

GROUTING PVC PIPE IN CASINGS

When installing PVC pipes inside casings, grouting may be used to provide additional support and protection for the pipeline. Grouting is the process of filling the gap between the pipe and casing (referred to as the “annular space”) with a sealing material known as grout. Whether or not to grout a casing is the decision of the project owner or design engineer. Alternatives include leaving the casing open or filling it with blown-in sand or pea gravel.

NOMENCLATURE

There are several types of pipe involved in the process of grouting pipes in casings: the pipe running through the casing is called the “carrier pipe,” “internal pipe,” “liner pipe,” or “jacked pipe”; the casing itself is called the “casing pipe” or “host pipe”; and the pipes through which grout flows into the casing are known as the “grout pipes.”

GROUTING THE ANNULAR SPACE

Depending on the project, various types of grout may be used. In general, grout is a cementitious material that lacks larger-sized aggregates found in concrete. For some applications, a bentonite clay mixture can be used instead.

Grout flows more easily than concrete and offers several advantages by:

- providing support to permanently keep the carrier pipe in proper alignment.
- reinforcing the casing pipe, which is especially important if it is corroded or has been structurally compromised.
- forming a barrier to prevent water from flowing into or through the annular space.

However, it has one major disadvantage: if the carrier pipe requires removal, disassembly of a grouted-in pipe is very difficult.

INSTALLATION CONSIDERATIONS

Several items should be considered when grouting around a PVC carrier pipe in a casing:

- **Flotation:** prior to grouting operations, PVC pipe must be prevented from floating out of alignment due to the density of grout. One option is to support it at intervals using casing spacers that are centered in the casing. Another is to fill the pipe with water — see “Filling the Carrier Pipe with Water” below. As well, installers should avoid wedging PVC pipe into place to prevent movement. Wedges apply point loads to the pipe, which is undesirable since it creates local distortions.
- **Heat of hydration:** as grout cures, it creates heat known as the “heat of hydration.” PVC pipe wall temperature should be controlled to be a maximum of 140°F (60°C). Contractors typically use a predetermined mix design for grout and should have an estimate for heat of hydration temperatures before installation. Consequently, it can be determined if excessive heat is a concern. Alternate mix designs with foam admixtures which reduce heat of hydration can also be used.
- **External pressure:** during grouting, installers should ensure excessive grouting pressure does not distort or collapse the pipe. Each DR has an allowable grouting pressure that should not be exceeded (see table). Using foam admixtures can reduce grouting pressures.

ALLOWABLE GROUTING PRESSURE FOR PVC PIPE (psi)										
DR 51	DR 41	DR 35	DR 32.5	DR 27.5	DR 26	DR 25	DR 21	DR 18	DR 17	DR 14
3.7	7.3	12	15	25	30	34	58	95	110	210

Note: Allowable grouting pressure is based on a safety factor of 2.0 at 73°F (23°C) using $E = 400,000$ psi.

FILLING THE CARRIER PIPE WITH WATER

One technique to reduce the possibility of distortion, collapse, flotation, or excess heat of hydration is to fill the carrier pipe with water under low pressure. The internal pressure counteracts the external grouting pressure, minimizing the chance of distortion or collapse of the pipe. In addition, the weight of the water helps to prevent flotation and also acts as a heat sink, lowering the pipe’s wall temperature.

THE BOTTOM LINE

PVC pipes have been successfully grouted for decades. With proper installation, encasing PVC pipe in grout is a problem-free process.

References: “Handbook of PVC Pipe Design and Construction,” Fifth Edition, Uni-Bell PVC Pipe Association (2013); “What Type of Grout Do I Need to Fill My Casing?” multiurethanes.com (2020)