



Illinois Department of Transportation

Memorandum

To: Mike Brand

From: Masood Ahamd

By: Becky Marruffo

Subject: Pavement Design

Date: May 28, 2020

FAP 303 (US 20 BR)

Section 41R-1

D-92-073-11

Contract No. 64H08

US Business 20 from Day Avenue to Independence Avenue in Rockford

Attached is the updated pavement design for the subject section. This is a four-lane divided section with 20,304 square yards of new pavement and a total length of 0.57 miles. This is being re-submitted because the pavement design will expire on June 9, 2020 and is currently scheduled to be let on November 6, 2020.

The updated mechanistic pavement design and LCCA indicates that flexible pavement presents the lower first and life cycle costs, providing a 5.9% annual cost savings versus a rigid pavement design. The project is subject to the alternate bid procedure due to the LCCA not favoring a flexible or a rigid design by more than 10%.

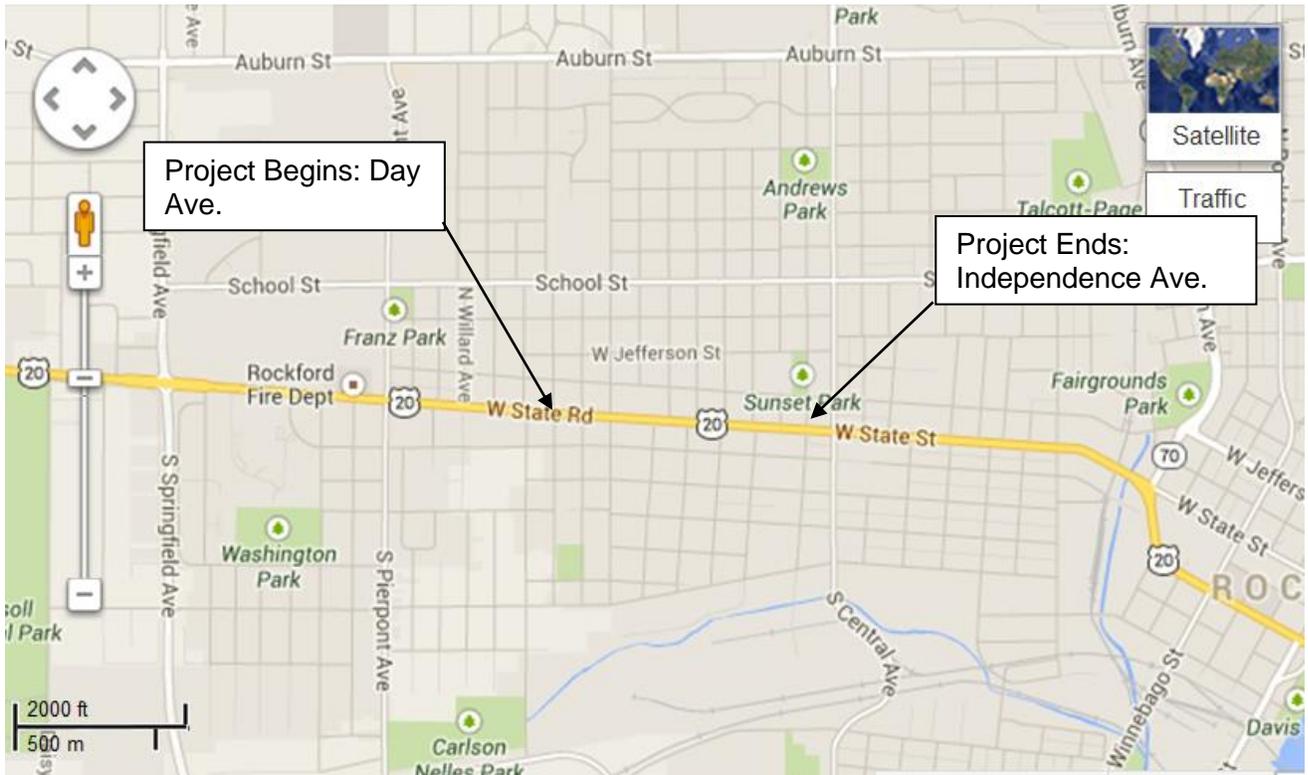
The District is requesting concurrence on the original pavement design that BDE approved on June 8, 2015 which consisted of alternate bids. Option 1 consisted of 9 inches of Jointed PCC Pavement with Tied PCC Curb & Gutter and Option 2 consisted of 9.75 inches of Full Depth HMA Pavement with PCC Curb & Gutter.

Attached is a location map, mechanistic pavement design spread sheet, life-cycle cost analysis, typical sections, and BDE approval letter for your use.

If you have any questions, please contact Corey Conderman at 815/284-5936.

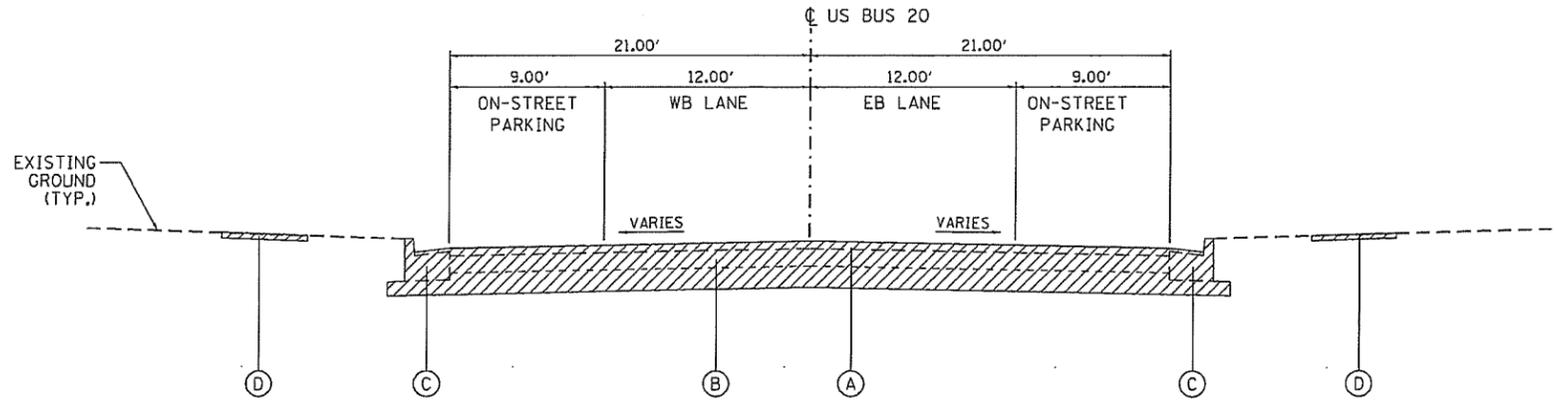
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Enclosures

LOCATION MAP



FAP 303 (US 20BR West State St.)
Section 41R-1
Winnebago County
Job No. D-92-073-11; C-92-012-14
64H08

Reconstruction of roadway, modernize traffic signals and improve intersections along US Business Route 20 (West State Street) from Day Avenue to Independence Avenue in Rockford. Project Length: 0.57 mile

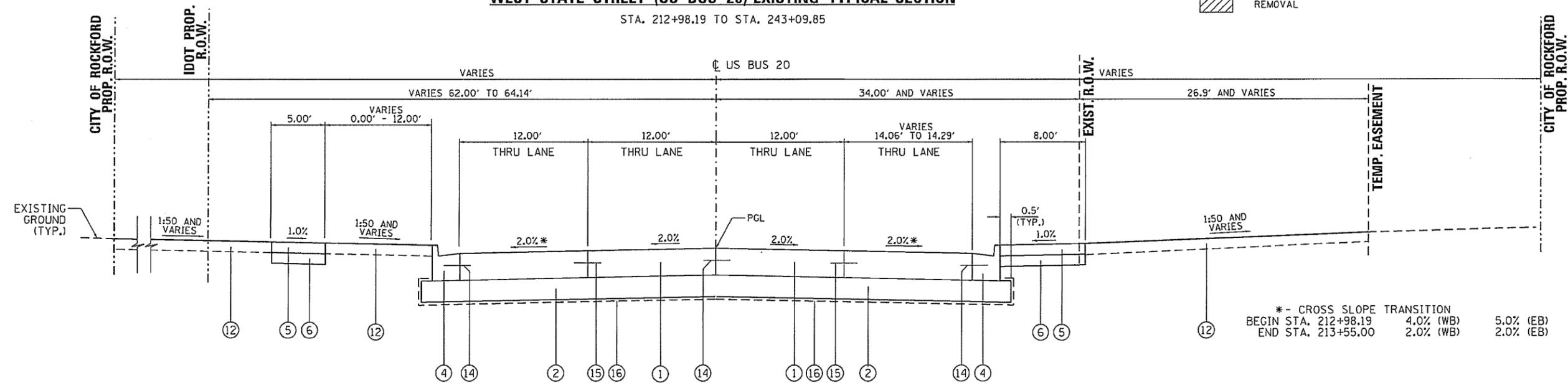


WEST STATE STREET (US BUS 20) EXISTING TYPICAL SECTION

STA. 212+98.19 TO STA. 243+09.85

EXISTING LEGEND

- (A) EXISTING BITUMINOUS OVERLAY 3 1/2"±
- (B) EXISTING CONCRETE PAVEMENT 9"±
- (C) EXISTING CURB AND GUTTER
- (D) EXISTING SIDEWALK
- [Hatched Box] REMOVAL



WEST STATE STREET (US BUS 20) PROPOSED TYPICAL SECTION

STA. 212+98.19 TO STA. 213+77.43

PROPOSED LEGEND

- (1) PORTLAND CEMENT CONCRETE PAVEMENT 9" (JOINTED)
- (2) AGGREGATE SUBGRADE IMPROVEMENT 12" OR 18" (REFER TO SCHEDULE, SHEET 27 FOR STATION LIMITS)
- (4) COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.24
- (5) PORTLAND CEMENT CONCRETE SIDEWALK, 4"
- (6) AGGREGATE BASE COURSE, TYPE B, 4"
- (7) HOT-MIX ASPHALT SURFACE COURSE, IL-9.5 FG, N50, 3"
- (8) AGGREGATE BASE COURSE, TYPE B, 6"
- (12) TOPSOIL FURNISH AND PLACE, 4"
- (14) #6 TIE BARS AT 24" CTS.
- (15) #6 TIE BARS AT 30" CTS.
- (16) -GEOTECHNICAL FABRIC UNDER 18" SUBGRADE AND MULTI-USE PATH
-GEOGRID FABRIC UNDER AGGREGATE SUBGRADE IMPROVEMENT, 12" (REFER TO SCHEDULE, SHEET 27 FOR STATION LIMITS)

WEST STATE STREET (US BUS 20)

STRUCTURAL DESIGN INFORMATION (RIGID PAVEMENT)

STRUCTURAL DESIGN TRAFFIC: YEAR: 2025
 PV=8.849 SU=230 MU=90
 ROAD/STREET CLASSIFICATION: CLASS 1
 PERCENT OF STRUCTURAL DESIGN TRAFFIC IN DESIGN LANE:
 P=32% S=45% M=45%
 TRAFFIC FACTOR: ACTUAL TF=0.87
 MINIMUM TF=5.02
 MINIMUM SUBGRADE SUPPORT RATING: POOR
 PAVEMENT STRUCTURE: 9" PCC (JOINTED)
 12" AGGREGATE

HOT-MIX ASPHALT MIXTURE REQUIREMENT

SIDE STREETS & ALLEYS	PERCENT AIR VOIDS @ Ndes
HMA SURFACE COURSE, MIX "C", N50, SPECIAL; 3.5"	4% @ 50 GYR.
MULTI-USE PATH	
HMA SURFACE COURSE, IL-9.5 FG, N50; 3"	3% @ 50 GYR.

1. THE UNIT WEIGHT USED TO CALCULATE ALL HOT-MIX ASPHALT SURFACE MIXTURES IS 112 LBS/SQ. YD./IN
 2. THE "AC TYPE" FOR POLYMERIZED HMA MIXES SHALL BE "SBS/SBR PG 76-22" AND FOR NON POLYMERIZED HMA THE "AC TYPE" SHALL BE PG 64-22" UNLESS MODIFIED BY SPECIAL PROVISIONS.
 FOR USE OF RECYCLED MATERIALS SEE SPECIAL PROVISIONS.



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	DRAWN - TSJ	REVISED -
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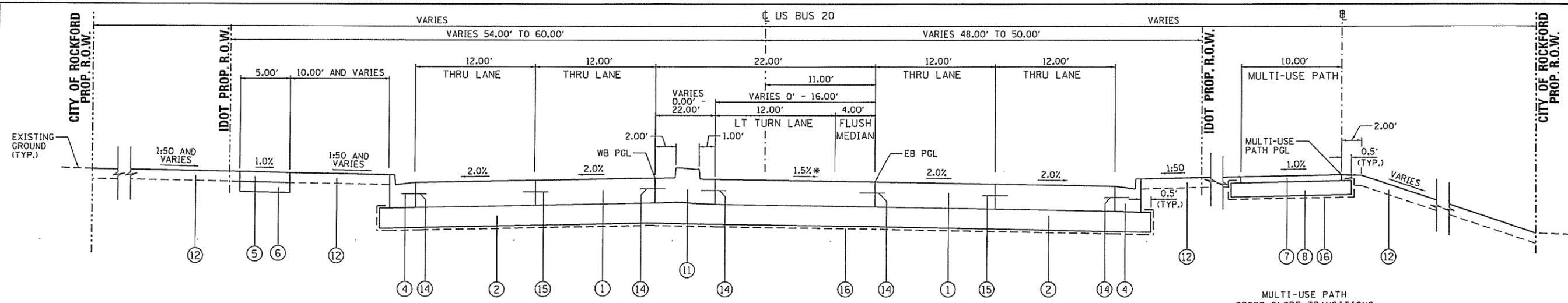
STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION

TYPICAL SECTIONS - PCC PAVEMENT (ALTERNATIVE 1)
WEST STATE STREET (US BUS 20)

SCALE: NTS SHEET 1 OF 7 SHEETS STA. N/A TO STA. N/A

F.A.P. RTE. 303	SECTION (40.4) R	COUNTY WINNEBAGO	TOTAL SHEETS 297	SHEET NO. 13
			CONTRACT NO. 64H08	
ILLINOIS FED. AID PROJECT				

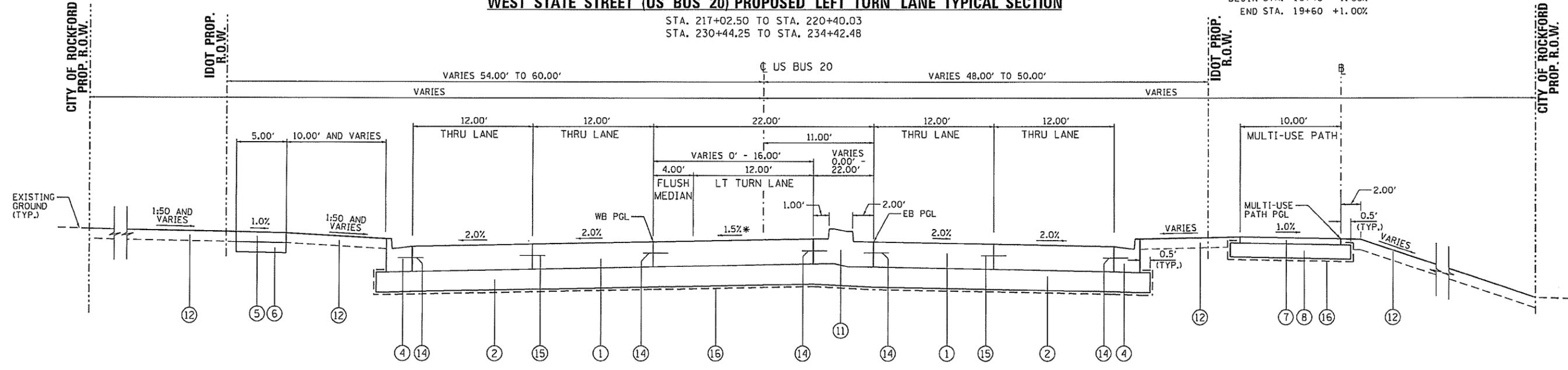
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WEST STATE STREET (US BUS 20) PROPOSED LEFT TURN LANE TYPICAL SECTION

STA. 217+02.50 TO STA. 220+40.03
 STA. 230+44.25 TO STA. 234+42.48

MULTI-USE PATH
 CROSS-SLOPE TRANSITIONS
 BEGIN STA. 19+40 -1.00%
 END STA. 19+60 +1.00%



WEST STATE STREET (US BUS 20) PROPOSED LEFT TURN LANE TYPICAL SECTION

STA. 220+40.03 TO STA. 223+76.04

* - SEE JOINTING PLANS FOR INTERSECTION GRADING

PROPOSED LEGEND

- ① PORTLAND CEMENT CONCRETE PAVEMENT 9" (JOINTED)
- ② AGGREGATE SUBGRADE IMPROVEMENT 12" OR 18" (REFER TO SCHEDULE, SHEET 27 FOR STATION LIMITS)
- ④ COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.24
- ⑤ PORTLAND CEMENT CONCRETE SIDEWALK, 4"
- ⑥ AGGREGATE BASE COURSE, TYPE B, 4"
- ⑦ HOT-MIX ASPHALT SURFACE COURSE, IL-9.5 FG, N50, 3"
- ⑧ AGGREGATE BASE COURSE, TYPE B, 6"
- ⑪ CONCRETE MEDIAN, TYPE SB
- ⑫ TOPSOIL FURNISH AND PLACE, 4"
- ⑭ #6 TIE BARS AT 24" CTS.
- ⑮ #6 TIE BARS AT 30" CTS.
- ⑯ -GEOTECHNICAL FABRIC UNDER 18" SUBGRADE AND MULTI-USE PATH
 -GEGRID FABRIC UNDER AGGREGATE SUBGRADE IMPROVEMENT, 12" (REFER TO SCHEDULE, SHEET 27 FOR STATION LIMITS)

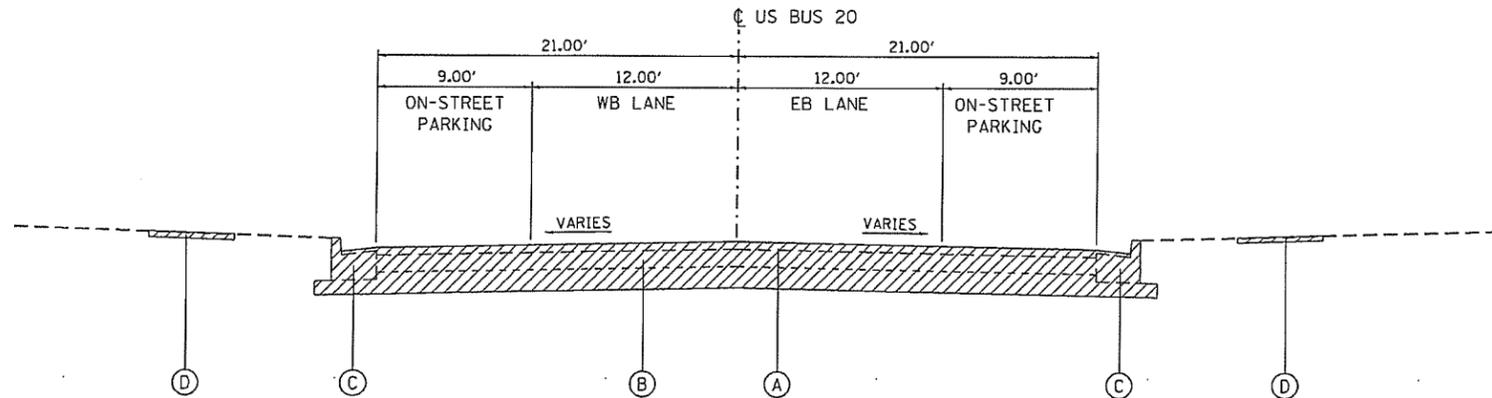
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STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION

TYPICAL SECTION - PCC PAVEMENT (ALTERNATIVE 1)		F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
WEST STATE STREET (US BUS 20)		303	(40,41) R	WINNEBAGO	297	15
SCALE: NTS	SHEET 3 OF 7 SHEETS	STA. N/A	TO STA. N/A		CONTRACT NO. 64H08	
ILLINOIS FED. AID PROJECT						

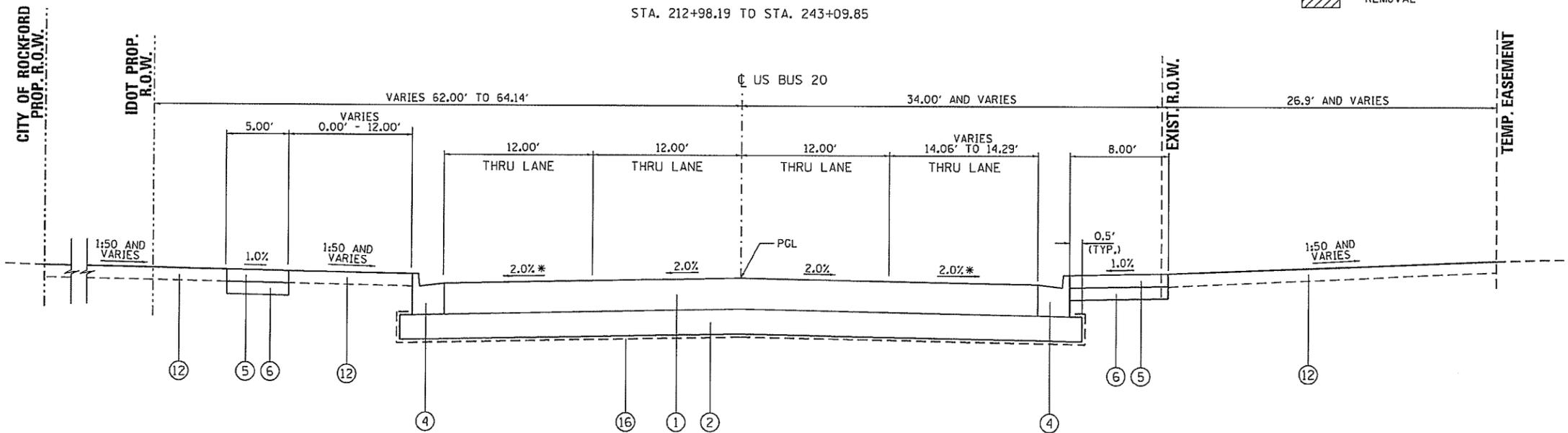


WEST STATE STREET (US BUS 20) EXISTING TYPICAL SECTION

STA. 212+98.19 TO STA. 243+09.85

EXISTING LEGEND

- (A) EXISTING BITUMINOUS OVERLAY 3 1/2"±
- (B) EXISTING CONCRETE PAVEMENT 9"±
- (C) EXISTING CURB AND GUTTER
- (D) EXISTING SIDEWALK
- [Hatched Box] REMOVAL



WEST STATE STREET (US BUS 20) PROPOSED TYPICAL SECTION

STA. 212+98.19 TO STA. 213+77.43

* - CROSS SLOPE TRANSITION
 BEGIN STA. 212+98.19 4.0% (WB) 5.0% (EB)
 END STA. 213+55.00 2.0% (WB) 2.0% (EB)

PROPOSED LEGEND

- (1) FULL DEPTH HOT-MIX ASPHALT PAVEMENT, 9.75"
 - POLYMERIZED HMA SURFACE COURSE, MIX "D", N50, 2"
 - POLYMERIZED HMA TOP BINDER COURSE, IL-19.0, N50, 3.75"
 - HMA LOWER BASE COURSE, IL-19.0, N50, 4"
- (2) AGGREGATE SUBGRADE IMPROVEMENT 12" OR 18"
 (REFER TO SCHEDULE, SHEET 27 FOR STATION LIMITS)
- (4) COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.24
- (5) PORTLAND CEMENT CONCRETE SIDEWALK, 4"
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- (8) AGGREGATE BASE COURSE, TYPE B, 6"
- (12) TOPSOIL FURNISH AND PLACE, 4"
- (16) -GEO TECHNICAL FABRIC UNDER 18" SUBGRADE AND MULTI-USE PATH
 -GEOGRID FABRIC UNDER AGGREGATE SUBGRADE IMPROVEMENT, 12"
 (REFER TO SCHEDULE, SHEET 27 FOR STATION LIMITS)

WEST STATE STREET (US BUS 20)

STRUCTURAL DESIGN INFORMATION

STRUCTURAL DESIGN TRAFFIC: YEAR: 2025
 PV=8,849 SU=230 MU=90
 ROAD/STREET CLASSIFICATION: CLASS I
 PERCENT OF STRUCTURAL DESIGN TRAFFIC IN DESIGN LANE:
 P=32% S=45% M=45%
 TRAFFIC FACTOR: ACTUAL TF=0.87
 MINIMUM TF=5.02
 MINIMUM SUBGRADE SUPPORT RATING: POOR

HOT-MIX ASPHALT MIXTURE REQUIREMENT

US BUS 20 PAVEMENT	PERCENT AIR VOIDS @ Ndes
POLYMERIZED HMA SURFACE COURSE, MIX D, N50; 2"	4% @ 50 GYR.
POLYMERIZED HMA BINDER COURSE, IL-19.0, N50; 3.75"	4% @ 50 GYR.
HMA BASE COURSE, IL-19.0, N50; 4"	4% @ 50 GYR.
SIDE STREETS & ALLEYS	
HMA SURFACE COURSE, MIX "C", N50, SPECIAL; 3.5"	4% @ 50 GYR.
MULTI-USE PATH	
HMA SURFACE COURSE, IL-9.5 FG, N50; 3"	3% @ 50 GYR.

1. THE UNIT WEIGHT USED TO CALCULATE ALL HOT-MIX ASPHALT SURFACE MIXTURES IS 112 LBS/SO. YD. / IN
 2. THE "AC TYPE" FOR POLYMERIZED HMA MIXES SHALL BE "SBS/SBR PG 76-22" AND FOR NON POLYMERIZED HMA THE "AC TYPE" SHALL BE PG 64-22" UNLESS MODIFIED BY SPECIAL PROVISIONS.
 FOR USE OF RECYCLED MATERIALS SEE SPECIAL PROVISIONS.



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 DATE - 02/26/2016

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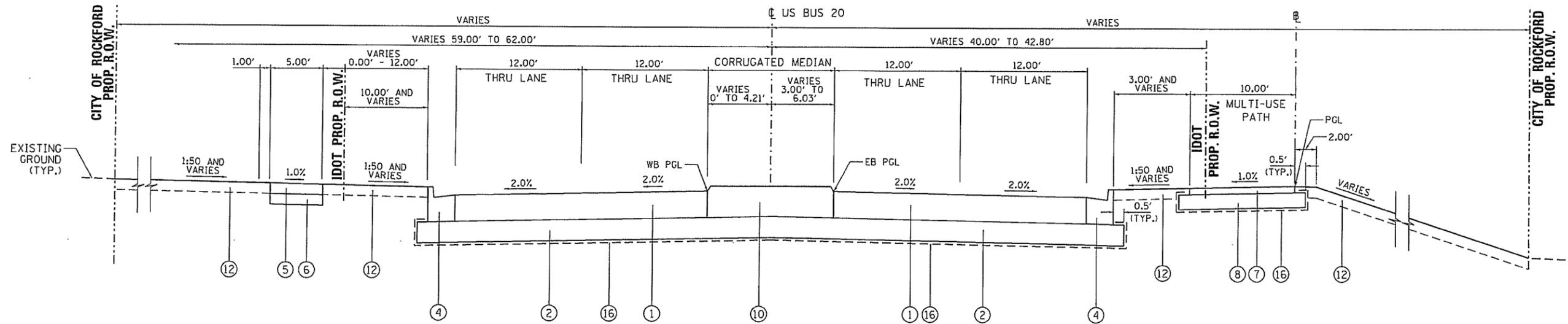
STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION

TYPICAL SECTIONS - HMA PAVEMENT (ALTERNATIVE 2)
 WEST STATE STREET (US BUS 20)

SCALE: NTS SHEET 1 OF 4 SHEETS STA. N/A TO STA. N/A

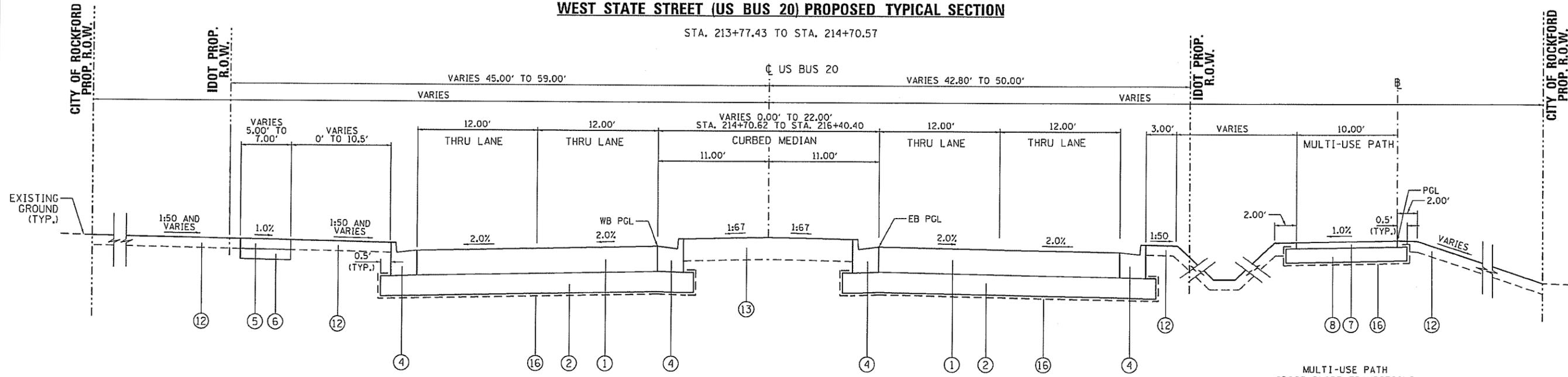
F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
303	(40,41) R	WINNEBAGO	297	20
ILLINOIS FED. AID PROJECT				

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WEST STATE STREET (US BUS 20) PROPOSED TYPICAL SECTION

STA. 213+77.43 TO STA. 214+70.57



WEST STATE STREET (US BUS 20) PROPOSED TYPICAL SECTION

STA. 214+70.57 TO STA. 217+02.50
 STA. 223+76.04 TO STA. 230+44.25
 STA. 234+42.48 TO STA. 241+80.00

MULTI-USE PATH
 CROSS-SLOPE TRANSITIONS

BEGIN STA. 22+80	+1.00%
END STA. 23+00	-1.00%
BEGIN STA. 23+30	-1.00%
END STA. 23+50	+1.00%

PROPOSED LEGEND

- | | |
|---|---|
| ① FULL DEPTH HOT-MIX ASPHALT PAVEMENT, 9.75"
- POLYMERIZED HMA SURFACE COURSE, MIX "D", N50, 2"
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| ④ COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.24 | ⑩ CORRUGATED MEDIAN |
| ⑤ PORTLAND CEMENT CONCRETE SIDEWALK, 4" | ⑫ TOPSOIL FURNISH AND PLACE, 4" |
| ⑥ AGGREGATE BASE COURSE, TYPE B, 4" | ⑬ TOPSOIL FURNISH AND PLACE, 10" |
| | ⑭ -GEOTECHNICAL FABRIC UNDER 18" SUBGRADE AND MULTI-USE PATH
-GEOGRID FABRIC UNDER AGGREGATE SUBGRADE IMPROVEMENT, 12"
(REFER TO SCHEDULE, SHEET 27 FOR STATION LIMITS) |

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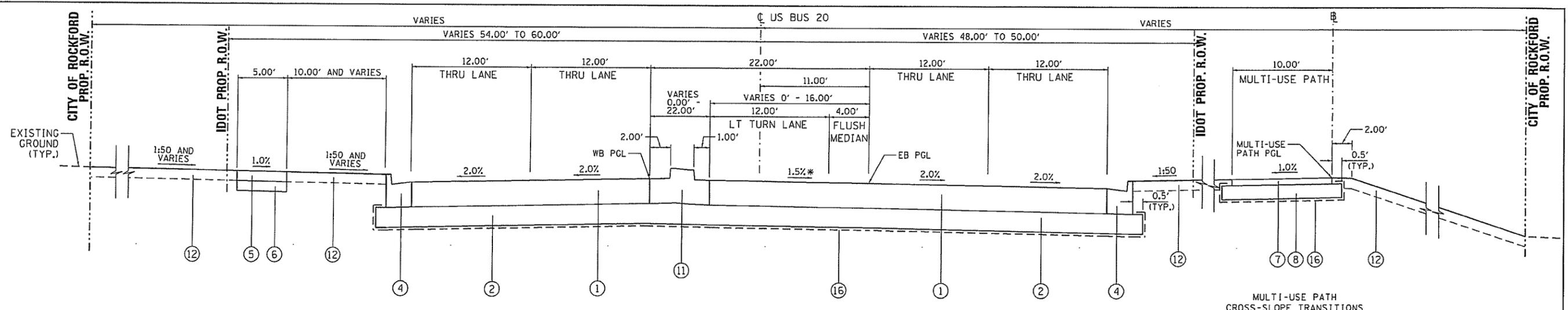
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PLOT DATE = 2/25/2016	DATE - 02/26/2016	REVISED -

STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION

TYPICAL SECTIONS - HMA PAVEMENT (ALTERNATIVE 2)
 WEST STATE STREET (US BUS 20)

SCALE: NTS SHEET 2 OF 4 SHEETS STA. N/A TO STA. N/A

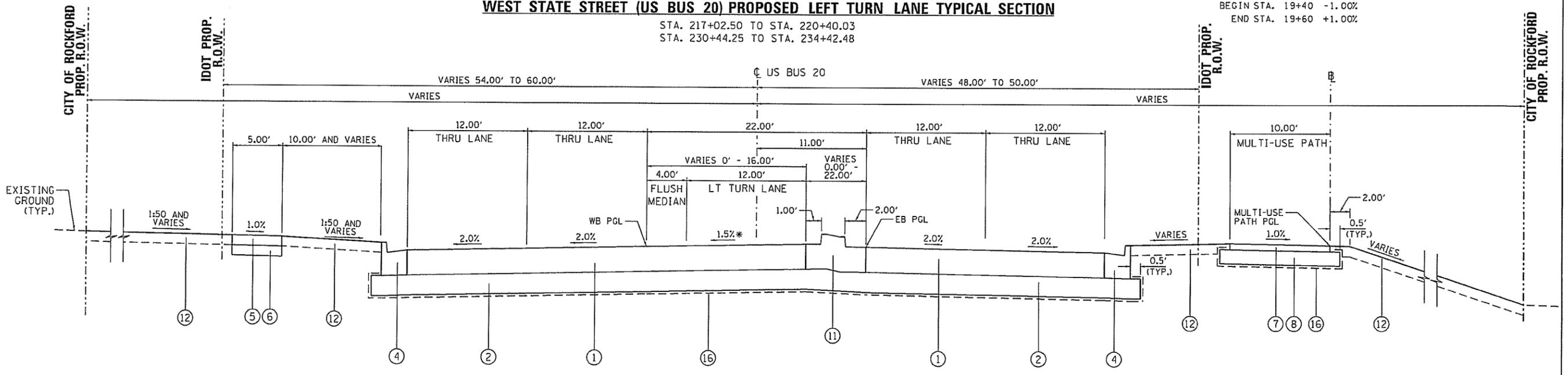
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303	(40,41) R	WINNEBAGO	297	21
			CONTRACT NO. 64H08	
ILLINOIS FED. AID PROJECT				



WEST STATE STREET (US BUS 20) PROPOSED LEFT TURN LANE TYPICAL SECTION

STA. 217+02.50 TO STA. 220+40.03
 STA. 230+44.25 TO STA. 234+42.48

MULTI-USE PATH
 CROSS-SLOPE TRANSITIONS
 BEGIN STA. 19+40 -1.00%
 END STA. 19+60 +1.00%



WEST STATE STREET (US BUS 20) PROPOSED LEFT TURN LANE TYPICAL SECTION

STA. 220+40.03 TO STA. 223+76.04

* - SEE JOINTING PLANS FOR INTERSECTION GRADING

PROPOSED LEGEND

- | | |
|---|---|
| ① FULL DEPTH HOT-MIX ASPHALT PAVEMENT, 9.75"
- POLYMERIZED HMA SURFACE COURSE, MIX "D", N50, 2"
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| ④ COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.24 | ⑪ CONCRETE MEDIAN, TYPE SB |
| ⑤ PORTLAND CEMENT CONCRETE SIDEWALK, 4" | ⑫ TOPSOIL FURNISH AND PLACE, 4" |
| ⑥ AGGREGATE BASE COURSE, TYPE B, 4" | ⑬ -GEOTECHNICAL FABRIC UNDER 18" SUBGRADE AND MULTI-USE PATH
-GEOGRID FABRIC UNDER AGGREGATE SUBGRADE IMPROVEMENT, 12"
(REFER TO SCHEDULE, SHEET 27 FOR STATION LIMITS) |

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	DATE - 02/26/2016	REVISED -

STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION

TYPICAL SECTION - HMA PAVEMENT (ALTERNATIVE 2)
 WEST STATE STREET (US BUS 20)

SCALE: NTS SHEET 3 OF 4 SHEETS STA. N/A TO STA. N/A

F.A.P. RTE. 303	SECTION (40,41) R	COUNTY WINNEBAGO	TOTAL SHEETS 297	SHEET NO. 22
ILLINOIS FED. AID PROJECT CONTRACT NO. 64H08				

PROJECT AND TRAFFIC INPUTS

(Enter Data in Gray Shaded Cells)

Route: **FAP 303 (US Bus 20)**
 Section: **41R-1**
 County: **Winnebago**
 Location: **from Day Ave to Independence Ave.**
 Facility Type: **Other Marked State Route**
 # of Lanes = **4**
 Road Class: **I**
 Subgrade Support Rating (SSR): **Poor**
 Construction Year: **2021**
 Design Period (DP) = **20** years

Comments:
 Design Date: **03/06/2020**
 Modify Date:

<-- BY	ADT	Year
Current:	8,745	2020
Future:	9,170	2040

	Structural Design Traffic			% of ADT in Design Lane
	Minimum ADT	Actual ADT	Actual % of Total ADT	
PV =	0	8,664	96.5%	P = 32%
SU =	250	224	2.5%	S = 45%
MU =	750	90	1.0%	M = 45%
Struct. Design ADT =	8,979 (2031)			

TRAFFIC FACTOR CALCULATION

FLEXIBLE PAVEMENT

Cpv = 0.15
 Csu = **132.5**
 Cmu = **482.53**
 TF flexible (Actual) = 0.67 (Actual ADT)
 TF flexible (Min) = 3.56 (Min ADT Fig. 54-2.C)

RIGID PAVEMENT

Cpv = 0.15
 Csu = **143.81**
 Cmu = **696.42**
 TF rigid (Actual) = 0.86 (Actual ADT)
 TF rigid (Min) = 5.02 (Min ADT Fig. 54-2.C)

NEW CONSTRUCTION / RECONSTRUCTION PAVEMENT DESIGN CALCULATIONS

Full-Depth HMA Pavement		JPC Pavement	
Use TF flexible =	3.56	Use TF rigid =	5.02
PG Grade Lower Binder Lifts =	PG 64-22 (Fig. 53-4.O)	Edge Support =	Tied Shoulder or C&G
HMA Mixture Temp. =	73.5 deg. F (Fig. 54-5.C)	Rigid Pavt Thick. =	9.00 in. (Fig. 54-4.E)
Design HMA Mixture Modulus (E _{HMA}) =	740 ksi (Fig. 54-5.D)		
Design HMA Strain (ε _{HMA}) =	84 (Fig. 54-5.E)		
Full Depth HMA Design Thickness =	9.75 in. (Fig. 54-5.F)		
Limiting Strain Criterion Thickness =	14.25 in. (Fig. 54-5.I)		
Use Full-Depth HMA Thickness =	9.75 inches	CRCP Thickness =	8.00 in. (Fig. 54-4.M)

TF MUST BE > 60 FOR CRCP

RECONSTRUCTION ONLY (SUPPLEMENTAL) PAVEMENT DESIGN CALCULATIONS

HMA Pavement Over Rubblized PCC		Unbonded Concrete Overlay	
Use TF flexible =	3.56	Review 54-4.03 for limitations and special considerations.	
HMA Overlay Design Thickness =	7.25 in. (Fig. 54-5.U)	JPCP Thickness =	NA inches
Limiting Strain Criterion Thickness =	in. (Fig. 54-5.V)		
Use HMA Overlay Thickness =	999.00 inches		

CONTACT RESEARCH FOR ASSISTANCE

DESIGN TABLES FROM BDE MANUAL CHAPTER 54 - PAVEMENT DESIGN

Class I Roads	Class II Roads	Class III Roads	Class IV Roads
4 lanes or more Part of a future 4 lanes or more One-way Streets with ADT > 3500	2 lanes with ADT > 2000 One way Street with ADT <= 3500	2 Lanes (ADT 750 -2000)	2 Lanes (ADT < 750)

Facility Type	Min. Str. Design Traffic (Fig 54-2.C)		
	PV	SU	MU
Interstate or Freeway	0	500	1500
Other Marked State Route	0	250	750
Unmarked State Route	No Min	No Min	No Min

Class Table for One-Way Streets	
ADT	Class
0 - 3500	II
>3501	I

Class	Traffic Factor ESAL Coefficients			
	Rigid (Fig. 54-4.C)		Flexible (Fig. 54-5.B)	
	Csu	Cmu	Csu	Cmu
I	143.81	696.42	132.50	482.53
II	135.78	567.21	112.06	385.44
III	129.58	562.47	109.14	384.35
IV	129.58	562.47	109.14	384.35

Class Table for 2 or 3 lanes (not future 4 lane & not one-way street)	
ADT	Class
0 - 749	IV
750 - 2000	III
>2000	II

Number of Lanes	Design Lane Distribution Factors For Structural Design Traffic (Fig. 54-2.B)					
	Rural			Urban		
	P	S	M	P	S	M
1 Lane Ramp	100%	100%	100%	100%	100%	100%
2 or 3	50%	50%	50%	50%	50%	50%
4	32%	45%	45%	32%	45%	45%
6 or more	20%	40%	40%	8%	37%	37%

LIFE-CYCLE COST ANALYSIS: NEW CONSTRUCTION / RECONSTRUCTION

FULL-DEPTH HMA PAVEMENT

Standard Design

ROUTE US 20 Bus. (West State St.)
 SECTION 41R-1
 COUNTY Winnebago
 LOCATION Day Ave to Independence Ave

FACILITY TYPE NON-INTERSTATE

PROJECT LENGTH 3012 FT ==> 0.57 Miles
 # OF CENTERLINES 2 CL
 # OF LANES 4 LANES
 # OF EDGES 4 EP
 LANE WIDTH - AVERAGE 12 FT
 SHOULDER WIDTH HMA Inside 0 FT
 HMA Outside 0 FT
 Total Width of Paved Shoulders 0 FT

PAVEMENT THICKNESS (FLEXIBLE) 9.75 IN 14.25 IN MAX
 SHOULDER THICKNESS 0.00 IN HMA SD Standard Design
 HMA OVERLAY THICKNESS 2.00 IN

FLEX PAVEMENT	TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
		3.56	0.67	3.56

Read Me!

HMA COST PER TON	UNIT PRICE
HMA SURFACE	\$94.49 / TON
HMA TOP BINDER	\$89.63 / TON
HMA LOWER BINDER	\$89.15 / TON
HMA BINDER (IL-9.5FG or IL-4.75)	\$0.00 / TON
HMA SHOULDER	\$0.00 / TON

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY UNIT	UNIT PRICE	COST
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HMA PAVEMENT (FULL-DEPTH)	(9.75")	20,304 SQ YD	\$49.37 / SQ YD	\$0
HMA SURFACE COURSE	(2.00")	2,274 TONS	\$94.49 / TON	\$214,870
HMA TOP BINDER COURSE	(2.25")	4,264 TONS	\$89.63 / TON	\$382,182
HMA LOWER BINDER COURSE	(5.50")	4,548 TONS	\$89.15 / TON	\$405,454

HMA SHOULDER	(0.00")	0 SQ YD	\$0.00 / SQ YD	\$0
CURB & GUTTER		0 LIN FT	\$0.00 / LIN FT	\$0

SUBBASE GRAN MATL TY C (TONS)		188 TONS	\$45.00 / TON	\$8,460
IMPROVED SUBGRADE:	Aggregate	24,269 SQ YD	\$10.56 / SQ YD	\$256,281

Earth Excavation		506 CU YD	\$24.00 / CU YD	\$12,144
Reserved For User Supplied Item		0 UNITS	\$0.00 / UNITS	\$0

PAVEMENT REMOVAL		16,064 SQ YD	\$12.00 / SQ YD	\$192,768
SHOULDER REMOVAL		0 SQ YD	\$0.00 / SQ YD	\$0

Note: * Denotes User Supplied Quantity

FLEXIBLE CONSTRUCTION INITIAL COST \$1,472,159
 FLEXIBLE CONSTRUCTION ANNUAL COST PER MILE \$105,253

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	UNIT COST
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ROUTINE MAINTENANCE ACTIVITY \$0.00 LANE-MILE / YEAR

HMA OVERLAY PVMT SURF	(2.00")	Surface Mix	\$10.38 / SQ YD
HMA OVERLAY PVMT	(2.00")	Surface Mix	\$10.38 / SQ YD
HMA SURFACE MIX	(2.00")	Surface Mix	\$10.38 / SQ YD
HMA BINDER MIX	(0.00")	4.75 Binder Mix	\$0.00 / SQ YD
HMA OVERLAY SHLD (Year 30)	(2.00")	Shoulder Mix	\$0.00 / SQ YD
HMA OVERLAY SHLD	(2.00")	Shoulder Mix	\$0.00 / SQ YD

MILLING (2.00 IN) \$2.84 / SQ YD

PARTIAL DEPTH PVMT PATCH (Mill & Fill Surf)		Surface Mix	\$85.90 / SQ YD
PARTIAL DEPTH SHLD PATCH (Mill & Fill Surf)		Shoulder Mix	\$0.00 / SQ YD

PARTIAL DEPTH PVMT PATCH (Mill & Fill +2.00")		Binder Mix	\$50.93 / SQ YD
PARTIAL DEPTH SHLD PATCH (Mill & Fill +2.00")		Shoulder Mix	\$0.00 / SQ YD

FULL-DEPTH HMA PAVEMENT
 HMA PAVEMENT OVER RUBBLIZED PCC PAVEMENT
 Figure 54-7.C
 STANDARD DESIGN

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 5							
	LONG SHLD JT R&S	100.00%	12,048	LIN FT	\$0.90	\$10,843	
	CNTR LINE JOINT R&S	100.00%	6,024	LIN FT	\$0.90	\$5,422	
	RNDM / THRM CRACK R&S	50.00%	6,626	LIN FT	\$0.90	\$5,963	
	PD PVMT PATCH M&F SURF	0.10%	20	SQ YD	\$85.90	\$1,718	
	PWFn =	0.8626		PW =	0.8626 X	\$23,946	\$20,656
YEAR 10							
	LONG SHLD JT R&S	100.00%	12,048	LIN FT	\$0.90	\$10,843	
	CNTR LINE JOINT R&S	100.00%	6,024	LIN FT	\$0.90	\$5,422	
	RNDM / THRM CRACK R&S	50.00%	6,626	LIN FT	\$0.90	\$5,963	
	PD PVMT PATCH M&F SURF	0.50%	102	SQ YD	\$85.90	\$8,762	
	PWFn =	0.7441		PW =	0.7441 X	\$30,990	\$23,059
YEAR 15							
	MILL PVMT & SHLD 2.00"	100.00%	20,304	SQ YD	\$2.84	\$57,663	
	PD PVMT PATCH M&F ADD'L 2.00"	1.00%	203	SQ YD	\$50.93	\$10,339	
	HMA OVERLAY PVMT 2.00"	100.00%	20,304	SQ YD	\$10.38	\$210,756	
	HMA OVERLAY SHLD 2.00"	100.00%	0	SQ YD	\$0.00	\$0	
	PWFn =	0.6419		PW =	0.6419 X	\$278,758	\$178,924
YEAR 20							
	LONG SHLD JT R&S	100.00%	12,048	LIN FT	\$0.90	\$10,843	
	CNTR LINE JOINT R&S	100.00%	6,024	LIN FT	\$0.90	\$5,422	
	RNDM / THRM CRACK R&S	50.00%	6,626	LIN FT	\$0.90	\$5,963	
	PD PVMT PATCH M&F SURF	0.10%	20	SQ YD	\$85.90	\$1,718	
	PWFn =	0.5537		PW =	0.5537 X	\$23,946	\$13,258
YEAR 25							
	LONG SHLD JT R&S	100.00%	12,048	LIN FT	\$0.90	\$10,843	
	CNTR LINE JOINT R&S	100.00%	6,024	LIN FT	\$0.90	\$5,422	
	RNDM / THRM CRACK R&S	50.00%	6,626	LIN FT	\$0.90	\$5,963	
	PD PVMT PATCH M&F SURF	0.50%	102	SQ YD	\$85.90	\$8,762	
	PWFn =	0.4776		PW =	0.4776 X	\$30,990	\$14,801
YEAR 30							
	HMA SD NON-INTERSTATE						
	MILL PVMT & SHLD 2.00"	100.00%	20,304	SQ YD	\$2.84	\$57,663	
	PD PVMT PATCH M&F ADD'L 2.00"	2.00%	406	SQ YD	\$50.93	\$20,678	
	PD SHLD PATCH M&F ADD'L 2.00"	1.00%	0	SQ YD	\$0.00	\$0	
	HMA OVERLAY PVMT 2.00"	100.00%	20,304	SQ YD	\$10.38	\$210,756	
	HMA OVERLAY SHLD 2.00"	100.00%	0	SQ YD	\$0.00	\$0	
	PWFn =	0.4120		PW =	0.4120 X	\$289,097	\$119,104
YEAR 35							
	LONG SHLD JT R&S	100.00%	12,048	LIN FT	\$0.90	\$10,843	
	CNTR LINE JOINT R&S	100.00%	6,024	LIN FT	\$0.90	\$5,422	
	RNDM / THRM CRACK R&S	50.00%	6,626	LIN FT	\$0.90	\$5,963	
	PD PVMT PATCH M&F SURF	0.10%	20	SQ YD	\$85.90	\$1,718	
	PWFn =	0.3554		PW =	0.3554 X	\$23,946	\$8,510
YEAR 40							
	LONG SHLD JT R&S	100.00%	12,048	LIN FT	\$0.90	\$10,843	
	CNTR LINE JOINT R&S	100.00%	6,024	LIN FT	\$0.90	\$5,422	
	RNDM / THRM CRACK R&S	50.00%	6,626	LIN FT	\$0.90	\$5,963	
	PD PVMT PATCH M&F SURF	0.50%	102	SQ YD	\$85.90	\$8,762	
	PWFn =	0.3066		PW =	0.3066 X	\$30,990	\$9,500
							\$387,812
ROUTINE MAINTENANCE ACTIVITY				2.28 Lane Miles	0.00	\$0	\$0
						MAINTENANCE LIFE-CYCLE COST	\$387,812
45	YEAR LIFE CYCLE	CRFn = 0.0407852	MAINTENANCE ANNUAL COST PER MILE			\$27,727	

PCC PAVEMENT

JPCP

ROUTE US 20 Bus. (West State St.)
 SECTION 41R-1
 COUNTY Winnebago
 LOCATION Day Ave to Independence Ave

FACILITY TYPE NON-INTERSTATE

PROJECT LENGTH 3012 FT ==> 0.57 Miles
 # OF CENTERLINES 2 CL
 # OF LANES 4 LANES
 # OF EDGES 4 EP
 LANE WIDTH - AVERAGE 12 FT
 SHOULDER WIDTH PCC Inside 0 FT
 PCC Outside 0 FT
 Total Width of Paved Shoulders 0 FT

PAVEMENT THICKNESS (RIGID) JPCP 9.00 IN TIED SHLD
 SHOULDER THICKNESS 0.00 IN

HMA OVERLAY THICKNESS 2.75 IN

RIGID PAVEMENT TRAFFIC FACTORS	MINIMUM	ACTUAL	USE
Worksheet Construction Type is New Construction	5.02	0.88	5.02
The Pavement Type is			JPCP

INITIAL COSTS

ITEM	THICKNESS	100% QUANTITY	UNIT	UNIT PRICE	COST
JPC PAVEMENT	(9.00")	20,304	SQ YD *	\$58.67 /SQ YD	\$1,191,236
PAVEMENT REINFORCEMENT		0	SQ YD	\$0.00 /SQ YD	\$0
STABILIZED SUBBASE	(4.00")	0	SQ YD *	\$0.00 /SQ YD	\$0
PCC SHOULDERS		0	SQ YD	\$0.00 /SQ YD	\$0
CURB & GUTTER		0	LIN FT	\$0.00 /LIN FT	\$0
SUBBASE GRAN MATL TY C	(~ 10.00")	0	TONS *	\$0.00 /TON	\$0
IMPROVED SUBGRADE:	Aggregate Width = 72.5	24,269	SQ YD *	\$10.56 /SQ YD	\$256,281
Reserved For User Supplied Item		0	UNITS	\$0.00 /UNITS	\$0
Reserved For User Supplied Item		0	UNITS	\$0.00 /UNITS	\$0
PAVEMENT REMOVAL		16,064	SQ YD	\$12.00 /SQ YD	\$192,768
SHOULDER REMOVAL		0	SQ YD	\$0.00 /SQ YD	\$0

Note: * Denotes User Supplied Quantity

RIGID CONSTRUCTION INITIAL COST \$1,640,285
 RIGID CONSTRUCTION ANNUAL COST PER MILE \$117,274

MAINTENANCE COSTS:

ITEM	THICKNESS	MATERIAL	T	UNIT COST
ROUTINE MAINTENANCE ACTIVITY				\$0.00 /LANE-MILE / YEAR
HMA OVERLAY	(2.75")		2.75	
HMA OVERLAY PAVEMENT	(2.75")	1.0005	2.75	\$14.09 /SQ YD
HMA SURFACE MIX	(1.50")	1.0052	1.50	\$7.68 /SQ YD
HMA BINDER MIX	(1.25")	1.0149	1.25	\$6.41 /SQ YD
HMA OVERLAY SHOULDER	(2.75")	Shoulder Mix	2.75	\$0.00 /SQ YD
CLASS A PAVEMENT PATCHING				\$0.00 /SQ YD
CLASS B PAVEMENT PATCHING				\$197.53 /SQ YD
CLASS C SHOULDER PATCHING				\$0.00 /SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA Surf)		Surface Mix	1.50	\$0.00 /SQ YD
PARTIAL DEPTH PVMT PATCH (Mill & Fill HMA 2.75")		Surface Mix	2.75	\$90.82 /SQ YD
LONGITUDINAL SHOULDER JOINT ROUT & SEAL				\$0.90 /LIN FT
CENTERLINE JOINT ROUT & SEAL				\$0.90 /LIN FT
REFLECTIVE TRANSVERSE CRACK ROUT & SEAL				\$0.90 /LIN FT
RANDOM CRACK ROUT & SEAL	(100% Rehab = 100.00' / Station / Lane)			\$0.90 /LIN FT

RIGID TOTAL LIFE-CYCLE COST \$1,970,078
 RIGID TOTAL ANNUAL COST PER MILE \$140,853

MAINTENANCE AND REHABILITATION ACTIVITY SCHEDULE

05/27/20

JOINTED PLAIN CONCRETE PAVEMENT
UNBONDED JOINTED PLAIN CONCRETE OVERLAY
Figure 54-7.A

MAINTENANCE COSTS:	ITEM	%	QUANTITY	UNIT	UNIT COST	COST	PRESENT WORTH
YEAR 10	PAVEMENT PATCH CLASS B	0.10%	20	SQ YD	\$197.53	\$3,951	
	PWFn =	0.7441		PW =	0.7441 X	\$3,951	\$2,940
YEAR 15	PAVEMENT PATCH CLASS B	0.20%	41	SQ YD	\$197.53	\$8,099	
	PWFn =	0.6419		PW =	0.6419 X	\$8,099	\$5,198
YEAR 20	PAVEMENT PATCH CLASS B	2.00%	406	SQ YD	\$197.53	\$80,197	
	SHOULDER PATCH CLASS C	0.50%	0	SQ YD	\$0.00	\$0	
	LONGITUDINAL SHLD JT R&S	100.00%	12,048	LIN FT	\$0.90	\$10,843	
	CENTERLINE JT R&S	100.00%	6,024	LIN FT	\$0.90	\$5,422	
	PWFn =	0.5537		PW =	0.5537 X	\$96,462	\$53,409
YEAR 25	PAVEMENT PATCH CLASS B	3.00%	609	SQ YD	\$197.53	\$120,296	
	SHOULDER PATCH CLASS C	1.00%	0	SQ YD	\$0.00	\$0	
	PWFn =	0.4776		PW =	0.4776 X	\$120,296	\$57,454
YEAR 30	NON-INTERSTATE						
	PAVEMENT PATCH CLASS B	4.00%	812	SQ YD	\$197.53	\$160,394	
	SHOULDER PATCH CLASS C	1.50%	0	SQ YD	\$0.00	\$0	
	HMA OVERLAY 2.75" (PVMT)	100.00%	20,304	SQ YD	\$14.09	\$286,083	
	HMA OVERLAY 2.75" (SHLD)	100.00%	0	SQ YD	\$0.00	\$0	
	PWFn =	0.4120		PW =	0.4120 X	\$446,477	\$183,943
YEAR 35	NON-INTERSTATE						
	LONGITUDINAL SHLD JT R&S	100.00%	12,048	LIN FT	\$0.90	\$10,843	
	CENTERLINE JT R&S	100.00%	6,024	LIN FT	\$0.90	\$5,422	
	RANDOM CRACK R&S	50.00%	6,024	LIN FT	\$0.90	\$5,422	
	REFLECTIVE TRANSVERSE CRACK R&S	40.00%	3,859	LIN FT	\$0.90	\$3,473	
	PD PVMT PATCH M&F HMA 2.75"	0.10%	20	SQ YD	\$90.82	\$1,816	
	PWFn =	0.3554		PW =	0.3554 X	\$26,976	\$9,587
YEAR 40	NON-INTERSTATE						
	PAVEMENT PATCH CLASS B	0.50%	102	SQ YD	\$197.53	\$20,148	
	LONGITUDINAL SHLD JT R&S	100.00%	12,048	LIN FT	\$0.90	\$10,843	
	CENTERLINE JT R&S	100.00%	6,024	LIN FT	\$0.90	\$5,422	
	REFLECTIVE TRANSVERSE CRACK R&S	60.00%	5,789	LIN FT	\$0.90	\$5,210	
	RANDOM CRACK R&S	50.00%	6,024	LIN FT	\$0.90	\$5,422	
	PD PVMT PATCH M&F HMA 2.75"	0.50%	102	SQ YD	\$90.82	\$9,264	
	PWFn =	0.3066		PW =	0.3066 X	\$56,309	\$17,262
							\$329,793
	ROUTINE MAINTENANCE ACTIVITY		2.28	Lane Miles	\$0.00	\$0	\$0
							MAINTENANCE LIFE-CYCLE COST \$329,793
45	YEAR LIFE CYCLE	CRFn = 0.0407852					MAINTENANCE ANNUAL COST PER MILE \$23,579

LIFE-CYCLE COST ANALYSIS: NEW DESIGN

Calculated / Revised : 5/27/20 11:01 AM

			JPCP	HMA
CONSTRUCTION	INITIAL COST	PRESENT WORTH	\$1,640,285	\$1,472,159
		ANNUAL COST PER MILE	\$117,274	\$105,253
MAINTENANCE	LIFE-CYCLE COST	PRESENT WORTH	\$329,793	\$387,812
		ANNUAL COST PER MILE	\$23,579	\$27,727
TOTAL	LIFE-CYCLE COST	PRESENT WORTH	\$1,970,078	\$1,859,971
		ANNUAL COST PER MILE	\$140,853	\$132,980

LIFE-CYCLE COST ANALYSIS: FINAL SUMMARY

LOWEST COST OPTION	=====>	HMA	\$132,980	
OTHER OPTIONS (LOWEST TO HIGHEST):	TYPE / PERCENTAGE	JPCP	\$140,853	5.9%