Bulletin 182B-Metric

evapco®

LSC-E/LRC

EVAPORATIVE CONDENSERS

IBC COMPLIANT DESIGNS

Technology for the Future...Available Today!

CERTIFIED EN ISO 9001 & ISO 14001

U.S. GREEN BUILDING COUNCIL MEMBER

IARW® International Association of Refrigerated Warehouses

Member of iiar International Institute of Ammonia Refrigeration www.iiar.org

LSC-E/LRC Design and Construction Features

The LSC-E and LRC units are a result of EVAPCO's extensive experience in forced draft centrifugal fan designs. Both models are designed for easy maintenance and long, trouble free operation. These units are also designed with IBC Compliant construction. All features shown are available on all models.

Thermal Pak® II Heat Transfer Technology

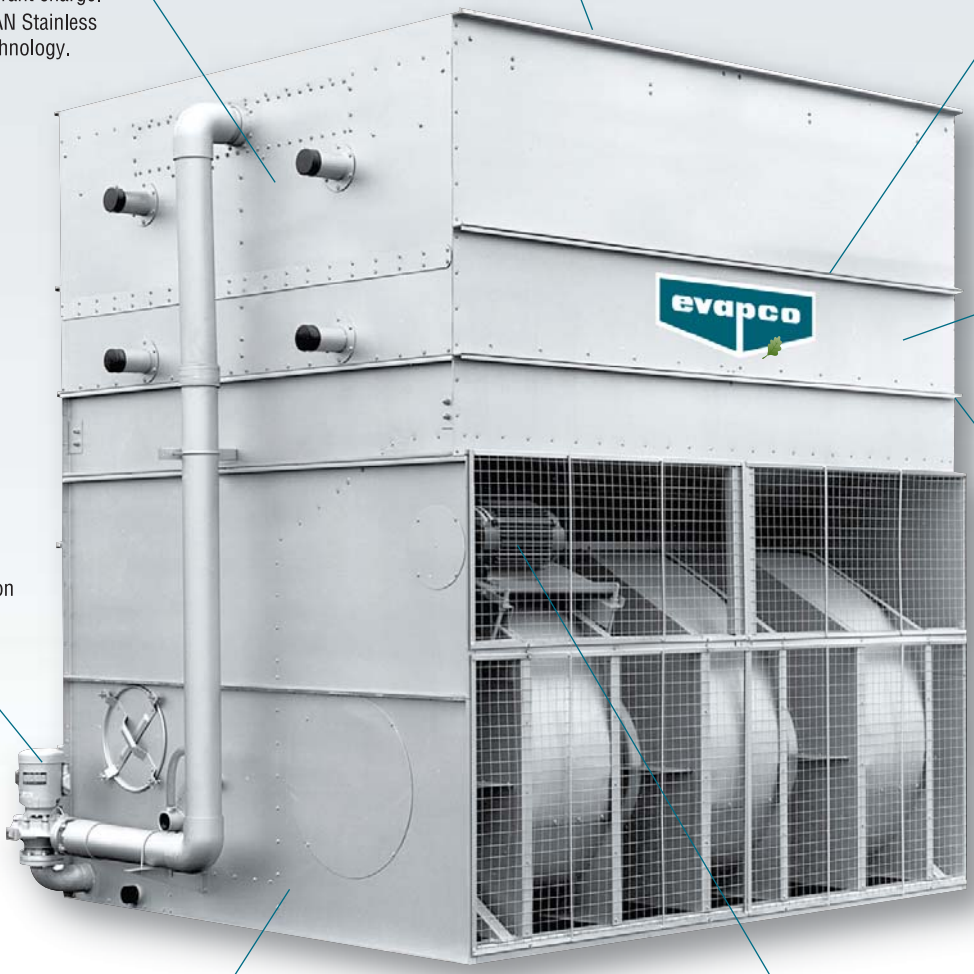
- More surface area per plan area than competitive designs.
- Improved heat transfer efficiency due to tube geometry and orientation of tubes.
- Lower refrigerant charge.
- Optional TITAN Stainless Steel Coil technology.

Water Saver Drift Eliminators

- Advanced design limits maximum drift rate to 0.001% of the recirculated water rate.
- Saves water and reduces water treatment cost.
- Greater structural integrity vs.old style blade-type.
- Recessed into casing for greater protection.

Double-Brake Flange Joints

- Stronger than single-brake designs by others
- Greater structural integrity
- Minimizes water leaks at field joints



LSC-E

G-235 Heavy Mill-Dip Galvanized Steel Construction

(Stainless steel available as an affordable option)

Totally Enclosed Pump Motors

- Help assure long, trouble-free operation

Unique Field Seam

- Eliminates up to 66% of fasteners.
- Self guiding channels improve quality of field seam to eliminate leaks.
- Easy to install.
- Lower installation cost.

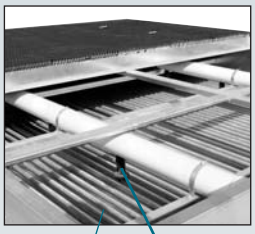
(on LSC-E units only)

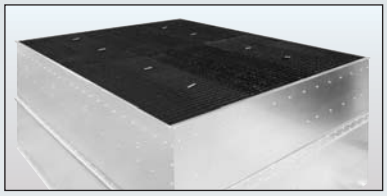
Sloped Pan Bottom

- Pan bottom slopes to drain.
- Easy to clean.
- Stainless steel strainer resists corrosion.

Totally Enclosed Fan Motors and Superior Drive System

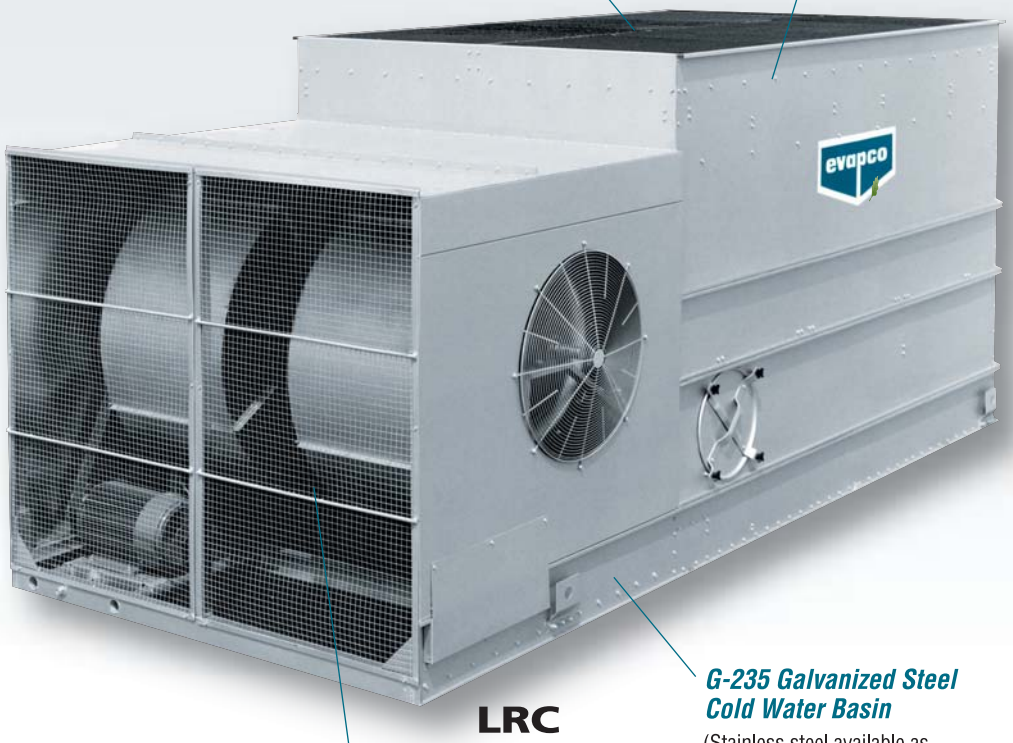
- Assures long life.
- All normal maintenance can be performed quickly from outside the unit.
- If required, motor may be easily removed.
- Motors located outboard on multi-cell units for easier drive system access.





Efficient Drift Eliminators

- Advanced design limits maximum drift rate to 0.001% of circulated spray water rate
- Corrosion resistant PVC for long life



PVC Spray Distribution Header with ZM® II Nozzles

- Large orifice nozzles prevent clogging (no moving parts).
- Redesigned nozzles for superior water distribution.
- Nozzles are threaded into header at proper orientation.
- Fixed position nozzles require zero maintenance.
- Threaded end caps for ease of cleaning.
- Guaranteed for life.

G-235 Galvanized Steel Cold Water Basin

(Stainless steel available as an affordable option)

Easy to Service Motor & Drive System

- Belt tensioning and bearing lubrication can be performed from outside the unit
- Locking mechanism can also be used as a wrench to adjust the belts (LRC only)
- Motor is fully accessible by removing one inlet screen
- Split fan housings allow removal of all mechanical equipment through the end of the unit (LRC only)

evapco SMART SHIELD®

Factory Mounted Solid Chemical Water Treatment System (Optional, not shown)

The LSC-E/LRC is available with a ***Smart Shield®*** (not shown) solid chemical water treatment system. EVAPCO's ***Smart Shield®*** System is an environmentally sensitive alternative for treating water in evaporative cooled equipment. The ***Smart Shield®*** system includes all components required for an effective water treatment system; factory mounted and wired.

Since its founding in 1976, EVAPCO, Incorporated has become an industry leader in the engineering and manufacturing of quality heat transfer products around the world. EVAPCO's mission is to provide first class service and quality products for the following markets:

- Industrial Refrigeration
- Commercial HVAC
- Industrial Process
- Power
- District Energy

EVAPCO's powerful combination of financial strength and technical expertise has established the company as a recognized manufacturer of market-leading products on a worldwide basis. EVAPCO is also recognized for the superior technology of their environmentally friendly product innovations in sound reduction and water management.

EVAPCO is an employee owned company with a strong emphasis on research & development and modern manufacturing plants. EVAPCO has earned a reputation for technological innovation and superior product quality by featuring products that are designed to offer these operating advantages:

- Higher System Efficiency
- Environmentally Friendly
- Lower Annual Operating Costs
- Reliable, Simple Operation and Maintenance

With an ongoing commitment to Research & Development programs, EVAPCO provides the most advanced products in the industry – ***Technology for the Future, Available Today***!

EVAPCO products are manufactured on five continents around the world and distributed through hundreds of factory-autherized sales representatives.

LSC-E/LRC Design Features

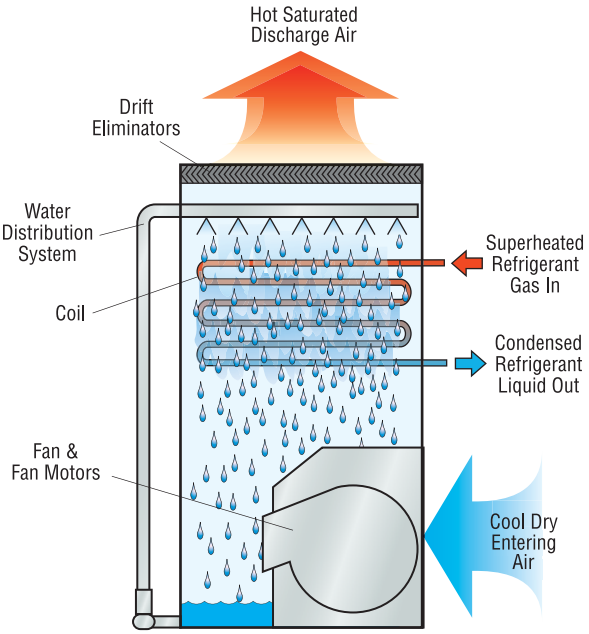
Proven Performance and Design Flexibility

Principle of Operation

The refrigerant gas is discharged from the compressor into the inlet connection of the evaporative condenser. Water from the condenser's sump is continuously distributed over the condenser coil, while ambient air is simultaneously forced into the unit. As the ambient air moves up through the coil section, a portion of the spray water is evaporated into the air stream.

The evaporative process cools the spray water, which in turn cools the tubes containing the refrigerant gas. The cool tube walls cause the refrigerant gas to give up heat and condense into a liquid. The condensed liquid flows out of the coil's sloping tubes to the high pressure liquid receiver for return to the system.

The hot saturated air is driven through the drift eliminators, where any entrained water droplets are removed. The condenser's fan then discharges this air stream out of the top of the unit at a high velocity, where it can dissipate harmlessly into the atmosphere. The water which was not evaporated falls into the sump and is recirculated by the spray pump to the water distribution system above the condensing coil section.



Example of an LSC-E

LSC-E/LRC Design Features

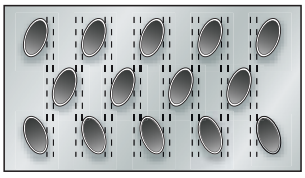
Thermal-Pak® II Coil

EVAPCO's Thermal-Pak® II condensing coils are designed for maximum heat transfer efficiency. This unique coil design utilizes counterflow heat transfer. The rows of elliptical tubes are staggered and angled in the direction of airflow to enhance air turbulance, thereby increasing heat transfer while minimizing airside pressure drop.

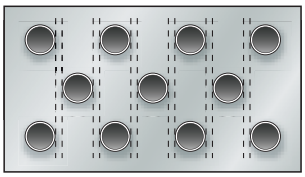
The design features of EVAPCO's Thermal-Pak® II condensing coils ensure the end user will receive the best evaporative heat transfer efficiency.

These characteristics and other engineering advancements of the Thermal-Pak® II have been proven in EVAPCO's world-class research and development laboratory resulting in the following end user benefits:

- Lower Operating Refrigerant Charge
- Low Power Consumption Per Ton
- Lower Operating Weight
- Small Plan Area Per Ton



Thermal-Pak® II Coil by EVAPCO



Round Tube Coil by Others

The coils are manufactured from high quality steel tubing following the most stringent quality control procedures. Each circuit is inspected to assure the material quality and then tested before being assembled into a coil. Finally, the assembled coil is tested at 2.69MPa air pressure under water to make sure it is leak free.

To protect the coil against corrosion, it is placed in a heavy-duty steel frame and the entire assembly is dipped in molten zinc (hot dip galvanized) at a temperature of approximately 427°C.

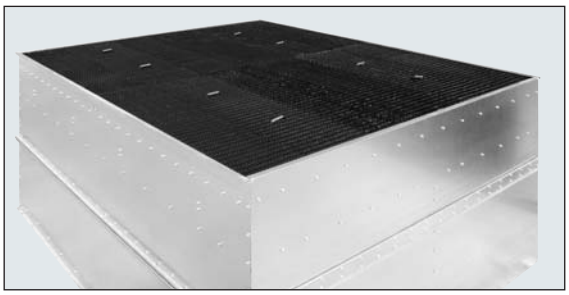
Thermal-Pak® II Coil

Efficient Drift Eliminators

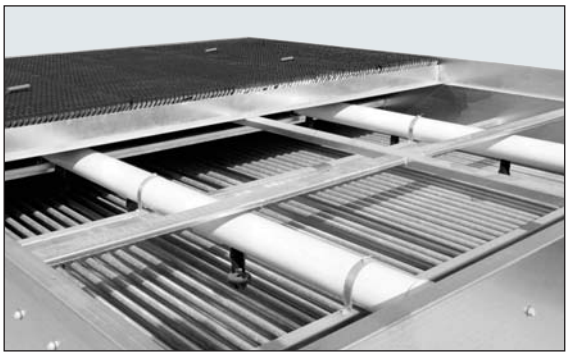
The LSC-E & LRC are provided with an efficient drift eliminator system that effectively reduces entrained water droplets from the air discharge to less than 0.001% of the spray water flow rate.

The eliminators are constructed of non-corrosive PVC with a multi-pass design for maximum drift reduction. They are assembled in modular sections for easy removal and access to the water distribution system.

In addition to reducing drift, the eliminators protect the spray system from debris and prevent sunlight from entering the condenser.



LSC-E and LRC Drift Eliminator



Drift Eliminators Removed for Coil Inspection

LSC-E/LRC Design Features

Construction Features

EVAPCO, long known for using premium materials of construction, has developed the ultimate system for corrosion protection in galvanized steel construction – the EVAPCOAT Corrosion Protection System. Marrying corrosion free materials with heavy gauge mill hot-dip galvanized steel construction to provide the longest life product with the best value.

G-235 Mill Hot-Dip Galvanized Steel Construction

Mill hot-dip galvanized steel has been successfully used for over 40 years for the protection of evaporative condensers against corrosion. There are various grades of mill galvanized steel each with differing amounts of zinc protection. EVAPCO has been a leader in the industry in developing heavier galvanizing, and was the first to standardize on G-235 mill hot-dip galvanized steel.

G-235 designation means there is a minimum of 2.35 ounces of zinc per square foot (approximatly 725 gram of zinc per square meter) of surface area as measured in a triple spot test. G-235 is the heaviest level of galvanizing available for manufacturing evaporative condensers and has a minimum of 12% more zinc protection than competitive designs using G-210 steel.

During fabrication, all panel edges are coated with a 95% pure zinc-rich compound for extended corrosion resistance.

Type 304 Stainless Steel Strainers

Subjected to excessive wear and corrosion, the sump strainer is critical to the successful operation of the condenser. EVAPCO uses only stainless steel for this very important component.

Unique Seam Design–Eliminate Field Leaks

The LSC-E/LRC features EVAPCO's unique panel construction design which includes a special butyl tape sealer with an integral sealing gasket. Each joint is then backed with a secondary caulking compound and encased in a double-brake flange for added strength and structural integrity. This unique sealing system has been proven effective in both laboratory tests and years of field application.

Easy Field Assembly

Fewer Fasteners–Lower Installed Cost

The LSC-E/LRC features a unique field seam design which ensures easier assembly and fewer field seam leaks. The field seam incorporates self-guiding channels to guide the coil casing section into position and set in place on the bottom basin section of the condenser.

In addition, the design eliminates up to 66% of the fasteners typically used to join the condenser sections in the field significantly reducing the contractor labor costs for installation.

Improved Maintenance

ZM® II Spray Nozzle Water Distribution System

Even and constant water distribution is paramount for reliable, scale-free evaporative condensing. EVAPCO's Zero Maintenance ZM® II Spray Nozzle remains clog-free under the toughest conditions to deliver approximately 4 l/s to every square meter of coil plan area.

The heavy-duty ABS ZM® II Spray Nozzles have a 32mm diameter opening and a 32mm splash plate clearance. The fixed position ZM® II Spray Nozzles are mounted in corrosion-free PVC water distribution pipes that have threaded end caps. Together, these elements combine to provide unequaled coil coverage, enhanced droplet formation and make the industries best performing maintenance-free water distribution system.

ZM® II Nozzle

Alternate Materials of Construction

For particularly corrosive environments, EVAPCO condensers available with Stainless Steel construction for the basin, casing and/or coil.

Stainless Steel Basin

The basin area of a condenser is often subjected to high concentrations of impurities and silt. In addition to the EVAPCOAT Corrosion Protection System, EVAPCO offers optional stainless steel construction for superior corrosion resistance. This option provides Type 304 or Type 316 stainless steel for the entire basin section.

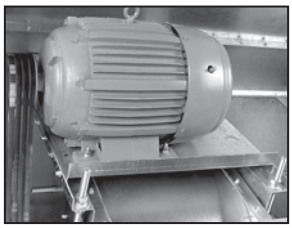
Stainless Steel Coils

The heat exchanger coil is the heart of the evaporative condenser. For this critical component, EVAPCO offers the option of Type 304L stainless steel construction using the Thermal-Pak® II coil design. Highly efficient heat transfer coils with the ultimate corrosion protection for evaporative cooling applications.

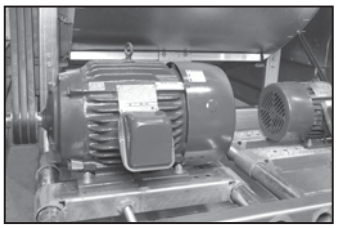
LSC-E/LRC Design Features

Fan Motor Mount

The T.E.F.C fan motors are mounted in a convienent open area for ease of belt tensioning, motor lubrication and electrical connection. The motor base is designed for easy adjustment and to be locked into position to maintain proper belt tension.



Example LSC-E Fan Motor Mount



LRC Fan Motor Mount
(shown with optional pony motor)

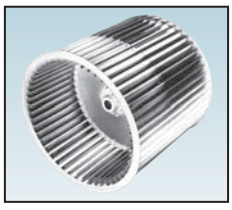
Fan Access-Split Housing

Another unique feature of the LRC Evaporative Condenser is the split fan housing. The split fan housing on the LRC allows quick removal of the fans from the front end of the unit. This feature allows fan removal when units are placed side by side where space is minimal.

Mechanical Drive System Access

The LSC-E and LRC mechanical drive systems are easy to maintain. Bearing lubrication and belt adjustment can be performed from outside the unit. **Motors are now mounted outboard on multi-cell units to facilitate access for maintenance.** There is no need to remove fan screens to maintain important drive components. In addition, the locking mechanism used to maintain belt tension can also work as a wrench to adjust the belt.

Centrifugal Fan Assembly



Fans on LSC-E and LRC Evaporative Condensers are of the forward curved centrifugal design with hot-dip galvanized steel construction. All fans are statically and dynamically balanced and are mounted in a hot-dip galvanized steel housing.

Forged Bearing Journal

The fan shafts used on all LSC-E and LRC models are standard with forged bearing journals, eliminating the two-piece fan shaft with welded journals, which is susceptible to rusting and eventual failure. The solid forged design of the LSC-E fan shaft provides durable long-lasting operation, free from premature mechanical failure. The LRC uses a ground and polished steel fan shaft, similar to what is used on EVAPCO's Induced Draft Evaporative Condensers.

Basin Access

The basin/fan section of a centrifugal fan unit is designed for accessibility and ease of maintenance. Fan and drive components are positioned to allow easy adjustment and cleaning. All grease fittings are in convenient locations for periodic lubrication.

Large circular access doors are provided to allow entry into the basin. All float valve and strainer assemblies are located near the door for easy adjustment and cleaning. The sump is designed to catch the dirt accumulated. This can be flushed out simply with a hose. The stainless steel strainers may be easily removed for periodic cleaning.

Capacity Control

The design wet bulb temperature for which a condenser is sized occurs only a small percentage of the time. Since the wet bulb temperature is lower than design much of the time, and cooling loads tend to fluctuate, some form of capacity control will be required.

EVAPCO offers two-speed fan motor as an option for alternative capacity control. In periods of lightened loads or reduced wet bulb temperatures the fans can operate at low speed providing about 60% of full speed capacity yet consuming only about 15% of full speed power. Since maximum wet bulb and maximum load very seldom coincide, the condenser will actually operate at half speed as much as 80% of the time.

EVAPCO recommends the use of Inverter Duty Motors when Variable Frequency Drives are utilized for capacity control.

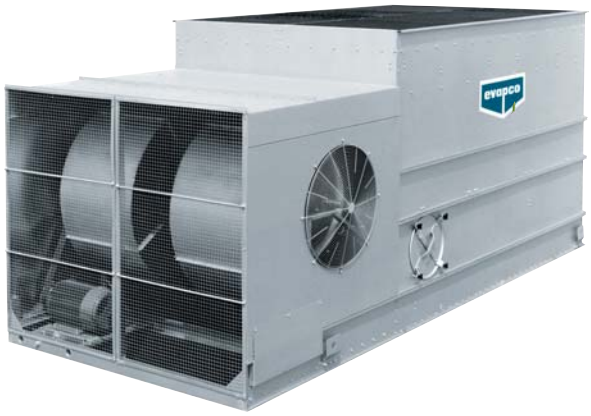
Pony motors are available as another capacity control method. Pony motors are smaller fan motors for use in times of reduced loading. The pony motor is typically 1/4 of the kW of the primary motor and can significantly reduce energy consumption.

LSC-E/LRC Design Features

Application Versatility

Centrifugal units are recommended for a wide range of installations. They are quiet, can easily be hidden, and the increase in fan kW over propeller fan units is generally not significant in the small size range. They are also excellent for installations where sound is sensitive, such as residential neighborhoods, and when the unit must handle external static pressure.

LSC-E Unit



LRC Unit

Very Quiet Operation

Centrifugal fan units operate at low sound levels which make this design preferred for installations with external static pressure where noise is a concern. Additionally, since the sound from the fans is directional, single sided air entry models can be turned away from critical areas avoiding a sound problem. When even quieter operation is necessary, centrifugal fan models can be equipped with optional sound attenuation packages. See the Sound Reducing Options section of this catalog or consult the factory for details.

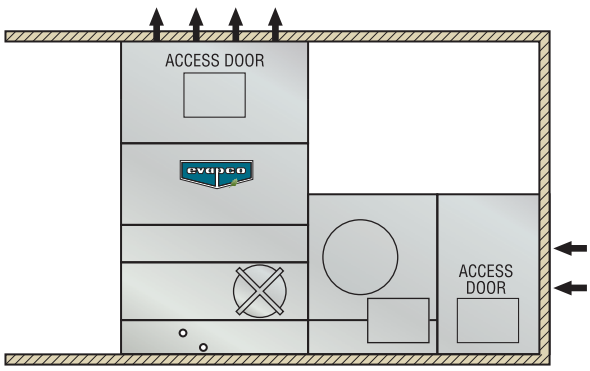
In addition, the LRC features a specially engineered fan enclosure and drive system that is designed to offer very quiet operation without the high cost of external attenuation packages. The LRC fan system was developed through hundreds of hours of laboratory tests resulting in the lowest standardized sound levels available in the industry. In fact, the sound level of the LRC on average is 2 dBA quieter than competitors' similar models.

Indoor Installation

All LSC-E and LRC Evaporative Condensers can be installed indoors where they normally require ductwork to and from the unit. The design of the ductwork should be symmetrical to provide even air distribution across both intake and discharge openings. Guidelines for Ducted Applications:

1) The static pressure loss imposed by the ductwork must not exceed 125Pa. The fan motor size must be increased for ESP up to 125Pa.
2) For ducted installations, the solid bottom panel option must be ordered. On the LRC blank off plates will also be provided in lieu of the side air inlet screens with this option.
3) NOTE: Access Doors must be located in the ductwork for service to the fan drive components and water distribution system.

Drawings are available showing recommended ductwork connections. See EVAPCO's Layout Guidelines for additional information.

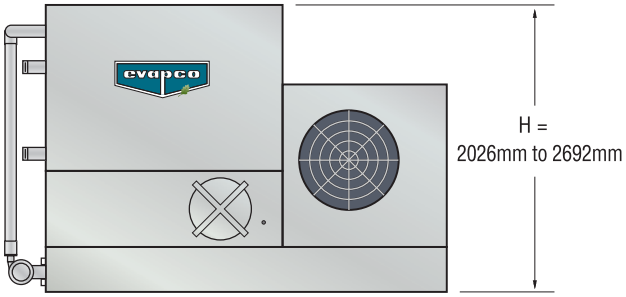


LRC Design Features

LRC Reduced Height and Maintenance Accessibility

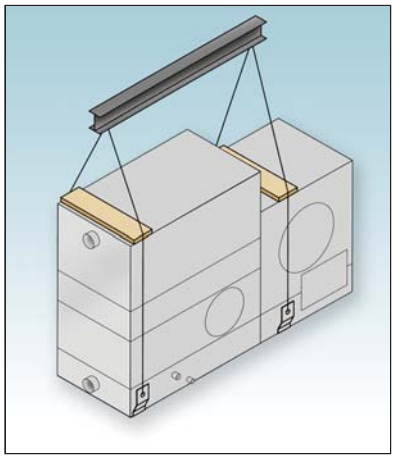
The LRC has been designed to satisfy installation requirements where height limits must be observed. The lower profile design of the LRC does not, however, sacrifice maintenance accessibility for reduced height. Its unique casing design allows the water distribution system, cold water basin, fan section and other unit components to be easily maintained.

Small, light-weight sections of the drift eliminators can be easily removed to access the water distribution system. A large circular access door is located on the side of the cold water basin to allow adjustment of the float assembly, removal of the stainless steel strainers and cleaning of the basin. The fan motor and drive system are located at one end of the unit and are completely accessible by removing the inlet screens. Routine bearing lubrication and belt tensioning can be performed from the exterior of the unit without removing the inlet screens.



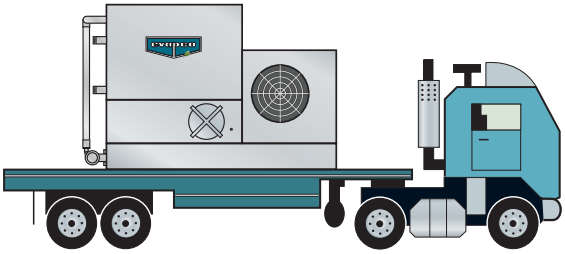
Low Installed Costs

The compact, unitary design of the LRC Evaporative Condenser allows it to be shipped completely assembled. This results in lower transportation costs and no assembly requirements at the job site. Note: Options such as sound attenuation and discharge hoods will require additional lifts and some minor assembly.



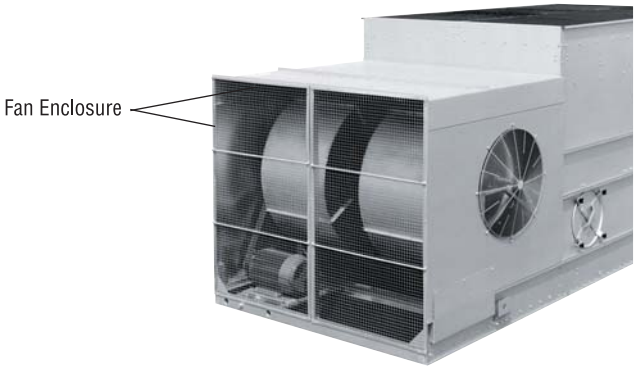
Transport of a Pre-Assembled Unit

Since the LRC ships fully assembled, it is ideal for truck-mounted applications, for remote sites or temporary installations.



Integral Fan Enclosure for Lower Sound

The LRC comes standard with an integral fan enclosure that reduces sound levels by 2 dB. This 3-sided enclosure also protects the fan and drive system for longer equipment life.



IBC COMPLIANCE

IBC Compliance

EVAPCO has been applying advanced structural technology to evaporative condensers for many years. Following seismic events in the mid 1990's EVAPCO introduced the UB Series of induced draft cooling towers, fluid coolers and evaporative condensers. These products were designed, built and independently certified for extreme seismic and wind forces. With the advent of the International Building Code, EVAPCO is now offering a new line of LSCE/LRC Evaporative Condensers that is IBC compliant as standard construction.

International Building Code

The International Building Code (IBC) is a comprehensive set of regulations addressing the structural design and installation requirements for building systems – including HVAC and industrial refrigeration equipment. As of June 2008, all 50 states plus Washington D.C have adopted the International Building Code. Compared to previous building codes that solely examined anchorage, the earthquake provisions contained within the International Building Code address anchorage, structural integrity, and operational capability of a component following a seismic event. The goal of the IBC is to minimize the loss of life and improve the capability of essential facilities to operate after a seismic event.

The International Building Code (IBC) was developed to replace the BOCA National Building Code, ICBO's Uniform Building Code and SBCCI's Standard Building Code. The International Building Code specifies that all components be designed to resist the equivalent seismic forces as the structure to which thay are installed whereas previous building codes focused exclusively on the structure of the building to provide resistance against seismic forces. These components include all aspects of the building architectural, electrical and mechanical systems. The failure of these components during a seismic event has been a common occurrence in recent history. Although the structure of the building may be relatively undamaged from an earthquake, the damage to the nonstructural components could be significant and result in considerable secondary damage to the building (ie. flooding, fire, structural damage).

Importance Factor (I_p)

A major parameter that must be determined prior to calculating the seismic design forcre is the component importance factor (Ip). ASCE 7-10 defines the component importance factor as:

Importance Factor, I_p	Classification
1.5	• Life safety component required to function after seismic event. • Component containing hazardous content where the quantity, if released, exceeds a threshold limit that is sufficient to pose a threat to the public. • Components installed at Risk Category IV (essential) facilities
1.0	All other components

The importance factor has significant impact on the design of the equipment necessary for the application. Please contact the factory for assistance in understanding your needs.

Design Implementation

In order to achieve this goal, an architect or civil engineer is responsible for analyzing the soil and the design of a structure to determine the factors to be used and provide those in construction documents. A mechanical consulting engineer and/or design build contractor applies these factors to advise the manufacturer on the proper design for the application. EVAPCO takes this information and determines the necessary condenser to meet IBC regulations. This process ensures that the mechanical equipment and its components are seismically compliant per the provisions of the International Building Code.

Independent Certification

All EVAPCO LSCE/LRC units are designed, analyzed, and constructed in accordance with the latest edition of the International Building Code (IBC) Regulations. LSCE/LRC is offered with a choice of two structural design packages: standard construction and upgraded construction.

For further questions regarding IBC compliance, please contact your local EVAPCO Representative or visit EVAPCO Asia/Pacific website at www.evapcoasia.com.

SMART SHIELD® Solid Chemical Water Treatment System

The LSC-E/LRC is available with EVAPCO's **Factory Mounted** water treatment systems. EVAPCO offers a soild chemical solution for water treatment to maintain your heat transfer efficiency and extend the life of the equipment. Each system has been specifically designed for your condenser.

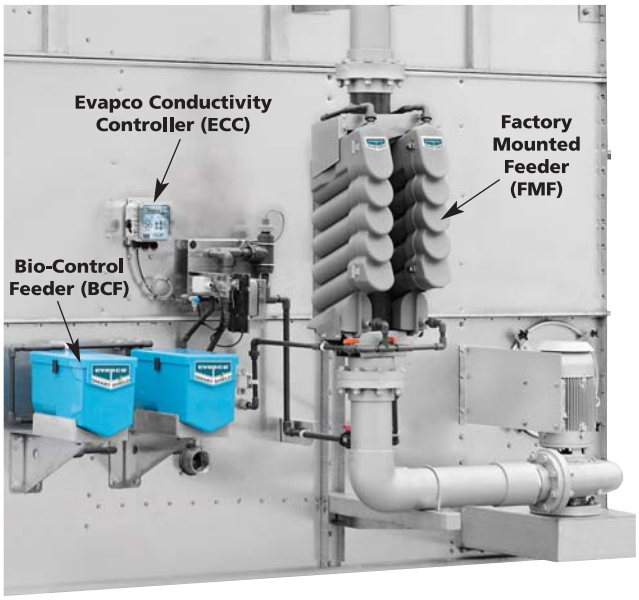
EVAPCO's Water Systems offer LSC-E/LRC owners a single-source of responsibility for equipment, water treatment, and service. Smart Shield® is manufactured and warranted by EVAPCO.

Benefits of adding an EVAPCO water treatment system include:

- **SAVES MONEY** by simplifying commission:
  - Single power connection is the only field installation requirement
- **Factory Mounting** your water treatment system ensures that it is installed to factory specifications.
- **Patented self-draining piping** eliminates the need for line insulation and heat tracing above the overflow level.
- **A Factory Authorized Service Partner** provides the first year of water system service and monitoring, to ensure proper operation and ongoing success.
- **Conductivity control package** maximizes water efficiency and features:
  - Low maintenance non-fouling torodial probe
  - USB port for downloadable 60 day audit trail of system operation
  - Motorized blowdown valve that provides the most reliable bleed control with power open / spring return operation.

EVAPCO's **Smart Shield®** system utilizes proven solid chemistry delivered via our revolutionary feed system. Patented controlled release scale and corrosion inhibitor is fed whenever your spray water pump is energized, keeping your system protected anytime the spray water pump is operating. **Smart Shield®** is a complete water treatment package that:

- Utilizes 'Bag in Bag' no touch chemical replenishments, making reloads easier and safer.
- Creates reduced packaging, shipping and handling providing a reduced carbon footprint compared to liquid chemicals.
- Eliminates the hazards associated with liquid chemicals, potential for liquid spills and the need for expensive feed pumps making it the easiest and safest chemical water treatment system available today.



LSC-E/LRC Selection Procedure

Two methods of selection are presented, the first is based on the total heat of rejection. The second and more simple method is based on evaporator tons. The evaporator ton method is only applicable to systems with open type reciprocating compressors.

The heat of rejection method is applicable to all but centrifugal compressor applications and is normally used for selecting evaporative condensers for use with hermetic compressors and screw compressors. It can also be used for standard open type reciprocating compressors as an alternate to the evaporator ton method.

The evaporator ton method is based on the estimated heat of compression. **The heat of rejection method of selection is more accurate and should be used whenever possible.**

Refer to the factory for selections on systems with centrifugal compressors.

Heat of Rejection Method

In the heat of rejection method, a factor for the specified operating conditions (condensing temperature and wet bulb) is obtained from Table 1 or 2 and multiplied times the heat of rejection. The resultant figure is used to select a unit from Table 3.

EXAMPLE

Given: 1000 kW evaporator load, ammonia refrigerant, at 36°C condensing temperature, 24°C W.B. temperature with a 300 kW compressor load.

Selection:	Evaporator Load	=	1000 kW
	Compressor Load	=	300 kW
	Total	=	1300 kW
			Heat of Rejection

From Table 2, the capacity factor for 36°C condensing temperature and 24°C wet bulb temperature = 1.20

1300 (Total Heat of Rejection)	x	1.20 (Capacity Factor)	=	1560 (Corrected Heat Rejection Load)

Therefore, from Table 3 select LSC-370E, or LRC-379 depending upon layout, fan kW, and any other design considerations.

Note: For screw compressor selections employing water cooled oil cooling, select a condenser for the total kW as in the example. The condenser can then function in one of two ways:

(1) Recirculating water from the water sump can be used for oil cooling. A separate pump should be employed and the return water should be directed into the water sump at the opposite end from the pump suction.

(2) The condenser coil can be circuited so that water or a glycol-water mixture for the oil cooler can be cooled in a separate section of the coil. Specify load and water flow required.

For refrigerant injection cooled screw compressors, select the condenser in the same manner as shown in the example.

If the oil cooler is supplied by water from a separate source, then the oil cooling load should be deducted from the heat of rejection before making the selection.

LSC-E/LRC Selection Procedure

TABLE 1 R-22 and R-134a Heat Rejection Factors

Condensing Pressure (kPa)		Cond. Temp. (°C)	Wet Bulb Temperature(°C)																
R-22	R-134a		10	12	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1090	669	30	1.07	1.15	1.25	1.38	1.47	1.57	1.69	1.83	2.00	2.23	2.50	2.86	3.36	—	—	—	—	—
1154	718	32	0.94	1.01	1.09	1.19	1.26	1.32	1.40	1.49	1.60	1.74	1.90	2.11	2.36	—	—	—	—	—
1220	759	34	0.85	0.90	0.97	1.04	1.09	1.14	1.20	1.26	1.34	1.43	1.54	1.66	1.81	2.02	2.31	—	—	—
1253	785	35	0.80	0.85	0.91	0.97	1.02	1.06	1.11	1.15	1.21	1.29	1.37	1.46	1.56	1.71	1.89	2.13	2.41	2.77
1287	814	36	0.77	0.81	0.86	0.92	0.96	1.00	1.04	1.07	1.13	1.19	1.26	1.34	1.43	1.56	1.71	1.90	2.14	2.43
1359	856	38	0.70	0.74	0.78	0.82	0.85	0.88	0.90	0.93	0.96	1.01	1.06	1.11	1.18	1.26	1.35	1.47	1.62	1.78
1431	915	40	0.65	0.67	0.70	0.73	0.76	0.78	0.80	0.83	0.86	0.89	0.93	0.97	1.02	1.08	1.14	1.22	1.32	1.44
1508	978	42	0.59	0.62	0.64	0.67	0.68	0.70	0.72	0.74	0.77	0.80	0.83	0.86	0.89	0.94	0.98	1.04	1.11	1.19
1587	1026	44	0.54	0.56	0.59	0.61	0.62	0.63	0.65	0.66	0.68	0.70	0.73	0.75	0.78	0.82	0.85	0.89	0.92	0.97

TABLE 2 Ammonia (R-717) Heat Rejection Factors

Condensing Pressure (kPa)	Cond. Temp. (°C)	Wet Bulb Temperature(°C)																	
		10	12	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1063	30	0.95	1.03	1.12	1.23	1.31	1.40	1.51	1.63	1.79	1.99	2.24	2.56	3.00	—	—	—	—	—
1133	32	0.84	0.90	0.97	1.06	1.12	1.18	1.25	1.32	1.43	1.55	1.70	1.88	2.11	—	—	—	—	—
1206	34	0.76	0.81	0.86	0.93	0.98	1.02	1.07	1.12	1.19	1.28	1.38	1.48	1.61	1.80	2.06	—	—	—
1245	35	0.71	0.76	0.81	0.87	0.91	0.95	0.99	1.03	1.08	1.15	1.23	1.30	1.39	1.53	1.69	1.90	2.15	2.47
1284	36	0.69	0.73	0.77	0.82	0.86	0.89	0.92	0.96	1.01	1.07	1.13	1.20	1.28	1.39	1.53	1.70	1.91	2.17
1365	38	0.63	0.66	0.69	0.73	0.76	0.78	0.81	0.83	0.86	0.90	0.94	0.99	1.05	1.12	1.21	1.31	1.44	1.59
1451	40	0.58	0.60	0.62	0.65	0.67	0.70	0.72	0.74	0.76	0.80	0.83	0.87	0.91	0.96	1.02	1.09	1.18	1.29
1539	42	0.53	0.55	0.57	0.60	0.61	0.63	0.64	0.66	0.68	0.71	0.74	0.76	0.80	0.84	0.88	0.93	0.99	1.06
1630	44	0.49	0.50	0.52	0.54	0.56	0.56	0.58	0.59	0.61	0.63	0.65	0.67	0.70	0.73	0.76	0.79	0.83	0.86

TABLE 3 Unit Heat Rejection Capacity

LSC-E - Centrifugal Fan Models

Model	kW Base	Model	kW Base	Model	kW Base	Model	kW Base	Model	kW Base
LSC-36E	155	**LSC-210E**	905	**LSC-400E**	1723	**LSC-620E**	2671	**LSC-960E**	4136
LSC-41E	177	**LSC-225E**	969	**LSC-410E**	1766	**LSC-625E**	2693	**LSC-980E**	4222
LSC-48E	207	**LSC-240E**	1034	**LSC-430E**	1853	**LSC-650E**	2800	**LSC-1000E**	4308
LSC-54E	233	**LSC-250E**	1077	**LSC-431E**	1857	**LSC-660E**	2843	**LSC-1020E**	4394
LSC-65E	280	**LSC-280E**	1206	**LSC-450E**	1939	**LSC-690E**	2973	**LSC-1030E**	4437
LSC-70E	302	**LSC-281E**	1211	**LSC-460E**	1982	**LSC-691E**	2977	**LSC-1060E**	4567
LSC-75E	323	**LSC-295E**	1271	**LSC-475E**	2046	**LSC-720E**	3102	**LSC-1080E**	4653
LSC-80E	345	**LSC-300E**	1292	**LSC-480E**	2068	**LSC-721E**	3106	**LSC-1100E**	4739
LSC-90E	388	**LSC-310E**	1335	**LSC-490E**	2111	**LSC-755E**	3253	**LSC-1120E**	4825
LSC-100E	431	**LSC-315E**	1357	**LSC-500E**	2154	**LSC-770E**	3317	**LSC-1180E**	5084
LSC-110E	474	**LSC-330E**	1422	**LSC-510E**	2197	**LSC-800E**	3447	**LSC-1250E**	5385
LSC-120E	517	**LSC-335E**	1443	**LSC-515E**	2219	**LSC-805E**	3468	**LSC-1310E**	5644
LSC-135E	582	**LSC-345E**	1486	**LSC-530E**	2283	**LSC-820E**	2533	**LSC-1380E**	5945
LSC-150E	646	**LSC-355E**	1530	**LSC-540E**	2326	**LSC-860E**	3705	**LSC-1440E**	6204
LSC-155E	668	**LSC-360E**	1551	**LSC-550E**	2369	**LSC-861E**	3709	**LSC-1510E**	6505
LSC-170E	732	**LSC-370E**	1594	**LSC-560E**	2413	**LSC-900E**	3877	**LSC-1610E**	6936
LSC-185E	797	**LSC-385E**	1659	**LSC-590E**	2542	**LSC-920E**	3964		
LSC-200E	862	**LSC-386E**	1663	**LSC-591E**	2546	**LSC-950E**	4093		

LRC - Centrifugal Fan Models

Model	kW Base	Model	kW Base	Model	kW Base	Model	kW Base	Model	kW Base
LRC-25	108	**LRC-65**	280	**LRC-128**	552	**LRC-211**	909	**LRC-269**	1159
LRC-27	116	**LRC-72**	310	**LRC-131**	564	**LRC-213**	918	**LRC-287**	1236
LRC-29	125	**LRC-76**	327	**LRC-140**	603	**LRC-225**	969	**LRC-300**	1292
LRC-35	151	**LRC-84**	362	**LRC-155**	668	**LRC-227**	978	**LRC-321**	1383
LRC-38	164	**LRC-91**	392	**LRC-174**	750	**LRC-233**	1004	**LRC-336**	1447
LRC-42	181	**LRC-101**	435	**LRC-183**	788	**LRC-240**	1034	**LRC-361**	1555
LRC-48	207	**LRC-108**	465	**LRC-188**	810	**LRC-246**	1060	**LRC-379**	1633
LRC-51	220	**LRC-114**	491	**LRC-190**	819	**LRC-249**	1073		
LRC-58	250	**LRC-116**	500	**LRC-201**	866	**LRC-255**	1099		

Note: Table 3 presents only the standard model selections.Other models exist for special fan power or layout applications.Please consult the factory or EVAPCO Representative for the special situations.

The heat of rejection in Table 3 is based on R-22 or R-134a standard conditions of 40.6°C(105°F) condensing and 25.6°C(78°F) wet bulb.

LSC-E/LRC Selection Procedure

Evaporator Ton Method

In the evaporator ton method, factors for the specified operating conditions (suction temperature, condensing temperature and wet bulb) are obtained from either Table 5 or 6 and multiplied times the heat load in tons. The resultant figure is used to select a unit from Table 4. The condenser model in Table 4 is equal to the unit capacity in evaporator tons for R-22 or R-134a conditions of 40.6°C (105°F) condensing, 4.4°C (40°F) suction and 25.6°C (78°F) wet bulb.

EXAMPLE

Given: 200 ton evaporator load, R-717, condensing at 35°C (95°F), with -12.2°C (+10°F) suction and 24.4°C (76°F) wet bulb temperatures.

Selection: The capacity factor from Table 6 for the given condensing and wet bulb conditions is 1.38, and the capacity factor for the suction temperature of -12.2°C (+10°F) is 1.03, so the corrected capacity required may be determined as:

200 X 1.38 X 1.03 = 284 corrected tons. Therefore, select a model LSC-300E or LRC-287 depending on unit type desired, and any layout or horsepower considerations.

Table 4 - Unit Sizes

LSC-E Models [1]			
LSC-36E	LSC-281E	LSC-510E	LSC-900E
LSC-41E	LSC-295E	LSC-515E	LSC-920E
LSC-48E	LSC-300E	LSC-530E	LSC-950E
LSC-54E	LSC-310E	LSC-540E	LSC-960E
LSC-65E	LSC-315E	LSC-550E	LSC-980E
LSC-70E	LSC-330E	LSC-560E	LSC-1000E
LSC-75E	LSC-335E	LSC-590E	LSC-1020E
LSC-80E	LSC-345E	LSC-591E	LSC-1030E
LSC-90E	LSC-355E	LSC-620E	LSC-1060E
LSC-100E	LSC-360E	LSC-625E	LSC-1080E
LSC-110E	LSC-370E	LSC-650E	LSC-1100E
LSC-120E	LSC-385E	LSC-660E	LSC-1120E
LSC-135E	LSC-386E	LSC-690E	LSC-1180E
LSC-150E	LSC-400E	LSC-691E	LSC-1250E
LSC-155E	LSC-410E	LSC-720E	LSC-1310E
LSC-170E	LSC-430E	LSC-721E	LSC-1380E
LSC-185E	LSC-431E	LSC-755E	LSC-1440E
LSC-200E	LSC-450E	LSC-770E	LSC-1510E
LSC-210E	LSC-460E	LSC-800E	LSC-1610E
LSC-225E	LSC-475E	LSC-805E	
LSC-240E	LSC-480E	LSC-820E	
LSC-250E	LSC-490E	LSC-860E	
LSC-280E	LSC-500E	LSC-861E	

LRC Models [1]			
LRC-25	LRC-76	LRC-174	LRC-246
LRC-27	LRC-84	LRC-183	LRC-249
LRC-29	LRC-91	LRC-188	LRC-255
LRC-35	LRC-101	LRC-190	LRC-269
LRC-38	LRC-108	LRC-201	LRC-287
LRC-42	LRC-114	LRC-211	LRC-300
LRC-48	LRC-116	LRC-213	LRC-321
LRC-51	LRC-128	LRC-225	LRC-336
LRC-58	LRC-131	LRC-227	LRC-361
LRC-65	LRC-140	LRC-233	LRC-379
LRC-72	LRC-155	LRC-240	

[1]**Note:** The condenser model in Table 4 is equal to the capacity in evaporator tons for R-22 or R-134a conditions of 40.6˚C (105˚F) condensing, 4.4˚C (40˚F) suction and 25.6˚C (78˚F) wet bulb.

LSC-E/LRC Selection Procedure

Table 5 - R-22 and R-134a Capacity Factors

Condensing Pres. (kPa)		Cond. Temp. °C	Wet Bulb Temperature, (°C)																	
R-22	R-134a		10	12	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1090	669	30	1.02	1.10	1.19	1.32	1.41	1.50	1.61	1.74	1.90	2.12	2.38	2.73	3.20	-	-	-	-	-
1154	718	32	0.91	0.97	1.05	1.15	1.21	1.28	1.35	1.43	1.55	1.67	1.83	2.03	2.27	-	-	-	-	-
1220	759	34	0.82	0.88	0.94	1.01	1.06	1.11	1.16	1.22	1.30	1.39	1.50	1.62	1.75	1.96	2.24	-	-	-
1253	785	35	0.78	0.83	0.89	0.95	0.99	1.03	1.08	1.12	1.18	1.26	1.34	1.43	1.52	1.67	1.85	2.08	2.35	2.70
1287	814	36	0.75	0.80	0.85	0.90	0.94	0.98	1.01	1.05	1.11	1.17	1.24	1.32	1.40	1.53	1.68	1.86	2.09	2.38
1359	856	38	0.69	0.73	0.77	0.81	0.84	0.87	0.89	0.92	0.96	1.00	1.05	1.10	1.17	1.25	1.34	1.45	1.60	1.76
1431	915	40	0.64	0.67	0.70	0.73	0.75	0.78	0.80	0.83	0.86	0.89	0.93	0.97	1.01	1.07	1.14	1.22	1.32	1.44
1508	978	42	0.60	0.62	0.64	0.67	0.69	0.71	0.73	0.75	0.77	0.80	0.83	0.86	0.90	0.94	0.99	1.05	1.11	1.19

Suction Temp. °C		-28.9	-23.3	-17.8	-12.2	-6.7	-1.1	4.4	10.0
Suction Press. (kPa)	R-22	69.6	113.8	165.5	226.1	296.5	378.5	472.3	579.2
	R-134a	-12.4	13.1	44.8	82.0	126.9	180.0	241.3	313.0
Capacity Factor		1.22	1.17	1.13	1.09	1.06	1.03	1.00	0.97

Table 6 - Ammonia (R-717) Capacity Factors

Condensing Pres. (kPa)	Cond. Temp. °C	Wet Bulb Temperature, (°C)																		
		10	12	14	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1063	30	0.96	1.03	1.12	1.24	1.32	1.41	1.52	1.65	1.80	2.00	2.25	2.57	3.02	-	-	-	-	-
1133	32	0.85	0.92	0.99	1.08	1.14	1.20	1.27	1.35	1.45	1.57	1.72	1.91	2.14	-	-	-	-	-
1206	34	0.78	0.83	0.88	0.95	1.00	1.05	1.10	1.15	1.22	1.31	1.41	1.52	1.66	1.85	2.11	-	-	-
1245	35	0.74	0.78	0.83	0.89	0.94	0.98	1.02	1.06	1.11	1.19	1.27	1.34	1.44	1.58	1.75	1.96	2.22	2.56
1284	36	0.71	0.75	0.80	0.85	0.89	0.92	0.96	0.99	1.04	1.10	1.17	1.24	1.32	1.43	1.57	1.75	1.97	2.24
1365	38	0.65	0.69	0.72	0.76	0.79	0.82	0.84	0.86	0.90	0.94	0.98	1.03	1.10	1.17	1.26	1.37	1.51	1.66
1451	40	0.60	0.63	0.66	0.69	0.71	0.74	0.76	0.77	0.80	0.84	0.88	0.92	0.95	1.01	1.07	1.15	1.24	1.35
1539	42	0.56	0.58	0.60	0.63	0.65	0.67	0.69	0.70	0.73	0.76	0.78	0.81	0.84	0.89	0.94	0.99	1.05	1.12

Suction Temp. °C	-34.4	-28.9	-23.3	-17.8	-23.3	-6.7	-1.1	4.4
Suction Press. (kPa)	-11.0	24.8	62.1	108.2	164.1	231.0	310.3	404.0
Capacity Factor	1.18	1.14	1.10	1.07	1.03	1.00	0.97	0.95

Note: Table 4 presents only the standard model selections. Other models exist for special fanpower or layout applications. Please consult the factory or EVAPCO Representative for the special situations.

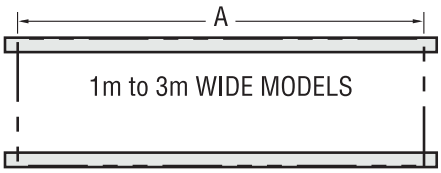
LSC-E/LRC Steel Support

EVAPCO LSCE/LRC condensers are designed to be supported with structural "I" beams located under the outer flanges and running the entire length of the unit. Mounting holes, 19mm in diameter are located in the bottom channels of the pan section to provide for bolting to the structural steel. (Refer to certified drawings from the factory for bolt hole locations.)

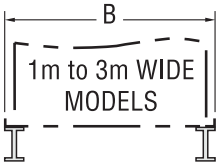
Beams should be level to within 1.5mm in 1m before setting the unit in place. Do not level the unit by shimming between it and the "I" beams as this will not provide proper longitudinal support.

Note: Consult IBC for required steel support layout and structural design.

Plan View



End Elevation

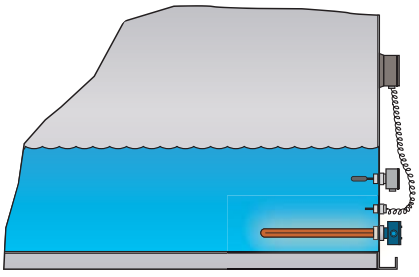


LSC-E DIMENSIONS		
1.2m Wide Models	**A**	**B**
LSC-36E to 80E	1826	1238
LSC-90E to 120E	2724	1238
LSC-135E to 170E	3651	1238
1.6m Wide Models	**A**	**B**
LSC-185E to 250E	3645	1652
LSC-280E to 385E	5483	1652
2.4m Wide Models	**A**	**B**
LSC-281E to 286E	3651	2388
LSC-410E to 560E	5486	2388
LSC-591E to 770E	7341	2388
LSC-820E to 1120E	11024	2388
3m Wide Models	**A**	**B**
LSC-400E to 515E	3651	2991
LSC-550E to 805E	5493	2991
LSC-800E to 1030E	7347	2991
LSC-1100E to 1610E	11036	2991

LRC DIMENSIONS		
1m Wide Models	**A**	**B**
LRC-25 to 72	3096	1029
1.5m Wide Models	**A**	**B**
LRC-76 to 114	3731	1540
LRC-108 to 183	4629	1540
LRC-190 to 246	5553	1540
2.4m Wide Models	**A**	**B**
LRC-188 to 269	4629	2388
LRC-249 to 379	5553	2388

Electric Heaters

Electric immersion heaters are available factory installed in the basin of the condenser. They are sized to maintain a +4°C to +5°C pan water temperature with the fans off and an ambient air temperature of -18°C. They are furnished with a thermostat a low water protection device to cycle the heater on when required and to prevent the heater elements from energizing unless they are completely submerged. All components are in weather proof enclosures for outdoor use. The heater power contactors and electric wiring are not included as standard.



LSC-E Basin Heater Sizing			
Unit	**kW (-18˚C)**	**kW (-29˚C)**	**kW (-40˚C)**
LSC-36E to 80E	(1) 2	(1) 3	(1) 4
LSC-90E to 120E	(1) 3	(1) 4	(1) 5
LSC-135E to 170E	(1) 3	(1) 5	(1) 7
LSC-185E to 250E	(1) 4	(1) 6	(1) 8
LSC-280E to 385E	(2) 3	(2) 4	(1) 12
LSC-281E to 286E	(1) 5	(1) 8	(1) 10
LSC-410E to 560E	(2) 4	(2) 6	(2) 7
LSC-591E to 770E	(2) 5	(2) 7	(2) 10
LSC-820E to 1120E	(2) 7	(2) 12	(2) 15
LSC-400E to 515E	(1) 7	(1) 10	(1) 15
LSC-550E to 805E	(2) 5	(2) 7	(2) 10
LSC-800E to 1030E	(2) 7	(2) 10	(2) 15
LSC-1100E to 1610E	(2) 10	(4) 7	(4) 9

LRC Basin Heater Sizing			
Unit	**kW (-18˚C)**	**kW (-29˚C)**	**kW (-40˚C)**
LRC-25 to 72	(1) 2	(1) 3	(1) 4
LRC-76 to 114	(1) 3	(1) 5	(1) 6
LRC-108 to 183	(1) 4	(1) 6	(1) 8
LRC-190 to 246	(1) 6	(1) 8	(1) 12
LRC-188 to 269	(1) 7	(1) 9	(1) 12
LRC-249 to 379	(1) 9	(1) 12	(1) 16

LSC-E/LRC Optional Equipment

Self Supporting Service Platforms

Some LSC-E/LRC condensers are available with self-supporting service platforms that include access ladders which are designed for easy field installation. This option offers significant savings in comparison to field constructed, externally supported catwalks. The EVAPCO service platform option may be installed on either side or the end opposite the connections.

Multiple Circuit Coils

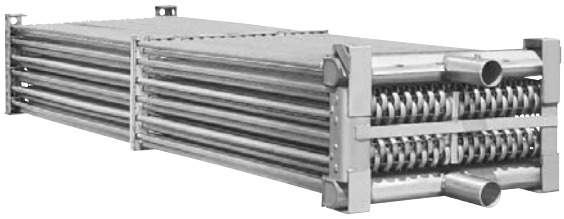
Condensers may be supplied with multiple circuit coils to match various system requirements such as split systems, or if a glycol or water circuit is desired for compressor head cooling.

ASME Coils

Evaporative condensers can be furnished with condensing coils manufactured in accordance with the ASME Pressure Vessel Code Section VIII, Division I. Coils built with this option will bear a ASME-stamp U designator indicating their compliance with the ASME code.

TITAN Coils – Stainless Steel Construction

EVAPCO offers the options of Type 304L or Type 316L stainless steel construction using the Thermal Pak® II coil design. Highly efficient heat transfer coils with the ultimate corrosion resistance and protection with five-year coil warranty.



Electric Water Level Control

Evaporative condensers may be ordered with an electric water level control in lieu of the standard mechanical float and make-up assembly. This package provides accurate control of water levels and does not require field adjustment.

Two Speed Motors

Two speed fan motors can provide an excellent means of capacity control. In periods of lightened loads or reduced wet bulb temperatures, the fans can operate at low speed, which will provide about 60% of full speed capacity, yet consume only about 15% of the power compared with high speed. In addition to the energy savings, the sound levels of the units will be greatly reduced at low speed.

Pony Motors

In addition to two speed fan motors, variable frequency drives (VFD's) and fan cycling on multiple motor units, pony motors are available as another capacity control method. Pony motors are smaller fan motors for use in times of reduced loading. The pony motor is typically 1/4 the kW of the primary motor and can significantly reduce energy requirements.

Remote Sump Configuration

For units operating in areas where temperatures may be very low, or where low temperatures may occur during periods when the unit is not operating, a sump located inside the building is the preferred means of ensuring that the basin water will not freeze. For these applications, the condenser will be supplied without the spray pump, suction strainers and all associated piping, but with an oversize bottom outlet.

Water Level Indicator

Condensers may be supplied with a water level indicator to provide a visual indication of basin water level without opening access doors or air inlet louvers. The level indicator can be furnished with an optional low and high level alarm switches or a transmitter for continuous level monitoring.

Screened Bottom Panels

Protective inlet screens are provided on the sides and/or end of the unit's air intake. Screens are not provided below the fan section since most units are mounted on the roof or at ground level. It is recommended that bottom screens be added to the unit when it will be elevated. These screens can be provided by the factory at an additional cost or added by the installing contractor.

Solid Bottom Panels for Ducted Installations

When centrifugal fan units are installed indoors and intake air is ducted to the unit, a solid bottom panel is required to completely enclose the fan section and prevent the unit from drawing air from the room into the fan intakes. When this option is ordered, air inlet screens are omitted.

Sound Attenuation Package

For extremely noise-sensitive applications, centrifugal fan models may be supplied with intake and/or discharge attenuation packages which greatly reduce sound levels. Oversize fan motors are required for this option in order to overcome the additional static pressure.

Oversized Access Door

For enhanced basin access, the Oversized Access Door option is available on LSC-E models LSC-400E through LSC-1610E. This option enables maintenance personnel to easily enter the basin for routine maintenance or for float valve adjustment.

LSC-E/LRC Product Applications

Design

LSC-E/LRC Condensers are of heavy-duty construction and designed for long trouble-free operation. Proper equipment selection, installation and maintenance is, however, necessary to ensure good unit performance. Some of the major considerations in the application of a cooler are presented below. For additional information, contact the factory.

Air Circulation

In reviewing the system design and unit location, it is important that proper air circulation be provided. The best location is on an unobstructed roof top or on ground level away from walls and other barriers. Care must be taken when locating condensers in wells or enclosures or next to high walls. The potential for recirculation of hot, moist discharge air back into the fan intake exists. Recirculation raises the wet bulb temperature of the entering air causing the tower pressure to rise above the design. For these cases, a discharge hood or ductwork should be provided to raise the overall unit height even with the adjacent wall, thereby reducing the chance of recirculation. Good engineering practice dictates that the cooling tower's discharge air not be directed or located close to or in the vicinity of building air intakes. Engineering assistance is available from the factory to identify potential recirculation problems and recommend solutions.

For additional information regarding layout of cooling towers, see EVAPCO Bulletin entitled *"Equipment Layout"*.

Piping

Condenser piping should be designed and installed in accordance with generally accepted engineering practice. All piping should be anchored by properly designed hangers and supports with allowance made for possible expansion and contraction. No external loads should be placed upon condenser connections, nor should any of the pipe supports be anchored to the unit framework. For additional information concerning refrigerant pipe sizing and layout, see EVAPCO Bulletin entitled *"Piping Evaporative Condensers"*.

Recirculating Water Quality

Proper water treatment is an essential part of the maintenance required for evaporative cooling equipment. A well designed and consistently implemented water treatment program will help to ensure efficient system operation while maximizing the equipment's service life. A qualified water treatment company should design a site specific water treatment protocol based on equipment (including all metallurgies in the cooling system), location, makeup water quality, and usage.

Bleed off

Each unit supplied with a pump mounted on the side is furnished with a clear bleed line for visual inspection and a valve which, when fully open, will bleed-off the proper amount of water. If the make-up water supplying the unit is relatively free of impurities, it may be possible to cut back the bleed, but the unit must be checked frequently to make sure scale is not forming. Make-up water pressure should be maintained between 140 and 340 kPa.

Water Treatment

A proper water treatment program is an essential part of routine maintenance in order to help assure proper operation and longevity of the unit. To help prevent the formation of "white rust", the interior of the unit should be passivated during start-up and monitored periodically as part of the water treatment program. For more information about white rust, please request a copy of EVAPCO Engineering Bulletin 36. A qualified water treatment company should be contacted to design a water treatment protocol specifically based on applicable location, water quality and unit materials of construction.

If acid is used for treatment, it should be accurately metered and the concentration properly controlled. **The pH of the water should be maintained between 6.5 and 8.0. Units constructed of galvanized steel operating with circulating water having a pH of 8.3 or higher will require periodic passivation of the galvanized steel to prevent the formation of "white rust".**

Batch chemical feeding is not recommended because it does not afford the proper degree of control. If acid cleaning is required extreme caution must be exercised and only inhibited acids recommended for use with galvanized construction should be used.

NOTE: Operating the condenser below 6.0 pH for any period of time may cause the removal of the protective zinc coating on the galvanized steel components.

For more information see EVAPCO Bulletin entitled **"Maintenance Instructions"**.

Control of Biological Contaminants

Water quality should be checked regularly for biological contamination. If biological contamination is detected, a more aggressive water treatment and mechanical cleaning program should be undertaken. The water treatment program should be performed in conjunction with a qualified water treatment company. It is important that all internal surfaces be kept clean of accumulated dirt and sludge. In addition, the drift eliminators should be maintained in good operating condition.

LSC-E/LRC SPECIFICATIONS

Furnish and install, as shown on the plans, an EVAPCO model _____ evaporative condenser. Each unit shall have condensing capacity of _____ kW heat rejection, operating with _____ refrigerant at _____ °C condensing temperature and _____ °C design wet bulb temperature.

Cold Water Basin – LRC

The complete cold water basin shall be constructed of G-235 hot-dip galvanized stainless steel for long life and durability.

Standard cold water basin accessories shall include G-235 galvanized stainless steel overflow, drain, anti-vortexing hood, strainers, brass make-up valve with unsinkable, foam filled plastic float and wastewater bleed line with adjustable valve.

Casing and Fan Section – LRC

The casing and fan section shall be constructed of G-235 galvanized steel for long life and durability. Fan section shall include fans, motors and drives. The entire drive system (including fans, motors, sheaves and belts) shall be located in the dry entering airstream.

Pan and Casing – LSC-E

The pan and casing shall be constructed of G-235 hot-dip galvanized steel for long life and durability. The heat transfer section shall be removable from the pan to provide easy handling and rigging.

The pan/fan section shall include fans, motors and drives mounted and aligned at the factory. These items shall be located in the dry entering air stream to provide maximum service life and easy maintenaince. Standard pan accessories shall include circular access doors, stainless steel strainers, wastewater bleed line with adjustable valve and brass makeup valve, with an unsinkable foam filled plastic float.

Centrifugal Fan Drives

Fans shall be forwardly curved centrifugal type of hot-dip galvanized construction. The fans shall be factory installed into the pan-fan section, and statically and dynamically balanced for vibration free operation. Fans shall be mounted on a hollow steel shaft with forged bearing journals. The fan shaft shall be supported by heavy-duty, self aligning bearings with cast-iron housings and lubrication fittings for maintenance.

The fan drive shall be V-belt type with taper lock bushings designed for 150% of motor nameplate horsepower. Drives are to be mounted and aligned at the factory.

Fan Motor

_____ kW totally enclosed fan cooled motor(s) shall be furnished suitable for outdoor service on _____ volts, _____ hertz, and _____ phase. Motor(s) shall be mounted on an adjustable base.

Heat Transfer Coil

The coil(s) shall be all prime surface steel, encased in steel framework with the entire assembly hot-dip galvanized after fabrication. Coil(s) shall be designed for free drainage of liquid refrigerant and tested to 2.69MPa air pressure under water.

Water Distribution System

The system shall provide a water flow rate of 4 lps over each square meter of the unit face area to ensure proper flooding of the coil. The spray header shall be constructed of Schedule-40, PVC pipe for corrosion resistance. All spray branches shall be removable and include a threaded end plug for cleaning. The water shall be distributed over the entire coil surface by heavy-duty ABS spray nozzles with large 32mm diameter opening and internal sludge ring to eliminate clogging. Nozzles are threaded into Schedule-40 Polyvinyl Chloride headers equipped with removable end plugs for ease of cleaning. Nozzles shall be threaded into a spray header to provide easy removal for maintenance.

Water Recirculation Pump

The pump(s) shall be a close-coupled, centrifugal type with mechanical seal. _____ kW totally enclosed, motor shall be furnished suitable for outdoor service on _____ volts, _____ hertz, and _____ phase.

Eliminators

The eliminators shall be constructed entirely of PVC that has been specially treated to resist ultra-violet light. Assembled in easily handled sections, the eliminator blades shall incorporate three changes in air direction to assure removal of entrained moisture from the discharge air stream. The maximum drift rate shall not exceed 0.001% of the recirculated water rate.

Finish-LSC-E

All pan and casing materials shall be constructed of G-235 heavy gauge mill hot-dip galvanized steel for maximum protection against corrosion. During fabrication, all panel edges shall be coated with 95% pure zinc-rich compound.

Finish-LRC

All basin, casing and fan section shall be constructed of G-235 heavy gauge mill hot-dip galvanized steel. During fabrication, all galvanized panel edges shall be coated with a 95% pure zinc compound.

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