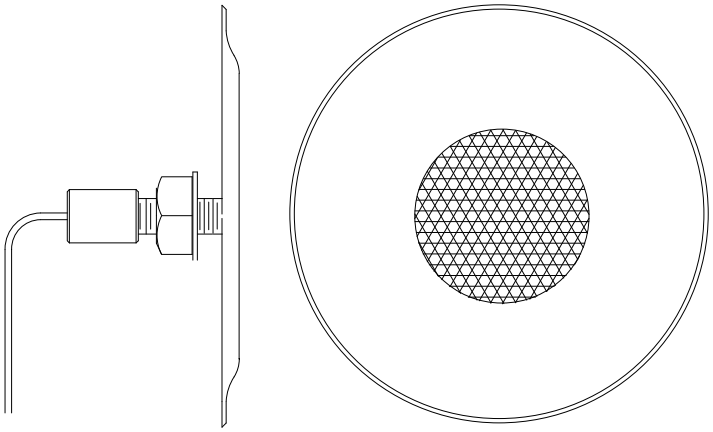
CerAnode™ Technologies International

Division of APS-Materials, Inc. ----------

CerAnode™ LSA™

-MMO DISK ANODE- MOLDED COMPOSITE DIELECTRIC SHIELD AND DIELECTRICS



EASY INSTALLATION

- Radial or Flat Surface
- Multilayer Composite
- Chlorine Gas Resistant
- High Impact Resistance
- Compliant Construction
- Greater Throwing Power
- Electrical Isolation
- Dimensional Stability
- Low Profile (1/2")

Life-Saver-Anode™

UNDERWATER CONNECTOR VERSION

AND

TERMINAL LUG VERSION

LOW PROFILE DISK ANODE FOR MOUNTING ON CATHODE SURFACE

WATER BOXES
DAM GATES
LOCK GATES
PUMPS
ETC.

MAR2016

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THE LIFE-SAVER-ANODE™ (LSA™)

The Life-Saver-Anode represents state-of-the-art technology in cathodic protection. Designed to "save the life" of water boxes, pumps, dam gates, lock gates, etc. This rugged anode is designed for harsh environments. It consists of a 5" 6" or 8" titanium disc, activated with a thin layer of abrasion resistant conductive ceramic. This disc is molded into a 12" low profile protective dielectric shield made of a resilient impact and chlorine resistant multi-layer FRP-polyurethane material (other materials and configurations are available). For Lock and Dam gates the protective shield is designed to protect the anode by absorbing the shock from ice and debris bumping against it and to also deflect these objects as they wash over its surface. It also serves as a dielectric shield to enhance the anode's throwing power and to provide electrical isolation from the cathode. The Life-Saver-Anode protrudes only 1/2" from the surface to which it is mounted. A 3-1/2" x 1" (1.25" optional) titanium reinforced FRP electrically non-conductive stud extends from the backside for mounting.

Installation of the Life-Saver-Anode is simple and easy. It mounts just as if you were installing a bolt through a steel plate. After installing the FRP bolt, washer and nut, the cable attaches simply, via a water-tight (underwater) connector cable for supplying current to the anode. A low resistance connector insures a sound electrical connection. The connector also features redundant seals both at the end which mates with the anode and at the end where the cable leaves the connector body. The materials used have been chosen to maintain their integrity at freezing temperatures, at 100 psi and in the presence of free chlorine. The anode is totally isolated electrically from the structure to which it is mounted. In addition to the underwater connector version, the LSA terminal lug version is ideal where there is no water at the connection end of the anode. The Terminal Lug (TL) version comes complete with a junction head.

The ceramic anode provides a long life of 20 years at the rated current output, longer of course, if the current demands are lower. It is available in a variety of ampere ratings. The Life-Saver-Anode also features dimensional stability for its 20-year design life. This class of conductive ceramic, consisting of mixed metal oxide of iridium, tantalum and titanium, results in dissolution rates superior to all other anode materials available on the market today. The durable ceramic coating provides both the abrasion and corrosion resistance necessary to meet most of the harsh environmental demands of the cathodic protection industry.

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CerAnode Life-Saver-Anode OPERATING PARAMETERS

Weight	*2 lbs (plus cable)*			*Comments*
Active Surface Area: *5 inch anode disk* *6 inch anode disk* *8 inch anode disk*	 *19.6 in.^{2}* *28.3 in.^{2}* *50.3 in.^{2}*			
Suggest Operating Voltages:	*There is no limit*			*There is no voltage limit in terms of the anode itself. If cathode structure is painted, the anode voltage should be monitored along with the instant off potential at the anode perimeter to prevent damage to the paint. Often an auxiliary shield coating is recommended.*
Part Number	*Current Capacity Anode Life:*	*Fresh Water (amps)*	*Brackish Water (amps)*	*Sea Water (amps)*	*Anode life calculations are based on the portion of the surface area where the majority of current exits. Decrease rating 50% in sea water below 10 degrees C and below 5 degrees in fresh. In fresh water it is often not possible to utilize the full current capacity due to anode resistance.*
LSA-12-H-5	*20 Years*	*2.2*	*3.3*	*5.5*	
	15 Years	*2.6*	*3.6*	*6.2*	
	10 Years	*3.3*	*4.2*	*7.1*	
LSA-12-H-6	*20 Years*	*3.2*	*4.7*	*8.0*	
	15 Years	*3.7*	*5.3*	*8.8*	
	10 Years	*4.7*	*6.1*	*10.2*	
LSA-12-H-8	*20 Years*	*5.5*	*8.4*	*14.2*	
	15 Years	*6.6*	*9.3*	*15.7*	
	10 Years	*8.4*	*10.9*	*18.2*	
Anode Resistance: (Circuit Resistance)	*Approx.* $R_{LSA} = \frac{\rho}{f}$ *for coated surfaces, i.e. lock and dam gates.*			*R = Resistance in Ohms. p = Electrolyte Resistivity in Ohms-cm. [R is total circuit, i.e. anode + coated cathode.] f = 21.5 for 5" disk, 25 for 6" disk & 35 for 8" disk*
Underwater Connector Version:	*Water tight for continuous immersion with multiple compression and resin seals. #8, #10 or #12 AWG DLO cable type with Hypalon insulation – min. 19 strand copper.*			*Tested at 100 psi and 30 VDC while immersed in 3.5% NaCl solution arranged within 1-1/2 in. from cathode surface with no anode material in the test cell. Current must equal zero on a meter capable of detecting one micro amp of current.*
Terminal Lug Version:	*3/8 in.-16 Terminal Lug with nickel-plated brass nut and washers inside an "LB" junction box. Mates with 3/4 in. threaded conduit.*			*Junction Box rotates to desired angle for conduit to exit and then locks into place.*

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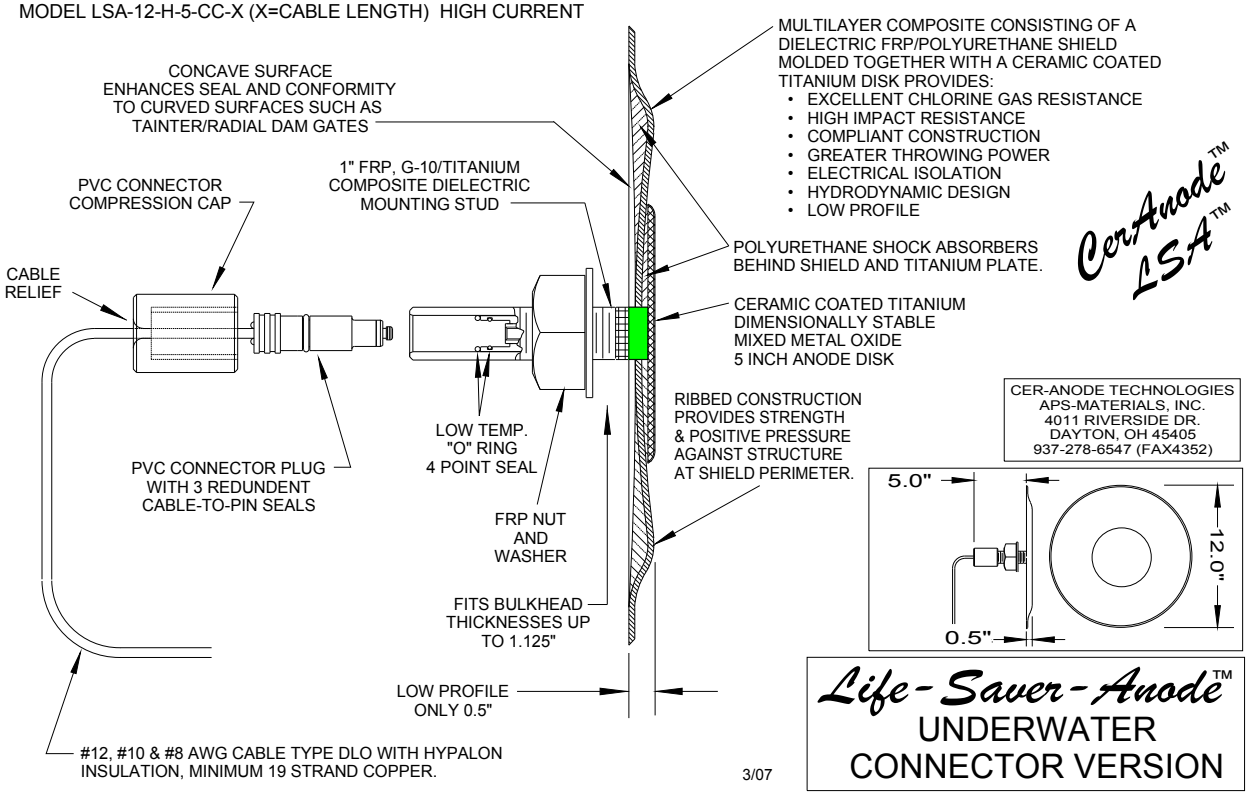
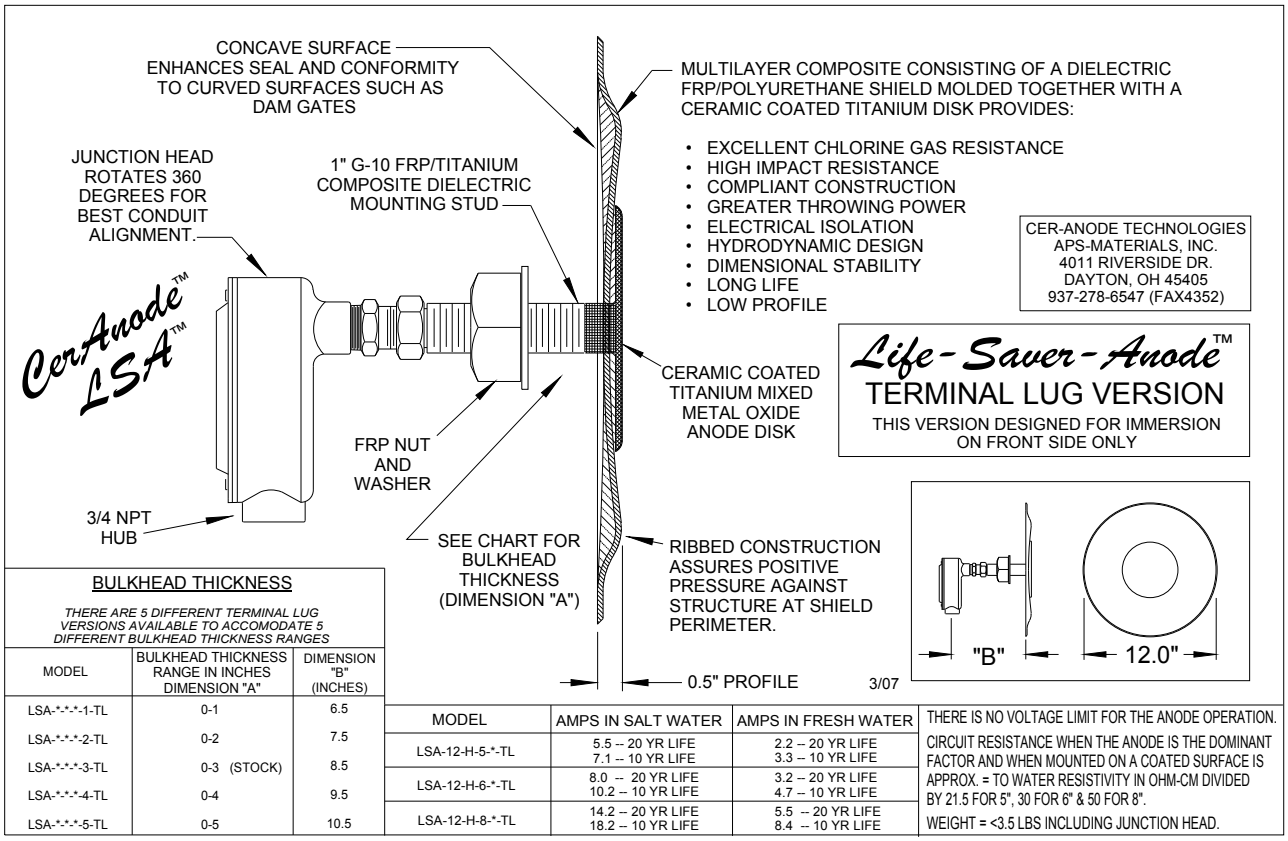
MODEL LSA-12-H-5-CC-X (X=CABLE LENGTH) HIGH CURRENT





BULKHEAD THICKNESS

THERE ARE 5 DIFFERENT TERMINAL LUG VERSIONS AVAILABLE TO ACCOMODATE 5 DIFFERENT BULKHEAD THICKNESS RANGES

MODEL	BULKHEAD THICKNESS RANGE IN INCHES DIMENSION "A"	DIMENSION "B" (INCHES)
LSA-*-*-*-1-TL	0-1	6.5
LSA-*-*-*-2-TL	0-2	7.5
LSA-*-*-*-3-TL	0-3 (STOCK)	8.5
LSA-*-*-*-4-TL	0-4	9.5
LSA-*-*-*-5-TL	0-5	10.5

MODEL	AMPS IN SALT WATER	AMPS IN FRESH WATER
LSA-12-H-5-*-TL	5.5 -- 20 YR LIFE 7.1 -- 10 YR LIFE	2.2 -- 20 YR LIFE 3.3 -- 10 YR LIFE
LSA-12-H-6-*-TL	8.0 -- 20 YR LIFE 10.2 -- 10 YR LIFE	3.2 -- 20 YR LIFE 4.7 -- 10 YR LIFE
LSA-12-H-8-*-TL	14.2 -- 20 YR LIFE 18.2 -- 10 YR LIFE	5.5 -- 20 YR LIFE 8.4 -- 10 YR LIFE

THERE IS NO VOLTAGE LIMIT FOR THE ANODE OPERATION.

CIRCUIT RESISTANCE WHEN THE ANODE IS THE DOMINANT FACTOR AND WHEN MOUNTED ON A COATED SURFACE IS APPROX. = TO WATER RESISTIVITY IN OHM-CM DIVIDED BY 21.5 FOR 5", 30 FOR 6" & 50 FOR 8".

WEIGHT = <3.5 LBS INCLUDING JUNCTION HEAD.

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CerAnode Technologies

division of

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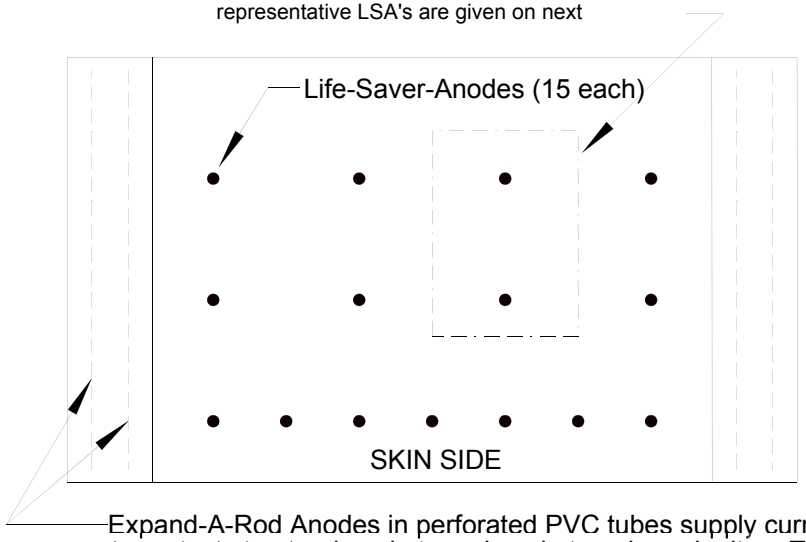
LIFE-SAVER-ANODE (LSA) EQUIPOTENTIAL DATA AT PIKE ISLAND UPSTREAM GATE, UPSTREAM RIVER WALL, AUXILIARY

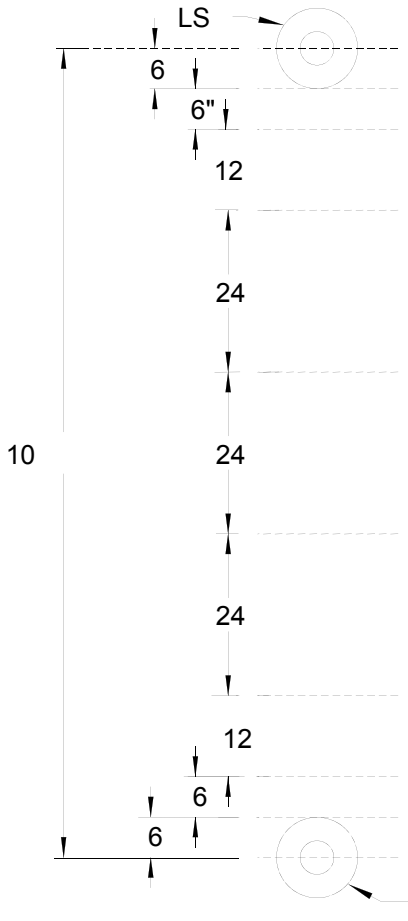
Equipotential data for the entire surface of a lockgate at Pike Island is
Consult CerAnode
Detailed equipotential data for
representative LSA's are given on next



Expand-A-Rod Anodes in perforated PVC tubes supply current to protect structural pockets and seal at quoin and miter. The throwing power of these anodes also contribute slightly to the polarization of the gate's skin surface by the LSA's.

EQUIPOTENTIAL DATA
LIFE-SAVER-ANODE (LSA)

DATE RECORDED = 1-20-88



	OFF POTENTIA (DVM)	INSTANT OFF POTENTIAL (SCOPE)	ON POTENTIAL (DVM)
LS	-0.937	-1.020	-5.040
6	-0.906	-0.940	-2.295
6"	-0.906	-0.960	-1.890
12	-0.910	-0.950	-1.500
24	-0.926	-0.960	-1.330
10			
24	-0.945	-1.000	-1.320
24	-0.974	-1.020	-1.472
12	-0.970	-1.040	-2.015
6	-0.964	-1.040	-3.300
6	-0.967	-1.040	-3.300
LS			

ANODE VOLTAGE = 9.88V, CURRENT = 0.040A/ANODE. CU/CUSO4 CELL 2-4".
ANODES ARE LOCATED ON UP STREAM GATE, 2nd & 3rd ANODE UP 2nd COLUMN FROM RIVER SIDE QUOIN WITH MORE ANODES BELOW THAN ABOVE.
GATE COATING = 20 YEAR OLD VINYL, WATER RESISTIVITY = 4,000 OHM-CM
CerAnode Technologies, DIV. of APS-Materials, Inc., Dayton, OH