Indiana Design Manual
Comprehensive Pavement Analysis Updates

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Welcome!

- Introductions
  - Kumar Dave, PE – INDOT, Manager Pavement Engineering
  - Mitchell Wilcox, EI – Michael Baker International, Inc.

- Goals of Today
  - Review Key Changes to IDM – Comprehensive Pavement Analysis
  - Review Corresponding Changes to Comprehensive Pavement Analysis Figures
  - Answer Questions Regarding Changes

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Agency's(INDOT) perspectives

- Pavement Design Chapter of IDM
  - Chapter 52(prior to 2014)
  - Chapter 304(2014 Revised)
  - Chapter 600(2019 Being Revised)
  - Work Load: >500 pavement designs/year(In house+Consultants)

- 2014 Revisions(Major).....under Mr. Holtz's direction
  - MEPDG
  - 5O Meetings(Indot+Fhwa+Research+Construction+Maintenance)
  - 1 year

Agency's perspectives

- 2019 Revisions/Updates
  - < 50 meetings
  - > 1 year
  - Michael Baker(Mitch Wilcox)

- 2019 Revisions/Updates
  - Pavement Design Process(Flow chart)
  - LPA
  - Recycling techniques(FDR,CIR..)
  - Patching….3D Survey Van
  - Thin Concrete Overlay
  - Drainage and Separation layers
  - Design Life

Agency's perspectives

- Instructions to the Pavement Designers
  - Need to see different alternatives using cost/lane mile/year
  - Use of recycle techniques
  - Meaningful Patching Table
  - Thin Concrete Overlay option
  - Appropriate use of Drainage and Separation layers
  - Design Life(do not blindly follow table)
  - Functional and Structural lives
  - Preliminary Pavement Design
  - Goal is to deliver great service to the customer (Agency Goal)
  - Taking INDOT to Next Level in Pavement Design

What's New?

- Chapter 304 is now Chapter 600
  - Pavement Design has its own IDM Section
  - Some section numbers have changed, but the primary section number is the same for most sections as it was in Chapter 304 (EX. 304-1.0 is now 600-1.0)
  - Some figures have changed, but many have the same general number (EX. FIGURE 304-21F is now FIGURE 600-21F)

600-1.0 - INTRODUCTION

- Expands on who may use this chapter.

- Adds clarity regarding the primary objective of a Pavement Designer: Least Cost of Ownership
  - *“It is the ultimate goal and primary purpose of the pavement designer to determine a pavement treatment that provides an appropriate level of service while yielding the least cost of ownership to the Department unless otherwise directed by INDOT pavement staff.”*

Figure 600-14A

Pavement-Work Type	Minimum Acceptable Design Life, Years[2]
CRCP (Continously Reinforced Concrete Pavement)	50
PCCP	30
PCCP over Existing Pavement	25
HMA Pavement with SMA	20
HMA with Surface Overlay on Rubblized PCCP	20
HMA Pavement	20
HMA Overlay on CRCP	20
HMA Overlay on Rubblized PCCP	20
Thin Concrete Overlay (TCO)	20
HMA Overlay on Cracked and Seated PCCP	12
HMA Overlay over Asphalt	
Rehabilitation (≥ 3 layers)	18
Rehabilitation (2 layers)	15
Preventive Maintenance (1 layer)[1]	9
HMA Overlay over PCCP	
Rehabilitation (≥ 3 layers)	15
Rehabilitation (2 layers)	12
Full Depth Reclamation	
FDR with Sruface Treatment	6
FDR with HMA Overlay	15
Cold In-Place Recycling (CIR)	10
Cold Central Plant Recycling (CCPR)	10
Hot In-Place Recycling (HIR)	6
PCCP Joint Sealing	8
Ultrathin Bonded Wearing Course (UBWC)	9
Microsurface Overlay	8
Thin HMA Overlay with Profile Milling	9
Concrete Pavement Rehabilitation (CPR) Techniques	6
Chip Seal	4
Asphalt Crack Sealing, Rout and Seal	3
Asphalt Crack Filling	1

[1] The performance period should be decreased to 8 yr for existing composite HMA

[2] It is the ultimate goal and primary purpose of the pavement designer to determine a pavement treatment that yields the least cost of ownership to the Department unless otherwise directed by INDOT pavement staff. In the instance that the most cost-effective pavement treatment lacks viability from either a project budget or constructability standpoint, the pavement designer should work with INDOT pavement staff to determine if a different pavement treatment should be recommended or if the programmatic intent should be altered through change management.

600-5.0 – PAVEMENT ANALYSIS AND DESIGN DEVELOPMENT

- Pavement Designer Responsibilities:
  - Overlay Projects: 30-year Design Run in PavementME
  - New Pavement: 50-year Design Run in PavementME
  - Figure 600-14B: Functional and Structural Criteria
- Preliminary Pavement Scope
  - 5.01(01) – Clarifies process and sources for determining the scope of a project
- Pavement Assignment
  - 5.01(02) – Defines the process for which pavement assignments will be made

600-5.0 – PAVEMENT ANALYSIS AND DESIGN DEVELOPMENT – Cont.

- INDOT Pavement Design Process
  - Preliminary Design - 5.01(03) – Figure 600-21EE
  - Final Design – 5.01(04) – Figure 600-21EE
- LPA Pavement Design Process (Design Memo 18-01)
  - Defines LPA Pavement Design requirements and process – Figure 600-21FF

Figure 600-14B

Performance Criteria	Performance Limit at End of Design Life	Reliability New Pavement Design	Reliability Overlay Design
Terminal IRI (in./mi.)	Freeway: 160	90%	90%
	Arterial, Urban: 190	90%	90%
	Arterial, Rural: 200	85%	85%
	Collector, Urban: 190	80%	80%
	Collector, Rural: 200	75%	80%
	Local: 200	70%	80%
AC Top-Down Fatigue Cracking (ft./mi.)	Freeway: 2000	90%	90%
	Arterial, Urban: 2000	90%	90%
	Arterial, Rural: 2000	85%	85%
	Collector, Urban: 2000	80%	80%
	Collector, Rural: 2000	75%	80%
	Local: 2000	70%	80%
AC Bottom-Up Fatigue Cracking (% lane area)	Freeway: 10	90%	*50%
	Arterial, Urban: 20	90%	*50%
	Arterial, Rural: 25	85%	*50%
	[illegible]	[illegible]	[illegible]
	Collector, Rural: 35	75%	*50%
	Local: 35	70%	*50%
AC Thermal Cracking (ft/mi/lane)	Freeway: 500	90%	*50%
	Arterial, Urban: 500	90%	*50%
	Arterial, Rural: 500	85%	*50%
	Collector, Urban: 500	80%	*50%
	Collector, Rural: 500	75%	*50%
	Local: 500	70%	*50%
Permanent Deformation - Total Pavement (in.)	Freeway: 0.75	90%	90%
	Arterial, Urban: 0.75	90%	90%
	Arterial, Rural: 0.75	85%	85%
	Collector, Urban: 0.75	80%	80%
	Collector, Rural: 0.75	75%	80%
	Local: 0.75	70%	80%
Permanent Deformation - AC Only Pavement (in.)	Freeway: 0.40	90%	90%
	Arterial, Urban: 0.40	90%	90%
	Arterial, Rural: 0.40	85%	85%
	Collector, Urban: 0.40	80%	80%
	Collector, Rural: 0.40	75%	80%
	Local: 0.40	70%	80%
AC Total Fatigue Cracking: Bottom-Up + Reflective (% Lane Area)	Freeway: 10	-	90%
	Arterial, Urban: 20	-	90%
	Arterial, Rural: 25	-	85%
	Collector, Urban: 30	-	80%
	Collector, Rural: 35	-	80%
	Local: 35	-	80%
AC Total Transverse Cracking: Thermal + Reflective (ft./mi.)	Freeway: 2500	-	90%
	Arterial, Urban: 2500	-	90%
	Arterial, Rural: 2500	-	85%
	Collector, Urban: 2500	-	80%
	Collector, Rural: 2500	-	80%
	Local: 2500	-	80%

* AC Bottom-Up Cracking and AC Thermal Cracking reliabilites for overlays are for analysis purposes only and should not be used as a crtieria, because they cannot be visually distinguished from reflective cracking.

PERFORMANCE CRITERIA FOR NEW OR REHABILITATION HMA

Figure 600-14B

Performance Criteria	Performance Limit at End of Design Life	Reliability New Pavement Design	Reliability Overlay Design
Terminal IRI (in./mi.)	Freeway: 160	90%	90%
	Arterial, Urban: 190	90%	90%
	Arterial, Rural: 200	85%	85%
	Collector, Urban: 190	80%	80%
	Collector, Rural: 200	75%	80%
	Local: 200	70%	80%
AC Top-Down Fatigue Cracking (ft./mi.)	Freeway: 2000	90%	90%
	Arterial, Urban: 2000	90%	90%
	Arterial, Rural: 2000	85%	85%
	Collector, Urban: 2000	80%	80%
	Collector, Rural: 2000	75%	80%
	Local: 2000	70%	80%
AC Bottom-Up	Freeway: 10	90%	*50%
	Arterial, Urban: 20	90%	*50%
	Arterial, Rural: 25	85%	*50%

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NOTES:

1. THIS FLOWCHART DIAGRAM OUTLINES THE GENERAL STEPS TO BE TAKEN WHEN COMPLETING A PAVEMENT DESIGN FOR INDOT PROJECTS, DETAILED INFORMATION REGARDING THE PAVEMENT DESIGN PROCESS AND THE NECESSARY REQUIREMENTS CAN BE FOUND IN CHAPTER 600 OF THE INDIANA DESIGN MANUAL
2. THE ENTIRE PROCESS, FROM THE TIME CENTRAL OFFICE PAVEMENT ENGINEERING ASSIGNS THE PAVEMENT DESIGN TO EITHER A CONSULTANT OR TO AN IN-HOUSE ENGINEER TO THE SUBMITTAL OF THE FINAL PAVEMENT DESIGN REPORT IS TYPICALLY (120) DAYS
3. SEE SPECIFICS OUTLINED IN CHAPTER 600 OF THE INDIANA DESIGN MANUAL
4. THE "DESIGN ENGINEER" OR "CONSULTANT DESIGNER" FOR EACH PROJECT IS THE DESIGNER PREPARING THE ROADWAY PLANS AND GEOMETRICS FOR THE PROJECT, SOMETIMES REFERRED TO AS THE SITE DESIGNER
5. PM = PROJECT MANAGER
6. PE = PROFESSIONAL ENGINEER

INDOT PAVEMENT DESIGN PROCESS
INDOT PROJECTS

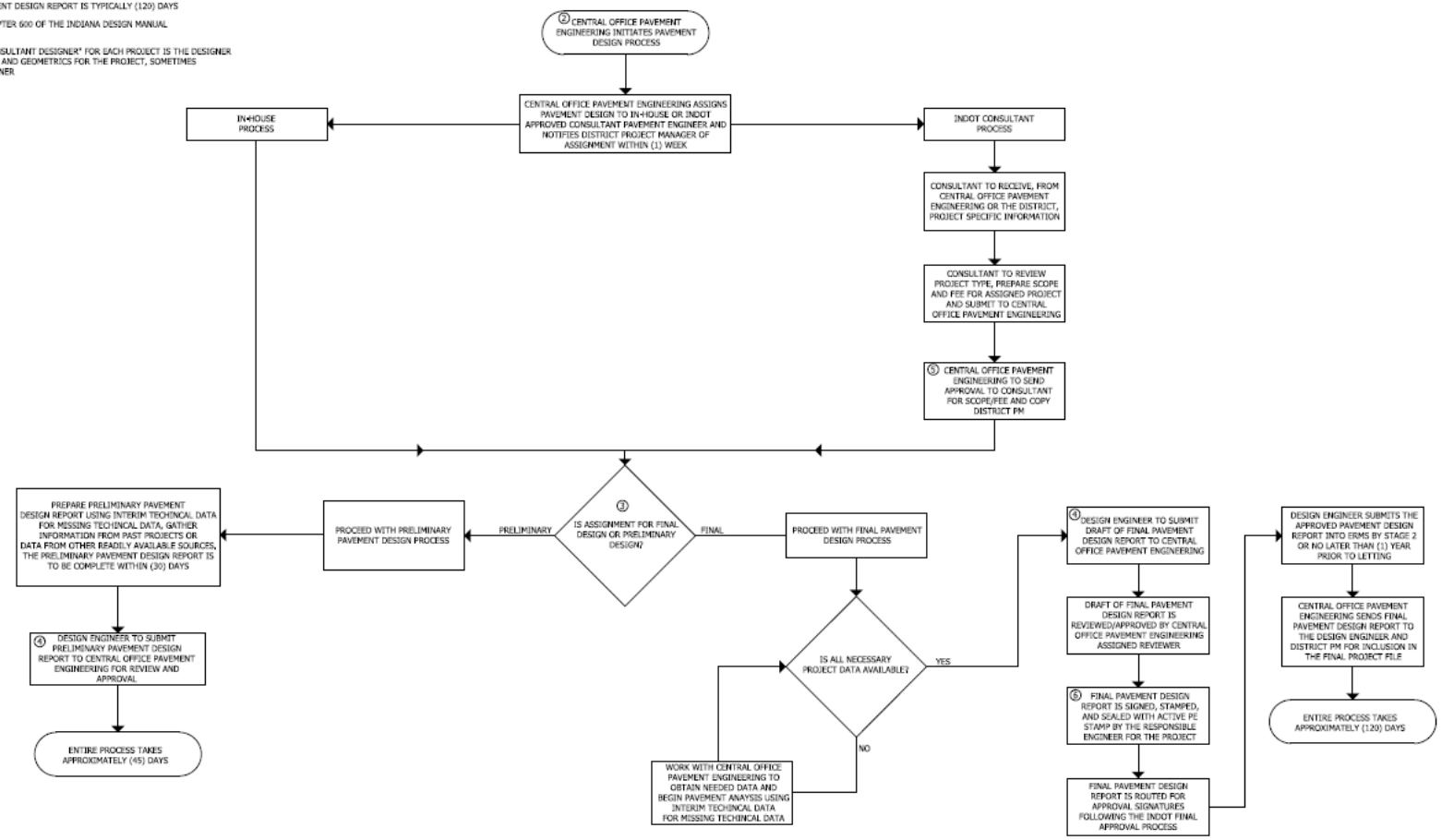

FIGURE 600-21EE

RECOMMENDED FOR APPROVAL _____ DESIGN ENGINEER DATE

DESIGNED: _____ DRAWN: _____

CHECKED: _____ CHECKED: _____

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PAVEMENT DESIGN FLOWCHART

HORIZONTAL SCALE	BRIDGE FILE
N/A	-
VERTICAL SCALE	DESIGNATION
N/A	N/A
SURVEY BOOK	SHEETS
-	1 of 1
CONTRACT	PROJECT
N/A	N/A

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NOTES:

① THIS FLOWCHART DIAGRAM OUTLINES THE GENERAL STEPS TO BE TAKEN WHEN COMPLETING A PAVEMENT DESIGN FOR LPA PROJECTS, DETAILED INFORMATION REGARDING THE PAVEMENT DESIGN PROCESS AND THE NECESSARY REQUIREMENTS CAN BE FOUND IN CHAPTER 600 OF THE INDIANA DESIGN MANUAL

② THE "DESIGN ENGINEER" OR "CONSULTANT DESIGNER" FOR EACH PROJECT IS THE DESIGNER PREPARING THE ROADWAY PLANS AND GEOMETRICS FOR THE PROJECT, SOMETIMES REFERRED TO AS THE SITE DESIGNER

INDOT PAVEMENT DESIGN PROCESS LPA PROJECTS

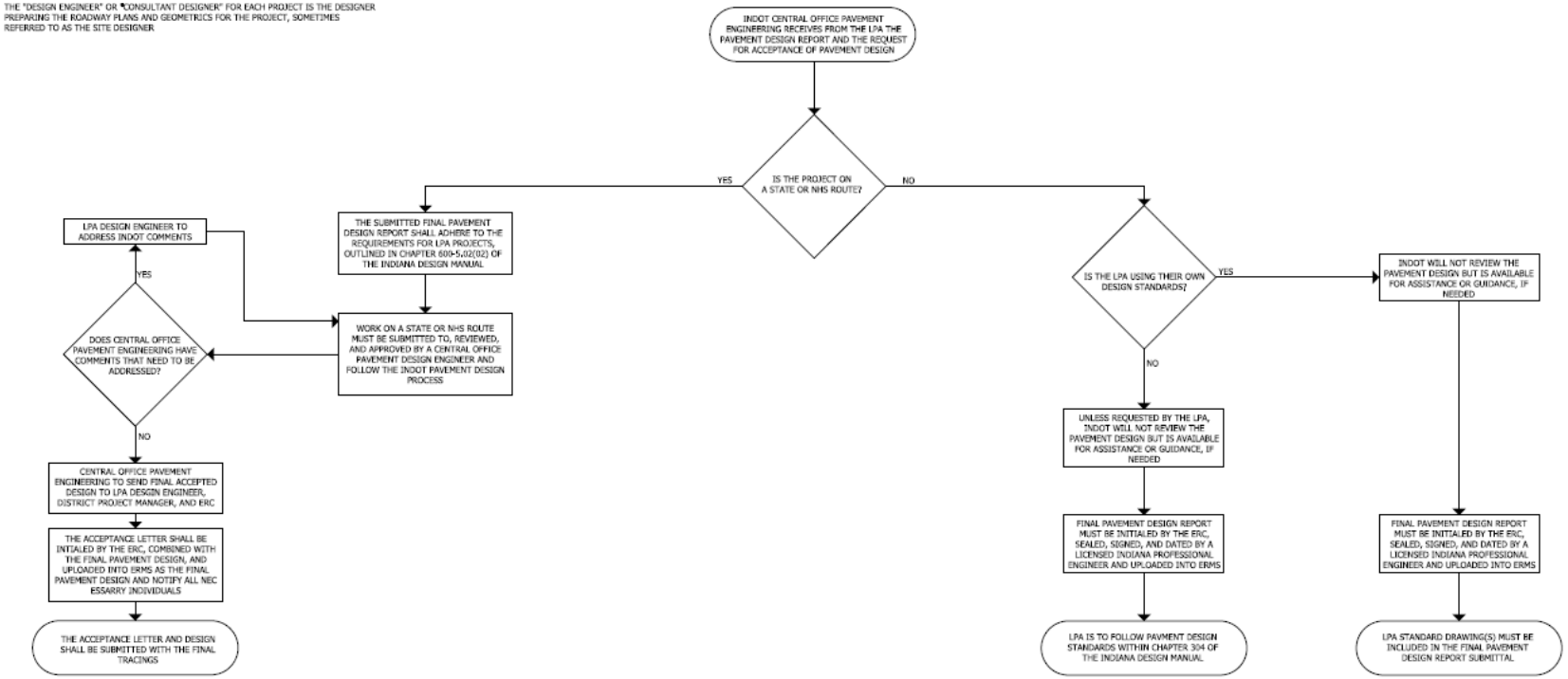

FIGURE 600-21FF

RECOMMENDED FOR APPROVAL _____ DESIGN ENGINEER DATE

DESIGNED: _____ DRAWN: _____

CHECKED: _____ CHECKED: _____

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PAVEMENT DESIGN FLOWCHART

HORIZONTAL SCALE	BRIDGE FILE
N/A	-
VERTICAL SCALE	DESIGNATION
N/A	N/A
SURVEY BOOK	SHEETS
-	1 OF 1
CONTRACT	PROJECT
N/A	N/A

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600-6.0: PAVEMENT PROJECT CATEGORIES

- Clarifies different pavement treatment types and the main category/work-type they fall under
- Section 19 eliminated and compiled into Section 6
- Figure 600-19A Revised: Includes matrix of decisions for treatments per old Section 19

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Figure 600-19A

Treatment	AADT[1]	Pavement Distresses	Rutting, in.	IRI	Friction Treatment?	Surface Aging	Longitudinal Joint
Crack Seal	Any	Low to Moderately Sever Transverse or Longitudinal Joints/Reflective Cracks	n/a	n/a	No	n/a	n/a
Crack Fill	Any	Low to Moderately Severe Longitudinal Cold Joint, Reflective & Edge Cracking Plus Low Severity Block Cracking	n/a	n/a	No	n/a	n/a
Fog Seal	< 5,000 [2]	Low-Severity Environmental Surface Cracks	n/a	n/a	No [3]	Retards aging and oxidation; arrests minor raveling	Required on surface layer over longitudinal joint 24-in. in width
Seal Coat	< 5,000 [2]	Low-Severity Environmental Surface Cracks	< 0.25 [4]	n/a [4]	Yes	Retards aging, oxidation, and minor raveling	n/a
Microsurface	Any	Low-Severity Surface Cracks	Any	< 130	Yes	Retards aging, oxidation, and minor raveling	n/a
UBWC	Any	Low to Moderately Severe Surface Cracks	< 0.25	< 140	Yes	Retards aging, oxidation, and moderate raveling	n/a
HMA Inlay	Any	Low to Moderately Severe Surface Cracks	Any	< 150	Yes	Replaces aged, oxidized, or raveled surface	n/a
Thin HMA Overlay w/Profile Milling	Less than 10 million, ESAL	Low to Moderately Severe Surface Cracks (For use on Category 1, 2, or 3 roads only)	< 0.25	< 150	Yes	Arrest aging, oxidation, and moderate raveling	n/a
HMA Overlay	Any	Low to Moderately Severe Surface Cracks	Any	< 150	Yes	Arrests aging, oxidation, and moderate raveling	n/a

Notes:

[1] For mainline pavement

[2] Unless traffic can be adequately controlled

[3] Treatment may reduceskid number

[4] Treatment does not address

HMA PREVENTIVE MAINTENANCE TREATMENTS

Figure 600-19A

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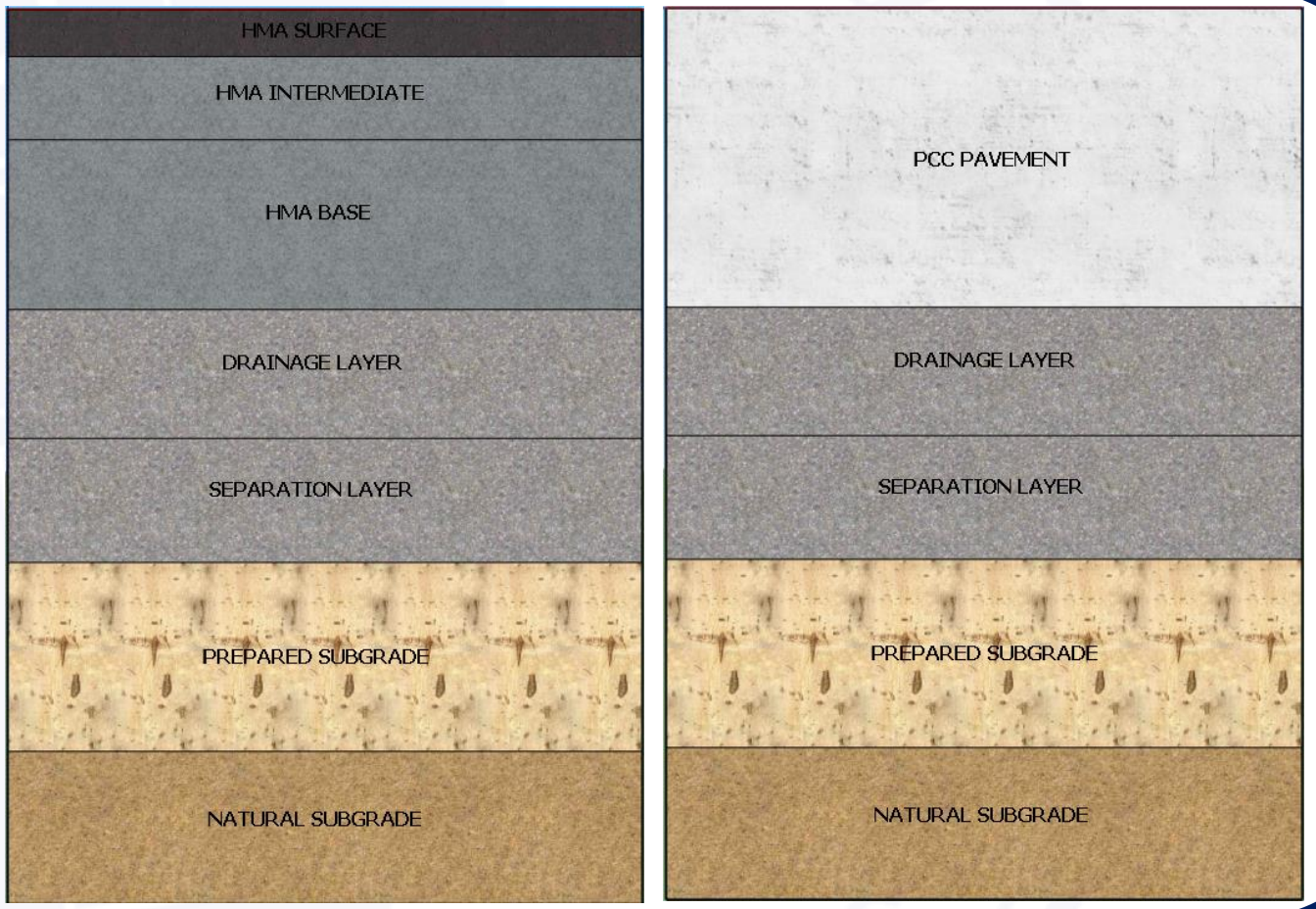
600-8.0 – PAVEMENT TYPES

- Pavement layer arrangement



600-8.0 – PAVEMENT TYPES

- Clarity regarding asphalt layer minimum thicknesses and target thickness added per NMAS.

MIXTURE TYPE, MAXIMUM PARTICLE SIZE AND HMA LAYER THICKNESS					
Mixture Type	Nominal Maximum Aggregate Size (NMAS, in.)	Maximum Particle Size (in.)	Minimum HMA Layer Thickness (in.)	Maximum HMA Layer Thickness (in.)	Target HMA Layer Thickness (in.)
9.5 mm	0.375 (3/8)	0.5	1.0	2.0	1.5
12.5 mm	0.5	0.75	1.5	3.0	2-2.5
19.0 mm	0.75	1.0	2.0	4.0	2.5 – 3.5
25.0 mm	1.0	1.5	3.0	6.0	3.5 - 5.5

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600-8.0 – PAVEMENT TYPES – Cont.

- Pavement drainage and separation layers

Layer Material Type	Minimum Thickness (in.)	Maximum Thickness (in.)
Aggregate	3.0	6.0
Open-Graded Asphalt	2.5	4.0
Cement-Treated Permeable Base	3.0	6.0
Synthetic Treated Permeable Base	NA	NA

DRAINAGE LAYER THICKNESSES

Layer Material Type	Minimum Thickness (in.)	Maximum Thickness (in.)
Aggregate	3.0	6.0
Geotextile	NA	NA

SEPERATION LAYER THICKNESSES

TYPICAL FULL-DEPTH HMA PAVEMENT DRAINAGE AND SEPERATION LAYERS

Figure 600-21D-2

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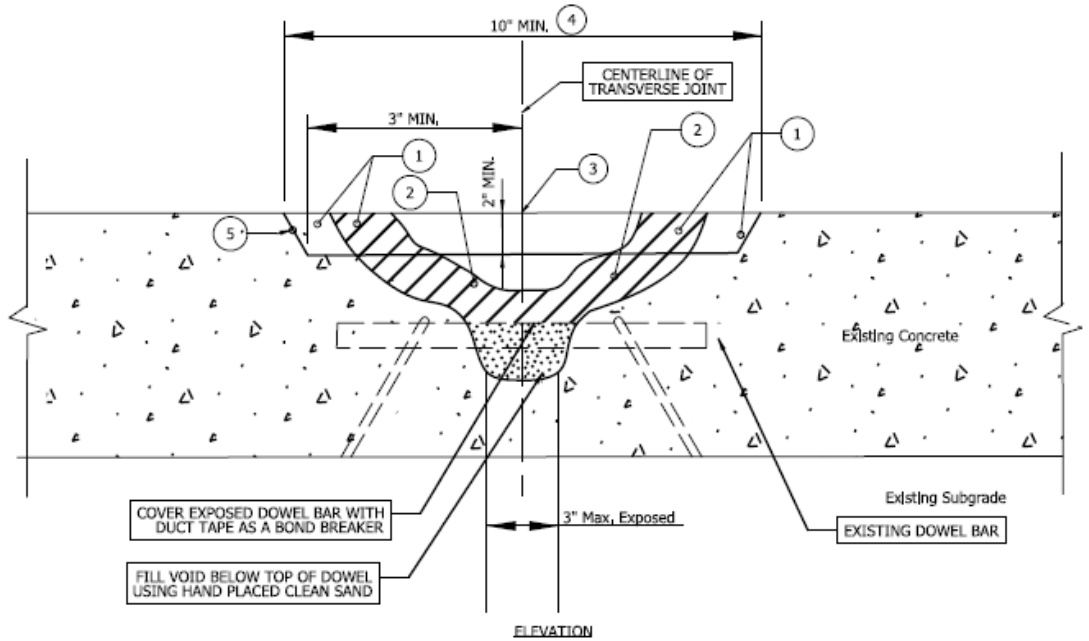
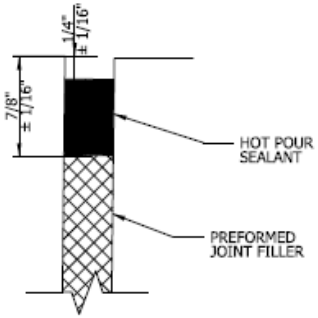
600-11.0 – PAVEMENT PATCHING - PCCP

- Expanded PCCP Patching for Partial Depth and Joint Repair
- PCCP Patching, Partial Depth:
  - PCCP Patching, Partial Depth is used to patch concrete pavement when full depth patching is not required, but an area of concrete, other than that around a joint, needs to be repaired
- PCCP Patching, Joint Repair
  - Joint repair of PCCP pavement includes the removal or replacement of shallow areas of PCCP at spalled or distressed joints

TRANSVERSE JOINT REPAIR, PARTIAL DEPTH



ELEVATION



JOINT DETAIL

NOTES:

1. REMOVE CONCRETE BY MILLING (TYPICAL) OR BY CHIPPING HAMMER.
2. REMOVE UNSOUND CONCRETE BY CHIPPING HAMMER. EXPOSE BAR ONLY IF NECESSARY. CHIPPING HAMMERS ARE LIMITED TO A MAXIMUM WEIGHT OF 35 POUNDS.
3. JOINT REESTABLISHMENT IS REQUIRED. FURNISH AND INSTALL 3/8" PREFORMED JOINT FILLER PRIOR TO CONCRETE PLACEMENT.
4. REPAIRS THAT INVOLVE BOTH SIDES OF JOINT SHALL HAVE AT LEAST 5 INCHES OF MILLING WIDTH, AS MEASURED FROM THE JOINT IN EITHER DIRECTION. SLABS THAT ONLY INVOLVE REPAIR TO ONE SIDE OF THE JOINT SHALL HAVE AT LEAST 10 INCHES OF MILLING WIDTH, AS MEASURED FROM THE JOINT AND SHALL NOT DISTURB THE CONCRETE IN THE ADJACENT SLAB.
5. SIDES OF REPAIR SHALL BE TAPERED 30° - 60° FROM VERTICAL

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Date:

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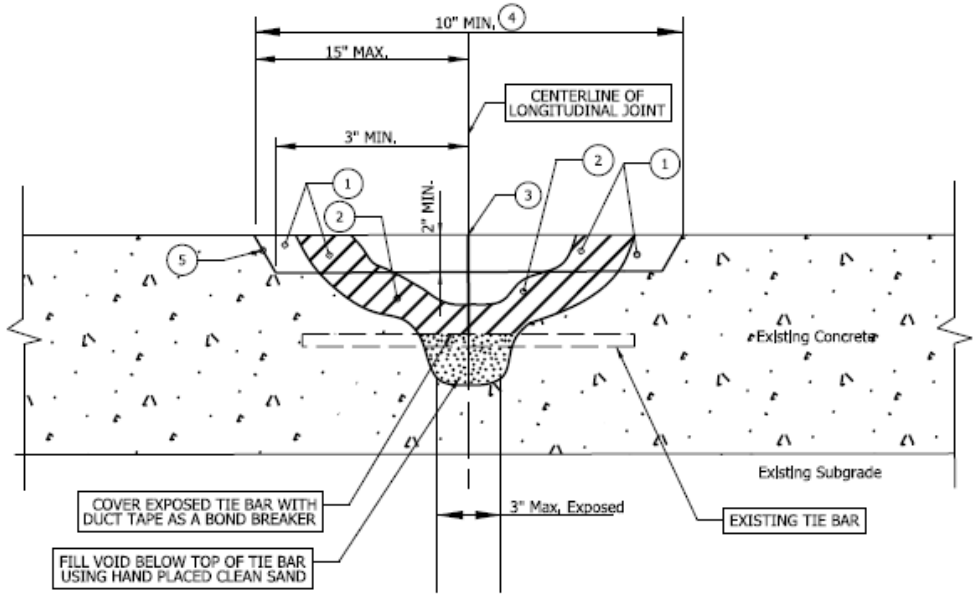
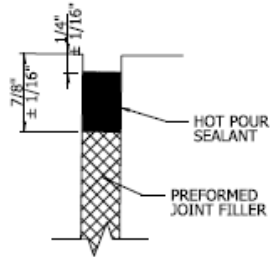
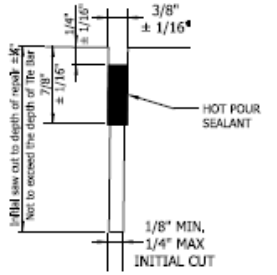
LONGITUDINAL JOINT REPAIR, PARTIAL DEPTH



ELEVATION



JOINT DETAIL-
PREFORMED JOINT FILLER/HOT POUR SEALANT OPTION



JOINT DETAIL-
INITIAL SAW CUT OPTION

NOTES:

1. REMOVE CONCRETE BY MILLING (TYPICAL) OR BY CHIPPING HAMMER.
2. REMOVE UNSOUND CONCRETE BY CHIPPING HAMMER, EXPOSE BAR ONLY IF NECESSARY, CHIPPING HAMMERS ARE LIMITED TO A MAXIMUM WEIGHT OF 35 POUNDS.
3. JOINT REESTABLISHMENT IS REQUIRED. IF USING PREFORMED OPTION, FURNISH AND INSTALL 3/8" PREFORMED JOINT FILLER PRIOR TO CONCRETE PLACEMENT.
4. REPAIRS THAT INVOLVE BOTH SIDES OF JOINT SHALL HAVE AT LEAST 5 INCHES OF MILLING WIDTH, AS MEASURED FROM THE JOINT IN EITHER DIRECTION.
   SLABS THAT ONLY INVOLVE REPAIR TO ONE SIDE OF THE JOINT SHALL HAVE AT LEAST 10 INCHES OF MILLING WIDTH, AS MEASURED FROM THE JOINT AND SHALL NOT DISTURB THE CONCRETE IN THE ADJACENT SLAB.
5. SIDES OF REPAIR SHALL BE TAPERED 30° - 60° FROM VERTICAL

Recommended for Approval:

Date:

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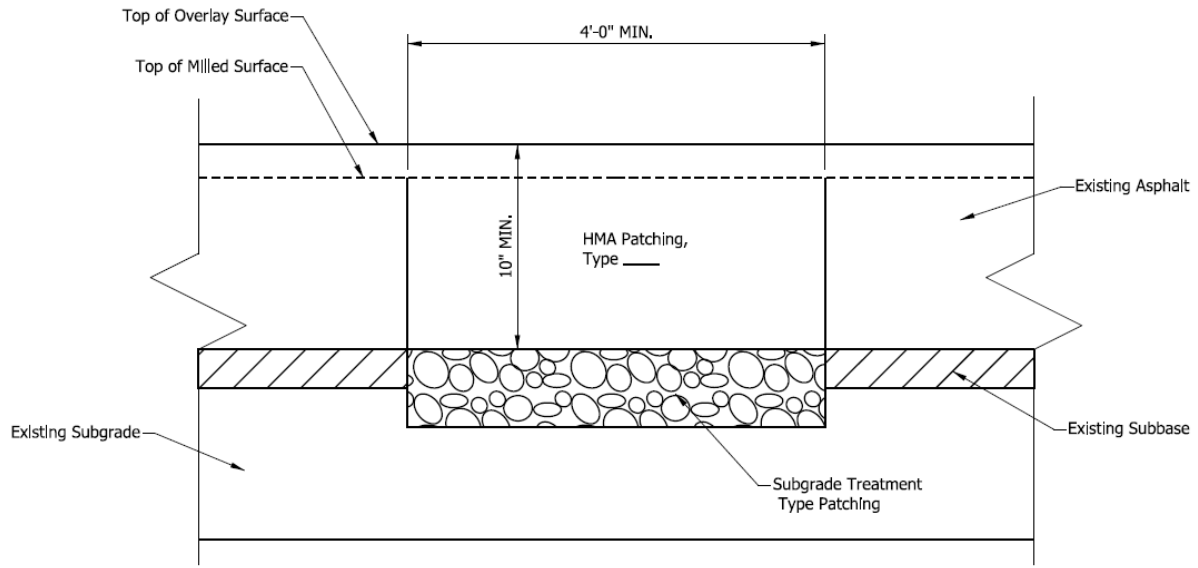
600-11.0 – PAVEMENT PATCHING – HMA

- Expanded HMA Patching: Partial Depth vs. Full Dept
- New Figure: 600-21CC-2



FULL-DEPTH HMA PATCH

Figure 600-21CC-2

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600-12.0 – PAVEMENT WIDENING

- Widening with HMA vs. QC/QA-HMA
- Width changed from 5 ft. to 8 ft.
- Language added regarding decision making per cost-effectiveness

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600-13.0 – PAVEMENT TESTING

- 3D Laser Pavement Condition Survey
  - A 3D Laser Condition survey is the process of collecting data to determine the structural integrity, distresses, skid resistance, and overall riding quality of the pavement.
- Coring
  - Shoulder Core Locations
- Geotechnical Testing
  - Requirements for the Geotechnical Report per pavement needs added.

600-14.0 – MEPDG GENERAL INPUTS USING AASHTOWARE PAVEMENT ME DESIGN SOFTWARE

- Minimum Tolerable Design Life for Analysis
  - Overlays – 30-year design life
  - New pavement – 50 year design life
  - Failure points determine functional and structural life that must be greater than or equal to minimum design lives in Figure 600-14A
- Performance Criteria for Pavement Design
  - Clarity added regarding functional vs. structural criteria

600-14.0 – MEPDG GENERAL INPUTS USING AASHTOWARE PAVEMENT ME DESIGN SOFTWARE

- Depth of Water Table
  - More detailed and clarified language added regarding selection of water table depth for design
- ME Design Calibration Factors
  - Although already in use, information regarding calibration factors has been added to the manual. Be sure to use INDOT calibration factors.
- PCCP Changes
  - Dowel Diameter: Requirement of 3 inches of cover
- Level 2 vs. Level 3 Inputs:
  - Clarity added as to when to use Level 2 vs. Level 3 Inputs

600-14.08 – OVERLAY DESIGN – THIN CONCRETE OVERLAYS

- Thin Concrete Overlays
  - Empirical design information added to the design manual for Thin Bonded Concrete Overlays

Effective Structural # = (Structural # from FWD) – (0.3 * Milling Thickness in inches)

Effective Structural Number	Concrete Overlay Thickness			
	< 1 million ESALs	1 to 3 million ESALs	3 to 5 million ESALs	5 to 10 million ESALs
2.0 - 2.5	4.5	5	5	6*
2.5 - 3.5	4.5	4.5	4.5	5
3.5 - 4.5	4	4	4.5	4.5
> 4.5	4	4	4	4.5

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600-16.0 – CONTINOUSLY REINFORCED CONCRETE PAVEMENT - CRCP

- CRCP section has been reduced significantly.
- The content for reinforcement, edge support, and end treatments of CRCP has been removed.
- Content can be found in FHWA-HIF-16-026 Design Manual “Continuously Reinforced Concrete Pavement Manual”

600-17.01 – MISCELLANOUS PAVEMENT PROJECT ELEMENTS

- Foundation Improvements
- Changes and added clarity to temporary pavement expectations
- Passing Blisters and Turn Lanes added
- Bridge Rehabilitation and Replacement, and Small Structure Replacement design and reporting expectations added (600-17.11 to 600-17.13)

SECTION REARRANGMENT

- Section 304-19.0 is no longer “Preventive Maintenance”. Content from this section has been transferred to 600-6.0 and Figure 600-19A

- Section 304-20.0 is now 600-19.0: “Life Cycle Pavement Cost Analysis”
  - Note: Life Cycle Cost Analysis (LCCA) has been replaced with Life Cycle Pavement Cost Analysis (LCPCA) – The intent is to create a focus on determining least cost of ownership of the pavement.
  - As mentioned previously, MEPDG runs for overlays and new pavement should be 30 years and 50 years respectively, and graphical outputs can then be used to determine the function and structural lives of the pavement section.

Figure 600-15A

Initial AADTT, trucks per day	Design ESALs, millions*	QC/QA-HMA Category**
AADT < 510	ESAL < 3	2
510 ≤ AADTT < 1700	3 ≤ ESAL < 10	3
AADTT ≥ 1700	≥ 10	4

2-LANE ROAD

Initial AADTT, trucks per day	Design ESALs, millions*	QC/QA-HMA Category**
AADTT < 570	< 3	2
570 ≤ AADTT < 1900	3 ≤ ESAL < 10	3
AADTT ≥ 1900	≥ 10	4

4-LANE ROAD

Initial AADTT, trucks per day	Design ESALs, millions*	QC/QA-HMA Category**
AADTT < 870	< 3	2
870 ≤ AADTT < 2900	3 ≤ ESAL < 10	3
AADTT ≥ 2900	≥ 10	4

6-LANE ROAD

Initial AADTT, trucks per day	Design ESALs, millions*	QC/QA-HMA Category**
AADTT < 1140	< 3	2
1140 ≤ AADTT < 3800	3 ≤ ESAL < 10	3
AADTT ≥ 3800	≥ 10	4

8-LANE ROAD

*ESAL values based on INDOT calculations of ESALs
**For open-graded mixtures OG 19.0 and 25.0, the QC/QA-HMA Category is 4

ESAL CATEGORY FOR QC/QA-HMA MIXTURES

Figure 600-15A

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Figure 600-15B

Initial AADTT, trucks per day	Design ESALs, millions*	HMA Category
AADT < 510	< 3	B
510 ≤ AADTT < 1700	3 ≤ ESAL < 10	C
AADTT ≥ 1700	≥ 10	D

2-LANE ROAD

Initial AADTT, trucks per day	Design ESALs, millions*	HMA Category
AADTT < 570	< 3	B
570 ≤ AADTT < 1900	3 ≤ ESAL < 10	C
AADTT ≥ 1900	≥ 10	D

4-LANE ROAD

Initial AADTT, trucks per day	Design ESALs, millions*	HMA Category
AADTT < 870	< 3	B
870 ≤ AADTT < 2900	3 ≤ ESAL < 10	C
AADTT ≥ 2900	≥ 10	D

6-LANE ROAD

Initial AADTT, trucks per day	Design ESALs, millions*	HMA Category
AADTT < 1140	< 3	B
1140 ≤ AADTT < 3800	3 ≤ ESAL < 10	C
AADTT ≥ 2900	≥ 10	D

8-LANE ROAD

*ESAL values based on INDOT calculations of ESALs

MIXTURE TYPE FOR HMA MIXTURES

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Figure 600-21D-1

HMA Thickness	Layer No.	Course	Lay Rate (lb/yd^2)	Aggregate Size, mm
7.0 in.*	1	Surface	165	9.5
	2	Intermediate	275	19.0
	3	Base	330	19.0
7.5 in.*	1	Surface	165	9.5
	2	Intermediate	275	19.0
	3	Base	385	19.0
8 in.*	1	Surface	165	9.5
	2	Intermediate	330	19.0
	3	Base	385	19.0
8.5 in.*	1	Surface	165	9.5
	2	Intermediate	385	19.0
	3	Base	385	19.0
9 in.*	1	Surface	165	9.5
	2	Intermediate	330	19.0
	3	Base	495	25.0
9.5 in.*	1	Surface	165	9.5
	2	Intermediate	330	19.0
	3	Base	550	25.0
10 in.*	1	Surface	165	9.5
	2	Intermediate	330	19.0
	3	Base	605	25.0
10.5 in.*	1	Surface	165	9.5
	2	Intermediate	385	19.0
	3	Base	605	25.0
11.0 in.*	1	Surface	165	9.5
	2	Intermediate	385	19.0
	3	Base	660	25.0
11.5 in.*	1	Surface	165	9.5
	2	Intermediate	330	19.0
	3	Base	385	19.0
	4	Base	385	19.0
12.0 in.*	1	Surface	165	9.5
	2	Intermediate	385	19.0
	3	Base	385	19.0
	4	Base	385	19.0
12.5 in.*	1	Surface	165	9.5
	2	Intermediate	330	19.0
	3	Base	440	25.0
	4	Base	440	25.0
13.0 in.*	1	Surface	165	9.5
	2	Intermediate	275	19.0
	3	Base	495	25.0
	4	Base	495	25.0
13.5 in.*	1	Surface	165	9.5
	2	Intermediate	330	19.0
	3	Base	495	25.0
	4	Base	495	25.0
14.0 in.*	1	Surface	165	9.5
	2	Intermediate	275	19.0
	3	Base	550	25.0
	4	Base	550	25.0

* Full-depth HMA Thicknesses listed are for surface, intermediate, and base layers only. Subbase, subgrade, and foundation layers that may be required are not listed in this table. Various alternatives for drainage and seperation layer materials, if required for a project, are discussed in this chapter and are summarized in Figure 600-21D-2.

FULL-DEPTH HMA PAVEMENT EXAMPLE SECTIONS

Figure 600-21D-1

Figure 600-21D-2

Layer Material Type	Minimum Thickness (in.)	Maximum Thickness (in.)
Aggregate	3.0	6.0
Open-Graded Asphalt	2.5	4.0
Cement-Treated Permeable Base	3.0	6.0
Synthetic Treated Permeable Base	NA	NA

DRAINAGE LAYER THICKNESSES

Layer Material Type	Minimum Thickness (in.)	Maximum Thickness (in.)
Aggregate	3.0	6.0
Geotextile	NA	NA

SEPERATION LAYER THICKNESSES

TYPICAL FULL-DEPTH HMA PAVEMENT DRAINAGE AND SEPERATION LAYERS

Figure 600-21D-2

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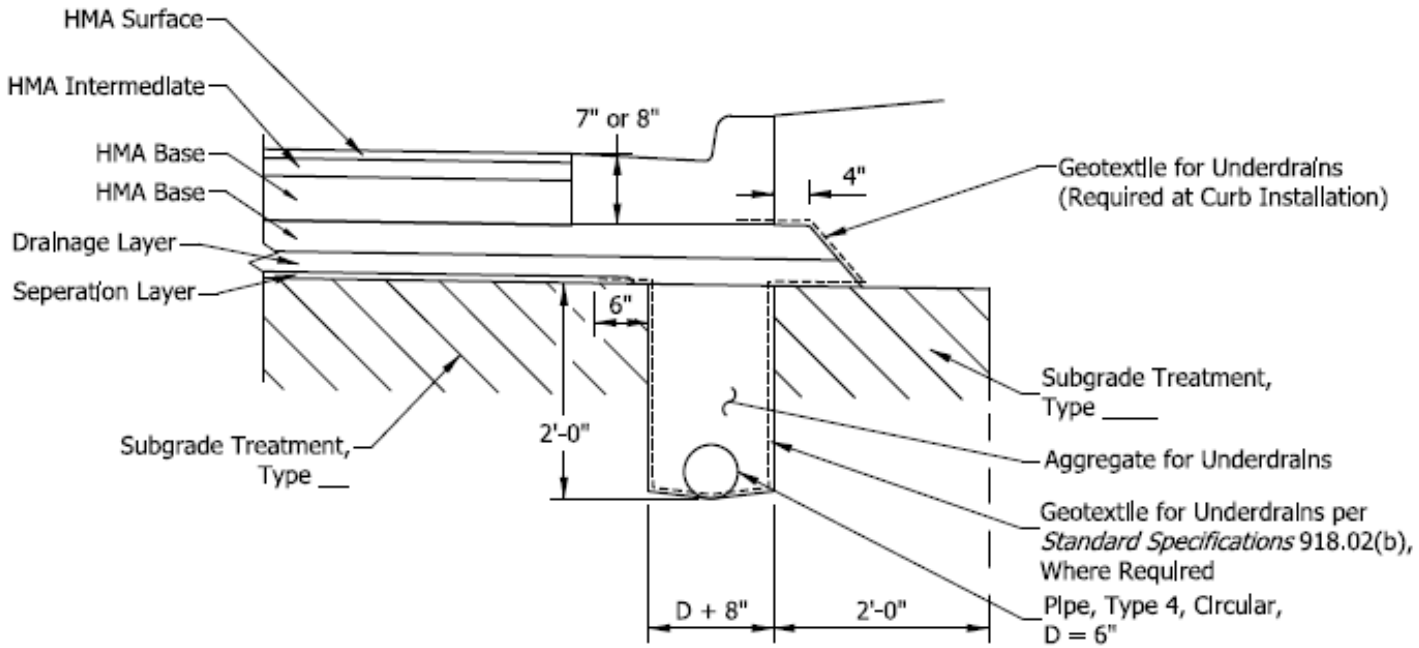
Figure 600-21K-1



CONCRETE CURB AND GUTTER SECTION FOR HMA PAVEMENT
WITH UNDERDRAIN, CURB ON HMA BASE

Figure 600-21K-1

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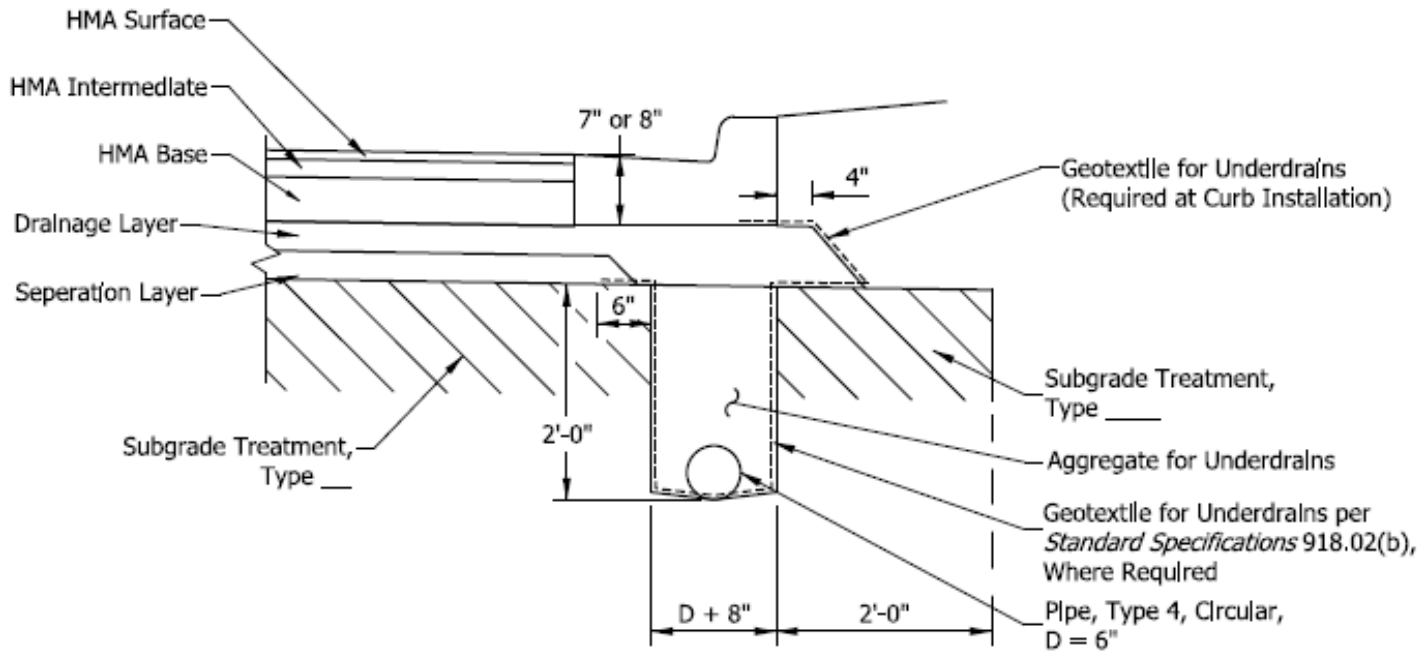
Figure 600-21K-2



CONCRETE CURB AND GUTTER SECTION FOR HMA PAVEMENT
WITH UNDERDRAIN, CURB ON DRAINAGE LAYER

Figure 600-21K-2

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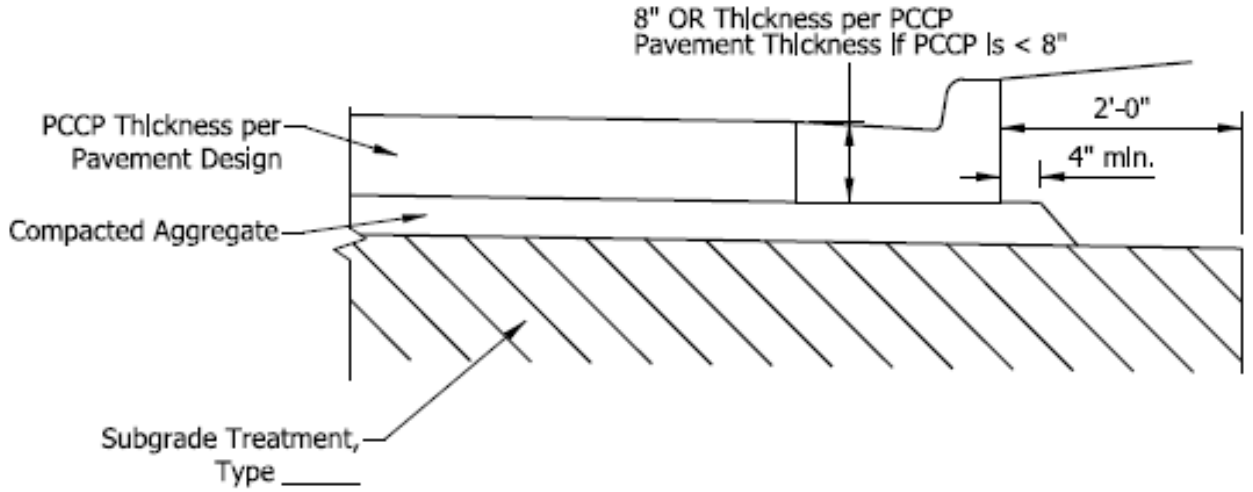
Figure 600-21M



CONCRETE CURB AND GUTTER SECTION FOR PCCP PAVEMENT WITHOUT UNDERDRAIN

Figure 600-21M

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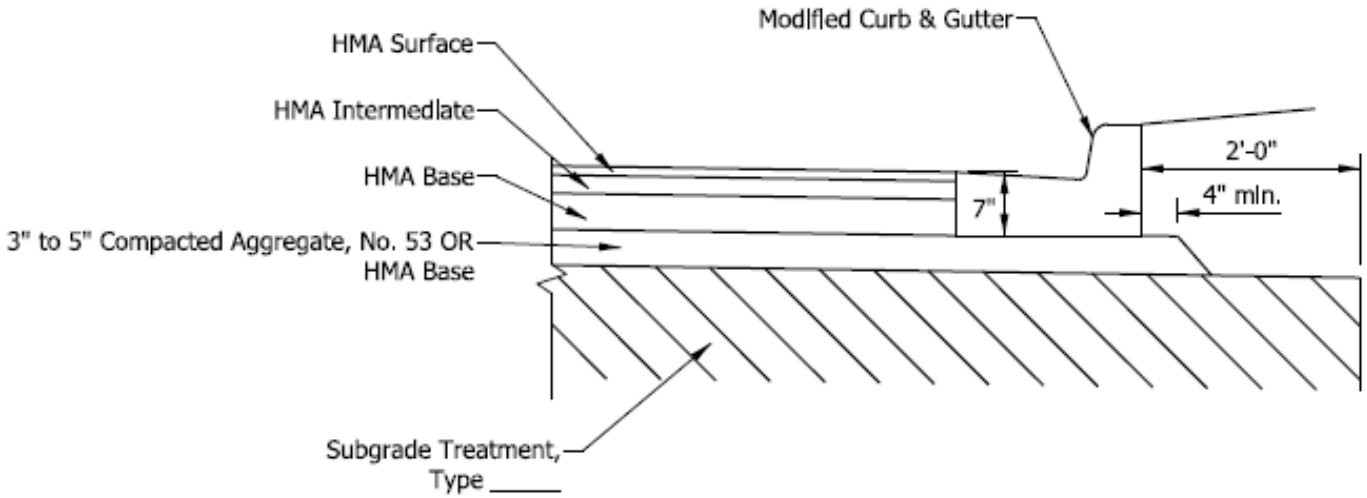
Figure 600-21N



MODIFIED CONCRETE CURB AND GUTTER SECTION FOR HMA PAVEMENT ON COMPACTED AGGREGATE WITHOUT UNDERDRAIN

Figure 600-21N

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Questions?