action: Passed as submitted ☐ revised ☐
Effective - _____ Letting
_____ Supplementals

Withdrawn ☐ Resubmit ☐

Received FHWA Approval? Y ☐ N ☐

Item No. 8-5
Mr. Miller
Date: 10/20/05

REVISION TO 2006 STANDARD SPECIFICATIONS

SECTION 725, LINE 17, DELETE AND INSERT AS FOLLOWS:

Foam Concentrate .....ASTM C ~~869~~ *796*

SECTION 725, BEGIN LINE 34, DELETE AS FOLLOWS:

The cellular concrete grout shall be designed ~~and produced~~ in accordance with ASTM C 796 except as herein modified.

SECTION 725, BEGIN LINE 59, DELETE AND INSERT AS FOLLOWS:

For each day worked or for each 100 cubic ~~meters~~ *yards* (100 cubic ~~yards~~ *meters*) placed, four test cylinders measuring 3 in. by 6 in. (75 mm by 150 mm) ~~shall~~ *will* be cast at the point of placement of the grout. ~~The~~ *Sampling, molding, curing, and compressive strength testing of the* cylinders ~~shall~~ *will* be ~~prepared, cured, and transported~~ in accordance with ASTM C ~~31~~ *495* , except as modified herein.

~~The compressive strength shall be determined in accordance with ASTM C 39, except as modified herein.~~ Initial curing ~~shall~~ *will* be at ~~room~~ *a* temperature *of 70° ± 10°F (21.1° ± 5.5°C)* and ~~shall~~ *will* be from 2 to 5 days. After the initial curing, the test specimens ~~shall~~ *will* be placed in a moist closet or moist room or stored in an enclosed curing tank above the water level. All specimens ~~shall~~ *will* be kept in their molds in the moist storage for the remainder of the curing period. The specimens ~~shall~~ *will* be tested at 28 days. At that time the specimens ~~shall~~ *will* be ~~stripped, capped, and~~ *prepared for testing in accordance with ASTM C 495 except the bearing surface may be ground or cut with a dry saw to meet surface tolerance. The specimens will not be capped. Specimens will be* tested in compression as rapidly as possible to minimize drying. If more than one specimen is removed from the moist storage at the same time, these specimens ~~shall~~ *will* be covered with a damp cloth until time of testing.

Other sections containing specific cross references:

None

General Instructions to Field Employees
Update Required? Y ☐ N ☐
By - Addition ☐ Revision ☐
Frequency Manual
Update Required? Y ☐ N ☐
By - Addition ☐ Revision ☐

Recurring Special Provisions potentially affected:

None

Standard Sheets potentially affected:

None

Motion: Mr.
Second: Mr.
Ayes:
Nays:

Action: Passed as submitted ☐ revised ☐
Effective - _____ Letting
_____ Supplementals

Withdrawn ☐ Resubmit ☐

Received FHWA Approval? Y ☐ N ☐

-----Original Message-----
From: MILLER, MARK
Sent: Wednesday, September 21, 2005 12:55 PM
To: SMITH, DAN
Subject: RE: Revisions to 725 Slip Lining of Existing Pipe

Yes, Dan – I have reviewed these changes and talked to Youlanda. This revision primarily corrects the ASTM reference numbers for test methods.
We are using this specification on many contracts and it is time to incorporate it in the book.

-----Original Message-----
From: SMITH, DAN
Sent: Tuesday, September 20, 2005 3:28 PM
To: MILLER, MARK
Subject: Revisions to 725 Slip Lining of Existing Pipe

Mark, Youlanda had me prepare a recurring special provision to revise Section 725, Slip Lining of Existing Pipe. A copy is attached.

May I place it on the October Standards Committee Agenda so we can delete the RSP?

Dan Smith
Specifications Manager
Indiana Department of Transportation
Rm N642
(317) 232-5353
Fax: 233-4929

Item No. 8-6
Mr. Caplinger
Date: 10/20/05

REVISION TO STANDARD DRAWINGS

802-SNGS-09, Steel Sign Posts
802-SNGS-10, Steel Sign Posts

PROPOSED NEW DRAWING

802-SNGS-13, Steel Sign Posts

Other sections containing specific cross references:

None

General Instructions to Field Employees
Update Required? Y ☐ N ☐
By - Addition ☐ Revision ☐

Frequency Manual
Update Required? Y ☐ N ☐
By - Addition ☐ Revision ☐

Recurring Special Provisions potentially affected:

None

Standard Sheets potentially affected:

See Above

Motion: Mr.
Second: Mr.
Ayes:
Nays:

Action: Passed as submitted ☐ revised ☐
Effective - _____ Letting
_____ Supplementals

Withdrawn ☐ Resubmit ☐

Received FHWA Approval? Y ☐ N ☐

MOUNTING / WIDTH x HEIGHT ("W x H")	5 ft		6 ft		7 ft		8 ft	
	U CHANNEL	SQUARE POST	U CHANNEL	SQUARE POST	U CHANNEL	SQUARE POST	U CHANNEL	SQUARE POST
12 x 12, 12 x 6, 12 x 9 12 x 12, 12 x 18, 12 x 30	1-A	1-Type 1	1-A	1-Type 1	1-A	1-Type 1	1-A	1-Type 1
12 x 36	1-A		1-A		1-A		1-A	
18 x 6, 18 x 12, 18 x 18	1-A		1-A		1-A		1-A	
18 x 24	1-A		1-A		1-A		1-A	
18 x 30	1-A		1-A		1-A		1-A	
18 x 48	1-A		1-A		1-A		1-A	
24 x 12, 24 x 18, 24 x 24	1-A		1-A		1-A		1-A	
24 x 30	1-A		1-A		1-A		1-A	
24 x 36	1-A		1-A		1-A		1-A	
30 x 18	1-A		1-A		1-A		1-A	
30 x 24	1-A		1-A		1-A		1-A	
30 x 30	1-A		1-A		1-A		1-A	
30 x 36	1-A		1-A		1-A		1-A	
30 x 42	1-B		1-B		1-B		1-B	
30 x 48	1-B		1-B		1-B		1-B	
36 x 12	2-A		2-A		2-A		2-A	
36 x 18	2-A		2-A		2-A		2-A	
36 x 24	2-A		2-A		2-A		2-A	
36 x 36	2-A		2-A		2-A		2-A	
36 x 48	2-A		2-A		2-A		2-A	
42 x 18	2-A		2-A		2-A		2-B	
42 x 24	2-A		2-A		2-A		2-A	
42 x 30	2-A		2-A		2-A		2-A	
42 x 36	2-A		2-A		2-A		2-A	
48 x 16	2-A		2-A		2-A		2-A	
48 x 18	2-A		2-A		2-A		2-A	
48 x 24	2-A		2-A		2-A		2-A	
48 x 30	2-A		2-A		2-A		2-A	
48 x 36	2-A	2-Type 2	2-A	2-Type 2	2-A	2-Type 2	2-A	2-Type 2
48 x 48	2-A		2-B		2-B		2-B	
48 x 60	2-B		2-B		2-B		2-B	
60 x 24	2-A		2-A		2-A		2-A	
60 x 30	2-A		2-A		2-A		2-A	
60 x 36	2-A		2-A		2-B		2-B	
60 x 48	2-B		2-B		2-B		2-B	
72 x 24	2-A		2-A		2-A		2-A	
72 x 36	2-B		2-B		2-B		2-B	
90 x 36 & 120 x 36	2-B	2-Type 3	2-B	2-Type 3	2-B	2-Type 3	2-B	2-Type 3

GENERAL NOTES

1. See Standard Sheet E 802-SNGS-10 for square steel sign post installation details.
2. The type 1 post shall be 2¼ in. x 2¼in. x 12 ga. wall thickness.
3. The type 2 post shall be 2 in. x 2 in. x 12 ga. wall thickness.
4. The type 3 post shall be 2½" x 2½" x 12ga. wall thickness.

INDIANA DEPARTMENT OF TRANSPORTATION

STEEL SIGN POSTS

SEPTEMBER 2004

STANDARD DRAWING NO. E 802-SNGS-09

RICHARD L. VanCLEAVE REGISTERED No. 9750 STATE OF INDIANA PROFESSIONAL ENGINEER

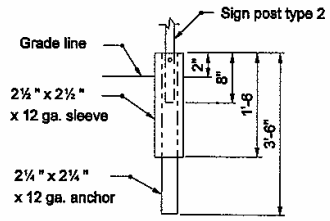
DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave — DESIGN STANDARDS ENGINEER — 9-01-04 DATE

/s/ Richard K. Smutzer — CHIEF HIGHWAY ENGINEER — 9-01-04 DATE

SQUARE POST

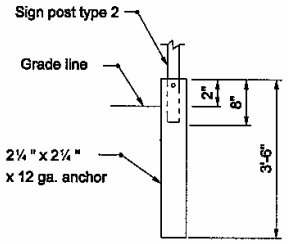
12 ga. Thickness



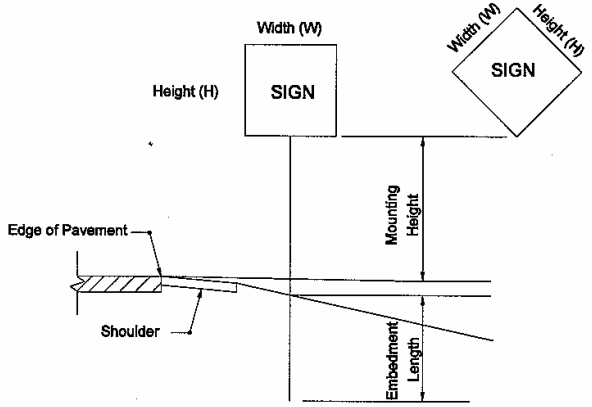
REINFORCED ANCHOR BASE

SQUARE POST

12 ga. Thickness

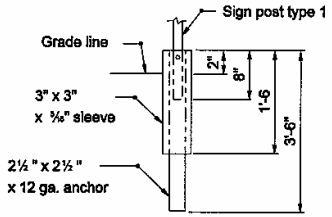


UNREINFORCED ANCHOR BASE



SQUARE POST

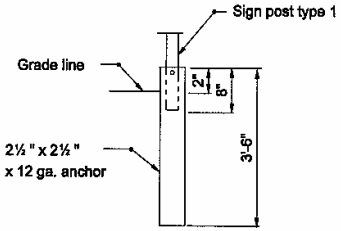
12 ga. Thickness



REINFORCED ANCHOR BASE

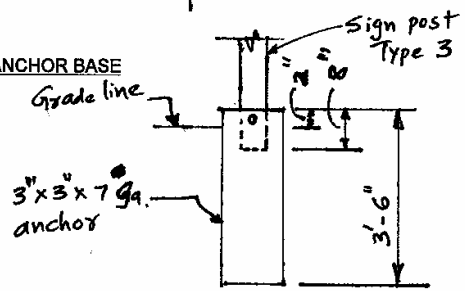
SQUARE POST

12 ga. Thickness



UNREINFORCED ANCHOR BASE

POST	TYPE	WALL THICKNESS	NO. OF POSTS PERMITTED IN 7 ft PATH	EMBEDMENT LENGTH
U-CHANNEL	A, B		1 OR 2	3'-6"
SQUARE	1	12 ga.	1	ANCHOR BASE
	2	12 ga.	1 OR 2	
	3	12 ga.	1	



UNREINFORCED ANCHOR BASE

GENERAL NOTES:

1. See Standard Drawing E-802-SNGS-09 for sign size and E802-SNPL-02 for mounting height table.

INDIANA DEPARTMENT OF TRANSPORTATION

STEEL SIGN POSTS

SEPTEMBER 2004

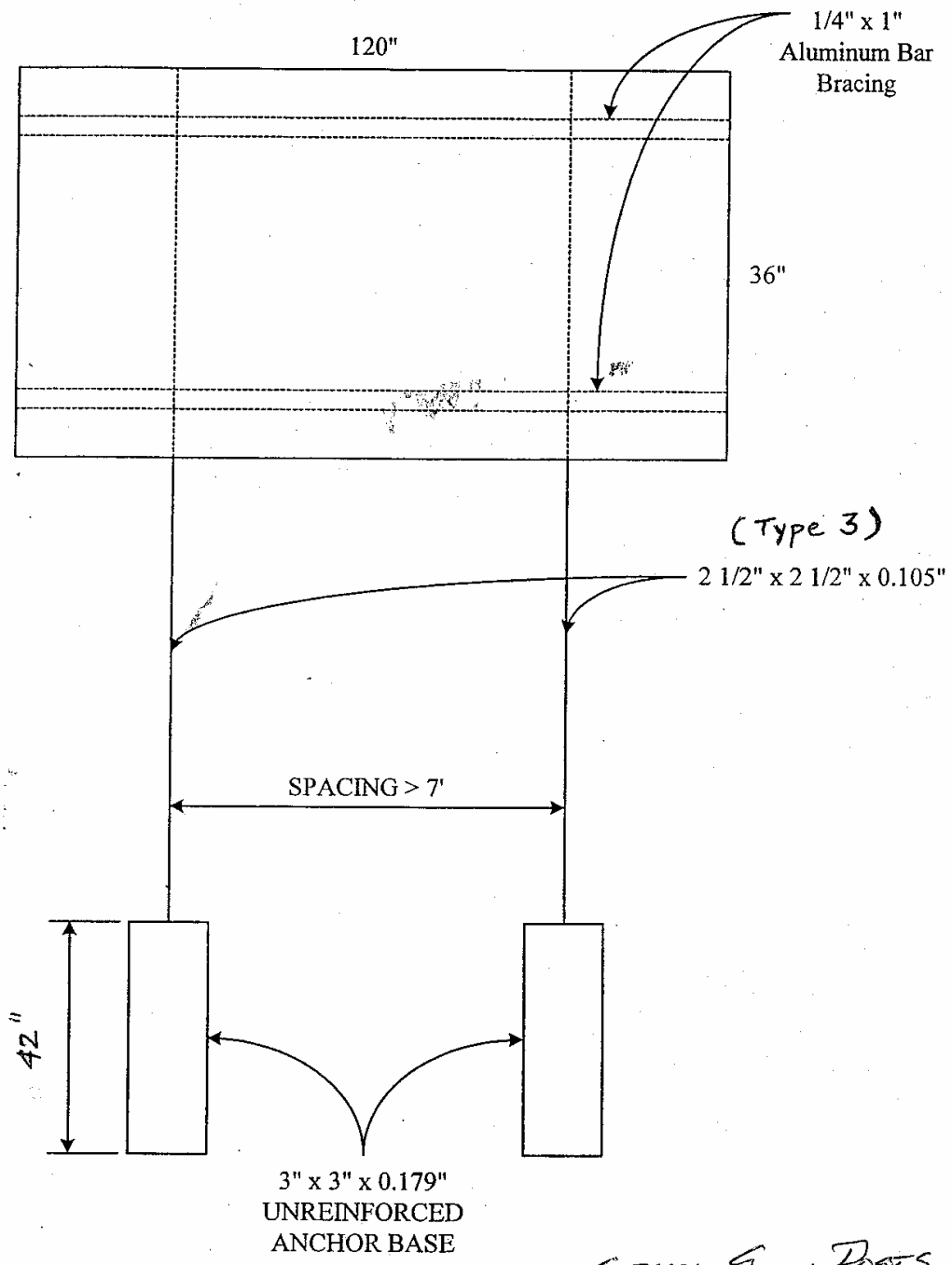
STANDARD DRAWING NO. E 802-SNGS-10

RICHARD L. VANCLEAVE REGISTERED PROFESSIONAL ENGINEER NO. 9750 STATE OF INDIANA

DESIGN STANDARDS ENGINEER

/s/ Richard L. VanCleave 9-01-04
DESIGN STANDARDS ENGINEER DATE

/s/ Richard K. Smutzer 9-01-04
CHIEF HIGHWAY ENGINEER DATE



STEEL SIGN POSTS

E 802-SNGS-13

NOTE: Maximum Sign Width 120", Height 36"

INDIANA DEPARTMENT OF TRANSPORTATION
DESIGN DIVISION
INDIANAPOLIS, INDIANA 46204-2249
INTER-DEPARTMENT COMMUNICATION

September 16, 2005

MEMORANDUM

TO: Thomas Caplinger
Road Design Engineer

Thru: Mike Holowaty MH
Manager, Specialty Projects Group

From: Pankaj Patel PP
Sign Design Engineer

Subject: Square Post Standard Drawings

We would like to make a revision on above standard drawings. We are adding 2 ½" x 2 ½" x 12 Ga. (Type 3) post to above standard drawings. We are already using this post for project specific. This post is meet federal breakaway criteria.

FIGURES 52-13A through 52-13X

Subgrade treatment transverse limit corrected to 0.6 m (2 ft) beyond outside edge of paved shoulder per current practice

Compacted aggregate base changed to No. 53, now sloped down at 45 deg beginning 0.3 m (1 ft) outside the shoulder break

HMA OG courses corrected to QC/QA

Slope break points shown where required

Where the shoulder pavement section is the same as that of the travelway, the outside of the underdrain trench moved to the outside of the edge of the shoulder pavement

New ramp pavement sections revised to be uniform for both travelway and shoulders

Figure 52-13A, Full Depth HMA Pavement, ≥ 30 Million ESALs
Figure 52-13B, Full Depth HMA Pavement, 10 Million ≤ ESALs < 30 Million
Figure 52-13C, Full Depth HMA Pavement, 1 Million ≤ ESALs < 10 Million
Figure 52-13D, Full Depth HMA Pavement, < 1 Million ESALs
Figure 52-13E, Composite HMA/Compacted Aggregate Pavement, < 1 Million ESALs
Figure 52-13F, PCCP Section With PCC Shoulder ≥ 30 Million ESALs
Figure 52-13G, PCCP Section With HMA Shoulder < 30 Million ESALs
Figure 52-13H, PCCP With Concrete Curb
Figure 52-13I, Overlay (Tilt To Crown Section)
Figure 52-13J, Overlay (Crown To Crown Section)
Figure 52-13K, Retrofit Underdrain
Figure 52-13L, Underdrain For HMA Pavement, < 30 Million ESALs
Figure 52-13M, Underdrain For HMA Pavement ≥ 30 Million ESALs
Figure 52-13N, Concrete Curb and Gutter Section For HMA Pavement With Underdrain
Figure 52-13O, Concrete Curb and Gutter Section For HMA Pavement Without Underdrain
Figure 52-13P, PCCP With Underdrain
Figure 52-13Q, Curbed PCCP With Underdrain
Figure 52-13R, Median Edge of Concrete Pavement Longitudinal Joint Options
Figure 52-13S, Full Depth HMA Ramp
Figure 52-13T, PCCP Ramp
Figure 52-13U, Ramp With Overlay
Figure 52-13V, HMA Pavement With Concrete Curb and Underdrain
Figure 52-13W, HMA Pavement With Concrete Curb and No Underdrain
Figure 52-13X, Parking Lot Pavement Sections

REVISIONS TO DESIGN MANUAL

SECTIONS 43-3.06, 45-1.02(05), and 52-9.02(06)
TABLES 53-1 through 53-9, 54-2A, and 55-3A through 55-3H
SECTION 56-4.04(3)

For paved shoulder of 1.2 m (4 ft) or narrower, cross slope changed to match that of adjacent travel lane

Section 43-3.06, Shoulder Superelevation
Section 45-1.02(05), Cross Slopes
Section 52-9.02(06), Shoulders

Table 53-1, Geometric Design Criteria For Freeways
Table 53-2, Geometric Design Criteria For Rural Arterials
Table 53-3, Geometric Design Criteria For State Rural Collector Roads
Table 53-4, Geometric Design Criteria For Local Agency Rural Collector Roads
Table 53-5, Geometric Design Criteria For Local Rural Roads
Table 53-6, Geometric Design Criteria For Multi-Lane Urban Arterials
Table 53-7, Geometric Design Criteria For Two-Lane Urban Arterials
Table 53-8, Geometric Design Criteria For Urban Collectors
Table 53-9, Geometric Design Criteria For Urban Local Streets
Table 54-2A, Geometric Design Criteria For Freeways
Table 55-3A, Geometric Design Criteria For Rural Arterials
Table 55-3B, Geometric Design Criteria For State Rural Collector Roads
Table 55-3C, Geometric Design Criteria For Local Agency Rural Collector Roads
Table 55-3D, Geometric Design Criteria For Rural Local Roads
Table 55-3E, Geometric Design Criteria For Multi-Lane Urban Arterials
Table 55-3F, Geometric Design Criteria For Two-Lane Urban Arterials
Table 55-3G, Geometric Design Criteria For Urban Collectors
Table 55-3H, Geometric Design Criteria For Urban Local Streets

Section 56-4.04(3) Cross Slopes

Other sections containing specific cross references:

None

General Instructions to Field Employees
Update Required? Y ☐ N ☐
By - Addition ☐ Revision ☐

Frequency Manual
Update Required? Y ☐ N ☐
By - Addition ☐ Revision ☐

Recurring Special Provisions potentially affected:

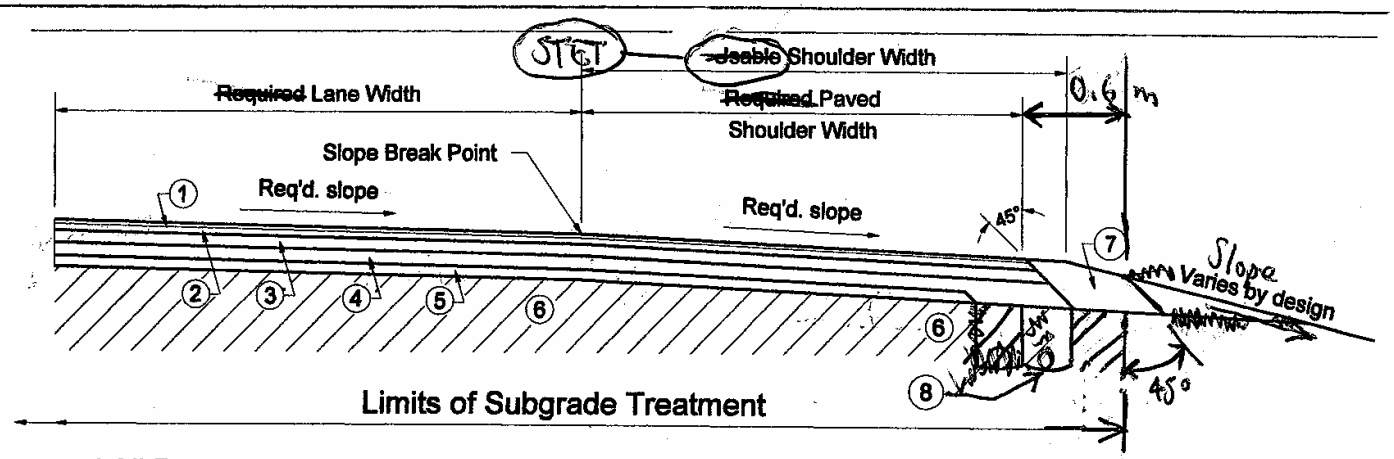
Standard Sheets potentially affected:

Motion: Mr.
Second: Mr.
Ayes:
Nays:

Action: Passed as submitted ☐ revised ☐
Effective - _____ Letting
_____ Supplementals

Withdrawn ☐ Resubmit ☐

Received FHWA Approval? Y ☐ N ☐

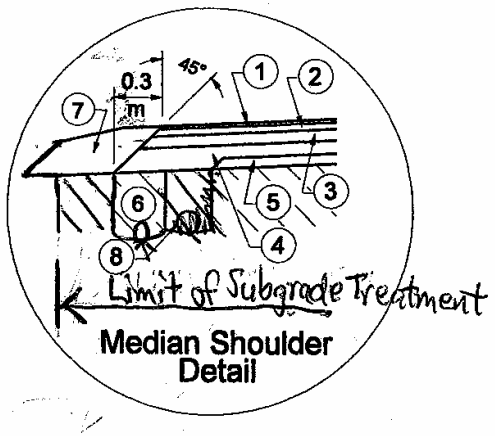


* All Pavement, Including All Shoulders

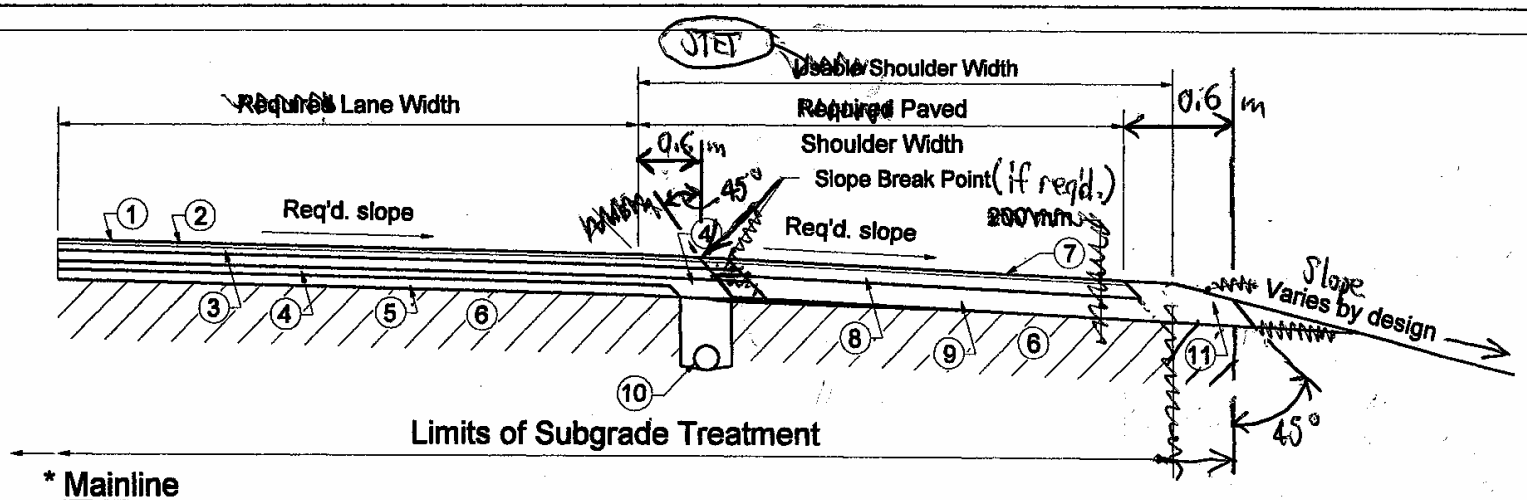
1. 90 kg/m² HMA Surface 9.5 mm
2. 150 kg/m² HMA Intermediate 19.0 mm
3. 240 kg/m² HMA Base 25.0 mm
4. ** 250 kg/m² Minimum HMA Intermediate OG25.0 mm
5. 240 kg/m² HMA Base 25.0 mm
6. Subgrade Treatment
7. Compacted Aggregate Base
8. Pipe, Type 4, Circular, 150 mm

* Open graded mixtures OG19.0 mm or OG25.0 mm should be QC/QA-HMA, 5, 76. For all other mixtures, see Section 52-9.02 to determine the appropriate HMA mixture designation.

** If underdrain systems are not met, Intermediate OG25.0 mm mix should be replaced with HMA Base 25.0 mm, minimum 270 kg/m².



FULL DEPTH HMA PAVEMENT,
≥ 30 MILLION ESALs
Figure 52-13A



*** Mainline**

① 90 kg/m² HMA Surface 9.5 mm
② 150 kg/m² HMA Intermediate 19.0 mm
③ 240 kg/m² HMA Base 25.0 mm
** ④ 165 kg/m² HMA Intermediate OG25.0 mm
⑤ 240 kg/m² HMA Base 25.0 mm
⑥ Subgrade Treatment
⑩ Pipe, Type 4, Circular, 150 mm

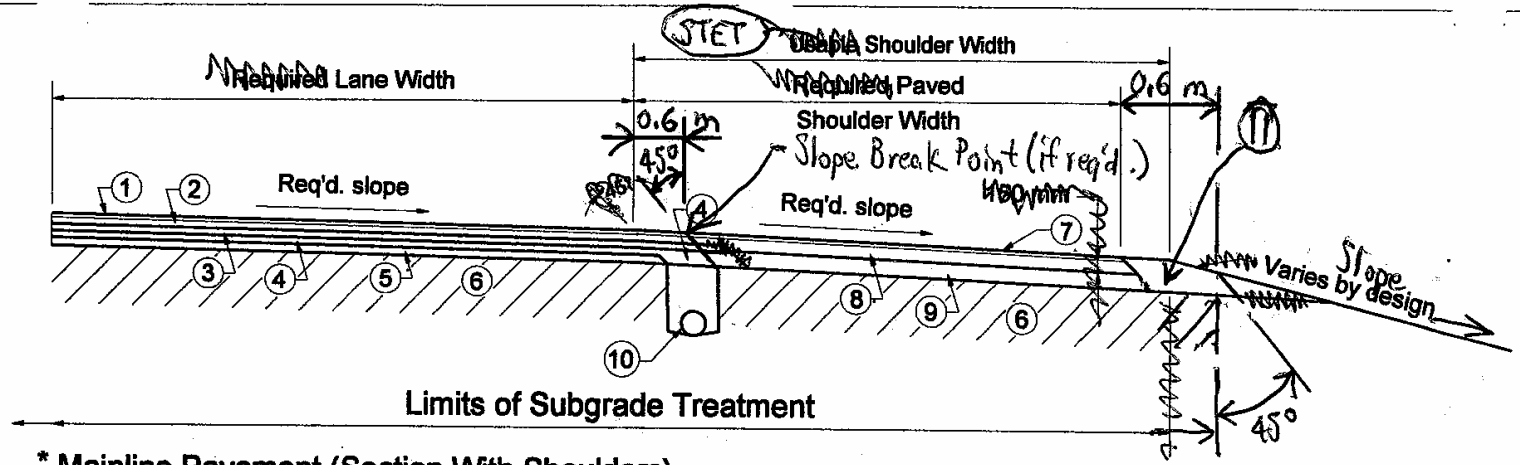
*** Shoulders**

⑦ 90 kg/m² HMA Surface 9.5 mm
⑧ 270 kg/m² HMA Base 25.0 mm
⑨ Compacted Aggregate Base, No. 53
(Depth equals mainline HMA thickness minus 150 mm)
⑪ Variable-Depth Compacted Aggregate Base, No. 53

* Open graded mixtures OG19.0 mm or OG25.0 mm should be QC/QA-HMA, 5, 76. For all other mixtures, see Section 52-9.02 to determine the appropriate HMA mixture designation.

** If underdrain warrants are not met, Intermediate OG25.0 mm mix should be replaced with HMA Base 25.0 mm, minimum 270 kg/m².

FULL DEPTH HMA PAVEMENT,
10 MILLION ≤ ESALs < 30 MILLION
Figure 52-13B



* Mainline Pavement (Section With Shoulders)

① 90 kg/m² HMA Surface 9.5 mm
② 150 kg/m² HMA Intermediate 19.0 mm
③ 150 kg/m² Minimum HMA Base 19.0 mm STET
** ④ 140 kg/m² Minimum QC/QA-HMA Intermediate OG19.0 mm
⑤ 180 kg/m² QC/QA-HMA Base 19.0 mm
⑥ Subgrade Treatment
⑩ Pipe, Type 4, Circular, 150 mm

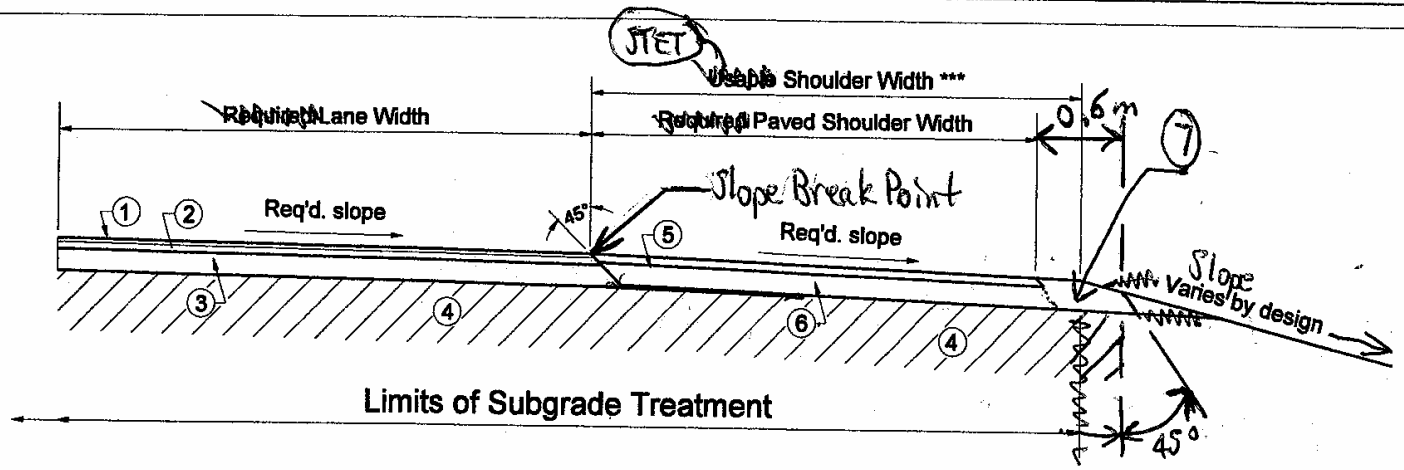
* Shoulders

⑦ 90 kg/m² HMA Surface 9.5 mm
⑧ 270 kg/m² HMA Base 25.0 mm
⑨ Compacted Aggregate Base, No. 53
(Depth equals mainline HMA thickness minus 150 mm)
⑪ Variable-Depth Compacted Aggregate Base, No. 53

* Open graded mixtures OG19.0 mm or OG25.0 mm should be QC/QA-HMA, 5, 76. For all other mixtures, see Section 52-9.02 to determine the appropriate HMA mixture designation.

** Where underdrain warrants are not required, Intermediate OG19.0 mm mix should be replaced with HMA Base 19.0 mm, minimum 270 kg/m². QC/QA-HMA 150

FULL DEPTH HMA PAVEMENT,
1 MILLION ≤ ESALs <10 MILLION
Figure 52-13C



* Mainline (Section With Shoulders)

① 90 kg/m² HMA Surface 9.5 mm
② 150 kg/m² HMA Intermediate 19.0 mm
** ③ 480 kg/m² HMA Base ~~19.0~~ 25.0 mm
④ Subgrade Treatment

* Shoulders

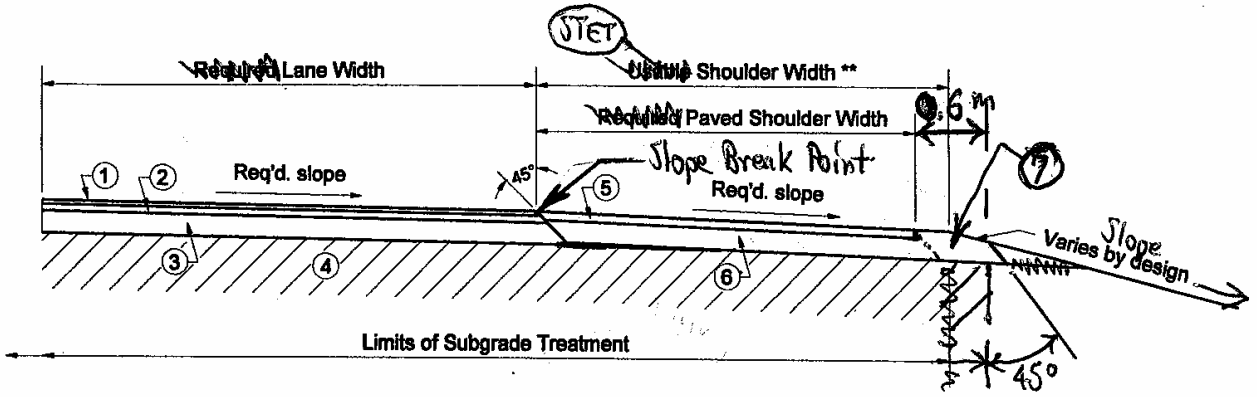
⑤ 180 kg/m² HMA Surface 9.5 mm ~~with Seal Coat~~ /2
⑥ ~~150~~ 225 mm Compacted Aggregate, ~~Base~~ No. 53
Or ⑤ & ⑥ may be replaced by
300 ~~150~~ mm Minimum Compacted Aggregate, ~~Base with Seal Coat~~ No. 53
⑦ Variable Depth Compacted Aggregate, ~~Base~~ No. 53

* Where underdrain warrants are not met, see Figure 52-13C.

** See Section 52-9.02 to determine the appropriate HMA mixture designation.

*** Earth may be substituted for compacted aggregate dependent on geometric requirements for the usable shoulder width outside the paved area.

FULL DEPTH HMA PAVEMENT, < 1 MILLION ESALs
Figure 52-13D



* Mainline (Section With Shoulders)

① 90 kg/m² HMA Surface 9.5 mm
② 150-330 kg/m² HMA Intermediate 19.0 mm
③ 125-200 mm Compacted Aggregate Base
① + ② + ③ ≥ 300 mm
④ Subgrade Treatment

* See Section 52-9.02 to determine the appropriate HMA mixture designation.

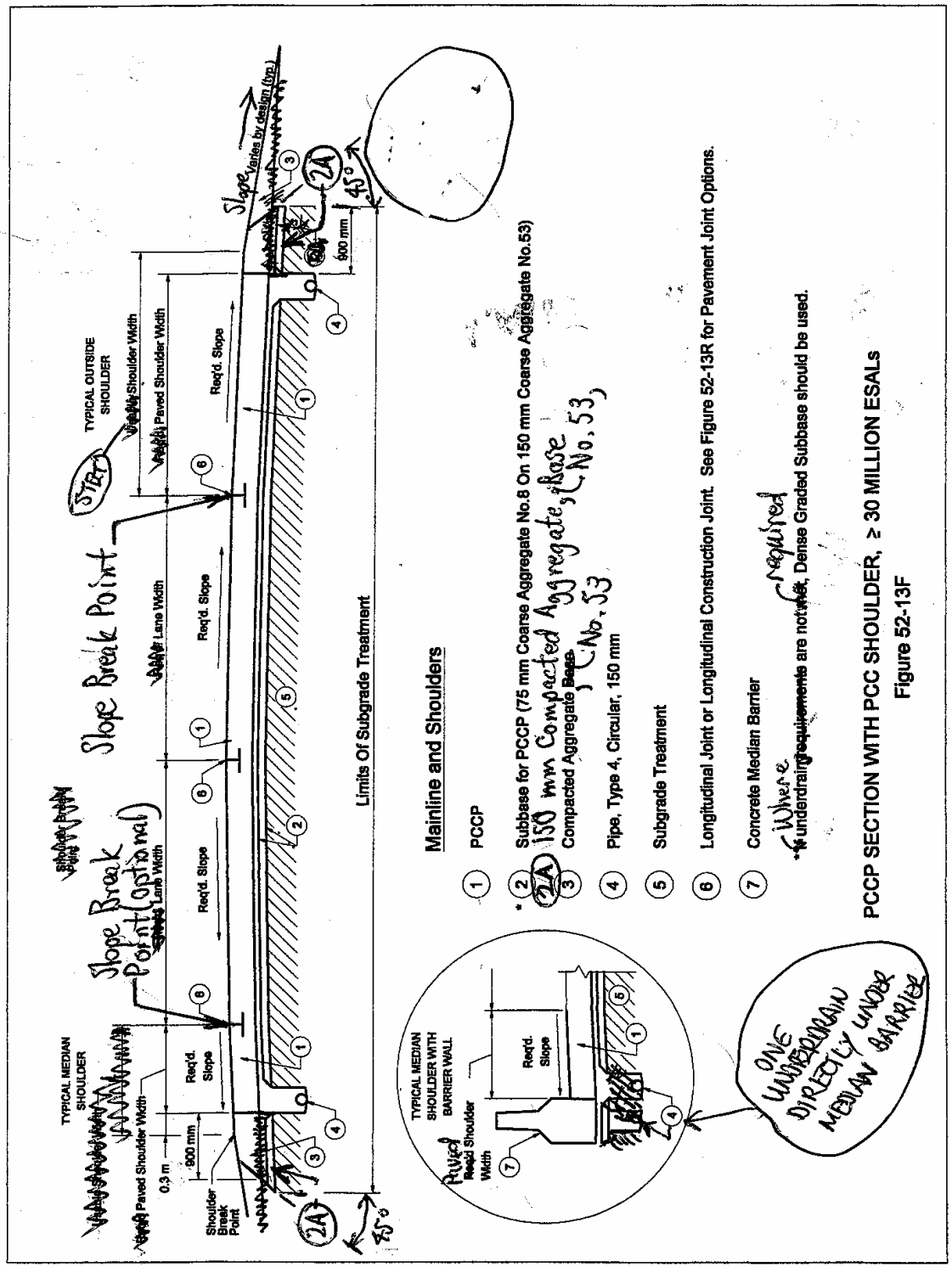
** Earth may be substituted for compacted aggregate dependent on geometric requirements for the usable shoulder width outside the paved area.

** Shoulders

⑤ 180 kg/m² HMA Surface 9.5 mm
⑥ ~~150~~ 225 mm Compacted Aggregate, ~~Base~~ No. 53
Or ⑤ & ⑥ may be replaced by
~~300~~ 250 mm Minimum Compacted Aggregate, ~~Base~~ No. 53
⑦ Variable Depth Compacted Aggregate, ~~Base~~ No. 53

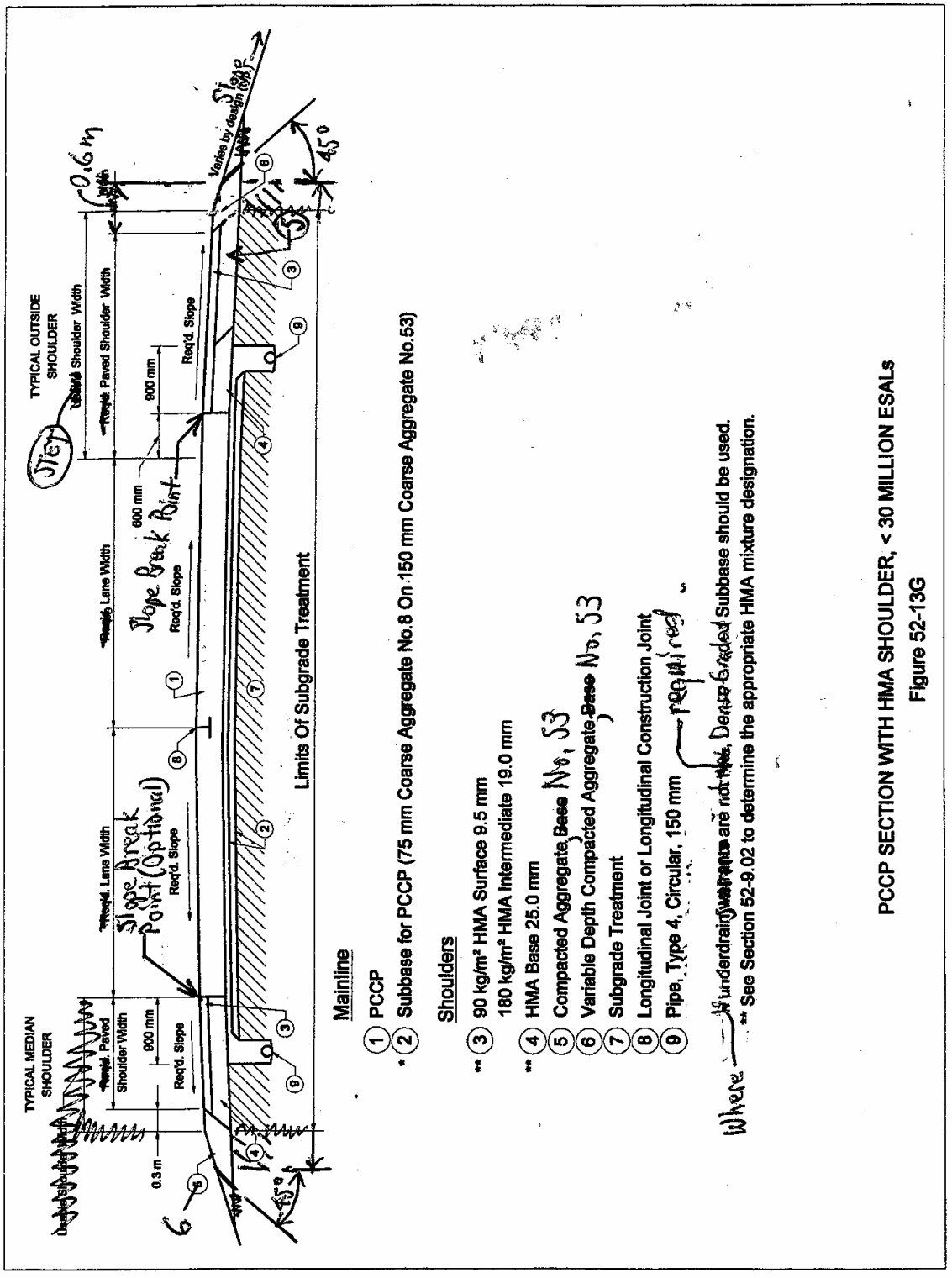
COMPOSITE HMA / COMPACTED AGGREGATE PAVEMENT
< 1 MILLION ESALs

Figure 52-13E



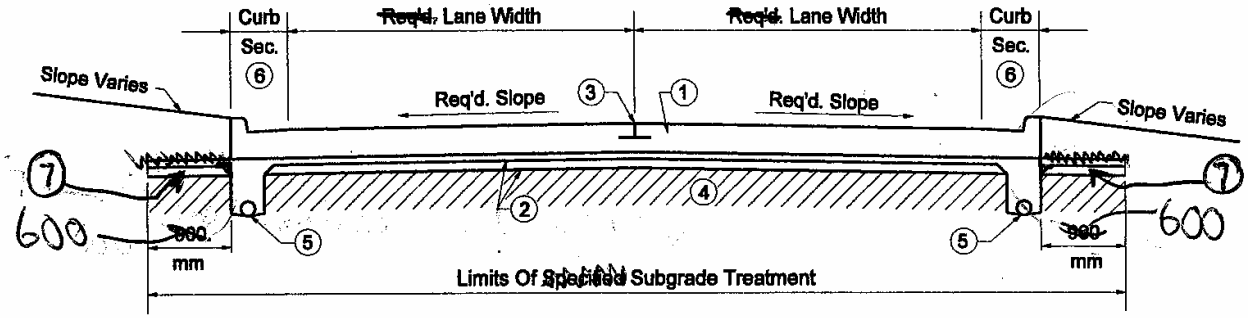
PCCP SECTION WITH PCC SHOULDER, ≥ 30 MILLION ESALs

Figure 52-13F



PCCP SECTION WITH HMA SHOULDER, < 30 MILLION ESALs

Figure 52-13G



Mainline

(1) PCCP

*(2) Subbase for PCCP (75 mm Coarse Aggregate #8 On 150 mm Coarse Aggregate #53)

(3) Longitudinal Joint or Longitudinal Construction Joint

(4) Subgrade Treatment

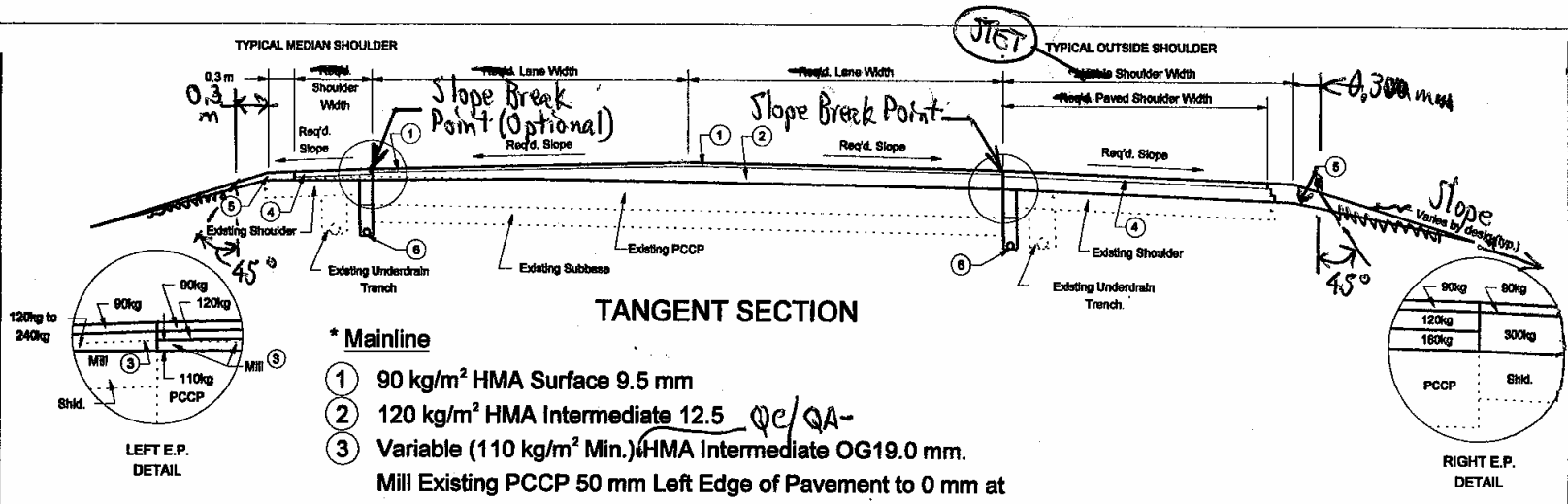
(5) Pipe, Type 4, Circular, 150 mm

(6) See Figure 52-13~~I~~Q for Geotextile Installation Requirements for Curbs (Required Only With Underdrains)

*~~K~~(Where underdrains ~~requirements~~ are not required, Dense Graded Subbase should be used.

(7) 150 mm Compacted Aggregate, No. 53

PCCP WITH CONCRETE CURB
Figure 52-13H



TANGENT SECTION

*** Mainline**

1. 90 kg/m² HMA Surface 9.5 mm
2. 120 kg/m² HMA Intermediate 12.5
3. Variable (110 kg/m² Min.) HMA Intermediate OG19.0 mm. Mill Existing PCCP 50 mm Left Edge of Pavement to 0 mm at Center of Passing Lane, Mill Shoulder to Match Pavement

*** Shoulder**

4. 90 kg/m² HMA Surface 9.5 mm on Variable HMA Intermediate 19.0 mm
5. Compacted Aggregate, ~~Base~~ No. 53
6. Pipe, Type 4, Circular, 100 mm

* Open graded mixture OG19.0 mm should be QC/QA-HMA, 5, 76. For all other mixtures, see Section 52-9.02 to determine the appropriate HMA mixture designation.

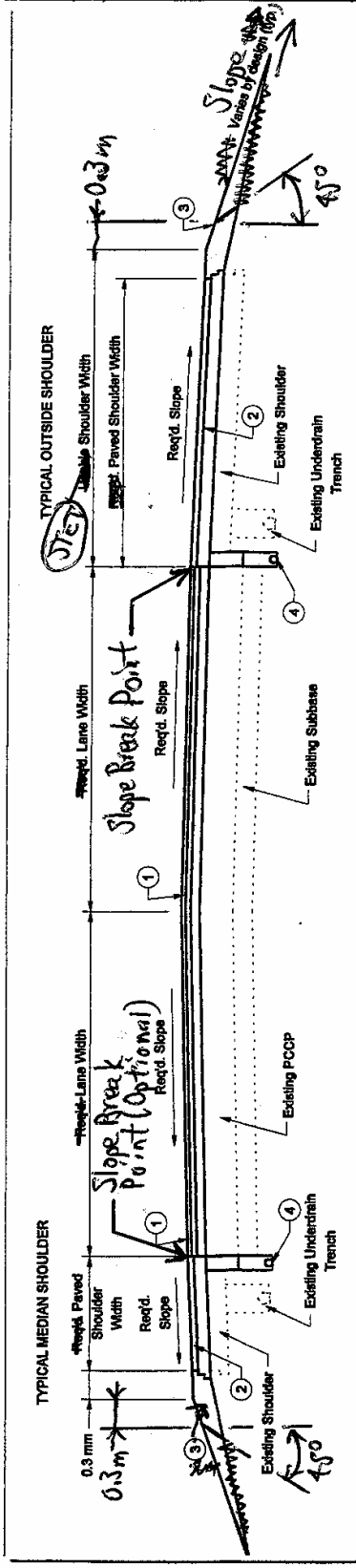
SUPERELEVATION SECTION

*** Mainline**

1. 90 kg/m² HMA Surface 9.5 mm
   120 kg/m² HMA Intermediate 12.5
2. Variable (110 kg/m² Min.) HMA Intermediate OG19.0 mm
3. Do not mill Existing PCCP

OVERLAY (TILT TO CROWN SECTION)

Figure 52-13 I



* Mainline

① 90 kg/m² HMA Surface 9.5 mm
120 kg/m² HMA Intermediate 12.5 mm
Variable depth QC/QA-HMA, 5, 76, Intermediate OG19.0 mm (110 kg/m² at Pavement Edge, 150 kg/m² at ℄)

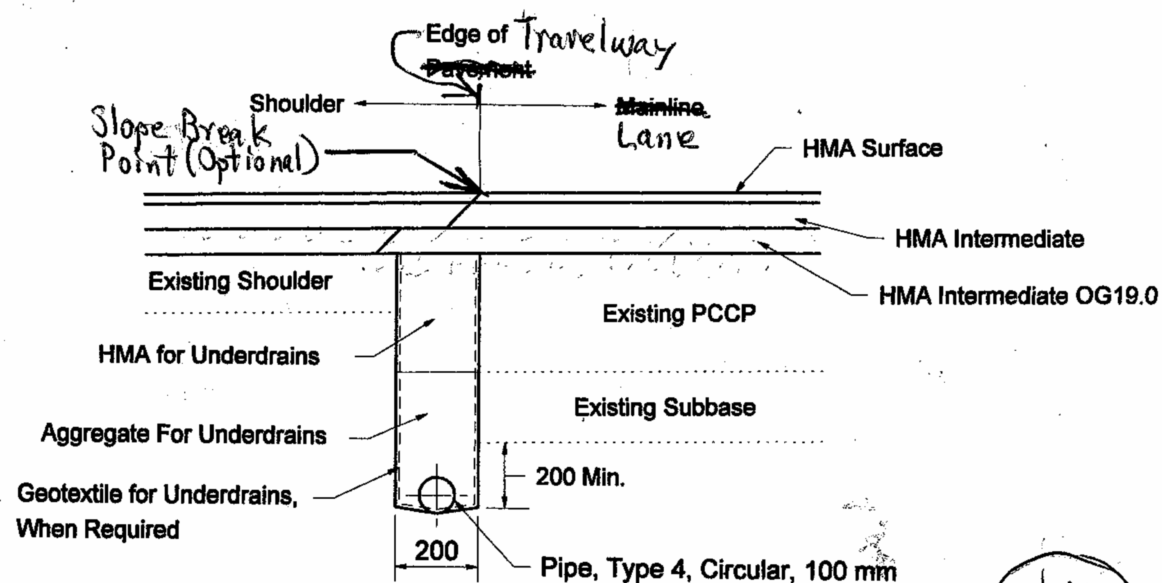
* Shoulder

② 90 kg/m² HMA Surface 9.5 mm on
240 kg/m² HMA Base 25.0 mm
③ Compacted Aggregate Base No. 53
④ Pipe, Type 4, Circular, 100 mm. See Figure 52-13K for Retrofit Underdrain Detail.

* Open graded mixture OG19.0 mm should be QC/QA-HMA, 5, 76. For all other mixtures, see Section 52-9.02 to determine the appropriate HMA mixture designation.

OVERLAY (CROWN TO CROWN SECTION)

FIGURE 52-13J

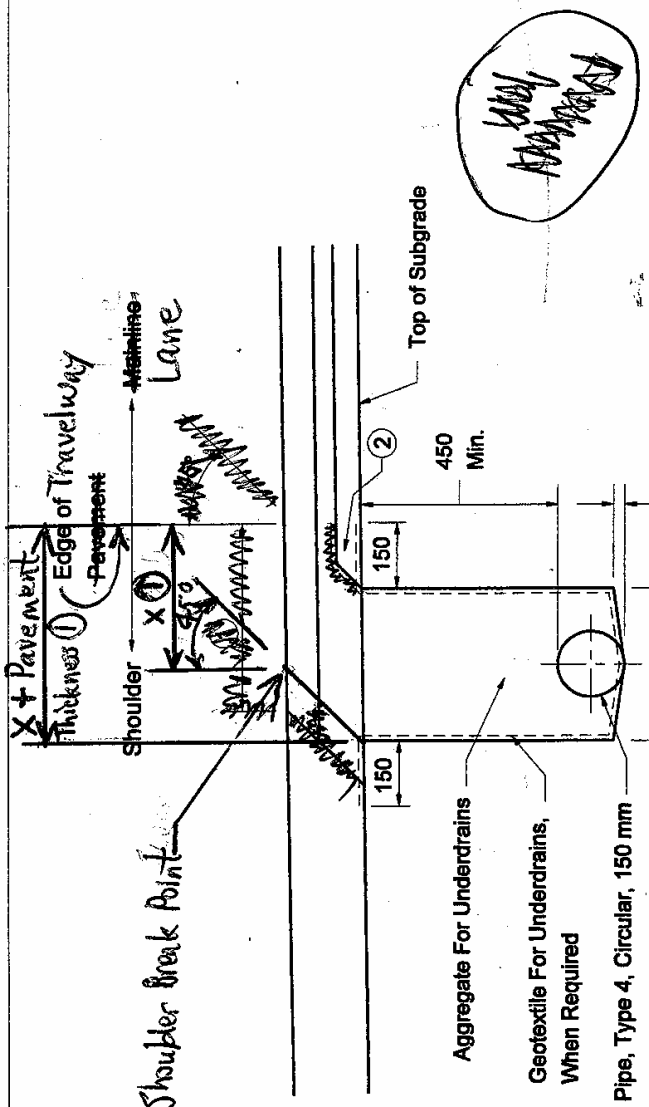


Notes:

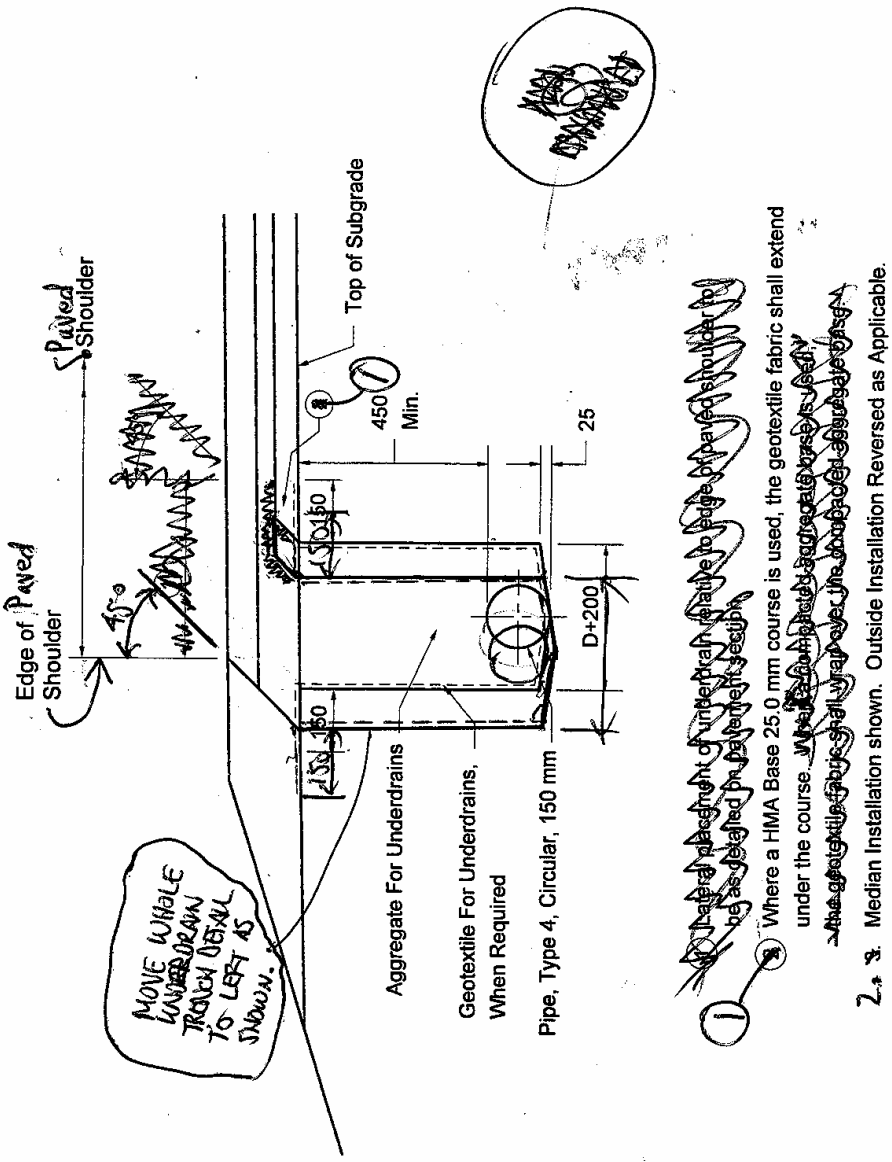
1. Open graded mixture OG19.0 mm should be QC/QA-HMA, 5, 76. For all other mixtures, see Section 52-9.02 to determine the appropriate HMA mixture designation.
2. Median installation shown. Outside installation reversed as appropriate. However, slope break point is required.

RETROFIT UNDERDRAIN

Figure 52-13K

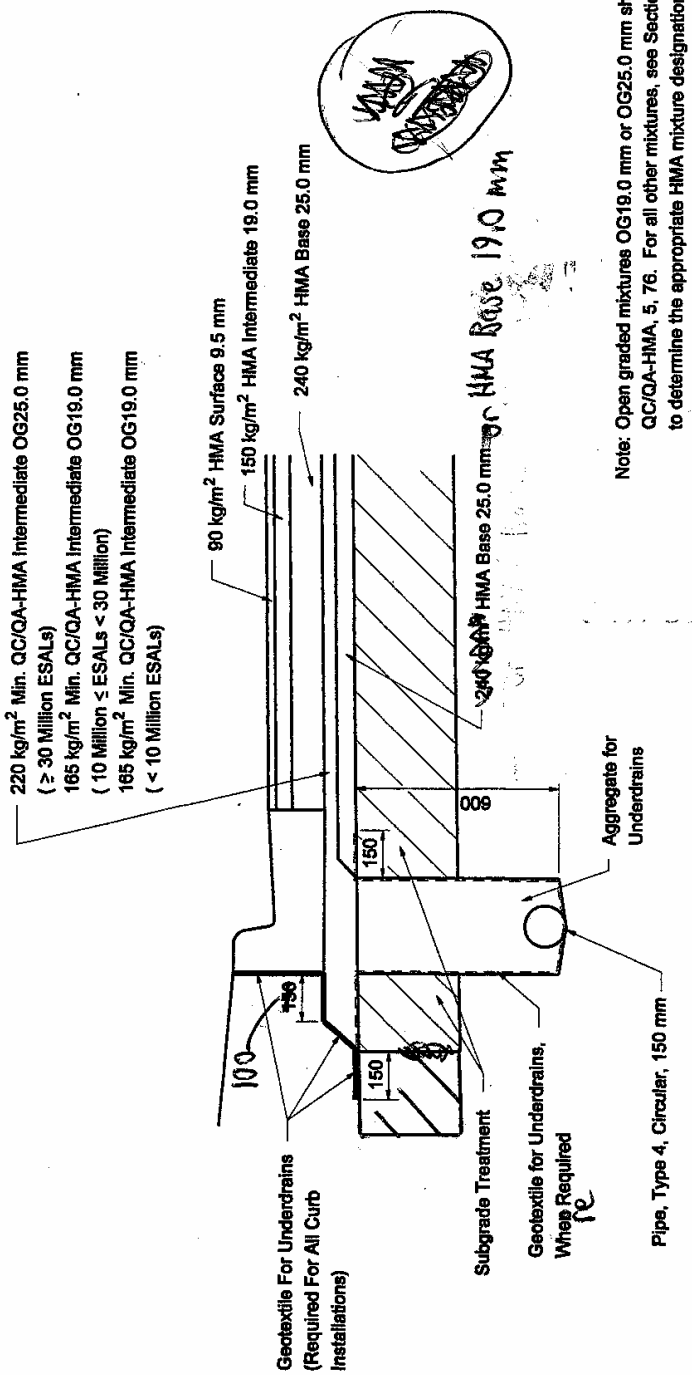


UNDERDRAIN FOR HMA PAVEMENT
< 30 MILLION ESALs
Figure 52-13L



UNDERDRAIN FOR HMA PAVEMENT
≥ 30 MILLION ESALs
Figure 52-13M

All dimensions are in mm unless otherwise noted

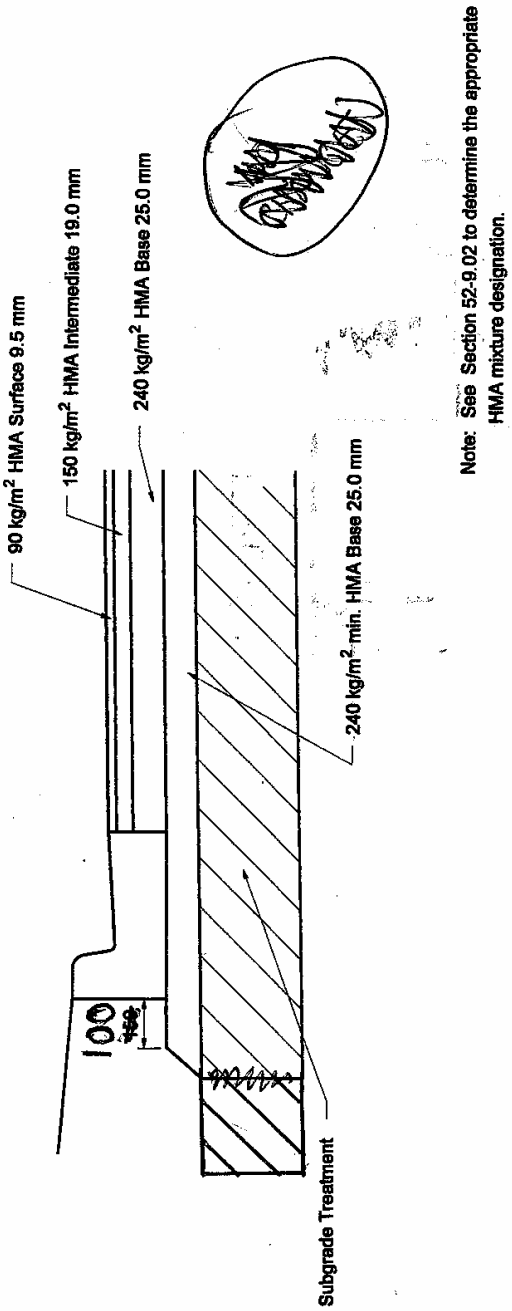


Note: Open graded mixtures OG19.0 mm or OG25.0 mm should be QC/QA-HMA, 5, 76. For all other mixtures, see Section 52-8.02 to determine the appropriate HMA mixture designation.

CONCRETE CURB AND GUTTER SECTION FOR HMA PAVEMENT WITH UNDERDRAIN

Figure 52-13N

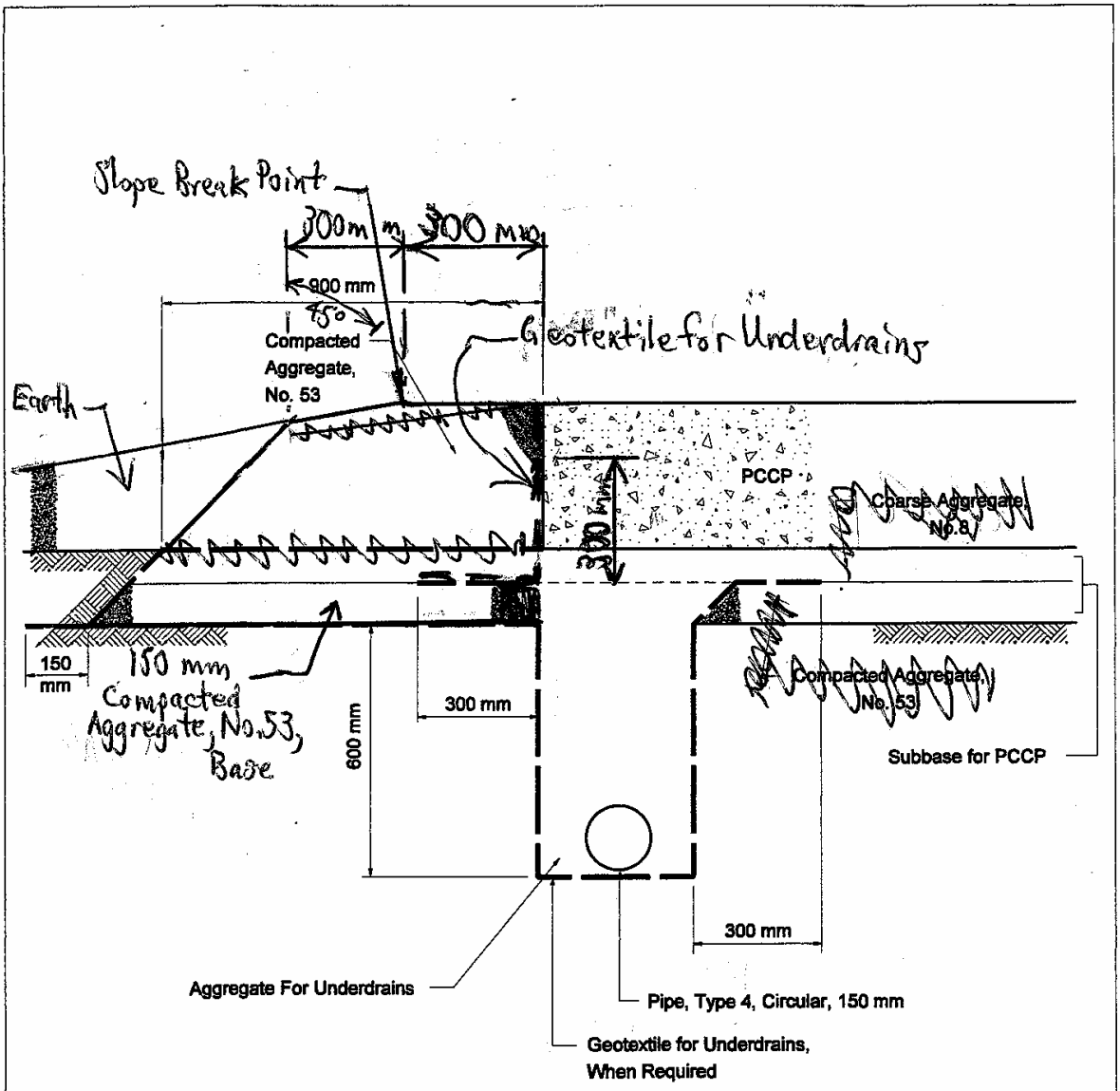
All dimensions are in mm unless otherwise noted



CONCRETE CURB AND GUTTER SECTION FOR HMA PAVEMENT
WITHOUT UNDERDRAIN

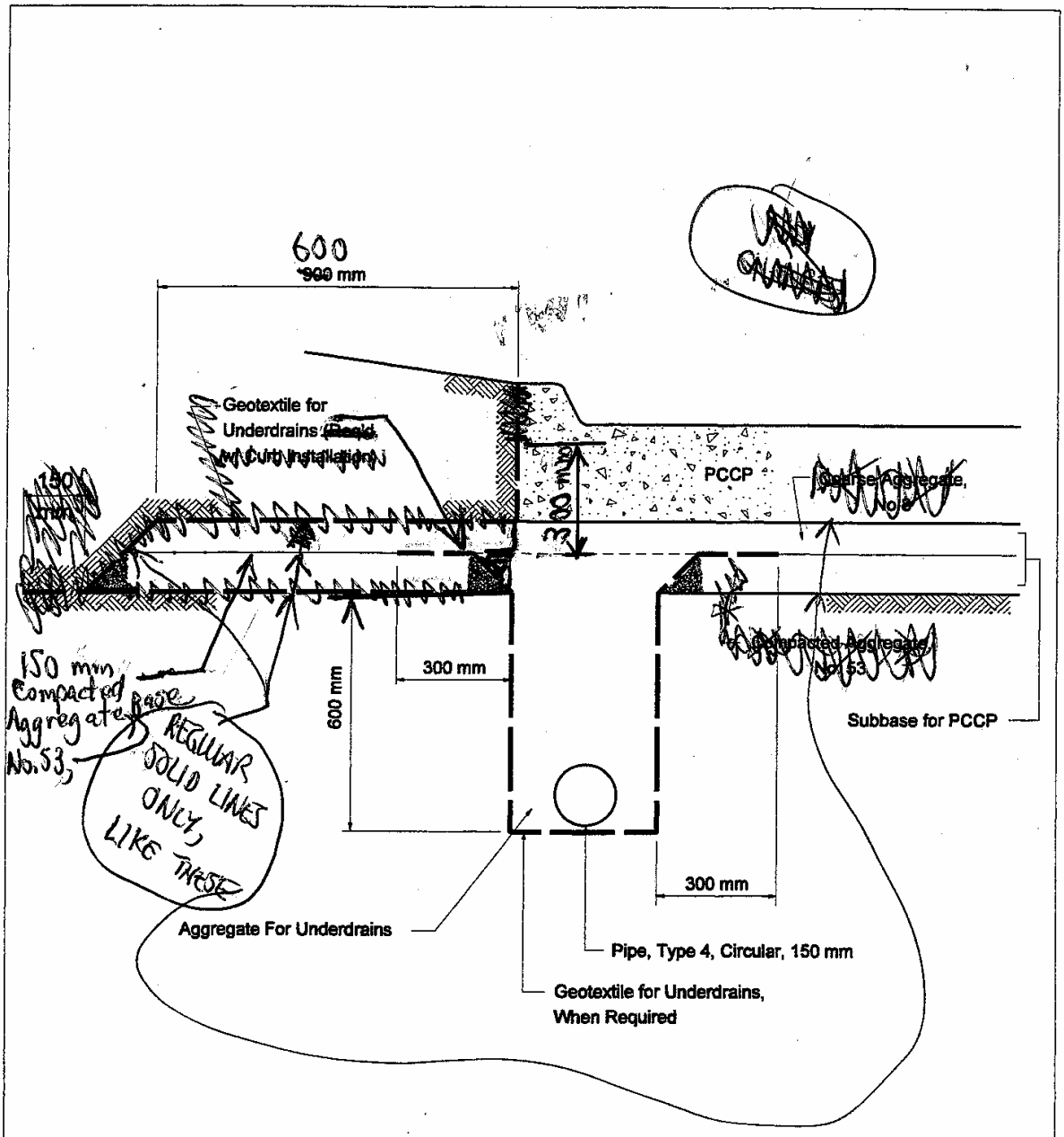
Figure 52-13 O

All dimensions are in mm unless otherwise noted



PCCP WITH UNDERDRAIN

Figure 52-13P

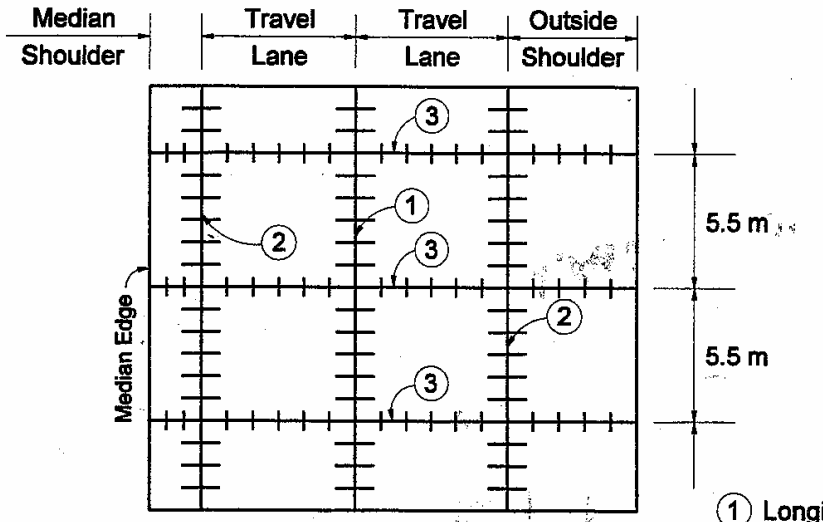


CURBED PCCP
WITH UNDERDRAIN

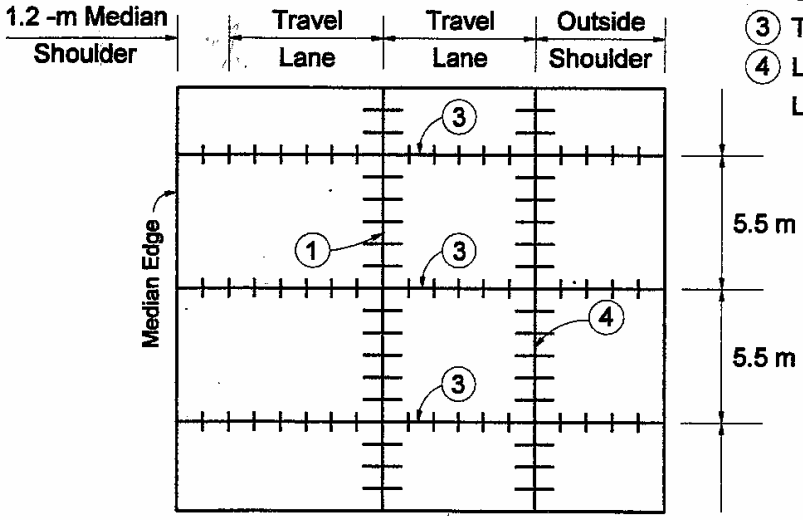
Figure 52-13Q

Note: Option to be determined by the contractor.

OPTIONS A AND B:



OPTION C:

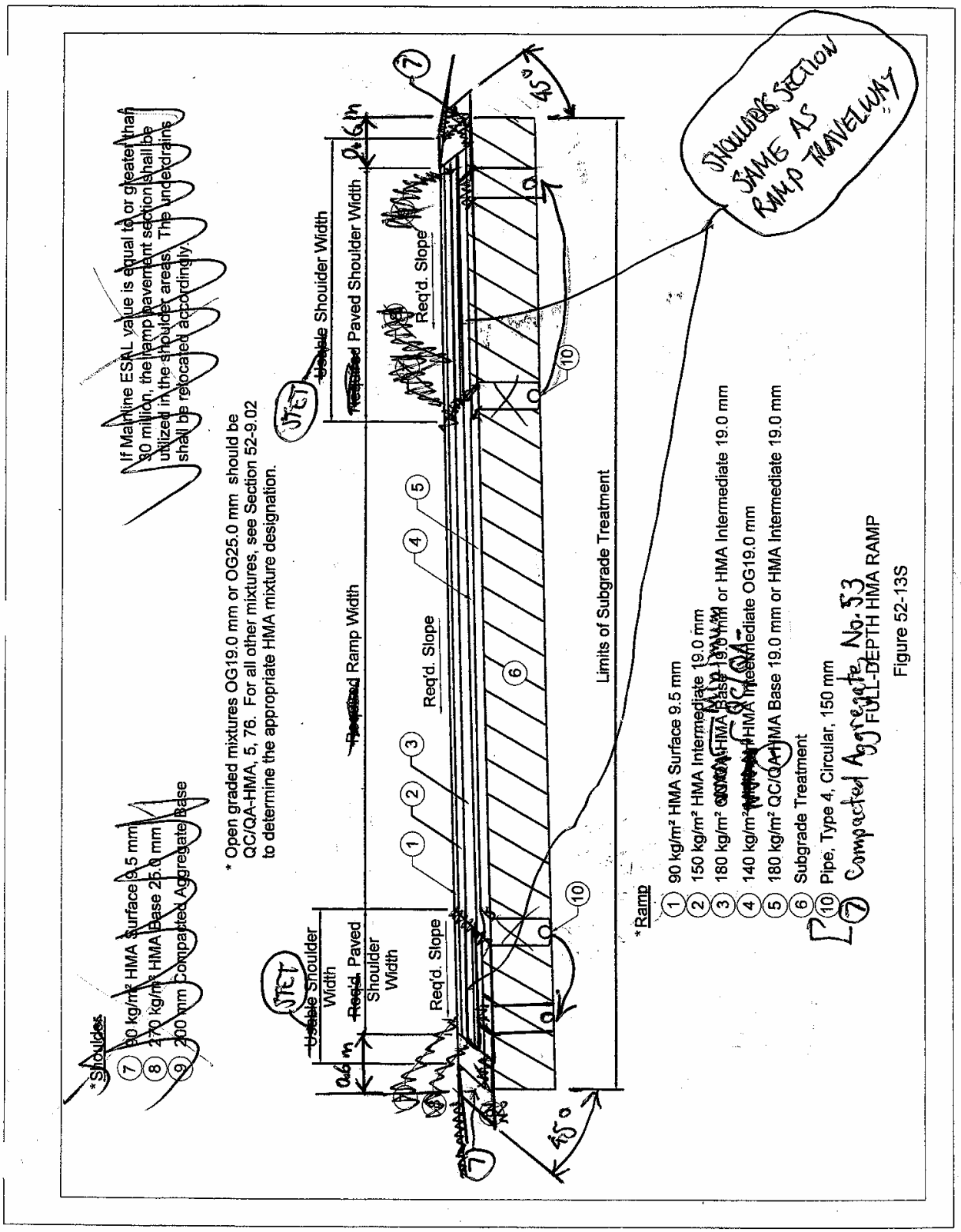


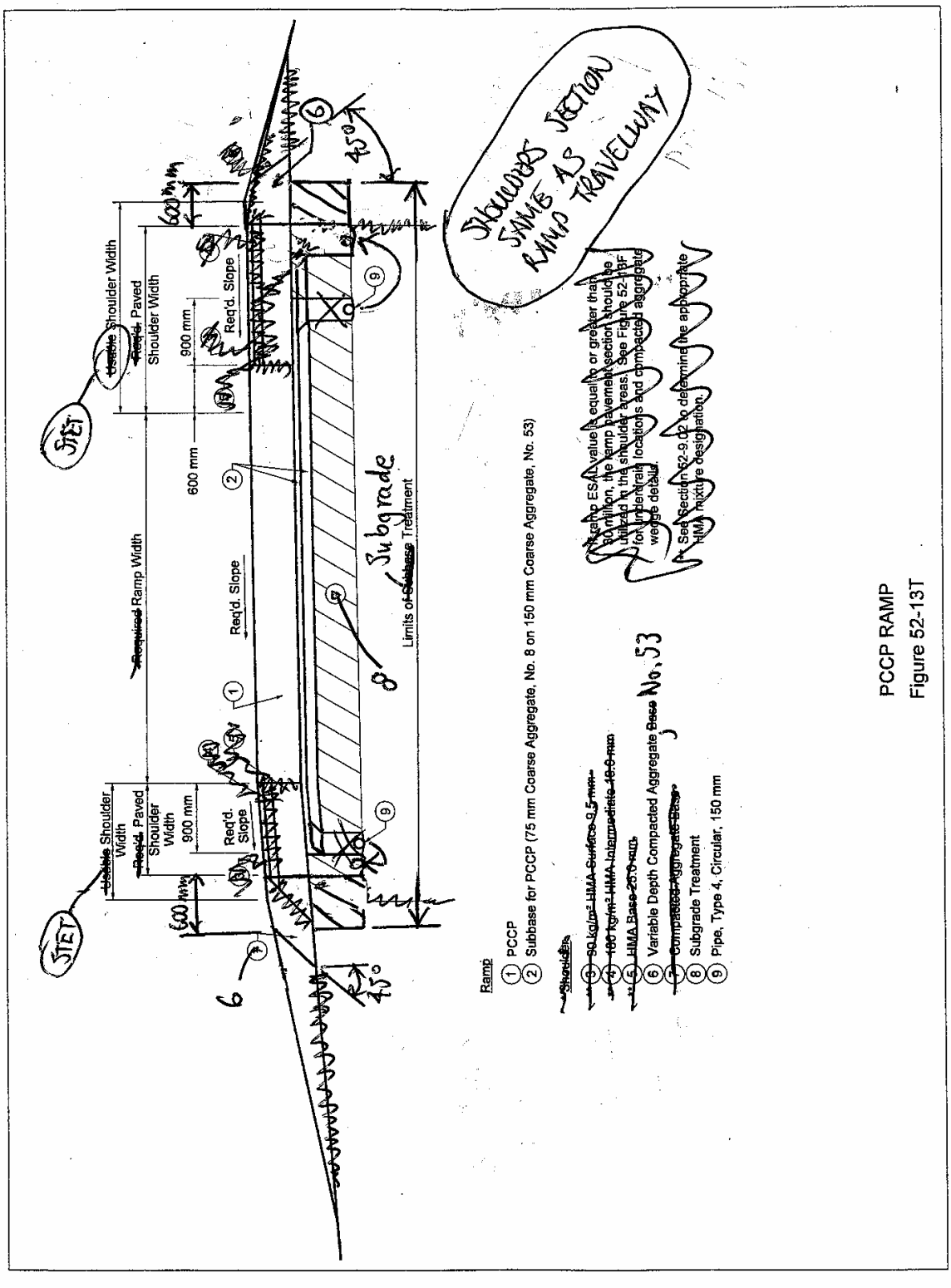
(1) Longitudinal Joint
(2) Option A: Longitudinal Joint
Option B: Longitudinal Constr. Joint
(3) Type D-1 Contraction Joint
(4) Longitudinal Joint or Longitudinal Constr. Joint

NO CHANGES

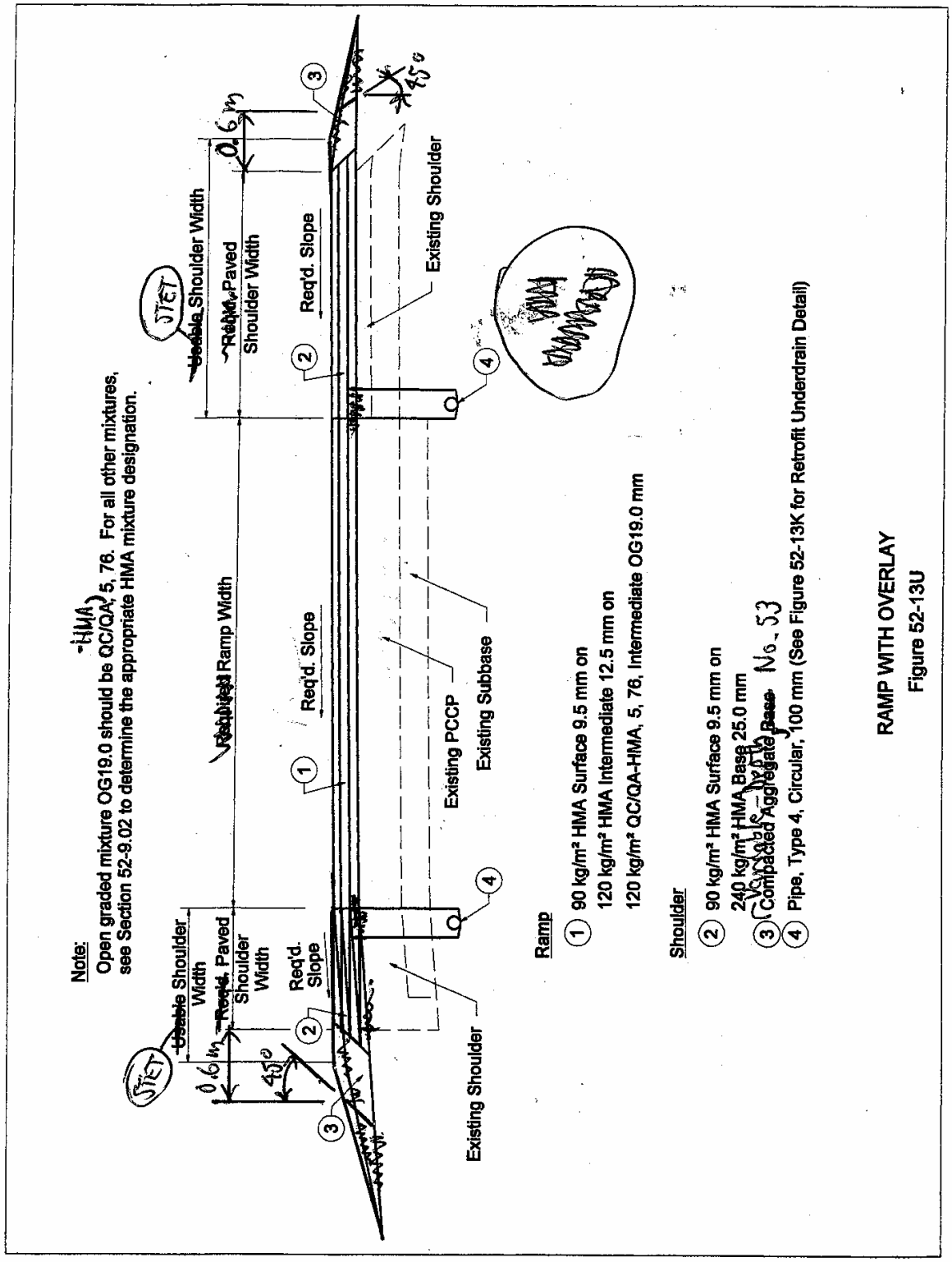
MEDIAN EDGE OF CONCRETE PAVEMENT LONGITUDINAL JOINT OPTIONS

Figure 52-13R


If Mainline ESAL value is equal to or greater than 30 million, the ramp pavement section shall be utilized in the shoulder areas. The underdrains shall be relocated accordingly.
* Open graded mixtures OG19.0 mm or OG25.0 mm should be QC/QA-HMA, 5, 76. For all other mixtures, see Section 52-9.02 to determine the appropriate HMA mixture designation.
Usable Shoulder Width
Required Paved Shoulder Width
Req'd. Slope
Required Ramp Width
Limits of Subgrade Treatment
45°
SHOULDER SECTION SAME AS RAMP TRAVELWAY
*Shoulders
7 90 kg/m² HMA Surface 9.5 mm
8 170 kg/m² HMA Base 25.0 mm
9 200 mm Compacted Aggregate Base
*Ramp
1 90 kg/m² HMA Surface 9.5 mm
2 150 kg/m² HMA Intermediate 19.0 mm
3 180 kg/m² QC/QA-HMA Base 19.0 mm or HMA Intermediate 19.0 mm
4 140 kg/m² QC/QA-HMA Intermediate OG19.0 mm
5 180 kg/m² QC/QA-HMA Base 19.0 mm or HMA Intermediate 19.0 mm
6 Subgrade Treatment
10 Pipe, Type 4, Circular, 150 mm
7 Compacted Aggregate No. 53
FULL-DEPTH HMA RAMP
Figure 52-13S



PCCP RAMP
Figure 52-13T



Note:
Open graded mixture OG19.0 should be QC/QA, 5, 76. For all other mixtures, see Section 52-9.02 to determine the appropriate HMA mixture designation.

Ramp

① 90 kg/m² HMA Surface 9.5 mm on
120 kg/m² HMA Intermediate 12.5 mm on
120 kg/m² QC/QA-HMA, 5, 76, Intermediate OG19.0 mm

Shoulder

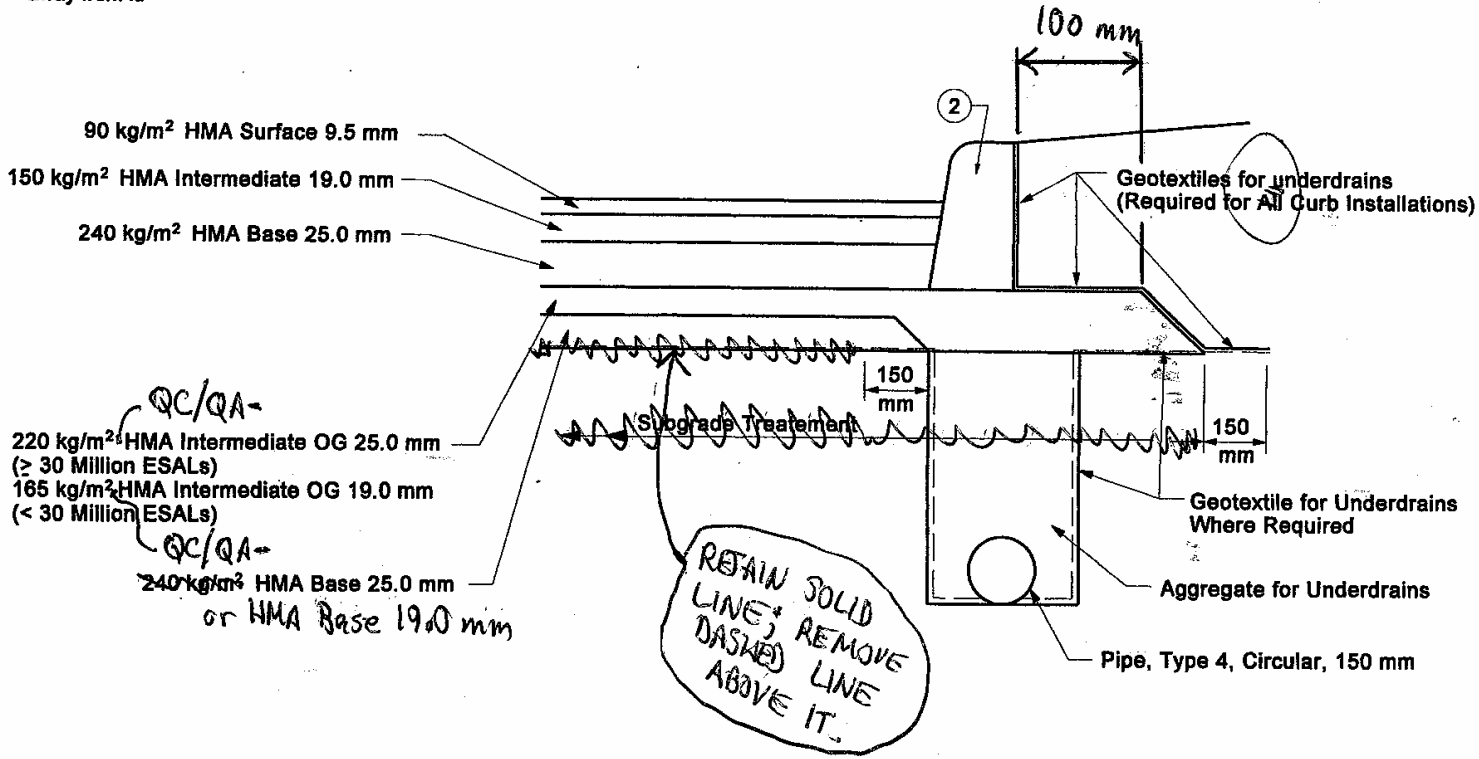
② 90 kg/m² HMA Surface 9.5 mm on
240 kg/m² HMA Base 25.0 mm
③ Compacted Aggregate Base
④ Pipe, Type 4, Circular, 100 mm (See Figure 52-13K for Retrofit Underdrain Detail)

RAMP WITH OVERLAY
Figure 52-13U

Notes:

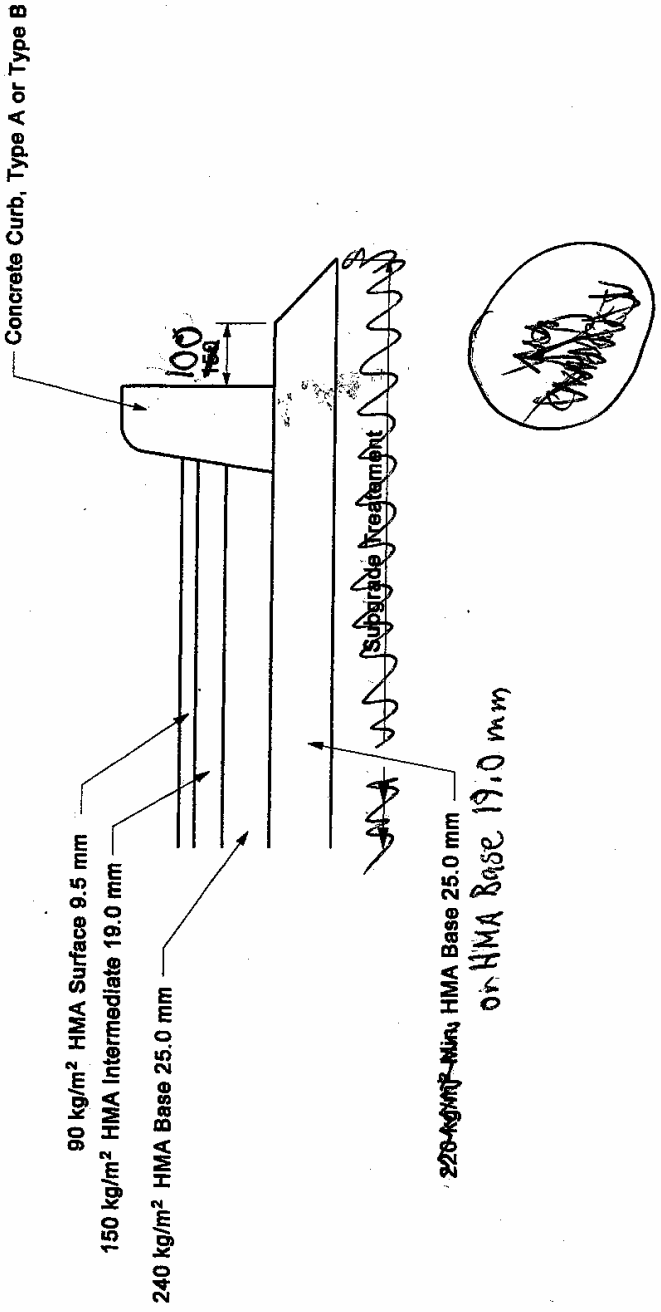
1. Open graded mixtures OG 19.0 mm or OG 25.0 mm should be QC/QA-HMA, 5, 76. For all other mixtures, see Section 52-9.02 to determine the appropriate HMA mixture designation.

(2) Concrete Curb and Gutter, Type A desirable. Type B curb may be used where drainage is away from it.



HMA PAVEMENT WITH CONCRETE CURB AND UNDERDRAIN

Figure 52-13V



HMA PAVEMENT WITH CONCRETE CURB AND NO UNDERDRAIN
Figure 52-13W

Notes:
See Section 52-9.02 to determine the appropriate HMA mixture designation.

Light-Duty HMA / Aggregate Composite Section
(Equivalent to Class II Drive Section):

90 kg/m^2 HMA Surface Type A on
150 kg/m^2 Intermediate Type A on
~~200~~ mm Min. Compacted Aggregate Base, No. 53

Medium-Duty HMA / Aggregate Composite Section
(Equivalent to Class IV Drive Section):

90 kg/m^2 HMA Surface Type B on
150 ~~270~~ kg/m^2 Intermediate Type B on
200 ~~150~~ mm Min. Compacted Aggregate Base, No. 53

Heavy-Duty HMA / Aggregate Composite Section
(Equivalent to Class VI Drive Section):

90 kg/m^2 HMA Surface Type B on
330 kg/m^2 Intermediate Type B on
250 mm Min. Compacted Aggregate Base, No. 53

PCCP Section:

150 mm Min. PCCP for Approaches on
150 mm Dense Grade Subbase

PARKING LOT PAVEMENT SECTIONS

Figure 52-13X

43-3.06 Shoulder Superelevation

43-3.06(01) High Side Shoulder

On the high side of superelevated sections, the following criteria will apply to the shoulder slope:

1. Typical Application. The high-side shoulder will be sloped as follows:

   a. If the superelevation rate on the curve is 4% or less, typically use 4% (its normal cross slope).

   b. If the superelevation rate on the curve is greater than 4% but less than or equal to 6%, typically use 2% down away from the traveled way.

   c. If the superelevation rate on the curve is greater than 6%, typically use 1% towards the traveled way.

REPLACE WITH (1)

~~d. Where the 1.2 m wide paved median shoulder is the high-side shoulder, it should be sloped, preferably, in the same plane as the pavement.~~

(1)

d. Where the ~~1.2-m wide~~ paved median shoulder is the high-side shoulder *and is 1.2 m or narrower*, it should ~~preferably~~ be sloped in the same plane as the ~~pavement~~ *travelway. See Figure 43-3M, Paved-Shoulder Cross Slopes, Superelevated Section, With Underdrains; or Figure 43-3N, Paved-Shoulder Cross Slopes, Superelevated Section, Without Underdrains, for more-specific information.*

Paved Shld. Width, w (m)	*High-Side Shoulder x-slope*	*Low-Side Shoulder x-slope*
$0.6 \leq w \leq 1.2$	*e*	*e*
$w > 1.2$	*e for 0.6 m Closest to Travel Lane, then ***	*e for 0.6 m Closest to Travel Lane, then ****

e = superelevation rate for travelway
*** as outlined in Section 43-3.06(01)*
**** as outlined in Section 43-3.06(02)*

PAVED-SHOULDER CROSS SLOPES
SUPERELEVATED SECTION, WITH UNDERDRAINS

Figure 43-3M

Paved Shld. Width, w (m)	*High-Side Shoulder x-slope*	*Low-Side Shoulder x-slope*
$0 \leq w \leq 0.6$	*e*	*e*
$0.6 < w \leq 1.2$	*e*	*e*
$w > 1.2$	**	***

e = superelevation rate for travelway
*** as outlined in Section 43-3.06(01)*
**** as outlined in Section 43-3.06(02)*

PAVED-SHOULDER CROSS SLOPES
SUPERELEVATED SECTION, WITHOUT UNDERDRAINS

Figure 43-3N

2. Maximum Rollover. Where the typical application cannot be provided, the high-side shoulder must be sloped such that the algebraic difference between the shoulder and adjacent travel lane will not exceed 8%.

3. Shoulder as Deceleration Lane. At some intersections, drivers may use a paved shoulder as a right-turn lane on a superelevated horizontal curve. Chapter Forty-six presents cross slope breakover criteria between a turning roadway and a through travel lane at an intersection at-grade. Where the shoulder is used by turning vehicles, the designer should limit the shoulder rollover to the turning roadway breakover criteria (4% to 5%).

43-3.06(02) Low Side (Inside) Shoulder

On the low side of a superelevated section, typical practice is to retain the normal shoulder slope until the adjacent superelevated travel lane reaches that slope. The shoulder is then superelevated concurrently with the travel lane until the design superelevation is reached (i.e., the inside shoulder and travel lane will remain in a plane section).

7. improving sight distance around horizontal curves;

8. enhancing highway aesthetics;

9. facilitating maintenance operations (e.g., snow storage);

10. providing additional lateral clearance to roadside appurtenances (e.g., guardrail, traffic signals);

11. facilitating pavement drainage;

12. providing space for pedestrian and bicycle use; and

13. providing space for bus stops.

45-1.02(03) Widths

Shoulder widths will vary according to functional classification, traffic volumes, urban/rural location, curbed/uncurbed facilities and the project scope of work. The tables in Chapters Fifty-three through Fifty-six present the paved and usable shoulder width criteria for these various conditions. See Section 49-5.0 for shoulder widths where guardrail is required.

45-1.02(04) Surface Types

For new or reconstructed projects on State highways, all shoulders will be either paved with asphalt or concrete. Desirably, on 3R and partial 3R projects on State highways, the shoulder should be paved. However, sealed aggregate shoulders may be appropriate on some State highways. For non-State highways, desirably, the shoulder should be paved. However, a sealed aggregate or earth surface is acceptable.

REPLACE WITH (2)

45-1.02(05) Cross Slopes

The cross slope of the shoulder varies according to the shoulder type and width. It should be the same across the full width of the usable shoulder. One exception is noted in Section 55-4.03(02) Item 4. The tables in Chapters Fifty-three through Fifty-six provide the cross slopes used for each classification. For narrow shoulders (e.g., shoulder widths that are less than 1.2 m), the shoulder cross slope will typically be the same as the adjacent travel lane. The following summarizes INDOT and local public agency practices.

1. Paved. Typical cross slopes for paved shoulders are 4%.

45-1.02(05) Cross Slopes

(2)

The cross slope of the shoulder varies according to the shoulder type and width. It should be the same across the full width of the usable shoulder. One exception is noted in Section 55-4.03(02) Item 4. The tables in Chapters Fifty-three through Fifty-six provide the cross slopes used for each classification. For ~~narrow shoulders (e.g.,~~ *a paved* shoulder ~~widths that are less than~~ *of* 1.2 m ~~)~~ *or narrower*, the shoulder cross slope ~~will typically~~ *should* be the same as that of the adjacent travel lane. *See Figure 45-1A(1), Paved-Shoulder Cross Slopes and Pavement Treatments, Tangent Section, With Underdrains; or Figure 45-1A(2), Paved-Shoulder Cross Slopes and Pavement Treatments, Tangent Section, Without Underdrains.*

Paved Shld. Width, w (m)	*Shoulder x-slope*	*Shoulder Pavement Section*
$0.6 \leq w \leq 1.2$	*2% ***	*Same as Travelway*
$w > 1.2$	*2% **, for 0.6 m, then 4%*	*Same as Travelway for 0.6 m, then 90 kg/m^2 HMA Surface, 270 kg/m^2 HMA Base, 150 mm comp. agg.**

** If less than 1 million ESALs, this should be 180 kg/m^2 on 150 mm comp. agg.*
*** Where the travelway tangent cross slope differs from 2%, the shoulder cross slope should match the travelway cross slope.*

PAVED-SHOULDER CROSS SLOPES AND PAVEMENT TREATMENTS, TANGENT SECTION, WITH UNDERDRAINS

Figure 45-1A(1)

Paved Shld. Width, w (m)	*Shoulder x-slope*	*Shoulder Pavement Section*
$0 \leq w \leq 0.6$	*2% ***	*Same as Travelway*
$0.6 < w \leq 1.2$	*2% ***	*90 kg/m^2 HMA Surface, 270 kg/m^2 HMA Base, 150 mm comp. agg.**
$w > 1.2$	*4%*	*90 kg/m^2 HMA Surface, 270 kg/m^2 HMA Base, 150 mm comp. agg.**

** If less than 1 million ESALs, this should be 180 kg/m^2 on 150 mm comp. agg.*
*** Where the travelway tangent cross slope differs from 2%, the shoulder cross slope should match the travelway cross slope.*

PAVED-SHOULDER CROSS SLOPES AND PAVEMENT TREATMENTS, TANGENT SECTION, WITHOUT UNDERDRAINS

Figure 45-1A(2)

The following summarizes INDOT and local public agency practices.

should be reduced according to the AASHTO *Guide for Design of Pavement Structures,* Part III, Chapter 5, Table 5.2, Suggested Layer Coefficients for Existing AC Pavement Layer Materials.

52-9.02(06) Shoulders

For HMA shoulders of less than 1.2 m in width, the project designer should specify the same HMA pay item designation and thickness as used for the mainline. For HMA shoulders greater than or equal to 1.2 m in width, the project designer should specify the HMA pay item designation for the appropriate ESAL level identified in Section 52-13.0.

Shoulder corrugations should be in accordance with Chapter Forty-nine.

REPLACE WITH (3)

52-9.02(07) [Section Deleted]

52-9.02(08) HMA Mixture for Approaches

HMA mixture for approaches is a mixture designated for driveways, public road approaches, crossovers, turn lanes, acceleration and deceleration lanes, mailbox approaches on non-paved shoulders, etc. It should be used for short projects where the HMA quantity is less than 200 Mg, i.e., bridge replacement or overlays, small structure replacement, etc., where the paving involves a large amount of handwork or non-paving movement of the paver and rollers.

For driveways, public road approaches and crossovers the limits and HMA section for HMA mixtures for approaches are shown on the INDOT *Standard Drawings.* Where the AADT exceeds the amount shown on the INDOT *Standard Drawings*, the HMA section must be determined in accordance with Section 52-8.0.

For public road approaches the limits for HMA mixtures for approaches may be extended to include up to an additional 30 m of pavement to meet project requirements. If the project requires more than 30 m of additional pavement, the public road approach will be designed and paid for as HMA mixtures for approaches and the additional pavement, will be designed and paid for in accordance with Section 52-8.0.

52-9.02(06) Shoulders

(3)

For HMA *paved* shoulders of ~~less than~~ 1.2 m ~~in width~~ *or narrower*, the project designer should specify the same HMA pay item designation*s* and thickness*es* as *those* used for the ~~mainline~~ *adjacent travel lanes*. For HMA *paved* shoulders ~~greater than or equal to~~ *wider than* 1.2 m ~~in width~~, the project designer should specify the *thicknesses and* HMA pay item designation*s* for the appropriate ESAL level identified in the figures in Section 52-13.0.

For HMA paved shoulders of 1.2 m or narrower consisting of 360 kg/m^2 over 150 mm of compacted aggregate, the project designer should specify the same HMA pay item designation for the surface course as that of the travelway's HMA surface course.

Shoulder corrugations should be in accordance with ~~Chapter Forty-nine~~ *Section 45-1.02(06)*.

[F:\Des\05ShXSm-dm.doc]

Design Element				Manual Section	Rural	Urban
Design Controls	Design Forecast Year			40-2.02	20 Years	20 Years
	*Design Speed (km/h)			40-3.0	110	80-110 (1)
	Access Control			40-5.0	Full Control	Full Control
	Level of Service			40-2.0	Desirable: B Minimum: C	Desirable: B Minimum: C (2)
Cross Section Elements	Travel Lane	*Width		45-1.01	3.6 m	3.6 m
		Surface Type(3)		Chp. 52	Asphalt / Concrete	Asphalt / Concrete
	Shoulder	*Right Width(4)		45-1.02	Usable: 3.3 m Paved: 3.0 m	Usable: 3.3 m Paved: 3.0 m
		*Left Width(5)			2 Ln: D 2.4, M 1.2 m Paved; 3 Ln: 3.0 m Paved	2 Lanes: 1.2 m Paved 3 Lanes: 3.0 m Paved
		Surface Type(3)		Chp. 52	Asphalt / Concrete	Asphalt / Concrete
	Cross Slope	*Travel Lane (6)		45-1.01	Paved 2%	Paved 2%
		Shoulder		45-1.02	*Width ≤ 1.2 m: 2%; Width > 1.2 m: 4%* (6A)	*Width ≤ 1.2 m: 2%; Width > 1.2 m: 4%* (6A)
	Auxiliary Lanes	*Lane Width		45-1.03	3.6 m	3.6 m
		*Shoulder Width			Right: 3.0 m (7) Left: 1.2 m	Right: 3.0 m (7) Left: 1.2 m
	Median Width	Depressed		45-2.0	Desirable: 25 m Minimum: 18 m	Desirable: 18 m Minimum: 7.9 m
		Flush (CMB)			Minimum: 8.0 m	Minimum: 8.0 m
	Clear Zone			49-2.0	(8)	(8)
	Side Slopes (9)	Cut	Foreslope	45-3.0	6:1 (10)	6:1 (10)
			Ditch Width		1.2 m (11)	1.2 m (11)
			Backslope		4:1 (12)	4:1 (12)
		Fill		45-3.0	6:1 to Clear Zone; 3:1 max. to Toe	6:1 to Clear Zone; 3:1 max. to Toe
	Median Slopes			45-2.02	Desirable: 8:1 Maximum: 5:1	Desirable: 8:1 Maximum: 5:1
Bridges	New and Reconstructed Bridges	*Structural Capacity		Chp. 60	HS-20 & Alternate Military Loading (13)	HS-20 & Alternate Military Loading (13)
		*Clear Roadway Width (14)		45-4.01	Full Paved Approach Width	Full Paved Approach Width
	Existing Bridges to Remain in Place	*Structural Capacity		Chp. 60	HS-20 & Alternate Military Loading (13)	HS-20 & Alternate Military Loading (13)
		*Clear Roadway Width		45-4.01	Travelway Plus 3.0 m Rt. & 1.2 m Lt. Shoulders	Travelway Plus 3.0 m Rt. & 1.2 m Lt. Shoulders
	*Vertical Clearance (Freeway Under) (15c)	New and Replaced Overpassing Bridges (15a)		44-4.0	5.05 m	5.05 m (15b)
		Existing Overpassing Bridges			4.90 m	4.90 m (15b)
		Sign Truss / Pedestrian Bridges (15a)			New: 5.35 m Existing: 5.20 m	New: 5.35 m Existing: 5.20 m
	Vertical Clearance (Freeway over Railroad) (16)			Chp. 69	7.00 m	7.00 m

* Controlling design criteria (see Section 40-8.0).

GEOMETRIC DESIGN CRITERIA FOR FREEWAYS
(New Construction / Complete Reconstruction)

Table 53-1

GEOMETRIC DESIGN CRITERIA FOR FREEWAYS
(New Construction/Complete Reconstruction)

Footnotes to Table 53-1

(1) Design Speed. An 80-km/h design speed may be considered in restrictive urban areas.

(2) Level of Service. A minimum Level of Service of "D" may be used on urban reconstruction projects.

(3) Surface Type. The pavement type selection will be determined by the INDOT Pavement Design Engineer.

(4) Shoulder Width (Right). The following will apply:

a. The shoulder is paved to the face of guardrail. The desirable guardrail offset is 0.6 m from the effective usable shoulder width. See Section 49-5.0 for more information.

b. Where the number of trucks exceeds 250 DDHV, a 3.6-m right shoulder should be used. If the 3.6-m shoulder is used, the usable shoulder width will be 3.9 m.

c. Usable shoulder width is defined as the distance from the edge of the travel lane to the shoulder break point.

(5) Shoulder Width (Left). The following will apply:

a. Typically, the usable shoulder width is equal to the paved shoulder width. The desirable guardrail offset is 0.6 m from the usable shoulder width. See Section 49-5.0 for more information.

b. Where there are 3 or more lanes in one direction and the volume of trucks exceed 250 DDHV, a 3.6-m left shoulder should be used.

c. For left shoulders greater than 1.2 m, the usable shoulder width will be 0.3 m more than the paved shoulder width.

(6) Cross Slope (Travel Lane). Cross slopes of 1.5% are acceptable on existing bridges to remain in place.

(6A) Cross Slope (Shoulder). *See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information.*

(7) Auxiliary Lane Shoulder Width (Right). On reconstruction projects, a 1.8-m right shoulder may be used.

(8) Clear Zone. The clear zone will vary according to design speed, traffic volumes, side slopes and horizontal curvature. See Section 49-2.0.

(9) Side Slopes. Values in the tables are for new construction. See Section 45-3.0 and section 45-8.0 for more information. For reconstruction projects, see Section 49-3.0.

(10) Foreslope. See Sections 49-2.0 and 49-3.0 for the lateral extent of the foreslope in a ditch section.

(11) Ditch Widths. In rock cuts, a V ditch should be used. See Section 45-8.0.

Design Element			Manual Section	2-Lane			Multi-Lane	
Design Controls	Design Year Traffic	AADT	40-2.01	< 400	400 ≤ AADT < 2000	≥ 2000	**Undivided	Divided
	Design Forecast Year		40-2.02	20 Years			20 Years	
	*Design Speed (km/h) (1)		40-3.0	Level: 100-110; Rolling: 80-100			100	110
	Access Control		40-5.0	Partial Control / None			Partial Control / None	
	Level of Service		40-2.0	Desirable: B; Minimum: C			Desirable: B; Minimum: C	
Cross Section Elements**	Travel Lane	*Width	45-1.01	3.6 m			3.6 m	
		Typical Surface Type (2)	Chp. 52	Asphalt / Concrete			Asphalt / Concrete	
	Shoulder (3)	*Width Usable	45-1.02	1.8 m	2.4 m	3.3 m (3b)	3.3 m (3b)	Right: 3.3 m (3b) Left: 1.2 m (3e)
		*Width Paved	45-1.02	1.2 m	1.8 m	3.0 m (3b)	3.0 m (3b)	Right: 3.0 m (3b) Left: 1.2 m (3e)
		Typical Surface Type (2)	Chp. 52	Asphalt / Concrete			Asphalt / Concrete	
	Cross Slope	*Travel Lane (4)	45-1.01	2%			2%	
		Shoulder	45-1.02	Paved Width ≤ 1.2 m: 2%; Width > 1.2 m: 4% (4A)			Paved Width ≤ 1.2 m: 2%; Width > 1.2 m: 4% (4A)	
	Auxiliary Lanes	Lane Width (5)	45-1.03	Desirable: 3.6 m; Minimum: 3.3 m			Desirable: 3.6 m; Minimum: 3.3 m	
		Shoulder Width (6)		Same as Next to Travel Lane			Same as Next to Travel Lane	
	Median Width		45-2.0	N/A			0.0 m	Desirable: 25.0 m Minimum: 4.8 m (7)
	Clear Zone		49-2.0	(8)			(8)	
	Side Slopes (9)	Cut – Foreslope	45-3.0	6:1 (10)			6:1 (10)	
		Cut – Ditch Width		1.2 m (11)			1.2 m (11)	
		Cut – Backslope		4:1 for 6.0 m; 3:1 Max. to Top (12)			4:1 for 6.0 m; 3:1 Max. to Top (12)	
		Fill	45-3.0	6:1 to Clear Zone; 3:1 Max. to Toe			6:1 to Clear Zone; 3:1 Max. to Toe	
	Median Slopes		45-2.02	N/A			Desirable: 8:1; Maximum: 5:1	
Bridges***	New and Reconstructed Bridges	*Structural Capacity	Chp. 60	HS-20 (13)				
		*Clear Roadway Width(14)	45-4.01	Full Paved Approach Width				
	Existing Bridges to Remain in Place	*Structural Capacity	Chp. 60	HS-20				
		*Clear Roadway Width	45-4.01	Travelway Plus 0.6 m on Each Side				
	*Vertical Clearance (Arterial Under)	New and Replaced Overpassing Bridges (15)	44-4.0	5.05 m				
		Existing Overpassing Bridges		4.30 m				
		Sign Truss / Pedestrian Bridges (15)		New: 5.35 m; Existing: 5.20 m				
	Vertical Clearance (Arterial Over Railroad) (16)		Chp. 69	7.00 m				

* Controlling design criteria (see Section 40-8.0). ** All multi-lane arterials on new locations should be designed as Divided.
*** Selection of the cross section and bridge elements is based on the design year traffic volumes irrespective of the design speed.

GEOMETRIC DESIGN CRITERIA FOR RURAL ARTERIALS
(New Construction / Reconstruction)
Table 53-2

GEOMETRIC DESIGN CRITERIA FOR RURAL ARTERIALS
(New Construction/Reconstruction)

Footnotes to Table 53-2

(1) Design Speed. The minimum design speed should equal the minimum value from the table or the anticipated posted speed limit after construction, whichever is greater. The state legal limit is 90 km/h on non-posted highways.

(2) Surface Type. The pavement type selection will be determined by the INDOT Pavement Design Engineer.

(3) Shoulder. The following will apply:

a. If there are 3 or more lanes in each direction and there is a median barrier, a 3.0 m paved shoulder and a 0.6 m offset is required.
b. On reconstruction projects, the usable shoulder width may be 3.0 m, and the paved width may be 2.4 m.
c. The shoulder is paved to the face of guardrail. The desirable guardrail offset is 0.6 m from the effective usable shoulder width. See Section 49-5.0 for more information.
d. Usable shoulder width is defined as the distance from the edge of the travel lane to the shoulder break point.
e. If there are three or more lanes in each direction, a full-width shoulder, 3.3 m usable and 3.0 m paved, is desirable.

(4) Cross Slope (Travel Lanes). Cross slopes of 1.5% are acceptable on existing bridges to remain in place. Where three or more lanes are sloped in the same direction, each successive pair of lanes may have an increased sideslope.

(4A) Cross Slope (Shoulder). See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information.

(5) Auxiliary Lane (Lane Widths). Truck climbing lanes will be 3.6 m.

(6) Auxiliary Lane (Shoulder Widths). At a minimum, a 0.6-m shoulder may be used adjacent to auxiliary lanes. At a minimum, shoulders adjacent to truck climbing lanes will be 1.2 m.

(7) Median Width (Flush). Values in the table are for new construction. Medians of less than 7.5 m should be avoided at intersections. Median widths of greater than 18 m are undesirable at signalized intersections or intersections that may become signalized in the foreseeable future. On reconstruction projects, the minimum flush median width is 4.2 m for roadways with left-turn lanes and 6.6 m for roadways with concrete median barrier.

(8) Clear Zone. The clear zone will vary according to design speed, traffic volumes, side slopes and horizontal curvature. See Section 49-2.0.

(9) Side Slopes. Values in the tables are for new construction. See Section 45-3.0 and Section 45-8.0 for more information. For reconstruction projects, see Section 49-3.0.

(10) Foreslope. See the Sections 49-2.0 and 49-3.0 for the lateral extent of the foreslope in a ditch section.

(11) Ditch Widths. In rock cuts, a "V" ditch should be used. See Section 45-8.0.

(12) Backslopes. Backslopes for rock cuts will vary according to the height of the cut and geotechnical factors. See Section 45-8.0 for typical rock cut sections.

Design Element				Manual Section	2-Lane			
Design Controls	Design Year Traffic	AADT		40-2.01	< 400	400 ≤ AADT < 1500	1500 ≤ AADT < 2000	> 2000
	Design Forecast Year			40-2.02	20 Years			
	*Design Speed (km/h) (2)	Level		40-3.0	60 - 90	80 - 90	80 - 90	100
		Rolling			60 - 90	60 - 90	60 - 90	80 - 90
	Access Control			40-5.0	None			
	Level of Service			40-2.0	Desirable.: B; Minimum: C			
Cross Section Elements**	Travel Lane	*Width		45-1.01	D: 3.6 m; M: 3.3 m	D: 3.6 m; M: 3.3 m	D: 3.6 m; M: 3.3 m (20)	3.6 m
		Typical Surface Type (3)		Chp. 52	Asphalt / Concrete			
	Shoulder (4)	*Width Usable		45-1.02	1.2 m	1.8 m	2.4 m	3.0 m
		*Width Paved		45-1.02	0.6 m	1.2 m	1.8 m	2.4 m
		Typical Surface Type (3)		Chp. 52	Asphalt / Concrete			
	Cross Slope	*Travel Lane (5)		45-1.01	2% - Paved			
		Shoulder		45-1.02	Paved: *Width ≤ 1.2 m: 2%; Width > 1.2 m: 4% (5A)*			
	Auxiliary Lanes	Lane Width		45-1.03	Des: Same as Through Lanes; Min: 3.3 m			Desirable: 3.6 m Minimum: 3.3 m
		Shoulder Width (6)			Same as Next to Travel Lane			
	Clear Zone			49-2.0	(7)			
	Side Slopes (8)	Cut	Foreslope	45-3.0	Des: 6:1; Max: 4:1 (9)			
			Ditch Width		1.2 m (10)			
			Backslope		4:1 for 6.0 m; 3:1 Max. to Top (11)			
		Fill		45-3.0	Des: 6:1 to Clear Zone; Max: 3:1 to Toe			
Bridges**	New and Reconstructed Bridges	*Structural Capacity		Chp. 60	HS-20 (12)			
		*Clear Roadway Width (13)		45-4.01	Full Paved Approach Width			
	Existing Bridges to Remain in Place	*Structural Capacity		Chp. 60	HS-15			
		*Clear Roadway Width (14)		45-4.01	6.6 m	6.6 m	7.2 m	8.4 m
	*Vertical Clearance (Collector Under)	New and Replaced Overpassing Bridges (15)		44-4.0	4.45 m			
		Existing Overpassing Bridges			4.30 m			
	Vertical Clearance (Collector Over Railroad) (16)			Chp. 69	7.00 m			

* Controlling design criteria (see Section 40-8.0). D or Des: Desirable; M or Min: Minimum
** Selection of the cross section and bridge elements is based on the design year traffic volumes irrespective of the design speed.

GEOMETRIC DESIGN CRITERIA FOR STATE RURAL COLLECTOR ROADS
(New Construction / Reconstruction)

Table 53-3

GEOMETRIC DESIGN CRITERIA FOR STATE RURAL COLLECTORS
(New Construction/Reconstruction)

Footnotes to Table 53-3

(1) (Note deleted.)

(2) Design Speed. The minimum design speed should equal the minimum value from the table or the anticipated posted speed limit after construction, whichever is greater. The state legal limit is 90 km/h on non-posted highways.

(3) Surface Type. The pavement type selection will be determined by the INDOT Pavement Design Engineer.

(4) Shoulder Width. The following will apply:

a. The shoulder is paved to the face of guardrail. The desirable guardrail offset is 0.6 m from the effective usable shoulder width. See Section 49-5.0 for more information.

b. Usable shoulder width is defined as the distance from the edge of the travel lane to the shoulder break point.

(5) Cross Slope (Travel Lanes). Cross slopes of 1.5% are acceptable on existing bridges to remain in place.

(5A) Cross Slope (Shoulder). See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information.

(6) Auxiliary Lane (Shoulder Widths). At a minimum, a 0.6-m shoulder may be used adjacent to auxiliary lanes.

(7) Clear Zone. The clear zone will vary according to design speed, traffic volumes, side slopes and horizontal curvature. See Section 49-2.0.

(8) Side Slopes. Values in the tables are for new construction. See Section 45-3.0 and Section 45-8.0 for more information. For reconstruction projects, see Section 49-3.0

(9) Foreslope. See the Sections 49-2.0 and 49-3.0 for the lateral extent of the foreslope in a ditch section.

(10) Ditch Widths. In rock cuts, a "V" ditch should be used. See Section 45-8.0.

(11) Backslopes. Backslopes for rock cuts will vary according to the height of the cut and geotechnical factors. See Section 45-8.0 for typical rock cut sections.

(12) Structural Capacity (New and Reconstructed Bridges). The following will apply:

a. All bridges on facilities with greater than 600 trucks per day should be checked using the Alternate Military Loading.
b. All State highway bridges within 25 km of a Toll Road Gate must be designed for Toll Road Loading.
c. All bridges on "Extra Heavy Duty Highways" must be designed for the Michigan Train truck loading configuration.
d. See Chapter Sixty for additional information on the loading configurations.

(13) Width (New and Reconstructed Bridges). Minimum clear roadway width will be 9.4 m. See Section 59-1.0 for more information on bridge widths.

Design Element				Manual Section	2-Lane			
Design Controls	Design Year Traffic	AADT		40-2.01	< 400	400 ≤ AADT < 1500	1500 ≤ AADT < 2000	≥ 2000
	Design Forecast Year			40-2.02	20 Years			
	*Design Speed (km/h) (3)	Level		40-3.0	60 - 90	80 - 90	80 - 90	100
		Rolling			50 - 90	60 - 90	60 - 90	80 - 90
	Access Control			40-5.0	None			
	Level of Service			40-2.0	Desirable: B; Minimum: C			
Cross Section Elements**	Travel Lane	*Width (4)		45-1.01	3.0 m (4a)	3.3 m	3.3 m (4b)	3.6 m
		Typical Surface Type		Chp. 52	Asphalt / Concrete			
	Shoulder	*Width Usable		45-1.02	Des: 1.2 m Min: 0.6 m (5)	Des: 1.8 m Min: 1.2 m	Des: 2.4 m Min: 1.8 m	Des: 3.0 m Min: 2.4 m
		*Width Paved (optional)		45-1.02	0.6 m	1.2 m	1.8 m	2.4 m
		Typical Surface Type		Chp. 52	Asphalt / Aggregate / Earth			
	Cross Slope	*Travel Lane (6)		45-1.01	Width ≤ 1.2 m: 2%; Width > 1.2 m: 4%			
		Shoulder		45-1.02	6% Asphalt, 6%-8% Aggregate, 8% Earth			
	Auxiliary Lanes	Lane Width		45-1.03	3.0 m		Desirable: 3.3 m Minimum: 3.0 m	Desirable: 3.6 m Minimum: 3.0 m
		Shoulder Width			Desirable: Same as Next to Travel Lane; Minimum: 0.6 m			
	Clear Zone			49-2.0	(7)			
	Side Slopes (8)	Cut	Foreslope	45-3.0	Des: 6:1; Max: 4:1 (9)			
			Ditch Width		1.2 m (10)			
			Backslope		4:1 for 6.0 m; 3:1 Max. to Top (11)			
		Fill		45-3.0	Des: 6:1 to Clear Zone; Max: 3:1 to Toe			
Bridges**	New and Reconstructed Bridges	*Structural Capacity		Chp. 60	HS-20			
		*Clear Roadway Width (12)		45-4.01	Travelway + 1.2 m	Travelway + 1.8 m	Travelway + 2.4 m	Full Paved Approach Width
	Existing Bridges to Remain in Place	*Structural Capacity		Chp. 60	HS-15			
		*Clear Roadway Width (13)		45-4.01	6.6 m	6.6 m	7.2 m	8.4 m
	*Vertical Clearance (Collector Under)	New and Replaced Overpassing Bridges (14)		44-4.0	4.45 m			
		Existing Overpassing Bridges			4.30 m			
	Vertical Clearance (Collector Over Railroad) (15)			Chp. 69	7.00 m			

* Controlling design criteria (see Section 40-8.0). Des: Desirable; Min: Minimum.
** Selection of the cross section and bridge elements is based on the design year traffic volumes irrespective of the design speed.

GEOMETRIC DESIGN CRITERIA FOR LOCAL AGENCY RURAL COLLECTOR ROADS [1]
(New Construction / Reconstruction)

Table 53-4

GEOMETRIC DESIGN CRITERIA FOR LOCAL AGENCY RURAL COLLECTORS
(New Construction/Reconstruction)

Footnotes to Table 53-4

(1) Applicability. This table is only applicable to Federal-aid funded projects.

(2) (Blank.)

(3) Design Speed. The minimum design speed should equal the minimum value from the table or the anticipated posted speed limit after construction, whichever is greater. The state legal limit is 90 km/h on non-posted highways.

(4) Travel Lane Width. The following will apply:

a. Use a 3.3-m width if the design speed is 90 km/h.
b. Use a 3.6-m width if the design speed is 90 km/h.

(5) Shoulder Width. The following will apply:

a. If guardrail is present, the minimum shoulder width is 1.2 m.
b. Usable shoulder width is defined as the distance from the edge of the travel lane to the shoulder break point.

(6) Cross Slope (Travel Lanes). Cross slopes of 1.5% are acceptable on existing bridges to remain in place.

(6A) Cross Slope (Shoulder). See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information.

(7) Clear Zone. The clear zone will vary according to design speed, traffic volumes, side slopes and horizontal curvature. See Section 49-2.0.

(8) Side Slopes. Values in the tables are for new construction. See Section 45-3.0 and Section 45-8.0 for more information. For reconstruction projects, see Section 49-3.0.

(9) Foreslope. See Sections 49-2.0 and 49-3.0 for the lateral extent of the foreslope in a ditch section.

(10) Ditch Widths. In rock cuts, a "V" ditch should be used. See Section 45-8.0

(11) Backslopes. Backslopes for rock cuts will vary according to the height of the cut and geotechnical factors. See Section 45-8.0 for typical rock cut sections.

(12) Width (New and Reconstructed Bridges). The following will apply:

a. Where the approach roadway width (travelway plus shoulders) is surfaced, that surfaced width will be carried across all structures.
b. Widths of bridges more than 30 m in length will be analyzed individually. At a minimum, the roadway width of these bridges will be the width of travel lanes plus a 0.9 m right shoulder and 0.9 m left shoulder for highways with AADT > 400.

c. See Section 59-1.0 for more information on bridge widths.

Design Element				Manual Section	2-Lane					
Design Controls	Design Year Traffic	AADT		40-2.01	< 50	50 ≤ AADT < 250	250 ≤ AADT < 400	400 ≤ AADT < 1500	1500 ≤ AADT < 2000	≥ 2000
	Design Forecast Year			40-2.02	20 years					
	*Design Speed (km/h) (3)	Level		40-3.0	50 - 90	50 - 90	60 - 90	80 - 90	80 - 90	80 - 90
		Rolling			50 - 90	50 - 90	50 - 90	60 - 90	60 - 90	60 - 90
	Access Control			40-5.0	None					
	Level of Service			40-2.0	Desirable: B; Minimum: D					
Cross Section Elements**	Travel Lane	*Width		45-1.01	3.0 m	3.0 m	3.0 m (4a)	3.3 m	3.3 m(4b)	3.6 m
		Typical Surface Type		Chp. 52	Asphalt / Concrete / Aggregate					
	Shoulder	*Width Usable		45-1.02	0.6 m	0.6 m	0.6 m	1.8 m (5)	1.8 m	2.4 m
		Typical Surface Type		Chp. 52	Asphalt / Aggregate / Earth					
	Cross Slope	*Travel Lane (6)		45-1.01	2%-3% Asphalt / Concrete; 6% Aggregate					
		Shoulder		45-1.02	4%-6% Asphalt / Concrete; 6%-8% Aggregate; 8% Earth					
	Auxiliary Lanes	Lane Width		45-1.03	Same as Travel Lane			Des: Same as Travel Lane; Min: 3.0 m		
		Shoulder Width			Desirable: 1.2 m; Minimum: 0.6 m					
	Clear Zone			49-2.0						
	Side Slopes	Cut	Foreslope	45-3.0	4:1 (V > 60) (8); 3:1 (V ≤ 60) (8)					
			Ditch Width		Des: 1.2 m; Min: 0.0 m					
			Backslope		4:1 (V > 60); 3:1 (V ≤ 60) (9)					
		Fill	0-9 m Height	45-3.0	Desirable: 4:1; Maximum: 3:1					
			>9 m Height		3:1					
Bridges**	New and Reconstructed Bridges	*Structural Capacity		Chp. 60	HS-20					
		*Clear Roadway Width (10)		45-4.01	Travelway + 1.2 m			Travelway + 1.8 m		Full Paved Approach Width
	Existing Bridges to Remain in Place	*Structural Capacity		Chp. 60	HS-10	HS-15				
		*Clear Roadway Width (11)		45-4.01	6.0 m		6.6 m		7.2 m	8.4 m
	*Vertical Clearance (Local Road Under)	New and Replaced Overpassing Bridges (12)		44-4.0	4.45 m					
		Existing Overpassing Bridges			4.30 m					
	Vertical Clearance (Local Road Over Railroad) (13)			Chp. 69	7.00 m					

*Controlling design criteria (see Section 40-8.0). ** Selection of the cross section and bridge elements is based on the design year traffic volumes irrespective of the design speed.
Des: Desirable. Min: Minimum.

GEOMETRIC DESIGN CRITERIA FOR LOCAL RURAL ROADS (1)
(New Construction / Reconstruction)

Table 53-5

GEOMETRIC DESIGN CRITERIA FOR RURAL LOCAL ROADS
(New Construction/Reconstruction)
Footnotes to Table 53-5

(1) Applicability. This table is only applicable to Federal-aid projects.

(2) (Blank).

(3) Design Speed. The minimum design speed should equal the minimum value from the table or the anticipated posted speed limit after construction, whichever is greater. The state legal limit is 90 km/h on non-posted highways.

(4) Lane Width. The following will apply:

a. Use 3.3 m lanes where $V \geq 90$ km/h.
b. Use 3.6 m lanes where $V \geq 90$ km/h.

(5) Shoulder Width. The following will apply:

a. For $400 \leq AADT < 1500$, the shoulder width may be 1.2 m.
b. Usable shoulder width is defined as the distance from the edge of the travel lane to the shoulder break point.

(6) Cross Slope (Travel Lanes). Cross slopes of 1.5% are acceptable on existing bridges to remain in place.

(6A) Cross Slope (Shoulder). See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information.

(7) Clear Zone. The clear zone will vary according to design speed, traffic volumes, side slopes and horizontal curvature. See Section 49-2.0. For design speeds less than 80 km/h, a 3.0 m clear zones may be used.

(8) Foreslope. See Sections 49-2.0 and 49-3.0 for the lateral extent of the foreslope in a ditch section.

(9) Backslopes. Backslopes for rock cuts will vary according to the height of the cut and geotechnical factors.

(10) Width (New and Reconstructed Bridges). Widths of bridges more than 30 m in length will be analyzed individually. At a minimum, the roadway width of these bridges will be the width of travel lanes plus a 0.9-m right shoulder and 0.9-m left shoulder for highways with AADT > 2000. Where shoulders are paved, it is desirable to provide the full approach roadway width. See Section 59-1.0 for more information on bridge widths.

(11) Width (Existing Bridges to Remain in Place). Minimum clear widths that are 0.6 m narrower may be used on roads with few trucks. The clear roadway width should be at least the same width as the approach travelway. For one-lane bridges, the width may be 5.4 m. For bridges of more than 30 m in length, the values in the table do not apply. The acceptability of these bridges will be assessed individually.

Design Element				Manual Section	Design Values (By Type of Area)		
					Suburban	Intermediate	Built-Up
Design Controls	Design Forecast Year			40-2.02	20 Years	20 Years	20 Years
	*Design Speed (km/h) (1)			40-3.0	Curbed: 70 Uncurbed: 80-100	Curbed: 60 Uncurbed: 80	Curbed: 50-60
	Access Control			40-5.0	Partial Control / None	None	None
	Level of Service			40-2.0	Des: B; Min: C	Des: C; Min: D	Des: C; Min: D
	On-Street Parking			45-1.04	None	Optional (2)	Optional (2)
Cross Section Elements	Travel Lane	*Width (3)		45-1.01	Curbed: 3.6 m Uncurbed: 3.6 m	Curbed: Des.: 3.6 m; Min.: 3.3 m Uncurbed: Des.: 3.6 m; Min.: 3.3 m	Curbed: Des.: 3.6 m; Min.: 3.0 m
		Typical Surface Type (4)		Chp. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	*Curb Offset (5)			45-1.02	0.6 m	0.6 m	0.6 m
	Shoulder	*Paved Width (6)		45-1.02	Right: 3.0 m; Left: 1.2 m	Right: 2.4 m; Left: 1.2 m	Right: 1.8 m; Left: 1.2 m
		Typical Surface Type (4)		Chp. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	Cross Slope	*Travel Lane (7)		45-1.01	2% Also 4%	2% *Width ≤ 1.2 m: 2%; Width > 1.2 m: 4% (7A)*	Also 2% 4%
		Shoulder		45-1.02			
	Auxiliary Lanes	Lane Width		45-1.03	Des: 3.6 m; Min: 3.3 m	Des: 3.6 m; Min: 3.3 m	Des: 3.6 m; Min: 3.0 m
		Curb Offset (8)			0.3 m	0.3 m	0.3 m
		Shoulder Width			Des: 3.0 m; Min: 0.6 m	Des: 2.4 m; Min: 0.6 m	Des: 1.8 m; Min: 0.6 m
		Typical Surface Type (4)		Chp. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	TWLTL Lane Width			46-5.0	Des: 4.8 m; Min. 4.2 m	Des: 4.8 m; Min: 4.2 m	Des: 4.2 m; Min: 3.6 m
	Parking Lane Width			45-1.04	N/A	Des: 3.6 m; Min: 3.0 m (9)	Des: 3.6 m; Min: 3.0 m (9)
	Median Width	Depressed		45-2.0	8.0 m - 15.0 m	N/A	N/A
		Raised Island			Des: 5.4 m; Min: 3.9 m (10)	Des: 5.4 m; Min: 1.2 m (10)	Des: 5.4 m; Min: 1.2 m (10)
		Flush / Corrugated			Des: 4.8 m; Min: 3.9 m (10)	Des: 4.8 m; Min: 1.2 m (10)	Des: 4.8 m; Min: 1.2 m (10)
	Sidewalk Width (11)			45-1.06	1.5 m with 1.5 m Buffer (Des)	1.5 m with 1.5 m Buffer (Des)	Varies; 1.8 m Min
	Bicycle Lane Width (12)			51-7.0	Curbed: 1.5 m Uncurbed: Shld Width +1.2 m	Curbed: 1.5 m Uncurbed: Shld Width +1.2 m	Curbed: 1.5 m
	Clear Zones			49-2.0	(13)	(13)	(13)
	Typical Curbing Type (where used) (14)			45-1.05	Sloping / Vertical	Sloping / Vertical	Sloping / Vertical
	Side Slopes (Uncurbed) (15)	Cut	Foreslope	45-3.0	6:1 (16)	6:1 (16)	N/A
			Ditch Width		1.2 m (17)	1.2 m (17)	N/A
			Backslope		4:1 for 6.0 m; 3:1 Max. to Top (18)	4:1 for 6.0 m; 3:1 Max. to Top (18)	N/A
		Fill			6:1 to Clear Zone; 3:1 Max. to Toe	6:1 to Clear Zone; 3:1 Max. to Toe	N/A
	Side Slopes (Curbed)	Cut (Backslope)		45-3.0	(19)	(19)	(19)
		Fill			12:1 for 3.6 m; 3:1 Max. to Toe	12:1 for 3.6 m; 3:1 Max. to Toe	12:1 for 3.6 m; 3:1 Max. to Toe
	Median Slopes (Depressed)			45-2.0	Des: 8:1; Max: 5:1	N/A	N/A

*Controlling design criteria (see Section 40-8.0). Des: Desirable. Min: Minimum.

GEOMETRIC DESIGN CRITERIA FOR MULTI-LANE URBAN ARTERIALS
(New Construction / Reconstruction)

Table 53-6

GEOMETRIC DESIGN CRITERIA FOR MULTI-LANE URBAN ARTERIALS
(New Construction/Reconstruction)

Footnotes to Table 53-6

(1) Design Speed. The minimum design speed should equal a) the minimum value from the table, b) the anticipated posted speed limit after construction or c) the state legal limit on non-posted highways, whichever is greater. The legal limit in urban districts is 50 km/h. Based upon an engineering study, these speeds may be raised to an absolute maximum of 90 km/h.

(2) On-Street Parking. In general, on-street parking is discouraged.

(3) Travel Lane Width. For arterials on the National Truck Network, the right lane must be 3.6 m in width.

(4) Surface Type. The pavement type selection will be determined by the INDOT Pavement Design Engineer.

(5) Curb Offset. The curb offset (for both left and right) should be 0.6 m. Vertical curbs introduced intermittently should be offset 0.6 m. In restricted locations, a continuous vertical curb may be offset 0.3 m, and a sloping curb offset may be zero.

(6) Shoulder Width. The following will apply:
- a. The shoulder is paved to the face of guardrail. The desirable guardrail offset is 0.6 m from the effective usable shoulder width. See Section 49-5.0 for more information.
- b. The table values apply to paved shoulder widths. Desirably, an additional 0.3 m of compacted aggregate will be provided.

(7) Cross Slope (Travel Lanes). Cross slopes of 1.5% are acceptable on existing bridges to remain in place.

(7A) Cross Slope (Shoulder). See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information.

(8) Curb Offset for Auxiliary Lanes. On curbed sections, the offset may be zero.

(9) Parking Lanes. Where the parking lane will be used as a travel lane during peak hours or may be converted to a travel lane in the future, the width should be equal to the travel lane width plus a 0.3 m offset to the curb (if present). Cross slopes for parking lanes are typically 1% steeper than the adjacent travel lane.

(10) Minimum Median Width. The criteria in the table assume the presence of mountable curbs with a 0.0-m curb offset.

(11) Sidewalk Width. Buffers less than 0.6-m wide are not allowed. If no buffer is provided, the sidewalk width should be 1.8 m.

(12) Bicycle Lane Width. The widths in the table are in addition to the width of parking lanes, if present. See Section 51-7.0 for additional details.

(13) Clear Zones. The following will apply:
- a. Facilities with Vertical Curbs. The clear zone will be measured from the edge of travel lane or will be to the right-of-way line, whichever is less. No clear zone is required where there is 24-hour parking.
- b. Facilities with Sloping Curbs or without Curbs. The clear zone will vary according to design speed, traffic volumes, side slopes and horizontal qcurvature.
- c. All Curbed Facilities. There should be an appurtenance-free area as measured from the gutter line of any curb.

Design Element				Manual Section	Design Values (By Type of Area)		
					Suburban	Intermediate	Built-up
Design Controls	Design Forecast Year			40-2.02	20 Years	20 Years	20 Years
	*Design Speed (km/h) (1)			40-3.0	Curbed: 60-80 Uncurbed: 70-90	Curbed: 60 Uncurbed: 80	Curbed: 50-60
	Access Control			40-5.0	Partial Control / None	None	None
	Level of Service			40-2.0	Des: B; Min: C	Des: C; Min: D	Des: C; Min: D
	On-Street Parking			45-1.04	None	Optional (2)	Optional (2)
Cross Section Elements	Travel Lane	*Width (3)		45-1.01	Curbed: 3.6 m Uncurbed: 3.6 m	Curbed: Des.: 3.6 m; Min.: 3.3 m Uncurbed: 3.6 m	Curbed: Des.: 3.6 m; Min.: 3.3 m
		Typical Surface Type (4)		Chp. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	*Curb Offset (5)			45-1.02	0.6 m	0.6 m	0.6 m
	Shoulder	*Paved Width (6)		45-1.02	3.0 m	2.4 m	1.8 m
		Typical Surface Type (4)		Chp 52.	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	Cross Slope	*Travel Lane (7)		45-1.01	2%	2%	2%
		Shoulder (7A)		45-1.02	4%	4%	4%
	Auxiliary Lanes	Lane Width		45-1.03	Des: 3.6 m; Min: 3.3 m	Des: 3.6 m; Min: 3.3 m	Des: 3.3 m; Min: 3.0 m
		Curb Offset (8)			0.3 m	0.3 m	0.3 m
		Shoulder Width			Des: 3.0 m; Min: 0.6 m	Des: 2.4 m; Min: 0.6 m	Des: 1.8 m; Min: 0.6 m
		Typical Surface Type (4)		Chp. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	TWLTL Lane Width			46-5.0	Des: 4.8 m; Min. 4.2 m	Des: 4.8 m; Min: 4.2 m	Des: 4.2 m; Min: 3.6 m
	Parking Lane Width			45-1.04	N/A	Des: 3.6 m; Min: 3.0 m (9)	Des: 3.6 m; Min: 3.0 m (9)
	Sidewalk Width (10)			45-1.06	1.5 m with 1.5 m Buffer (Des)	1.5 m with 1.5 m Buffer (Des)	Varies; 1.8 m Min
	Bicycle Lane Width (11)			51.7.0	Curbed: 1.5 m Uncurbed: Shld. Width +1.2 m	Curbed: 1.5 m Uncurbed: Shld. Width +1.2 m	Curbed: 1.5 m
	Clear Zones			49-2.0	(12)	(12)	(12)
	Typical Curbing Type (where used) (13)			45-1.05	Sloping / Vertical	Sloping / Vertical	Sloping / Vertical
	Side Slopes (Uncurbed) (14)	Cut	Foreslope	45-3.0	6:1 (15)	6:1 (15)	N/A
			Ditch Width		1.2 m (16)	1.2 m (16)	N/A
			Backslope		4:1 for 6.0 m; 3:1 Max. to Top (17)	4:1 for 6.0 m; 3:1 Max. to Top (17)	N/A
		Fill			6:1 to Clear Zone; 3:1 Max. to Toe	6:1 to Clear Zone; 3:1 Max. to Toe	N/A
	Side Slopes (Curbed)	Cut (Backslope)		45-3.0	(18)	(18)	(18)
		Fill			12:1 for 3.6 m; 3:1 Max. to Toe	12:1 for 3.6 m; 3:1 Max. to Toe	12:1 for 3.6 m; 3:1 Max. to Toe

*Controlling design criteria (see Section 40-8.0). Des: Desirable; Min. Minimum.

GEOMETRIC DESIGN CRITERIA FOR TWO-LANE URBAN ARTERIALS
(New Construction / Reconstruction)

Table 53-7

GEOMETRIC DESIGN CRITERIA FOR TWO-LANE URBAN ARTERIALS
(New Construction/Reconstruction)
Footnotes to Table 53-7

(1) Design Speed. The minimum design speed should equal a) the minimum value from the table, b) the anticipated posted speed limit after construction or c) the state legal limit on non-posted highways, whichever is greater. The legal limit in urban districts is 50 km/h. Based upon an engineering study, these speeds may be raised to an absolute maximum of 90 km/h.

(2) On-Street Parking. In general, on-street parking is discouraged.

(3) Travel Lane Width. For arterials on the National Truck Network, lane widths must be 3.6 m.

(4) Surface Type. The pavement type selection will be determined by the INDOT Pavement Design Engineer.

(5) Curb Offset. The curb offset should be 0.6 m. In restricted locations, a continuous vertical curb may be offset 0.3 m, and a sloping curb offset may be zero. Vertical curbs should not be used unless V < 80 km/h.

(6) Shoulder Width. The following will apply:

a. The shoulder is paved to the face of guardrail. The desirable guardrail offset is 0.6 m from the effective usable shoulder width. See Section 49-5.0 for more information.

b. The table values apply to paved shoulder widths. Desirably, an additional 0.3 m of compacted aggregate will be provided.

(7) Cross Slope (Travel Lanes). Cross slopes of 1.5% are acceptable on existing bridges to remain in place.

(7A) Cross Slope (Shoulder). See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information.

(8) Curb Offset for Auxiliary Lanes. On curbed sections, the offset may be zero.

(9) Parking Lanes. Where the parking lane will be used as a travel lane during peak hours or may be converted to a travel lane in the future, the width should be equal to the travel lane width plus a 0.3 m offset to the curb (if present). Cross slopes for parking lanes are typically 1% steeper than the adjacent travel lane.

(10) Sidewalk Width. Buffers less than 0.6-m wide are not allowed. If no buffer is provided, the sidewalk width should be 1.8 m.

(11) Bicycle Lane Width. The widths in the table are in addition to the width of parking lanes, if present. See Section 51-7.0 for additional details.

(12) Clear Zones. The following will apply:

a. Facilities with Vertical Curbs. The clear zone will be measured from the edge of travel lane or will be to the right-of-way line, whichever is less. No clear zone is required where there is 24-hour parking.

b. Facilities with Sloping Curbs or without Curbs. The clear zone will vary according to design speed, traffic volumes, side slopes and horizontal curvature.

c. All Curbed Facilities. There should be an appurtenance-free area as measured from the gutter line of any curb.

d. Values. See Section 49-2.0 for specific clear zone values.

(13) Curbing Type. Vertical curbs can only be used with design speeds less than 80 km/h.

Design Element				Manual Section	Design Values (By Type of Area)		
					Suburban	Intermediate	Built-Up
Design Controls	Design Forecast Year			40-2.02	20 Years	20 Years	20 Years
	*Design Speed (km/h) (2)			40-3.0	Curbed: 50-70 Uncurbed: 50-80	Curbed: 50-70 Uncurbed: 50-70	Curbed: 50-60
	Access Control			40-5.0	None	None	None
	Level of Service			40-2.0	Desirable: C; Minimum: D	Desirable: C; Minimum: D	Desirable: C; Minimum: D
	On-Street Parking			45-1.04	Optional (3)	Optional (3)	Optional (3)
Alignment Elements	Travel Lane	*Width (4)		45-1.01	Curbed: Des: 3.6 m; Min: 3.3 m Uncurbed: Des: 3.6 m; Min: 3.3 m	Curbed: Des: 3.6 m; Min: 3.3 m Uncurbed: Des: 3.6 m; Min: 3.3 m	Curbed: Des: 3.6 m; Min: 3.0 m
		Typical Surface Type (5)		Chp. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	*Curb Offset (6)			45-1.02	0.6 m	0.6 m	0.6 m
	Shoulder	*Paved Width (7)		45-1.02	2.4 m	1.8 m	1.2 m
		Typical Surface Type (5)		Chp. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	Cross Slope	*Travel Lane (8)		45-1.01	2%	2%	2%
		Shoulder (8A)		45-1.02	4%	4%	~~4%~~ 2%
	Auxiliary Lanes	Lane Width		45-1.03	Des: 3.6 m; Min: 3.3 m	Des: 3.6 m; Min: 3.0 m	Des: 3.6 m; Min: 3.0 m
		Curb Offset			Des: 0.3 m; Min: 0.0 m	Des: 0.3 m; Min: 0.0 m	Des: 0.3 m; Min: 0.0 m
		Shoulder Width			Des: 2.4 m; Min: 0.6 m	Des: 1.8 m; Min: 0.6 m	Des: 1.2 m; Min: 0.6 m
		Typical Surface Type (5)		Chp. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	TWLTL Lane Width			46-5.0	Des: 4.8 m; Min: 3.6 m	Des: 4.2 m; Min: 3.6 m	Des: 4.2 m; Min: 3.6 m
	Parking Lane Width (1)			45-1.04	Des: 3.0 m; Min: 2.4 m	Des: 3.0 m; Min: 2.4 m	Des: 3.0 m; Min: 2.4 m
	Median Width	Raised Island		45-2.0	Des: 5.4 m; Min: 1.2 m (9)	Des: 5.4 m; Min: 1.2 m (9)	Des: 5.4 m; Min: 1.2 m (9)
		Flush / Corrugated			Des: 4.8 m; Min: 1.2 m (9)	Des: 4.8 m; Min: 1.2 m (9)	Des: 4.8 m; Min: 1.2 m (9)
	Sidewalk Width (10)			45-1.06	1.5 m with 1.5 m Buffer (Des)	1.5 m with 1.5 m Buffer (Des)	Varies, 1.8 m Min
	Bicycle Lane Width (11)			51-7.0	Curbed: 1.5 m Uncurbed: Shld. Width +1.2 m	Curbed: 1.5m Uncurbed: Shld. Width +1.2 m	Curbed: 1.5 m
	Clear Zones			49-2.0	(12)	(12)	(12)
	Typical Curbing Type (where used) (13)			45-1.05	Sloping / Vertical	Sloping / Vertical	Sloping / Vertical
	Side Slopes (Uncurbed) (14)	Cut	Foreslope	45-3.0	Des: 6:1; Max: 4:1 (15)	Des: 6:1; Max: 4:1 (15)	N/A
			Ditch Width		1.2 m (16)	1.2 m (16)	N/A
			Backslope		4:1 for 1.2 m; 3:1 Max. to Top (17)	4:1 for 1.2 m; 3:1 Max. to Top (17)	N/A
		Fill			Des: 6:1 to Clr Zone; 3:1 Max to Toe Max: 4:1 to Clr Zone; 3:1 Max to Toe	Des: 6:1 to Clr Zone; 3:1 Max to Toe Max: 4:1 to Clr Zone; 3:1 Max to Toe	N/A
	Side Slopes (Curbed)	Cut(Backslope)		45-3.0	(18)	(18)	(18)
		Fill (19)			12:1 for 3.6 m; 3:1 Max to Toe	12:1 for 3.6 m; 3:1 Max to Toe	12:1 for 3.6 m; 3:1 Max to Toe

* Controlling design criteria (see Section 40-8.0). Des: Desirable; Min: Minimum.

GEOMETRIC DESIGN CRITERIA FOR URBAN COLLECTORS
(New Construction / Reconstruction)

Table 53-8

GEOMETRIC DESIGN CRITERIA FOR URBAN COLLECTORS
(New Construction/Reconstruction)

Footnotes to Table 53-8

(1) Parking Lane. In residential areas, a parallel parking lane from 2.1 to 2.4 m in width should be provided on one or both sides of the street. In commercial or industrial areas, parking lane widths should range from 2.4 to 3.3 m, and should usually be provided on both sides of the street. Where curb-and-gutter sections are used, the gutter pan width may be considered as part of the parking lane width. Where practical, the parking lane width should be in addition to the gutter pan width.

(2) Design Speed. The minimum design speed should equal a) the minimum value from the table, b) the anticipated posted speed limit after construction or c) the state legal limit on non-posted highways, whichever is greater. The legal limit in urban districts is 50 km/h. Based upon an engineering study, these speeds may be raised to an absolute maximum of 90 km/h.

(3) On-Street Parking. In general, on-street parking is discouraged.

(4) Travel Lane Width. In industrial areas, a 3.6-m travel lane should be used. Where right-of-way is restricted, 3.0-m lanes can be used in residential areas, and 3.3-m lanes can be used in industrial areas. On multi-lane facilities in built-up areas, the minimum width is 3.0 m.

(5) Surface Type. The pavement type selection will be determined by the INDOT Pavement Design Engineer on State highways.

(6) Curb Offset. The curb offset should be 0.6 m. In restricted locations, a continuous vertical curb may be offset 0.3 m, and a sloping curb offset may be zero. Vertical curbs should not be used unless V < 80 km/h.

(7) Shoulder Width. The following will apply:
- a. The shoulder is paved to the face of guardrail. The desirable guardrail offset is 0.6 m from the effective usable shoulder width. See Section 49-5.0 for more information.
- b. The table values apply to paved shoulder widths. Desirably, an additional 0.3 m of compacted aggregate will be provided.

(8) Cross Slope (Travel Lanes). Cross slopes of 1.5% are acceptable on existing bridges to remain in place.

(8A) *Cross Slope (Shoulder). See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information.*

(9) Minimum Median Width. The criteria in the table assume the presence of mountable curbs with a 0.0-m curb offset.

(10) Sidewalk Width. Buffers less than 0.6-m wide are not allowed. If no buffer is provided, the sidewalk width should be 1.8 m.

(11) Bicycle Lane Width. The widths in the table are in addition to the width of parking lanes, if present. See Section 51-7.0 for additional details.

(12) Clear Zones. The following will apply:
- a. Facilities with Vertical Curbs. The clear zone will be measured from the edge of travel lane or will be to the right-of-way line, whichever is less. No clear zone is required where there is 24-hour parking.
- b. Facilities with Sloping Curbs or without Curbs. The clear zone will vary according to design speed, traffic volumes, side slopes and horizontal curvature.
- c. All Curbed Facilities. There should be an appurtenance-free area as measured from the gutter line of any curb.
- d. Values. See Section 49-2.0 for specific clear zone values

Design Element				Manual Section	Design Values (By Type of Area)		
					Suburban	Intermediate	Built-Up
Design Controls	Design Forecast Year			40-2.02	20 Years	20 Years	20 Years
	*Design Speed (km/h) (2)			40-3.0	Curbed: 50-60 Uncurbed: 50-70	Curbed: 50-60 Uncurbed: 50-60	Curbed: 40-60
	Access Control			40-5.0	None	None	None
	Level of Service			40-2.0	Desirable: C; Minimum: D	Desirable: C; Minimum: D	D
	On-Street Parking			45-1.04	Optional (3)	Optional (3)	Optional (3)
Cross Section Elements	Travel Lane	*Width (4)		45-1.01	Curbed: 3.3 m Uncurbed: 3.3 m	Curbed: 3.0 m Uncurbed: 3.3 m	Curbed: 3.0 m
		Typical Surface Type		Chp. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	*Curb Offset (5)			45-1.02	0.6 m	0.6 m	0.6 m
	Shoulder	*Usable Width		45-1.02	Des: 1.2 m; Min: 0.6 m	Des: 1.2 m; Min: 0.6 m	Des: 1.2 m; Min: 0.6 m
		Typical Surface Type		Chp. 52	Asphalt / Concrete / Aggregate / Earth	Asphalt / Concrete / Aggregate / Earth	Asphalt / Concrete / Aggregate / Earth
	Cross Slope	*Travel Lane (6)		45-1.01	2%	2%	2%
		Shoulder		45-1.02	4%-6% Asph. / Conc.; 6%-8% Aggr.; 8% Earth	4%-6% Asph. / Conc.; 6%-8% Aggr.; 8% Earth	4%-6% Asph. / Conc.; 6%-8% Aggr.; 8% Earth
	Auxiliary Lanes	Lane Width		45-1.03	Des: 3.3 m; Min: 3.0 m	Des: 3.3 m; Min: 3.0 m	3.0 m
		Curb Offset			Des: 0.3 m; Min: 0.0 m	Des: 0.3 m; Min: 0.0 m	Des: 0.3 m; Min: 0.0 m
		Shoulder Width			Des: 1.2 m; Min: 0.6 m	Des: 1.2 m; Min: 0.6 m	Des: 1.2 m; Min: 0.6 m
		Typical Surface Type		Chp. 52	Asphalt / Concrete / Aggregate / Earth	Asphalt / Concrete / Aggregate / Earth	Asphalt / Concrete / Aggregate / Earth
	Parking Lane Width (1)			45-1.04	Des: 2.7 m; Min: 2.4 m	Des: 2.7 m; Min: 2.4 m	Des: 2.7 m; Min: 2.4 m
	Sidewalk Width (7)			45-1.06	1.5 m with 1.5 m Buffer (Des)	1.5 m with 1.5 m Buffer (Des)	Varies, 1.8 m Min
	Bicycle Lane Width (8)			51-7.0	Curbed: 1.5 m Uncurbed: Shld. Width +1.2 m	Curbed: 1.5 m Uncurbed: Shld. Width +1.2 m	Curbed: 1.5 m
	Clear Zones			49-2.0	(9)	(9)	(9)
	Typical Curbing Type (where used)			45-1.05	Vertical / Sloping	Vertical / Sloping	Vertical / Sloping
	Side Slopes (Uncurbed)	Cut	Foreslope	45-3.0	3:1 Max	3:1 Max	N/A
			Ditch Width		Des: 1.2 m; Min: 0.0 m	Des: 1.2 m; Min: 0.0 m	N/A
			Backslope		3:1 Max (10)	3:1 Max. (10)	N/A
		Fill			3:1 Max	3:1 Max.	N/A
	Side Slopes (Curbed)	Cut (Backslope)		45-3.0	(11)	(11)	(11)
		Fill (12)			12:1 for 3.6 m; 3:1 Max to Toe	12:1 for 3.6 m; 3:1 Max to Toe	12:1 for 3.6 m; 3:1 Max to Toe

* Controlling design criteria (see Section 40-8.0).
** Table applies only to projects with Federal-aid funds.
Des: Desirable; Min: Minimum.

GEOMETRIC DESIGN CRITERIA FOR URBAN LOCAL STREETS **
(New Construction / Reconstruction)

Table 53-9

Design Element				Manual Section	Rural	Urban
Design Controls	Design Forecast Year			54-3.01	20 Years (1)	20 Years (1)
	*Design Speed (km/h)			54-3.01	Min: Original Design Speed	Min: Original Design Speed (2)
	Access Control			40-5.0	Full Control	Full Control
	Level of Service			40-2.04	Desirable: B; Minimum: C	Desirable: B; Minimum: D
Cross Section Elements	Travel Lane	*Width		54-3.03	3.6 m	3.6 m
		Surface Type(3)		Chp. 52	Asphalt / Concrete	Asphalt / Concrete
	Shoulder	*Right Width(4)		54-3.03	Usable: 3.3 m; Paved: 3.0 m	Usable: 3.3 m; Paved: 3.0 m
		*Left Width(5)			2 Lanes: 1.2 m Paved. 3 Lanes: 3.0 m Paved	2 Lanes: 1.2 m Paved. 3 Lanes: 3.0 m Paved
		Surface Type(3)		Chp. 52	Asphalt / Concrete	Asphalt / Concrete
	Cross Slope	*Travel Lane (6)		45-1.01	2% Paved	Paved 2%
		Shoulder		45-1.02	Paved *Width ≤ 1.2 m: 2%; Width > 1.2 m: 4% (6A)*	*Width ≤ 1.2 m: 2%; Width > 1.2 m: 4% (6A)*
	Auxiliary Lanes	*Lane Width		45-1.03	3.6 m	3.6 m
		*Shoulder Width			Left or Right: Des: 3.6 m; Min: 1.8 m	Left or Right: Des: 3.6 m; Min: 1.8 m
	Median Width	Depressed		54-3.03	Existing	Existing
		Flush (CMB)			Existing	Existing
	Clear Zone			49-2.0	(8)	(8)
	Side Slopes (9)	Cut	Fore Slope	54-3.03	2:1 or Flatter	2:1 or Flatter
			Ditch Width		Existing	Existing
			Back Slope		2:1 or Flatter	2:1 or Flatter
		Fill		45-3.0	2:1 or Flatter	2:1 or Flatter
	Median Slopes			45-3.03	Desirable: 8:1; Maximum: 4:1	Desirable: 8:1; Maximum: 4:1
Bridges	New and Reconstructed Bridges	*Structural Capacity		Chp. 60	HS-20 & Alt. Military Loading (10)	HS-20 & Alt. Military Loading (10)
		*Clear Roadway Width(11)		54-5.0	Full Paved Approach Width	Full Paved Approach Width
	Existing Bridges to Remain in Place	*Structural Capacity		Chp. 60	HS-20 & Alt. Military Loading (10)	HS-20 & Alt. Military Loading (10)
		*Clear Roadway Width		54-5.0	Travelway Plus 3.0 m Rt. & 1.2 m Lt. Shoulders (7)	Travelway Plus 3.0 m Rt. & 1.2 m Lt. Shoulders (7)
	*Vertical Clearance (Freeway Under) (12a)	New and Replaced Overpassing Bridges (12b)		54-5.0	5.05 m	5.05 m (12c)
		Existing Overpassing Bridges			4.90 m	4.90 m (12c)
		Sign Truss / Pedestrian Bridges			New: 5:35 m; Existing: 5.20 m	New: 5.35 m; Existing: 5.20 m
	Vertical Clearance (Freeway over Railroad) (13)			Chp. 69	7.00 m	7.00 m

* Controlling design criteria (see Section 40-8.0).

GEOMETRIC DESIGN CRITERIA FOR FREEWAYS
(3R / Partial 4R Projects)

Table 54-2A

GEOMETRIC DESIGN CRITERIA FOR FREEWAYS
(3R/Partial 4R Projects)
Footnotes to Table 54-2A

(1) Design Forecast Year. Resurfacing pavements may have a 10-year design life.

(2) Design Speed. The existing posted speed limit may be used in restricted urban conditions, but not less than 80 km/h on Interstate highways.

(3) Surface Type. The pavement type selection will be determined by the Pavement Design Engineer.

(4) Shoulder Width (Right). The following will apply:

a. The shoulder is paved to the face of guardrail. The desirable guardrail offset is 0.6 m from the effective usable shoulder width. See Section 49-5.0 for more information.

b. When the number of trucks exceeds 250 DDHV, a 3.6-m right shoulder should be considered. If the 3.6-m shoulder is used, the usable shoulder width will be 3.9 m.

c. Usable shoulder width is defined as the distance from the edge of the travel lane to the shoulder break point.

(5) Shoulder Width (Left). The following will apply:

a. Typically, the usable shoulder width is equal to the paved shoulder width. The desirable guardrail offset is 0.6 m from the effective usable shoulder width. See Section 49-5.0 for more information.

b. When there are 3 or more lanes in one direction, a 3.6-m left shoulder should be provided if practical.

c. Usable shoulder width is defined as the distance from the edge of the travel lane to the shoulder break point. Usable width is typically 0.3 m wider than the paved shoulder width.

(6) Cross Slope (Travel Lane). Cross slopes of 1.5% are acceptable on existing bridges to remain in place.

(6A) Cross Slope (Shoulder). See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information.

(7) Shoulders for Bridges to Remain in Place. For such bridges of length > 60 m, the minimum shoulder width on the right and the left may be 1.1 m.

(8) Clear Zone. The clear zone will vary according to design speed, traffic volumes, side slopes and horizontal curvature. See Section 49-2.0.

(9) Side Slopes. In most cases, retention of the existing side slope shape which are 2:1 or flatter will be acceptable. However, existing fill slopes steeper than 4:1 should be evaluated for flattening. Section 54-3.03 provides additional information for side slope criteria on projects with freeway widening (i.e., lane and/or shoulder widening).

(10) Structural Capacity (New and Reconstructed Bridges). Other loadings will apply to the Toll Road System and Indiana "Extra Heavy Duty Highways." See Chapter Sixty for more information.

(11) Width (New and Reconstructed Bridges). See Sections 45-5.0 and 59-1.0 for more information on bridge widths.

Design Element				Manual Section	2-Lane				Multi-Lane	
Design Controls	Design Year Traffic (AADT)			40-2.01	< 400	400 ≤ AADT < 3000	3000 ≤ AADT < 5000	≥ 5000	Undivided	Divided
	Design Forecast Year			55-4.01	20 Years (1)				20 Years (1)	
	*Design Speed (km/h) (2)			55-4.01	Posted Speed Limit				Posted Speed Limit	
	Access Control			40-5.0	Partial Control / None				Partial Control / None	
	Level of Service			40-2.0	Desirable: B; Minimum: D				Desirable: B; Minimum: D	
Cross Section Elements	Travel Lane	*Width		55-4.05	3.6 m	3.6 m	3.6 m	3.6 m	3.6 m	
		Typical Surface Type (3)		Ch. 52	Asphalt / Concrete				Asphalt / Concrete	
	Shoulder (4)	Width Usable		55-4.05	D: 1.8 m M: 0.6 m	D: 2.4 m M: 0.9 m	D: 2.4 m M: 1.8 m	D: 3.3 m M: 2.4 m	Desirable: 3.3 m Minimum: 2.4 m	Rt: D: 3.3 m; M: 2.7 m Lt: D: 1.2 m; M: 1.2 m
		*Width Paved		55-4.05	D: 1.2 m M: 0.0 m	D: 1.8 m M: 0.6 m	D: 1.8 m M: 0.6 m	D: 3.0 m M: 0.6 m	Desirable: 3.0 m Minimum: 2.4 m	Rt: D: 3.0 m; M: 2.4 m Lt: D: 1.2 m; M: 0.9 m
		Typical Surface Type (3)		Ch. 52	Asphalt / Concrete / Sealed Aggregate				Asphalt / Concrete / Sealed Aggregate	
	Cross Slopes	*Travel Lane (5)		55-4.05	2%				2%	
		Shoulder (6)		55-4.05	4% Asphalt / Concrete; 6% Sealed Aggregate				4% Asphalt / Concrete; 6% Sealed Aggregate	
	Auxillary Lanes	Lane Width		55-4.05	Desirable: 3.6 m; Minimum: 3.3 m				Desirable: 3.6 m; Minimum: 3.3 m	
		Shoulder Width			Des: Same as Next to Travel Lane; Min: 0.6 m				Des: Same as Next to Travel Lane; Min: 0.6 m	
	Median Width			55-4.05	N/A				0.0 m	Existing
	Obstruction Free Zone			55-5.02	See Section 55-5.02				See Section 55-5.02	
	Side Slopes	Cut	Foreslope	55-4.05	2:1 or Flatter (7)				2:1 or Flatter (7)	
			Ditch Width		(7)				(7)	
			Backslope		2:1 or Flatter (7)				2:1 or Flatter (7)	
		Fill			2:1 or Flatter (7)				2:1 or Flatter (7)	
	Median Slopes			55-4.05	N/A				Desirable: 8:1; Maximum: 4:1	
Bridges**	New and Reconstructed Bridges	*Structural Capacity		Ch. 60	HS-20 (8)					
		*Clear Roadway Width (9)		55-6.03	Full Paved Approach Width					
	Existing Bridges to Remain in Place	*Structural Capacity		Ch. 60	HS-20					
		*Clear Roadway Width		55-6.02	Travelway Plus 0.6 m on Each Side					
	*Vertical Clearance (Arterial Under) (10)	New and Replaced Overpassing Bridges		55-6.0	5.05 m					
		Existing Overpassing Bridges (11)			4.30 m					
		Sign Truss / Pedestrian Bridges			New: 5.35 m; Existing: 5.20 m					
	Vertical Clearance (Arterial Over Railroad) (12)			Ch. 69	7.00 m					

D or Des: Desirable; M or Min: Minimum.

* Controlling design criteria (see Section 40-8.0). ** Selection of the cross section and bridge elements is based on the design year traffic volumes irrespective of the design speed.

GEOMETRIC DESIGN CRITERIA FOR RURAL ARTERIALS
(3R Projects)

Table 55-3A

(3R Projects)

Footnotes to Table 55-3A

(1) Design Forecast Year. For resurfacing projects, the pavement should be designed for at least a 10-year design life.

(2) Design Speed. The minimum design speed should equal a) the anticipated posted speed limit after construction or b) the state legal limit (90 km/h) on non-posted highways.

(3) Surface Type. The pavement type selection will be determined by the INDOT Pavement Design Engineer or by the local jurisdiction.

(4) Shoulder. The following will apply:

a. On INDOT facilities, the shoulder is paved to the front face of guardrail. The desirable guardrail offset is 0.6 m from the effective usable shoulder width. In restrictive situations, the guardrail offset may be 0.3 m from the effective usable shoulder width. See Section 49-5.0 for more information.

b. If guardrail is present, the minimum offset from E.T.L. to the front face of guardrail should desirably be equal to the shy line distance, but not less than 1.2 m. See Section 49-5.0 for shy line offsets.

c. Usable shoulder width is defined as the distance from the edge of the travel lane to the shoulder break point.

(5) Cross Slope (Travel Lane). Cross slopes of 1.5% are acceptable on existing bridges to remain in place.

(6) Cross Slope (Shoulder). Table values are for tangent sections. *See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information.* See ~~Section 43-3.06 *Figure 43-3M or Figure 43-3N*~~ for shoulder cross slope on a horizontal curve.

(7) Side Slopes. Section 55-4.05 provides additional information for side slope criteria.

(8) Structural Capacity (New and Reconstructed Bridges). The following will apply:

a. All bridges on facilities with greater than 600 trucks per day should be checked using the Alternate Military Loading.
b. All State highway bridges within 25 km of a Toll Road Gate must be designed for Toll Road Loading.
c. All bridges on "Extra Heavy Duty Highways" must be designed for the Michigan Train truck loading configuration.
d. See Chapter Sixty for additional information on the loading criteria.

(9) Width (New and Reconstructed Bridges). Widths are minimums for 3R projects. See Section 59-1.0 for additional information on bridge widths. On State highways, the minimum clear roadway width should be 9.4 m.

(10) Vertical Clearance (Arterial Under). Table values include an additional 150-mm allowance for future pavement overlays. Vertical clearances apply from usable edge to usable edge of shoulders.

Design Element				Manual Section	2-Lane				
* Design Controls	Design Year Traffic (AADT)			40-2.01	< 400	400 ≤ AADT < 1000	1000 ≤ AADT < 3000	3000 ≤ AADT < 5000	≥ 5000
	Design Forecast Year			55-4.01	20 Years (1)				
	*Design Speed (km/h) (2)			55-4.01	Posted Speed Limit				
	Access Control			40-5.0	None				
	Level of Service			40-2.0	Desirable: B; Minimum: D				
Cross Section Elemnts	Travel Lane	*Width		55-4.05	Des: 3.6 m Min: 3.0 m	Des: 3.6 m Min: 3.3 m	Des: 3.6 m Min: 3.3 m	3.6 m (3)	3.6 m (3)
		Typical Surface Type (4)		Ch. 52	Asphalt / Concrete				
	Shoulder (5)	Width Usable		55-4.05	Des: 1.2 m Min: 0.6 m	Des: 1.8 m Min: 0.6 m	Des: 2.4 m Min: 0.9 m	Des: 2.4 m Min: 1.8 m	Des: 3.0 m Min: 1.8 m
		*Width Paved		55-4.05	Des: 0.6 m Min: 0.0 m	Des: 1.2 m Min: 0.0 m	Des: 1.2 m Min: 0.6 m	Des: 1.8 m Min: 0.6 m	Des: 2.4 m Min: 0.6 m
		Typical Surface Type (4)		Ch. 52	Pave. Width ≤ 1.2 m: Asphalt / Concrete / Sealed Aggregate				
	Cross Slope	*Travel Lane (6)		55-4.05	Pave. Width > 1.2 m: 2% Typical; 3% Maximum				
		Shoulder (7)		55-4.05	4%-6% Asphalt / Concrete; 6% Sealed Aggregate				
	Auxiliary Lanes	Lane Width		55-4.05	Des: Same as Travel Lane Min: 3.0 m		Des: Same as Travel Lane Min: 3.3 m		
		Shoulder Width			Des: Same as Next to Travel Lane; Min: 0.6 m				
	Obstruction Free Zone			55-5.02	See Section 55-5.02				
	Side Slopes	Cut	Foreslope	55-4.05	2:1 or Flatter (8)				
			Ditch Width		(8)				
			Backslope		2:1 or Flatter (8)				
		Fill		55-4.05	2:1 or Flatter (8)				
Bridges**	New and Reconstructed Bridges	*Structural Capacity		Ch. 60	HS-20 (9)				
		*Clear Roadway Width (10)		55-6.03	Full Paved Approach Width				
	Existing Bridges to Remain In Place	*Structural Capacity		Ch. 60	HS-15				
		*Clear Roadway Width (11)		55-6.02	6.6 m	6.6 m	7.2 m	8.4 m	8.4 m
	*Vertical Clearance (Collector Under)	New and Replaced Overpassing Bridges (12)		55-6.0	4.45 m				
		Existing Overpassing Bridges (13)			4.30 m				
	Vertical Clearance (Collector Over Railroad) (14)			Ch. 69	7.00 m				

Des: Desirable; Min: Minimum.

* Controlling design criteria (see Section 40-8.0). ** Selection of the cross section and bridge elements is based on the design year traffic volumes irrespective of the design speed.

GEOMETRIC DESIGN CRITERIA FOR STATE RURAL COLLECTOR ROADS (3R Projects)

Table 55-3B

GEOMETRIC DESIGN CRITERIA FOR STATE RURAL COLLECTOR ROADS
(3R Projects)

Footnotes to Table 55-3B

(1) Design Forecast Year. For resurfacing projects, the pavement should be designed for at least a 10-year design life.

(2) Design Speed. The minimum design speed should equal a) the anticipated posted speed limit after construction or b) the state legal limit (90 km/h) on non-posted highways.

(3) Travel Lane (Widths). A minimum 3.3-m travel lane may be used where truck volumes are less than 200 trucks per day.

(4) Surface Type. The pavement type selection will be determined by the INDOT Pavement Design Engineer or by the local jurisdiction.

(5) Shoulder. The following will apply:

a. On INDOT facilities he shoulder is paved to the front face of guardrail. The desirable guardrail offset is 0.3 m from the effective usable shoulder width. In restrictive situations, the guardrail offset may be 0.3 m from the effective usable shoulder width. See Section 49-5.0 for more information.

b. If guardrail is present, the minimum offset from E.T.L. to the front face of guardrail should desirably be equal to the shy line distance, but not less than 1.2 m. See Section 49-5.0 for shy line offsets.

c. Usable shoulder width is defined as the distance from the edge of the travel lane to the shoulder break point.

(6) Cross Slope (Travel Lane). Cross slopes of 1.5% are acceptable on existing bridges to remain in place.

(7) Cross Slope (Shoulder). Table values are for tangent sections. *See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information.* See ~~Section 43-3.06, *Figure 43-3M or Figure 43-3N*~~ for shoulder cross slope on a horizontal curve.

(8) Side Slopes. Section 55-4.05 provides additional information for side slope criteria.

(9) Structural Capacity (New and Reconstructed Bridges). The following will apply:

a. All bridges on facilities with greater than 600 trucks per day should be checked using the Alternate Military Loading.
b. All State highway bridges within 25 km of a Toll Road Gate must be designed for Toll Road Loading.
c. All bridges on "Extra Heavy Duty Highways" must be designed for the Michigan Train truck loading configuration.
d. See Chapter Sixty for additional information on the loading criteria.

(10) Width (New and Reconstructed Bridges). Widths are minimums for 3R projects. See Section 59-1.0 for additional information on bridge widths. On State highways, the minimum clear roadway width should be 9.4 m.

Design Element				Manual Section	2-Lane				
Design Controls	Design Year Traffic (AADT)			40-2.01	< 400	400 ≤ AADT < 1000	1000 ≤ AADT < 3000	3000 ≤ AADT < 5000	≥ 5000
	Design Forecast Year			55-4.01	20 Years (2)				
	*Design Speed (km/h)			55-4.01	See Section 55-4.01 (3)				
	Access Control			40-5.0	None				
	Level of Service			40-2.0	Desirable: B; Minimum: D				
Cross Section Elements	Travel Lane	*Width (4)		55-4.05	Des: 3.0 m Min: 2.7 m (4a)	Des: 3.3 m Min: 3.0 m (4b)	Des: 3.3 m Min: 3.0 m (4b)	Des: 3.6 m Min: 3.3 m	Des: 3.6 m Min: 3.3 m (4c)
		Typical Surface Type		Ch. 52	Asphalt / Concrete				
	Shoulder (5)	Width Usable		55-4.05	Des: 1.2 m Min: 0.6 m	Des: 1.8 m Min: 0.6 m	Des: 1.8 m Min: 0.9 m	Des: 2.4 m Min: 1.8 m	Des: 3.0 m Min: 2.4 m
		*Width Paved		55-4.05	Des: 0.6 m Min: 0.0 m	Des: 0.6 m Min: 0.0 m	Des: 1.2 m Min: 0.6 m	Des: 1.8 m Min: 0.6 m	Des: 2.4 m Min: 0.6 m
		Typical Surface Type		Ch. 52	Asphalt / Aggregate / Earth				
	Cross Slope	*Travel Lane (6)		55-4.05	2%-3%				
		Shoulder (7)		55-4.05	4%-6% Asphalt; 6%-8% Aggregate; 8% Earth				
	Auxiliary Lanes	Lane Width		55-4.06	Des: 3.0 m; Min: 2.7 m		Des: 3.3 m; Min: 3.0 m		Des: 3.6 m Min: 3.0 m
		Shoulder Width			Des: Same as Next to Travel Lane; Min: 0.6 m				
	Obstruction-Free Zone			55-5.02	See Section 55-5.02				
	Side Slopes	Cut	Foreslope	55-4.05	2:1 or Flatter (8)				
			Ditch Width		(8)				
			Backslope		2:1 or Flatter (8)				
		Fill		55-4.05	2:1 or Flatter (8)				
Bridges**	New and Reconstructed Bridges	*Structural Capacity		Ch. 60	HS-20				
		*Clear Roadway Width (9)		55-6.03	Travelway +1.2 m	Travelway +1.8 m	Travelway +1.8 m	Travelway +2.4 m	Full Paved Appr. Width
	Existing Bridges to Remain in Place	*Structural Capacity		Ch. 60	HS-15 (10)				
		*Clear Roadway Width (11)		55-6.02	6.6 m	6.6 m	7.2 m	8.4 m	8.4 m
	*Vertical Clearance (Collector Under)	New and Replaced Overpassing Bridges (12)		55-6.0	4.45 m				
		Existing Overpassing Bridges			4.30 m				
	Vertical Clearance (Collector Over Railroad) (13)			Ch. 69	7.00 m				

Des: Desirable; Min: Minimum.

* Controlling design criteria (see Section 40-8.0). ** Selection of the cross section and bridge elements is based on the design year traffic volumes irrespective of the design speed.

GEOMETRIC DESIGN CRITERIA FOR LOCAL AGENCY RURAL COLLECTOR ROADS (1)
(3R Projects)

Table 55-3C

GEOMETRIC DESIGN CRITERIA FOR LOCAL AGENCY RURAL COLLECTOR ROADS[1]
(3R Projects)

Footnotes to Table 55-3C

(1) Applicability. This table is only applicable to Federal-aid funded projects.

(2) Design Forecast Year. For resurfacing projects, the pavement should be designed for at least a 10-year design life.

(3) Design Speed. The minimum design speed should equal a) the anticipated posted speed limit after construction or b) the state legal limit (90 km/h) on non-posted highways.

(4) Travel Lane (Width). A 3.3-m travel lane width should be used where truck volumes exceed 200 trucks per day. In addition, the following will apply:

a. Where V ≥ 80 km/h, the minimum width is 3.0 m.
b. Where V ≥ 80 km/h, the minimum width is 3.3 m.
c. Where V ≥ 80 km/h, the minimum width is 3.6 m.

(5) Shoulder Width. The following will apply:

a. The desirable guardrail offset is 0.3 m from the effective usable shoulder width. See Section 49-5.0 for more information.

b. If guardrail is present, the minimum offset from the E.T.L. to face of guardrail should desirably be equal to the shy line offset distance, but not less than 1.2 m (see Section 49-5.0 for shy line offsets).

c. Usable shoulder width is defined as the distance from the edge of the travel lane to the shoulder break point.

(6) Cross Slope (Travel Lane). Cross slopes of 1.5% are acceptable on existing bridges to remain in place.

(7) Cross Slope (Shoulder). Table values are for tangent sections. *See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information.* See ~~Section 43-3.06~~ *Figure 43-3M or Figure 43-3N* for shoulder cross slope on a horizontal curve.

(8) Side Slopes. Section 55-4.05 provides additional information for side slope criteria.

(9) Width (New and Reconstructed Bridges). The following will apply:

a. Where the approach roadway width (travelway plus shoulders) is surfaced, that surfaced width will be carried across all structures.

Design Element				Manual Section	2-Lane				
Design Controls	Design Year Traffic (AADT)			40-2.01	< 400	400-≤ AADT < 1000	1000-≤ AADT < 3000	3000-≤ AADT < 5000	≥ 5000
	Design Forecast Year			55-4.01	20 Years (2)				
	*Design Speed (km/h)			55-4.01	See Section 55-4.01 (3)				
	Access Control			40-5.0	None				
	Level of Service			40-2.0	Desirable: B; Minimum: D				
Cross Section Elements**	Travel Lane	*Width (4)		55-4.05	Des: 3.0 m; Min: 2.7 m (4a)		Des: 3.3 m Min: 3.0 m (4b)	Des: 3.6 m Min: 3.3 m (4c)	Des: 3.6 m Min: 3.3 m (4c)
		Typical Surface Type		Ch. 52	Asphalt / Concrete / Aggregate				
	Shoulder (5)	Width Usable		55-4.05	Min: 0.6 m	Des: 1.2 m Min: 0.6 m	Des: 1.8 m Min: 0.9 m	Des: 1.8 m Min: 1.2 m	Des: 2.4 m Min: 1.8 m
		Typical Surface Type		Ch. 52	Asphalt / Aggregate / Earth				
	Cross Slope	*Travel Lane (6)		55-4.05	2%-3% Asphalt / Concrete; 6%-8% Aggregate				
		Shoulder (7)		55-4.05	4%-6% Asphalt; 6%-8% Aggregate; 8% Earth				
	Auxiliary Lanes	Lane Width		55-4.06	Des: Same As Travel Lane Min: 2.7 m		Des: Same as Travel Lane Min: 3.0 m		
		Shoulder Width			Des: 1.2 m; Min: 0.6 m				
	Obstruction Free Zone			55-5.02	See Section 55-5.02				
	Side Slopes	Cut	Foreslope	55-4.05	2:1 or Flatter (8)				
			Ditch Width		(8)				
			Backslope		2:1 or Flatter (8)				
		Fill		55-4.05	2:1 or Flatter (8)				
Bridges**	New and Reconstructed Bridges	*Structural Capacity		Ch. 60	HS-20				
		*Clear Roadway Width (9)		55-6.03	Travelway +1.2 m	Travelway +1.8 m			Full Paved Appr. Width
	Existing Bridges to Remain in Place	*Structural Capacity		Ch. 60	HS-15 (10)				
		*Clear Roadway Width (11)		55-6.02	6.0 m	6.6 m	7.2 m	8.4 m	8.4 m
	*Vertical Clearance (Collector Under)	New and Replaced Overpassing Bridges (12)		55-6.0	4.45 m				
		Existing Overpassing Bridges			4.30 m				
	Vertical Clearance (Collector Over Railroad) (13)			Ch. 69	7.00 m				

Des: Desirable; Min: Minimum.

* Controlling design criteria (see Section 40-8.0). ** Selection of the cross section and bridge elements is based on the design year traffic volumes irrespective of the design speed.

GEOMETRIC DESIGN CRITERIA FOR RURAL LOCAL ROADS [1]
(3R Projects)

Table 55-3D

GEOMETRIC DESIGN CRITERIA FOR RURAL LOCAL ROADS[1]
(3R Projects)

Footnotes to Table 55-3D

(1) Applicability. This table is only applicable to Federal-aid funded projects.

(2) Design Forecast Year. For resurfacing projects, the pavement should be designed for at least a 10-year design life.

(3) Design Speed. The minimum design speed should equal a) the anticipated posted speed limit after construction or b) the state legal limit (90 km/h) on non-posted highways.

(4) Travel Lane (Width). A 3.3-m travel lane should be used where truck volumes exceed 200 trucks per day. In addition, the following will apply:

a. Where V ≥ 80 km/h, the minimum width is 3.0 m.
b. Where V ≥ 80 km/h, the minimum width is 3.3 m.
c. Where V ≥ 80 km/h, the minimum width is 3.6 m.

(5) Shoulder Width. The following will apply:

a. The desirable guardrail offset is 0.3 m from the effective usable shoulder width. In restrictive situations, the guardrail offset may be 0.3 m from the effective usable shoulder width. See Section 49-5.0 for more information.

b. If guardrail is present, the minimum offset from E.T.L. to face of guardrail should desirably be equal to the shy line offset distance, but not less than 1.2 m (see Section 49-5.0 for shy line offsets).

c. Usable shoulder width is defined as the distance from the edge of the travel lane to the shoulder break point.

(6) Cross Slope (Travel Lane). Cross slopes of 1.5% are acceptable on existing bridges to remain in place.

(7) Cross Slope (Shoulder). Table values are for tangent sections. *See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information.* See ~~Section 43-3.06~~ *Figure 43-3M or Figure 43-3N* for shoulder cross slope on a horizontal curve.

(8) Side Slopes. Section 55-4.05 provides additional information for side slope criteria.

(9) Width (New and Reconstructed Bridges). Widths of bridges more than 30 m in length will be analyzed individually. At a minimum, the roadway width of these bridges will be the width of travel lanes plus a 0.6-m right shoulder and 0.6-m left shoulder. Where shoulders are paved, it is desirable to provide the full roadway width across the bridge. See Section 59-1.0 for more information on bridge widths.

(10) Structural Capacity (Existing Bridges to Remain in Place). Where the AADT ≤ 50, an HS-10 is acceptable.

Design Element			Manual Section	Design Values (By Type of Area)		
				Suburban	Intermediate	Built-Up
Design Controls	Design Forecast Year		55-4.01	20 Years (1)	20 Years (1)	20 Years (1)
	*Design Speed (km/h) (2)		55-4.01	Posted Speed Limit	Posted Speed Limit	Posted Speed Limit
	Access Control		40-5.0	Partial Control / None	None	None
	Level of Service		40-2.0	Des: B; Min: D	Des: C; Min: D	Des: C; Min: D
	On-Street Parking		45-1.0	None	Optional (3)	Optional (3)
Cross Section Elements	Travel Lane	*Width (4)	55-4.05	Curbed: Des: 3.6 m; Min: 3.3 m Uncurbed: Des: 3.6 m; Min: 3.3 m	Curbed: Des: 3.6 m; Min: 3.3 m Uncurbed: Des: 3.6 m; Min: 3.3 m	Curbed: Des: 3.6 m; Min: 3.0 m
		Typical Surface Type (5)	Ch. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	*Curb Offset (6)		55-4.05	Des: 0.6 m; Min: 0.3 m	Des: 0.6 m; Min: 0.3 m	Des: 0.6 m; Min: 0.3 m
	Shoulder	*Paved Width (7)	55-4.05	Right: 3.0 m; Left: 1.2 m	Right: 2.4 m; Left: 0.9 m	Right: 1.8 m; Left: 0.9 m
		Typical Surface Type (5)	Ch. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	Cross Slope	*Travel Lane (8)	55-4.05	2% - 3%	2% - 3%	2% - 3%
		Shoulder (9)	55-4.05	Right: 4% - 6%; Left: 2%	4% - 6%	4% - 6%
	Auxiliary Lanes	Lane Width	55-4.05	Des: 3.6 m; Min: 3.3 m	Des: 3.6 m; Min: 3.0 m	Des: 3.6 m; Min: 3.0 m
		Curb Offset		Des: 0.3 m; Min: 0.0 m	Des: 0.3 m; Min: 0.0 m	Des: 0.3 m; Min: 0.0 m
		Shoulder Width		Des: 3.0 m; Min: 0.6 m	Des: 2.4 m; Min: 0.6 m	Des: 1.8 m; Min: 0.6 m
		Typical Surface Type (5)	Ch. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	TWLTL Lane Width		46-5.0	Des: 4.8 m; Min. 4.2 m	Des: 4.8 m; Min: 3.6 m	Des: 4.2 m; Min: 3.3 m
	Parking Lane Width		45-1.04	N/A	Des: 3.0 m; Min: 2.4 (10)	Des: 3.0 m; Min: 2.4 m (10)
	Median Width	Depressed	55-4.05	Existing	Existing	N/A
		Raised Island		Des: 4.8 m; Min: 0.6 m	Des: 4.8 m; Min: 0.6 m	Des: 4.8 m; Min: 0.6 m
		Flush / Corrugated		Des: 4.8 m; Min: 0.6 m	Des: 4.8 m; Min: 0.6 m	Des: 4.8 m; Min: 0.6 m
	Sidewalk Width (11)		55-4.05	1.2 m with 1.5-m Buffer (Des)	Des: 1.8 m; Min: 1.2 m	Des: 1.8 m; Min: 1.2 m
	Bicycle Lane Width (12)		51-7.0	Curbed: 1.5 m Uncurbed: Shld. Width +1.2 m	Curbed: 1.5 m Uncurbed: Shld. Width +1.2 m	Curbed: 1.5 m
	Obstruction Free Zone		55-5.02	See Section 55-5.02	See Section 55-5.02	See Section 55-5.02
	Typical Curbing Type (where used) (13)		55-4.05	Vertical / Sloping	Vertical / Sloping	Vertical / Sloping
	Side Slopes (Uncurbed)	Cut: Foreslope	55-4.05	2:1 or Flatter	2:1 or Flatter (14)	N/A
		Cut: Ditch Width		(14)	(14)	N/A
		Cut: Backslope		2:1 or Flatter (14)	2:1 or Flatter (14)	N/A
		Fill		2:1 or Flatter (14)	2:1 or Flatter (14)	N/A
	Side Slopes (Curbed)	Cut (Backslope)	55-4.05	(15)	(15)	(15)
		Fill		2:1 or Flatter (14)	2:1 or Flatter (14)	2:1 or Flatter (14)
	Median Slopes (Depressed)		55-4.05	Desirable: 8:1; Maximum: 4:1	Desirable: 8:1; Maximum: 4:1	Desirable: 8:1; Maximum: 4:1

Des: Desirable; Min: Minimum

* Controlling design criteria (see Section 40-8.0).

Width ≤ 1.2 m: 2%-3%
Width > 1.2 m:

GEOMETRIC DESIGN CRITERIA FOR MULTI-LANE URBAN ARTERIALS
(3R Projects)

Table 55-3E

GEOMETRIC DESIGN CRITERIA FOR MULTI-LANE URBAN ARTERIALS
(3R Projects)

Footnotes to Table 55-3E

(1) Design Forecast Year. For resurfacing projects, the pavement should be designed for at least a 10-year design life.

(2) Design Speed. The minimum design speed should equal a) the anticipated posted speed limit after construction or b) the state legal limit on non-posted highways. The legal limit is 50 km/h and with an engineering study may be raised to a maximum of 90 km/h.

(3) On-Street Parking. In general, on-street parking is discouraged.

(4) Travel Lane (Width). For arterials on the National Truck Network, the right lane must be 3.6-m travel lane in width. For other routes, a minimum 3.3-m travel lane should be used where truck volumes exceed 200 trucks a day. See Section 55-4.05.

(5) Surface Type. The pavement type selection will be determined by the INDOT Pavement Design Engineer or by the local jurisdiction.

(6) Curb Offset. A continuous vertical curb may be offset 0.3 m, and a sloping-curb offset may be zero.

(7) Shoulder. The following will apply:

a. On INDOT facilities, the shoulder is paved to the front face of guardrail. The desirable guardrail offset is 0.6 m from the effective usable shoulder width. See Section 49-5.0 for more information.

b. If guardrail is present, the minimum offset from E.T.L. to face of guardrail should desirably be equal to the shy line offset distance, but not less than 1.2 m (see Section 49-5.0 for shy line offsets). In restrictive situations, the guardrail offset may be 0.3 m from the effective usable shoulder width.

c. The table values apply to paved shoulder widths. Desirably, an additional 0.3 m of compacted aggregate will be provided.

(8) Cross Slope (Travel Lane). Cross slopes of 1.5% are acceptable on existing bridges to remain in place.

(9) Cross Slope (Shoulder). Table values are for tangent sections. *See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information*. See ~~Section 43-3.06~~ *Figure 43-3M or Figure 43-3N* for shoulder cross slope on a horizontal curve.

(10) Parking Lanes Width. The following will apply:

a. Where the parking lane will be used as a travel lane during peak hours or may be converted to a travel lane in the future, the width should be equal to the travel lane width plus the curb offset width (if present).

b. Parking lanes for residential usage may be 0.3 m less.

Design Element				Manual Section	Design Values (By Type of Area)		
					Suburban	Intermediate	Built-up
Design Controls	Design Forecast Year			55-4.01	20 Years (1)	20 Years (1)	20 Years (1)
	*Design Speed (km/h) (2)			55-4.01	Posted Speed Limit	Posted Speed Limit	Posted Speed Limit
	Access Control			40-5.01	Partial Control / None	None	None
	Level of Service			40-2.0	Des: B; Min: D	Des: C; Min: D	Des: C; Min: D
	On-Street Parking			45-1.0	None	Optional (3)	Optional (3)
Cross Section Elements	Travel Lane	*Width (4)		55-4.05	Curbed: Des: 3.6 m; Min: 3.3 m Uncurbed: Des: 3.6 m; Min: 3.3 m	Curbed: Des: 3.6 m; Min: 3.3 m Uncurbed: Des: 3.6 m; Min: 3.3 m	Curbed Des: 3.6m Curbed Min: 3.0 m
		Typical Surface Type (5)		Ch. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	*Curb Offset (6)			55-4.05	Des: 0.6 m; Min: 0.3 m	Des: 0.6 m; Min: 0.3 m	Des: 0.6 m; Min: 0.3 m
	Shoulder	*Paved Width (7)		55-4.05	Des: 3.0 m; Min: 1.8 m	Des: 2.4 m; Min: 1.2 m	Des: 1.8 m; Min: 0.6 m
		Typical Surface Type (5)		Ch. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	Cross Slope	*Travel Lane (8)		55-4.05	2%-3%	2%-3%	2%-3%
		Shoulder (9)		55-4.05	4%-6%	4%-6%	4%-6%
	Auxiliary Lanes	Lane Width		55-4.05	Des: 3.6 m; Min: 3.3 m	Des: 3.6 m; Min: 3.3 m	Des: 3.6 m; Min: 3.0 m
		Curb Offset			Des: 0.3 m; Min: 0.0 m	Des: 0.3 m; Min: 0.0 m	Des: 0.3 m; Min: 0.0 m
		Shoulder Width			Des: 3.0 m; Min: 0.6 m	Des: 2.4 m; Min: 0.6 m	Des: 1.8 m; Min: 0.6 m
		Typical Surface Type (5)		Ch. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	TWLTL Lane Width			46-5.0	Des: 4.8 m; Min. 4.2 m	Des: 4.8 m; Min: 3.6 m	Des: 4.8 m; Min: 3.3 m
	Parking Lane Width			45-1.04	N/A	Des: 3.0 m; Min: 2.4 m (10)	Des: 3.0 m; Min: 2.4 m (10)
	Sidewalk Width (11)			45-1.06	1.2 m with 1.5-m Buffer (Des)	Des: 1.8 m; Min: 1.2 m	Des: 1.8 m; Min: 1.2 m
	Bicycle Lane Width (12)			51-7.0	Curbed: 1.5 m Uncurbed: Shld. Width +1.2 m	Curbed: 1.5 m Uncurbed: Shld. Width +1.2 m	Curbed: 1.5 m
	Obstruction Free Zone			55-5.02	See Section 55-5.02	See Section 55-5.02	See Section 55-5.02
	Typical Curbing Type (where used) (13)			55-5.0	Vertical / Sloping	Vertical / Sloping	Vertical / Sloping
	Side Slopes (Uncurbed)	Cut	Foreslope	55-5.0	2:1 or Flatter (14)	2:1 or Flatter (14)	N/A
			Ditch Width		(14)	(14)	N/A
			Backslope		2:1 or Flatter (14)	2:1 or Flatter (14)	N/A
		Fill			2:1 or Flatter (14)	2:1 or Flatter (14)	N/A
	Side Slopes (Curbed)	Cut (Backslope)		55-4.05	(15)	(15)	(15)
		Fill			2:1 or Flatter (14)	2:1 or Flatter (14)	2:1 or Flatter (14)

Des: Desirable; Min: Minimum.

* Controlling design criteria (see Section 40-8.0).

Width ≤ 1.2m: 2%-3%
Width > 1.2m:

GEOMETRIC DESIGN CRITERIA FOR TWO-LANE URBAN ARTERIALS
(3R Projects)

Table 55-3F

GEOMETRIC DESIGN CRITERIA FOR TWO-LANE URBAN ARTERIALS
(3R Projects)

Footnotes to Table 55-3F

(1) Design Forecast Year. For resurfacing projects, the pavement should be designed for at least a 10-year design life.

(2) Design Speed. The minimum design speed should equal a) the anticipated posted speed limit after construction or b) the state legal limit on non-posted highways. The legal limit is 50 km/h and with an engineering study may be raised to a maximum of 90 km/h.

(3) On-Street Parking. In general, on-street parking is discouraged.

(4) Travel Lane (Width). For arterials on the National Truck Network, the right lane must be 3.6-m travel lane in width. For other routes, a minimum 3.3-m travel lane should be used where truck volumes exceed 200 trucks a day. See Section 55-4.05.

(5) Surface Type. The pavement type selection will be determined by the INDOT Pavement Design Engineer or by the local jurisdiction.

(6) Curb Offset. A continuous vertical curb may be offset 0.3 m, and a sloping-curb offset may be zero.

(7) Shoulder. The following will apply:

a. On INDOT facilities, the shoulder is paved to the front face of guardrail. The desirable guardrail offset is 0.6m from the effective usable shoulder width. See Section 49-5.0 for more information.

b. If guardrail is present, the minimum offset from E.T.L. to face of guardrail should desirably be equal to the shy line offset distance, but not less than 1.2 m (see Section 49-5.0 for shy line offsets). In restrictive situations, the guardrail offset may be 0.3 m from the effective usable shoulder width.

c. The table values apply to paved shoulder widths. Desirably, an additional 0.3 m of compacted aggregate will be provided.

(8) Cross Slope (Travel Lane). Cross slopes of 1.5% are acceptable on existing bridges to remain in place.

(9) Cross Slope (Shoulder). Table values are for tangent sections. *See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information.* See ~~Section 43-3.06~~ *Figure 43-3M or Figure 43-3N* for shoulder cross slope on a horizontal curve.

(10) Parking Lanes Width. The following will apply:

a. Where the parking lane will be used as a travel lane during peak hours or may be converted to a travel lane in the future, the width should be equal to the travel lane width plus the curb offset width (if present).

b. Parking lanes for residential usage may be 0.3 m less.

Design Element			Manual Section	Design Values (By Type of Area)		
				Suburban	Intermediate	Built-Up
Design Controls	Design Forecast Year		55-4.01	20 Years (1)	20 Years (1)	20 Years (1)
	*Design Speed (km/h) (2)		55-4.01	Posted Speed Limit	Posted Speed Limit	Posted Speed Limit
	Access Control		40-5.0	None	None	None
	Level of Service		40-2.0	Desirable: C; Minimum: D	Desirable: C; Minimum: D	Desirable: C; Minimum: D
	On-Street Parking		45-1.0	Optional (3)	Optional (3)	Optional (3)
Cross Section Elements	Travel Lane	*Width (4)	55-4.05	Curbed: Des: 3.6 m; Min: 3.0 m Uncurbed: Des: 3.6 m; Min: 3.0 m	Curbed: Des: 3.6 m; Min: 3.0 m Uncurbed: Des: 3.6 m; Min: 3.0 m	Curbed Des: 3.6 m Curbed Min: 3.0 m
		Typical Surface Type (5)	Ch. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	*Curb Offset (6)		55-4.05	Des: 0.6 m; Min: 0.3 m	Des: 0.6 m; Min: 0.3 m	Des: 0.6 m; Min: 0.3 m
	Shoulder	*Paved Width (7)	55-4.05	Des: 2.4 m; Min: 1.2 m	Des: 1.8 m; Min: 0.9 m	Des: 1.2 m; Min: 0.6 m
		Typical Surface Type (5)	Ch. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	Cross Slope	*Travel Lane (8)	55-4.05	2%-3%	2%-3%	2%-3%
		Shoulder (9)	55-4.05	4%-6%	4%-6%	4%-6%
	Auxiliary Lanes	Lane Width	55-4.05	Des: 3.6 m; Min: 3.0 m	Des: 3.6 m; Min: 3.0 m	Des: 3.6 m; Min: 2.7 m
		Curb Offset		Des: 0.3 m; Min: 0.0 m	Des: 0.3 m; Min: 0.0 m	Des: 0.3 m; Min: 0.0 m
		Shoulder Width		Des: 2.4 m; Min: 0.6 m	Des: 1.8 m; Min: 0.6 m	Des: 1.2 m; Min: 0.6 m
		Typical Surface Type (5)	Ch. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	TWLTL Lane Width		46-5.0	Des: 4.8 m; Min: 3.6 m	Des: 4.2 m; Min: 3.3 m	Des: 4.2 m; Min: 3.0 m
	Parking Lane Width		45-1.04	Des: 3.0 m; Min: 2.4 m	Des: 3.0 m; Min: 2.4 m (10)	Des: 3.0 m; Min: 2.4 m (10)
	Median Width	Raised Island	55-4.05	Des: 4.8 m; Min: 0.6 m	Des: 4.8 m; Min: 0.6 m	Des: 4.8 m; Min: 0.6 m
		Flush / Corrugated		Des: 4.8 m; Min: 0.6 m	Des: 4.8 m; Min: 0.6 m	Des: 4.8 m; Min: 0.6 m
	Sidewalk Width (11)		55-4.05	1.2 m with 1.5-m Buffer (Des)	Des: 1.8 m; Min: 1.2 m	Des: 1.8 m; Min: 1.2 m
	Bicycle Lane Width (12)		51-7.0	Curbed: 1.5 m Uncurbed: Shld. Width +1.2 m	Curbed: 1.5 m Uncurbed: Shld. Width +1.2 m	Curbed: 1.5 m
	Obstruction Free Zone		55-5.02	See Section 55-5.02	See Section 55-5.02	See Section 55-5.02
	Typical Curbing Type (where used) (13)		55-4.05	Vertical / Sloping	Vertical / Sloping	Vertical / Sloping
	Side Slopes (Uncurbed)	Cut: Foreslope	55-4.05	2:1 or Flatter (14)	2:1 or Flatter (14)	N/A
		Cut: Ditch Width		(14)	(14)	N/A
		Cut: Backslope		2:1 or Flatter (14)	2:1 or Flatter (14)	N/A
		Fill		2:1 or Flatter (14)	2:1 or Flatter (14)	N/A
	Side Slopes (Curbed)	Cut (Backslope)	55-4.05	(15)	(15)	(15)
		Fill		2:1 or Flatter (14)	2:1 or Flatter (14)	2:1 or Flatter (14)

Des: Desirable; Min: Minimum.

* Controlling design criteria (see Section 40-8.0).

GEOMETRIC DESIGN CRITERIA FOR URBAN COLLECTORS
(3R Projects)

Table 55-3G

Width ≤ 1.2 m: 2% - 3%
Width > 1.2 m:

GEOMETRIC DESIGN CRITERIA FOR URBAN COLLECTORS
(3R Projects)

Footnotes to Table 55-3G

(1) Design Forecast Year. For resurfacing projects, the pavement should be designed for at least a 10-year design life.

(2) Design Speed. The minimum design speed should equal a) the anticipated posted speed limit after construction or b) the state legal limit on non-posted highways. The legal limit is 50 km/h and with an engineering study may be raised to a maximum of 90 km/h.

(3) On-Street Parking. In general, on-street parking is discouraged.

(4) Travel Lane (Width). A minimum 3.3-m travel lane should be used where truck volumes exceed 200 trucks per day. See Section 55-4.05.

(5) Surface Type. The pavement type selection will be determined by the INDOT Pavement Design Engineer or by the local jurisdiction.

(6) Curb Offset. A continuous vertical curb may be offset 0.3 m, and a sloping-curb offset may be zero.

(7) Shoulder. The following will apply:

a. On INDOT facilities, the shoulder is paved to the front face of guardrail. The desirable guardrail offset is 0.6 m from the effective usable shoulder width. See Section 49-5.0 for more information.

b. If guardrail is present, the minimum offset from the E.T.L. to face of guardrail should desirably be equal to the shy line offset distance, but not less than 1.2 m (see Section 49-5.0 for shy line offsets). In restrictive situations, the guardrail offset may be 0.3 m from the effective usable shoulder width.

c. The table values apply to paved shoulder widths. Desirably, an additional 0.3 m of compacted aggregate will be provided.

(8) Cross Slope (Travel Lane). Cross slopes of 1.5% are acceptable on existing bridges to remain in place.

(9) Cross Slope (Shoulder). Table values are for tangent sections. *See Figure 45-1A(1) or Figure 45-1A(2) for more-specific information.* See ~~Section 43-3.06~~ *Figure 43-3M or Figure 43-3N* for shoulder cross slope on a horizontal curve.

(10) Parking Lanes Width. Parking lanes for residential usage may be 0.3 m less. Cross slopes for parking lanes are typically 1% steeper than the adjacent travel lane. In residential areas, a parallel parking lane from 2.1 to 2.4 m in width should be provided on one or both sides of the street. In commercial or industrial areas, parking lane widths should range from 2.4 to 3.3 m, and should usually be provided on both sides of the street. Where curb-and-gutter sections are used, the gutter pan width may be considered as part of the parking lane width. Where practical, the parking lane width should be in addition to the gutter pan width.

(11) Sidewalk Width. Table values are for the installation of new sidewalks. Existing sidewalk widths of 0.9 m or greater (with or without a buffer) may be retained. Buffer strips of 1.2 m or more are desirable.

Design Element			Manual Section	Design Values (By Type of Area)		
				Suburban	Intermediate	Built-Up
Design Controls	Design Forecast Year		55-4.01	20 Years (1)	20 Years (1)	20 Years (1)
	*Design Speed (km/h) (2)		55-4.01	See Section 55-4.01	See Section 55-4.01	See Section 55-4.01
	Access Control		40-5.0	None	None	None
	Level of Service		40-2.0	Desirable: C; Minimum: D	Desirable: C; Minimum: D	Desirable: C; Minimum: D
	On-Street Parking		45-1.0	Optional (3)	Optional	Optional
Cross Section Elements	Travel Lane	*Width (4)	55-4.05	Curbed: Des: 3.3 m; Min: 3.0 m Uncurbed: Des: 3.3 m; Min: 3.0 m	Curbed: Des: 3.0 m; Min: 2.7 m Uncurbed: Des: 3.3 m; Min: 3.0 m	Curbed Des: 3.0 m Curbed Min: 2.7 m
		Typical Surface Type	Ch. 52	Asphalt / Concrete	Asphalt / Concrete	Asphalt / Concrete
	*Curb Offset (5)		55-4.05	Des: 0.6 m; Min: 0.3 m	Des: 0.6 m; Min: 0.3 m	Des: 0.6 m; Min: 0.3 m
	Shoulder	*Usable Width	55-4.05	Des: 1.2 m; Min: 0.6 m	Des: 1.2 m; Min: 0.6 m	Des: 1.2 m; Min: 0.6 m
		Typical Surface Type	Ch. 52	Asphalt / Concrete / Aggregate / Earth	Asphalt / Concrete / Aggregate / Earth	Asphalt / Concrete / Aggregate / Earth
	Cross Slope	*Travel Lane (6)	55-4.05	2%-3%	2%-3%	2%-3%
		Shoulder (7)	55-4.05	2%-~~4%~~~~6%~~ Asphalt / Concrete; 6%-~~8%~~ Aggregate; 8% Earth	2%-~~4%~~~~6%~~ Asphalt / Concrete; 6%-~~8%~~ Aggregate; 8% Earth	2%-~~4%~~~~6%~~ Asphalt / Concrete; 6%-~~8%~~ Aggregate; 8% Earth
	Auxiliary Lanes	Lane Width	55-4.05	Des: 3.3 m; Min: 3.0 m	Des: 3.3 m; Min: 2.7 m	Des: 3.0 m; Min: 2.7 m
		Curb Offset		Des: 0.3 m; Min: 0.0 m	Des: 0.3 m; Min: 0.0 m	Des: 0.3 m; Min: 0.0 m
		Shoulder Width		Des: 1.2 m; Min: 0.3 m	Des: 1.2 m; Min: 0.3 m	Des: 1.2 m; Min: 0.3 m
		Typical Surface Type	Ch. 52	Asphalt / Concrete / Aggregate / Earth	Asphalt / Concrete / Aggregate / Earth	Asphalt / Concrete / Aggregate / Earth
	Parking Lane Width (3)		45-1.04	Des: 2.7 m; Min: 2.1 m	Des: 2.7 m; Min: 2.1 m	Des: 2.7 m; Min: 2.1 m
	Sidewalk Width (8)		55-4.05	1.2 m with 1.5-m Buffer (Des)	Des: 1.8 m; Min: 1.2 m	Des: 1.8 m; Min: 1.2 m
	Bicycle Lane Width (9)		51-7.0	Curbed: 1.5 m Uncurbed: Shld. Width +1.2 m	Curbed: 1.5 m Uncurbed: Shld. Width +1.2 m	Curbed: 1.5 m
	Obstruction Free Zone		55-5.02	See Section 55-5.02	See Section 55-5.02	See Section 55-5.02
	Typical Curbing Type (where used)		55-4.05	Vertical / Sloping	Vertical / Sloping	Vertical / Sloping
	Side Slopes (Uncurbed)	Cut – Foreslope	55-4.05	2:1 or Flatter (10)	2:1 or Flatter (10)	N/A
		Cut – Ditch Width		(10)	(10)	N/A
		Cut – Backslope		2:1 or Flatter (10)	2:1 or Flatter (10)	N/A
		Fill		2:1 or Flatter (10)	2:1 or Flatter (10)	N/A
	Side Slopes (Curbed)	Cut (Backslope)	55-4.05	(11)	(11)	(11)
		Fill		2:1 or Flatter (10)	2:1 of Flatter (10)	2:1 or Flatter (10)

Des: Desirable; Min: Minimum.

* Controlling design criteria (see Section 40-8.0).
** Table applies only to projects with Federal-aid funds.

GEOMETRIC DESIGN CRITERIA FOR URBAN LOCAL STREETS
(3R Projects)

Table 55-3H

56-4.04(03) Cross Slopes

1. Travel Lanes. Pavement cross slopes on tangent sections should be reviewed for all types of partial 3R treatments. Improving pavement cross slope, where required, may be completed through staged construction, e.g., combining surface milling with pavement core investigation with a variable depth cross-section of HMA Intermediate course in accordance with the INDOT *Standard Specifications* prior to placing a uniform-depth HMA Surface course.

   A preventative maintenance treatment is exempt from crown correction only if the existing rural pavement cross slope is 2%, or if the existing urban pavement cross slope is 1.5 to 3%. If the slope is outside this range, a combination of surface milling and a uniform-depth HMA Surface course should be used.

2. Shoulders. Paved shoulder slopes of 1.2 m or narrower should match the mainline cross slope or the existing shoulder slope, or should desirably be 4%. Aggregate and earth shoulder slopes should be 4% to 8%. In a horizontal curve, shoulder slope should be determined in accordance with Section 43-3.0.

Paved shoulder slopes wider than 1.2 m should match

56-4.04(04) Curbs

In areas where the curb height is not adequate for drainage, the pavement adjacent to the curb should be milled to the depth required for adequate drainage. If the curb is not structurally adequate, curb replacement should be considered. The pavement in these areas should be evaluated for possible future replacement.

56-4.04(05) Monuments

All existing Department monuments should be perpetuated. The designer is responsible for contacting the county surveyor for a list of monuments to be reset, witnessed, and monumented. All affected monuments are to be shown on the plans, or the required information is to be provided prior to construction.

56-4.04(06) Sight Distance Improvements

Existing geometrics should be maintained if no adverse accident history exists. See Chapter Fifty-five for desirable geometric criteria.

REVISION TO 2006 STANDARD SPECIFICATIONS

SECTION 922, BEGIN LINE 5, DELETE AND INSERT AS FOLLOWS:

(a) Model Approval

Each model of controller and its cabinet will be tested, evaluated, and approved prior to use. Testing, evaluation, and approval will require a minimum of six months to perform. The period of evaluation will commence when the Department receives the preliminary product evaluation form accompanied by the product brochure, operational manual, maintenance manual, and documented theory of operation. The ~~Procurement and Distribution Division~~ *Logistical Support Center* will advise the manufacturer or vendor, in writing, of the date to deliver the controller and cabinet, for which model approval is requested, to the ~~Procurement and Distribution Division~~ *Logistical Support Center*. Certification in accordance with 922.01(f)6b, shall be received at the ~~Procurement and Distribution Division~~ *Logistical Support Center* a minimum of two weeks prior to the date of delivery of the controller and cabinet. Certifications in accordance with 922.01(f)6a, schematics for the controller and cabinet, operational manuals, theory of operation and parts list shall be furnished with the controller when it is submitted to the ~~Procurement and Distribution Division~~ *Logistical Support Center* for evaluation and testing. The controller and cabinet will undergo the bench test in accordance with 922.01(d). A controller or control unit that fails the bench test procedure three times will be rejected and will not be placed upon the approved products list, nor will it be considered for future evaluation without documented changes to design. A list of approved Models will be maintained by the Department. Only models from the approved list of Control Equipment in effect as of the date of letting, or as otherwise specified, shall be used in the contract. Continued failure and repeated malfunctions of an approved controller or control equipment shall be cause to remove that model from the Department's list of approved Products.

A design change to an approved model of controller will require a resubmittal of the model for testing, evaluation, and approval. Permanent addition or removal of component parts or wires will be considered to be a design change.

(b) Controllers or Control Units Furnished and Installed by the Contractor

A controller with all components of equipment, necessary for an operating signal, wired into a cabinet will be a control unit. The Contractor shall prepare three packets for each control unit and provide these packets to the Engineer. Packet 1 shall consist of one complete set of wiring and schematic diagrams for the control unit and its appurtenances and a listing of model name/number and serial number of the removable equipment that can be readily exchanged or replaced, such as controller enclosure, controller modules, load switches, conflict monitor, detectors, and flashers. Packets 2 and 3 shall each consist of the same items as in Packet 1 plus a descriptive parts list and instruction and maintenance manuals that include the manufacturer's data sheets on each different type of I.C. chip being used, connection diagrams, voltage checks and the theory of operation. Each packet shall be labeled with the name of the intersection, the Contract Number, the Commission Number and the date of installation. Packet 1 will be forwarded to the ~~Procurement and Distribution Division~~ *Logistical Support Center*, packet 2 will be retained in the controller cabinet, and Packet 3 will be retained by the District Traffic Office.

SECTION 922, BEGIN LINE 79, DELETE AND INSERT AS FOLLOWS:

If the control unit fails the bench test procedure, the control unit shall be removed from the ~~Procurement and Distribution Division~~ *Logistical Support Center* for repairs and returned to the Traffic Support Center for retesting. The cover letter for the resubmittal of the control unit for retesting shall include an explanation of why the unit failed and what specific repairs were made.

SECTION 922, BEGIN LINE 174, DELETE AND INSERT AS FOLLOWS:

With each controller unit and cabinet there shall be furnished three complete sets of wiring and schematic diagrams, two descriptive parts lists, two instruction and maintenance manuals that include the manufacturer's data sheets on each different type of integrated circuit chip being used that has not been previously submitted to and on file at the ~~Procurement and Distribution Division~~ *Logistical Support Center*, connection diagrams, voltage checks and the Theory of Operation. The instructions manual shall contain explicit programming procedures for all required features and any additional features incorporated in the controller's design. All schematics shall also include numbered test points, where applicable, with operating voltages.

SECTION 922, BEGIN LINE 342, DELETE AND INSERT AS FOLLOWS:

1. General

The controller shall be keyboard entry, menu-driven with liquid crystal type display. The controller shall have internal preemption, time base coordination, telemetry, printer and interconnect modules. The microprocessor shall utilize non-volatile memory devices. If "0" Powered Ram is utilized, the shelf life, with load, shall be a minimum of 10 years. Time base coordination shall use battery backed RAM to maintain the system clock and power outage. Any external battery within the controller unit shall be turned off or disconnected during storage and shipment. With each controller unit and cabinet, there shall be furnished three complete sets of wiring and schematic diagrams, two descriptive parts lists, two instruction and maintenance manuals that include the manufacturer's data sheets on each different type of integrated circuit chips used that has not been previously submitted to and on file at the ~~Procurement and Distribution Division~~ *Logistical Support Center*, connection diagrams, voltage checks, and the Theory of Operation. The instruction manual shall contain explicit programming procedures for all required NEMA features and any additional features of which are incorporated into the controller design. All schematics shall also include numbered test points, where applicable, with operating voltages.

SECTION 922, BEGIN LINE 490, DELETE AND INSERT AS FOLLOWS:

Each traffic signal control unit purchased by the Department shall have a minimum two year operational warranty or the manufacturer's standard warranty, whichever is longer. The two year warranty shall begin on the date the control unit is received at the ~~Procurement and Distribution Division~~ *Logistical Support Center*. The vendor or manufacturer shall be responsible, during the warranty period, for transportation costs to and from the Procurement and Distribution Division for items requiring warranty service.

REVISION TO 2006 STANDARD SPECIFICATIONS

SECTION 922, CONTINUED.

Other sections containing specific cross references:

922.01(d)
922.01(a) Pg 900-172

922.01(f)7
922.01(e)7 Pg 900-178

General Instructions to Field Employees
Update Required? Y ☐ N ☐
By - Addition ☐ Revision ☐

Frequency Manual
Update Required? Y ☐ N ☐
By - Addition ☐ Revision ☐

Recurring Special Provisions potentially affected:

Standard Sheets potentially affected:

None

Motion: Mr.
Second: Mr.
Ayes:
Nays:

Action: Passed as submitted ☐ revised ☐
Effective - _____ Letting
_____ Supplementals

Withdrawn ☐ Resubmit ☐

Received FHWA Approval? Y ☐ N ☐

Item No. 8-9
Mr. Miller
Date: 10/20/05

REVISION TO 2006 STANDARD SPECIFICATIONS

SECTION 107, BEGIN LINE 680, 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. *The Contractor shall provide a defect free maintenance bond for one year from the time of the notification of acceptance.*

Other sections containing specific cross references:

108.11, Page 100-81

General Instructions to Field Employees
Update Required? Y ☐ N ☐
By - Addition ☐ Revision ☐
Frequency Manual
Update Required? Y ☐ N ☐
By - Addition ☐ Revision ☐

Recurring Special Provisions potentially affected:

None

Standard Sheets potentially affected:

None

Motion: Mr.
Second: Mr.
Ayes:
Nays:

Action: Passed as submitted ☐ revised ☐
Effective - _____ Letting
_____ Supplementals

Withdrawn ☐ Resubmit ☐

Received FHWA Approval? Y ☐ N ☐