LIBERTY ELECTRIC PRODUCTS

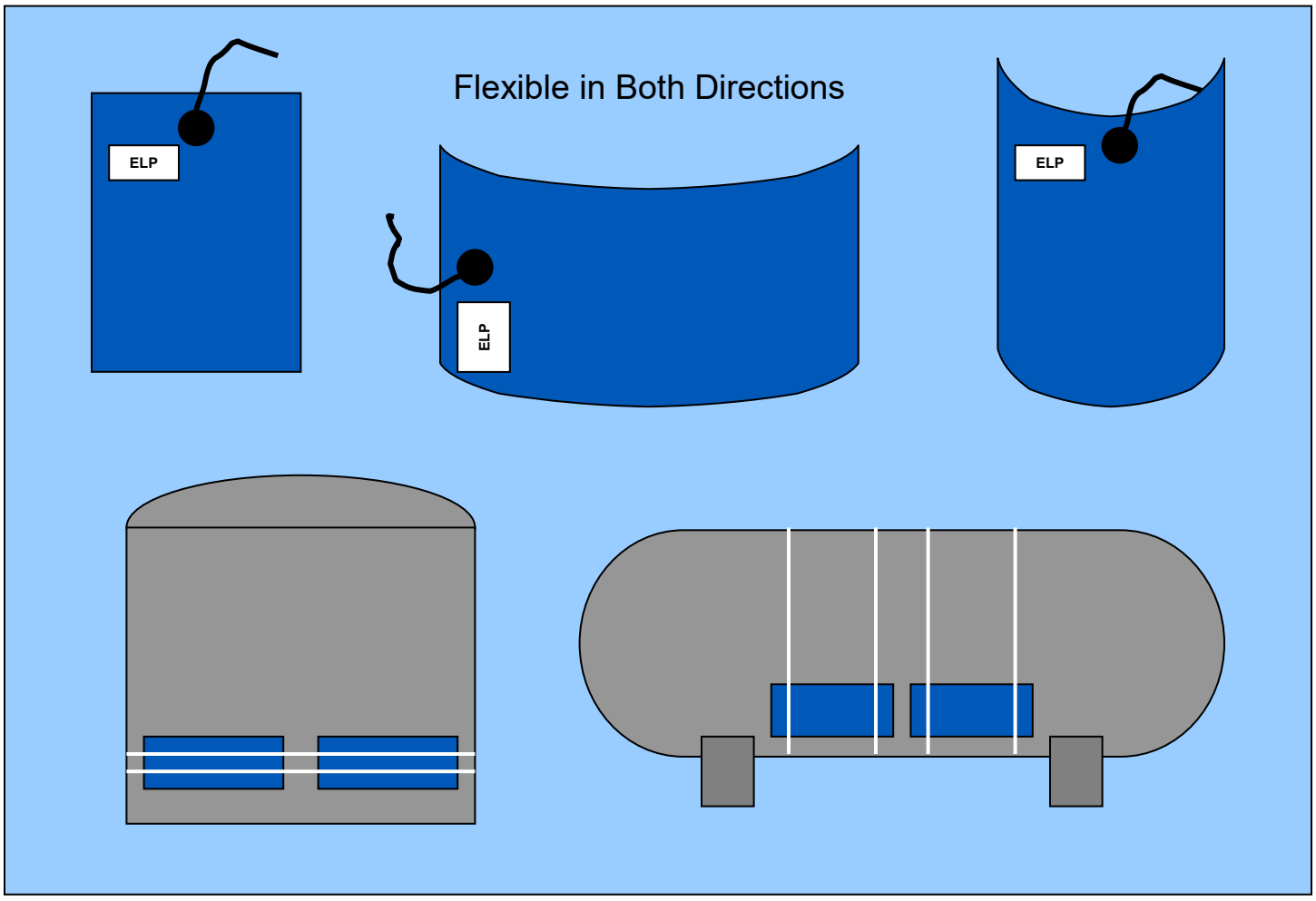
FM APPROVED

ELP

TANK HEATING PANEL

The ELP (Epoxy Laminated Panel) is the most versatile tank heater available. Possessing unique flexibility, ELP heating panels can be used in a variety of heating applications ranging from freeze protection to process heating up to 212°F (100°C).

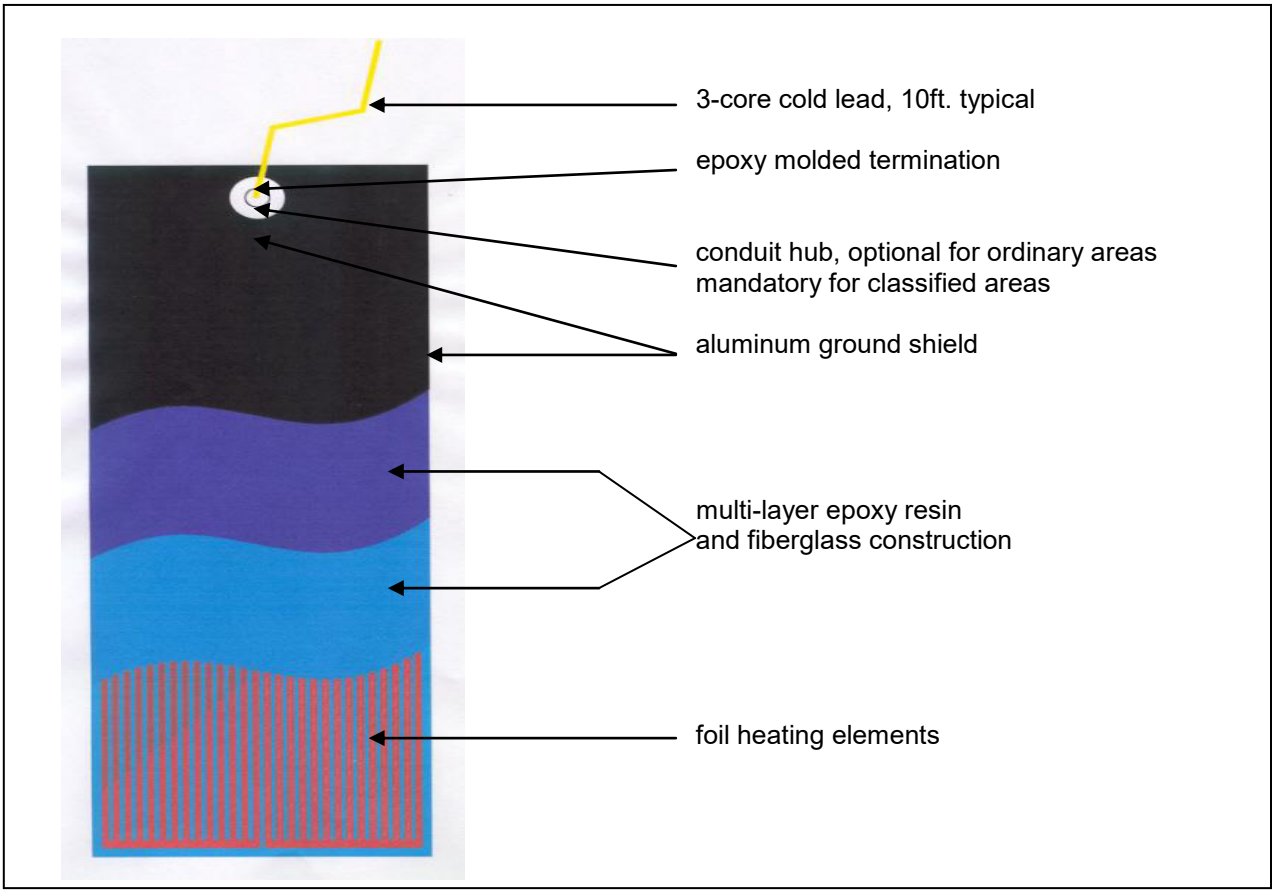
ELP Heating Panels can be used on either vertical or horizontal tanks of metallic or non-metallic construction. They can be used in dry, wet, or corrosive environments in ordinary or approved hazardous locations.



ELP Heating Panel - the Superior Heater for Tank Heating Applications up to 212°F (100°C)

The ELP panel is the heater for the 21st century.

Its unique epoxy-fiberglass construction utilizes foil resistance elements that are synonymous with our proven range of products. The low watt density of this heating panel, together with its low mass, provide unequaled thermodynamic performance. The ELP heater is heat and pressure cured to give its robust qualities such as strength, durability, heat, water, and corrosion resistance. All panels have 10'-0" long waterproof cold leads.



ELP Specifications

Model:	ELP-1	ELP-2	ELP-3	ELP-4	ELP-5	ELP-6	ELP-7	ELP-8	ELP-9
Size (inches)	24 x 18	48 x 18	48 x 24	48 x 36	48 x 40	48 x 18	48 x 24	48 x 36	48 x 40
Power (watts)	275	550	400	1100	480	550	400	1100	480
Voltage (volts)	120	120	120	120	120	240	240	240	240
D.C. Resistance* (ohms)	52	26	36	13	30	105	144	52	120
Weight (lbs.)	3	6	8	12	13	6	8	12	13
Area (sq.ft.)	3	6	8	12	13.3	6	8	12	13.3
Power Density (w/sq.ft.)	92	92	50	92	36	92	50	92	36
Current (amps)	2.3	4.6	3.3	9.2	4	2.3	1.7	4.6	2

Maximum Exposure Temperature..... 250°F / 121°C
Minimum Installation Temperature ..... -40°F / -40°C
Option - Conduit Hub (-H) ..... 1/2" NPT, Aluminum

Cold Lead ..... #16awg cable, 105° C, 600V, 13A
Minimum Bending Radius .... 2 feet

Resin System: The resin system is based on a BROMINATED BISPHENOL A epoxide resin cured with DICYANDIAMIDE and BENZYLDIMETHYLAMINE.
Fire Retardancy: The resin system is approved by Underwriters Laboratory (File E 53727) to UL 94 V 0 flammability rating when used in NEMA grade FR4 laminates.

* Resistance (@70°F) +/- 10%.

Heating System Design Guide

To determine the amount of heaters required for a typical tank heating application, follow these easy steps:

1. Calculate total Tank Surface Area
   Tank Area = 3.142 x D x (R+H)
   Where, D = tank diameter
   R = tank radius
   H = tank height (or length)
2. Find Basic Heat Loss from Table 1.
3. Find Insulation Correction Factor from Table 2.
4. Find Windage Factor from Table 3.
5. Add 10% for vertical tanks standing on a concrete base - 1.1 multiplier.
6. Add 10% for safety - 1.1 multiplier.
7. Calculate the Total Heat Loss,
   Multiply steps:
   1x2x3x4x5x6 = Total Heat Loss (Heat Required).
8. Select a suitable ELP Heating Panel for the application from the ELP Specifications.
9. Find the ELP Load Factor at the application temperature from the ELP Load Factor Graph.
10. Calculate selected ELP heater wattage at the application temperature. Multiply Load Factor from step 9 by selected ELP wattage.
11. Calculate selected ELP heater wattage due to voltage difference from design. Multiply the heater wattage (step 10) by the corresponding voltage factor from Table 4.
12. Determine the quantity of ELP Heating Panels required. Divide Total Heat Loss/Requirement by the actual ELP wattage. Divide step 7 by step 11.

    Note: If this result's fraction exceeds 0.1, increase the quantity of ELP Heaters by one (to next higher whole number).

Table 1 - Basic Heat Losses (W/sq.ft.)

Delta T (°F)	Insulation Thickness (In)				
	1	1 1/2	2	3	4
50	3.6	2.3	1.7	-	-
75	5.4	3.5	2.6	2.0	-
100	7.2	4.8	3.5	2.6	-
125	9.0	6.2	4.5	3.3	-
150	10.9	7.6	5.5	4.0	3.1
175	12.9	9.0	6.6	4.7	3.7
200	14.8	10.4	7.7	5.4	4.3
225	-	11.9	8.9	6.2	4.9
250	-	13.5	10.1	7.0	5.5

Table 2 - Thermal Insulation Correction Factors

Thermal Insulation Type	Insulation Factor
Polyurethane	0.7
Fiberglass	1.0
Foamed Plastic	1.1
Polystyrene	1.2
Calcium Silicate	1.5
Cellular Glass	1.6

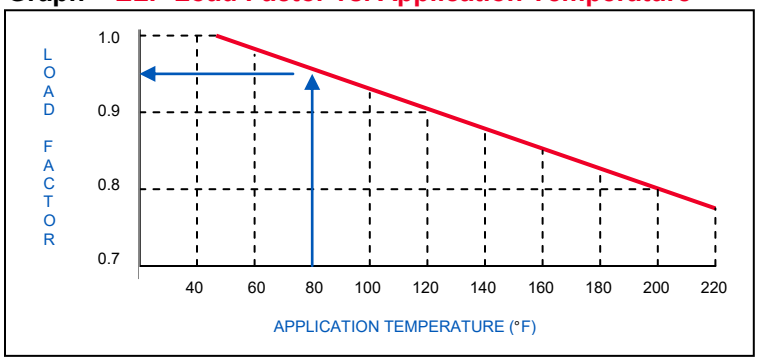
Heating System Design Example

Maintain a 12'-0" diameter by 20'-0" high vertical tank at 80°F, when the minimum ambient temperature is -20°F and wind is 25mph. Tank will be insulted with 2" thick polyurethane foam insulation and is mounted on a concrete base. Heaters will operate on 220VAC.

1. To calculate total Tank Surface Area in sq.ft., multiply the following:
   Tank Area=3.142 x D x (R+H)=3.142 x 12' x (6'+20')=980sq.ft.
   where D = 12', R = 6', H = 20'
2. The Basic Heat Loss from Table 1 for Delta T = 100°F, (80°F - (-20°F)), and 2" thermal insulation is 3.5watts/sq.ft.
3. The Insulation Correction Factor from Table 2 for Polyurethane thermal insulation is 0.7.
4. The Windage Factor from Table 3 for 25mph wind velocity is 1.12.
5. To add 10% for vertical tanks standing on a concrete base multiply by 1.1.
6. To add 10% for safety - multiply by 1.1.
7. To calculate the Total Heat Loss (Heat Required), multiply steps 1 through 6.
8. For this 220VAC application, an ELP-6 (48" x 18", 550W, 240V) is a suitable choice.
9. To find the ELP Load Factor at 80°F from the Graph, follow 80°F vertical line up to the graph and then horizontally across to the left and read the value of 0.95.
10. To calculate actual ELP wattage, multiply 550W x 0.95 = 523W.
11. Since the supply voltage is 220VAC while heater design is 240VAC, multiply heater wattage (523W) from step 10 by the corresponding voltage factor 0.84 from Table 4: 523W x 0.84 = 439W.
12. To determine the total quantity of ELP Heating Panels required for this heating system, divide step 7 by step 11:

    Quantity of ELP Panels = 3254W ÷ 439W = 7.4 Panels.
    Since the fraction exceeds 0.1, the total quantity of ELP tank heating panels required is 8.

Graph - ELP Load Factor vs. Application Temperature



The ELP heating panel possesses a feature of being able to "load shed". ELP heater decreases its power output as its temperature increases. Use the above graph to determine each heater's wattage at the application tem perature

Table 3 - Windage Factors

Wind Velocity (mph)	W.F.
0 - 10	1.03
11 - 20	1.07
21 - 30	1.12
31 - 50	1.17

Table 4 - Voltage Factors

Supply Voltage	V.F.
120	1.00
115	0.92
110	0.84
240	1.00
220	0.84
208	0.75

ELP

TANK HEATING PANEL

Notes:

1. Non-metallic tanks, lined tanks, tanks containing heat sensitive or viscous materials require special considerations. Consult HOTFOIL.
2. Most typical heating applications drawing less than 20 amps of current may be controlled directly by one or two 20amp rated thermostats.
3. All applications drawing more than 20amps of current, use multi-phase voltage, alarm, or monitoring, etc. require special control equipment - consult HOTFOIL.
4. For tank "heat up" applications - consult HOTFOIL.
5. Hotfoil recommends the use of an override thermostat or controller on all applications.

Installation:

ELP heating panels are quick and easy to install, require no special tools or skills. Heaters are usually installed by banding them to the tank with metal bands or polyester straps. Installation of several ELP heating panels takes only a few minutes. Refer to ELP Installation Instructions for full details.

ELP Ordering Information:

ELP – X – X – 10

- **10** – Standard 10'-0" 3-core lead unless otherwise requested
- **X** – Option – With Hub "H" **
No Hub - Standard
- **X** – ELP Model Number

** Hubs - "A" Aluminum (Standard)
"SS" Stainless Steel
"P" PVC Coated

** Note: Hubs are supplied as standard on ELP Panels when used in hazardous locations.

FM Approvals

Class I, Division 2, Groups B, C, D
Class II, Divisions 1 & 2, Groups F, G
Class III, Divisions 1 & 2
Ordinary Areas

FM
APPROVED

LIBERTY ELECTRIC PRODUCTS

Liberty Electric Products
113 Twin Oaks Drive
Syracuse, NY 13206
Tel: (315) 437-8100
Fax: (315) 437-0681
www.libertyelectricproducts.com