To many people in the industry, freight-elevator-door control systems seem complex. When they are up and running, they seem to work great, when the system is down, it seems hard to even know where to start to troubleshoot. This does not have to be the case.

Freight-door controllers have come a long way from the old “clapper” relay logic door controllers with any number of “Christmas Tree” switches that used to fill large door control cabinets with a maze of wiring. Today's controllers are easier to install, have optional “slave” operation for simple interface with elevator controllers like Motion Control Engineering, Inc. (MCE), they use the latest technologies like microprocessors or programmable logic controller along with proximity sensors for reliable trouble free operation. Freight-door manufacturers are now including light curtains as the standard door protection over the traditional contact reversing edge which allows user selectable automatic closing per the requirements of ASME A17.1-2000. You can be assured that in the latest freight-door controllers, consideration has been given to make the installation, troubleshooting and maintenance as quick and easy as possible.

Freight-door controllers start off with the following basic components:
1. Door controller to elevator controller interface connections typically for auto-open, inspection operation, fire service and other control optional initiations and contacts.
2. A processor unit using a microprocessor like a Program - matic Logic Controller (PLC) in order to keep the cost down and improve reliability.
3. Door, gate and retiring cam motor control designed to provide smooth reliable operation of what can be very large and heavy doors.
4. A “zoning” method usually installed at the landing door and activated by the retiring cam. The zone switch is used to initiate only the landing door operators and push buttons at the car's landing destination.
5. A reliable open and close limit switch arrangement for proper start, slowdown and sequence of operation of the doors and gates.

To complete the door controller, today's freight-door systems are fitted with easy-to-install safety edges such as non-contact infrared light curtains for best protection, automatic or momentary pressure closing requiring an audible signal device. A power transformer is included. Transformers can now be pre-wired and mounted within the controller cabinet making installation quicker by having to mount only one controller box. Physically smaller dimensions for microprocessors and PLCs have also eliminated the need for a second control box where the elevator has front and rear openings.

Let's start with electrical interface requirements. Standard freight-elevator-door controllers are equipped with Sequence Operation per EN81-1998, ASME A171.1-2000 and CSA B44-00. Sequence operation of the door and gate ensure that the car gate does not begin to open until the bi-parting door has completed 2/3 of its opening before the car gate begins to open, and that the car gate has finished 2/3 of its closing before the bi-parting door begins to close. This is to remove the tripping hazard caused by the lower panel of the bi-parting door by blocking the elevator car entrance with the car gate thus not allowing ingress or egress before the landing door is open. For door controllers designed for Firefighters Emergency Operation per ASME A171.1-2000, sequence of operation is not required during Phase 2 Operation in order to allow faster operation of the door by the firefighters.

Freight-door controllers require the following initiations:
- Retiring Cam – A constant initiation is required to pick the retiring cam and lock the door for elevator travel. Once the doors are closed, the signal to lift the cam is received and the interlock functions to lock the door. Only after a locked signal is received by the elevator controller, as part of the interlock circuit, is the car allowed to move.
- Auto-Open – Momentary initiation allows the doors to automatically open once the car is leveling within the leveling zone.
- Phase 1 Emergency Recall – A constant signal is required to initiate closing of the doors (in some cases a visual and audible signal is provided to tell the operator to close the doors). Reopening devices affected by smoke must be ignored in this operation and, if the doors close automatically, they must be reduced in speed to keep their closing kinetic energy below 3.5 Joules or 2.5 ft-lb. The units for closing kinetic energy are not related to the closing force but rather the speed and mass of the car gate in the formula KE=1/2mv^2. To illustrate an example of the calculation we take a 100kg–car gate operating in slow speed at 0.2mps (typical slow speed):

\[ KE = \frac{1}{2}mv^2 = \frac{1}{2} \times (100\text{kg}) \times (0.2\text{mps})^2 = 2 \text{ Joules} \]

If you are doing this calculation in imperial units, don’t forget that the mass of the gate must be in units of slugs for proper calculation.
- Designated or Alternate Landing – During Phase 1 Recall Operation, this initiation will indicate to the freight-door...
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controller that the elevator is at the recall designated or alternate landing floor, and thus the door will remain open awaiting use by the emergency personnel.

- **Phase 2 Emergency In-Car Operation “ON”, “HOLD” & “OFF”** – Three separate initiations are required to indicate the in-car operation of the elevator. Door operation and push-button function are specific to each of the operations. It should be noted that vertically sliding doors have specific requirements different from passenger horizontally sliding doors.

- **Hall Door Button** – Use the corridor door open and close button control function initiation when switching to attendant operation. The latest freight-door controllers do not necessarily require corridor button cut-off in Phase 2 Emergency Operation if the function is performed automatically within the door controller.

- **Inspection Circuit Cut-Off** – During inspection, it is important to disable the freight-door controller using this initiation to avoid unwanted door operation.

In order to complete the interface, signals for car gate fully open and for door fully closed, along with the requisite interlock and gate contact signals, are provided.

The freight door controller is typically installed in the machine room. Wiring from the freight door controller needs to connect to three places, the elevator car, the hoistway landing doors and the elevator controller. Therefore, it makes sense to install the controller in the machine room rather than the car top. Wiring to the elevator controller is required to facilitate the initiations and signals mentioned above. Another set of wires goes to the elevator car for the car gate components, retiring cam, reopening device and other components. Finally, a set of wiring also goes down or up the hoistway wall near the landing doors as wiring is required for the hoistway door motors, hall push buttons and interlock circuits.

Hoistway wiring offers the best opportunity for alternate methods to reduce the amount of wiring. One such method that has been around for many years is the use of the zone switch. A zone switch integrated with the door

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*Figure 1: Master limit freight-door control*
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freight-door applications. Conductors are sufficiently served with #18AWG for most.

In freight elevator doors, the elevator serves. The savings are a multiple of the number of floors.

Traditional methods which require switches for each landing and wiring is reduced this way.

Door limit switches also offer an opportunity to reduce the amount of hoistway wiring. Traditionally, at least two switches were provided for each landing door and activated by the door for open and close slowdown. These switches were either wired in series or parallel to each of the landing doors before being brought back to the door controller. Every individual switch has to be adjusted and when many floors necessitated many switches, troubleshooting is like trying to find the one burnt-out bulb in a string of Christmas tree lights.

Another method is to mount two switches on the elevator car using proximity sensors. The latest in proximity sensor technology offers high reliability and the extended ranges necessary to control the landing doors from the side of the elevator car using a “master limit” arrangement. Figure 1 illustrates how the proximity sensors control slowdown of the landing door from the car. With the door motor and hall push buttons properly zoned-in, operation of the landing door is controlled by the proximity sensors that function to control the speed of the landing door as it operates.

The advantage of this method of door control can be found in two items: 1) proximity sensors by nature do not require any physical contact, can only sense metallic targets (not effected by dirt, grease or water) and are solid state lasting millions of cycles. Therefore, after installation, no further adjustment or maintenance is required, and 2) since one set of limit switches operate all landing doors in that line, significant savings are had in the installation and wiring compared with traditional methods which require switches for each landing. The savings are a multiple of the number of floors the elevator serves.

On the car you will find a gate operator, a gate contact, a reopening device, a retiring cam, limit switches and door/gate operation push buttons. The door open and close push buttons are typically part of the car operating station. Ideally, #14AWG size wires should be used for the car gate operator and retiring cam motor, although #18AWG will suffice in many cases, and these can be doubled up when necessary. Control conductors are sufficiently served with #18AWG for most freight-door applications.

Once the hoistway door and car gate components have been wired per the manufacturer’s prints, it is time to move on to the operation of the doors. It is important to note the operation of the hoistway landing door and car gate are dependant of each other because of their sequence of operation. The car gate will not function properly without the proper operation of the landing door and vice-versa. Begin your initial startup with the doors closed and the elevator leveled at a floor. Stay at this floor until the door is working properly there. Start by making sure the retiring cam is extended and the zone switches are fully activated. The zone switch usually has an input to the controller that will initiate the door function, begin by finding this input. It is usually part of a series of contacts starting with a zone contact followed by stop switches or other stop devices like unlocking device switch.

Once you know the controller is initiated through this input, make sure the input from the slowdown switches is functioning properly. Typically, the normal open speed input will be high for both door and gate and will go to low to initiate the slowdown. Make sure both door and gate open limits are high when the door and car gate is closed. The close limits should be low. Initiate the open push button. The open relay and the door and gate relay should start the motors. This is where you will find out if the three-phase motors are phased properly. If the door or car gate motors run in the wrong direction and want to close the door rather than opening, it is likely the phase is reversed. Freight doors use three-phase motors and can easily be reversed by switching any two wires to the motor. When you get the doors to open, note that the landing door will open first and, once it reaches its open limit, the car gate will begin to open (sequence operation). After both door and car gate reach their open limits, a timer will time out the final operation. This timer is typically user adjustable. The close operation is more complex. Now, you will need to make sure your reopening device is functioning properly before you will be able to close the doors. A fail-to-safe operation will not allow proper closing unless the input is high when the device is not obstructed. You will also need to apply continuous pressure to the close button unless momentary pressure or automatic close has been selected.

Once the basic operation is complete, try the initializations for the Emergency Operations and check for proper function. A properly functioning door and car gate at the initial floor will make adjustment easier when moving to the remaining floors in line. Typically, if the car gate was working at the initial floor, you will
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only have to check the functions of the landing door as you move the car to the remaining floors for adjustment. Freight-elevator doors, installation and proper adjustment are key. Once all the floors have been adjusted and the system is operating properly, it should provide years of trouble-free operation.

With consolidation of the elevator industry and the demand for quicker installations and easier commissioning, the application of new technologies and functions has demanded changes of the freight-door manufacturers. There is the possibility of other devices and features that can be applied someday to freight-door control. For example, many customers are asking why motor drives have not been applied to freight doors. There has been some limited success in this research but motor drives by nature have hurdles to overcome. Because they use pulse-width modulation to provide speed control, the drive signals have high order harmonics that cause noise and cannot be transferred along lengthy travel or hoistway cables due to interference that will cause possible motor burnouts.

Closed-loop operation is another industry buzzword being asked of freight-elevator doors. The true definition of a closed-loop controller basically ensures that the speed of the motor is regulated by the drive system despite fluctuations in load, similar to a car cruise control. Although accurate speed control may be ideal for elevator traction motors or similar applications, it has the potential for applying relatively high forces under heavy loads in order to keep its speed. This is not required in door control and not desired where freight handlers and passengers are operating the doors. Best suited for their application, freight door motors are typically high slip in order to allow smooth safe operation of the doors. Precise speed control is not required.

If these hurdles are overcome, however, there may be a place for these technologies in freight doors. With the advent of the machine-room-less elevator and other fantastic new methods of elevating, the future for freight-elevator-door control may look entirely different than it does today.

Steve Reynolds is with Product Development at The Peelle Company Ltd.
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INSTALLING FREIGHT ELEVATOR DOORS

by Joseph De Simone

Introduction

This article is meant to provide field mechanics with a general step-by-step guide for the successful installation of freight elevator doors and gates. It should be noted, however, that each manufacturer of freight elevator doors provides specific installation instructions with their equipment. These job specific installation instructions should be followed in lieu of the general instructions set out below.

Scope

While the ASME A17.1-2000 Code recognizes several types of freight elevator entrances (Section 2.11.2.2 ASME A17.1-2000 Code), this article will cover only vertically sliding bi-parting counterbalanced freight elevator doors and gates. Bi-parting freight elevator doors consist of two panels, one that slides upward and one that slides downward when opening. Vertical bi-parting doors provide full opening width access to the inside of the car, but require very little additional hoistway space. Bi-parting doors can be applied in most hoistway situations, including short spandrel heights, shallow pit, and low overheads. They can be power or manually operated and are designed to match the capacity and class of loading of the freight elevator.

General Code Requirements and Considerations

By definition, a freight elevator is “...an elevator used primarily for carrying freight, and on which only the operator and the persons necessary for unloading and loading the freight are permitted to ride” (Section 1.3, ASME A17.1-2000 Code). Car gate and car door requirements are set forth in Sections 2.11, 2.12, 2.13, 2.14 and 2.16 of the ASME A17.1-2000 Code. These sections also include the requirements for the contacts, interlocks and power, operation associated with freight elevators.

Hoistway Safety

Prior to starting the installation work, ensure that all necessary barricades are in place and that they meet the OSHA and local authority requirements. This is especially true in view of the fact that, very often, the door installation work is performed from a running platform.

In addition, you will most certainly need a hoist or chain fall for the movement of the freight door materials. Make sure the hoist, hoist support, hoist chains, slings, straps, and any other accessories that will be used to hoist the door panels into position, are capable of safely supporting the door panels. Carefully inspect each component of the hoisting system for damage or wear before use.

Identification and Handling of Freight Doors

Freight elevator door panels require special handling. Always transport and store the freight door panels vertically, with the heavy side down. Never transport or store the freight door panels laying flat.

Each door is identified with a number (Figure 1). The manufacturer’s door number corresponds with the landing designation set out in the approved layout drawings. The door number is used throughout the job to identify mated door panels, guides and other associated hardware. Typically, the corresponding numbers are located on the side angles of the upper and lower door panels.

Freight door installation and maintenance is principally accomplished from the hoistway side of the opening. For this reason, all freight door equipment is marked left or right hand, as viewed from the hoistway (standing in the car looking out). For example, an interlock mounted on the right hand side of the opening, viewed from the hoistway side, is properly identified as a right hand interlock.

The Field Survey

A field survey of the hoistway is the single most important step in the freight elevator door installation process. It is also the step most ignored by elevator mechanics.

First, check floor heights, opening heights, and returns on the job, and compare them with your approved layout drawings. From the layout and your own measurements, make sure that floor heights are adequate so that all doors can be opened fully without interfering with closed doors at floors above or below. If the height is not adequate
at a particular floor or floors, it will be necessary to install a pass type door. (This should have been noted on the layout and the appropriate special materials provided.) Any discrepancy here must be immediately brought to the attention of the freight door manufacturer. Likewise, check the distance between the jamb and the side wall to insure that there is sufficient space for the door operators, interlocks, retiring cam and other freight door components. Again, any discrepancy here must be immediately reported to the freight door manufacturer.

Finally, verify the distance from the car platform to the entrance sill, and confirm that it is the same across the face of the opening at each landing. The distance from the car platform to the entrance sill must not cause the running clearance between the platform and the doors to drop below 1/2 inch (13 millimeters), or increase to more than 1-1/2 inches (38 millimeters). Also, at each opening, verify that all sills are level. Sills must be level to a tolerance of 1/8 inch (three millimeters) for every eight feet (2,440 millimeters).

Remember, an incorrect hoistway equals a bad installation. If after completing the field survey, it is determined that the existing hoistway conditions are incorrect or different from that depicted in the approved layout drawings, stop and contact the freight door manufacturer. Do not assume responsibility for an incorrect hoistway.

**Step 1: Installation of Door Guide Rails**

The entrance frames for a freight elevator door are usually installed by others. Since door guide rails run almost continuous from the bottom to the top of the hoistway, and are attached to the entrance frames, it is essential that the frames be installed directly above one another in proper relation to the elevator main guide rails. The frames must be held square and plumb to within 1/4 inch (six millimeters).

Make a thorough survey of the conditions, and check them against your approved door layout drawings. This can be done by one of two methods: Method 1 – drop a plumb line down the hoistway and use a guide rail gauge angle to set the guide rails, or Method 2 – utilize the car platform as a template. For purposes of this article, we will describe the steps involved in Method 1. Method 2 assumes that the car platform travel is true and plumb throughout the entire hoistway and is not the preferred method for guide rail installation.

Locate the guide rail gauge angle provided by the freight elevator door manufacturer (Figure 2). The guide rail gauge angle contains three factory-made marks at each end: Mark 1 (towards the center of the opening) indicates the edge of the jamb. Mark 2 (center) is the edge of the guide. Mark 3 is the center of the bolt hole. These three marks, along with a plumb line, are used to survey the hoistway entrances and insure proper opening width for your freight door equipment.

Drop and secure a plumb line from top to bottom of the hoistway and verify the distance from the plumb line to each jamb. The plumb line should be set approximately two inches (50 millimeters) off the sill. This plumb line must remain secure throughout the guide rail installation.

At the top, middle, and bottom of each opening, make a temporary mark on the guide rail gauge angle at the plumb line. Upon completion, make a permanent mark on the guide rail gauge angle at the halfway point between the two outside temporary plumb line marks (Figure 3). At each opening, align the permanent plumb line mark on the guide rail gauge angle with the plumb line. While holding the guide rail gauge angle level, verify on both sides of the hoistway: (1) the edge of guide mark does not fall inside the entrance at either side of the hoistway, and (2) the center of bolt hole mark does not fall closer than 1/2 inch (13 millimeters) to the outside of the edge of jamb. If you have either of these conditions, stop and call the freight door manufacturer immediately.

Guide rails are manufactured and shipped in pairs (left and right) for specific landings. There are three types of guide rails – lower, intermediate and upper. Upper guides are marked to correspond to the opening for which they serve as the upper guide. Intermediate guides act as the upper guide for a lower opening and extend up to act as...
On one side of the opening, set the bottom of the upper or intermediate guide even with the center line reference mark (Figure 5). Please note that there is a bright yellow label on the guide rail identifying the bottom end of the guide rail. Do not consider the strap welded across the upper/intermediate guide rail when lining up the bottom of the guide with the center line reference mark. Clamp the guide rail into position. Check the side-to-side position of the rail at several places along its length using the guide rail gauge angle and plumb line. Please note that intermediate guides extend upward to within 1/2 inch of the center line reference mark of the opening above. If the guide rail is too long, the upper end may be sawed off to obtain the 1/2 inch (13 millimeter) clearance. If significantly more or less than 1/2 inch (13 millimeter) clearance exists, contact the freight door manufacturer immediately for assistance.

Drill the appropriate hole at the top of every slot on the guide rail within the entrance frame, and every fourth slot outside the entrance frame. Apply a small amount of lubricant to the threads of the self-tapping bolts provided by the manufacturer, and insert into holes. It is important that you do not use washers under the head of the guide rail bolts. Guide lugs are used to secure guide rails extending beyond the steel entrance frame.

Using the plumb line and level, verify that the guide rail is plumb and true. Should the guide rails vary in and out from the jamb, it will be necessary to shim behind the guide rail to insure the rail is plumb and true. Slotted shims and kicker shims are provided for this purpose. Please note that excessive shimming of the door guides may void the entrance fire rating, and may cause your installation to fail inspection.

After the upper/intermediate guide is set, install the lower guide rail 1/2 inch (13 millimeters) below the center line reference mark, using the same method described above.

The lower guide for next opening. Intermediate guides are marked to correspond to the opening for which they serve as the upper guide. Lower Guides are marked to correspond to the opening for which they serve as the lower guide, followed by the letter “A.”

Beginning with the lowest opening, measure up from the finished sill one half the designed opening height, as shown on the approved layout drawings, and place a center line reference mark on each jamb (Figure 4). Using the guide rail gauge angle and level, make sure that the reference marks are level with each other. If the marks are not level, use the lower of the two sides as the reference point.

**Step 2: Installation of the Door Operators**

Mount a power door operator to the upper/intermediate guide on each side of the opening with the motor on the back side (nearest the wall) and the junction box...
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down (Figure 6). Each Operator has a 3/8 inch (9.5 millimeters) roll pin between the mounting bolt holes. Position the roll pin in the hole provided in the upper/intermediate guide rail to establish proper location and assist in the mounting operation. Using the mounting hardware provided by the freight door manufacturer, bolt the door operators to the side of the upper/intermediate guide rails in the holes provided. Please note that for pass type doors, the door operator mounting holes are located in the pass guide rail.

Step 3: Installation of the Interlock

Mount the interlock and side opposite latch (when applicable) to the lower end of the upper/intermediate guide rail, in the holes provided just above the center of the opening, using the mounting hardware provided by the freight door manufacturer (Figure 7). Please note that for pass type doors, the interlock mounting holes are located in the pass guide rail. Refer to the approved layout drawings to confirm which side of the hoistway the interlocks mount. Do not install the interlock roller arms at this time.

When applicable, mount the center latch in the center of the sill and lintel. It is very important that the center of the opening be accurately located, and that the devices are accurately located in relation to this centerline.

Step 4: Installation of the Door Panels

The lower door panel is installed first. Place the door panel in an upright position on the floor, using wooden blocks beneath the side angles to guard against damage and injury. Wrap lifting straps around both door arms of the lower door panel and carefully lift the lower door panel into the opening (Figure 8). Important! Be sure the hoist, hoist support, hoist chains, slings, straps, and any other accessories used to hoist the door panels into position, are capable of safely supporting the door panels. Carefully swing the lower door panel into position between guides and lower the door panel onto the guide stops or sill stops.

Push the door panel against the guide bolts. If both side angles on the door panel are flat against all the guide bolts, twist is not present. You may proceed with installation. If both side angles are not flat against the guide bolts, the door panel has some twist that must be removed before continuing with the installation of the door panel.

If twist exists, one method of removing it is as follows: (1) While the door panel is still hanging from the hoist, place a block at one corner of the door panel between the edge of the panel and the elevator platform. Grip the door panel at the corner diagonally opposite the blocked corner, and apply pressure to the upper edge of the panel opposite the observed twist.
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Once you have determined that you are working with a flat door panel, install four guide shoes in the pre-drilled tapped holes on the door panel side angle. The guide shoe mounting bolts should be loosely tightened at this point. The guide shoes will be adjusted and tightened after the door chains have been installed.

After installing guide shoes, lower the door panel to its full open position. Where applicable, adjust the guide stops to insure that the lower door panel is 1/8 inch (three millimeters) below the sill and level from side-to-side. You can now remove the lower door panel from the hoist.

After installing the lower door panel, install the upper door panel following the above steps. Hoist the upper door panel into an open position that is level from side-to-side and 1/8 inch (three millimeters) above the lintel. The upper door panel should remain suspended from your hoist until door chain rods and chains are fully installed.

**Step 5: Installation of the Chain Rods and Chains**

Hand actuate the latch on the interlock and insert the temporary hold open clip provided by the freight elevator door manufacturer. Holding the chain rod with the threaded end down and the slots parallel to the door panel, pass the chain rod up through the latch and rod guide on the interlock. Insert the threaded end of the chain rod through the lower door panel pick-up and rod positioner. Allow the chain rod to rest on the temporary chain rod spacer that is strapped to the rod. Thread a hex nut and lock nut onto the chain rod. Adjust and loosely tighten the rod positioner, located on the door panel door arm, to get the chain rod as true and plumb as possible at this time. Please note that it is important to get the chain rod true and plumb; failure to do so will result in poor operation of the freight door and could cause damage to the interlock.

Locate the door panel gauge angle. Verify that the length of the door panel gauge angle equals the opening height of the door panels plus 1/4 inch (six millimeters). Hoist the upper panel to its full open height and be sure that the lower door panel is resting firmly on the guide stops. Use the door panel gauge angle to verify that the doors are at their full opening height. With the door panels at their full open height, cut the door chain to correct length and attach it to the chain rod. Repeat the process on the opposite side, and remove the chain rod spacers from both chain rods.

Carefully transfer the weight of the upper door panel from the hoist to the chain. Once all of the panel's weight is supported by the chains, un-strap the upper door panel from the hoist. Adjust and tighten the door panel guide shoes to allow free movement of the door panels. Limit side-to-side play to about 1/16 inch (two millimeter). Close the door panels and remove the temporary interlock open clip. Using a level, check both door panels to insure that they are square and level. Check to see that the chain rods are approximately centered in the rod guides. Tighten the rod positioner on the lower door panel door arms, adjust if necessary to center, and plumb the chain rods. Secure the rod positioner in place.

With the interlock in the locked position, the door panel should not be able to open more than 3/4 inch (19 millimeters). The lower chain rod may be adjusted slightly to accomplish this. Please note that any adjustment to the lower chain rods must be compensated for by adjusting the door adjuster rod on the upper panel to maintain door open height (e.g., if the lower chain rod hex nuts are loosened two turns, the upper door adjuster rod square nuts must be tightened two turns.

**Step 6: Installation of the Door Limit Switch**

With the door panels in the closed position, attach the limit switch and bracket assembly to the upper/intermediate guide rail directly below the door operator, and on the same side of the opening as the interlock in the pre-drilled holes provided by the freight door manufacturer (Figure 10).

Attach the door open cam to the upper door panel.
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Bracket and adjust to a middle position. There is a channel on the back side of the door open cam. This channel fits over the square nut that secures the upper chain rod, and prevents any movement. Adjust the nylon gib so that the door open cam properly actuates the limit switch.

Open the door one-to-two inches (300-to-600 millimeters). Mount the door closed cam on the upper door panel in the holes provided by door manufacturer at the upper end of the door side angle. Adjust to a middle position, and check to make sure that the door closed cam clears the door operator.

When applicable, attach an Auto-Sta Set Switch to the guide stop on the interlock side of the hoistway. The Auto-Sta Set Switch is actuated by a permanent cam angle attached to the lower door arm. Adjust the position of the Auto-Sta Set Switch by means of the slot in the mounting bracket, so that the switch is actuated when the lower door is 1/4 inch to 3/4 inch from full open.

**Step 7: Installation of the Emergency Unlocking Devices**

When applicable, install the emergency unlocking device (EUD). Please refer to the approved layout drawings, and note the designated floors for the EUD installation.

Drill a hole through the hoistway wall. This hole should be aligned as closely as possible to the hole in the top of the interlock roller arm. Install the EUD pipe through the hoistway wall. Attach EUD box to EUD pipe on hall side using the mounting hardware provided by the freight elevator door manufacturer. Hold the EUD box in a plumb position and then, using the hole in EUD box, drill the necessary mounting holes and fix the EUD box in position. Thread the EUD chain and wiring through the EUD pipe from the hall/box side. Using an “S” hook, attach the EUD chain to the hole at the top of the interlock roller arm. (Figure 11).

Operation of the interlock by the pull chain unlocks the freight doors when the car is not present at the landing. For this reason, please limit access to the emergency unlocking device (EUD) keys.

**Conclusion**

This completes the mechanical portion of the freight door installation process. Still remaining is the mechanical installation of the car gate, hoistway and electrical wiring, and installation of the freight elevator door controller, all of which are beyond the scope of this article. It is important to reiterate that the steps set out in this article are general in nature. Please consult the specific installation instructions provided by the freight elevator door manufacturer before starting your job.

*Joseph De Simone* is vice president of Sales at Courion. His entire 40-year career has been in the freight elevator door industry, working in Chicago, New York, and currently in St. Louis. He has been an active participant and past treasurer of the Chicago Elevator Association. De Simone also has been an active member and supporter of National Association of Elevator Contractors (NAEC) serving for three years on the Members Services Committee. In 2000, he was elected to serve a three-year term on the board of directors of NAEC and has served as the elected treasurer for the past two years. He currently is the Supplier Chairman, Finance Committee Chairman and Board Liaison to the Awards Committee for the NAEC.