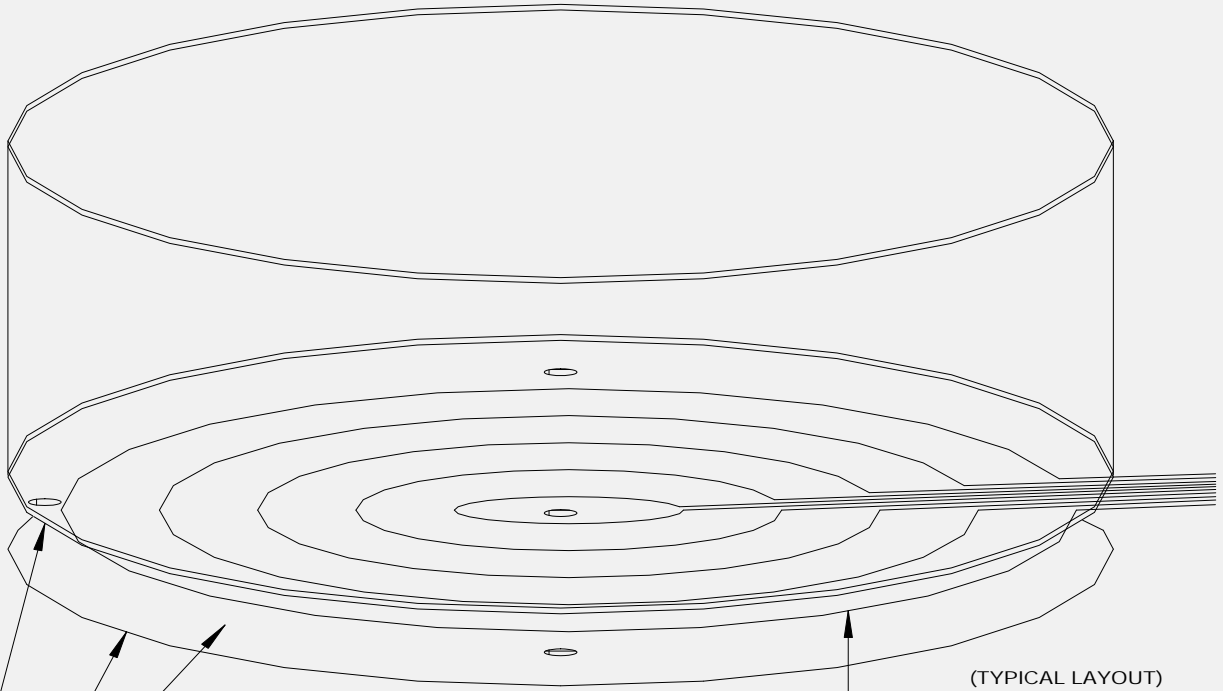


*CerAnode
Mixed Metal Oxide Anode System
for
Aboveground Storage Tank Bottom
Cathodic Protection*



- SAND BETWEEN LINER & TANK BOTTOM
- SECONDARY CONTAINMENT
- TANK BOTTOM
- — 5 PERM. REF. CELLS

CerAnode PiggyBack Anode System

**LONG LIFE
ECONOMICAL
HIGH RELIABILITY
EASY FAST "JIT" INSTALLATION**

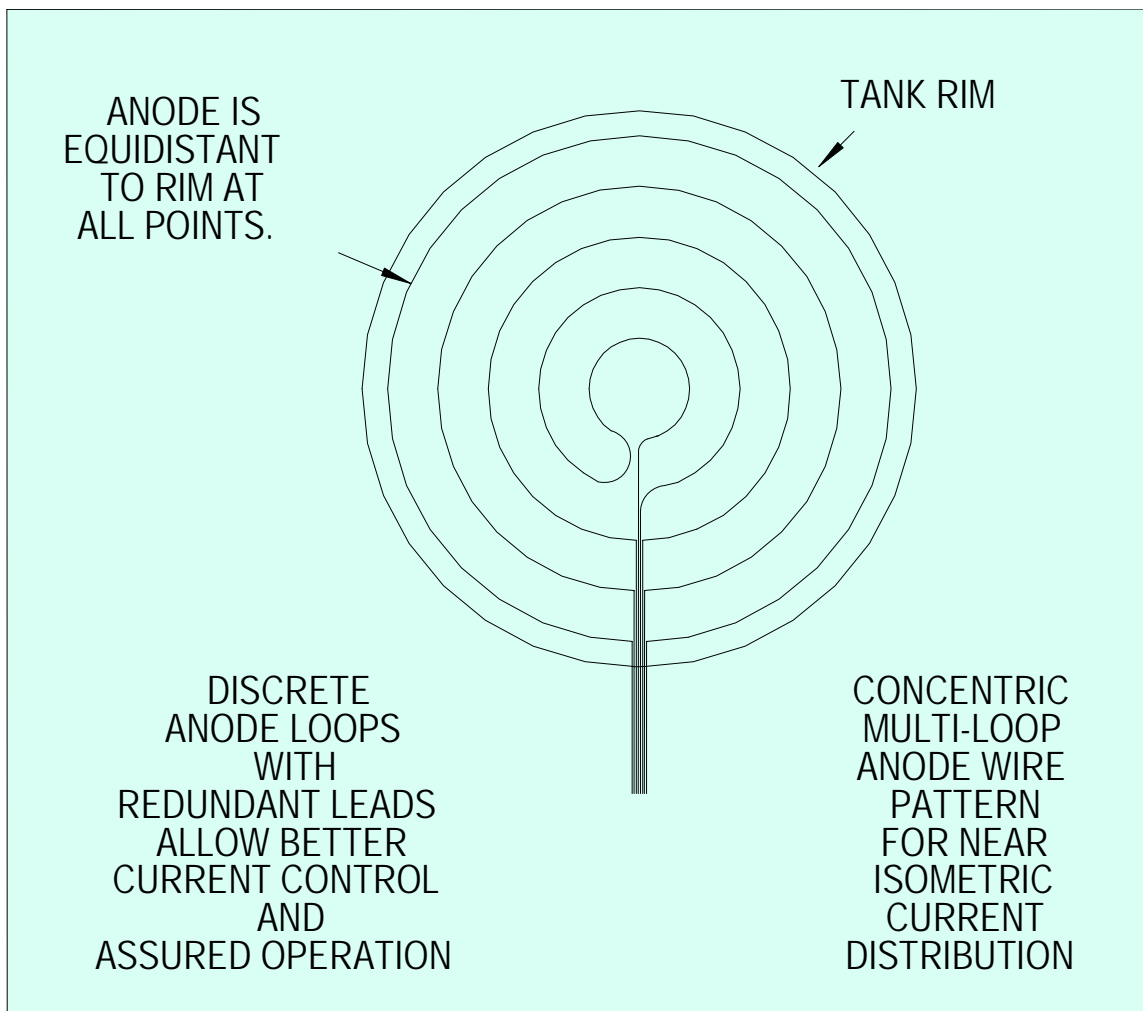
CerAnode PiggyBack™ Tank Bottom Anode

FEATURES

- **Discrete concentric arcs**
- **Each arc has individual redundant leads**
- **Arcs follow tank bottom symmetry**
- **Current distribution is optimized**
- **Groundbed resistance is optimized**
- **Optimized for Tank Annular Plate & Rim Protection**
- **Designed for direct burial in sand**
- **100% factory heavy duty connections**
- **Less than 10% current attenuation**
- **Power Efficient**
- **Easy to Install**
- **Optional integrated plastic mesh**
- **Customized computer design printout**
- **Arrives on site ready to lay in place**
- **Low Cost**
- **50-year design life**
- **JIT (just in time) on site**
- **It makes sense**

TANK BOTTOMS

The CerAnode PiggyBackTM Tank Bottom Anode System provides optimized cathodic protection for New Tanks, Existing Tank Bottom Replacement or Double Bottom Applications where space is limited due to a close-proximity plastic secondary-containment liner. In fulfilling its purpose the plastic liner not only isolates the tank bottom from its general environment to prevent possible pollution, but it also isolates the tank bottom electrically from traditional cathodic protection currents. The PiggyBackTM Anode System, consisting of a series of concentric loops (arcs) in a narrow plane between the tank bottom and plastic liner, is the ideal CP solution. The loops are spaced 2 to 8 feet (normally 5 feet) to provide the desired current distribution and to optimize the anode "throwing power." The factory designed spacing compensates for distance available between the anode and the tank bottom.

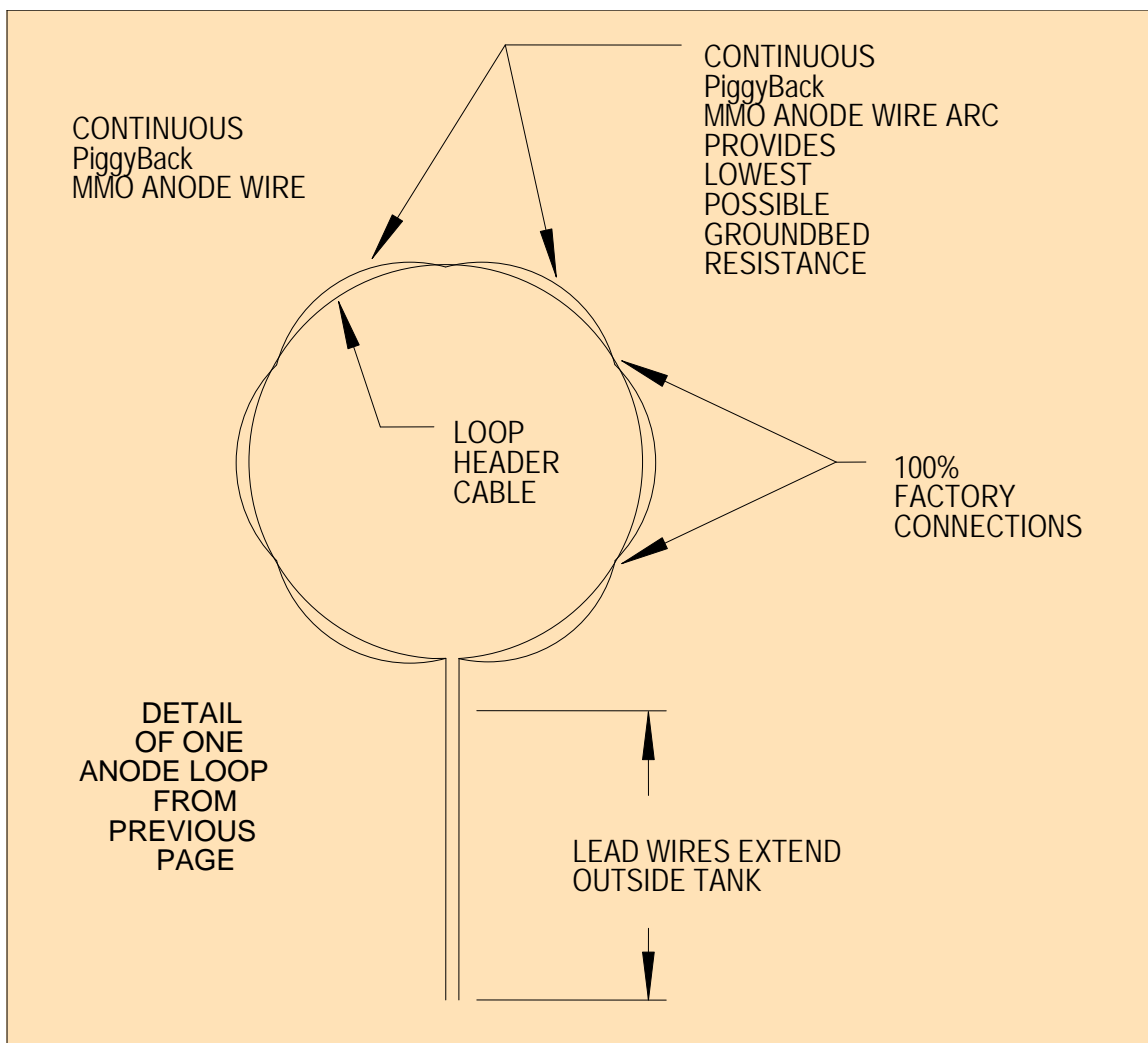


DETAIL OF ANODE LOOP PATTERN UNDER THE TANK BOTTOM

Instead of being closed loops, the two ends of each loop (arc) are brought out to a terminal box providing redundant connections for every loop. Each loop can be operated independently or even electrically disconnected, if the need should ever arise, and the remaining portion of the system will continue to function as normal.

The first loop is concentric with the tank rim and equidistant from the rim. It is spaced at a distance from the rim of no more than half the general loop spacing to make a consistent amount of current available all around the rim where it is most important. Since this under-tank area at the tank rim is most susceptible to corrosion due to its close proximity to the atmospheric elements, this anode system allows for easy optimization of protection currents in this area by loop spacing adjustment. The anode-to-tank rim symmetry helps to insure optimal current transfer.

Each concentric anode loop consists of an appropriately sized standard high molecular weight (HMWPE) header cable, or other cable choice, with a 1.5 or 3 mm diameter mixed metal oxide (MMO) anode wire "PiggyBacked" the entire active loop length as seen below. The anode wire being continuous around each loop results in significantly more anode length compared to traditional systems. This design optimizes both the length and the diameter of anode wire for a given application resulting in extra low groundbed resistance and close to ideal current distribution.



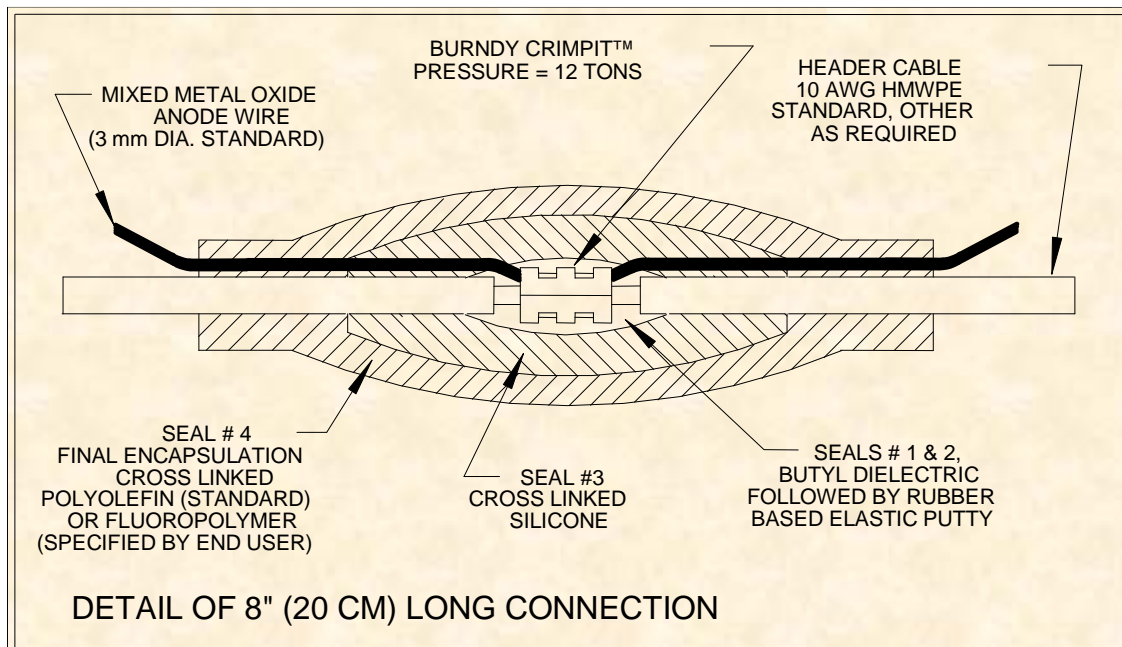
DETAIL OF THE PiggyBack Anode™ LOOP ASSEMBLY

Note that the MMO Anode wire is connected to the header cable at preset intervals around the loop. The spacing of the connection intervals is determined by the mathematical relationship between the wire's electronic resistance, the header cable resistance and the electrolyte resistivity to produce isometric current distribution from the anode with minimal attenuation.

In some double bottom applications where the anode will be installed within inches of the tank bottom, the PiggyBack™ Anode System is available with an integral plastic mesh sleeve around the header-anode wire assembly for added protection against possible anode wire to tank bottom shorts. In all situations the tank construction specification used by the tank contractor should be written with sufficient tutorial to properly educate the tank bottom contractor of the importance of maintaining the anode integrity during construction.

ANODE CONSTRUCTION DETAILS

The type of materials selected to manufacture the anode assembly have withstood the test of time to assure a high level of product confidence. The header cable is standard HMWPE (High Molecular Weight Polyethylene) or Fluoro (fluoropolymer) HMWPE Cathodic Protection Cable as specified. These cables have been recognized as standard in the CP industry for many years. The Anode Wire also has a long and established history. It is made from Commercially Pure Grade 1 Titanium and is activated with mixed metal oxides of iridium, tantalum and titanium. These are among the most corrosion resistant materials known to man. The result is an essentially inert dimensionally stable impressed current anode. Customized MMO activation provides the required current density for the design life of the anode system at the least cost. The all important header cable to anode connection materials also have a well established history.



The only connections necessary in the field are at the rectifier terminal box. All header-to-anode connections are manufactured at the factory in a controlled environment. The MMO Anode Wire is electrically connected to the header cable using a standard hydraulic 12 ton crimp to assure a positive low resistance electronic connection. The metallic components of this connection are then isolated from the electrolyte with four distinct seals. These redundant seals are designed and arranged in such a way to assure zero moisture and oxygen penetration into the metallic connection area over the life of the anode material. The connection's encapsulation in combination with the seals also provides the mechanical integrity needed to prevent cable movement from disturbing the connection's isolation from the environment.

A HISTORY OF QUALITY DESIGN AND QUALITY MATERIALS

Providing CP for applications that are difficult or costly to replace if they should ever fail, demands a solid CP design and the most reliable materials available. CerAnode has a history of manufacturing QUALITY into its anode products. From the materials used to the all important anode connections, close attention has always been given and always will be given to the construction detail of each anode produced. This is an important moral commitment that benefits the customer. The PiggyBack™ Anode System used in conjunction with other adjunct materials combine to make one of the most cost efficient and effective anode systems available.