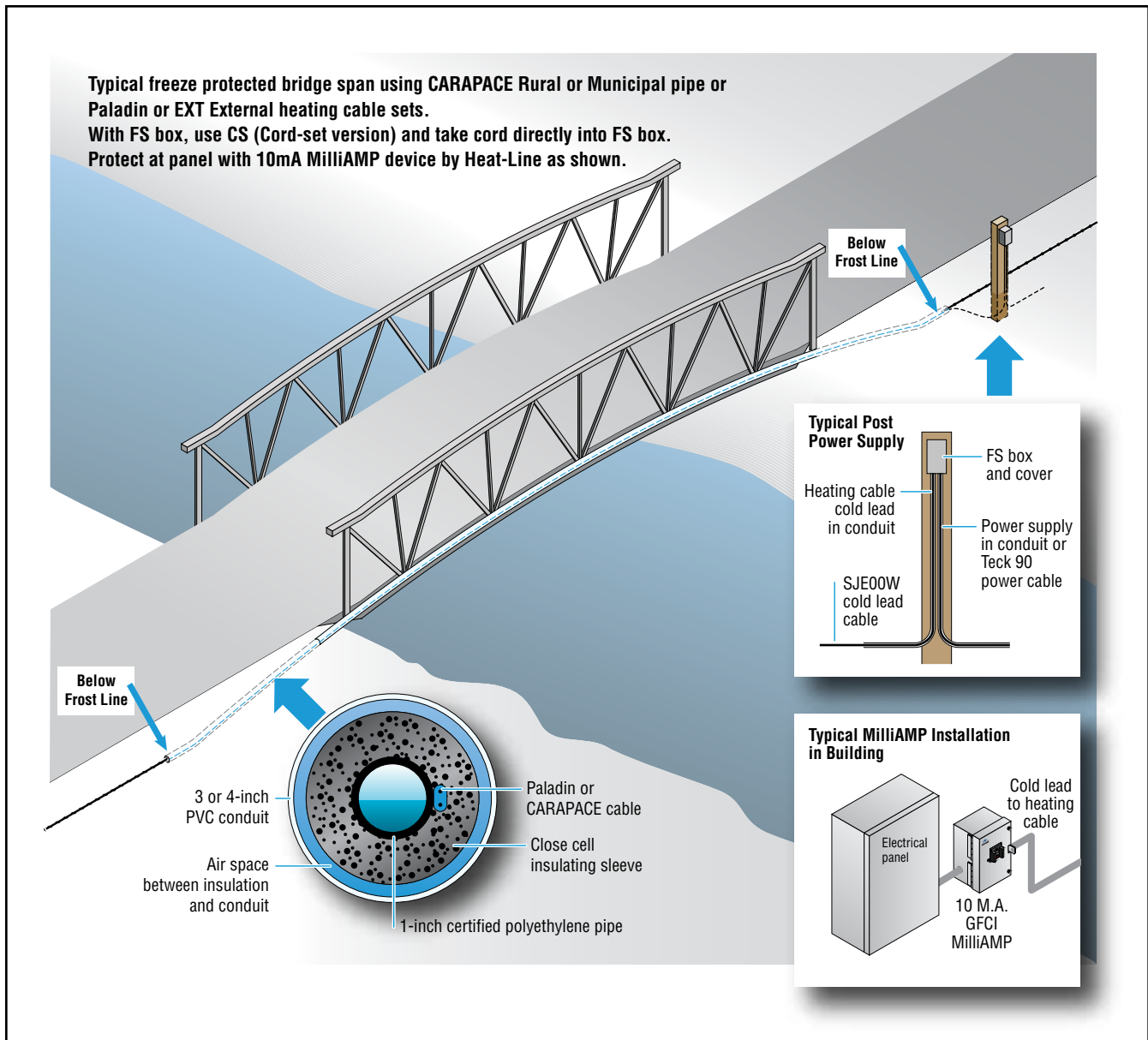




# CARAPACE, Paladin or EXT On a Bridge Span

## CONCEPTUAL DRAWING



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## SELF-REGULATING HEATING CABLES

CARAPACE is a freeze protected supply pipe which combines a self-regulating heater and high density polyethylene pipe all in one system. CARAPACE systems employ the unique performance of advanced self-regulating heating cable technology. The heating cable automatically adjusts; increasing or decreasing heat output to match heat loss at each point throughout the length of the pipe. As the surrounding temperature increases, CARAPACE automatically decrease their heat output, and vice versa. The result is energy savings. CARAPACE provides superior performance in the coldest climates and the most rugged environments as heat is gently applied to the pipe, preventing freezing.

### THERMOSTATS AND TIMERS

Thermostats and timers can be used to control the heating cable in an ON/ OFF operation thereby reducing the amount of energy consumed. A control device combined with insulation substantially minimizes operational costs.

### INSULATION

When installing a CARAPACE system it is recommended to always use pipe insulation; even if the pipe can be buried. A thermally insulated

pipe requires much less heat to protect and is not as susceptible to freezing. Heat-Line products are designed to be used with thermal insulation to reduce heat loss and greatly improve energy efficiency.

As CARAPACE features self-regulating technology, when the warmth generated by the heating cable system is captured by insulation, the amount of energy produced by the heating cable is vastly lowered and therefore operational costs reduced.

## CARAPACE AT A GLANCE

- cCSAus B137.1 Drinking Water NSF/ANSI 61 approved
- 5 year warranty with optional 10 year
- Can be fully insulated to decrease operating costs
- Can be used with a variety of control devices including thermostats and timers
- Will never melt or over-heat the water pipe, even if the pipe is dry
- Labour savings - no need to excavate below the frost line or blast rock
- Suitable for direct earth burial, above ground and/or wet locations
- Approved for high pressure and constant pressure systems, 200 PSI Rural and 250 PSI Municipal
- Available job-ready (factory terminated) or cut-to-length for field termination
- Unique construction provides superior heat transfer

## SPECIAL REQUIREMENTS

Since 1988 Heat-Line® has been specializing in freeze protection of all types. If you have a special application of any kind, give us a call. Special system designs are common to us. We manufacture many other innovative products not mentioned in this brochure.



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HLCP-0418-1



# CARAPACE®

A self-regulating heated polyethylene pipe for  
water supply or sewage applications.



NSF/ANSI 61

## ABOUT CARAPACE

CARAPACE is a high performance freeze protected potable water pipe constructed of virgin high-density polyethylene resins certified for potability, direct earth burial, and free air installations. Engineered as an advanced freeze protection solution, CARAPACE utilizes Heat-Line's proven self-regulating heating cable technology for efficient and reliable performance. CARAPACE is suitable for all rural and municipal installations where new polyethylene pipe and freeze protection is required. CARAPACE offers a cost-effective alternative to blasting and excavating where natural frost protection is not possible. The patented construction of CARAPACE provides superior thermal heat transfer and unsurpassed energy efficiency when combined with thermal insulation and a thermostat control.



## APPLICATION

CARAPACE is designed to provide energy efficient municipal and domestic water pipe and sewage forced main freeze protection. CARAPACE offers a more reliable, cost-effective alternative to blasting and excavation. This product represents the highest quality pipe freeze protection in the world.

Application examples include but are not limited to:

- Residential water supply lines (lake, river, well, building to building, municipal)
- Constant pressure or high pressure water systems
- Municipal residences and commercial buildings
- Water supply and sewage delivery systems in mining and exploration camps
- Small diameter septic pipes (such as force main)
- Residential and commercial sewage and waste water force mains

## CONSTRUCTION & OPERATION

CARAPACE is constructed using a high density NSF STD 14 approved polyethylene pipe for high strength and potability. The self-regulating heating cable is extruded directly onto the outer surface of the pipe with a thin layer of high density polythene. The extruded layer provides a protective shell to guard against mechanical injury while ensuring the conductive self-regulating heating cable remains in unyielding contact with the pipe wall. This unique construction makes CARAPACE the only product Heat-Line recommends for use with high pressure and constant pressure water supply systems.



## PRODUCT SPECIFICATIONS

### Approvals

- cCSAus B137.1 approved (Canada and USA)
- cNSF 14-61 approved (Canada and USA)
- NSF/ANSI 61 Drinking Water Safe
- Usage W Canada, Installation Type A USA

### Electrical Specifications

- Direct earth burial and wet location certified
- 120V / 3 watt/ft systems – maximum length of 240 ft
- 120V / 5 watt/ft systems – maximum length of 240 ft
- 240V / 3 watt/ft systems – maximum length 660 ft
- 240V / 5 watt/ft systems – maximum length 540 ft
- GFC models - 27 milliamp ground fault circuit interrupter plug-in device
- CS models - 12 - 14 AWG SJEOOW supply cord for direct hard wire connection, GFCI must be field installed

### Plumbing Specifications

- Constructed of PE 4710 Resin HDPE
- 1 inch ID (SIDR-9) and 1.25 inch ID (SIDR-9) 200PSI NSF STD 14 polyethylene
- 1 inch CTS (SODR-9) 250PSI NSF STD 14 polyethylene
- Compatible with fittings and connectors made for HDPE water pipe and tubing
- Suitable for above ground applications when properly insulated





# CARAPACE®

*The Only Certified Rural and Municipal Freeze Protected Water Supply Pipe.*

CARAPACE is a high performance, freeze protected (heated), HDPE polyethylene water pipe designed for use in municipal or domestic water supply and sewage force main applications.

Available as a complete job-ready system or on 1000 foot reels for field splicing and terminating.



Patents USA and Canada





## UNIQUE, PATENTED PRODUCT

CARAPACE is a unique, patented product constructed of high density polyethylene pipe (HDPE) with a proprietary self-regulating heating cable extruded directly onto the outer surface of the pipe. The heating cable is then mechanically protected by a high density polyethylene outer jacket or shell, ensuring the conductive core of the heating cable remains in continuous contact with the pipe wall while protecting it from mechanical injury.

The special construction of CARAPACE provides superior thermal heat transfer and unsurpassed energy efficiency when combined with thermal insulation and a thermostat.

CARAPACE is available in two options depending on job requirements. CARAPACE can be supplied factory finished to a specified length with power and end terminations installed or as a cut-to-length product for field measuring and terminating.

## ALTERNATIVE TO EXCAVATING

CARAPACE is an excellent alternative to costly excavating and blasting of rock or wherever permanent or temporary reliable freeze protection is required. The durability and termination flexibility of CARAPACE renders it a suitable product for a vast variety of applications, including residential, agriculture, commercial, industrial, mining and exploration, remote camps and construction.

## DIRECT EARTH BURIAL

CARAPACE is a CSA B137.1, NSF 14-61 approved product constructed with high density PE 4710 polyethylene for portability and is approved for direct earth burial and free air installations.

CARAPACE Rural Grade is available in 120 volt and 240 volt and sized in SIDR (internal diameter), 200 PSI rated, high density polyethylene. CARAPACE Rural Grade 250 PSI rated is also available by special order.

CARAPACE Municipal Grade is available in 240 volt and sized in CTS (copper tube size), 250 PSI rated, high density polyethylene. 120 volt Municipal Grade is available by special order.

Pipe temperatures can be maintained using insulation and thermostatic control.

# CARAPACE®



## MUNICIPAL AND DOMESTIC FREEZE PROTECTION

CARAPACE is a high performance product designed to provide energy efficient and reliable municipal and domestic pipe freeze protection.

## ELIMINATES STEAMING OR JETTING OUT PIPES

CARAPACE can be used continuously through winter as freeze protection or as a precautionary system in problematic geographies. In this case, as freeze-maintenance on the fringe of the frost line, the system can simply be energized in the event of a freeze. Water will begin flowing in minutes, preventing and eliminating the costly expense and need to steam or jet out pipes.

# CARAPACE® | Energy Consumption Case Study

Location Information	Nearest city / town	Carnarvon, ON CANADA
	Latitude	45°02'43"N
	Longitude	78°41'53"W
	Elevation (above sea level)	1,090 feet
Lake Information	Lake bed	Sand
	Obstructions	None
	4 foot water depth	110 feet from shoreline
	10 foot water depth	150 feet from shoreline
	20 foot water depth	170 – 180 feet from shoreline
Property Information	Elevation (above lake level)	30 – 40 feet
	Terrain	Rock
	Shoreline	Rock
Product Information	Product	CARAPACE, 1" Rural (ID controlled), 240 volt, 5w @ 50°F
	System length	270 feet (90 on land, 180 in the lake)
	Pipe insulation on land	Yes (90 feet)
	Pipe insulation in lake	None
	Ground coverage	None (could not bury)
	Thermostat	Yes
	Thermostat setting	50°F (10°C)
	Sensor location	45 feet from building on pipe under insulation (coldest point)
Test Results	CARAPACE was powered on November 10, 2007	
	CARAPACE was shut down on April 25, 2008	
	70 Days of Recorded Temperatures from November 10, 2007 to April 25, 2008	
	Coldest recorded temp.	-27.4°F (-33°C)
	Warmest recorded temp.	48.2°F (9°C)
	Average temp.	17.7°F (-8°C)
	Kilowatt usage	1,821 kW/h
	Price per kw/h (April 2008)	\$0.05
	Cost for entire CARAPACE operation	\$91.05

## Disclaimer

Energy consumption will change depending on product selection, application, location and climate. This case study should be used as an example only, but exemplifies the high performance capability of the product.



# CARAPACE® | Technical Specifications

	Rural grade	Municipal grade
Pipe pressure rating	200 PSI 250 PSI available by special order	250 PSI
Available pipe sizes	ID Controlled 1" and 1¼"	Copper Tube Size 1" (1¼" by special request)
Inner pipe construction	High Density Polyethylene PE 4710	High Density Polyethylene PE 4710
Outer extruded membrane	High Density Polyethylene PE 4710	High Density Polyethylene PE 4710
NSF approval for potable water	14/61	14/61
CSA approval for potable water	B137.1	B137.1
ASTM approvals	D2737	D2737
Withstand petroleum products?	Yes – Verify with factory for type of petroleum, ordinary electrical class only. NOT hazardous locations	Yes – Verify with factory for type of petroleum, ordinary electrical class only. NOT hazardous locations
Heat distribution	Adjusts heat output microscopically at every point in its length in response to temperature	Adjusts heat output microscopically at every point in its length in response to temperature
Heating cable – class	Self-Regulating	Self-Regulating
Heating cable – jacket	Fluoropolymer	Fluoropolymer
Heating cable – core	Conductive Polymer	Conductive Polymer
Cable wattages available	3W/ft, 5W/ft	3W/ft, 5W/ft
Voltages available	120, 240, 208-277	240, 208-277 120 volt by special order
Max circuit length, 3 watt 120 volt	270 ft	120 volt by special request only
Max circuit length, 5 watt 120 volt	230 ft	120 volt by special request only
Max circuit length, 3 watt 240 volt	660 ft	660 ft
Max circuit length, 5 watt 240 volt	540 ft	540 ft
Maximum length /reel	1000 ft	1000 ft
cCSAus NSF approvals	Yes	Yes
Warranty	5 year limited warranty/ 10 year optional	5 year limited warranty/ 10 year optional





# CARAPACE<sup>®</sup> Features / Benefits / Differentiators / Applications / Redundancy

## Features

- Made of potable HDPE
- Available in 1" and 1¼" SIDR sizes and 1" CTS size
- Thermostats and other control devices are optional
- Will not melt or overheat
- Can be fully insulated
- Extremely energy efficient
- Available in 120 volt or 240 volt systems
- Available with either GFCI plug or CS hard wire connection
- Self-regulating, high performance, conductive polymer cable
- 5 year limited warranty/ 10 year optional
- Available in common and custom lengths

## Benefits

- Interfaces with standard fittings known in the trade
- Durable for applications above ground
- Available on 1000 foot reels for field cutting and terminating
- Limits or eliminates trenching and/or blasting
- Inherent mechanical protection
- Application flexibility
- Fast installation
- Proven performance in extreme cold climates
- Each finished system is tested prior to shipment
- Single trade installation
- Manufactured to finished lengths for individual service requirements
- Can be insulated to maximize energy efficiency
- Thermostats not required for applications where they are not beneficial
- No high limit devices required
- Unlimited control options

## Differentiators

- The only fully certified, complete, integral freeze protected pipe
- CSA B137.1 approved (CANADA)
- NSF 14/61 approved in the USA for potability
- Manufactured in North America
- cCSAus approved for installation throughout the USA and Canada
- Clear, concise installation and support documentation
- Will not melt or overheat pipe
- Available in short, long and custom lengths
- Extremely High Quality and Excellent Warranty

## Applications

- Frozen sites where water is required
- Residential water supply
- Municipal water supply
- Sewage force mains
- Whenever deep blasting would be required to reach frost line
- Floating docks/ sea walls
- Bridge crossings
- Construction sites
- Mining / oil / gas sites (ordinary locations)
- Shallow trenches
- Remote camps
- Ground source heat pump headers

## Redundancy

- CARAPACE can be used as a backup system
- When pipes are installed on the fringe of the frost line or in critical areas under roadways etc.,
- CARAPACE can be energized if freezing occurs, restoring water flow in minutes while preventing the need for costly jetting or steaming of pipes

# CARAPACE® | Product Codes

## CARAPACE (Pre-Assembled and Factory Finished)

Example: **CR2 - 5 - 125 - 100 - GFC or CS**

Product		Cord-Set Type	Length of CARAPACE (ft)	
CR	Rural, SIDR 200 psi, 120 volt	GFC Ground Fault Protected	<i>Max length</i>	<i>Max length</i>
CR2	Rural, SIDR 200 psi, 240 volt			
CM2	Municipal, CTS 250 psi, 240 volt, ONLY			
Wattage				
5	5 Watt self-regulating heater			
3	3 Watt self-regulating heater			
Pipe Size				
100	Pipe size 1" (CR - I.D. controlled) (CM - O.D. CTS)			
125	Pipe size 1¼" (CR - I.D. controlled)			

**CS (No GFCI) Cord Connected**

<i>Max length</i>
270 ft
230 ft
660 ft
540 ft

**Note:** "CS" systems must provide 20 Amp circuits for circuit lengths greater than 550 ft for 3 watt CARAPACE and 460 ft for 5 watt CARAPACE.

## CARAPACE (Rural) (Sold in 1000 ft reels) *Internal diameter controlled*

Example: **RHPE2 - 5 - 100**

Product		Pipe Size
RHPE	SIDR 200 psi, 120 volt	100 Pipe size 1"
RHPE2	SIDR 200 psi, 240 volt	125 Pipe size 1¼"
Wattage		
5	5 Watt self-regulating heater	
3	3 Watt self-regulating heater	

## CARAPACE (Municipal) (Sold in 1000 ft reels) *Copper Tube Size*

Example: **MHPE2 - 3 - 100**

Product		Pipe Size
MHPE2	CTS, 250 psi, 240 volt	100 Pipe size 1"
Wattage		
5	5 Watt self-regulating heater	
3	3 Watt self-regulating heater	

# CARAPACE® | Accessories

Product Code	Description
CR-HTLN-CKIT	CSA CS100 Power Connection & CESS End Seal Kit
CR-HTLN-CS100	CSA Power Connection Kit
CR-HTLN-CESS	CSA End Seal Boot Kit
GF-STAT	Ground Fault Protected Thermostat 120 volt/240 volt