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**Tertiary Preferred Structures**

Mega Specialty Structures (12 ft ≤ span ≤ 20 ft)

* RCB – with haunches
* 3-sided flat top – with haunches
* 3 sided arch top

All modeled with an Ent. Coef. =0.5

Haunches are to be modeled on structures up to 18 ft spans

**Secondary Preferred Structures**

Deformed Pipe and Specialty Structures:

* RCB –Reinforced Concrete Boxes – with haunches (Entrance Coef. =0.5)
* CMPA – Corrugated Metal Pipe Arch (Ent. Coef. =0.9)
* RCPE – Reinf. Conc. Elliptical Pipe (Ent. Coef. =0.5)
* Slab Top – no haunches (Ent. Coef. =0.5)

**Primary Preferred Structures**

Circular:

* Smooth and corrugated

All modeled as thin edge projecting

**Small Structures**

**Lining Options** (For CMP and CMPA original structures) (worksheets found on the INDOT Hydraulics Website) -inverts to be raised by the thickness of the liner

* HDPE Liner – Ent. Coef. = 0.7 – inverts to be raised by thickness of pipe
	+ [Elliptical HDPE Pipe Lining Worksheet](https://www.in.gov/indot/files/Elliptical%20Coordinates%20for%20HY-8%20%28v%203.0%29%20Web%20version.xlsx)
* CIPP – cured in place pipe – Ent. Coef. =0.7 or 0.5 if existing has headwall
	+ CIPP Lining Worksheet
* 5” paved invert – matches the original structures entrance coefficient -
	+ 5" Paved Invert Worksheet
* Steel Liner – size specifications are proprietary - Ent. Coef. =0.7 or 0.5 if existing has headwall

**Bridges** (Span >20 ft)

* RCB – (max size is 24’ span x 12’ rise – sizes dependent on manufacturer)
* 3-sided flat top
* 3-sided arch top (must be provided as an option if the resulting size is within 4 ft span of flat top option up to 40 ft span)
* Spill Though bridge – if the single span structures are greater than 30 ft

**Notes**:

* Sump depths should be added to all proposed projects based off IDM Fig. 203-2E and have a bottom n-value of 0.030-0.035 with the sides matching the structure type n-value
* For circular pipes, the interior roughness type (smooth, semi-smooth, corrugated) should be specified, not the material type.
* Deformed pipes may also be requested even if circular pipes are available. If circular pipes are beginning to be too large, deformed pipes and specialty structures may be the more preferred option.
* Proposed structures are preferred to be modeled without a headwall but if necessary for safety, erosion issues or to obtain a hydraulically better structure.
	+ In a low cover situation, headwalls or safety end sections may be installed with reason stated and type being proposed.
	+ Jack and bored pipes should be considered for liners if a beveled edge headwall on the proposed liner is not sufficient.
* Haunch sizes are available on the Specialty Structure Coordinate Generator worksheet located on the INDOT hydraulics website.
* Corrugated metal box options may be proposed if requested by the owner or if CMPA’s are not practical.
	+ Corrugated metal boxes are not allowed under high volume roads or interstates
* To determine if a proposed option has adequate cover, the Minimum Culvert Cover Worksheet may be used and is located on the INDOT Hydraulics website.
* If the structure is originally a culvert, HY8 v7.2 is the preferred software to use for modeling assuming a spill through bridge is not proposed.
* Downstream (DS) cross sections should come from surveys and should not use the trapezoidal, triangular, or rectangular options in HY8.
	+ Irregular cross-sections is the preferred option unless there is a known stagnant water surface or there is a DS structure that affects the modeled structure.
* Joint probability should be studied if within larger stream flood plains.
* The plans and low structure elevations must match the model and the report
* For 3-sided flat tops and 3-sided arch top bridges (spans over 20 ft), the structure free board over Q100 elevation is 1 ft. For spill through bridges, structural freeboard over the Q100 elevation is 2 ft as per IDM 203-3.02(03)