PVC PIPE IN CONTACT WITH CONCRETE

One of the reasons for PVC pipe's success is its versatility and adaptability for differing installation conditions. For some projects, poured concrete may be used, either for thrust blocking or for protective encasement around the pipe.

In this document, the term "concrete" is used to describe several cementitious materials. For some applications, there is full contact between pipe and concrete over the pipe length. For others, there is contact over only a small portion of the pipe surface.

APPLICATIONS AND BENEFITS

PVC pipe is in contact with cement-based materials for several different applications:

1. ***Thrust blocks***: used to prevent separation of joints in pressure pipe systems. Most common use of concrete and PVC pipe.
2. ***Concrete encasement***: widely used for PVC electrical utility ducts. Encasement protects pipe from damage, isolates separate pipes in a duct bank, and provides safety from electrical shock for anyone digging in the area.
3. ***Sewer connectors***: short lengths of belled PVC pipe are grouted into manhole walls. These connectors provide simple, slip-on connectors for sewer pipelines.
4. ***Concrete collars***: collars are keyed into surrounding soil to prevent pipe on steep slopes from sliding downhill.
5. ***Grouting of casings***: for this application, see PVC Pipe Association (PVCPA) Tech Brief "Grouting PVC Pipe in Casings."

For properly designed and installed concrete structures, there is no damage to PVC pipe from contact with concrete: no physical damage, no chemical attack, no harmful long-term effects. Some PVC pipe products are specifically intended for encasement in concrete such as EB20 and EB35 electrical utility duct ("EB" stands for "Encased Burial" per NEMA standard TC6&8).

INSTALLATION TOPICS

Depending on the application, one or more of the following installation-related subjects may need to be addressed:

1. ***Flotation***: PVC pipe tends to move upward if concrete is not placed correctly and must be prevented from floating out of alignment. Methods to prevent movement during pouring operations include pouring concrete in lifts or filling the pipe with water in advance. Alternatively, installers can place sandbags or weights on the pipe or use bars or restraints to hold it down. Any hardware used to prevent flotation must not cause point loads on the pipe. Do not use wood wedges to hold pipe in casings or use bent-over rebar to prevent duct-bank pipe from moving upward.
2. ***Dropping of concrete onto pipe***: during pouring, concrete should never be dropped onto pipe as it may cause impact damage or move the pipe out of alignment. Improper concrete installation can cause pipe to be squeezed into a vertical oval shape, especially for pipe with lower stiffness. In extreme cases, concrete can theoretically cause collapse of the pipe. This is mostly a concern for pipe in casings, where grout is injected into the casing under pressure instead of open-trench pouring, which is typically performed with concrete. Depending on the project, concrete may be required to be placed in lifts to prevent distortion or damage from occurring.
3. ***Heat of hydration***: during the concrete curing process, heat is generated (known as "heat of hydration"). The vast majority of installations experience no issues with excessive heating. If this is a concern, choosing concrete formulations with low heat of hydration is the most common solution. Another option is to dissipate heat by filling the pipe with water (essentially creating a heat sink) until the concrete has cured.
4. ***Differential settlement***: once pipe is installed and in service, differential settlement (where concrete and surrounding soil settle at different rates) may be a concern. In practice, the difference in settlement is minimal and has not proven to be a problem. Placement of two short pipe lengths next to areas of potential differential settlement can minimize the effects of movement.

THE BOTTOM LINE

Concrete has been used successfully with PVC pipe for many decades. When properly designed and constructed, concrete assemblies have provided significant benefits over a wide range of applications.

References: "Handbook of PVC Pipe Design and Construction," Fifth Edition, PVCPA (2013); Howard, A., "Pipeline Installation 2.0" (2015); NEMA TC6&8 "Polyvinyl Chloride (PVC) Plastic Utilities Duct for Underground Installation," National Electrical Manufacturers Association (2020); NEMA TCB-2 "Guidelines for the Selection and Installation of Underground Non-Metallic Raceways," National Electrical Manufacturers Association (2017); Technical Brief: "Flowable Fill and PVC Pipe," PVCPA (2020); Technical Brief: "Grouting PVC Pipe in Casings," PVCPA (2021)

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