Culvert Inspection/Maintenance

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Joints

- Critical component of culvert inspection, particularly concrete
- Soil displacement can lead to voids around the pipe, eventually leading to problems at the surface (pavement).
- Voids are often hard to find and fix once they start.
- Joint problems near the inlet and outlet of the pipes can be an indicator that the culvert is undersized.

Joints

- Critical if the voids are transporting road embankment with damage to the embankment and/or pavement.

Joints

- Look for holes in the embankment.
- Look at cracks in the pavement

Joints

Joints

Joints

Section Deformation

- Typically more of a concern with flexible pipe (metal or plastic)
- Bulging on the bottom half of the culvert may be an indicator of high groundwater table (referred to as a “boil”).

Section Deformation

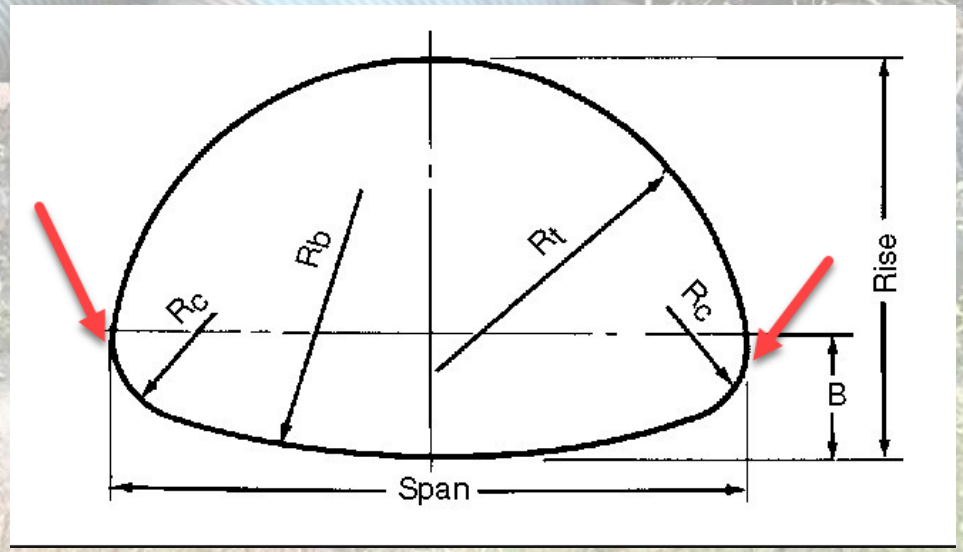
- Multiple forms of “plastic” pipe (HDPE, polyethylene, polypropylene).
- Department to track polypropylene pipe installations.

Corrosion (Metal)

- Another critical component.
- Any holes in the pipe will lead to soil transport leading to voids.
- Failure in metal pipes can happen rather quickly during flood events.

Corrosion (Metal)

- Corrosion at the lower hinge point of arch pipe can be problematic



Corrosion (Metal)

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M-94 over E. Br. Chocolay River

Corrosion (Concrete)

Road over

- Looking for void reflections at the surface

End Section

- Again, separation from pipe can be an indication of an undersized culvert.
- Again, separation can quickly lead to voids around pipe.

Scour

- Usually an indicator of an undersized pipe.
- Can lead to end section separation at the outlet.
- Can lead to piping underneath culvert, leading to voids

Scour

- Can look like a pool area downstream.
- Worth measuring depth to make sure the culvert isn’t undermined.

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Scour

- Embankment failure or scour?

Riprap

- Multiple failure methods (toe failure, shear failure, winnowing, dissolution).
- Sometimes the riprap is still in place, but overgrown with vegetation (need to probe).
- Can be critical inspection item for slab culverts.
- Need filter (i.e. geotextile) for success.
- Ideally riprap would extend min. 10 feet in all directions around culvert end section, and up road embankment above top of end section.

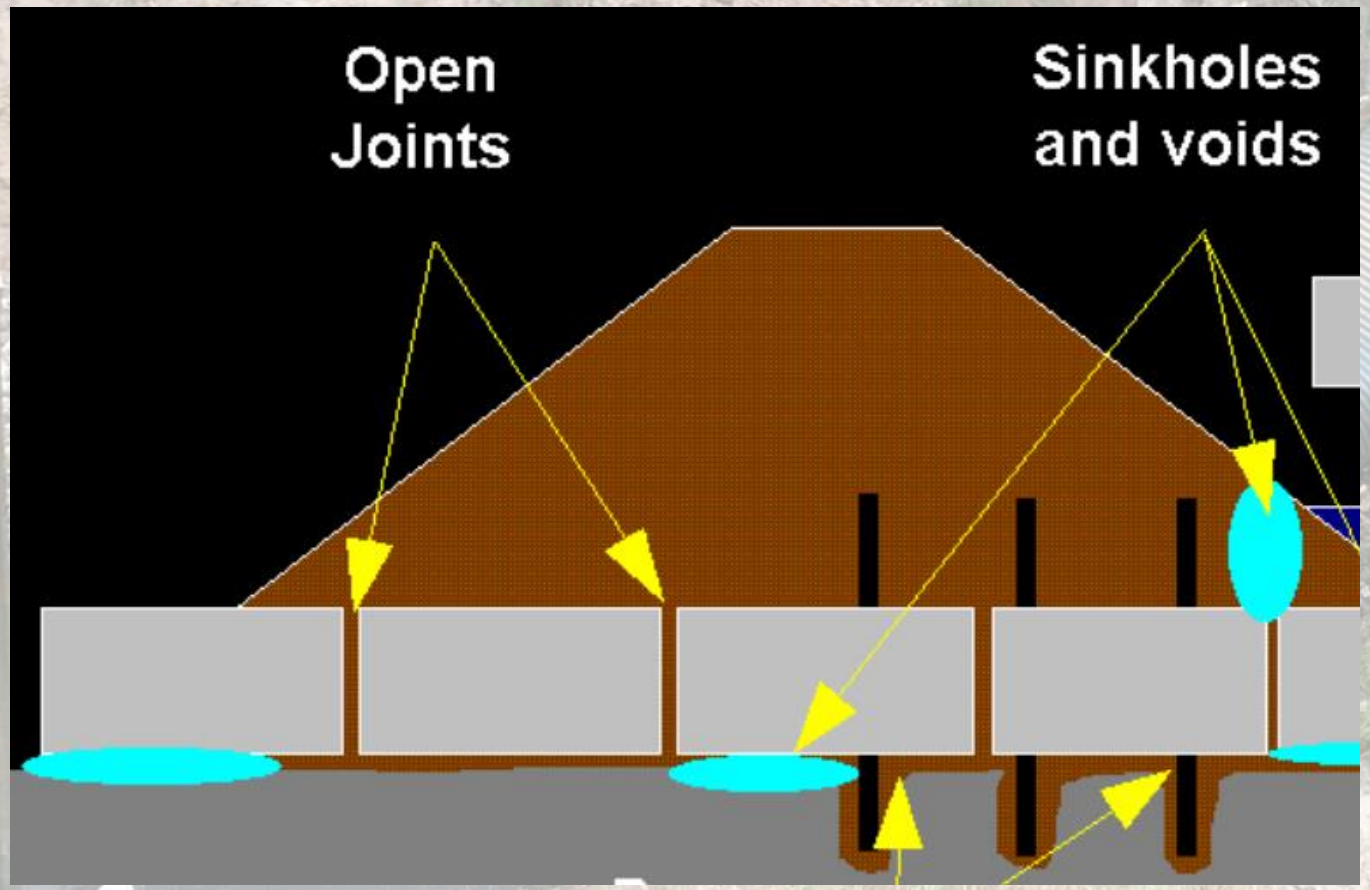
Sediment

- Generally more an issue with multiple barrel culverts.

Invert Location

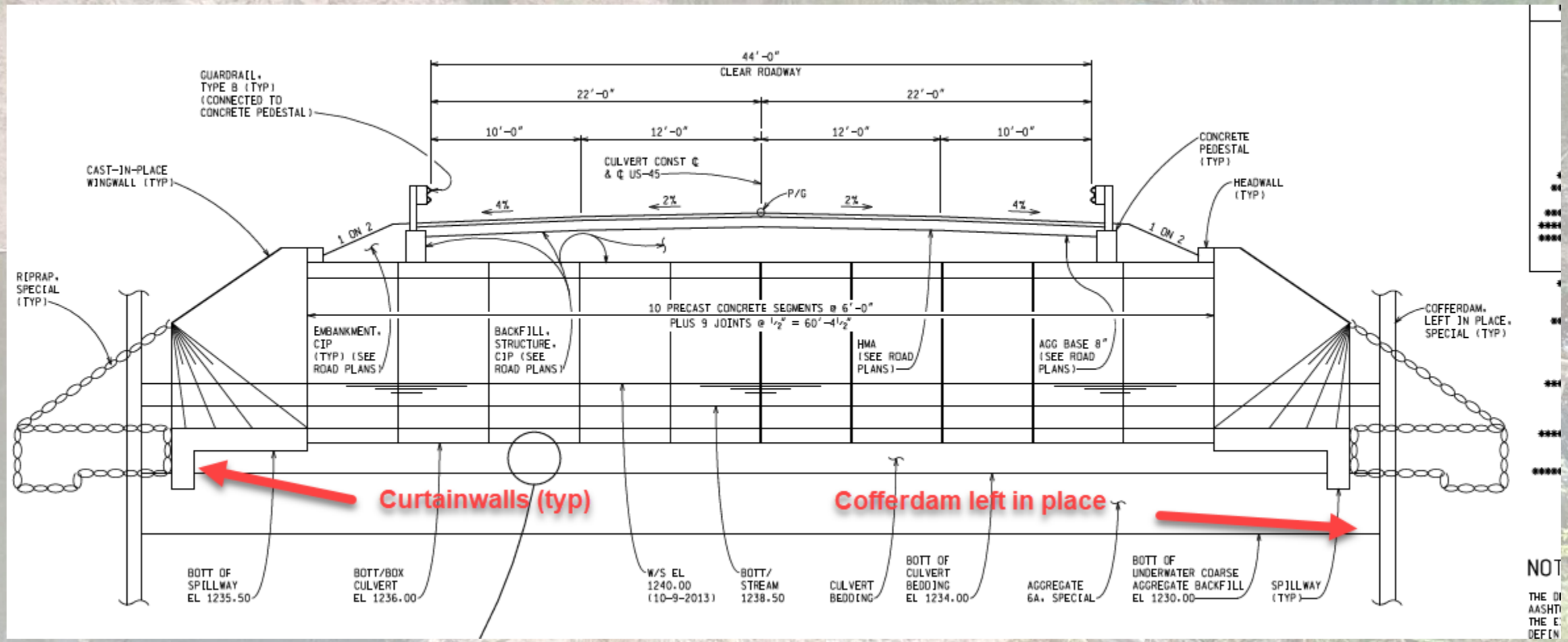
- Perched culverts can lead to piping underneath the barrel.
- Can be caused by stream degradation, drain cleanouts, and scour.
- Can be a critical component, as it can lead to voids around the culvert.

Invert Location



- Commercial end sections often don't have anti seep protection (i.e. curtainwalls). Without protection, the piping can occur rapidly.
- If culvert perched below anti seep device, it must be classified as critical (3 – 1).

Invert Location



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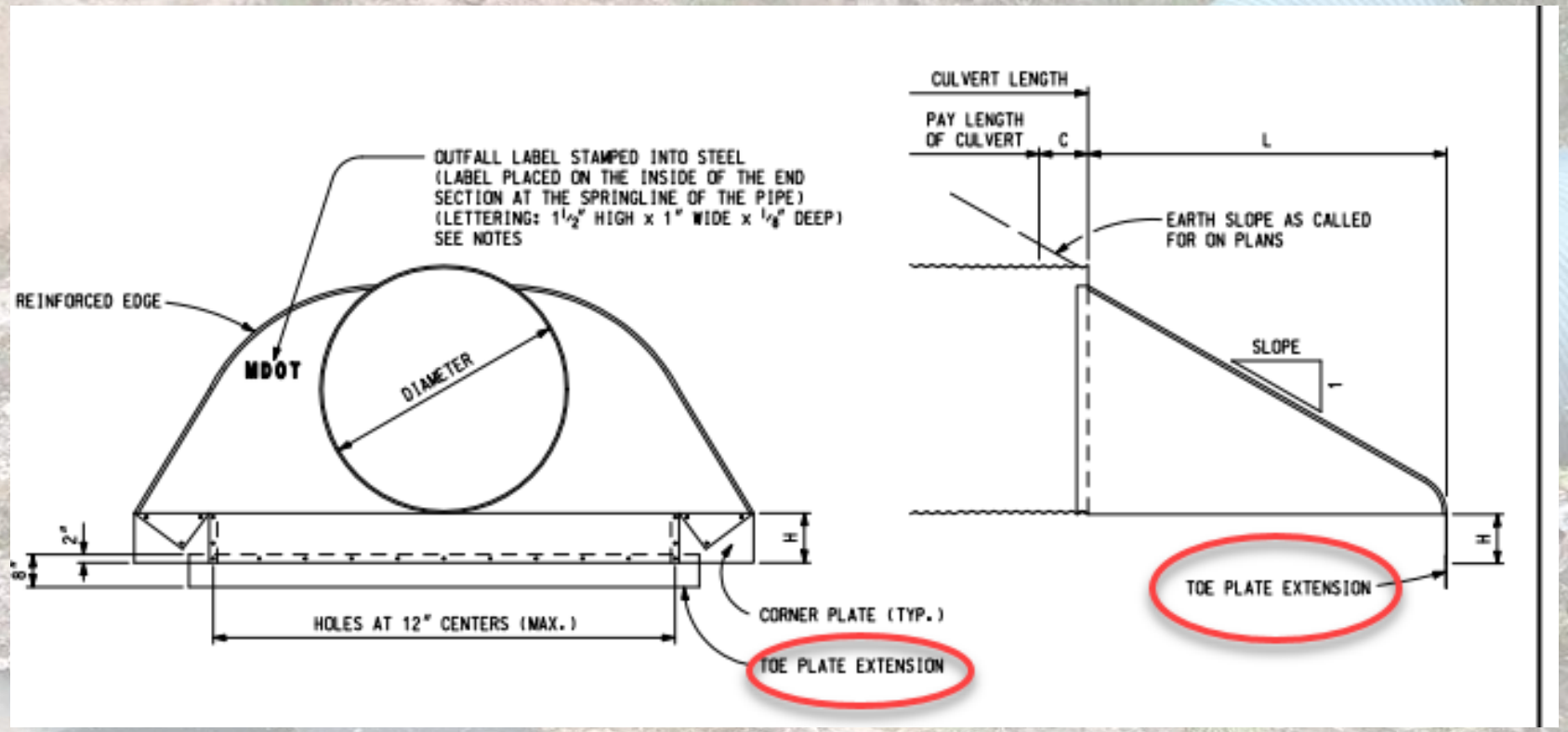

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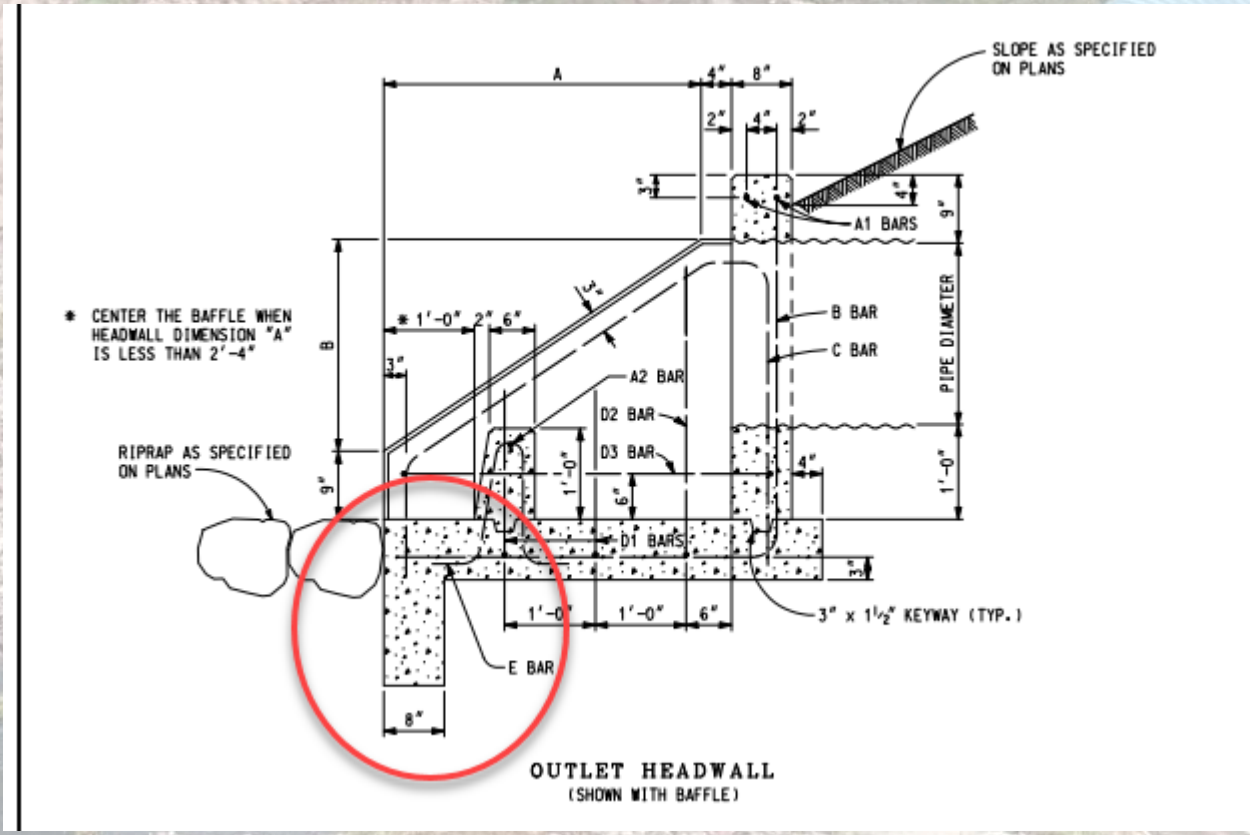

Invert Location

Footing exposed

- Critical inspection component.
- Slab culverts can be like mini scour critical bridges.
- Many slab installations in the state, as was once a standard plan.
- Slabs often get mistaken for boxes.

Footing exposed

Footing exposed

- Beware of slabs that have been extended with circular culverts.
- There was a connection collar detail that was used in the 1980s and early 1990s.

Footing exposed

Other Problems

- Settlement due to construction in soft soils

Other Problems

- Stream meandering and/or poor alignment.

Other Problems

- Clogging due to debris or sediment

Maintenance

- Culvert linings
  - Culvert acts as an equalizer (rare)
  - Driveway culvert only conveying ditch flow from MDOT ROW.
  - Culvert that is a CMP that will not experience inlet control over the range of design flows.
  - Energy dissipation required if outlet velocities exceed 6 ft/s.
  - Perched culverts still can have piping underneath.

Maintenance

- I-94 at Tanner Creek
  - Culvert lining in mid-2000's
  - Riprap basin added at the outlet, with sheeting added at the apron/curtainwall.

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- I-94 at Tanner Creek
  - Photos in 2017:

Maintenance

- Articulating concrete block installation – slab culvert
- Consult with Geotech with excavation near footings

Maintenance

- M-34 over Bear Creek
  - Stream realignment using ACB. Original photo in 2005 with post-construction in 2017.

Questions?