Electrification Systems

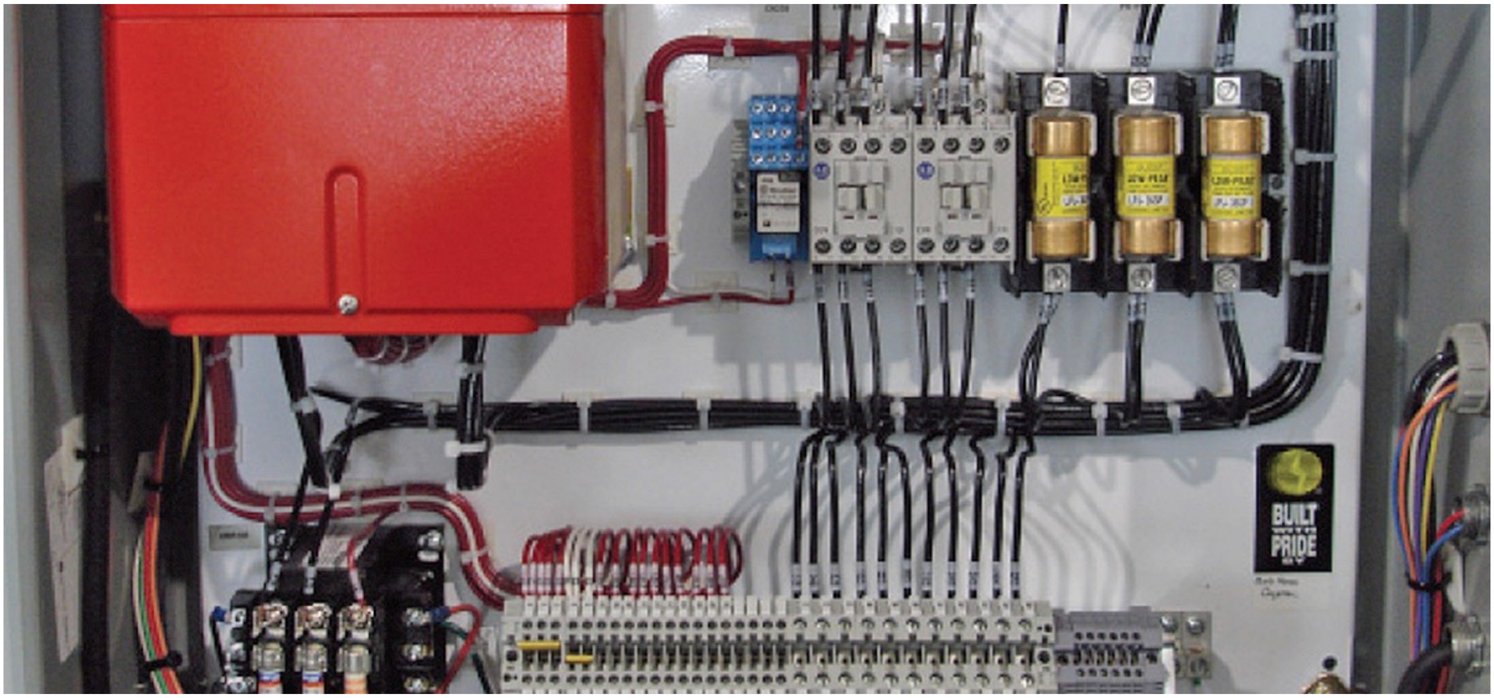
One of the most important components of an overhead crane system is the electrification system. Admittedly, overhead crane electrification can be one of the more complex subject matters. With different types of electrification systems available, and different varieties that exist for each type of system, it can be difficult to determine which electrification method is best for powering your overhead crane.

Our goal for this lesson is to:

- Define terms related to overhead crane electrification
- Breakdown and explain the three main types of overhead crane electrification:
    - Conductor bars
    - Festoon systems
    - Cable reels
- Explain how each crane electrification system works and lay out the different options available for each system
- Discuss the advantages and disadvantages of each crane electrification system
- Identify what types of crane applications or environments each electrification system may be best suited for

Definition of Terms

Before we jump into the different types of electrification options for overhead cranes, let's look at some definitions for terms that may be used throughout this article:



Electric Overhead Traveling Crane

Electrically operated machine for lifting, lowering and transporting loads. It consists of a movable bridge carrying a fixed or movable hoist mechanism and travels on an overhead runway structure.

Power Circuit

Provides energy to lift loads and run the motors that perform work

Control Circuit

Supplies power and includes circuitry to activate the devices that turn the main motors off and on. The crane and hoist are run by a push button type control or radio remote used by the operator. For safety reasons, the control circuit operates at a lower voltage and current to reduce the shock hazard to the operator.

Mainline Conductors

Rigid construction bars, cable festoon system, or cable reel that delivers the mainline power along a runway or monorail track.

Bridge Conductors

Electrical conductors located along the bridge structure of a crane to provide power to the trolley and hoist.

Runway Conductors

Main conductors mounted on, or parallel to, the runway which supplies current to the crane.

Enclosed Conductors

A conductor or group of conductors substantially enclosed to prevent accidental contact.

Collectors

Contacting devices for collecting current from the runway or bridge conductors. Mainline collectors are mounted on the bridge to transmit current from the runway conductors, and the trolley collectors are mounted on the trolley to transmit current from the bridge conductors.

Controller

Device for regulating the power delivered to the motor or other equipment.

Festoon Cables

Looped wires, or more commonly flat cable, that carry power and control across a bridge or along a runway or monorail.

Cable Reels

Also known as electrical cord or power reels, these are one of several alternatives for providing power to electric hoists. Multiple conductor power cable is wrapped around a drum, which rotates to payout or retract the necessary length of cable for the application.

Disconnect

Device where the conductors of a circuit can be disconnected from their power source

Explosion Proof

Electrical specification that includes a variety of components that must be supplied as per the demands of the Group, Class, and Division of the hazardous area in which they are expected to operate

Festoon Stack-Up

When the cables gather together at the end of a rail, it can limit the travel of the components causing the crane or trolley to stop short of it’s full range of travel

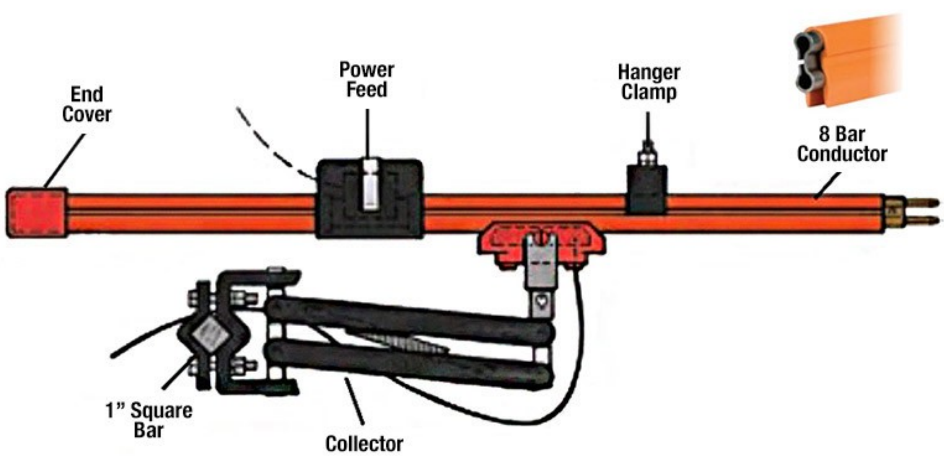
How an Electric Overhead Crane Receives Power

Cable festoons, conductor bars, or cable reels are used to transfer power from the building supply to the crane runway and bridge crane control panel. The same components are then used to supply power across the bridge to the hoist trolley.

An operator controls the movement of the crane and hoist via push button pendants or radio remote controls. All of these components combined allow the bridge and hoist to move into position over the load. Once the load is lifted, the push button pendant or radio remote control are used to drive the bridge crane to its destination and lower the load.

Crane Electrification via Insulated Conductor Bars

Conductor bars (also referred to as power bars, figure eight bars or hot bars) are one of the most common methods of electrifying and supplying power to a crane and hoist. A conductor bar uses a sliding shoe collector system, which removes most of the exposed conductor safety hazards and can supply higher amperage power compared to other power systems.



Today, most conductor bar electrification systems are insulated with a cover. There are some applications where the conductor bar may not be insulated, but the most common types have insulated covers.

Components:

1. **Conductor bar –** the supply of incoming power and/or control along the runway or bridge
2. **Power feed –** attachment of incoming power to the conductor bar
3. **Collector –** a contacting device to collect the electrical current from the conductor bar and forward it to a machine
4. **Brackets –** supporting device for attachment of multiple hangers to the runway or bridge
5. **Hangers –** attach the conductor bar to the brackets
6. **End cover –** safety protection at the end of conductor system
7. **Anchor clamp –** supporting device for directing movement of conductors during thermal expansion and contraction

Advantages:

Conductor bar systems for overhead cranes can be used on both indoor and outdoor cranes and are most typically installed on the crane's runway systems or on monorail cranes. One of the main advantages of using a conductor bar system is that they can be used on runways with more than one bridge operating on them.

They're also very cost-effective and easy to install with many different types of brackets and hanger clamps. In addition, they are ideal for low headroom applications where cables cannot hang down, and for systems that utilize a curve or track switch.

One final advantage is that conductor bars are excellent for crane setups where future upgrades or expansions may be a consideration. Runway systems can be extended easier and with less cost because conductor bars are so easy to connect together for installation. Conductor bars are also the perfect solution for continuation of power in interlocking crane systems.

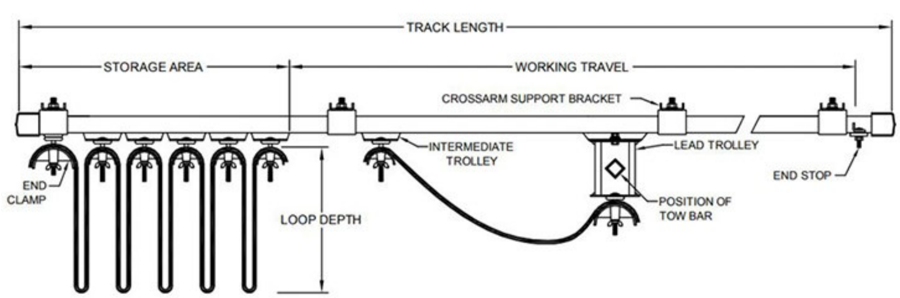
Disadvantages:

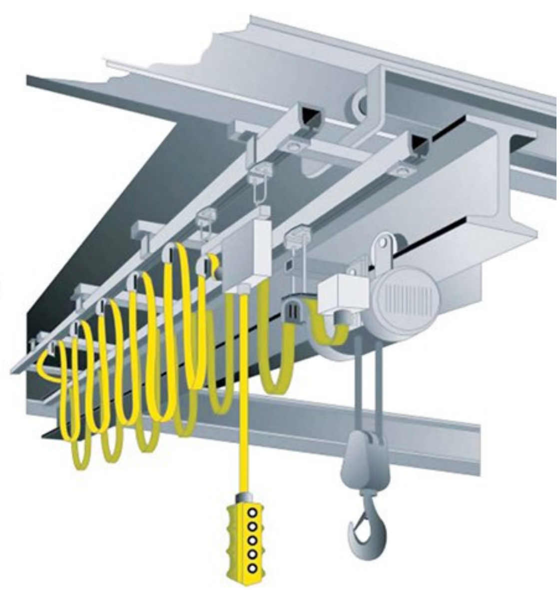
On a conductor bar system, one of the main disadvantages is that the collector shoes can wear out quickly and need to be serviced or replaced often depending on the severity of use.

Another disadvantage is that a conductor bar system can never be utilized in an environment that requires an explosion proof crane, and they should not be used to power transfer carts.

Crane Electrification via Festoon Systems

A festoon electrification system utilizes flat or round cable on a trolley traveling on a C track, square rail, or an I-beam. This method of overhead crane electrification provides direct contact, which provides greater resistance to wear on the system's components.

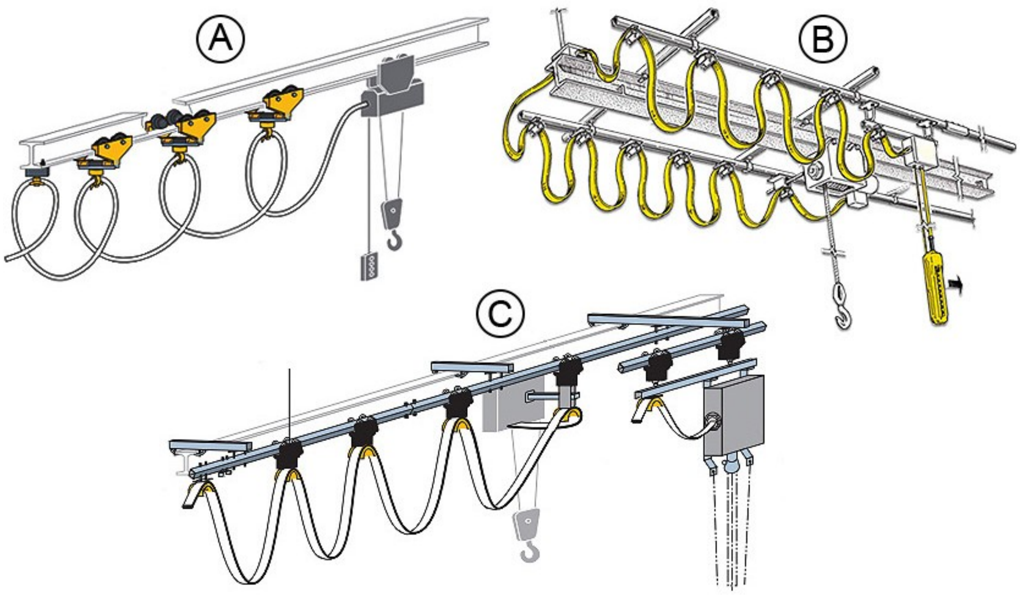




Festoon systems are extremely reliable and can be used in all kinds of applications from indoor to outdoor applications, high heat environments, and in other demanding environments like in mills and at port facilities. They can also be used to safely provide power and control for explosion proof cranes.

Festoon electrification systems are most commonly found on bridge cranes, but can also be used on other types of overhead cranes like gantry cranes, some forms of monorail cranes, and jib cranes. However, some types of festoon track may not be recommended for monorail setups where there may be curves in the rail.

Types of Festoon Systems:



Track-Mounted Cable Festoon Systems – effective cable management in light to medium-duty applications. Track-mounted systems allow you to organize and move cables and/or hoses for power and control circuits. These systems are reliable, efficient, easy to install, and have low maintenance requirements.

- Track material can be made out of galvanized, stainless, or sometimes PVC materials for corrosive environments
- Can be run indoors or outdoors in dusty, dirty, or corrosive environments, in high-temperature environments, and can be used for applications that require an explosion proof design

Square Rail Festoon Systems – Runs on a square or diamond-shaped track. This type of track is especially useful in dirty or dusty environments, can be used indoors or outdoors, and will work for applications that require an explosion proof design.

- Perfect for monorail cranes as it can be configured to work in a straight, curved, or circular track design
- I-Beam Cable Festoon Systems – ideal for medium to high-duty applications and environments. Different carriers available from basic economic versions to custom-design. Ease of maintenance and high-reliability in any operating environment. Pre-assembled systems are available for easier installation.
- Can be configured in a basic economical design or totally customized for specialized systems
- Built for demanding environments like steel mills, plants, and ship to shore cranes. They are simple to install and low-maintenance.

Advantages:

A festoon system organizes and allows cable to stack up without twisting and the trolleys can accommodate multiple layers of cable.

Festoon systems are easy to maintain and have a pretty straight forward design and operation. They are hard-wired to operate in harsh or extreme temperatures and environments and can be configured in basic economic designs to accommodate a few light cables or can be totally customized with more complex cable packages for heavier-duty applications.

Encoder cables (and other types of cables) can also be run to the hoist motor from a control panel on the bridge crane for special and unique applications. Festoon systems may also utilize “plug and play” electrical connections made of male and female pin connector sets that make installation simple and easy.

Disadvantages:

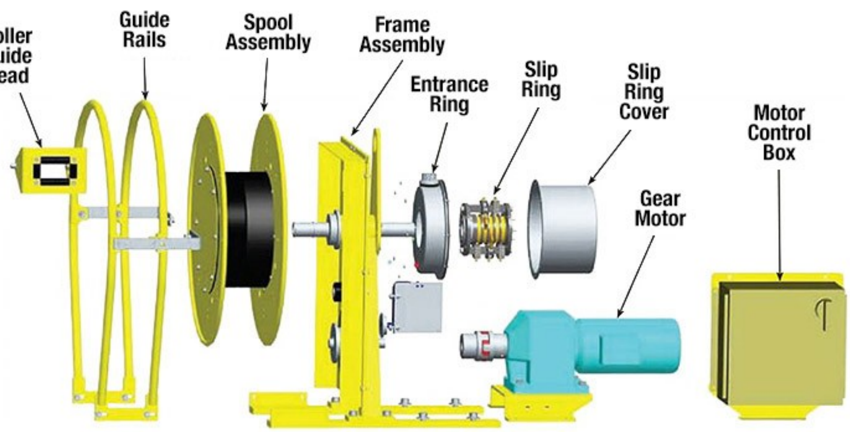
A festoon system is not ideal for use on runways that have multiple bridges. Each bridge must be wired separately which can cause complexities and isn’t a very cost-effective design. In addition, monorail systems that utilize a complex curve or track switch cannot use a standard C track or I-beam rail for power delivery.

Additionally, if the crane has a long runway system or wide span, you can experience festoon cable stack-up which limits the crane or hoist travel near the end stops.

If the environmental factors are not taken into consideration, stressors such as UV, oil, radiation, abrasion, temperature, and friction can cause the cable to degrade over time. Environmental factors must be considered so that the proper materials for the cable and cable jackets are selected during the design and manufacturing processes.

Crane Electrification via Cable Reels

Another type of crane electrification method involves the use of a cable reel—either spring-loaded or motor-driven—to release, retrieve, and store conductor cable for crane equipment. A reel with conductor cable wrapped around it is most often used for mainline power delivery along a runway or monorail. When mounted to a trolley, a cable reel can be used to deliver power and control to a below-the-hook lifting device or other equipment attached to the crane hook.



Cable reels utilize a very simple design that automatically winds and stores flexible cables. Cable reel electrification requires little to no maintenance and is easy to install. They can also be mounted stationary, or on a swivel base to allow the cable to payout in multiple angles and directions.

Advantages:

Cable reels may see limited use for standard crane applications but can provide the right electrification method for special applications in tough environments—both indoor and outdoor. Cable reels are often considered for explosion proof applications or for monorails with lighter capacity hoists. They can also be used for below-the-hook devices requiring electrification.

Cable reels can protect cable against corrosive, acidic, or explosive environments with stainless or galvanized steel construction and powder coated components. They're also great for demanding applications where daily cycles and crane usage are high. These are popular for mobile or heavy-duty gantry cranes and can be used on both electric and pneumatic air systems.

Disadvantages:

You may experience a sag factor which will cause the cable to hang or drop down when the cable is stretched out over a long distance.

As you can see, many different factors can play into selecting the appropriate electrification system for an overhead crane. During the consultation process, an overhead crane manufacturer will work with you to determine which system is best for your needs, by considering the following:

- Type of crane: bridge, gantry, monorail, jib?
- What is being powered: bridge, trolley, runway, below-the-hook device?
- Operating environment: dusty/dirty, temperature, moisture, corrosive?
- Duty cycle and usage of the crane?
- Any special considerations for access/installation, or future maintenance?

Pendant & Radio Controls

On electrified overhead crane systems, the crane's controls allow an operator to direct the movement of the crane and the hoist. The three types of movement that are influenced by a crane's control system are:

- **Crane motion –** moving the crane up and down the runway
- **Hoist positioning –** side-to-side / lateral movement
- **Hoist lifting motion –** moving the hook up and down

There are two ways that a crane can be operated:

1. An operator can control the crane from an exposed or enclosed cab attached to the crane and utilize one or two other co-workers on the ground who help guide and position the load using hand signals.
2. A crane can be controlled by an operator on the floor using a push button pendant system that is attached to the crane itself, or a wireless control that utilizes a radio transmitter and receiver.

Over time, there has been a trend towards moving operators out of the cabs and putting them down on the floor where they're closer to the load—giving the operator increased visibility and better vantage points to lift and lower loads.

With pendant or radio controls, you can operate a crane to lift, position, and lower the load with one person. For years, the standard crane went out with pendant controls, but over time the prices of radio controls have dropped—evening out the cost of both types of control systems.

If a crane operator is trained properly, pendant and radio controls can both be perfectly safe methods for controlling and operating a crane. However, when researching and designing an overhead crane system, our customers frequently ask us whether push button pendant controls or radio controls are better, or which system they might be able to use to upgrade or modernize their overhead crane.

Remote Radio Controls

A wireless remote transmitter with a series of buttons or levers is either held by the operator or is clipped onto a harness or belt worn by the operator. The remote transmitter sends a radio signal to a receiver unit mounted on the crane.

This unit transforms the signal into electrical energy and passes it on to the intermediate relay unit on the crane, and the appropriate contact is activated to then move the crane up and down the runway, move the hoist or trolley side to side, and raise or lower the hook.

Advantages of Using Radio Controls

20-30 years ago, radio controls for an overhead crane system had a pretty bad reputation. They were expensive and also experienced a lot of interference issues that caused control problems—ultimately leading to productivity issues and frustration for the end-user.

Over time, advances in technology have greatly improved the functionality of the transmitter and receiver—becoming a solid and reliable choice for controlling an overhead crane system. Also, as wireless and radio control technologies became more prevalent, the price of these remote systems has reduced drastically—making them more of a cost-effective solution and more in line with the cost of pendant control systems.

Radio controls are battery-operated and can be handheld or designed in a “bellybox” style, where the operator clips it onto their belt or attaches it to a harness or shoulder strap. Both styles can be compact, lightweight, and ergonomically-designed—with multiple speed configurations and intuitive controls.

The main advantage of using a radio control for your overhead crane is that it eliminates the dependence on being tethered to the crane itself—either via cab controls or pendant controls. Because the operator doesn’t have to be near the load to lift, position, or lower it, radio controls can help protect them from hazards like:

- Vapor, smoke, or chemical exposure
- Radiation
- High heat or hot metals
- High voltage / electric shock
- High humidity

Not only can the operator work on the floor safely away from hazards, but they’ll also get a better vantage point to perform the lifts effectively. The operator doesn’t necessarily have to walk with the load as it moves down the crane bay, so radio controls help keep the operator away from trip or fall hazards like obstacles on the floor, workers, and other machinery or equipment in operation. They’re also ideal for higher duty classes like D, E, or F where the crane runs up and down the runways more often, and at a faster rate.

A cost-savings benefit of operating a crane via radio controls is that it offers improved visibility for the operator. With only one operator required to control the crane from the ground, you no longer need a team of two or three workers operating a crane from cab and the floor to lift, move, and lower loads via hand signals. Productivity can also be improved with better visibility—helping with faster load positioning and damage control as the operator can better judge load and clearance obstacles from the ground.

Advanced engineered radio controls can also provide diagnostics and data information to the crane operator or to a service technician who is on site servicing or inspecting an overhead crane. These advanced radio systems can supply data on:

- Runtime usage
- Drives
- Weight on the hook
- Number of picks made
- Diagnostics or fault codes for issues requiring maintenance

In the event of an issue or fault code that requires maintenance, a crane service technician can pull information right off of the radio control rather than having to get up on a lift to dig around and find the cause of the problem.

Disadvantages of Using Radio Controls

Radio crane controls are not recommended for Class A or Class B type cranes that don't get used very often. The reason being that the controls are battery operated and there's an increased chance that the batteries will be dead or won't be charged fully when the crane needs to be operated.

Again, because these controls run off of replaceable or rechargeable batteries, radio controls need to have the batteries checked or replaced often, which can cause headaches for the operator and affect production if not maintained properly.

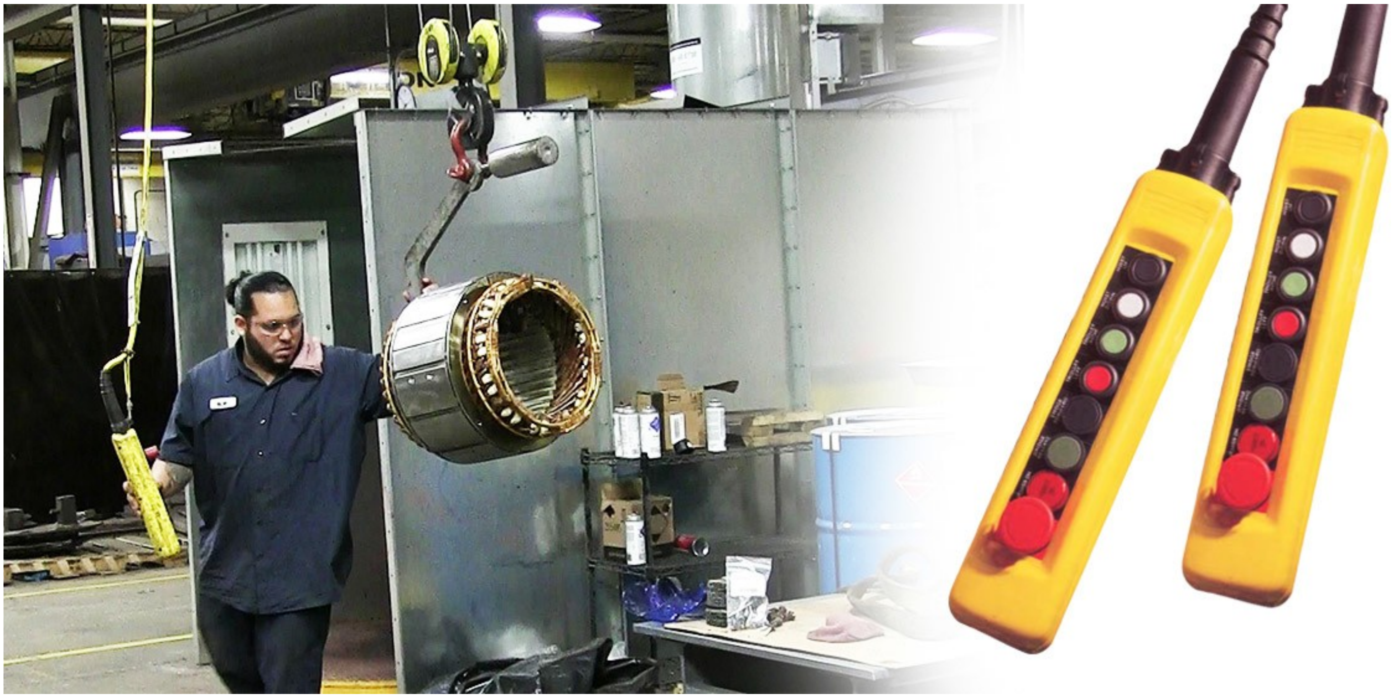
Another disadvantage to using a radio control for controlling an overhead crane is that it is more susceptible to damage because it's a handheld device. Although it's made of sturdy plastic and rubber materials, it can still sustain damage that may affect functionality if dropped repeatedly.

Although not very common, there are environments that create their own radio waves that may interfere with the operation of an overhead crane. An example might be a facility that performs induction heating or induction welding procedures. Radio waves created during these processes may disrupt the communication between the radio's transmitter and receiver.

Finally, because the transmitter is not tethered to the crane, it can be misplaced if a central storage location is not pre-determined.

Pendant Controls for Overhead Cranes

A handheld controller with push buttons is directly wired into the hoist or a separate festoon track and hangs down to be used by the operator. The operator holds the control pendant and walks with the crane and the load as he moves it down the runway.



The operator can also laterally position the hoist and control the up and down lifting movement of the hook using the pendant control.

Advantages of Using Pendant Controls

Years ago, pendant controls used to go out with just about all types of overhead crane systems. As the prices of radio control systems dropped, they became more widely-used. Pendant systems are still very popular today because of their reliability and ergonomic design changes to make them more comfortable for the operator to use. Today's pendant design is a much smaller and lighter piece and can be operated using one hand.

The most important advantage that pendant controls have is their reliability. Because they're hard wired into the hoist or a festoon system, there is no interference between a remote radio transmitter and the receiver.

Due to their rugged design, pendant controls are highly resistant to mechanical damage and contaminants. Some of the benefits of their design include:

- High impact resistance – can't be dropped by the operator, since it's suspended from the crane
- Resistance to corrosion, moisture, dust, dirt, and grime
- Insulated design provides shock resistance
- Ergonomic design for comfort and less fatigue for the operator

Although pendant controls can be used on almost any type of overhead crane, they are ideal for cranes that are in lower duty cycle classes. Because it is hardwired into the electrification system, the crane controls will always have power, so the operator doesn't have to worry about replacing or charging batteries for a crane that doesn't get used too often. Often, pendant controls are the preferred control method for explosion proof cranes.

Compared to radio controls, the pendant is always readily available since it hangs down from the crane itself. The operator doesn't have to worry about finding it or keeping track of it like they would with a radio transmitter.

Disadvantages of Using Pendant Controls

The major disadvantage of using a pendant control is that it puts the operator close to the load at all times. Especially when working with heavy loads and/or hazardous materials like hot metals or chemicals, putting the operator near the load can increase the chance of an accident or exposure to harmful materials.

Another major disadvantage is that the operator has to follow the load along the floor of the facility, and this can increase the risk of a trip or fall hazard. The operator has to be aware of material or obstacles on the floor and also know where their co-workers are working and what machinery or equipment is operating nearby.

Overhead cranes that are in high-use duty cycles, can move up and down the runway quickly and it can be difficult or impossible for the operator to keep up using a pendant system. In situations where a process crane or a Class D, E, or F crane are being used, it's much more practical for the operator to control the crane from a cab or by using a radio control.

Finally, the push button controls can get caught on machines or other obstructions within a crane bay, which can cause the pendant to become disconnected from the crane. In addition, the wires inside the push button cable can break over time due to pulling and catching on obstructions and obstacles as it moves down the crane bay.

Hoist Options

A hoist could be considered the most important component of an overhead crane system because it's the device that actually performs the lifting and lowering of a load. An overhead crane's hoist lifts and lowers a load by means of a drum or lift-wheel, in which chain or wire rope wraps around.

Hoists can be defined by two main characteristics:

- **The lifting medium** (wire rope or chain) used to support the load
- **The power source** (manual / hand-powered, electric-powered, or air-powered) used to perform the lift

There are many different configurations of hoists depending on the lifting medium they use, the power sources used to operate the hoist, and the mounting system. It can be difficult to understand what these different terms mean, and which style is best for your overhead crane system.

Chain Hoists

Chain hoists use metal chain as the lifting medium and perform the lift by pulling the chain through sprockets and then deposit it into a container. Chain hoists are a popular choice because they're relatively low maintenance and can be less expensive than a wire rope hoist system. Chain hoists can be powered manually, electrically, or pneumatically.

While they're a reliable and economical option, chain hoists do have a lower capacity and are more commonly found on lighter duty applications under 5-tons.

The major benefits of using a chain hoist include:

- Ability to change the height of the lift by changing out the chain
- Compact, space-saving design with no drum
- Portable and can tolerate greater levels of abuse
- Capacity up to 25-tons (as standard design)
- Chain can last longer than wire rope

The main disadvantages of using a chain hoist include:

- Limited lifting speed
- Noisier operation
- May be problematic at lift heights above 20 feet

Wire Rope Hoists

Wire rope hoists use wire rope as the lifting medium and perform the lift by wrapping the wire rope cable around a grooved drum. Wire rope hoists can be powered manually, electrically, or pneumatically.

Wire rope is a popular choice in production environments because it can perform lifts at a faster speed, higher heights, and can also be rated for severe duty classifications—Class D, E, and F cranes.

The main advantages of using a wire rope hoist include:

- Offers very fast lifting speeds
- Can be rated to severe duty classifications
- Dominates the market at 10-tons and above
- Quieter and smoother lifting operation

The main disadvantages of using a wire rope hoist include:

- Wire rope may not be as durable as chain in certain instances
- Wire rope drum occupies more space than a chain hoist
- More expensive than chain hoists

Manual Hoists

Manual hoists can be designed in either a chain or wire rope configuration, and are mainly used for occasional lifts where speed of the lift is not a factor. One chain is used to lift and lower the load and the other chain is used to support the load. The chain is pulled using a hand-over-hand motion, or a handheld lever or ratchet, to turn the gears located inside the hoist and deposit the chain in a chain basket.

Manual hoists have a simple design that allows for easy inspection, maintenance, and cleaning. Their compact design allows them to be used in tight quarters, and in applications where electricity is impractical or is not available.

Manual hoists are most often used in rigging, maintenance, construction, automotive, general manufacturing, mining, and oil applications. There are three main types of manual hoists, including:

Hand Chain Hoists

- Ideal for construction, maintenance, automotive, and industrial applications
- Typical capacities can range anywhere from 1/4-ton to 50-ton
- Can be attached to a beam or trolley and utilize a vertical pull to produce a vertical lift
- Spark-resistant design can be accomplished using stainless or bronze hooks, wheels, and chains

Lever Hoists or Ratchet Hoists

- Ideal for construction sites, plant maintenance, and industrial applications
- Design allows the user to pull, lift, and position materials either horizontally or vertically
- Typical capacities can range anywhere from 1/2-ton to 9-ton
- 360° rotation of the lever and top swivel hook for easy rigging
- Compact, portable, and durable design allows it be used in tight quarters

Lineman's Hoist

- Web straps instead of metal rope or chain material allow linemen to work on energized power lines
- Lightweight and one-hand operation
- Designed for precise pulling in tight spots

Electric Hoists

Electric hoists can be designed to use chain or wire rope, and use an electric motor to turn gears located inside the hoist that lift or lower the load. Electric hoists are controlled by push button pendant or radio controls.

Electric hoists are typically hard-wired into the crane's electrification system and utilize 220v/440v or 230v/460v. Light duty electric hoists can utilize 110v and plug directly into a standard outlet.

Electric hoists can be used in a variety of applications and come in numerous types and configurations, but are limited by duty cycle and can't run continuously. The electric motor in the hoist requires a cooling-off period in between uses to ensure that the motor doesn't overheat.

HMI/ASME Hoist Duty Classifications

There are five main duty classifications for electric hoists outlined by HMI/ASME. Each duty cycle classification takes a number of factors into consideration, including the following:

- Average operating time per day
- Load spectrum
- Starts per hour
- Operating periods
- Equipment life

See the chart below for guidelines on hoist duty cycle classifications based on lifting application, max run time, and max number of starts for uniformly distributed and infrequent work periods.

Hoist Duty Class	Typical Areas of Application	Operating Time Ratings at 65% Mean Load Factor			
		Uniformally Distributed Work Periods		Infrequent Work Periods	
		Max On Time Min/Hour	Max No. Starts/Hour	Max On Time from Cold Start	Max Number Starts
H1 Infrequent Handling or Standby	Powerhouse and utilities, infrequent handling. Hoists used primarily to install and service heavy equipment, loads frequently approach capacity and hoist idle for long periods between use.	7.5 mins (12.5%)	75	15 mins	100
H2 Light Use	Light machine shop fabricating, service and maintenance; loads and utilization randomly distributed; rated loads infrequently handled. Total running time not over 12.5% of the work period.	7.5 mins (12.5%)	75	15 mins	100
H3 Standard Use	General machine shop fabricating, assembly, storage, and warehousing; loads and utilizatiopn randomly distributed. Total running time not over 25% of work period.	15 mins (25%)	150	30 mins	200
H4 Heavy Use	High volume handling of heavy loads, frequently near rated load in steel warehousing, machine and fabricating shops, mills, and foundries, with total running time not 50% of the work period. Manual or automatic cycling operations of lighter loads with rated loads infrequently handled such as in heat treating or plating operations, with total running time frequently 50% of the work period.	30 mins (50%)	300	30 mins	300
H5 Severe Use	Bulk handling of material in combination with buckets magnets, or other heavy attachments. Equipment can often be cab operated. Duty cycles approaching continuous operations are frequently necessary. User must specify exact details of operation, including weight of attachments.	60 mins (100%)	600	N/A	N/A

Electric Chain Hoists

- Ideal for manufacturing, power generation, and industrial facilities
- Come in a number of different configurations with different options
- Consider the following when determining the hoist duty cycle, number of lifting speeds, and environment in which it will be used:
  - Lifts per hour
  - Capacity at which you are lifting
  - Amount of time the hoist is in operation

Electric Wire Rope Hoists

- Ideal for industrial, hazardous, spark-resistant, and many other applications
- Light and heavy duty models are available
- Preferred for strength and performance and variety of capacities and lifts

Pneumatic (Air) Hoists

Pneumatic hoists, often referred to as air hoists, utilize a rotary or piston-driven motor powered by compressed air. Air passes through the system and cools the hoist as it operates, so air hoists can run continuously without rest or risk of overheating—unlike an electric hoist system.

Air hoists are ideal for industrial and heavy-duty production environments and perform exceptionally well in high-speed and heavy-usage environments with constant start and stop. They have a high lifting capacity (up to 100 tons) and are unaffected by high-heat environments. Air hoists are frequently used in explosion proof environments and can be configured to be spark-resistant using brass or stainless components.

A pneumatic air hoist is only as good as the quality of the air, air flow, and pressure that it receives for it to work at its rated capacity and performance.

Air Chain Hoists

- Offer rugged construction, minimum headroom, low maintenance, and are impervious to dust and humidity—making them ideal for manufacturing, power, and industrial facilities
- Excel in places where safety is paramount because compressed air does not generate sparks, making it the preferred choice in hazardous areas
- Allows for variable speed controls and precise load spotting where heavy items are lifted and positioned as part of production or warehousing

Air Wire Rope Hoists

- Strength and productivity for lifting and position virtually any load
- Available in a wide range of capacities and lifts to suit any industrial, spark-resistant, or hazardous application

Built Up Hoists

Built up hoists are highly-engineered and completely integrated systems that are used primarily on Class D, E, and F cranes. These hoist systems operate on process cranes and are built to withstand high-output production and demanding industrial environments. No two built up hoist systems are alike as they're completely customized for the job at hand.

Some of the applications where a built up hoist might be utilized include:

- Automation
- Bucket hoists
- Ladle and charging hoists
- Explosion proof hoists
- Magnet service
- Wet and dry end paper-mill service
- Turbine handling
- Critical lifts
- Die flipping and metal coil handling

A built up hoist consists of robust and specially-designed components that are designed to work together to accomplish a very specific and precise lift. Some of these components include:

- Drums
- Motor
- Gear box
- Couplings
- Sheaves
- Encoder
- Brakes
- Limit switches
- Drives and control systems
- Festooning

Many of these components are precision-machined to very specific tolerances and designed to last so they can perform a complex or critical lift over and over again. The materials used on a built up hoist are often high alloy, heat-treated/hardened, and precision welded to reduce stress, fatigue, and distortion within the system.

Advantages of a Built Up Hoist

Package hoist systems are primarily designed to be used on lower duty cycle overhead cranes. They fit a specific design criteria and meet the duty cycle requirements of the crane based on their capacity and amount of use they'll see during the course of their lifetime.

On a built up hoist, all of the components are specifically engineered for a specific purpose and are designed to last a very long time. These are systems that do one thing very well and they thrive in applications where a complex lift is needed. It's not unreasonable to see built up hoists that can stay in service for 40 years or more when they're designed properly!

Built up hoists are also designed to be more reliable, easier to inspect, and easier to service and repair than a package hoist system. A catwalk or service platform is commonly found on cranes with built up hoists to allow maintenance and service personnel access to the hoist for inspection or maintenance.

These types of hoists often have individual grease ports for the roller bearings to allow for easy lubrication. The hoist and trolley are also designed to allow easy access to gear boxes, brakes, and couplings for adjustment or repair.

Built up hoists are found on top running double girder crane systems. This design gives them the advantage of:

- No limits to the maximum span or capacity of the crane, hoist, or trolley
- The most overhead room
- The greatest hook height

On a new process crane, the system will come standard with modern features and technologies, which provide better controls, precision movement, and safety when moving a load through a facility. Some of these technologies include:

- Variable frequency drives
- Anti-sway technologies
- Slow down and stop limit switches
- Remote radio controls
- Monitoring and diagnostics

Utilizing diagnostics information, maintenance personnel can monitor the time between recommended maintenance intervals for individual hoist components. This also allows them to schedule preventative maintenance to help reduce equipment downtime.

For example, by monitoring the predictable preventative maintenance schedule, they can help improve the crane's safety by knowing when the hoist components have reached the end of their useful service life so they can either rebuild the internal components or replace them entirely.

In a steel mill, automotive stamping facility, or mass-production environment, there really is no better option than a built up hoist to handle technical and dangerous overhead lifts.

Disadvantages of a Built Up Hoist

Cost would be the biggest disadvantage to specifying a built up hoist into an overhead crane system. The cost factors into the equation in many ways:

- Only compatible with top running double girder crane systems
- Additional engineering and design requirements
- Specialized components and lead times
- Additional transportation and freight costs
- More complicated / longer installation

Lower duty cycle cranes can utilize more standardized and economical hoists—resulting in significant cost savings. However, it can be argued that the initial investment into upgraded built up hoist components and technologies will offset the costs of future maintenance and repairs. By taking the time to engineer the hoist to perform exactly as intended, and to withstand the rigors of the lift it will be performing, the hoist will experience a longer operating life and will be more durable and more reliable for the end-user.

Versatility would be another disadvantage to a built up hoist. These hoists are designed to do one thing and do that one thing extremely well. Lower duty hoist systems have a little more flexibility in terms of how they can be used. They can pick various types of materials and vary the frequency of lifts within their capacity and duty cycle requirements.

Training and inspection would be another factor for the end-user. Even to a seasoned crane operator, there will be an adjustment period to get used to the way the crane handles and performs. If the crane operators were used to operating an older package hoist system, the controls and performance of a new built up hoist can feel very different. The components of the hoist are also more complex and may require more training or a more seasoned inspector to perform frequent and periodic crane inspections.

Most crane manufacturers or service companies will offer training for the operators and in-house maintenance personnel once the crane system has been installed—these trainings can be fully customized based on the preferences of the business owner, operators, and maintenance personnel.

Wrapping it up

We hope that this lesson gave you a better understanding of the different types of overhead crane hoist configurations that are available to you. When designing your overhead crane system, careful consideration should be given to the design and specifications of the hoist—as this will be the device actually performing the lifting and lowering of the loads.

If your hoist will be used in low headroom applications, or will be used on a high-capacity overhead crane system, then you should make sure that you receive and carefully review approval drawings. This will verify that the hoist specifications meet the operating and usage requirements of your lifting needs.

Also, consider whether a chain hoist or wire rope hoist is more applicable for your lifting needs, and whether a manual hoist, electric hoist, or air-powered hoist will meet the demands and usage requirements of your crane system.