

## Common Foundation Considerations Checklist

Below is a checklist covering some common foundation considerations for pipe and culvert support.

Note that some specifications described in the following content may not be the same as the specifications followed by your agency. Always check with your State agency's standards and specifications when using these guidelines.

### Sections

- **Handling Unsuitable Foundations Soils**
- **Uneven Foundation**
- **Soft Foundations**
- **Pockets of Unstable Soil**
- **Dealing with Swampy Conditions**
- **Improved Support**
- **Settlement Under High Fill Loads**
- **Pipe/Culverts Supported on Rock**

### Handling Unsuitable Foundations Soils

- If unsuitable, soft, or non-uniform foundations are encountered, they must be treated correctly to ensure satisfactory results**
- It is critical to achieve uniformity along the pipe with homogeneous foundation to yield under the pipe, both in relation to and alongside the pipe**

### Uneven Foundations

- When the excavated grade line reveals both soft and hard spots, or an uneven foundation, the foundation must be changed to make it as uniform as possible
- Sometimes hard spots can be excavated below grade and replaced with softer material
- Alternatively, it may be more economical to excavate the entire foundation slightly below grade line and replace it with suitable, uniform material
- In any event, any abrupt changes from hard to soft foundation must be avoided

### Pockets of Unstable Soil

- If unstable foundation material is in small pockets, it is best to excavate all of the poor foundation and replace it with suitable backfill material
- Frequently, a relatively thin mat of granular material will provide satisfactory support, but it may be necessary to replace very soft foundations to a depth great enough to support not only the pipe, but also the heavier backfill placed beside it

### Dealing with Swampy Conditions

- Swampy foundations are challenging and may require a foundation built with a load distribution platform and suitable backfill

### Improved Support

- Whenever an improved foundation is stabilized by using a coarse granular material, consideration of the bedding and backfill material becomes even more important
- Fine materials can migrate into coarser materials and geotextile separators are often required to prevent this migration

### Settlement Under High Fill Loads

- Cambering the center part of the foundation will compensate for unequal settlement under the weight of heavy embankments
- This assures proper grade after settlement and prevents the structure from sagging in the middle as the foundation consolidates
- Generally, sufficient camber can be obtained by installing the upstream half of the pipe on a flat grade and the downstream half on a steeper than normal grade
- If camber is considered necessary based on foundation soil conditions, the amount of camber must be determined by a qualified soils engineer
- If pipe is setting on cushioned rock or other adequate strength foundation, no camber is necessary, as settlement will be minor
- Cambered installations are special applications that should be evaluated by the engineer and pipe manufacturer
- Be careful not to raise the center of the pipe above the inlet, as this will pocket water in the pipe

### Pipe/Culverts Supported on Rock

- Rock encountered in the foundation must be removed to provide more than the minimum bedding thickness underneath the structure
- Excavate wide enough to avoid any possibility of the pipe resting on the rock, and provide access to adequately haunch the pipe
- The excavated area is then backfilled with compacted, granular soil to cushion the pipe