

Culvert Installation, Bedding, and Backfill Inspection Checklist

The checklist below summarizes some important points that you should remember while inspecting for culvert installation, bedding, and backfill.

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

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Delivery to Project

- When pipe is delivered to a project, it is important that the contractor uses the appropriate equipment and methodology to offload it to avoid damage.**
- The pipe should be stockpiled at a convenient location to facilitate access for installation.**
- The sections of pipe should be stockpiled and layered in the manner they were loaded on the truck at the plant.**

- The bottom layer of pipe should be placed on a flat surface, and the pipe should be blocked to minimize any potential movement.
- The pipe should be placed by alternating the bell and spigot ends for each layer.
- Pipe stockpiles on the job site should be 6 feet high or less when possible.

Visual Inspection and Acceptance on Site

- Once the pipe is offloaded at the job site, the inspector should conduct a visual inspection for acceptance for installation.
- The proper size should be verified for the application and the following information, at a minimum, must be clearly labeled on the pipe:
 - The class of pipe and the specification designation; for example, Class IV meeting the requirements of ASTM C 76
 - The date the pipe was manufactured
 - The name or trademark of the manufacturer
- The pipe certifications verifying the pipe meets specification should be provided by the manufacturer at the time of delivery.
- The inspector must also verify that gaskets and external bands are from an approved materials list and that they are stored properly on site.
 - Typically, the gaskets can be stored inside one of the pipes in a manner that protects them from sunlight, dirt, debris, or other possible damage.
- The inspector must visually inspect all pipes for acceptance prior to installation.
- Pipe not meeting the agency's acceptance criteria must be rejected.
- Visually inspect the pipe for manufacturing flaws or damage that may have occurred during shipment, loading, or offloading.

- When inspecting concrete pipes, check for:**
 - Cracks in the barrel or shell and at the ends
 - Honeycombing due to improper proportioning or segregation of the concrete mix
 - Spalling and exposed reinforcing steel
- When inspecting corrugated metal pipes, look for:**
 - Bruised or broken zinc or polymer coating
 - Out-of-round shape, dents, or bends
- For high density polyethylene (HDPE) or polyvinyl chloride (PVC) pipe look for:**
 - Out-of-round shape
 - Blemishes or other imperfections in the extrusion
 - The presence of honing marks on the spigot end

Trench Details

- The specific trench details must be followed by the contractor for the given application and type of pipe that will be installed.**
- Most agencies utilize a set of standard plans that are followed for the various trench details.**
- The inspector must verify that the appropriate details are being followed for the pipe type and application.**
- The trench width and depth and the bedding and backfill material must be in accordance with the standard plans unless otherwise directed by the engineer.**

Trench Excavation

- During the excavation for the pipe installation, the contractor must conduct the work in accordance with the trench details specified on the plans.
- The plan depth of the excavation must be sufficient to account for the pipe bedding requirements.
- If poor soils are encountered, the material must be undercut and replaced with suitable bedding material appropriate for the application.
- During the trench excavation, the contractor must follow all applicable OSHA requirements.
- For deeper excavations, trench boxes or other shoring methods need to be used.
- The excavated material must be stored at the appropriate distance from the trench to ensure that stability is maintained at all times.

Pipe Installation and Bedding

- Once the excavation is complete, place the pipe bedding in accordance with the required, approved standards.
- The inspector must verify that appropriate bedding material is being used. Where appropriate, a hole should be excavated to account for the bell of the pipe.
- The inspector must ensure the gaskets are installed properly and fit in the groove or seat uniformly around the entire circumference of the pipe.
- After the gasket has been installed, the pipe joint should be lubricated thoroughly around the entire circumference.

- The contractor should use a lubricant as recommended and approved by the pipe and gasket manufacturer.
- The pipe must be installed to the required line and grade as specified on the plans.
- The contractor should use a laser or other approved device to accurately install the pipe.
- The inspector may want to periodically verify the pipe is being installed at the proper line and grade.
- During the installation, the contractor should make adjustments to line and grade by adding or removing bedding material as necessary.
- Pushing the pipe to grade with a backhoe should not be permitted.
- The individual pipe sections should be pushed together utilizing equipment and methodology that is recommended by the pipe manufacturer.
 - Other installation methods may cause damage to the pipe.

Backfill

- Once the pipe has been installed, backfill with the appropriate, specified materials.
- Compact the haunch of the pipe in accordance with the manufacturer's requirements.
- As previously mentioned, the haunch of the pipe is generally defined as that area from the 3 o'clock position to the 5 o'clock position and from the 7 o'clock position to the 9 o'clock position.
- Place backfill material in lift thicknesses in accordance with the agency's specifications.
 - This is typically 10 inches thick or less.

- The lift must be compacted to the specified density requirement.
- Each lift should be tested by the density inspector to verify that adequate compaction has been obtained before placing the next lift.
- After the pipe has been backfilled, the contractor must maintain the required minimum 3 feet of cover over the pipe, or otherwise protect it from potential damage from construction equipment.

Post-construction Inspection and Acceptance

- Once the pipe has been installed and backfilled, post-construction inspection for acceptance must be conducted.
- All installed pipe should be videotaped to determine if there is any damage or installation defects prior to acceptance.
- It is desirable to conduct this work prior to paving in case some of the pipe must be removed.
- The video camera should be operated at a relatively slow speed, such as 0.5 feet per second, stopping as necessary at all joints and anomalies.
- The video should be reviewed, looking for various deficiencies such as cracks, excessive joint openings, standing water, and other anomalies that will impact the intended design life of the pipe.
- For HDPE and PVC, if required, conduct mandrel testing to verify if there is deflection and if it is within the specified tolerance.

Corrective Actions

- If the pipe is found to be unacceptable, corrective actions can include removal and replacement of individual sections of pipe or the entire run.

- Some common repair techniques include chemical grouting of joints or cracks, utilizing the packer method, or direct injection method, depending on the pipe diameter.
- The packer method is used when the pipe size is too small to be accessed by a worker.
- The direct injection method requires access to the pipe by a worker.
- Some agencies may permit the use of a liner as a corrective measure instead of removing and replacing a run of pipe.
 - This method is usually only permitted after pavement has been placed and it is not feasible to remove the pipe.