

Grooved Piping Systems in Buried Applications

Grounding/Bonding/Cathodic Protection

INTRODUCTION

Product applications and processes regarding direct burial and corrosion protection methods are not unique to pipe joints installed with Victaulic couplings. Victaulic couplings are suitable for use in buried systems and systems utilizing specialized corrosion protection such as the methods mentioned in this paper. The application of these methods will not affect joint performance provided the coatings, coverings and/or hardware manufacturer's instructions for corrosion protection are followed and the pipe joints are installed and maintained in accordance with their respective installation instructions.

Direct buried piping systems are one of the original applications for Victaulic couplings. Victaulic piping systems have been incorporated successfully in buried services for over 80 years with installations dating back to the 1930's. The primary advantages of Victaulic grooved mechanical and bolted split sleeve couplings are the characteristics of the joint, specifically coupling flexibility, and their ability to provide allowance for system expansion, contraction, and deflection.

Victaulic flexible couplings can provide all of these features in combination with a self-restrained joint. As with all other traditional methods of joining pipe, the effects of soil conditions on buried systems must be incorporated into system design to prevent corrosion. Special coatings and/or cathodic protection may be applied to ensure system longevity.

The following technical paper will address the use of grooved mechanical and bolted split sleeve couplings in buried systems including information on the direct burial of piping systems and methods of protecting piping systems such as the use of coatings, grounding, bonding, and cathodic protection.

DIRECT BURIAL

Victaulic grooved, shouldered, Vic-Ring®, and bolted split sleeve type couplings can be direct buried following the same guidelines as welded and split sleeve systems as shown in AWWA C604 Standard for Installation of Buried Steel Water Pipe – 4 in and Larger. There are no special design considerations when utilizing grooved or bolted split sleeve couplings with respect to pipe and joint loading in direct buried systems. Direct burial of grooved and bolted split sleeve couplings will not adversely affect joint performance or reliability. Mechanical joining systems provide a fully restrained pipe joint while also allowing for flexibility at the joint.

For buried services, the deflection characteristic of grooved and bolted split sleeve joining systems is the most important benefit. This serves to minimize the stresses that result from movement caused by ground and system thermal changes (i.e., freezing and thawing which cause the ground to shift), settlement, and seismic effects. Flexibility must also be provided at ground breakthroughs to accommodate differential settlement of piping. None of these characteristics are simultaneously available in any other traditional joining technique, such as flanged, threaded, or welded. For specific capabilities and performance information on joint flexibility reference the specific flexible coupling submittal by visiting www.victaulic.com



VICTAULIC PRODUCTS IN BURIED SERVICES CIRCA 1930'S.



36"/900MM VICTAULIC AGS STYLE W77 FLEXIBLE COUPLINGS DIRECT BURIED
PENNSTOCKVANCOUVER ISLAND, BC CANADA



SHOAL CREEK, GA 60 & 72"/1500 & 1800MM VICTAULIC BOLTED SPLIT SLEEVE
AND STYLE 44 VIC-RING COUPLINGS

JOB/OWNER

System No. _____

Location _____

CONTRACTOR

Submitted By _____

Date _____

ENGINEER

Spec Sect _____ Para _____

Approved _____

Date _____

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COATINGS/COVERINGS/HARDWARE

It is the responsibility of the system designer to review ground soil conditions and make a determination of the appropriate coating for the application. On steel or iron piping systems, the same type of protection system used on the pipe may be also used for the pipe couplings.

Victaulic grooved couplings are manufactured from ductile iron meeting the requirements of ASTM A536 Grade 65-45-12 with zinc electroplated carbon steel hardware as a standard. Victaulic bolted split sleeve couplings are manufactured from ASTM A36 steel and/or ASTM A-240 stainless steel with zinc electroplated carbon steel hardware as a standard. Victaulic couplings can be directly coated both prior to installation and/or post installation for the purpose of providing a corrosion resistant barrier. Optional factory applied coatings include, paints, galvanizing, coal tar epoxy, organic zinc primer, bituminous, or epoxy.

These coatings may also be applied in the field directly onto installed couplings. External coverings such as, heat shrink tubing, tapes or wraps, mastics, wax and asphaltic tapes may also be applied directly over Victaulic couplings. These coverings will provide the same corrosion protection to Victaulic couplings as they do with other traditional joining methods and can be installed in the same manner. The coating manufacturer's instructions should be followed to ensure proper coating performance. For added corrosion protection, stainless steel bolting is also offered as an alternative to plated steel for buried applications. It should be noted that to ensure joint performance is maintained with the applied coating, the maximum coating thickness in the groove or shoulder area of the pipe and on the interior surfaces Victaulic couplings must not exceed 0.010"/0.25mm. Coatings external to the coupling and groove or shoulder are not restricted. For thicker coating requirements, contact Victaulic for details.



FIELD APPLIED WAX TAPE COVERING BOLTS ON VICTAULIC AGS COUPLING



FIELD APPLIED HEAT SHRINK COVERING JOINT



VICTAULIC AGS COUPLING WITH FACTORY APPLIED EPOXY COATING



FACTORY APPLIED RILSAN® COATING ON PIPE

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INSTALLATION OF ASPHALTIC TAPE WRAP

GROUNDING/EARTHING OF BURIED PIPING SYSTEMS

It is the designer's responsibility to use good piping practices to ensure buried systems are adequately protected. Grounding of buried systems is necessary to ensure proper protection of a piping system from outside sources of electrical activity such as lightning strikes, power line breaks, and stray currents. Grounding is also necessary to ensure static electricity within a pipeline does not build to a potentially dangerous level.

Stainless steel and bare steel direct buried systems are naturally grounded and do not require additional grounding, however systems that incorporate coatings or wraps may require additional grounding/earthing which may only be done at selected locations along the piping system. Stainless steel, bare, painted, or galvanized Victaulic grooved and bolted split sleeve type couplings, when installed on uncoated, galvanized, or enamel painted pipe ends will provide continuity across the pipe joint through the coupling housing. This is important for systems that are grounded only at select locations and where continuity across the pipe joints is required. Joint continuity is achieved by the high contact forces that occur between the coupling housings and the pipe in the area of the groove/restraint ring. Underwriters Laboratory (UL) has listed both painted and galvanized Victaulic rigid and flexible grooved couplings for the grounding and bonding of systems, KDER. EX1820 - Grounding and Bonding Equipment.

Similar to other joining methods, when the mating surfaces of either the pipe end or coupling are coated with something other than paint or galvanizing prior to coupling installation, the use of grounding clips and/or grounding blocks will maintain continuity across the joint. It should be noted that in the event cathodic protection of the piping system is incorporated, the coupling housings must always be connected to the grounding method to ensure bonding of the coupling housing to the protected pipeline occurs.

BONDING OF BURIED PIPING SYSTEMS

Bonding of buried systems may be necessary to ensure electrical continuity through pipe joints and/or continuity with adjacent piping systems. Bonding is achieved by direct connection of the two materials to be bonded together through the use of jumper wires, continuity clips, or some other means of providing continuity between the two materials.

Victaulic couplings that are bare, painted, or galvanized will provide continuity across the pipe joint therefore bonding the piping system along its length. Systems incorporating imposed current cathodic protection may require additional bonding to adjacent pipelines to ensure even protection to adjacent systems.

CATHODIC PROTECTION OF A BURIED PIPING SYSTEM

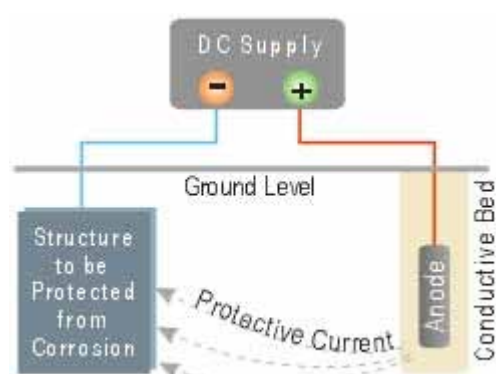
It is the designer's responsibility to use good piping practices to ensure buried systems are adequately protected. Cathodic protection of a piping system can be accomplished by several methods. By definition, cathodic protection is a technique used to control the corrosion of a material by making it the cathode of an electrochemical cell. Cathodic protection is employed to protect a wide range of ferrous metallic equipment and structures in various environments such as pipelines, ships, tanks, casings, and offshore platforms.

The most common methods of cathodic protection are the use of hot dip galvanizing and high zinc content coatings. The zinc coats the carbon steel surface acting as a sacrificial anode preventing the corrosion of the underlying and surrounding material. However as with all sacrificial coatings, the coating will eventually become depleted and will no longer be able to protect the underlying material, typically carbon steel, from corrosion. Other methods of cathodic protection include the installation of zinc anodes directly onto the surface of the material to be protected or the use of zinc rich corrosion resistant paints and coatings.

IMPOSED CURRENT CATHODIC PROTECTION

In areas where pipeline integrity and longevity is required, and where pipeline integrity must be monitored, the use of imposed current cathodic protection can be applied. This method of protection utilizes localized sacrificial anodes or remote anode beds along with an imposed current to ensure corrosion protection is even along the length of the pipeline. This method is often used in conjunction with pipeline coatings. As with grounding, continuity of the pipeline is required to ensure the imposed current can freely travel the length of the protected area.

Couplings installed in an area protected by cathodic protection must be in direct contact or bonded to the pipe to ensure continuity through the connection and even protection of the joint. Continuity between the pipe and coupling is necessary to ensure the couplings do not experience accelerated corrosion.



TYPICAL LAYOUT FOR IMPOSED CURRENT CATHODIC PROTECTION

For complete contact information, visit www.victaulic.com

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