

Underground Duct

Advantages, Description & Installation of Underground Duct Systems

Underground Duct

PVS (Polyvinyl Steel) coated underground HVAC duct (also known as PCD, PVC coated, and PVCSS) is UL® listed and specified more often by architects, engineers, and contractors than any other underground air delivery system because it offers both the strength of steel and the inertness of plastic. These attributes make PVS ideal for in underground as well as corrosive fume exhaust applications, such as in the plating industry.

How PVS is manufactured

PVS is manufactured by a three step process: 1) hot-dipped, galvanized G-60 steel is cleaned and fire treated; 2) a special epoxy primer is baked onto both sides of the sheet; 3) Finally, a 4 mil. polyvinyl chloride coating is heat fused onto one side (4 x 1) for underground HVAC or onto both sides (4 x 4) for chemical fume exhaust applications. The result is a tough, corrosion resistant surface that will not crack, chip, peel, or rust.

Advantages of underground PVS duct

- Placing ductwork underground results in a more aesthetically pleasing interior. *Acoustical* aesthetics is also improved since most or all of the “rumble” associated with interior duct is significantly reduced or eliminated.
- The space between the ceiling and roof can be reduced, making it easier to install electrical and fire suppression systems.
- Installing duct underground allows the air delivery system to be designed for optimum efficiency because ducts do not have to run through, or parallel to roof supports. In addition, runs inside interior or exterior walls can often be eliminated.
- Underground duct is a cost effective solution when air needs to be supplied to adjacent or contiguous buildings because a central unit can serve all locations.
- PVS duct requires no protection from concrete or the minerals and salts found in backfill.
- It is strong enough to walk on and will carry moderate soil loads; yet it can be cut or modified on the jobsite with circular or saber saws fitted with metal cutting blades.



Installation

Although PVS duct has been used successfully in underground applications for over 30 years, successful results depend on correct installation procedures.

Engineering Considerations:

- It is always recommended that duct systems—whether above or below grade—be designed by a qualified engineer and installed by a qualified contractor. When a concrete slab **will not** cover underground duct, special consideration must be given to potential future loading from heavy equipment. If such loading is expected, PVS duct can be incased in concrete, in which case the duct will need to be securely tied down to prevent “floating.” When a concrete slab **will** cover the duct, loading is not as critical, but it is recommended that the duct not be buried deeper than 2.5 times its diameter. At depths greater than 2.5 times the diameter, additional measures must be taken to insure the duct does not collapse. Such measures include the use of painted angle-iron flange connectors for added stiffness at joints, special reinforcing around the duct, or (on ducts 36” or larger) internal reinforcement. *Consult a qualified engineer when such measures are required or when there is any concern about loading.*

Preparing the sub grade:

- PVS duct can be placed directly on the soil with no special precautions to protect the duct. However, drainage needs to be considered because standing water may eventually find its way into the duct causing mold and odor problems. The grade should always be sloped back to the utility room, and **never** place PVS duct at or below the water table.
- It is recommended that the duct be placed on 2” to 6” of pea gravel or other material that will permit easy drainage, especially when soil conditions are marginal. (Although not required to protect the duct, a vapor barrier should be placed under the duct and below the entire slab to prevent moisture from percolating through the concrete.)

Connecting and fastening:

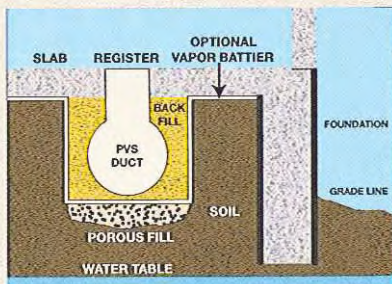
PVS Duct and fittings (or connectors) have male and female ends, respectively, and they are designed to slip together. Before joining, PVC sealant must be applied to the outside of the female fitting (or connector) and the inside of the duct. The joint must then be fastened around its circumference with sheet metal screws spaced no more than 6" apart and with a minimum of three screws per joint. Sealant should then be applied to the joint's edge and to screw heads. After the sealant has cured, the joint should be wrapped with two to three layers of PVC tape.

Spot surface repair:

The plastic surface of PVS duct is exceptionally tough, but it can be scratched. When scratches expose bare metal, they should be sealed with PVC tape or PVC Touch-Up Paint spray. Having these remedies available at the jobsite helps to assure that this detail is not neglected.

Backfilling:

After the duct has been placed, spread backfill evenly in several layers (depending on the diameter of the pipe) and tamp each layer. Tamping should be done carefully to avoid denting or scratching the pipe's surface; do not use mechanical tampers since their shockwaves can severely damage the duct. Do not toss backfill directly on the duct since this may cause denting, scratching, or even collapse if a large weight of fill is dumped directly onto the pipe. Similar care should be taken if concrete is being used to encase the duct.



The duct, encased either in concrete or buried directly below a concrete slab, is installed above the original line of undisturbed soil and above the water table. Encasing the duct in concrete with porous fill beneath is the best way to install PVS duct. An optional vapor barrier can be placed between the pipe and the fill. Always consult local building codes for specific installation instructions.

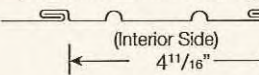
Table 36-1: Load Specifications

Diameter (inches)	Max. Loading (lbs./linear ft.)
8" or less*	400
9" to 13-1/2"*	600
14" to 36"***	1800

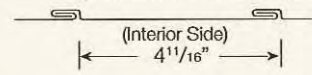
*Uncorrugated **Corrugated

All ducts 14" or larger are corrugated for underground applications. Loading specifications for ducts larger than 36" have not been determined.

Corrugated Lateral Section (diameters 14" and above)



Standard Lateral Section (diameters 4" to 13 1/2")



Precautions and limits:

Sheet metal duct is flexible, not rigid, so greater care must be taken when installing PVS duct. Three parameters need to be considered: External load (soil load = point load), soil stiffness (modulus), and pipe stiffness. In the absence of test data, a soil modulus of 200 PSI and a soil density of 120 lbs/ft³ can be used in calculations. Consult with an engineer. **PVS Temperature Limits:** Operating temperatures for PVS range from -40° F to 250° F, with limited exposure to 400° F.



Spiral Manufacturing Co., Inc. offers a broad line of Class 1 PVS Spiral pipe and fittings. We build custom made fittings and hoods on request to accompany our standard product line. Our PVS products comply with the following codes and industry standards:

- UL 181 Class 1
- International Mechanical Code 1996 Section 603
- ICBO Uniform Mechanical Code - (UMC) 1997
- SMACNA Sheet Metal Air Conditioning Contractors National Association