Hydraulics Updates to the Indiana Design Manual

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March 8, 2017
Updates to the IDM

How-to Information

Helpful set of presentations on the Office of Hydraulics website

Related Links and Documents

Design Guidance
- Indiana Design Manual
- Standard Drawings
- Archived Projects' Plan Request
- Permit Manual
- RIAS
- HEC-PAS Bridge and Scour Modeling Procedures

Hydrology Links
- NOAA Precipitation Frequency Estimates
- NOAA - Vertcon
- DNR Coordinated Discharges
- DNR Hydraulics Model Library
- DNR Peak Discharge Determination System
- DNR Floodplain Information Portal
- USGS Streamstats v3
- USDA NRCS Soil Surveys
- Purdue Regression

Other Links and Forms
- Field Data Form
- Safety briefing Form
- INDOT Traffic Count Database System

Past Presentations
- Hydraulics Presentation - County Bridge Conference 2016
- Hydraulics Presentation - Bridge Hydraulics Parameters 2014
- Hydraulic Training Conference - February 7, 2017
  - IDM Updates
  - Pipe Lines
  - Small Structure Replacement
  - Drainage Area & Discharge Determination
  - Hydraulic Data - Bridges
  - Bridge Rehab Scour
Updates to the IDM

Status of the current updates...

Mmmm... It is done!
Updates to the IDM

Bridge REPLACEMENT Updates...

ONE FOOT
Updates to the IDM

Bridge REPLACEMENT Updates...
Backwater...

First assess the existing backwater

**Basic** backwater criteria:

<table>
<thead>
<tr>
<th>If the existing backwater is...</th>
<th>The allowable backwater will be...</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 3 feet</td>
<td>3 feet or less</td>
</tr>
<tr>
<td>Between 0.14 and 3 feet</td>
<td>Match or improve existing</td>
</tr>
<tr>
<td>Less than 0.14 feet</td>
<td>Up to 0.14 feet</td>
</tr>
</tbody>
</table>

This can be affected by other factors →
Updates to the IDM

Bridge Replacement

**Backwater: Check velocity...**

Requires judgment

Evidence of instability?

If the existing bridge is unstable, the average velocity in the proposed bridge waterway should be $\leq 1.5 \times$ the downstream channel velocity.
Backwater: U/S structures...
Updates to the IDM

Bridge Replacement

Backwater: U/S structures...

Lowest adjacent land grade
1 Foot

“Target” water surface elevation
**Backwater: U/S structures**

Is the “Target” water surface elevation less than 1 foot of backwater?

Lowest adjacent land grade

Existing backwater (More than 1 foot)
Backwater: U/S structures...

“Target” water surface elevation = 1.5 feet of backwater: GOOD!

Lowest adjacent land grade

Existing backwater (More than 1 foot)
Updates to the IDM  Bridge Replacement

**Backwater: U/S structures...**

- Lowest adjacent land grade

Proposed water surface elevation for 1.0 feet of backwater. **Allowed!**

"Target" water surface elevation < 1.0 feet of backwater. **OOPS!**

Existing backwater (More than 1 foot)
Backwater: Waterway areas...

Gross Waterway Area
Backwater: Waterway areas...

Net Waterway Area
Updates to the IDM

Bridge Replacement

**Backwater: Waterway areas...**

Request plans at: [http://www.in.gov/indot/2345.htm](http://www.in.gov/indot/2345.htm)
**Other Criteria: Freeboard...**

**Current criteria:**

Ideal is 2’ or... maybe 1’ or... maybe 3’

**New criteria:**

What do I need to achieve?
Other Criteria: Freeboard...

Goal: Meet the existing criteria

Three possibilities:

1. The existing low structures is above the goal
2. The existing low structure is in pressure flow
3. The existing low structure is above the 1% EP elevation, but no pressure flow
Other Criteria: Freeboard...

Matching existing freeboard

Debris issues?

Yes: Meet the current criteria
Other Criteria: Freeboard...

Matching existing freeboard

Debris issues?

Yes: Meet the current Criteria

No: Can match the PROFILE

0.81'
Updates to the IDM

Bridge Replacement

Two-Span Structures

05/13/2014
Updates to the IDM

Culvert REPLACEMENT Updates…

Replacement in Kind…
Culvert REPLACEMENT Updates...

Replacement in Kind... Is now the main policy!
Replacements in Kind... is now the main policy!

**Backwater...**

Proposed backwater can be as much as 3 feet *provided* is less than the existing backwater.

But what if an upstream structure would be affected? See the bridge design criteria...
Other Criteria...

Span and Waterway Area:

Proposed ≥ Existing

1% EP Water Surface

Existing Waterway Area
Other Criteria...

Outlet Velocity ≤ 1.5 x Channel Velocity

Does the pipe have a scour issue?
Other Criteria...

Outlet Velocity $\leq 1.5 \times$ Channel Velocity

Exceptions:

- Minimum outlet velocity $= 6.5$ ft/sec
- 1 foot of backwater
Culvert Extension

- The headwater elevation has to stay the same
- Remember: HEADwater, not BACKwater
- How to deal with that?

If the culvert is extended, what happens to the headwater here?

Pipe Invert El 864.71
Str.112 Line "A"

Str. 112 Line "A"
24" Ø CMP

Pipe Invert El 859.61
Str. 112 Line "A"

Pipe Invert El 859.15
Str. 112 Line "A"

15'

15'

Existing

217' - 2.35%
Other Things...

When making a submittal, include the electronic files - and mention the version that is used.

Is there concern about downstream impacts? Contact the Office of Hydraulics.
50% Clogging Factor...

REQUiRED

Bridge deck drains

NOT REQUiRED

Sags with flanking inlets
**Flanking Inlets...**

Required for curb and gutter sections.

Required for median and side ditches unless there is a good place for the water to go.
New set of standard drawings...
Cover is now based on pipe type and size

<table>
<thead>
<tr>
<th>CORNER RADIUS (in.)</th>
<th>SPAN (in.)</th>
<th>RISE (in.)</th>
<th>AREA (sq ft)</th>
<th>THICKNESS (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.060</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>MIN.</td>
</tr>
<tr>
<td>8 (Min.) 18 3/4 (Typ.)</td>
<td>60</td>
<td>46</td>
<td>15.6</td>
<td>1.1</td>
</tr>
<tr>
<td>9 (Min.) 20 3/4 (Typ.)</td>
<td>66</td>
<td>51</td>
<td>19.3</td>
<td>1.1</td>
</tr>
<tr>
<td>12 (Min.) 22 7/8 (Typ.)</td>
<td>73</td>
<td>55</td>
<td>23.2</td>
<td>1.1</td>
</tr>
<tr>
<td>14 (Min.) 20 7/8 (Typ.)</td>
<td>81</td>
<td>59</td>
<td>27.4</td>
<td>1.2</td>
</tr>
<tr>
<td>14 (Min.) 22 5/8 (Typ.)</td>
<td>87</td>
<td>63</td>
<td>32.1</td>
<td>1.2</td>
</tr>
<tr>
<td>16 (Min.) 24 3/8 (Typ.)</td>
<td>95</td>
<td>67</td>
<td>37.0</td>
<td>1.2</td>
</tr>
<tr>
<td>16 (Min.) 26 1/8 (Typ.)</td>
<td>103</td>
<td>71</td>
<td>42.4</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Updates to the IDM

More to come...

Culvert Lining and more...

Find information on the INDOT Hydraulics website

http://in.gov/indot/3595.htm
THANKS

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