

# TANK BATTERY PROTECTION

PATENTED, PROVEN AND  
DEPENDABLE SINCE 1971



**LIGHTNING  
ELIMINATORS**  
[WWW.LIGHTNINGPROTECTION.COM](http://WWW.LIGHTNINGPROTECTION.COM)

# TANK BATTERY PROTECTION



## Tank Battery Protection Against Arc Discharge Events

**Electrical discharge and subsequent explosive detonation of the ullage inside chemical storage tanks**

In recent years there has been a growing trend in the use of fiberglass storage tanks in the oil and gas industry. The majority of these tanks are used at remote well sites and salt water disposal sites located throughout the United States. According to the American Petroleum Institute (API), fiberglass tanks should not be used for oil production but, because of the corrosive nature of this production process, fiberglass tanks are typically the preferred storage method at these locations. Fiberglass tanks, due to their non-conductive construction, create a number of challenges that directly relate to the effects of a lightning discharge.

If a fiberglass tank is adversely affected by a lightning-related event, the results can be monumental with some of these lightning-triggered events costing millions of dollars for product loss, cleanup, capital loss and litigation. Even if the tanks are not struck directly by a lightning termination, a nearby lightning strike can still create an internal spark that can and, in some cases, will lead to an explosive event and a catastrophic failure.



High electrostatic fields produced during thunder and lightning storms create vulnerability through both primary and secondary sources causing arcing both internally and externally which can lead to:

- **Explosive detonation**
- **Electronic and electrical degradation of I&C systems**
- **Complete shutdown or failure of operational systems**
- **Dangerous step and touch potentials**

Lightning Eliminators & Consultants, Inc. (LEC) has developed a number of products to address the primary and secondary effects related to the lightning phenomenon to ensure maximum site and tank integrity. In addition to the protection from direct lightning strikes, LEC manufactures a complete line of AC power low and medium-voltage surge protection devices as well as low-voltage surge protection.

LEC's patented lightning-strike prevention system bleeds off the induced potential on the protected area and tanks during the course of the thunderstorm thereby reducing it to a much lower level in relationship to the surrounding environment. The thunder cell above the tanks and area of concern creates the induced charge. With this technology, the lightning impulse is not encouraged, but discouraged.

## Arc Mitigation Components

Each facility has different needs and concerns. Different products are used in order to design the proper solution for your facility. Below are just a few of the products that LEC uses when creating the best custom solution that meets your company's needs.

## Lightning Protection

### Streamer Delaying Air Terminal (SDAT)

The SDAT is the least expensive of LEC's lightning protection products. Unlike traditional lightning rods, which are designed to collect strikes, the SDAT is a less comprehensive variation of a charge transfer device, also designed to prevent lightning strikes within a designated area, but used when basic lightning protection is an acceptable solution.



### Spline Ball Ionizer® (SBI®)

The Spline Ball Ionizer is UL listed and used to supplement DAS and/or for structures that require lightweight protection with a low-wind profile. When used as primary protection, the SBI acts as a hybrid ionizer/air terminal, preventing most strikes and collecting any it cannot prevent.

### Dissipation Array® System (DAS®)

The patented Dissipation Array System has over 99% effectiveness and eliminates the threat of lightning-strike formation within a protected area by using [charge transfer technology](#) to keep the electrical field below lightning potential. The DAS is a custom-engineered system protecting over 3000 installations worldwide and covered by LEC's "No-Strike" warranty providing [terms and conditions](#) are met. For additional information visit [www.lightningprotection.com/das](http://www.lightningprotection.com/das)

## Grounding Protection

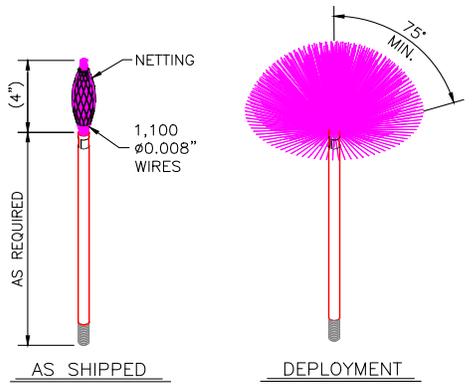
### In-Tank Potential Equalizer™ (IPE™)

The IPE is made specifically for non-metal and lined tanks and meets API - 2003. When the IPE is inserted into a tank and externally grounded, it will discharge any static electricity within the tank's contents and also keep the potential of the tank's contents equal to ground potential. In addition, connecting the IPE to an external ground will create a partial Faraday cage, thus further limiting the electric field strength within the tank. The effects of the IPE will minimize the possibility of electrical discharge and vapor ignition within the tank. For more information visit [www.lightningprotection.com/ipe/](http://www.lightningprotection.com/ipe/)

## Surge Protection

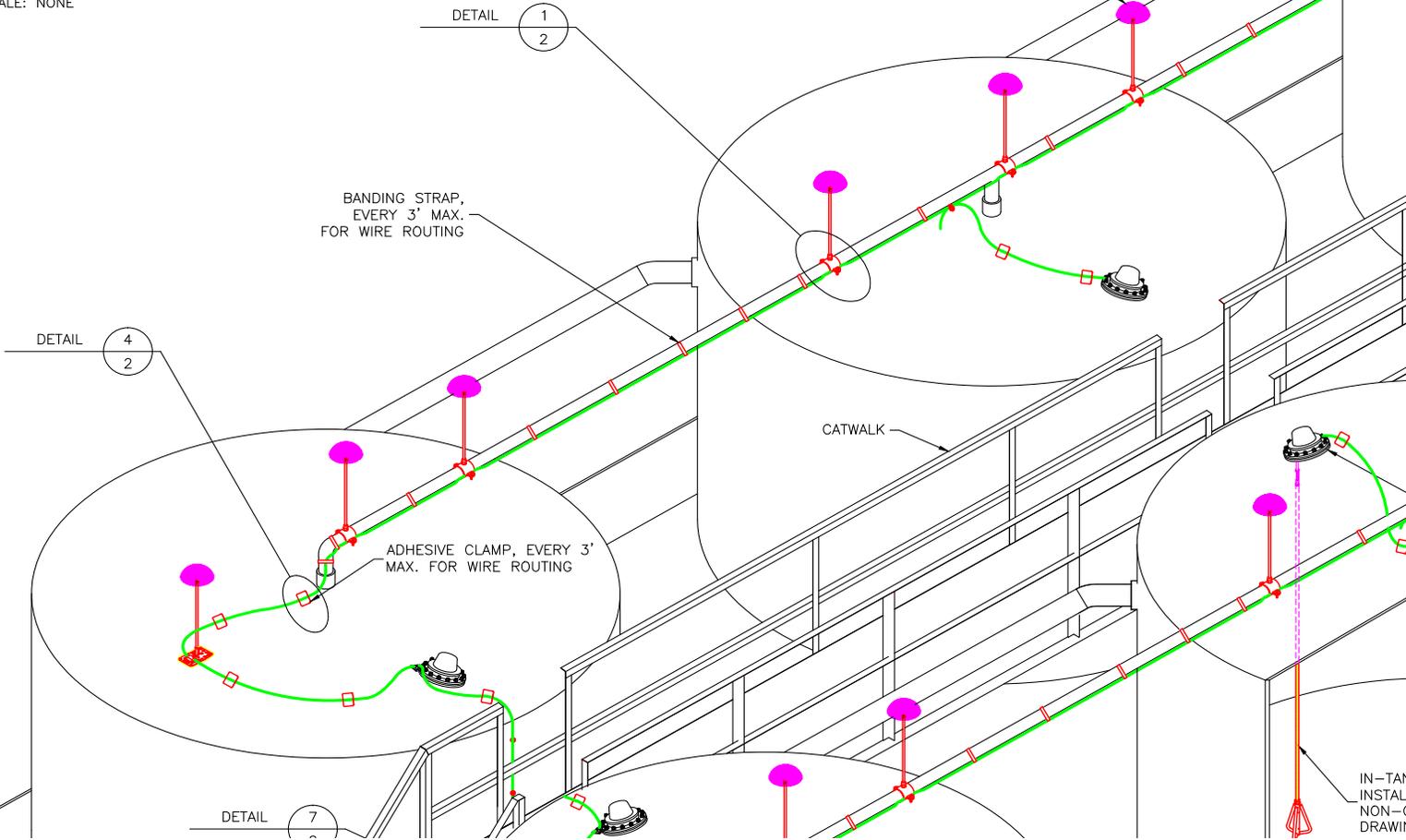
### Surge Products

Lightning and other transients can easily damage or destroy sensitive electronics, causing expensive downtime and repairs. Lightning Eliminators offers a full line of surge protection devices for all of your critical applications, backed with expert consulting and support.



STREAMER DELAYING AIR TERMINAL  
DEPLOYMENT INSTRUCTIONS  
 •SCALE: NONE

STREAMER DELAYING AIR TERMINAL (SDAT), TYP. WHERE SHOWN THUS.



**Disclaimer:**

This catalogue was developed through compiling information based on our experience. We have not independently tested, evaluated or verified the accuracy of any information or the soundness of any judgments contained in this guide other than directly with respect to the products we design and install.

Buyer has been informed that LEC has limited experience, knowledge, and expertise in the requirements for adequately "bonding" the equipment and machinery to which LEC's products, services, systems or solutions will be affixed. Accordingly, Buyer agrees that it shall not be entitled to rely on information, guidelines, or other materials relating to bonding which LEC has provided to Buyer. Further, Buyer agrees that LEC shall not be responsible for, and waives and releases any right it might otherwise have to assert a claim for, any damage, loss or expense resulting, in whole or in part, from any incomplete, or nonexistent, or insufficient bonding on any of Buyer's machinery or equipment. LEC strongly advises Buyer to consult its own expert regarding bonding.

TO GROUND ROD, 2 PLACES  
 SEE DETAIL 8/2 FOR GROUND  
 ROD CONNECTION DETAILS  
 WHERE APPLICABLE.  
 CONNECTION TO EXISTING  
 GROUND GRID BY OTHERS.



3  
2

## IPE™ IN-TANK POTENTIAL EQUALIZER

Storage Tank Arc Discharge Mitigation; the IPE is made specifically for non-metal and lined tanks to discharge any static electricity within the tank's contents keeping the potential of the tank's contents equal to ground potential.

6



## BASES

Various bases in bronze and aluminum for mounting air terminals such as the SDAT.

14



## TANK BATTERY DIAGRAM

Tanks Battery Illustration with all the lightning protection products and components and hardware, including page locators- Downloadable.

8



## BONDING CLAMPS, LUGS & PLATES

For securing, bonding and routing cable to catwalk handrails, I-Beam structures, additional angle iron and other surfaces in addition to piping.

16



## SDAT STREAMER DELAYING AIR TERMINAL

A less expensive alternative to standard air terminals for new or existing lightning protection systems.

10



## GROUNDING CONNECTORS & RODS

A ground rod is designed to stabilize voltages from the power source and to dissipate a static discharge (usually lightning) to earth.

18



## CABLE

Tinned/Bare copper can be used as a down conductor, for common bonding and grounding.

12



## APPENDIX

Additional products, installation drawings and ordering information with form.

### Additional Lightning Protection Solutions:

We have included our Spline Ball Ionizer (SBI®) and Dissipation Array® System (DAS®) in the Appendix to provide more additional and more robust options for lightning protection.

## FLEXIBLE BRAID STRAPS

Equal potential bonding for thief hatches

13



The Streamer Delaying Air Terminal (SDAT), is our most basic type of lightning protection and certainly sufficient for most tank battery installations, however, there are instances that require a higher level of protection and might need a more enhanced product.

Feel free to discuss these options with your sales representative at Lightning Eliminators. We will guide you through the process and determine if your facility falls into this category.

21



TANK POTENTIAL  
ELECTRIFIED ON ALL  
CONDUCTIVE  
SURFACES  
FIG 0010793

CONTAINMENT WALL/BERM

### TANK BATTERY LAYOUT

• SCALE: NONE

This document contains confidential and proprietary information of Lightning Eliminators & Consultants, Inc. and is protected by copyright, trade secret, and other state and federal laws. Its receipt or possession does not convey any rights to reproduce, disclose its contents, or to manufacture, use or sell anything it may describe. Reproduction, disclosure, or use without specific written authorization of LEC, Inc. is strictly forbidden.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. LOCATING DIMS : XX'-XX"±6" XX"±1/16", X X"/X"±1/32, XX"±0.5" NOTES : X"±1/16", X"/X"±1/32"	ENGINEERED MDA DATE 10/18/13
	DRAWN MDA DATE 10/18/13
	CHECKED KSC DATE 6/16/14
	APPROVED DATE



**LIGHTNING ELIMINATORS**

NOTICE  
THIS DRAWING DENOTES THE FINISHED DESIGN OF THE LEC INC.'S LIGHTNING PROTECTION SYSTEM. ACCEPTANCE OF THIS DRAWING SIGNIFIES FINAL APPROVAL HEREON. ANY CHANGE TO THIS DESIGN MAY IMPACT THE AGREED UPON PURCHASE PRICE. THEREFORE, ANY CHANGE MUST BE AGREED TO BY ALL CONCERNED PARTIES PRIOR TO CHANGE.  
7:37 NOV 17, 2014



Lightning Eliminators & Consultants, Inc.

6687 Boulder, CO PH: 303 447-2828 FX:

## STREAMER DELAYING AIR TERMINAL (SDAT) LAYOUT

D	DRAWING NO. 0010838-5	SCALE 1/2"=1'-0"	FILENAME 0010838.D24	SHEET 1
---	-----------------------	------------------	----------------------	---------

DELAYING AIR TERMINAL (SDAT)

K, EVERY 3 WIRE ROUT

OUND ROU 9/2 FOR CONNECTION APPLICABLE TO E D GRID BY

TANKS, FLANGES, ID SYSTEM,

2. AN IN-TANK POTENTIAL EQUALIZER (IPE) BONDED TO THE GROUND SYSTEM SHOULD BE INSTALLED ON ALL TANKS WHICH ARE NOT INTERNALLY CONDUCTIVE.
3. COAT ALL MECHANICAL GROUNDING CONNECTIONS WITH LECTRA SHIELD.
4. LEC IS NOT RESPONSIBLE FOR THE EFFECT OF UNIDENTIFIED CORROSIVES.
5. WHERE ONLY (2) TWO SDAT'S ARE REQUIRED, UTILIZE HIGHEST POINT METHODOLOGY OF PLACE SDAT'S AROUND PERIMETER.

# IPE™ In-Tank Potential Equalizer

## Storage Tank Arc Discharge Mitigation

### Charge Mitigation for Non-Metal & Lined Tanks Containing Flammable or Combustible Liquids

The problem of internal electrical discharges and the subsequent ignition of the vapors inside tanks containing flammable or combustible liquids is becoming more widespread as the use of non-metal and lined tanks proliferates.

The IPE is made specifically for non-metal and lined tanks to discharge any static electricity within the tank's contents keeping the potential of the tank's contents equal to ground potential.

- **Anchored design:** Maximizes surface exposure and minimizes movement.
- **Corrosion Resistant:** All 316 stainless steel construction.
- **Cost Efficient:** Costs a fraction of competitive products.
- **API 2003:** In addition the IPE will allow you to meet API-2003 for non-metal and lined tanks.
- **Quick & Easy Install:** Only common hand tools needed for rapid installation in existing thief hatch flange.
- **No Points:** Smooth surface minimizes risk of corona and arc discharge from points.

**Note:** While multiple points for charge transfer are recommended in open air, points within an enclosed chamber containing explosive gasses are not recommended and could be an explosive hazard per NASA Technical Note D-440.



# IPE™ Ordering Information

Part Number	Description	*Length	** Tank Height
0010890	IPE-18, Cable, Anchor, 316	18 ft.	15 ft.
0010892	IPE-23, Cable, Anchor, 316	23 ft.	20 ft.
0010894	IPE-28, Cable, Anchor, 316	28 ft.	25 ft.
0010933	IPE-33, Cable, Anchor, 316	33 ft.	30 ft.
0010935	IPE-38, Cable, Anchor, 316	38 ft.	35 ft.

**\*Custom sizes available upon request      \*\* For use on tanks of nominal height**

**IPE meets API-2003 for non-metal and lined tanks**

## IPE™ Installation

(you may click the diagram to download it)

**TYPICAL ROOF MOUNT**  
#SCALE: 3"=1'-0"

**TYPICAL THIEF HATCH MOUNT**  
#SCALE: 3"=1'-0"

**NOTES**

- ASSEMBLE ALL THREADED CONNECTIONS BY APPLYING FULL EFFORT WITH PIPE WRENCH.
- SECURE IN-TANK POTENTIAL EQUALIZER WITH TIE-OFF ROPE PRIOR TO PLACING IN TANK TO PREVENT LOSS.
- GUARD ALL MECHANICAL SPINDLING CONNECTIONS WITH LECTRA SHIELD OR OTHER ELECTRICALLY CONDUCTIVE CORROSION INHIBITOR.
- INSTALL IN-TANK POTENTIAL EQUALIZER AS CLOSE TO CENTER OF TANK AS POSSIBLE.
- SEE DRAWING 0010793 FOR BONDING DETAILS.

**REVISION HISTORY**

BY	REV	DESCRIPTION	DATE	APPROVAL
NRH	A	ADDED DISC.	2/17/15	

**NOTICE**

LECTRA OFFERS THESE GENERIC DRAWINGS FOR INFORMATIONAL PURPOSES ONLY AND NOT FOR RELIANCE FOR A SPECIFIC PROJECT. LECTRA DISCLAIMS WARRANTY AND LIABILITY REGARDING THE ADEQUACY OF THESE DRAWINGS, PLANS, AND SPECIFICATIONS FOR ANY PARTICULAR PROJECT. USER MUST SEEK INDEPENDENT ADVICE (INCLUDING, BUT NOT LIMITED TO, CONSULTATION REGARDING BONDING, LIGHTNING PROTECTION, AND ENGINEERING) TO DETERMINE THE ADEQUACY OF ANY DRAWINGS, PLANS AND SPECIFICATIONS FOR ANY PARTICULAR PROJECT.

**IN-TANK POTENTIAL EQUALIZER (IPE) - CABLE WITH ANCHOR INSTALLATION DETAILS**

0010891

15:42 FEB 17, 2015



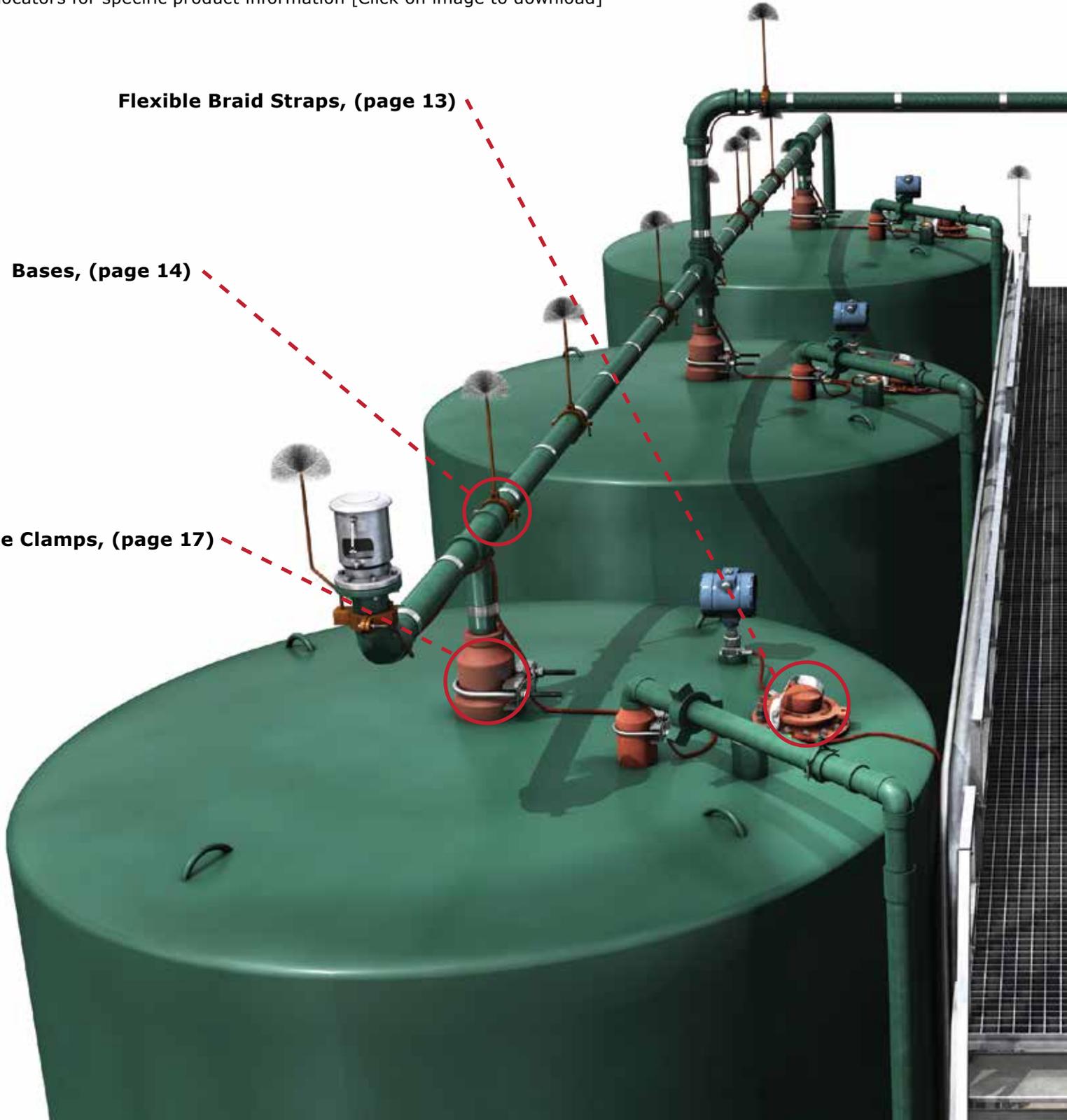
# TANK BATTERY DIAGRAM

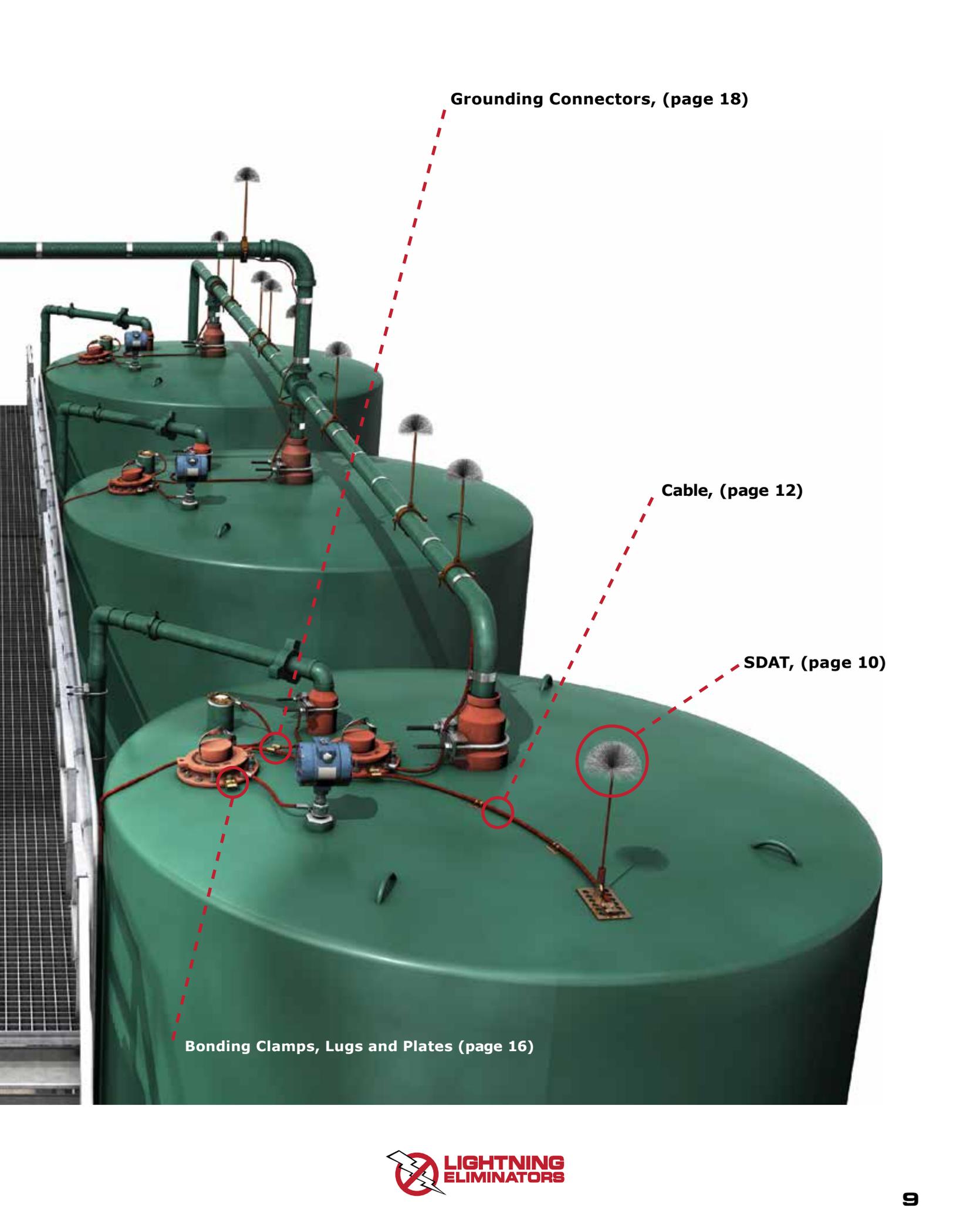
**Note:** This diagram includes multiple configurations as an example of all the potential products which can be used in a lightning protection system and is not meant as a single solution or instructions. Please view appropriate page locators for specific product information [Click on image to download]

**Flexible Braid Straps, (page 13)**

**Bases, (page 14)**

**Pipe Clamps, (page 17)**





**Grounding Connectors, (page 18)**

**Cable, (page 12)**

**SDAT, (page 10)**

**Bonding Clamps, Lugs and Plates (page 16)**

# SDAT Streamer Delaying Air Terminal

The SDAT from Lightning Eliminators offers a less expensive alternative to standard air terminals for new or existing lightning protection systems. Unlike traditional lightning rods which are designed only to collect strikes, the LEC SDAT is designed to delay upward streamer generation, reduce the risk of direct strikes, and function as a highly efficient air terminal.

## The LEC SDAT Advantage

- Hybrid protection
- Easy installation
- Stainless steel points
- Aluminum & copper shaft options
- Multiple length options
- Lightweight, low wind profile
- Minimizes risk to property and personnel



The LEC SDAT is an off-the-shelf product that mounts easily in existing hardware, offering a simple and inexpensive way to improve the performance of standards-based systems and is compliant for use in any NFPA 780 installation.

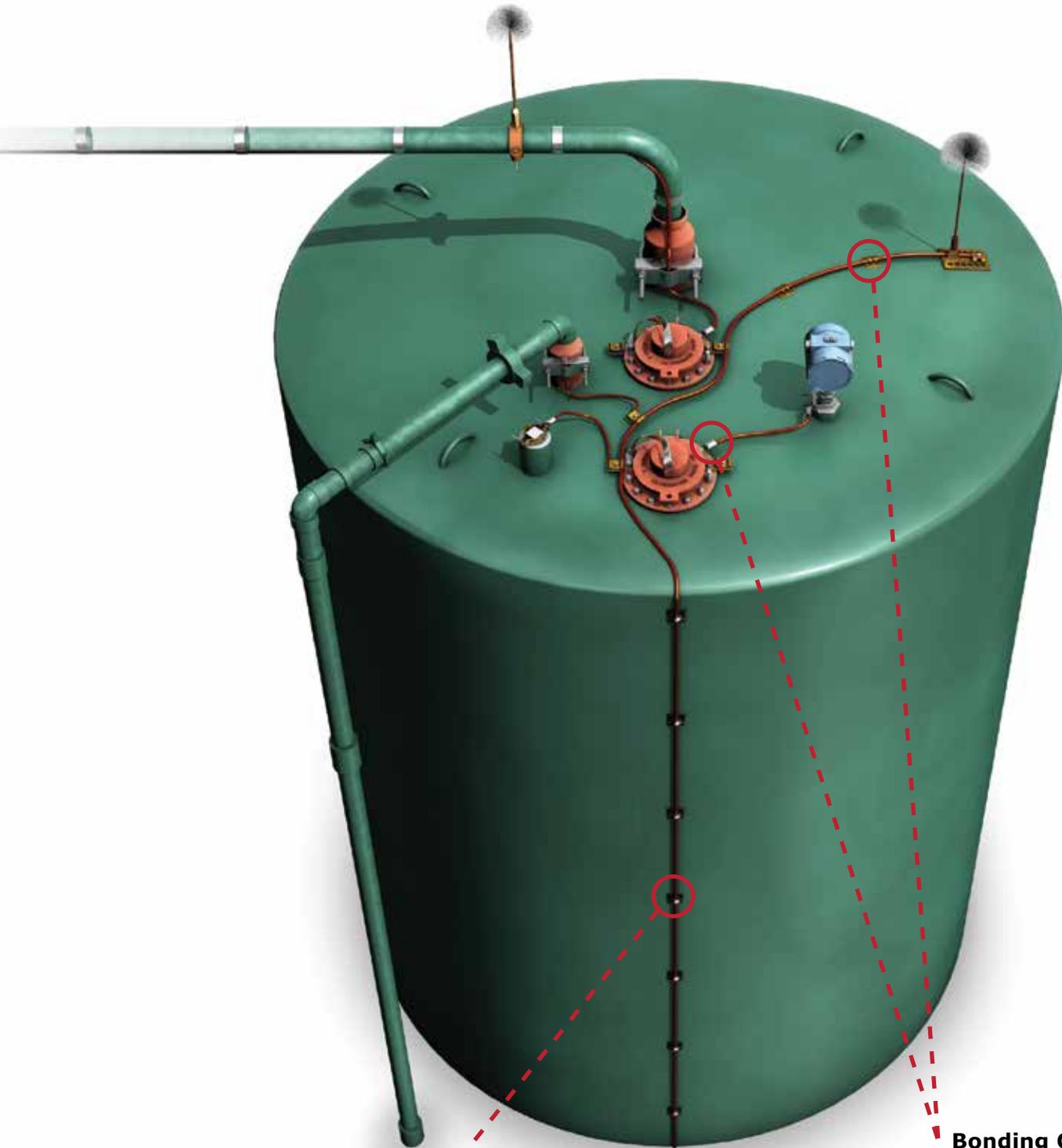
Part Number	*Size	Material	Description
0010596	1/2" ø X 18"	Copper	Straight
0010613	1/2" ø X 24"	Copper	Straight
0010553	1/2" ø X 18"	Aluminum	Straight
0010612	1/2" ø X 24"	Aluminum	Straight
0011025	1/2" ø x 24"	Copper	30° Double bend
0011026	1/2" ø x 24"	Aluminum	30° Double bend

***\*Additional sizes available upon request***



# SINGLE TANK DIAGRAM

**Note:** This diagram includes multiple configurations as an example of all the potential products which can be used in a lightning protection system and is not meant as a single solution or instructions. Please view appropriate page locators for specific product information [\[Click on image to download\]](#)



Wire Routing (page 16)

Bonding Clamps, Lugs and Plates (page 16)



# CABLE

Tinned/Bare copper can be used as a down conductor, for common bonding and grounding.



**Part # 0009752**

Part Number	Description	Nominal Diameter	Circular mils
0009751	32/17 Stranded copper wire	0.4"	65,600
0009752	32/17 Stranded Tinned copper wire	0.4"	65,600
0003663	24/14 Stranded aluminum wire	0.5"	98,600



**Part # 0009751**



**Part # 0009752**



**Part # 0003663**

# FLEXIBLE BRAID STRAPS

Part # 0010959



Flexible braid straps provide equal potential bonding for thief hatches.



## Tinned Copper Flexible Braid Conductors

Part Number	Size	Hole Size	Hardware Kit Part No.
0010957	15/16" X 10"	9/16" Ø	0010979 or 0010980
0010958	15/16" X 12"	9/16" Ø	0010979 or 0010980
0010959	15/16" X 16"	9/16" Ø	0010979 or 0010980
0010960	15/16" X 24"	9/16" Ø	0010979 or 0010980



Part # 0010979



Tinned Copper Flexible Braid Conductors



Part # 0010980

## Hardware Kits for Flexible Braid Conductors

Part Number	Includes
0010979	(1) 1/4"-20 x 1 1/4" Bronze Hex Tap Bolt; (2) 1/4" Bronze Flat Washers; (1) 1/4" Bronze Lock Washer; (1) 1/4"-20 Bronze Hex Nut
0010980	(1) 1/4"-20 x 1 1/4" Bronze Hex Tap Bolt; (1) 1/4"-20 x 1 1/2" Bronze Hex Tap Bolt; (4) 1/4" Bronze Flat Washers; (2) 1/4" Bronze Lock Washer, (2) 1/4"-20 Bronze Hex Nut

### Notes:

Use hardware kit #0010979 for installing a single flexible braided conductor where one (1) existing mechanical fastener can be utilized and therefore only one (1) new mechanical fastener is needed.

Use hardware kit #0010980 for installing a single flexible braided conductor where no existing mechanical fasteners can be utilized and therefore two (2) new mechanical fasteners are needed.



# BASES

Various bases in bronze and aluminum for mounting air terminals such as the SDAT.

**Swivel Base**—an adhesive mounting air terminal base which can be used horizontally on flat or gently sloping surfaces.

Part Number	Description
0010948	Heavy cast bronze
0010881	Heavy cast aluminum
<b>Note:</b> See M1 Adhesive on page 15	

**Pipe & Handrail Base** – Pipe clamp mounting air terminal base which can be used horizontally and vertically for 1/2" SDAT.

Part Number	Description
0010777	Fits 1 3/4" to 2 1/2" O.D., Heavy cast bronze
0010768	Fits 2 1/2" to 4 1/2" O.D., Heavy cast bronze
0005754	Fits 3/4" to 1 1/2" O.D., Aluminum
0005755	Fits 1 3/4" to 2 1/2" O.D., Aluminum

Part # 0010777



Part # 0010948



## Swivel Adapters

**Swivel F- M** – Double Swivel Adapter for use in mounting air terminals with standard points and bases to alter direction of point.

Part Number	Description
0005944	1/2" Female to 1/2" Male, Heavy cast bronze

Part # 0005944



**Swivel F-F** – Swivel adapter for use in mounting air terminals when base is mounted on an angled surface.

Part Number	Description
0005299	1/2" Female to 1/2" Female, Heavy cast bronze

Part # 0005299





**Saddle Pipe Base** - Stainless steel base for mounting air terminal to large diameter horizontal or vertical piping or poles.

Part Number	Description
0010953	Fits 3" O.D. or greater



**Beam Clamp Base** - Stainless steel base for mounting air terminals to angle iron handrails.

Part Number	Description
0011027	Stainless steel air terminal base for mounting to horizontal portion of angle handrail

**Hose Clamps** - for use with 0010953 saddle base or securing conductors or base to piping

Part Number	Description
0003150	2" to 10" O.D.

**M1 Adhesive**

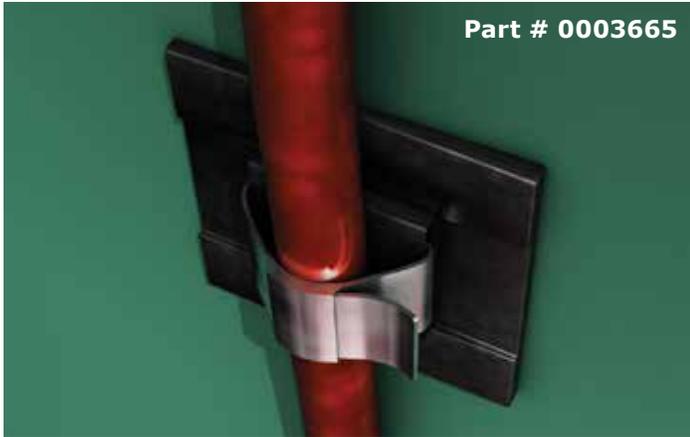
Part Number	Description
0009796	10.1 oz. tube

**Note:** One tube is required for approximately every 9 cable clamps (Part # 0001903) or 9 swivel bases (Part # 0010948 or 0010881).

Part # 0011027



# Bonding Clamps, Lugs & Plates



## Wire Routing

Clamps and fasteners for securing cable to surfaces.

**Note:** Lightning Eliminators recommends fastening every 3' or less.

### Epoxy Clamp

Part Number	Description
0003665	1" x 1" Nylon epoxy cable tie clamp
0001871	$\frac{3}{16}$ " x 5" Stainless steel cable tie



### Wraplock

Part Number	Description
0000533	$\frac{1}{2}$ " wide stainless steel banding 100' roll

### Cable Fastener

Part Number	Description
0001903	32/17 Wire Cable Fastener

### Epoxy

Part Number	Description
0006759	2-part Epoxy Cup and Mixer Sticks

**Note:** One cup is required for approximately every 3 nylon clamps (Part # 0003665).



**Part # 0010966**

**Bonding Lug** – Heavy cast bronze bonding lug:  $\frac{9}{16}$ " mounting hole for thief hatch bonding.

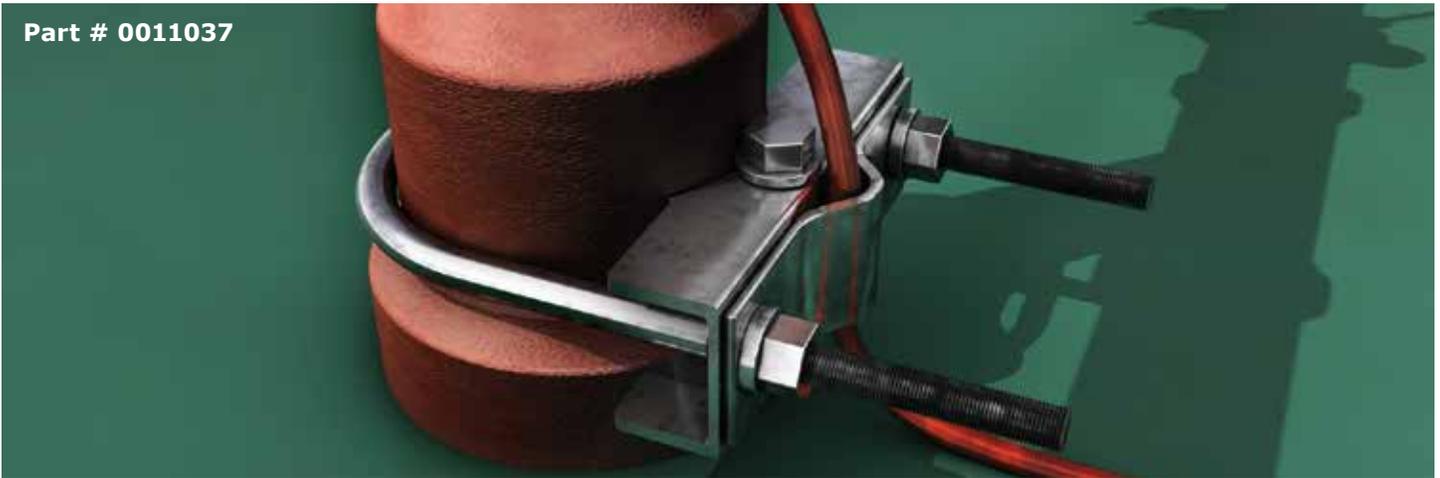
Part Number	Description
0010966	with 3" Square of Contact surface; Heavy cast bronze

**Hand Rail Clamp** – Fits  $\frac{5}{8}$ " beam thickness – Heavy cast bronze

Part Number	Description
0010965	Fits $\frac{5}{8}$ " Beam thickness – Heavy cast bronze

**Note:** See M1 adhesive on page 15.

Part # 0011037



**Bonding C-Clamp** – Cast bronze bonding plate & clamp used to secure cable to metal beams and handrails up to 1 ½” thick

Part Number	Description
0007514	10 square inches of contact surface, cast bronze

**Pipe Clamps & Straps** – Bronze Clamps and Tinned Copper Straps for securing cable to piping.

Part Number	Fits O.D. Pipe	Description
0009715	¾” – 1 ½”	Heavy cast bronze
0009716	1 ¾” – 2 ½”	Heavy cast bronze
0010820	2 ½” – 4 ½”	Heavy cast bronze
0010964	4 ½” – 6”	Tinned copper strap
0009918	6 ½” – 8”	Tinned copper strap
Custom clamps available upon request for sizes > 4 ½” Ø		

**U-Bolt Bonding Clamps**-for securing either copper or aluminum cable to piping

Part Number	Fits O.D. Pipe	Description
0011036	1 7/8”-3”	Lead coated bronze
0011037	2 ¾”-4 ½”	Lead coated bronze

Part # 0010965



Part # 0009715



Part # 0009716



# GROUNDING Connectors & Ground Rods



Part # 0001899

Used for connecting cable to a thief hatch or for cable-to-cable connections.

## Connectors

**Parallel Clamp** – used for parallel conductor connections.

Part Number	Description
0001899	Bronze parallel splice clamp 1 1/2" contact
0010882	Aluminum parallel splice clamp 1 1/2" contact

Part # 0001899



**Split Bolt** – cable-to-cable connector used to connect copper cables, aluminum cables, or a combination of the two.

Part Number	Description
0009564	#6 str. – 32/17 Split bolt connector
0009565	32/17 - 32/17 Split bolt connector
0009567	4/0 – 4/0 Split bolt connector

**Bimetallic Connector & Lugs** – required when connecting copper and aluminum.

Part Number	Description
0006668	Cast combination bronze & aluminum used for transitioning between copper & aluminum cables. For use with 32/17 - 4/0 cable.
0009083	Tin-plated copper barrel lug with 1/2" bolt hole. Suitable for 32/17 or 2/0 cable.

Part # 0006668



**Copper Bolt Hole Bonding Plate** – used for connecting copper cable to a thief hatch.

Part Number	Description
0010993	8 sq. in. cast bronze bonding plate or bus terminal with a 1/2" hole. Has bolt pressure-type cable connector with 2" of contact. Size: 2 1/2" x 3 1/2"

## Chem-Rod & Ground Rods

A ground rod is designed to stabilize voltages from the power source and to dissipate a static discharge (usually lightning) to earth. The earth ground conductor should never carry current under normal use, unless a ground fault or lost neutral connection occurs.

**Chem-Rod® Low-Impedance Chemical Grounding Electrode**-The Chem-Rod uses advanced engineering to achieve a consistent, low-impedance electrical connection with the earth, even in unfavorable and varying ground conditions (like permafrost).

The Chem-Rod solves problems found with conventional ground rods by requiring less real estate and fewer electrodes to meet specified resistance.



### Chem-Rod Ordering Information

Part Number	Description
0001402	Vertical Chem-Rod, Copper, 8' long, w/ 2 bags of Ground Augmentation Fill (GAF).
0001405	Vertical Chem-Rod, Copper, 10' long, w/ 3 bags of Ground Augmentation Fill (GAF).

**Note:** Each Chem-Rod comes with a 2' pigtail of 4/0 stranded copper wire and a High Density Polyethylene (HDPE) well cover | Tinned Copper Chem-Rod, H-20 traffic rated well cover and Horizontal type Chem-Rod are **available upon request**.

NFPA Study Results		Electrode Resistance in Ohms		
Site Location USA	Soil Resistivity (ohm*cm)	Standard ground rod 5/8" x 8'	CR-10 in 10' hole with GAF	CR-10H in 9' trench with GAF
Las Vegas, NV	8,579	85.0	<b>19.0</b>	N/A
Northbrook, IL	2,647	7.3	<b>2.9</b>	4.3
Dallas, TX	2,739	4.7	2.3	<b>2.0</b>
Poughkeepsie, NY	22,407	137.3	<b>24.8</b>	33.8
Staunton, VA	11,701	33.9	<b>15.4</b>	18.6

**BOLD** numbers indicate lowest reading of all electrodes. CR-10 = 10' vertical Chem-Rod; CR-10H=10' horizontal Chem-Rod. National Electrical Grounding Research Project (NEGRP) was managed and sponsored by the National Fire Protection Association (NFPA) Research Foundation.

**Efficient grounding systems reduce the risk of electrical arcing and fires. The Chem-Rod improves reliability for many applications, including:**

Lightning protection systems | Prevention of accidents caused by static charge and stray currents | Protection of central communications, electronics, and AC power systems| Meeting grounding safety requirements for electrical substations | Ground fault neutralization | Safeguarding critical instrumentation and process-control equipment.



## Ground Rods

Part Number	Description
0003207	Copper Rod, 5/8" Ø X 8'
0004289	Copper Rod, 3/4" Ø X 10'

Part # 0003207



## Ground Rod Connectors

Heavy cast bronze ground rod clamp with 3" contact area and two 5/16" stainless steel bolts for tension on rod. Suggested torque – 150 in-lbs. UL listed for lightning protection.

Part Number	Cable Size	Ground Rod Size
0009941	Up to 3/4" Ø	1/2" Ø
0004318	Up to 7/8" Ø	3/4" Ø

Part # 0004318



## Additional Ground Rod Connecting Options for Bonding

Cast bronze tap type ground rod clamp with single 3/8" bronze bolt for tension on rod.

Part Number	Cable Size	Rod Size
0001538	Between #10 solid-#2 stranded.	1/2" Ø
0000899	Between #8 solid and 1/0 stranded.	3/4" Ø

Part # 000899



# APPENDIX

Additional [lightning protection](#) products, installation drawings, [Terms & Conditions](#) and ordering information with form.



# SBI Spline Ball Ionizer | A Higher Level of Lightning Protection



The SBI is a modular lightning prevention component used to supplement Dissipation Array installations, and as the first line of defense for structures that require lightweight protection with a low wind profile.

The SBI is a hybrid lightning protection concept engineered to provide multiple layers of protection for critical applications. In its primary mode, the SBI lowers the risk of direct strikes by utilizing a phenomenon known as charge transfer, where a well-grounded point exchanges ions between the air and earth. This ionizing capability helps keep the local electric field below lightning potential, making the protected site less likely to experience direct strikes.

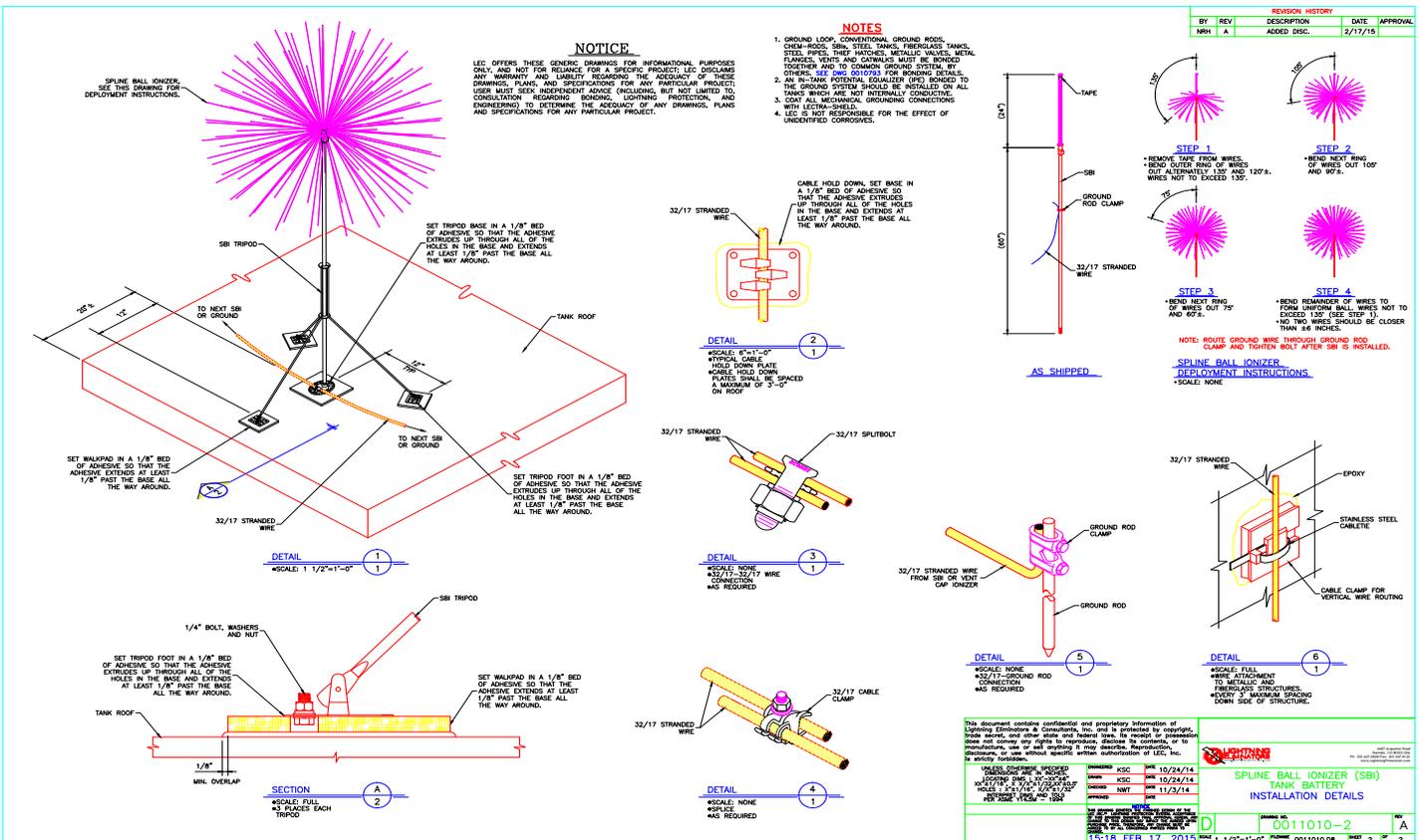
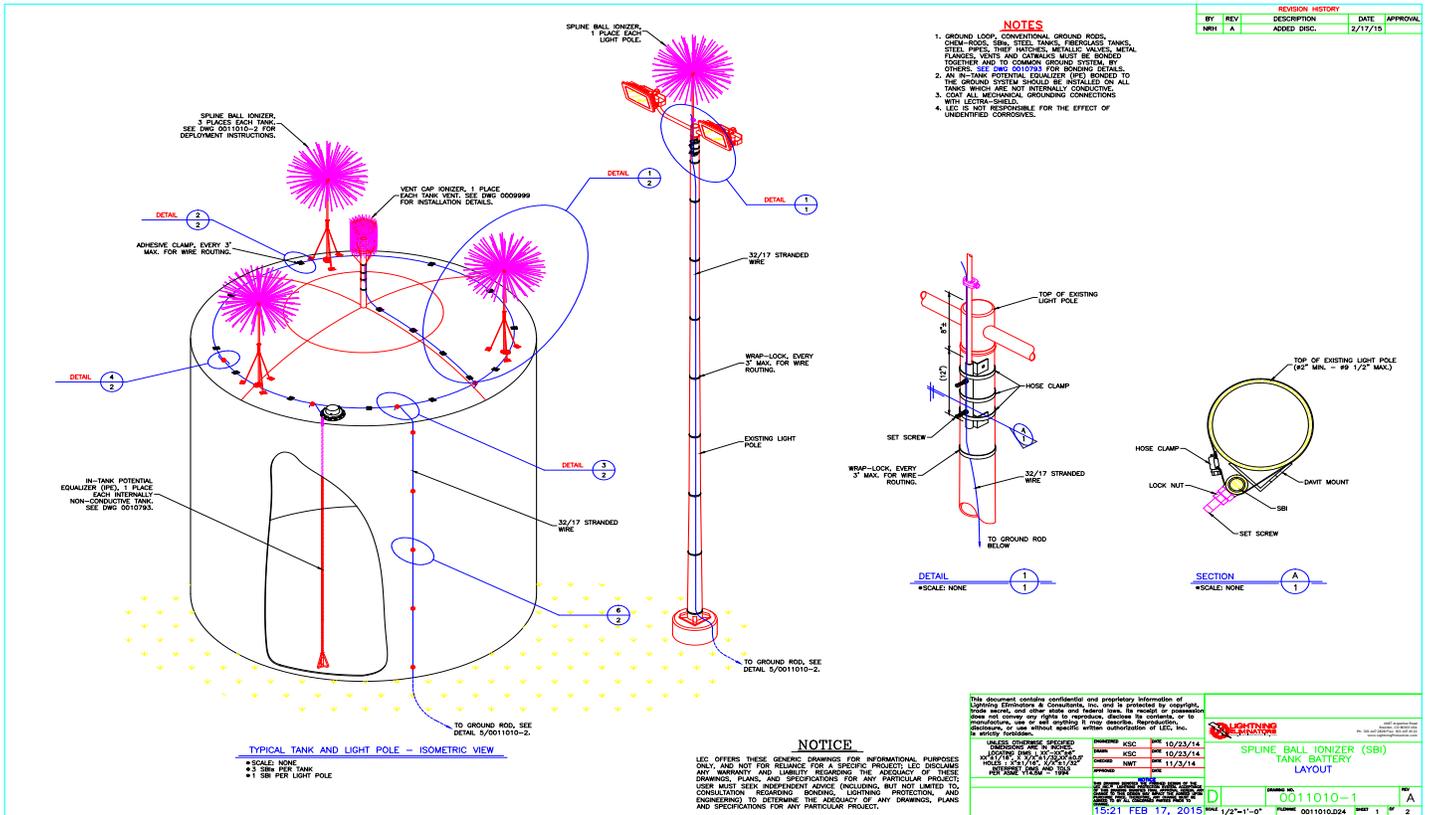
Part Number	Product Description	Description
0003810	ASSY,SBI,48-120,36 TRPD,FLAT,GLV	Assembly that includes 1 SBI, 1 tripod base, and all components necessary for installation on top of a tank.
0007088	ASSY,SBI,48-120,60 GLV, <10,STRGHT	Assembly that includes 1 SBI & all components necessary for attachment to the top of a light pole less than 10" in diameter.

## Vent Cap Ionizer

Removes charge from gases passing through an Enardo Valve.

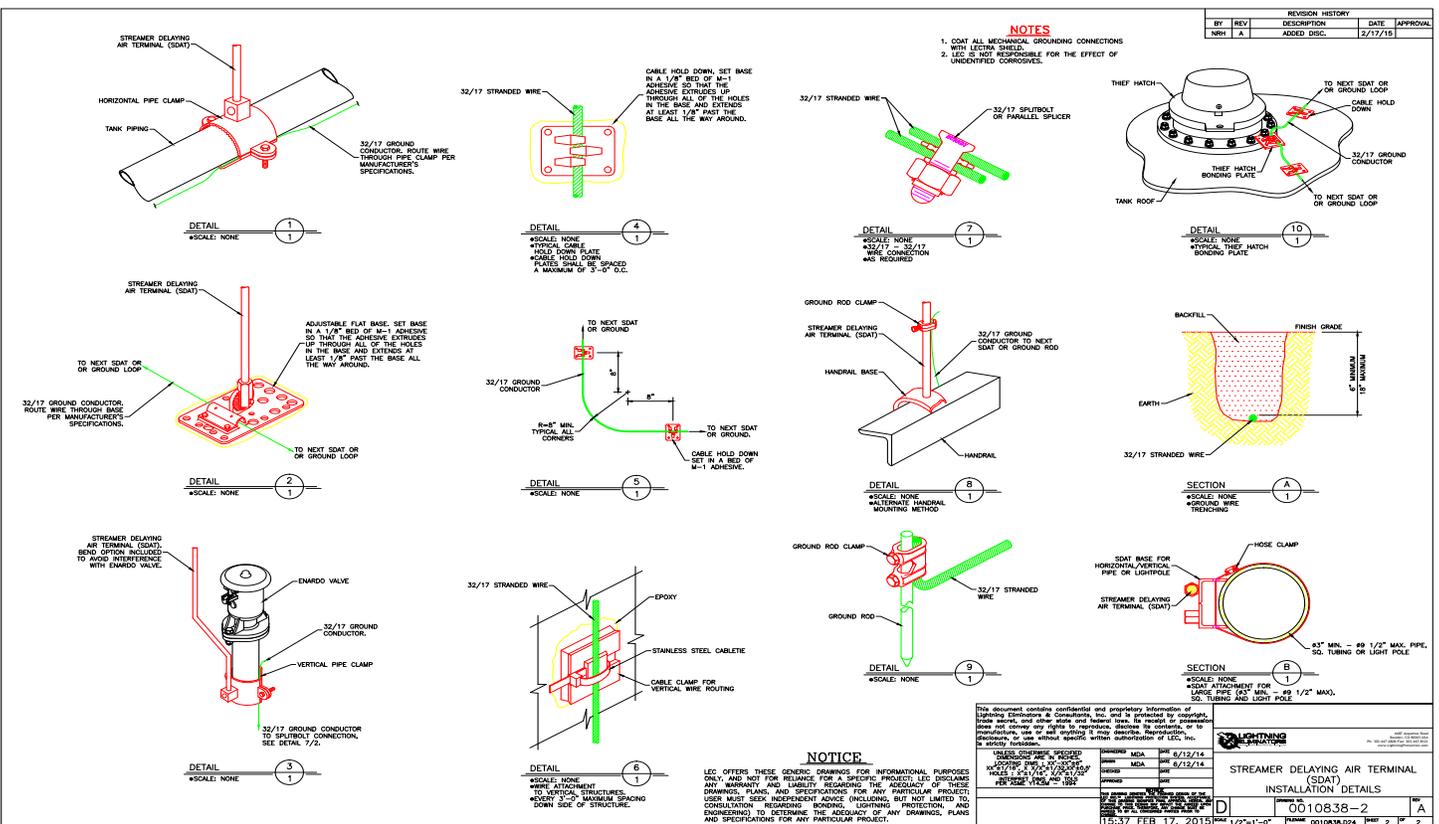
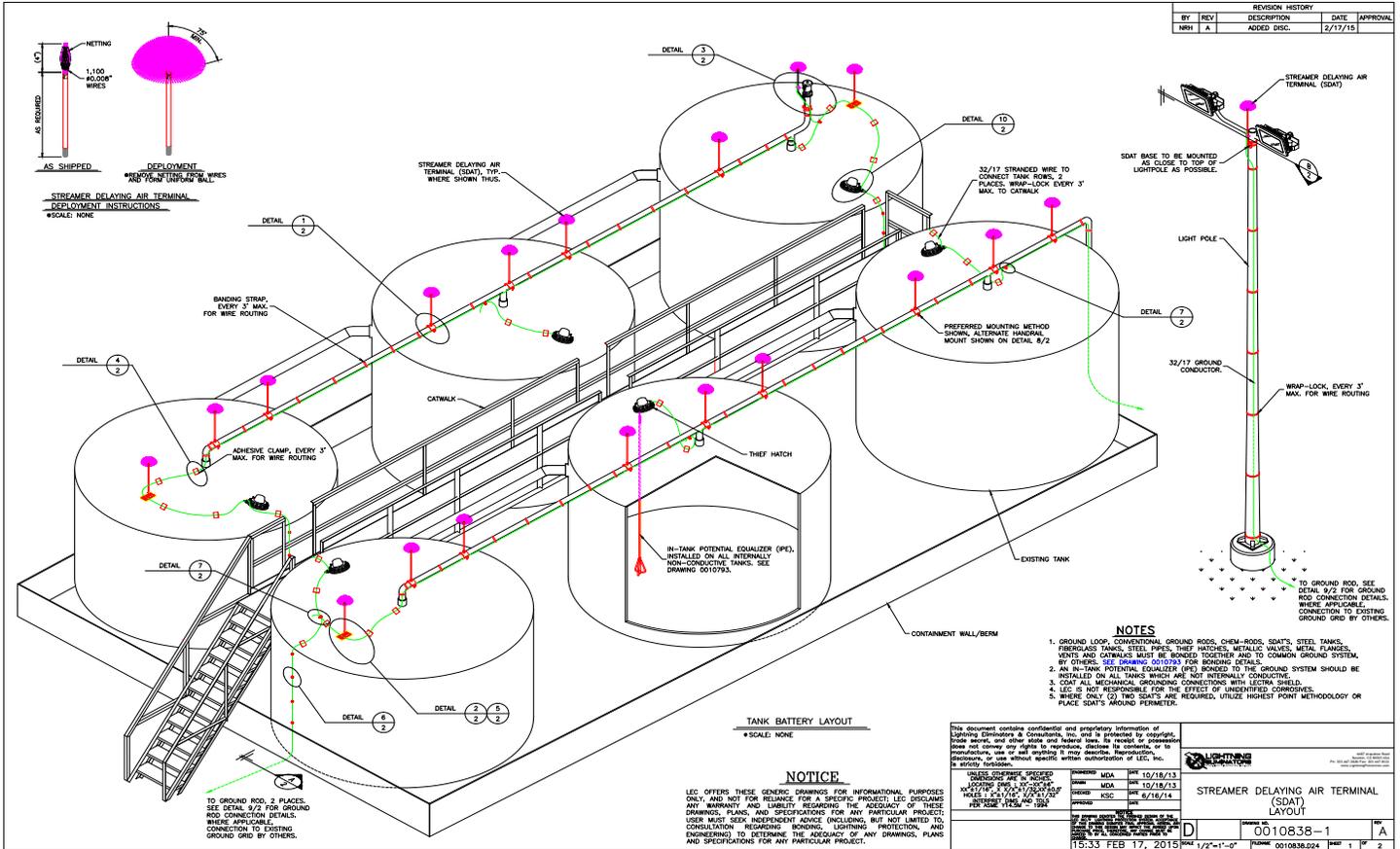
Part Number	Description
0009999	ASSY, CAP, IONIZER, 14DIA, 316L





# SDAT installation

(you may click the diagrams to download them)





*"Engineering Lightning Prevention, Grounding & Surge Solutions World Wide Since 1971"*

Name: \_\_\_\_\_  
 Company: \_\_\_\_\_  
 Address: \_\_\_\_\_  
 E-Mail: \_\_\_\_\_  
 Phone: \_\_\_\_\_

Line	Part #	Item	QTY	List Price	Unit Price	Ext
1		.		\$-	\$-	\$-
2		.		\$-	\$-	\$-
3		.		\$-	\$-	\$-
4		.		\$-	\$-	\$-
5		.		\$-	\$-	\$-
6		.		\$-	\$-	\$-
7		.		\$-	\$-	\$-
8		.		\$-	\$-	\$-
9		.		\$-	\$-	\$-
10		.		\$-	\$-	\$-
11		.		\$-	\$-	\$-
12		.		\$-	\$-	\$-
13		.		\$-	\$-	\$-
14		.		\$-	\$-	\$-
15		.		\$-	\$-	\$-
16		.		\$-	\$-	\$-
				Sub Total		\$-
				Taxes		N/A
				Freight		TBD
				Quote Total		\$-
Terms: Net 30 FOB: Boulder <a href="#">Click Here for Terms and Conditions of Sale</a>						

Click here to access our downloadable version of the form. Once downloaded, you can complete your order and email to: [info@lecglob.com](mailto:info@lecglob.com)



## LIGHTNING ELIMINATORS TERMS AND CONDITIONS OF SALE

Lightning Eliminators and Consultants, Inc. ("LEC") offers to sell only on the condition that Buyer's acceptance is expressly limited to LEC's Terms and Conditions of Sale. LEC's acceptance of any order from Buyer is expressly made conditional on agreement to these Terms and Conditions of Sale unless otherwise specifically agreed to in writing by LEC. In the absence of such written agreement, commencement of performance or delivery shall be for Buyer's convenience only and shall not be construed as an acceptance by LEC of Buyer's Terms and Conditions of Purchase. If a contract is not earlier formed by mutual agreement in writing, Buyer's acceptance of any goods or services shall be deemed acceptance of the LEC Terms and Conditions of Sale as stated herein.

### 1. PRICES

All prices for sales are F.C.A. LEC Dock, Boulder, Colorado, USA. Prices are always stated in U.S.A. dollars (\$). Except for services and customized products, prices are obtained from LEC's most recent published price list. LEC reserves the right to change prices without notice, and those prices on the most recent published price list at the time an order is accepted will apply unless otherwise provided in a written quotation from LEC.

Unless otherwise agreed to in writing by LEC, all price quotations expire ninety (90) days after the date of the written quotation. All prices quoted are valid only if Buyer's requested delivery date, including any change orders, is within six (6) months of the date on which the original order is accepted.

Unless otherwise agreed to in writing by LEC, all prices quoted are exclusive of all taxes (except taxes levied against LEC's income), including state and local use, sales, property (ad valorem), and similar taxes. Buyer agrees to pay such taxes unless Buyer has provided LEC with a valid exemption resale certificate in the appropriate form for the jurisdiction of Buyer's place of business and any jurisdiction to which equipment is to be directly shipped hereunder or unless such sale is otherwise exempt from such taxes. When applicable, such taxes shall appear as a separate item on LEC's invoice.

All freight and packing charges are the responsibility of the Buyer, including, but not limited to shipping, insurance, customs, duties, taxes, and broker fees.

All tooling or engineering charges included in an invoice shall not imply ownership of the tools or designs by the Buyer. Proprietary materials are covered in Section 10 of these Terms and Conditions of Sale.

### 2. PAYMENT AND SECURITY TERMS

Payment is to be in U.S.A. dollars (USD\$). LEC's normal terms of payment shall be NET 30 DAYS (on approved credit) from date of invoice. In the event payment is not received at the

[Please click here for complete terms and conditions](#)

# DAS<sup>®</sup> | The Highest Level of Lightning Protection

## Dissipation Array<sup>®</sup> System

### A Total Lightning Prevention Solution

DAS prevents direct lightning strikes within a designated area of protection and LEC's "No-Strike" warranty ensures complete protection on all LEC supervised installations.

Engineered to integrate with any building, rig, tower, tank, stack or other structure, DAS technology has been in use since 1971. With over 3,000 systems installed worldwide, accruing over 50,000 system-years, DAS maintains a success rate over 99% and continues to protect thousands of sites without incident.

## How does it work?

DAS prevents direct lightning strikes by reducing the electric field to below lightning-collection levels, within the protected area. As a result, DAS helps to prevent downtime and loss of assets, while increasing personnel safety.

DAS interrupts the formation of these upward streamers through point discharge, a phenomenon where a well-grounded point exchanges ions between the air and the ground.

Point discharge becomes more efficient when the points are connected to a low-impedance grounding system and more ions can be transferred with a greater number of points. DAS technology takes advantage of these principles with an optimal point configuration able to interrupt the formation of upward streamers, thereby preventing direct strikes. To learn more about direct strike prevention visit [www.lightningprotection.com/das](http://www.lightningprotection.com/das)

## DAS System Components

DAS is a key component of your lightning protection system, working with grounding and surge suppression to achieve complete protection. A typical system includes:

**1. The Dissipation Array<sup>®</sup> System (DAS<sup>®</sup>):** available in a range of configurations for almost any structure.



**2. Chem-Rod<sup>®</sup>:** a low-impedance grounding system using chemically-charged electrodes

**3. Surge Protection Devices (SPD):** to protect against transients traveling through data lines and other conductive paths.

**4. Spline Ball Ionizer<sup>®</sup> (SBI<sup>®</sup>):** a modular strike prevention device, as needed to supplement the DAS area of protection.

As a facility grows and expands, LEC works with you to evaluate how your system is affected, recommends necessary changes and works with you to ensure uninterrupted state-of-the-art protection.

For additional information or guidance on the best lightning protection solution for your tank battery please contact Lightning Eliminators at [info@LECGlobal.com](mailto:info@LECGlobal.com) or **1 (800) 521-6101**. We will assist you on determining what best suits your needs. International callers dial **00 +1 + 303-447-2828**.



**LIGHTNING  
ELIMINATORS**  
WWW.LIGHTNINGPROTECTION.COM

**LIGHTNING ELIMINATORS & CONSULTANTS, INC.**

6687 Arapahoe Road, Boulder, CO 80303

**303-447-2828**, [Info@lecglobal.com](mailto:Info@lecglobal.com)

or **1 (800) 521-6101**

[www.LightningProtection.com](http://www.LightningProtection.com)

**Made in the U.S.A.**