

Bridge Design Aids
 Pete White
 INDOT Standards and Policy
 January 21, 2020

NextLevel
INDIANA

1

Bridge Design Aids

- What are Bridge Design Aids (BDA)?
 - Documents, resources, and tools to assist Designers
 - Not official INDOT policy
- Where are BDAs located?
 - INDOT’s website (<https://www.in.gov/dot/div/contracts/standards/bridges/BDA.htm>)

- [ASCE-INDOT Structures Committee](#)
- [INDOT Bridge Design Conference](#)
- [Federal Lands Design Resources](#)
- [Purdue Road School Archived Presentations](#)
- **Design Aid**
 - [100-01 Bridge Sample Plans - Bridge Replacement](#)
 - [100-02 Bridge Sample Plans - Thin Deck Overlay](#)
 - [List of all Bridge Design Aids by Date](#)

NextLevel
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2

Bridge Design Aids

- Who develops BDAs?
 - INDOT
 - ASCE/INDOT Structures Committee
 - You!
- What BDAs have been posted this year?



BDA Number	Date	Subject
BDA List		
100-02	01/13/2020	Bridge Sample Plans - Thin Deck Overlay
412-03	01/13/2020	Polymeric Overlay Considerations
402-01	04/17/2019	Life Cycle Cost Analysis

NextLevel
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3

BDA 412-03 Polymeric Overlay Considerations

- What is a Polymeric Bridge Deck Overlay?
 - Also known as a Bridge Thin Deck Overlay or Epoxy Overlay
 - A thin (approx. 3/8") protective layer placed on a concrete bridge deck
 - Intended as a preventative maintenance technique to keep chlorides out of concrete



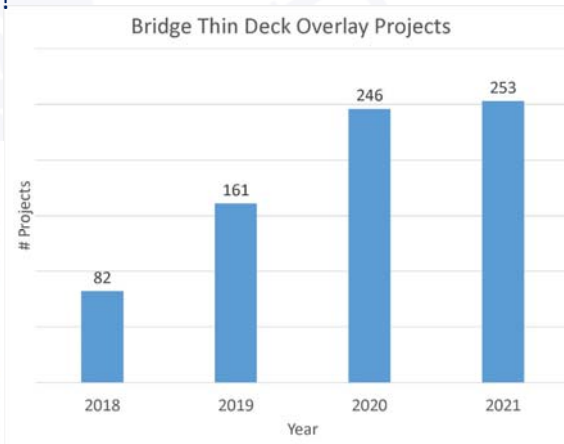
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4

BDA 412-03 Polymeric Overlay Considerations

- Why do we need a Bridge Design Aid?

- We're doing a lot of them
- There isn't much existing guidance
- The devil is in the details



NextLevel
INDIANA

5

BDA 412-03 Polymeric Overlay Considerations

- Bridge Condition Considerations

- Coordinate with the District Bridge Asset Engineer
- Per BCPMA rules, max. amount of patching must be less than 10% of the deck area
- No surface milling or hydrodemolition, so chlorides will not be removed
- Existing spalls are an indication that chlorides have already penetrated to rebar depth
- Polymeric overlays are sensitive to moisture and shouldn't be used where water is anticipated to wick through cracks, such as bridge approach slabs



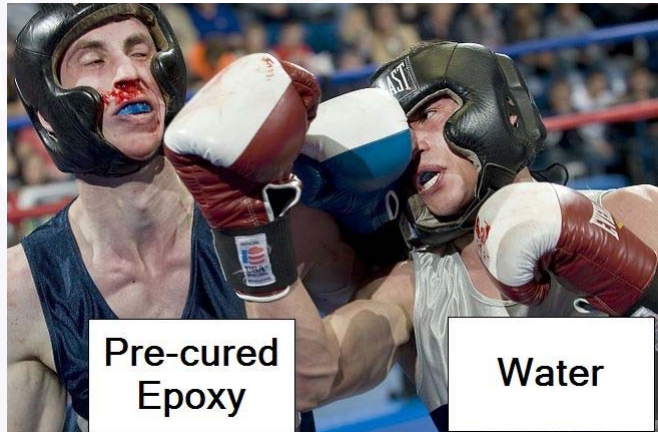
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6

BDA 412-03 Polymeric Overlay Considerations

- Construction Considerations

- Fast cure time, but construction duration depends on many factors
- Cure time increases as temps drop
- Concrete moisture content must be less than 5%, or 75% humidity
 - No rain for 24 hrs prior to installation is general rule
 - Dew is common during summer months
- New concrete will require about 28 days before sufficiently dry
- Polymeric overlay material can only be used in shallow patches, typically less than patches with exposed rebar



NextLevel INDIANA

7

BDA 412-03 Polymeric Overlay Considerations

- Construction Considerations

- Work with BAEs and District Construction for MOT design
- Get in and out quickly with detours
- Portable signals preferred over flagging (can't flag in the dark)
- Consider environmental and site factors when estimating construction duration



NextLevel INDIANA

8

BDA 412-03 Polymeric Overlay Considerations

- Construction Sequence

- Step 1 – Sounding and patching deck
 - Sounding rate approx. 5,000 SFT/hr
 - Patching rate varies, approx. 100 SFT in an 8 hr shift
- Step 2 – Moisture testing
 - ASTM D4263 requires the plastic sheet to remain taped to the surface for 16 hours (use shoulder)
 - Portable moisture meters are commonly used



https://fhwaapps.fhwa.dot.gov/ndep/DisplayTechnology.aspx?tech_id=16

© Rutgers University



<http://www.astmd4263.com/>



NextLevel INDIANA

9

BDA 412-03 Polymeric Overlay Considerations

- Construction Sequence

- Step 3 – Shot blasting and surface preparation
 - Shot blasting - approx. 10,000 to 40,000 SFT/8 hr shift
 - Material often left in tines will require hand grinding
 - Hand grinding – approx. 200 SFT/hr (isolated locations)
 - Surface roughness measured using ICRI roughness chips



<https://shotblastinc.com/shot-blasting-uses/>



Insufficient shot blasting - tine grooves remain prominent



Correct shot blasting - tine grooves mostly removed

NextLevel INDIANA

10

BDA 412-03 Polymeric Overlay Considerations

- Construction Sequence

- Step 4 – Test patches
 - 1.5' x 3' test patches required for every span and every 600 SYS
 - Production equipment should be used for test patches
 - Pull-off tests must demonstrate adequate bond of the epoxy to the concrete
 - Construction duration varies based on cure time, 12 hrs is reasonable assumption
 - Currently allowed to be performed on shoulders



11

BDA 412-03 Polymeric Overlay Considerations

- Construction Sequence

- Step 5 – Overlay application
 - Installation required within 24 hours following shot blasting and surface preparation
 - Not allowed to be installed between October 15 and April 1
 - Deck temperature must be between 60°F and 100°F at the time of application
 - Moisture requirements apply



(First course, second phase)

12

BDA 412-03 Polymeric Overlay Considerations

- Construction Sequence

- Epoxy thickness is controlled by use of v-notch squeegees



- Min. application rates to ensure complete coverage

Course	Rate, Gal./100 sq ft	Aggregate, lbs/sq yd*
1	No less than 2.5	No less than 10
2	No less than 5.0	No less than 14

* Application of aggregate shall be of sufficient quantity to completely cover the epoxy.



13

BDA 412-03 Polymeric Overlay Considerations

- Construction Sequence

- Step 5 – Overlay application, cont.
 - First course must fully cure prior to installation of second course

The minimum curing periods shall be as follows:

Course	Minimum temperature of deck surface, °F					
	60-64	65-69	70-74	75-79	80-84	>85
1	4 hours	3 hours	2.5 hours	2 hours	1.5 hours	1 hour
2	6.5 hours*	5 hours	4 hours	3 hours	3 hours	3 hours

* Course 2 shall be cured for 8 hours if the air temperature drops below 60°F during the curing period.



14

BDA 100-02 Sample Plans –Thin Deck Overlay

INDOT | BRIDGE DESIGN AIDS

BDA 100-02 | JANUARY 10, 2020

BRIDGE SAMPLE PLANS – BRIDGE THIN DECK OVERLAY

Reference: IDM 14-2.05 Bridge Plans, Preservation Project

IDM 412-2.01 Preventative Maintenance Project

BDA 412-01 Patching Quantities for Polymeric Overlays

BDA 412-03 Polymeric Overlay Project Considerations

The following set of sample bridge plans has been developed to illustrate a typical set of Bridge Thin Deck Overlay plans. The tables throughout this set of sample plans have been generated using the Excel spreadsheet [Tables for Bridge PM Thin Deck Overlay.xlsm](#). Instructions for using this spreadsheet are provided on the Instructions tab within the file.



17

BDA 100-02 Sample Plans –Thin Deck Overlay

INSTRUCTIONS FOR COMPLETING THE TABLES FOR BRIDGE PM PLANS

This file can be used to complete the following tasks:

- Create a comma-delimited list of bridge NBI's.
- Create the following tables to be added to Bridge PM plans:
 - Bridge Index for Title Sheet
 - Location Table for Index Sheet
 - Maintenance of Traffic Summary
 - Bridge Painting and Locations Table for Summary Sheet
 - Bridge Painting Information Table for Summary Sheet
 - Summary of Bridge Quantities
 - Overlay Details Tables
 - Pavement Marking Quantities



18

INDIANA DEPARTMENT OF TRANSPORTATION Text Style: 12 Pt Text

BRIDGE PREVENTATIVE MAINTENANCE PLANS Text Style: 18 Pt Text

BRIDGE THIN DECK OVERLAY Text Style: 14 Pt Text

CONTRACT NO. B-41048 Text Style: 9 Pt Text

PROJECT LOCATION
Vincennes District

Str. No.	Dist No.	Bridge File Number	County
①	1800307	061-63-07662	PIKE
②	1800308	068-67-07188	WARRICK
③	1800313	061-42-07853	KNOX
④	1602150	164-35-05597 BEBL	WARRICK
⑤	1800898	057-26-07177	GIBSON

Indiana Department of Transportation
Standard Specifications dated 2020
to be used with these plans.

PLANS PREPARED BY: Text Style: 9 Pt Text **Engineer of Record**

PHONE NUMBER: 317-535-1234

PE SEAL

DATE: \$SIG_DT\$

CERTIFIED BY: Text Style: 9 Pt Text

RECOMMENDED FOR LETTING: INDIANA DEPARTMENT OF TRANSPORTATION

DATE: _____

PURPOSE:

The purpose of this sheet is to provide an overview of the project, including project data, project location, and approval signatures.

REQUIRED ELEMENTS:

- ① Project Information required on every plan sheet:
 - Contract No.
 - Page No. and Total Pages
- ② Project Work Description
- ③ County/District Location Map
- ④ Project Location Map:
 - Show all contract structures and relative location throughout district
 - North Arrow and Scale (Typically No Scale)
- ⑤ Bridge Index Table
 - See Tables Excel file for instructions.
- ⑥ Standard Specification Reference
- ⑦ Engineer of Record
 - For in-house projects, show "Indiana Department of Transportation"
- ⑧ Signature Block and PE Seal

INTENDED USE AND DISCLAIMER INFORMATION:

This set of sample plan sheets is provided for illustrative purposes only. The callouts and notes in this sample plan are intended only to show a need for a callout, level of specificity, and its expected appearance. INDOT makes no guarantee of the accuracy of data used for this hypothetical project although every attempt has been made to produce a reasonable design in accordance with the current Indiana Design Manual. The Designer must determine specific content of notes for higher individual project. In the event of a conflict, the policies stated in the current Indiana Design Manual and INDOT CAD Standards Manual will govern.

① 1 of 25

19

INDIANA DEPARTMENT OF TRANSPORTATION Text Style: 12 Pt Text

INDEX Text Style: 18 Pt Text

TITLE SHEET	1	
INDEX SHEET	2	
GENERAL NOTES & UTILITIES INFORMATION SHEET	3	
LOCATION INFORMATION SHEET	4	
MAINTENANCE OF TRAFFIC	5 - 18	
CONSTRUCTION DETAILS	19 - 23	
PAVEMENT MARKINGS SUMMARY	24	
BRIDGE SUMMARY	25	

③

REVISIONS		
SHEET NO.	DATE	REVISIONS

INDEX SHEET

④

PE SEAL

Recommended for Approval:
#/NF_#/NF#/NF#

Date: \$SIG_DT\$

PURPOSE:

The purpose of this sheet is to provide a listing of all sheets in the plans and utilities contact information.

REQUIRED ELEMENTS:

- ① Project Information required on every plan sheet:
 - Contract No.
 - Page No. and Total Pages
- ② Sheet Index
- ③ Revisions Information (complete as needed):
 - Sheet No., Date, and Note of Revision
- ④ Signature Block and PE Seal

① 2 of 25

20

1 Contract No. B-XXXX

2 GENERAL NOTES

Plans for the existing structures are available upon request from the Research & Document Library, Indiana Department of Transportation.

Bridge deck to be patched prior to placement of overlay.

Polymeric Concrete Bridge Deck Overlay (3/8" thickness) shall be applied to the areas shown in the plans.

Existing Joint Type I-A shall be saw cut and sealed after application of polymeric overlay system.

The following surfaces shall be Surface Sealed in accordance with 702.21 of the Specifications:
 Indicated areas of the bridge railings, bridge railing transitions, and top surface of reinforced concrete bridge approach slabs (when not part of the Polymeric Overlay area).


All permanent pavement paint markings shall be applied twice (reflected in Permanent Pavement Markings Quantities).

Typ: All Notes on General Notes Sheet
 Notes Title: 12 Pt Text
 Notes Text: 9 Pt Text

3 UTILITIES

NO UTILITY INVOLVEMENT IS ANTICIPATED

INDIANA UNDERGROUND PLANT PROTECTION SERVICE, INC.



Per Indiana State Law IC-8-1-26-16, It is against the law to excavate without notifying the underground location service two (2) working days before commencing work.

INDIANA UNDERGROUND
 1-800-382-5544 OR CALL 811
 24 HOURS A DAY 7 DAYS A WEEK

Note: Utility Locations are shown based upon information (maps and paint marks) supplied by others, and there is no guarantee of the accuracy or completeness of said locations

4

GENERAL NOTES & UTILITIES INFORMATION SHEET

1 3 of 25

Recommended for Approval:
 #BYG_SIGNATURE#

Date: \$SIG_DT\$

PURPOSE:
 The purpose of this sheet is to provide the General Notes and utilities contact information.

REQUIRED ELEMENTS:

- 1 Project Information required on every plan sheet:
 - Contract No.
 - Page No. and Total Pages
- 2 General Notes
- 3 Utilities Information:
 - Name, Address, Contact Person, Contact Phone
 - 811 Logo and Statement
- 4 Signature Block and PE Seal

SPECIAL CONSIDERATIONS:
 Polymeric Concrete Bridge Deck Overlay provision must be included in the contract documents.



21

1 Contract No. B-XXXX

2 BRIDGE LOCATION INFORMATION TABLE

Str.	Des No.	Bridge File Number (Structure Type)	Route and Crossing	Location	Route	RP	County	Latitude/Longitude
1	1800307	061-63-07662 (Prestressed Concrete Box Beam)	SR 61 over PATOKA RIVER	SR 61 02.06 N SR 364	SR 61	35+87	PIKE	Lat.: N 38° 22' 49" Lon.: W 87° 13' 02"
2	1800308	068-87-07188 (Prestressed Concrete I Beam or Bulb-T Beam)	SR 68 over BIG CREEK - NEW CHANNEL	SR 68 04.30 W SR 61	SR 68	31+96	WARRICK	Lat.: N 38° 11' 39" Lon.: W 87° 22' 29"
3	1800313	061-42-07853 (Reinforced Concrete Slab)	SR 61 over BEECH CREEK	SR 61 04.87 N SR 56	SR 61	49+85	KNOX	Lat.: N 38° 13' 24" Lon.: W 87° 18' 09"
4	1602150	164-35-05597 BEEL (Reinforced Concrete Slab)	I-64 EBL over BIG CREEK	I-64 03.50 W SR 61	I-64	35+81	WARRICK	Lat.: N 38° 11' 12" Lon.: W 87° 21' 26"
5	1800898	057-26-07177 (Reinforced Concrete Slab)	SR 57 over SMITH FORK	SR 57 02.04 N SR 68	SR 57	14+20	GIBSON	Lat.: N 38° 12' 56" Lon.: W 87° 25' 59"

Typ: All Tables and Notes on Location Information Sheet
 Table Title: 12 Pt Text
 Table Data: 9 Pt Text
 Text Notes: 9 Pt Text

PURPOSE:
 The purpose of this sheet is to provide detailed location data and descriptions for all contract structures.

REQUIRED ELEMENTS:


- 1 Project Information required on every plan sheet:
 - Contract No.
 - Page No. and Total Pages
- 2 Bridge Location Information Table
 - See Tables.xls file for additional instructions.
- 3 Signature Block and PE Seal

LOCATION INFORMATION SHEET

1 4 of 25

Recommended for Approval:
 #BYG_SIGNATURE#

Date: \$SIG_DT\$



22

1 Contract No. B-XXXX

2 MAINTENANCE OF TRAFFIC SUMMARY

Contract Structure No.	Des No.	Route and Crossing	MOT Type	IHPC Preapproved Time by Closure Type		Comments	Speed Posted
				Shoulder Closure	Lane Closure		
1	1800307	SR 61 over PATOKA RIVER	Phased Single Lane Closure w/ Temporary Signal (See Shts. 8-11 for details.)	**	**	Double Lane Closure not allowed	55
2	1800308	SR 68 over BIG CREEK - NEW CHANNEL	Detour (See Shts. 12 & 13 for details.)	**	**		55
3	1800313	SR 61 over BEECH CREEK	Detour (See Shts. 14 & 15 for details.)	**	**		55
4	1602150	I-64 EB, over BIG CREEK	Shoulder Closure or Single Lane Closure	Anytime	Anytime	Double Lane Closure not allowed	70
5	1800898	SR 57 over SMITH FORK	Detour (See Shts. 16 & 17 for details.)	**	**		55

** Not applicable to this project.

NOTES 3

Weekend or Nighttime Only: Single lane closure or single lane restrictions in each direction between Friday 9:00 p.m. to Monday 6:00 a.m. and weekdays 9:00 p.m. to 6:00 a.m.

Nighttime Only: Single lane closure or single lane restriction in each direction any day of the week 9:00 p.m. to 6:00 a.m.

Any lane or shoulder closures outside the allowable times shown in the Traffic Summary require approval from District Traffic.

For Shoulder Closure Detail, see Sht. 6.

For Single Lane Closure Detail, see Sht. 7.

Typ. All Tables and Notes on Maintenance of Traffic Summary Table Sheet:
 Table Title: 12 PT Text
 Table Desc: 9 PT Text
 Text Notes: 9 PT Text

PURPOSE:
 The purpose of this sheet is to provide a summary of Maintenance of Traffic details for each contract structure.

REQUIRED ELEMENTS:

- 1 Project Information required on every plan sheet:
 - Contract No.
 - Page No. and Total Pages
- 2 Maintenance of Traffic Summary:
 - See Tables.xls for additional instructions.
- 3 Notes
- 4 Signature Block and PE Seal

SPECIAL CONSIDERATIONS:
 This table can be amended for locations not on the interstate. The "IHPC..." column can be changed to "Proposed MOT" with standard drawings or plan set sheet numbers referenced for each location.

4

MAINTENANCE OF TRAFFIC SUMMARY TABLE

Recommended for Approval: #ENG_XXXXXXXX
Date: \$\$SIG_DT\$\$

1 5 of 25

23

1 Contract No. B-XXXX

2 SHOULDER CLOSURE DETAIL

NOTES 6

Channelizing Devices shall be spaced at 20' in tapered sections and at 50' in tangent sections. See Std. Dwg. 801-TCDA-01 for acceptable types of devices.

Portable Changeable Message Sign shall be placed as directed by the Engineer.

Worksite Added Penalty Signs to be placed as stated in RSP 801-8-542.

For additional information, see Std. Dwg. 801-TCSC series.

LEGEND 5

Work Site

Channelizing Device

MAINTENANCE OF TRAFFIC QUANTITIES 4

Shoulder Closure	
Pay Item	Quantity
Construction Sign, Type A	10 Ea.
Maintaining Traffic	1 LS

CONSTRUCTION SIGNS 3

XW20-1 (A) ROAD CONSTRUCTION AHEAD

XW21-5-A (B) RIGHT SHOULDER CLOSED

C20-2 (C) END ROAD WORK

PURPOSE:
 The purpose of this sheet is to provide a detail and signage for a temporary shoulder closure when included in the Maintenance of Traffic Summary table.

REQUIRED ELEMENTS:

- 1 Project Information required on every plan sheet:
 - Contract No.
 - Page No. and Total Pages
- 2 Shoulder Closure Detail:
 - Work Area
 - Shoulder Taper
 - Channelizing Devices
 - Construction Signs
- 3 Construction Signs with descriptions
- 4 Maintenance of Traffic Quantities
- 5 Legend
- 6 Notes
- 7 Signature Block and PE Seal

SPECIAL CONSIDERATIONS:
 Shoulder Closure Detail shown is for Multi-Lane Divided Highway application. Shoulder Closure on a Two-Lane Two-Way Road requires slightly different sign layout and quantities. See Std. Dwg. 801-TCLC-07 for information.

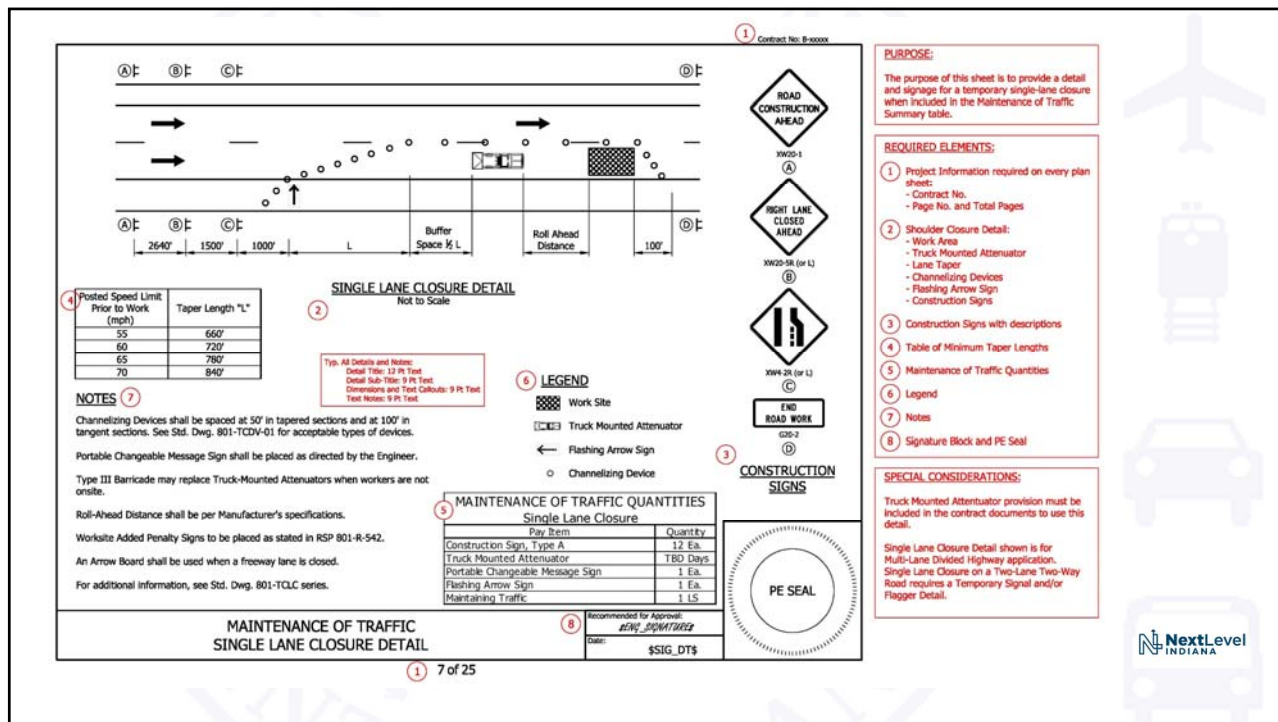
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MAINTENANCE OF TRAFFIC SHOULDER CLOSURE DETAIL

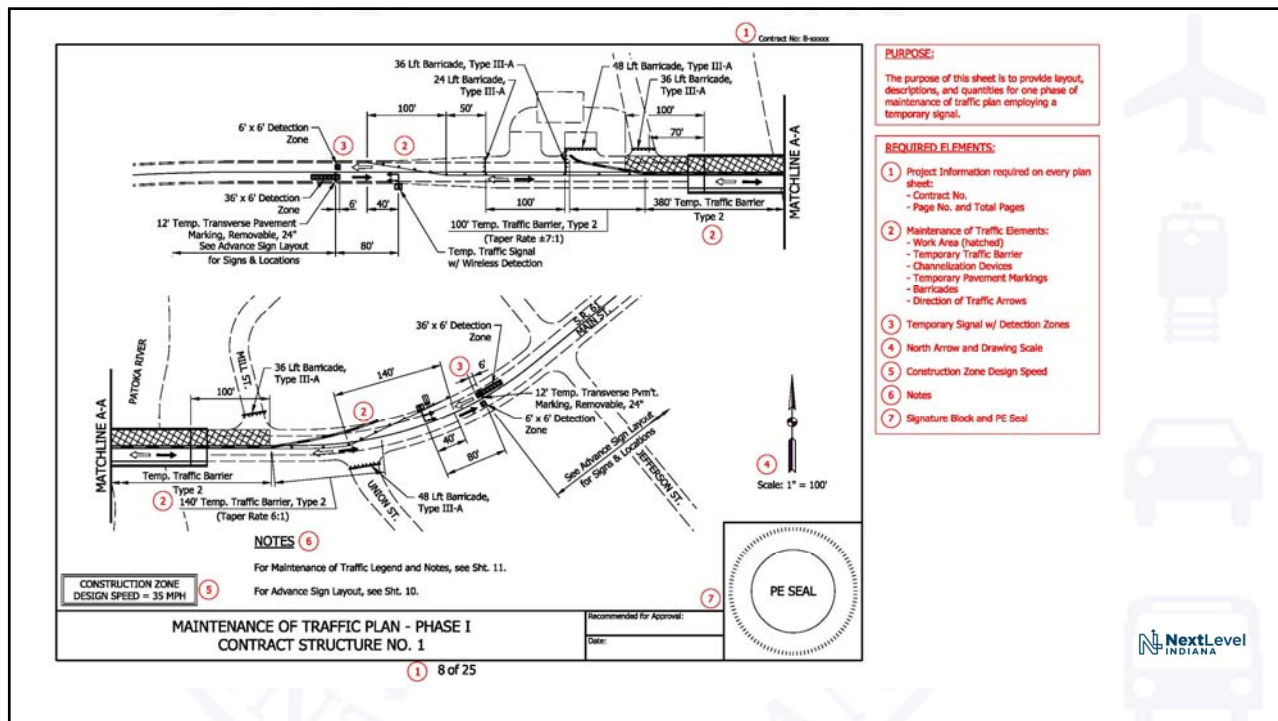
Recommended for Approval: #ENG_XXXXXXXX
Date: \$\$SIG_DT\$\$

1 6 of 25

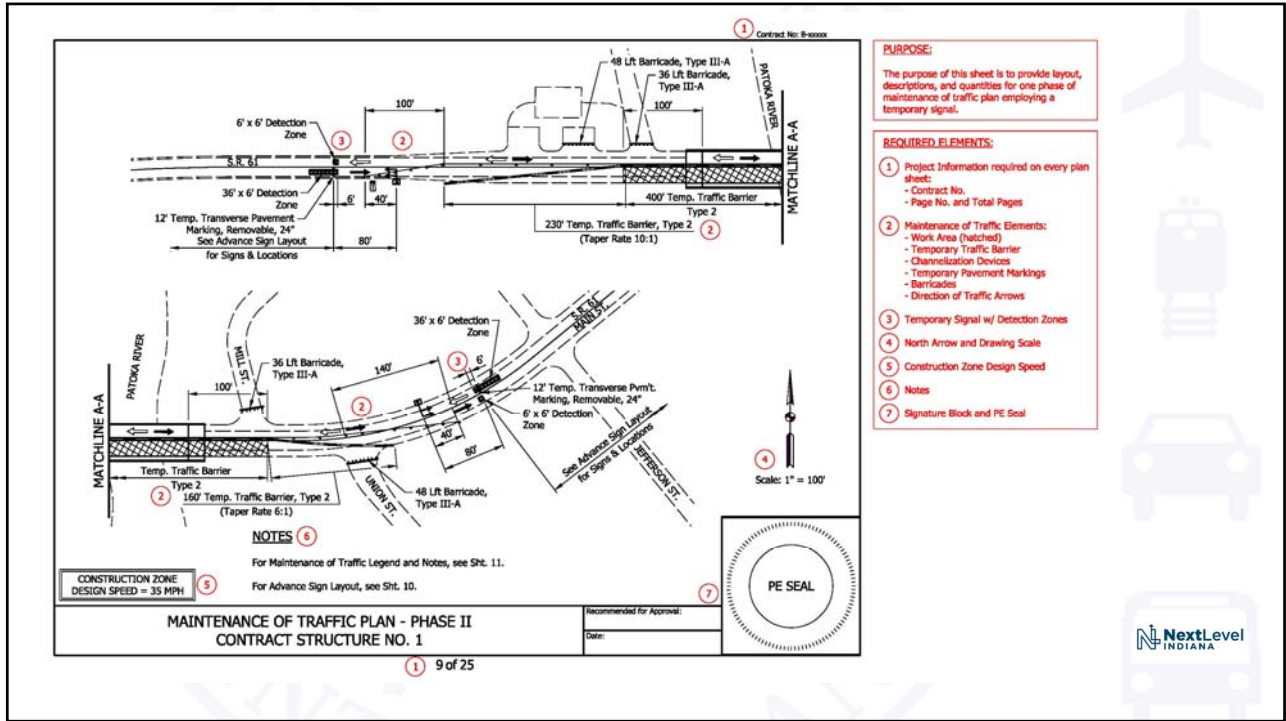
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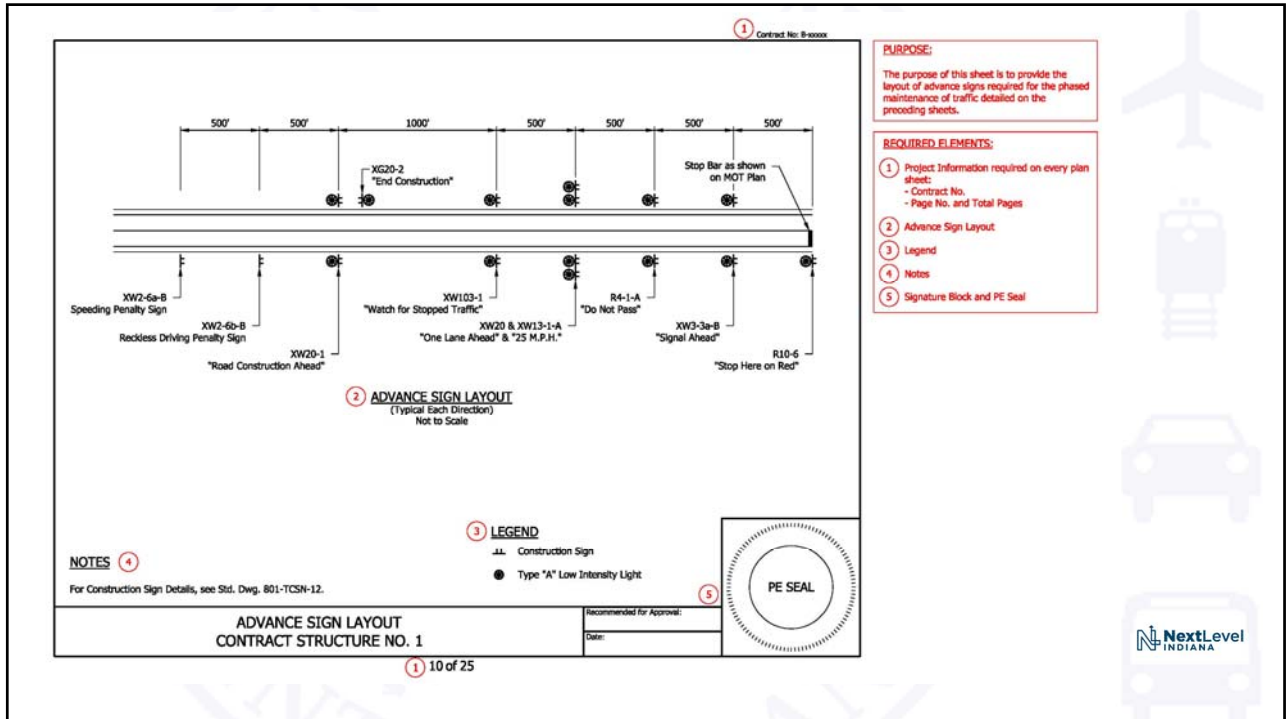
25



26



27



28

1 Contract No. B-XXXXX

NOTES 4

One lane of traffic shall be maintained throughout the length of the project.
 Contractor to provide 11' travel lane and 1' min. shoulder.
 Construction Zone Design Speed = 35 mph.
 Drums to be spaced at 20' in taper and 40' in tangent section.

SIGNALIZATION NOTES 5

All signal equipment to remain the property of the Contractor.
 Timing information will be furnished by the District Traffic Engineer.

SIGNAL PHASING DIAGRAM

LEGEND 3

- ⏏ Construction Sign
- Construction Warning Light, Type A
- ← Flashing Arrow Sign
- Channelizing Device
- Direction of Traffic
- ▨ Work Area
- Temporary Traffic Barrier
- ⚡ Temporary Traffic Signal & Support
- ⏏ Barricade, Type III-A

MAINTENANCE OF TRAFFIC QUANTITIES 2

Des. No. 1800307 - Contract Str. No. 1

Pay Item	Quantity		Total to be Paid
	Ph. I	Ph. II	
Construction Sign, Type A	EACH	16	16
Temporary Transverse Pavement Marking, Removable, 24"	LFT	24	24
Temporary Traffic Signal	LS	1	1
Temporary Traffic Barrier, Type 2	LFT	620	790
Barricade, Type III-A	LFT	228	168
Flashing Arrow Sign	DAY	2	2
Maintaining Traffic	LS	-	1

Typ: All Details, Notes, and Tables:
 Detail Title: 12 Pt Text
 Text Callouts: 9 Pt Text
 Text Notes: 9 Pt Text
 Table Data: 9 Pt Text

MAINTENANCE OF TRAFFIC LEGEND & NOTES
 CONTRACT STRUCTURE NO. 1

Recommended for Approval:
 Date: _____

PE SEAL

6

PURPOSE:
 The purpose of this sheet is to provide notes, legend, and maintenance of traffic quantities for the MOT plan detailed on the preceding sheets.

REQUIRED ELEMENTS:

- 1 Project Information required on every plan sheet:
 - Contract No.
 - Page No. and Total Pages
- 2 Maintenance of Traffic Quantities for Detour Route Signs
- 3 Legend
- 4 Notes
- 5 Signalization Notes and Signal Phasing Diagram
- 6 Signature Block and PE Seal

1 Contract No. B-XXXXX

NOTES 3

For Maintenance of Traffic Legend and Quantities, see Sht. 13.
 For Work Area Sign Layout Detail, see Sht. 18.

PURPOSE:
 The purpose of this sheet is to show details and signage for a detour route when called for in the Maintenance of Traffic Summary table.

REQUIRED ELEMENTS:

- 1 Project Information required on every plan sheet:
 - Contract No.
 - Page No. and Total Pages
- 2 Detour Map: (Typ. Not to Scale)
 - North Arrow
 - Project Area
 - Roads with labels
 - Detour Route Clearly Identified
 - Detour Traffic Direction Arrows
 - Barricades, Road Closure Sign Assemblies
 - Detour Route Markers
 - Construction Signs
- 3 Notes
- 4 Signature Block and PE Seal

DETOUR PLAN - S.R. 68
 CONTRACT STRUCTURE NO. 2

Recommended for Approval:
 Date: _____

DETOUR PLAN - S.R. 68
 CONTRACT STRUCTURE NO. 2

Recommended for Approval:
 Date: _____

PE SEAL

4

PURPOSE:
 The purpose of this sheet is to show details and signage for a detour route when called for in the Maintenance of Traffic Summary table.

REQUIRED ELEMENTS:

- 1 Project Information required on every plan sheet:
 - Contract No.
 - Page No. and Total Pages
- 2 Detour Map: (Typ. Not to Scale)
 - North Arrow
 - Project Area
 - Roads with labels
 - Detour Route Clearly Identified
 - Detour Traffic Direction Arrows
 - Barricades, Road Closure Sign Assemblies
 - Detour Route Markers
 - Construction Signs
- 3 Notes
- 4 Signature Block and PE Seal

1 Contract No. B-xxxxx

2 DETOUR ROUTE MARKERS

4 ROAD CLOSURE SIGN ASSEMBLIES

6 LEGEND

- Construction Sign
- Type III Barricade
- Type III Barricade & Road Closure Sign Assembly
- Type "A" Low Intensity Light
- E East
- W West
- L Left
- R Right

5 MAINTENANCE OF TRAFFIC QUANTITIES
Des No. 1800308 - Contract Str. No. 2

Qty/Item	Quantity
Construction Sign, Type A	24 Ea.
Detour Route Marker Assembly	31 Ea.
Road Closure Sign Assembly	5 Ea.
Barricade, Type III-A	96 Lft.
Barricade, Type III-B	48 Lft.
Maintaining Traffic	1 L5.

8 PE SEAL

NOTES

See Std. Dwg. 801-TCDD-01 for additional sign location details.
For Work Area Sign layout Detail, see Sht. 18.

DETOUR SIGNS - S.R. 68
CONTRACT STRUCTURE NO. 2

Recommended for Approval: _____
Date: _____

1 13 of 25

31

1 Contract No. B-xxxxx

2

8 PE SEAL

NOTES

For Maintenance of Traffic Legend and Quantities, see Sht. 15.
For Work Area Sign Layout Detail, see Sht. 18.

DETOUR PLAN - S.R. 61
CONTRACT STRUCTURE NO. 3

Recommended for Approval: _____
Date: _____

1 14 of 25

32

Contract No. B-xxxxx
1

2 DETOUR ROUTE MARKERS

3 CONSTRUCTION SIGNS

4 ROAD CLOSURE SIGN ASSEMBLIES

6 LEGEND

- Construction Sign
- Type III Barricade
- Type III Barricade & Road Closure Sign Assembly
- Type "A" Low Intensity Light
- N North
- S South
- L Left
- R Right

5 MAINTENANCE OF TRAFFIC QUANTITIES
Des No. 1800313 - Contract Str. No. 3

Pay Item	Quantity
Construction Sign, Type A	22 Ea.
Detour Route Marker Assembly	22 Ea.
Road Closure Sign Assembly	6 Ea.
Barricade, Type III-A	96 Lft
Barricade, Type III-B	48 Lft
Maintaining Traffic	1 LS

NOTES

See Std. Dwg. 801-TCDT-01 for additional sign location details.
For Work Area Sign Layout Detail, see Sht. 18.

15 of 25

PURPOSE:
The purpose of this sheet is to provide illustrations, descriptions, and quantities of signs required for detour route detailed on the preceding sheet.

REQUIRED ELEMENTS:

- Project Information required on every plan sheet:
- Contract No.
- Page No. and Total Pages
- Detour Route Markers (See IMUTCD for additional location information.)
- Construction Signs (See IMUTCD for additional location information.)
- Road Closure Sign Assemblies (See IMUTCD for additional location information.)
- Maintenance of Traffic Quantities for Detour Route Signs
- Legend
- Notes
- Signature Block and PE Seal

Recommended for Approval: _____
Date: _____

33

Contract No. B-xxxxx
1

2

I-69/SR 168 DETAIL
Not to Scale

I-69/SR 68 DETAIL
Not to Scale

NOTES

For Maintenance of Traffic Legend and Quantities, see Sht. 17.
For Work Area Sign Layout Detail, see Sht. 18.

16 of 25

PURPOSE:
The purpose of this sheet is to show details and signage for a detour route when included in the Maintenance of Traffic Summary table.

REQUIRED ELEMENTS:

- Project Information required on every plan sheet:
- Contract No.
- Page No. and Total Pages
- Detour Map: (Typ. Not to Scale)
- North Arrow
- Project Area
- Roads with labels
- Detour Route Clearly Identified
- Detour Traffic Direction Arrows
- Barricades, Road Closure Sign Assemblies
- Detour Route Markers
- Construction Signs
- Notes
- Signature Block and PE Seal

Recommended for Approval: _____
Date: _____

34

1 Contract No. B-XXXX

2 DETOUR ROUTE MARKERS

3 CONSTRUCTION SIGNS

4 ROAD CLOSURE SIGN ASSEMBLIES

5 MAINTENANCE OF TRAFFIC QUANTITIES

Pay Item	Quantity
Construction Sign, Type A	16 Ea.
Detour Route Marker Assembly	23 Ea.
Road Closure Sign Assembly	5 Ea.
Barricade, Type III-A	96 Lft
Barricade, Type III-B	48 Lft
Maintaining Traffic	1 LS

6 LEGEND

- ⋈ Construction Sign
- Type III Barricade
- ▣ Type III Barricade & Road Closure Sign Assembly
- Type "A" Low Intensity Light
- N North
- S South
- L Left
- R Right

7 NOTES

See Std. Dwg. 801-TCDT-01 for additional sign location details.
For Work Area Sign Layout Detail, see Sht. 18.

DETOUR SIGNS - S.R. 57
CONTRACT STRUCTURE NO. 5

PURPOSE:

The purpose of this sheet is to provide illustrations, descriptions, and quantities of signs required for detour route detailed on the preceding sheet.

REQUIRED ELEMENTS:

- 1 Project Information required on every plan sheet:
 - Contract No.
 - Page No. and Total Pages
- 2 Detour Route Markers (See IMUTCD for additional location information.)
- 3 Construction Signs (See IMUTCD for additional location information.)
- 4 Road Closure Sign Assemblies (See IMUTCD for additional location information.)
- 5 Maintenance of Traffic Quantities for Detour Route Signs
- 6 Legend
- 7 Notes
- 8 Signature Block and PE Seal

8 PE SEAL

1 17 of 25

35

1 Contract No. B-XXXX

2 WORK AREA SIGN LAYOUT DETAIL

3 CONSTRUCTION SIGNS

4 ROAD CLOSURE SIGN ASSEMBLIES

5 MAINTENANCE OF TRAFFIC QUANTITIES

Pay Item	Quantity
Construction Sign, Type A	12 Ea.
Road Closure Sign Assembly	2 Ea.
Barricade, Type III-A	96 Lft

6 LEGEND

- ⋈ Construction Sign
- Type III Barricade
- ▣ Type III Barricade & Road Closure Sign Assembly
- Type "A" Low Intensity Light
- ▨ Work Area

7 NOTES

Worksite Added Penalty Signs to be placed as stated in RSP 801-R-542.
For additional information, see Std. Dwg. 801-TCSG-01 through -03.

MAINTENANCE OF TRAFFIC
WORK AREA SIGN LAYOUT DETAIL

PURPOSE:

The purpose of this sheet is to provide a detail and signage for the work area to accompany rural detours detailed on other sheets in the plans.

REQUIRED ELEMENTS:

- 1 Project Information required on every plan sheet:
 - Contract No.
 - Page No. and Total Pages
- 2 Work Area Sign Layout Detail
- 3 Construction Signs (See IMUTCD for additional location information.)
- 4 Road Closure Sign Assemblies (See IMUTCD for additional location information.)
- 5 Maintenance of Traffic Quantities for Work Area Signs (to be included in MOT Quantities for each Location)
- 6 Legend
- 7 Notes
- 8 Signature Block and PE Seal

8 PE SEAL

1 18 of 25

36

2 PLAN
Not to Scale

3 TYPICAL SECTION
Not to Scale

4 BRIDGE DECK OVERLAY DATA
Des No. 1800307 - Contract Str. No. 1

Out-to-Out Bridge Floor Length (ft)	Bridge Clear x Roadway Width (ft)	Deck Area (Sft)	Extend Overlay over RCBA (Y/N)	RCBA Area (Sft)	Total Bridge Deck Overlay Area (Sys)
203.0	x 40.0	= 8,120.0	Y	1,804.0	1,103

NOTES 5
For General Notes, see Sheet 3.

CONSTRUCTION DETAILS
CONTRACT STRUCTURE NO. 1

Recommended for Approval: _____
Date: _____

19 of 25

1 Contract No. B-xxxxx

PURPOSE:
The purpose of this sheet is to provide information necessary to show limits of work and quantity of deck overlay.

REQUIRED ELEMENTS:

- Project Information required on every plan sheet:
- Contract No.
- Page No. and Total Pages
- Plan View showing limits of work to be performed and bridge deck geometry.
- Typical Section showing limits of work to be performed and bridge superstructure general configuration.
- Quantity calculation for deck overlay.
- Notes
- Signature Block and PE Seal

Typ: All Details, Notes, and Tables:
Detail Title: 12 Pt Text
Text Callouts: 9 Pt Text
Text Notes: 9 Pt Text
Table Data: 9 Pt Text

PE SEAL

37

2 PLAN
Not to Scale

3 TYPICAL SECTION
Not to Scale

4 BRIDGE DECK OVERLAY DATA
Des No. 1800308 - Contract Str. No. 2

Out-to-Out Bridge Floor Length (ft)	Bridge Clear x Roadway Width (ft)	Deck Area (Sft)	Extend Overlay over RCBA (Y/N)	RCBA Area (Sft)	Total Bridge Deck Overlay Area (Sys)
202.0	x 45.3	= 9,150.6	N		1,017

NOTES 5
For General Notes, see Sheet 3.

CONSTRUCTION DETAILS
CONTRACT STRUCTURE NO. 2

Recommended for Approval: _____
Date: _____

20 of 25

1 Contract No. B-xxxxx

PURPOSE:
The purpose of this sheet is to provide information necessary to show limits of work and quantity of deck overlay.

REQUIRED ELEMENTS:

- Project Information required on every plan sheet:
- Contract No.
- Page No. and Total Pages
- Plan View showing limits of work to be performed and bridge deck geometry.
- Typical Section showing limits of work to be performed and bridge superstructure general configuration.
- Quantity calculation for deck overlay.
- Notes
- Signature Block and PE Seal

SPECIAL CONSIDERATIONS:
Show Existing R/W only when contract contains work requiring Contractor to be off of the existing pavement.

Typ: All Details, Notes, and Tables:
Detail Title: 12 Pt Text
Text Callouts: 9 Pt Text
Text Notes: 9 Pt Text
Table Data: 9 Pt Text

PE SEAL

38

1 Contract No. B-XXXXX

2 PLAN
Not to Scale

Hatched Area Indicates Limits of Bridge Deck Overlay

PURPOSE:

The purpose of this sheet is to provide information necessary to show limits of work and quantity of deck overlay.

3 TYPICAL SECTION
Not to Scale

Replace Pavement Markings in Kind (Typ.)

REQUIRED ELEMENTS:

- 1 Project Information required on every plan sheet:
- Contract No.
- Page No. and Total Pages
- 2 Plan View showing limits of work to be performed and bridge deck geometry.
- 3 Typical Section showing limits of work to be performed and bridge superstructure general configuration.
- 4 Quantity calculation for deck overlay.
- 5 Notes
- 6 Signature Block and PE Seal

Typ. All Details, Notes, and Tables:
Detail Title: 12 Pt Text
Text Callouts: 9 Pt Text
Text Notes: 9 Pt Text
Table Data: 9 Pt Text

BRIDGE DECK OVERLAY DATA Des No. 1800313 - Contract Str. No. 3					
Out-to-Out Bridge Floor Length (ft)	Bridge Clear x Roadway Width (ft)	Deck Area (Sft)	Extend Overlay over RCBA (Y/N)	RCBA Area (Sft)	Total Bridge Deck Overlay Area (Sys)
79.0	x 36.7	= 2,899.3	N		323

NOTES 5

For General Notes, see Sheet 3.

CONSTRUCTION DETAILS
CONTRACT STRUCTURE NO. 3

1 21 of 25

PE SEAL

39

1 Contract No. B-XXXXX

2 PLAN
Not to Scale

Hatched Area Indicates Limits of Bridge Deck Overlay

PURPOSE:

The purpose of this sheet is to provide information necessary to show limits of work and quantity of deck overlay.

3 TYPICAL SECTION
Not to Scale

Replace Pavement Markings in Kind (Typ.)

REQUIRED ELEMENTS:

- 1 Project Information required on every plan sheet:
- Contract No.
- Page No. and Total Pages
- 2 Plan View showing limits of work to be performed and bridge deck geometry.
- 3 Typical Section showing limits of work to be performed and bridge superstructure general configuration.
- 4 Quantity calculation for deck overlay.
- 5 Notes
- 6 Signature Block and PE Seal

Typ. All Details, Notes, and Tables:
Detail Title: 12 Pt Text
Text Callouts: 9 Pt Text
Text Notes: 9 Pt Text
Table Data: 9 Pt Text

BRIDGE DECK OVERLAY DATA Des No. 1602150 - Contract Str. No. 4					
Out-to-Out Bridge Floor Length (ft)	Bridge Clear x Roadway Width (ft)	Deck Area (Sft)	Extend Overlay over RCBA (Y/N)	RCBA Area (Sft)	Total Bridge Deck Overlay Area (Sys)
119.0	x 39.3	= 4,676.7	N		520

NOTES 5

For General Notes, see Sheet 3.

CONSTRUCTION DETAILS
CONTRACT STRUCTURE NO. 4

1 22 of 25

PE SEAL

40

1 Contract No. B-XXXX

2 PLAN
Not to Scale

3 TYPICAL SECTION
Not to Scale

4 BRIDGE DECK OVERLAY DATA
Des No. 1800898 - Contract Str. No. 5

Out-to-Out Bridge Floor Length (Ft)	Bridge Clear x Roadway Width (Ft)	= Deck Area (Sf)	Extend Overlay over RCBA (Y/N)	RCBA Area (Sf)	Total Bridge Deck Overlay Area (Sf)
116.0	x 45.3	= 5,254.8	Y	3,580.0	982

5 NOTES
For General Notes, see Sheet 3.

CONSTRUCTION DETAILS
CONTRACT STRUCTURE NO. 5

6

1 23 of 25

PURPOSE:
The purpose of this sheet is to provide information necessary to show limits of work and quantity of deck overlay.

REQUIRED ELEMENTS:

- 1 Project Information required on every plan sheet:
- Contract No.
- Page No. and Total Pages
- 2 Plan View showing limits of work to be performed and bridge deck geometry.
- 3 Typical Section showing limits of work to be performed and bridge superstructure general configuration.
- 4 Quantity calculation for deck overlay.
- 5 Notes
- 6 Signature Block and PE Seal

Typ: All Details, Notes, and Tables:
Detail Title: 12 Pt Text
Text Callouts: 9 Pt Text
Text Notes: 9 Pt Text
Table Data: 9 Pt Text

PE SEAL

NextLevel INDIANA

41

1 Contract No. B-XXXX

2 PERMANENT PAVEMENT MARKINGS QUANTITIES

Contract Structure No.	Bridge File Number	Line, Paint			Line, Multi-Component			Snow-Plowable Raised Pavement Marker	Remarks
		Solid White 4 in.	Solid Yellow 4 in.	Broken Yellow 4 in.	Solid White 4 in.	Solid Yellow 4 in.	Broken White 5 in.		
		LFT	LFT	LFT	LFT	LFT	LFT		
1	Des No 1800307 061-03-07602	488	488					3	
2	Des No 1800308 068-07-07188	404	404					3	
3	Des No 1800313 061-02-07853	158	158					1	
4	Des No 1602150 364-35-05597 BEBL				119	119	30	2	
5	Des No 1800898 057-26-07177	390		49				3	
TOTALS FOR CONTRACT		1440	1050	49	119	119	30	12	

** Estimated quantity

3 NOTES
The Contractor shall determine the quantities upon which to base its bid.

PAVEMENT MARKINGS SUMMARY SHEET

4

1 24 of 25

PURPOSE:
The purpose of this sheet is to provide a summary of quantities for each bridge in the contract.

REQUIRED ELEMENTS:

- 1 Project Information required on every plan sheet:
- Contract No.
- Page No. and Total Pages
- 2 Permanent Pavement Markings Quantities:
- Paint
- Multi-Component
- Snowplowable Raised Pavement Markers
(See Tables.xls for additional instructions.)
- 3 Notes
- 4 Signature Block and PE Seal

Typ: All Tables and Notes on Pavement Markings Summary Sheet:
Table Title: 12 Pt Text
Table Data: 9 Pt Text
Text Notes: 9 Pt Text

PE SEAL

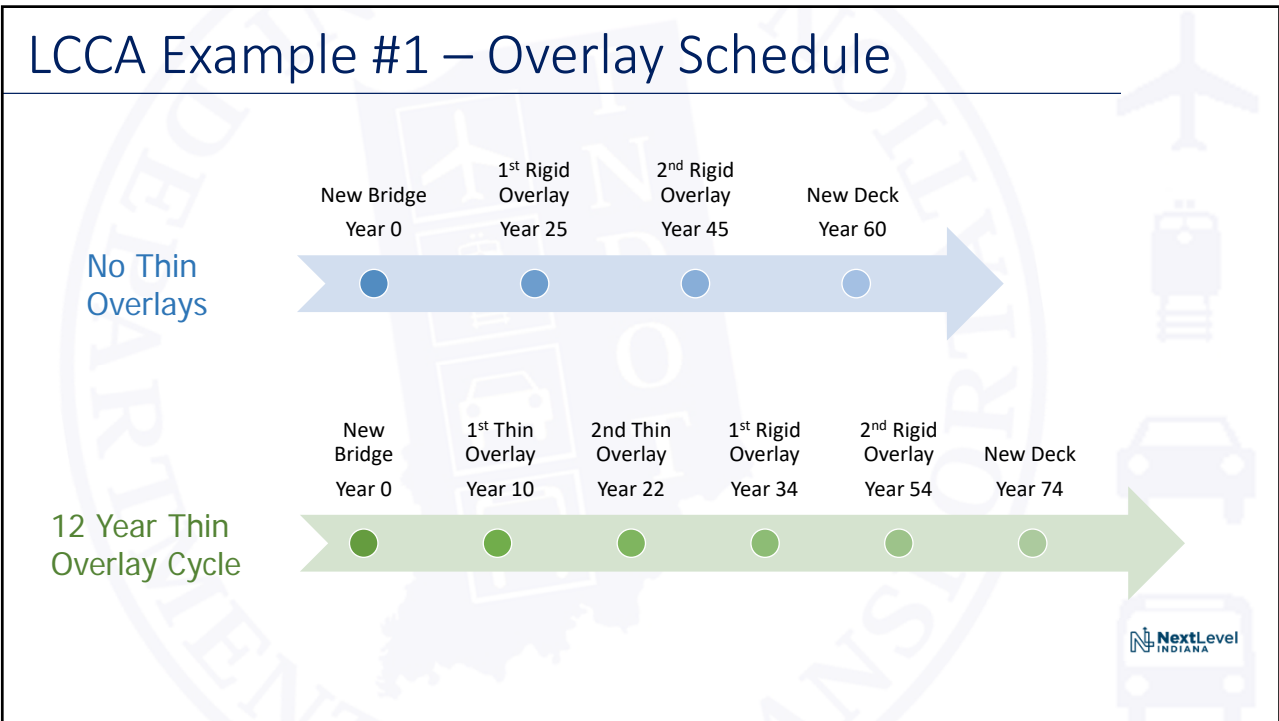
NextLevel INDIANA

42

Estimated Service and Design Life

Bridge Element	Estimated Service Life * (25%-75% Probability)	Estimated Design Life
Wearing Surface (without Maintenance)	15 - 26 years	25 years
Deck	31 - 63 years	50 years
Concrete Superstructure	34 - 72 years	75 years
Steel Superstructure	39 - 77 Years	75 years
Substructure	37 - 75 years	75 years
Reinforced Bridge Approach Slab	No data	25 years
SS Joint	No data	15 years
Modular Joint	No data	50 years
Other Joint	No data	5 years
Preservation Treatment		
Surface Seal	No data	5 years
Flexible Overlay	No data	12 years
Rigid Overlay	14 - 20 years	20 years
Painting	No data	20 years
Metalizing/Galvanizing	No data	60-75 years

45



46

LCCA Example #2 – Interstate vs County



Shorter Service Life on Interstate due to Higher Traffic Volumes in General and More Truck Traffic



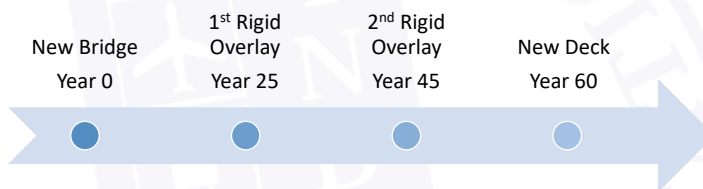
Longer Service Life on Local Collector due to Lower Traffic Volumes in General and Minimal Truck Traffic



47

LCCA Example #3 – Design Life vs Service Life

No Thin Overlays



12 Year Thin Overlay Cycle




15 Year Thin Overlay Cycle




48

LCCA Example #3 – Design Life vs Service Life


PRECISION VS ACCURACY




✓ Precision
✗ Accuracy




✗ Precision
✓ Accuracy



✗ Precision
✗ Accuracy




✓ Precision
✓ Accuracy





49

LCCA Example #4 – MOT Evaluation



VS





50

LCCA Example #5 – Other Scenarios

Built In Access Points



Access Equipment



51

Questions?



52